Offshore Wind Cable Corridor Constraints Assessment

Final Report | Report Number 23-06 | January 2023

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Offshore Wind Cable Corridor Constraints Assessment

Final Report

Prepared for:

New York State Energy Research and Development Authority

Albany, NY

Kate McClellan Press
Senior Project Manager

Prepared by:

WSP USA

New York, NY

Janine Whitken
Assistant Vice President, Earth & Environment
and

VHB

New York, NY

Cindy Shurling
Federal Environmental Practice Leader

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Abstract

This study supplements a collection of studies prepared on behalf of NYSERDA to provide information related to a variety of environmental, social, economic, regulatory, and infrastructure-related issues implicated in planning for future offshore wind energy development off the coast of New York State. This study provides the understanding of environmental, technical, and stakeholder constraints, as well as opportunities, concerns, impacts, and risks of potential undersea and overland cable corridors and associated landings; and informs potential future policy actions to maximize the benefits of OSW and minimize conflicts and impacts in a timeframe to support achieving the mandated 9 GW of offshore wind by 2035.

Keywords

offshore wind, transmission, constraints, siting principles, undersea cables

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Acronyms and Abbreviations

AC	Alternating Current
ACHP	Advisory Council on Historic Preservation
AIS	Automated Identification Systems
AWOIS	Automated Wreck and Obstruction Information System
BIA	Biologically Important Area
BMP	Best Management Practices
BOEM	Bureau of Ocean Energy Management
CECPN	Certificate of Environmental Compatibility and Public Need
CEHA	Coastal Erosion Hazard Areas
Climate Act	Climate Leadership and Community Protection Act
CMP	Coastal Management Program
ConEd	ConEdison
COP	Construction and Operations Plan
CSRM	Coastal Storm Risk Management
CWG	Cable Working Group
CZMA	Coastal Zone Management Act
DC	Direct Current
DOE	Department of Energy
EFH	Essential Fish Habitat
EM&CP	Environmental Management and Construction Plan
EMF	Electromagnetic Fields
ENC	Electronic Navigational Charts
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FLAG	Fibre-optic Link Around the Globe
FR	Federal Register
FUDS	Formerly Used Defense Site
GARFO	Greater Atlantic Regional Fisheries Office
GIS	Geographic Information System
GW	Gigawatts
HDD	Horizontal Directional Drill
HVAC	High-voltage Alternating Current
HVDC	High-voltage Direct Current
IBA	Important Bird Areas
IMO	International Maritime Organization
IPaC	Information for Planning and Consulting
IR	Inadvertent Releases
kV	Kilovolts

LWRP	Local Waterfront Revitalization Programs
MARCO	Mid-Atlantic Regional Council on the Ocean
MBR	Minimum Bend Radius
mG	Milligauss
MGP	Manufactured Gas Plant
MW	Megawatts
NARW	North Atlantic Right Whale
NEFMC	New England Fishery Management Council
Neptune	Neptune Regional Transmission System
NM	Nautical Mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NR	National Register
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NYC	New York City
NYCRR	New York Codes, Rules and Regulations
NYCWRP	New York City Waterfront Revitalization Program
NYNHP	New York Natural Heritage Program
NYS	New York State
NYSAGM	New York State Department of Agriculture and Markets
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
NYSDOT	New York State Department of Transportation
NYSDPS	New York State Department of Public Services
NYSERDA	New York State Energy Research Development Authority
NYSM	New York State Museum
NYSOGS	New York State Office of General Services
NYSOPRHP	New York State Office of Parks, Recreation and Historic Preservation
NYSPSC	NYS Public Service Commission
OPSAR	Oil Spill Prevention, Administration and Response
OSHA	Occupational Safety and Health Administration
OSW	Offshore Wind
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PMAZ	Priority Marine Activity Zones
POI	Points of Interconnection
PSC	Public Service Commission

REC	Recognized Ecological Complex
RFI	Request for Information
ROW	Rights-of-Way
SAV	Submerged Aquatic Vegetation
SCFWH	Significant Coastal Fish and Wildlife Habitat
SMA	Seasonal Management Area
SMIA	Significant Maritime Industrial Areas
SPDES	State Pollutant Discharge Elimination System
SSWQMP	Suspended Sediment and Water Quality Monitoring Plan
SWPPP	Stormwater Pollution Prevention Plan
T&D	Transmission and Distribution
T&E	Threatened and Endangered
TOYR	Time of Year Restrictions
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USCG	United States Coast Guard
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
VOC	Volatile Organic Compounds

Glossary

Approach Areas	The three offshore marine approaches (South Shore, Long Island Sound, and New York Harbor) and overall land-based approaches to points of interconnection (POIs).
Avoidance	An approach to project siting, development activities, and operations of facilities that result in no or negligible impacts to a resource.
Corridor	Area of consideration for cable siting.
Minimization	An action that minimizes the severity of effects of an unavoidable impact to a resource.
Mitigation	An action that compensates for (replaces) any loss of resource or resource function, such as purchase of wetland mitigation bank credits; contribution to a mitigation fund as appropriate; or replacement.
Study Area	All onshore and offshore areas in New York State where cables may connect offshore wind projects with POIs.
Subzone	Portion of a zone with unique constraints requiring further evaluation and consideration.
Zone	Location within a potential corridor with constraints of similar type and significance or an area to connect a landfall with one or more POIs maximizing existing rights-of-way (ROWs).

Summary

The New York State Energy Research and Development Authority (NYSERDA) commissioned this analysis to document and increase the understanding of environmental, technical, and stakeholder constraints, as well as opportunities, concerns, impacts, and risks, of potential undersea and overland cable corridors and associated landings; and inform potential future policy actions that maximize the benefits of offshore wind (OSW) and minimize conflicts and impacts in a timeframe to support achieving the mandated 9 gigawatts (GW) of OSW by 2035.

S.1 Introduction

The Offshore Wind Cable Corridor Constraints Assessment documents the effort to increase the understanding of challenges and opportunities relevant to OSW development through the collaboration of the Cable Working Group (CWG); engagement of agencies and stakeholders; and analysis of environmental, technical, and stakeholder opportunities, concerns, impacts, and risks of potential undersea and overland cable corridors and associated landings. The CWG includes NYSERDA, the New York State Department of Environmental Conservation (NYSDEC), Department of State (NYSDOS), Department of Transportation (NYSDOT), Office of General Services (NYSOGS), and Department of Public Service (NYSDPS). CWG comprises the State agency partners critical to the OSW cable regulatory process.

The scope of this assessment does not address all aspects of potential cable corridors but focuses on issues most likely to present risks and opportunities relevant to achieving 9 GW of OSW by 2035. The scope of the assessment does not substitute for a site-specific analysis of feasibility or impacts or prescribe any analysis of alternative routes required as part of any regulatory review process.

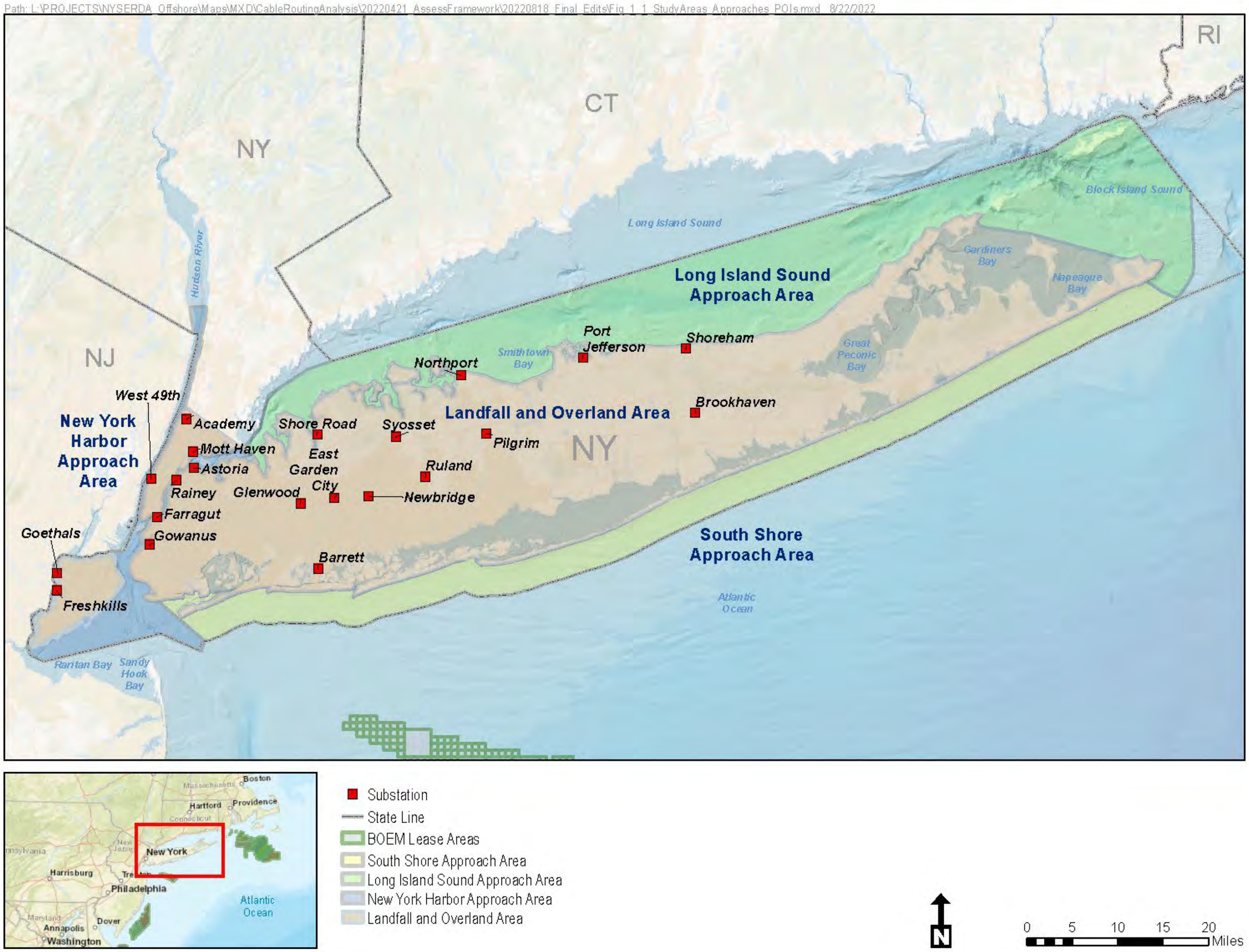
The study area consists of four areas for bringing OSW energy to the New York City (NYC) and Long Island transmission grid: South Shore, Long Island Sound, New York Harbor Approach Areas, and the Landfall and Overland Area. The study area boundaries reflect the jurisdictional borders between New York and Connecticut, and New Jersey, and federal waters, shown in Figure S-1. The legal and regulatory jurisdictions determine the applicable permitting and compliance requirements. In practice, the states share the resources of the Hudson River and Long Island Sound, and OSW cables may cross State boundaries.

To connect an OSW project to New York State's power grid, transmission cables will likely route through State waters to the point of interconnection (POI), which requires approvals from multiple State agencies. The Certificate of Environmental Compatibility and Public Need (CECPN or Certificate) is the primary authorization for transmission lines pursuant to Article VII of the New York State Public Service Law, which permits construction, operation, and maintenance of transmission lines. The Bureau of Ocean Energy Management (BOEM) leads the federal environmental review process for approving OSW projects, including evaluation of the transmission interconnection cable. Other federal agencies, like the U.S. Army Corps of Engineers, have separate regulatory reviews and consultations for activities in State waters.

Stakeholders in the development of the assessment included environmental non-governmental organizations, academic institutions, the maritime community, the OSW industry, federal agencies, adjacent states, and other potentially interested parties. Feedback from stakeholders is also integral to understanding the constraints, concerns, and relative risks associated with OSW cables and connection to the transmission grid. NYSERDA engaged with stakeholders through the Request for Information (RFI) process, NYSERDA's Technical Working Groups, and via individual meetings.

The technical characteristics of cable systems and cable installation technologies, including high-voltage direct current (HVDC) and high-voltage alternating current (HVAC) features and parameters related to installation, operation, maintenance, and cost provide foundation information to support the understanding of impacts from cable installation, operation, maintenance, and decommissioning. Technical and engineering factors determine spatial requirements for cable installation and maintenance necessary to avoid or address potential constraints undersea and on land. These factors include burial depth, lateral and vertical cable separation distances, horizontal directional drilling (HDD) requirements, and onshore cable landing workspace. OSW projects use cables to connect individual turbines within the OSW project (i.e., inter-array cables) and one or several export cables (transmission cables) to connect to POIs on land. The primary factors affecting costs for OSW cables are the length of the route, conditions in the local environment, mobilization of installation vessels, and costs associated with minimization and mitigation measures necessary to address impacts to resources and communities. Localized conditions include rights-of-way (ROW) access, construction in urban areas, conflicts with other utilities, permitting requirements, crossing natural or humanmade barriers, and the real estate values for the converter station. These factors result in highly variable cost estimates when calculated on a per-mile basis. The route may be longer to avoid certain local conditions or include innovative techniques or mitigation to address impacts that affect the cost of the OSW cable. Onshore routes will likely include multiple installation techniques between a landfall and POI to avoid constraints and minimize impacts, including environmental resources, topography, and utilities.

Figure S-1. Study Area and Approach Areas



S.2 Constraints Analysis

The assessment focuses on resources most likely to affect the feasibility of siting OSW cables rather than on all resources and potential impacts from construction, operation, and maintenance. The constraints analysis developed the criteria and process for analyzing and ranking potential constraints for OSW cable corridors by focusing on the resources with potential to affect or be affected by OSW cable siting, design, construction (i.e., installation), operation, and maintenance. The CWG evaluated the methods and results of the constraints analysis and provided guidance and direction based on available data and extensive knowledge of the resources. The resources evaluated within the study area reflect environmental, technical, and stakeholder concerns regarding the degree to which they could affect siting of OSW cables, landing areas, and connection to onshore POIs. Available spatial data, prior studies, technical expertise, professional judgment, and other information about conditions relevant to offshore and onshore transmission cables make up the quantitative and qualitative characteristics evaluated for each resource. Each resource is evaluated individually, not in comparison to each other.

Table S-1 lists the 13 undersea resources analyzed for potential constraints to OSW cables and the characteristics of each resource that affect feasibility of siting an OSW cable.

Table S-1. Undersea Resources and Criteria for Analyzing Constraints for OSW Cable Corridors

Resource	Characteristics Affecting Feasibility
NATURAL AND ENVIRONMENTAL RESOURCES	
Marine Geology and Hydrology	Shallow bedrock and/or hardbottom structure. Cohesive clays in substrate. Rocky shoals and boulder fields (e.g., as part of glacial moraines). Strong currents and associated seabed mobility (scour, sand waves) and added complexity for cable installation. Steep slopes of the seabed.
Aquatic Biological Resources and Sensitive Habitats	Designated critical habitat, seasonal management areas (SMAs) (i.e., for whales), existing or planned artificial reefs, cold-water corals, shellfish beds, Natural Heritage Communities, submerged aquatic vegetation (SAV), designated threatened and endangered (T&E) species habitat, New York City Waterfront Revitalization Program (NYCWRP) designations (Recognized Ecological Complexes [REC] and Ecologically Significant Maritime and Industrial Area), Significant Coastal Fish and Wildlife Habitat (SCFWH), hard and complex seafloor (sensitive habitat indicator).
Waterbody Dimensions	Depth: Draft restriction for installation vessels. Width: Physical constraint of landmasses on either side of potential corridor.

Table S-1 continued

Resource	Characteristics Affecting Feasibility
SOCIOECONOMIC RESOURCES	
Recreational and Commercial Fishing	Recreational and commercial fishing with particular attention to bottom-oriented fishing gear such as dredging or trawling.
Vessel Traffic	Density of commercial vessels (as measured by AIS). Designated Areas: Ferry routes.
Navigation Areas	Federally designated navigation channels. Anchorages. Shipping lanes/fairways. Navigation safety and security zones; danger areas.
Other Recreation	Recreational wreck or artificial reef diving sites; sailing race routes/areas; wildlife viewing areas.
Borrow Areas and Ocean Disposal Sites	Dredged material disposal site. Offshore sand borrow areas.
Marine Archaeology and Cultural Resources	Shipwrecks, obstructions. Potential Holocene sites. Federal, state (underwater components), and local parks.
Waterfront Infrastructure	Areas of dense industrial marine activity such as piers or major shipping hubs. Resilience projects. Hardened shorelines.
EXISTING INFRASTRUCTURE AND HAZARDS	
Linear Utilities	Transmission cables. Telecommunication cables. Pipelines. Sewers/outfalls. Aqueducts.
Tunnels and Bridges	Transportation tunnels. Bridges.
Sediment Contamination and UXOs	Contaminated sediment. UXOs.

The landfall and overland constraints analysis assumes the use of existing ROWs for potential co-location with OSW cables due to the extent of developed land and associated spatial limitations. Table S-2 identifies the 21 POIs included in one or more of the onshore zones, which were representative substations considered potentially feasible POIs in the New York Power Grid Study analysis.

Table S-2. Points of Interconnection Included in Onshore Zones

NYC and Long Island Substations Representing Potential POIs		
Academy	Glenwood	Port Jefferson
Astoria	Goethals	Rainey
Barrett	Gowanus	Ruland Road
Brookhaven	Mott Haven	Shoreham
East Garden City	Newbridge Road	Shore Road
Farragut	Northport	Syosset
Freshkills	Pilgrim	West 49th Street

Table S-3 lists the resources analyzed for potential constraints and the characteristics of the resource that affect feasibility of siting an OSW cable.

Table S-3. Resources and Criteria for Analyzing Constraints for Landfall and Overland Area

Resource	Characteristics Affecting Feasibility
NATURAL AND ENVIRONMENTAL RESOURCES	
Geology and Topography	Steep slopes Faults
Surface Water and Wetlands	Federally regulated waters (includes wetlands). State protected Article 15 waters and Article 24 freshwater wetlands and adjacent areas, and locally protected wetlands.
Critical Species and Sensitive Habitats	Federally- or state-listed endangered or threatened species or associated habitat, designated critical habitat. Important Bird Areas (IBAs) NYCWRP designations SCFWH Natural Heritage Communities. Conservation and mitigation sites.
Land Use	Federal, State, or municipal-owned/managed lands. Indigenous lands CEHAs Residential land use
SOCIOECONOMIC AND COMMUNITY RESOURCES	
Environmental Justice Populations and Disadvantaged Communities	Environmental justice populations. Disadvantaged communities.
Cultural Resources	Known archaeological and architectural resource sites. National Register of Historic Places (NRHP) sites/districts.
Other Recreation	Recreational use and public access recreational paths, trails, routes, and areas. Wildlife viewing areas, water trails, and surfing/beachgoing areas.

Resource	Characteristics Affecting Feasibility
EXISTING INFRASTRUCTURE	
Linear Utilities	Overhead and underground electric transmission cables. Underground telecommunication cables. Pipelines (gas and hazardous liquid). Outfalls Aqueducts
Transportation	Non-commuter railroads FHWA-funded parkways and controlled access highways.
Shoreline Protection	USACE Coastal Storm Risk Management (CSRM) projects. Piers, bulkheads, shoreline restoration, rip rap, etc.
Areas of Contamination	NYSDEC remediation sites. USEPA Superfund Sites.

S.3 Assessment of Resources Affecting Feasibility of OSW Cables

The assessment analyzes the locations of resources most likely to affect the feasibility of OSW cables. Section 3 summarizes existing conditions; identifies potential impacts that may occur from siting, design, construction, operation, and maintenance, and decommissioning of OSW cables; and identifies minimization and mitigation measures. The analysis provides guidance from the CWG on options for addressing placement of cables in locations of greatest constraint, particularly if prior permits did not completely address the most important aspects of the resource. Publicly available Geographic Information System (GIS) data provides the primary information for existing conditions and associated potential impacts, supplemented by desktop research and experience.

Table S-4 provides the cross reference for the consolidation of undersea resources into categories for further analysis, and Table S-5 provides the same for the Landfall and Overland Area.

Table S-4. Cross Reference for the Consolidation of Undersea Resource Topics

Section 3 Resource Topic	Resources from Section 2
Marine Geology and Hydrology	Marine Geology and Hydrology Borrow Areas Waterbody Dimensions
Marine Commercial and Recreational Uses	Recreational and Commercial Fishing Other Recreation Linear Utilities Tunnels and Bridges Waterfront Infrastructure
Navigation and Vessel Traffic	Vessel Traffic Navigation Areas

Table S-4 continued

Section 3 Resource Topic	Resources from Section 2
Aquatic Biological Resources and Sensitive Habitats	Aquatic Biological Resources and Sensitive Habitats
Sediment Contamination and Water Quality	Sediment Contamination, Ocean Disposal Sites, and UXOs
Marine Archaeology and Cultural Resources	Marine Archaeology and Cultural Resources

Table S-5. Cross Reference for the Consolidation of Onshore Resource Topics

Section 3 Onshore Resource	Section 2 Onshore Resources Included
Steep Slopes	Topography
Coastal Resources	Other Recreation Critical Species and Sensitive Habitats
Terrestrial Biological Resources	Critical Species and Sensitive Habitats
Wetlands, Surface Water, and Water Quality	Surface Water and Wetlands
Cultural Resources	Cultural Resources
Areas of Contamination	Not used in Section 2
Land Use	Land Use Linear Utilities/Outfalls Transportation Shoreline Protection
Environmental Justice Populations and Disadvantaged Communities	Environmental Justice Populations and Disadvantaged Communities.

The Assessment compiles an inventory of minimization and mitigation measures from previously issued Article VII permits and current applications as representative of the study area and informative for future projects. Previously issued permits provide a record of agency decisions and a significant inventory of acceptable measures for addressing potential constraints to OSW cables. Project-specific minimization and mitigation measures will be identified and proposed by project applicants and evaluated by relevant regulatory authorities during future project reviews. Future mitigation and minimization measures will need to incorporate the latest technologies and be adjusted as needed to protect the natural and socio-economic resources to a similar extent as the measures for the current and reasonably foreseeable technologies.

The existing conditions of zones and subzones, potential impacts, and avoidance, minimization, and mitigation opportunities are presented for each undersea Approach Area and the Landfall and Overland Area. The descriptions of impacts focus on the locations where resources ranked high or, for consideration of cumulative potential constraints, where multiple resources ranked medium.

The impacts discussed with respect to installation also address potential impacts during decommissioning. The decommissioning of OSW cables may include deenergizing and leaving in place, or removal of the cables. In cases where cables are removed, impacts similar to installation will occur, such as vessels present in the area, and disturbance of the sea floor. Complete avoidance of impacts is the primary or preferred approach for siting of OSW cables.

S.4 Key Findings and Recommendations

New York State is committed to developing and advancing strategies to cost-effectively and responsibly meet New York State's Climate Act goals of 9 GW of OSW by 2035 and projections of the Climate Action Council beyond 9 GW. The assessment is a component of that commitment and that of the State agencies that comprise the CWG. New York State acknowledges the benefits of coordinated transmission planning and will continue to evaluate options to meet the State's goals. For the transmission grid to accommodate 9 GW, the Power Grid Study concluded that interconnection of 6 GW of OSW in New York City and the remaining 3 GW on Long Island should be feasible without major transmission upgrades. Table S-6 illustrates a potential combination of current, proposed, and future OSW cables through each undersea approach area. Assuming that future cables use HVDC and carry approximately 1 GW of electricity, this estimate reflects slightly more than 9 GW. The resulting allocations in Table S-6 represent conservative assumptions and considerations of constraints; actual distribution of cables would reflect future considerations within a dynamic and extremely competitive market.

Table S-6. Potential Combination of Current, Potential, and Future OSW Cables Using Each of the Undersea Approach Areas to Achieve NYS Climate Act Targets

Approach Area	Current, Potential, and Future OSW Projects	Type of Cable	Approximate Contribution to Climate Act, GW
New York Harbor	Empire Wind	HVAC	0.816
	Future	HVDC	4
		Subtotal	**~5**
Long Island Sound	Beacon Wind	HVDC	1.23
	Future	HVDC	1
		Subtotal	**~2**
South Shore	Sunrise Wind	HVDC	0.88
	South Fork Wind	HVAC	0.132
	Empire Wind 2	HVAC	1.26
	Future	HVDC	1
		Subtotal	**~3**
		TOTAL	**~10**

Note: This table is for illustrative purposes only and does not include considerations based on project-specific proposals. Nor does it consider any necessary environmental review or regulatory approvals needed.

The analysis and discussion in section 3 provide insights on the most significant constraints and the anticipated avoidance, minimization, and mitigation measures necessary to site OSW cables. The assessment demonstrated two key findings relevant to achieving 9 GW or more of OSW energy:

1. Future OSW cable siting should incorporate accepted siting principles based on CWG and OSW industry experience. Siting principles support installation of multiple cables, while minimizing use of space and impacts on environmental, cultural, and social resources.
2. Innovation in design, construction, operation, and maintenance techniques will be required beyond prior projects to address the site-specific and unique constraints, opportunities, schedule, and costs for siting OSW cables.

The combination of environmental, cultural, and social resources requires an organized approach to optimize the routing of transmission cables in New York State waters to meet the 9 GW of OSW mandated by the Climate Act, as well as consideration for potential future OSW directives. The assessment identifies standard industry practices in the U.S. and in Europe's OSW industry, as well as CWG experience that comprise principles to optimize routing of multiple OSW cables in New York waters and at landfall and overland routes. As the OSW industry develops and matures, these siting principles will evolve to reflect the lessons learned, and more siting principles may be appropriate, or revisions may occur.

Innovation and advances in technology will be required beyond prior projects to address site-specific and unique constraints. For each approach area and the Landfall and Overland Area, innovation and advances in technology can further address the most significant constraints; identify opportunities for further minimizing and mitigating impacts; address schedule risks for development of OSW projects, and support consideration of factors affecting costs of OSW cables.

1 Introduction and Overview

1.1 Introduction

The Climate Leadership and Community Protection Act (Climate Act) commits New York State to a zero-emission electricity system by 2040, requires the establishment of programs for the procurement of a minimum of 9 gigawatts (GW) of offshore wind (OSW) by 2035, and a reduction of greenhouse gas emissions to 85 percent below 1990 levels by 2050. OSW will be a crucial step on the pathway to meeting the State's ambitious and comprehensive climate and clean energy legislation. The New York State Energy Research Development Authority (NYSERDA) developed the Offshore Wind Cable Corridor Constraints Assessment to better understand the limitations to siting cables in New York State waters, at landfall, and along overland routes to existing points of interconnection (POIs). The goal of the assessment is to ascertain actions the State may consider to ensure maximum benefits of renewable OSW energy while avoiding or minimizing conflicts and impacts to activities and infrastructure. The assessment seeks to advance the coordination and planning efforts by building on existing work, previous studies, and work in progress, including NYSERDA's Power Grid Study, Offshore Wind Master Plan, and Port Uses and Navigational Assessment. This assessment coordinates the analysis and evaluation of potential corridors to support future decision-making and policy development to achieve New York State's goals and mandates, and to allow for commercial innovation. The Climate Act provides direction for the overarching goals of this assessment to:

- Document and increase the understanding of environmental, technical, and stakeholder constraints, as well as opportunities, concerns, impacts, and risks of potential undersea and overland cable corridors and associated landings.
- Inform potential future policy actions that maximize the benefits of OSW and avoid or minimize conflicts and impacts in a timeframe to support achieving the mandated 9 GW of OSW by 2035.

In addition, the New York State Climate Action Council released the Draft Scoping Plan for the Climate Act recommending policies and actions to help the State meet the Climate Act requirements, including projections of a potential 20 GW of OSW by 2050 (New York State Climate Action Council 2021). The acceleration in the development of OSW and renewable energy directives indicates development of more than 9 GW of OSW by 2035.

This assessment documents the effort to increase the understanding of challenges and opportunities relevant to OSW development through the collaboration of the Cable Working Group (CWG); engagement of agencies and stakeholders; and analysis of environmental, technical, and stakeholder opportunities, concerns, impacts, and risks of potential undersea and overland cable corridors and associated landings. The CWG includes NYSERDA, the New York State Department of Environmental Conservation (NYSDEC), Department of State (NYSDOS), Department of Transportation (NYSDOT), Office of General Services (NYSOGS), and Department of Public Service (NYSDPS). The CWG comprises the State agency partners critical to the OSW cable regulatory process. The CWG guided the systematic consideration of environmental and stakeholder factors to evaluate opportunities, constraints, concerns, impacts, and risks of potential OSW undersea and overland cable corridors and associated landings. The CWG evaluated the methods and results of the constraints analysis, examined the opportunities to avoid, minimize, and mitigate impacts, and balanced the risks and opportunities of options to route multiple OSW cables to the transmission grid.

Section 1 describes the study area for the OSW cable corridor, the major regulatory processes for siting and permitting, agency and stakeholder engagement, key previous and ongoing studies, and technical considerations for connecting OSW cables to the transmission grid.

Section 2 describes the criteria and process for analyzing and ranking potential constraints for undersea cable corridors and for overland cables and associated landings to focus on the most significant resources and constraints to OSW cables.

Section 3 analyzes the locations of the resources most likely to affect OSW cables identified in section 2, summarizing existing conditions; identifying potential impacts that may occur from siting, design, construction, operation, and maintenance, and decommissioning of OSW cables; and identifying minimization and mitigation measures. The analysis provides guidance from the CWG on options for addressing placement of cables in locations of greatest constraint, particularly if prior permits did not completely address the most important aspects of the resource.

Section 4 summarizes key findings regarding the most significant constraints, opportunities to reduce impacts, and considerations of schedule and costs to ensure maximum benefits of renewable OSW energy while avoiding, minimizing, and mitigating conflicts and impacts.

The scope of this assessment does not address all aspects of potential cable corridors but focuses on issues most likely to present risks and opportunities relevant to achieving 9 GW of OSW by 2035. The scope of the assessment does not:

- Identify complete routes or corridors.
- Rank or prioritize various routes, landfall, or POI options.

- Address whether the cables in State waters will connect to radial, meshed, or backbone transmission concepts.
- Substitute for or prescribe any analysis of alternative routes required as part of any regulatory review process for a specific proposed project.
- Assess the capacity of POI substations or upgrades that may be necessary at any location.

1.2 Study Area

The study area consists of four areas for bringing OSW energy to the New York City (NYC) and the Long Island transmission grid, shown in Figure 1 and described in Table 1. The relevant Bureau of Ocean Energy Management (BOEM) lease areas for development of OSW include the areas off the coasts of Connecticut, Rhode Island, and Massachusetts, and the New York Bight as shown in Figure 2. OSW energy sited in these lease areas may interconnect with the New York City and Long Island transmission grid or with neighboring states.

Table 1. Description of Study Areas for OSW Cable Corridor Constraints Assessment

Approach Area	Description
South Shore Approach Area	The south shore of Long Island seaward to the 3-nautical mile (nm) limit of State waters from Montauk Point in the east to Rockaway Point in the west.
Long Island Sound Approach Area	Long Island and New York City via Block Island Sound and Long Island Sound into the East River.
New York Harbor Approach Area	The Upper New York Bay into New York City, including extensions into the East and Hudson Rivers via the Lower New York Harbor and The Narrows.
Landfall and Overland Area	Long Island and New York City and the potential landfalls in each of the undersea cable approach areas, including two identified landfalls on Staten Island and 21 potential POIs.

The study area boundaries reflect the jurisdictional borders between New York State, Connecticut and New Jersey and federal waters, as shown on Figure 1. The legal and regulatory jurisdictions determine the applicable permitting and compliance requirements. In practice, the states share the resources of the Hudson River and Long Island Sound, and OSW cables may cross state boundaries. The CWG coordinated outreach to representatives of Connecticut and New Jersey to share information from this analysis and to obtain input, described further in Section 1.4: Stakeholder Engagement.

Within the study area, the demarcation between the undersea approach areas and the Landfall and Overland Area uses the National Oceanic and Atmospheric Administration (NOAA)–delineated shoreline of Long Island and New York City, with the exception of the north shore of Long Island. For the north shore of Long Island, northern embayments are not generally included in the onshore considerations. For the south shore of Long Island, the undersea approach area is seaward of the shoreline, and the Landfall and Overland Area includes the various bays and harbors along the south shore.

The Landfall and Overland Area includes the potential POIs that OSW projects seek to interconnect to the New York State's transmission grid. The assessment builds on the work of the NYSERDA Power Grid Study, described below, and does not make any further assessment on the ability of potential POIs to accommodate OSW interconnection. The comprehensive list ensures that the analysis considers multiple options and maximizes consideration of potential constraints distributed across Long Island and New York City.

1.3 Regulatory Overview for Connecting OSW to the Grid

To connect an OSW project to New York State's power grid, transmission cables will likely route through State waters to the POI, which requires approvals from multiple State agencies. The Certificate of Environmental Compatibility and Public Need (CECPN or Certificate) is the primary authorization for transmission lines pursuant to Article VII of the New York State Public Service Law, which permits construction, operation, and maintenance of transmission lines. The sections below describe the role of the NYSDPS as the lead agency, and other State agencies as parties to the proceedings. The role of each agency in the Article VII process also reflects the expertise and experience applied by the CWG and is reflected in this assessment. The Bureau of Ocean Energy Management (BOEM) leads the federal environmental review process for approving OSW projects, including evaluation of the transmission interconnection cable. The following describes the federal process.

As part of the Article VII process, New York State agencies recommend applicant-led coordination and information sharing calls prior to filing the Article VII application. The pre-application meetings facilitate a greater understanding of complex projects and information needed in the application. When applicants are able to share early-stage engineering and design options, agencies can provide guidance that informs decisions on the project and application materials. Agencies and applicants tailor the agenda for the reoccurring meetings to the project-specific information, communities, resources, and routes. Table 2 provides an example of topics for discussion at preapplication meetings. Table 3 summarizes the relevant applicable laws and regulations of these agencies as part of the Article VII process for components of OSW projects located within New York State boundaries [on land and within 3 nautical mile (nm) from shore].

Table 2. Example Topics for Pre-Application Article VII Filing Discussions

Description

• Cable routing alternative analysis for offshore and onshore (robust analysis needed for PSC Article VII and National Environmental Policy Act).
• Cable installation and burial:
  o Pre-installation methods
  o Cable installation tools, techniques, and methodologies.
  o Location where each tool will be utilized.
  o Target burial depth and locations.
  o Cable protection measures (where needed and what type).
  o Potential crossings of existing cables and pipelines.
  o Co-location opportunities on land.
• Geophysical survey results.
• Geotechnical survey, sediment sampling and benthic survey results.
• Sediment transport analysis & WQ modeling.
• Protected species time of year restrictions (TOYRs), avoidance, minimization and mitigation measures.
• Known or potential historic and archeological resources.
• Pre- and post-installation monitoring requirements.
• Stakeholder outreach:
  o EJ communities.
  o Fishermen and other mariners.
  o Fisheries compensation.
• Support facilities–converter station, O&M facility, etc.
• Cable decommissioning.

Table 3. Agencies with Article VII Jurisdiction for OSW Projects within New York State Waters

Agency/Entity	Permit/Approval/ Review Process	Applicable Laws/Regulations	Regulated Activity	Information Required
NYS Public Service Commission (NYSPSC)	CECPN under Article VII	• New York State Public Service Law, Article VII, § 120 et seq. • 16 New York Codes, Rules and Regulations (NYCRR) Parts 85-88	Construction and operation of a major utility transmission facility. Siting of major utility transmission facilities in New York is under the jurisdiction of the PSC. “Major” electrical transmission facilities are defined as having a design capacity of 100 kilovolts (kV) or more extending for at least 10 miles, or 125 kV and over, extending a distance of one mile or more. Note: This certificate is not required specifically for the cable landfall but for other project components (i.e., onshore cable connection and submarine export cable).	Applicant must demonstrate compliance with the substantive requirements of all applicable state and local approvals. Application must include: • Location of line and ROW. • Description of transmission facility. • Summary of studies of environmental impact. • Statement of need for the facility. • Description and analysis of reasonable alternate routes. • Any other relevant information.
NYS Department of Public Service (NYSDPS)	Participates in Article VII proceedings to represent the public interest		Issues CECPN for transmission lines pursuant to Article VII of the New York State Public Service Law, supported by NYSDPS, which includes input from other State agencies that are parties to the proceedings.	
NYS Department of Environmental Conservation (NYSDEC)	Participates in Article VII proceedings and issues State Pollutant Discharge Elimination System (SPDES) General Permit for Construction Activity and Section 401 Water Quality Certifications	Environmental Conservation Law / 6 NYCRR Parts 1-189, 190-199, 200-317, and 649-941	Provides comments on the application to ensure compliance with applicable regulations, including water resources; freshwater and tidal wetlands; marine resources; coastal erosion hazard areas (CEHAs); State-protected habitats, threatened and endangered (T&E) species; air resources, as well as impacts to environmental justice areas or disadvantaged communities; climate change impacts and resilience; regulation of invasive species; solid and hazardous waste; wells; and stormwater. NYSDEC evaluates the application to ensure that proposed impacts to natural and environmental resources are avoided and minimized to the maximum extent practicable. Potentially applicable laws and regulations include those addressing coastal zone hazard areas, placement of fill in navigable waters, tidal wetlands, freshwater wetlands, discharges of stormwater, and state-listed T&E species.	Included in Article VII Application

Table 3 continued

Agency/Entity	Permit/Approval/ Review Process	Applicable Laws/Regulations	Regulated Activity	Information Required
NYS Office of General Services (NYSOGS)	State Submerged Lands Easement	• New York Public Lands Law, Article 2, Section 3 • 9 NYCRR Part 270 & 271	The title to the bed of numerous bodies of water is held in trust for the People of the State of New York under the jurisdiction of the NYSOGS. Structures, including fill, located in, on, or above State-owned lands underwater require a license, grant, or easement from the NYSOGS. Pipelines, cables, docks, wharves, moorings, and permanent structures, including wind turbines and cables, require an easement.	Requires a completed application for use of land underwater, which includes: • Design plans approved by all involved agencies. • Certified copy of deed(s) of applicant's adjacent upland or consent of owner of such adjacent upland with a certified copy of the deed(s). • Copy of adjoining shorefront deed(s) and tax map section. • Duplicate copy of permit/letter issued by U.S. Army Corps of Engineers (USACE).
NYS Department of State (NYSDOS)	Participates in Article VII proceedings and undertakes Coastal Zone Management Program Review of Federal Consistency Certification	• Coastal Zone Management Act 16 United States Code 1451 et seq. and applicable regulations at 15 CFR Parts 923 and 930, et seq. • State Executive Law Article 42, § 910 et seq.; 15 Code of Federal Regulations Parts 923 and 930 • 19 NYCRR Part 600	Federal factions, those requiring federal license or permit, and Outer Continental Shelf Plans that affect any use or natural resource of the coastal zone must be certified as consistent with the policies of a state's federally approved Coastal Management Program (CMP). In New York, the coastal policies are those in the CMP, any applicable Local Waterfront Revitalization Programs (LWRPs), and regional programs (Long Island Sound CMP).	Federal consistency assessment form, including written analysis of the activity's consistency with state and applicable local coastal policies. Application must include but is not limited to: • Copy of the completed federal permit application and supporting documentation. • Copies of applications submitted to involved state agencies. • Environmental Impact Statement if required by a federal or state agency. • All documentation submitted to siting board if facility subject to Articles VII or 10 of the New York State Public Service Law.

Table 3 continued

Agency/Entity	Permit/Approval/ Review Process	Applicable Laws/Regulations	Regulated Activity	Information Required
NYS Department of Transportation (NYSDOT)	Highway Work Permit for Utility Work	New York Highway Law Article 3, § 52	Any utility work—including construction and installation—in State highway ROW, likely the interconnection from the landfall site to a substation.	PERM 32 application form, including work plans, a traffic maintenance plan, and supporting documents (e.g., insurance certificates).
	Special Hauling Permits	New York State Vehicle and Traffic Law § 385	Vehicles/loads that exceed the legal dimensions or weights specified in Section 385 of the NYS Vehicle and Traffic Law.	PERM 39 application form, including carrier information, vehicle information (i.e., vehicle dimensions and load information), and trip information (i.e., start date, permit type, routes).
	Use and Occupancy Agreement	17 NYCRR Part 131	Any utility work—including construction and installation—in State highway ROW, likely the interconnection from the landfall site to a substation.	Conformance with the NYSDOT Highway Design Manual Chapter 13, submission of Use and Occupancy permit application.
	Design Requirements	17 NYCRR Part 131	Any utility work—including construction and installation—in State highway ROW, likely the interconnection from the landfall site to a substation.	Conformance with the NYSDOT “Requirements for the Design and Construction of Underground Utility Installations Within the State Highway Right-of-Way” (Blue Book).
NYSDOT and Federal Highway Administration (FHWA)	NYSDOT and FHWA Approval of an exception to the NYS Utility Accommodation Plan for Longitudinal Installation along State ROW in State Highway, including a controlled access highway, Highway Work Permit, and Use and Occupancy Agreement [17 NYCRR § 131.16(d)].	New York Highway Law Article 3, § 52; 17 NYCRR Part 131;23 U.S.C. § 109; 23 CFR §§ 645.211 and 645.215	Longitudinal cable installation in a State ROW receiving federal funding and/or is a controlled access roadway.	Completion of National Environmental Policy Act process, including alternative alignment analyses; conformance with NYSDOT “Accommodation Plan for Longitudinal Use of Freeway Right-of-Way by Utilities”; conformance with the NYSDOT “Requirements for the Design and Construction of Underground Utility Installations Within the State Highway Right-of-Way” (Blue Book); information as required to fulfill federal statutory and regulatory requirements.

1.3.1 New York State Department of Public Service

The New York State Public Service Commission (NYSPSC) issues the CECPN for transmission lines pursuant to Article VII of the New York State Public Service Law. NYSDPS implements the PSC's legal mandates pursuant to Article VII. To grant a CECPN, PSC must make a number of determinations, including the nature of environmental impacts and the extent to which the facility minimizes adverse environmental impacts. PSC must also ensure that the facility conforms with applicable State and local laws, unless waived, and that the construction and operation of the facility is in the public interest. The Article VII application includes a detailed project description, summaries of any studies made of the environmental impact of the facility, and a description of any reasonable alternate routes among other required information to ensure a full environmental, public health and safety impact review of the siting, design, construction, and operation of major transmission facilities. The review of the facility by PSC and NYSDPS is broad and includes the proposed location and alternatives, appearance, cost, and construction and maintenance practices, as well as the need for the facility. Experts from NYSDPS, including engineers, environmental specialists, legal counsel, consumer outreach specialists, and economists analyze environmental, engineering, and safety issues. Many State agencies contribute to or are consulted during the review of the application as parties to the Article VII proceedings, including NYSDEC, NYSDOT, NYSDOS, NYSOGS, the New York State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP), and the New York State Department of Agriculture and Markets. The Article VII process also ensures consultation with NYSOPRHP for potential impacts to the quality of archeological or cultural property listed on the National or State Registers of Historic Places (or determined to be eligible for listing on New York State Register) and ensures that projects try to avoid or mitigate adverse impacts to such properties. The CECPN requires submittal of an Environmental Management and Construction Plan (EM&CP) for review and approval by the PSC prior to construction. Additionally, the PSC issues the Water Quality Certification for the project under Section 401 of the Clean Water Act.

1.3.2 New York State Department of State

NYSDOS reviews federal consistency certifications under the Coastal Zone Management Act. The project proponent submits a consistency certification to NYSDOS and the relevant federal authorizing agency which includes the applicant's assessment of the project's consistency with each of the relevant enforceable policies of New York State's CMP, including a copy of the Article VII application, federal permit application(s), and any other "necessary data and information," as specified in the Coastal Zone Management Act and New York State's Coastal Management Program. The CMP covers 44 policies applicable to development and use proposals within or affecting the State's coastal area. For example, NYSDOS review ensures consistency with these policies for projects that may affect significant coastal fish and wildlife habitats. For cables that cross New Jersey or Connecticut waters, the New Jersey Department of Environmental Protection and Connecticut Department of Energy and Environmental Protection will conduct a similar review to ensure constancy with their state policies. Additionally, Connecticut has an interstate consistency review of certain activities in New York State waters of Long Island Sound.

NYSDOS also reviews pre-construction geophysical and geotechnical surveys as part of the U.S Army Corps of Engineers (USACE) Nationwide Permit 6. NYSDOS reviews activities associated with authorizations under federal programs, such as BOEM Construction and Operations Plan (COP) review for OSW facilities and USACE discharge of fill, installation of in-water infrastructure, changes to structures in navigable waters, and disturbance to coastal uses and resources.

1.3.3 New York State Department of Environmental Conservation

NYSDEC evaluates potential effects on NYSDEC jurisdictional resources, in keeping with its mission to conserve, improve, and protect New York State's natural resources and environment. NYSDEC issues permits and any necessary water quality certifications for pre-construction geophysical and geotechnical surveys. During the Article VII review process, as a statutory party in the proceedings, NYSDEC provides comments to ensure compliance with applicable regulations, including water resources; freshwater and tidal wetlands; marine resources; coastal erosion hazard areas (CEHAs); State-protected habitats; threatened and endangered (T&E) species; air resources, as well as impacts to environmental justice areas or disadvantaged communities; climate change impacts and resilience; regulation of invasive species; solid and hazardous waste; wells; and stormwater. NYSDEC's evaluation ensures that proposed impacts to natural and environmental resources are avoided and minimized to the maximum extent practicable. NYSDEC's review also ensures that construction activities include best management practices (BMPs) consistent with regulatory requirements. Applicants for an Article VII CECPN also consult with NYSDEC on plans to mitigate any unavoidable impacts to protected resources. NYSDEC also reviews relevant components of the EM&CP prior to construction. Finally, NYSDEC issues any necessary permits or approvals under federally delegated programs, including but not limited to, coverage under the State Pollutant Discharge Elimination System (SPDES) general permit for stormwater discharges from construction activity.

1.3.4 New York State Office of General Services

NYSOGS holds title to the bed of numerous bodies of water in trust for the people of the State of New York. Installation of the transmission cable in State-owned land requires a State Submerged Lands Easement from NYSOGS. Easements for cables are for 25 years and the standard width is 30 feet. The easement fee, which is $24.98 per lineal foot for 2022, is adjusted annually on April 1 based on the United States Department of Labor consumer price index.

Applicants coordinate with NYSOGS on State ownership boundaries during the Article VII process. Once the PSC grants a CECPN, and other agencies approve plans or issue permits, including USACE, applicants may submit their application for an easement to NYSOGS. After review and approval, NYSOGS will issue a permit for construction and collect half of the estimated fee for the easement. After construction, applicants submit an as-built survey and legal description for approval by NYSOGS. Once NYSOGS collects the remaining fee based on the as-built survey, the easement is finalized and recorded.

1.3.5 New York State Department of Transportation

The installation of utilities within a State Highway rights-of-way (ROW) is regarded as a non-transportation use of NYSDOT property and the NYSDOT Accommodation Plan for Longitudinal Use of Freeway Right-of-Way by Utilities (“NYSDOT Utility Accommodation Plan”) does not provide for the installation of non-telecommunication facilities. NYSDOT’s jurisdictional scope for all NYSDOT property includes utility work, including construction, longitudinal cable installation, and perpendicular crossings in, on, or affecting State highway ROWs. The interconnection of the transmission cable from the landfall site to a POI may ultimately require the consideration of the use of existing transportation ROWs but only following a comprehensive alternatives analysis demonstrating that there is no feasible alternative. In addition to the alternatives analysis, there are further requirements to be met prior to NYSDOT granting permits for Use and Occupancy Agreements for such installation.

During the Article VII review process, NYSDOT provides comments on the certificate application to ensure compliance with applicable regulations, including utility installation methodologies and hauling of equipment necessary for construction and maintenance. NYSDOT also reviews relevant components of the Article VII EM&CP prior to construction. An Article VII CEPCN does not create a property right in

The State highway necessary to enter upon such highway and modify the property. Under certain circumstances, Federal Highway Administration (FHWA) and NYSDOT must complete a review and authorization for a utility installation within a State highway ROW on a case-by-case basis, and this review is separate and distinct from the Article VII proceeding.

NYSDOT regulations at 17 New York Codes, Rules, and Regulations (NYCRR) Part 131 identify the requirements associated with the accommodation of utility facilities located within State highway ROW, and those public and private utility facilities that affect the use and operation of State highway facilities. In addition, 17 NYCRR Part 131 is applicable to other highways in which federal laws or regulations require such compliance. If any controlled access facilities are being considered for such co-locations, the occupancy must comply with 17 NYCRR Part 131, 23 CFR Part 645 and Highway Law Section 52 and may require an application for an exception to the NYSDOT Utility Accommodation Plan. Because a transmission cable is a non-transportation use of the ROW, the project proponent would request an exception to the NYSDOT Utility Accommodation Plan, which is a process that includes FHWA review and approval of the request prior to the NYSDOT issuance of a Use and Occupancy Agreement and Highway Work permit. For certain major roads, including controlled access parkways and highways, both NYSDOT and FHWA, which provide funding for these roads, must provide authorization prior to installation.

The Use and Occupancy Agreement provides the conditions for the occupation of the ROW and is required of all utilities, except those that are municipally owned. NYSOPRHP owns some of the Long Island parkways (including causeway segments), which are controlled-access highways requiring NYSDOT and FHWA authorization. Prior to the accommodation of the longitudinal installation of a non-telecommunication cable within a controlled-access State highway ROW, the project proponent must conduct a comprehensive analysis of alternative alignments and demonstrate that installation along the alternatives is not feasible. FHWA would review an exception request to the accommodation of the transmission cable pursuant to compliance with the federal National Environmental Policy Act and federal DOT regulations and standards at 23 CFR Part 645 and 23 U.S.C. § 109.

1.3.6 Federal Agencies

The federal approval of an OSW project encompasses the review and approval of a COP by BOEM. The COP includes a description of all planned facilities, including onshore and support facilities, as well as anticipated project easements. The COP describes activities related to the project including construction, commercial operations, maintenance, decommissioning, and site clearance procedures.

The COP provides the basis for analyzing environmental and socioeconomic effects and operational integrity of the developer's proposed construction, operation, and decommissioning activities. BOEM will review the COP and conduct an environmental review of the COP pursuant to the National Environmental Policy Act through preparation of an Environmental Impact Statement. BOEM will consult with the U.S. Fish and Wildlife Service (USFWS) and the NOAA National Marine Fisheries Service (NMFS) for potential to affect wildlife species protected under the Endangered Species Act, Migratory Bird Treaty Act, Marine Mammal Protection Act, and the Magnuson-Stevens Fishery Conservation and Management Act, and with the State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation under Section 106 of the National Historic Preservation Act, if applicable. As the lead agency, BOEM manages and coordinates the Environmental Impact Statement development with cooperating agencies, including tribal, federal, State, and local government entities with jurisdiction, special expertise, or related decision-making capacity. Other federal agencies, like USACE, have separate regulatory reviews and consultations for activities in State waters. The USACE has the authority to oversee potential impacts to wetlands and waters of the United States under the Clean Water Act and Rivers and Harbors Act and, with the U.S. Coast Guard (USCG), potential impacts to navigation and navigable waterways.

BOEM is also preparing a Programmatic Environmental Impact Statement for Future Wind Energy Development in the New York Bight. The Programmatic Environmental Impact Statement will analyze the potential impacts of wind energy development activities and develop programmatic avoidance, minimization, mitigation, and monitoring measures relevant to projects in the New York Bight, including State waters.

1.4 Stakeholder Engagement

Stakeholders include environmental non-governmental organizations, academic institutions, the maritime community, the OSW industry, federal agencies, adjacent states, and other potentially interested parties. Feedback from stakeholders is also integral to understanding the constraints, concerns, and relative risks associated with OSW cables and connection to the transmission grid. NYSERDA engaged with stakeholders through the Request for Information (RFI) process, NYSERDA's Technical Working Groups, and via individual meetings.

1.4.1 Requests for Information

On December 21, 2021, NYSERDA issued an RFI for input from the public and interested stakeholders on the proposed approach described in the Draft Offshore Wind Cable Corridor Constraints Assessment Framework and to identify other issues to consider in the analysis of offshore and onshore cable corridor segments. The RFI included the Draft Offshore Wind Cable Corridor Constraints Assessment Framework, explanation on how to submit comments, information requested, and some initial questions to solicit input. The draft provided an annotated outline of the assessment and preliminary technical information on existing conditions and types of impacts from siting, design, construction, operation, and maintenance of OSW cables.

Table 4 lists the commenters who submitted written comments on the draft during the RFI period. All comments received through the RFI were collected, tracked, cataloged, and addressed in the preparation of this assessment. Table 5 provides an overview of the types of comments received.

Table 4. Commenters Submitting Written Comments on the Draft Assessment Framework

- Wallace & Associates (representing surfclam and ocean quahog fishing industry)
- Long Island Soundkeeper and Hudson Riverkeeper
- American Clean Power and NY Offshore Wind Alliance
- Attentive Energy
- PhDs from Various Universities with Marine Science degrees: Young Chen (State University of New York at Stony Brook), Kyle Newton (Oregon State University), Taylor Chapple (Oregon State University), Sarah Henkel (Oregon State University), Tobey Curtis (U.S. Department of Commerce), and Claire Ober (State University of New York at Stony Brook)
- Maritime Association Port of NY/NJ
- Towboat and Harbor Carriers Associate of NY and NJ
- The American Waterways Operators
- ConEdison (ConEd) Transmission
- Long Island Power Authority
- U.S. Coast Guard
- ANBARIC
- New Jersey Department of Environmental Protection
- Orsted
- Rise Light & Power
- Connecticut Department of Energy and Environmental Protection

Table 5. Overview of Comment Themes on the Draft Assessment Framework

• General support of the process and its transparent nature. • Benefits of independent ownership of offshore transmission. • Need for planned, competitively procured transmission. • Technical considerations for cable installation and maintenance. • Consideration of real estate and site control rights, specifically for landfall sites. • Additional outreach and coordination opportunities (e.g., BOEM, neighboring states, Port of NY/NJ Harbor Safety, federal agencies). • Request for clarification of constraints versus impacts. • Revisions to qualitative definitions in criteria tables for low/medium/high.	• Differentiation between existing resource characteristics present in the study area and existing resource characteristics that could be affected by installation and operations, considering mitigation measures. • Differentiation of temporary (construction) and permanent (operation) impacts to resources–both in impact analyses and in refining criteria tables. • Additional references for review and inclusion. • Need for coordination and optimization of all corridors and landfalls for long-term sustainability and cost-effective development. • Additional characteristics affecting feasibility for constraints analysis criteria or revisions to existing characteristics (e.g., depth criteria for waterbody dimensions).

After considering the input received and preparation of the Draft Offshore Wind Cable Corridor Constraints Assessment, NYSERDA issued an RFI on August 30, 2022, for input from the public and interested stakeholders on the draft assessment by October 28, 2022. The RFI included how to submit comments and specific questions to solicit input. Table 6 lists the commenters who submitted written comments on the draft during the RFI period. All comments received through the RFI were collected, tracked, cataloged, and addressed in the preparation of this final assessment. Table 7 provides an overview of the types of comments received.

Table 6. Submitted Written Comments on the Draft Assessment Report

• American Clean Power Association	• NextGen Highways
• ANBARIC	• NY & NJ Port Authority
• Attentive Energy	• Ørsted
• Bluepoint Wind	• Responsible Offshore Science Alliance
• Buro Happold	• Rise Light & Power LLC
• City of New York (via Couch White)	• Riverkeeper
• ConEdison Transmission	• TigerGenCo
• Connecticut DEEP	• Town of East Hampton
• ECOncrete	• United States DOI Bureau of Energy Management
• Gavin & Doherty Geosolutions Inc.	• Wildlife Conservation Society
• New York Offshore Wind Alliance	• XODUS

Table 7. Overview of Comment Themes on the Draft Assessment Report

• Support for the concept, the need for the analysis, and the completeness of the description of constraints and opportunities. • Use of the Assessment as a general tool not a site-specific/project-specific review. • Concern that local and federal regulations were not considered. • Additional outreach and coordination opportunities to other federal, state, and local agencies.	• Clarifications and suggested revisions of constraints analysis methodology and criteria. • Use of the minimization and mitigation measures for all projects. • Technical information clarifications (e.g., cable burial, cable separation distances, landfall considerations). • Next steps as a result of the Assessment. • Need for and benefits of holistic transmission planning.

1.4.2 Technical Working Group Meetings

Outreach included coordination through webinars with NYSERDA's Environmental, Fisheries, and Maritime Technical Working Groups to present the assessment framework and solicit feedback during the RFI period. This outreach allowed relevant technical experts to share maritime, environmental, and fisheries-related concerns and comments. Feedback was requested on whether the assessment framework fully captures and describes the constraints and opportunities in an efficient and complete manner, whether additional data or information should be included, and whether other stakeholders should be engaged.

1.4.3 Individual Meetings

Individual stakeholder meetings were coordinated as needed to solicit feedback and inform the assessment based on comments received during the RFI process. Meetings allowed for open dialogue in which participants could share knowledge and data. Individual meetings held with entities that responded to the RFI increased the understanding of concerns and comments:

- New York Sea Grant
- New England Interstate Water Pollution Control Commission
- Rise Light and Power
- Consolidated Edison Company (Con Edison)
- National Renewable Energy Laboratory (NREL)
- Connecticut Department of Energy and Environmental Protection
- New Jersey Department of Environmental Protection

1.5 Previous and Ongoing Studies

A number of previous studies, ongoing studies, and data collection that relied on available data, prior studies, and technical expertise informed the development of this assessment. The following sections summarize relevant recently conducted studies.

Also, the U.S. Department of Energy (DOE) and the Federal Energy Regulatory Commission (FERC) are implementing ongoing efforts/initiatives focused on the federal transmission landscape. For example, DOE's "Building a Better Grid" initiative, which was launched in January 2022, will identify national transmission needs and support the build-out of long-distance, high-voltage transmission facilities needed to meet President Biden's goal of 100 percent clean electricity by 2035 (DOE 2022). Additionally, DOE, through its NREL, is conducting a two-year Atlantic Offshore Wind Transmission Study and associated workgroups with states, and New York State is participating in these efforts. The Atlantic Offshore Wind Transmission Study evaluates coordinated transmission solutions to facilitate OSW energy development along the Atlantic Coast of the United States, addressing gaps in existing analyses (NREL 2022). FERC issued a Notice of Proposed Rulemaking on May 4, 2022, regarding Building for the Future through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection (87 Federal Register 2022). The proposed rulemaking focuses on addressing deficiencies in FERC's existing regional transmission planning and cost allocation requirement and is driven partly by the anticipated change in the nation's energy mix to accommodate future clean energy.

1.5.1 Offshore Wind Master Plan—Cable Landfall Permitting Study (2017)

In January 2018, NYSERDA published the New York State Offshore Wind Master Plan, which includes more than 20 studies that gathered data on environmental, social, economic, regulatory, and infrastructure issues relevant to OSW energy development and reflects the State's extensive outreach efforts with interested agencies, entities, communities, and individuals in the responsible and cost-effective development of OSW. One part of the Master Plan, the Cable Landfall Permitting Study (NYSERDA 2017a), characterizes existing nearshore and onshore resources, identifies potential areas of opportunities and constraints associated with future cable landfall sites, and presents an overview of the regulatory requirements for the various resources. The Cable Landfall Permitting Study focuses on cable landfalls along the South Shore of Long Island but does not consider cables making landfall through the Long Island Sound. A desktop analysis of relevant geospatial data and online databases focuses on two geographic areas: Long Island (South Shore)/Rockaway Peninsula and Hudson and East Rivers/New York City. The shoreline/nearshore zone extends a half-mile landward from the shoreline and 1,000 feet seaward from the shoreline. Onshore zones are characterized by areas extending landward of the shoreline/nearshore zone that encompass potential substation location(s) (interconnection points).

Constraints associated with the resources included in this study are qualified as hard or soft. Hard constraints refers to resources that create potential avoidance areas due to the potential inability to mitigate impacts, whereas soft resources are those that can be mitigated. The study notes that some of the resources are associated with both hard and soft potential constraints as well as potential opportunities in some instances. Although specific issues vary across the study area, the overall number of resources presenting hard and soft potential constraints are the same for both study areas.

1.5.2 Power Grid Study (2021)

The Accelerated Renewable Energy Growth and Community Benefit Act authorized work to identify transmission and distribution (T&D) upgrades needed to integrate required renewable resources and establish planning processes to support cost-effective and timely infrastructure development. To meet these directives, PSC, through NYSDPS, initiated a set of system studies, collectively referred to as the Power Grid Study (NYSDPS 2021). The Power Grid Study report summarizes the status of New York's T&D infrastructure to accommodate OSW power.

The Power Grid Study determined that integrating 9 GW of OSW generation by 2035, 6 GW in New York City and 3 GW on Long Island, is achievable without major onshore bulk transmission upgrades beyond expanding Long Island bulk transmission links and local upgrades in New York City. Meeting the milestones set out by the State for 2030 through 2050 requires investment in renewable generation, as well as storage, energy efficiency measures, electrification of transportation and heating sectors, and electric T&D infrastructure. In addition to meeting the 2030 milestones set out by the State, additional efforts are likely needed to:

- Accelerate certain local T&D upgrades over the next decade.
- Expand Long Island bulk transmission to facility interconnection.
- Identify feasible and cost-effective OSW interconnection-related substations and local transmission upgrades in the New York City area.
- Implement storage deployment that is closely coordinated with OSW and land-based interconnection needs.

The Power Grid Study found that interconnecting a maximum amount of OSW in the New York City area would be advantageous given the large load and strong bulk transmission system, and there are ways to overcome cable routing limitations, space constraints for onshore substations, and permitting complexities with careful planning of OSW transmission cable routes and POIs as well as the potential options for a meshed offshore network. In addition, the Power Grid Study prepared cost estimates, including procurement and installation for cables, that informs additional consideration of how costs affect siting of potential corridors. The Power Grid Study consists of three components: (1) the Utility Study, a study conducted by the Joint Utilities on local T&D needs; (2) the OSW Study, a study of offshore and onshore bulk-power transmission infrastructure scenarios and related environmental permitting considerations; and (3) the Zero Emissions Study, a statewide scenario-based study to analyze transmission, generation, and storage options. The Power Grid Study also provided valuable recommendations to the State, utilities, and transmission and renewable generation developers to meet Climate Act goals and requirements. Several recommendations are relevant to the assessment with respect to multidisciplinary coordination efforts to support the development of cost-effective options for routing up to 6,000 megawatts (MW) of OSW generation.

The Power Grid Study identifies POIs having promising performance for connection of OSW to the NY transmission grid. The Power Grid Study modeling results indicate that these substations exhibit insignificant or very little OSW curtailment in production costing analysis and little or no concerns in power flow analysis. The Power Grid Study acknowledges that some of these POIs merit consideration on a case-by-case basis, and that the POIs identified should not be considered as recommended by the study for OSW interconnections.

1.5.3 Offshore Wind Ports: Vessel Traffic Risk Assessment (Ongoing)

NYSERDA is undertaking a Vessel Traffic Risk Assessment to increase understanding of the port activities associated with providing at least 9 GW of OSW by 2035 and New York State's associated goal to be the nation's hub of the OSW industry. The study builds upon the NYSERDA Offshore Wind Ports: Vessel Traffic Assessment (COWI 2022) in which future known and hypothetical port uses related to OSW vessel traffic are assessed and a vessel traffic model (VTM) is developed to analyze current and future vessel traffic patterns. The vessel traffic risk assessment will assess impacts to existing navigational channels generated by potential OSW projects to identify areas of navigational risks and to qualitatively assess the projected vessel traffic change that could be caused by future OSW development in the region.

The vessel traffic risk assessment is modelling New York State's currently active non-OSW vessels, future non-OSW, and future OSW vessels, as well as comparing vessel density and associated risks at eight selected locations or passage lines. Preliminary results indicate that the relative increase in OSW vessel traffic is minor because of the large amount of passenger traffic in the State and that Tomkins Cove, Port of Coeymans, Ambrose Channel and Ward Point locations experience the largest relative increase in vessel traffic density.

The vessel traffic risk assessment will include typical mitigation measures that could be implemented, and preliminary measures relevant to this analysis include: specific risk mitigation strategies such as continuous monitoring of vessel traffic; coordination with the Port Authority of New York and New Jersey; broadcasting of warnings in areas where there is increased vessel traffic and potential for obstruction, and continuous communications using multi-channel, very high frequency; and close cooperation with the U.S. Coast Guard (USCG) and implementation of more tailored mitigation measures.

1.6 Technical and Cost Considerations for Offshore Wind Cables Interconnecting to the Grid

This section provides the technical characteristics of cable systems and cable installation technologies, including high-voltage direct current (HVDC) and high-voltage alternating current (HVAC) features and parameters related to installation, operation, maintenance, and cost, to support the understanding of impacts from cable installation, operation, maintenance, and decommissioning. To address the challenges outlined in locations with high constraints described in subsequent sections of this assessment, innovative solutions and technology advancements will be needed to overcome transmission challenges and to achieve the New York State's Climate Act mandates. The CWG encourages the development of such innovative solutions and technology advancements to address issues such as cable capacity, co-location of cables, heat dissipation, and burial depth constraints.

Technical and engineering factors determine spatial requirements for cable installation and maintenance necessary to avoid or address potential constraints undersea and on land. These factors include burial depth, lateral and vertical cable separation distances, horizontal directional drilling (HDD) requirements, and onshore cable landing workspace. OSW projects use cables to connect individual turbines within the OSW project (i.e., inter-array cables) and one or several export cables (transmission cables) to connect to POIs on land.

1.6.1 Undersea Cable Systems and Burial Depths

The export cable that connects the OSW project to the transmission grid use HVAC for distances of typically up to 60 nm (110 kilometers), and HVDC for greater distances as the most economical option (Levitan 2020). Because OSW turbines produce alternating current (AC), transmission by HVDC from the OSW project requires an offshore AC/direct current (DC) converter station. A converter station on land converts the voltage from DC back to AC as required for the interconnection to the grid. Both the HVAC and HVDC cable systems include a fiberoptic telecommunications cable for OSW operations and export cable monitoring.

Key characteristics of HVAC or HVDC cables include polarity, bundling, transmission capacity, heat dissipation, electromagnetic fields (EMF), and induced voltage. HVAC export cables are often bundled into a single, three-phase/three-core (trefoil) cable and include the fiberoptic cable. HVDC export cables may be monopolar or bipolar. Monopolar refers to a cable with a single conductor with negative polarity. A bipolar HVDC cable may be unbundled (consisting of two separate cables, one cable for each conductor), bundled (both conductors are bundled together), or as a coaxial cable (the return conductor surrounds the inner conductor). Bundled or coaxial HVDC cables require less space but are less flexible and heavier than an unbundled (non-coaxial) HVDC cable.

Current offshore HVAC cables can transmit up to 400 MW using the trefoil design (Levitan 2020). HVDC circuits can transmit up to 1,400 MW using the single-core designs based on current state-of-the-art technology. However, cable transmission capacities will increase as the industry advances. For example, the first contracts for extruded HVDC cable systems at 525 kilovolts (kV) have been awarded for the SuedOstLink project in Germany, rated at 2 GW (e.g., Prysmian Group 2022). Also, several suppliers are in the latter stages of pre-qualifying extruded submarine DC cable systems at 525 kV, which will have a similar or greater rating, and it is to be expected that the first contracts for submarine links using this technology will follow in the next few years (e.g., Frisk et al. 2019; INMR 2020). Similarly, submarine HVAC cables have been developed with the availability of 1-core and 3-core 400-kV designs, allowing a transmission capacity of 800 MW or more; however, these circuits continue to lag behind the power ratings of the HVDC circuits.

In addition, the PSC Order on Power Grid Study Recommendations, issued on January 20, 2022, found that HVDC cables provide significant technical benefits over HVAC cables, such as power flow controls and easier black start capabilities (NYSPSC 2022). Based on multiple factors, the PSC directed NYSERDA to include eligibility criteria in OSW procurements to require use of HVDC where appropriate to preserve maximum efficient use of constrained cable corridors.

Some of the energy from an electric current passing through a transmission cable is transformed into thermal energy (i.e., heat). Heat is generated because of resistance in the buried cable, which increases with the amount of transmitted energy, burial depth, and sediment resistivity. Cohesive sediments (such as compacted silt) generate high levels of heat because of their lower thermal conductivity (e.g., Taormina et al. 2020; Emeana et al. 2016; Sharples 2011). With increasing burial depth, the cable performance decreases as the rate of heat dissipation is reduced. Depending on the environment, burial depths typically can range from 4 feet up to 17 feet. These factors determine the size of the cable and maximum current, and consequently the cable design. However, once the heat reaches the seabed surface, it dissipates relatively quickly because of the cooling effect of the surrounding seawater.

An EMF is a combination of an electric field (existing between any high-voltage conductor and earth) and a magnetic field (created by an electrical current). The magnetic field comprises two types of fields: a static field associated with DC current flowing in the conductor, and a time-varying field associated with the AC current flowing in the conductor. For all AC and DC subsea cable designs, the earthed metallic sheath prevents any electric field external to the cables. The AC current in an HVAC power cable generates a time-varying EMF field. The DC current from an HVDC cable generates a combination of static EMF field and time-varying EMF due to the slightly less than 100 percent efficiency of the offshore conversion of the AC current produced by the OSW turbines to DC current.

The characteristics and strength of the time-varying EMF varies based on whether AC or DC is being transmitted and the configuration of the cables; whether the transmission is in three, single-core cables or one, three-core cable for AC; or whether the DC cables are installed separately or bundled together and oriented in relation to the earth’s natural magnetic fields. In all cases, the EMF strength is proportional to the current and increases as the separation between conductors increases. The time-varying EMF around single-core HVAC cables can extend dozens of feet, but the effect is reduced significantly in three-phase, three-core cable systems because of the proximity of the three-phase conductors to each other. For HVDC cables, the time-varying EMF are low. For bundled HVDC cables, the effect is further reduced, by comparison to cables laid separately, because of the combined effect of the cables carrying identical current in opposite directions. The static field associated with the DC current flowing in an HVDC cable interacts with the earth's magnetic field causing a localized increase or decrease in field strength, which decays rapidly as the distance from the center line of the cable increases. This interaction does not affect parallel-aligned infrastructure or at crossings; however, the interaction affects magnetic compasses, especially in shallow waters. Similar to the time-varying EMF, the effect is reduced for bundled cables compared to cables laid separately because of the combined effect of the cables carrying identical current in opposite directions. For cables laid separately, the effect increases as the cable separation increases.

The time-varying EMF generated by AC or DC cables induce a voltage in adjacent, parallel-aligned metallic infrastructure, depending on the separation between the cable and the infrastructure. The induction effect increases in proportion to the cumulative distance over which the HVAC or HVDC cable is parallel to the adjacent infrastructure and the current flowing in the cable. Crossings of other linear infrastructure (pipelines, telecommunications, and other electric cables) at an angle of or near 90 degrees mitigates the electromagnetic induction effect.

The induced voltage effects of HVAC and HVDC cables on other electric cables and other metallic linear infrastructure could be a factor for consideration where the separation distance is on the order of several feet. The effect may extend tens of feet if the cables run parallel to the affected infrastructure for hundreds or thousands of feet. Therefore, the effect must be assessed for each cable proposed for a multiple-cable (multi-cable) corridor, shore landing, and infrastructure crossing. In addition, the potential impact of any static EMF on vessel compass deviations must be assessed to ensure compliance with USCG regulations.

1.6.2 Undersea Cable Separation Distances

Lateral separation distances for OSW cables are primarily a function of three key requirements: (1) width and maneuverability of the cable burial tool on the seabed; (2) accommodation space for cable repair (referred to as a repair bight) and width and maneuverability of the cable burial tool; and (3) avoiding damaging adjacent linear infrastructure during cable installation and maintenance. In highly constrained waterways where a cable repair bight cannot be accommodated, the minimum cable spacing width is typically dictated by the width of the burial tool and an appropriate safety margin.

The length for a cable repair bight is a function of water depth, the cable's minimum bend radius (MBR), and the configuration of the deck of the cable repair vessel. These factors determine the width of the required area to place the repair bight on the seabed. As a result, repair bights are longer in deeper water and shorter in shallower water. For bundled HVDC cables, a repair bight is required for each individual cable on each side of the installed cable bundle. Therefore, as an example, two bundled HVDC cables installed adjacent to each other requires double the width of the repair bight. In locations where it is not possible to lay a repair bight or where there is insufficient space, laying a new section of cable may be necessary. In such cases, the repair bight can be located at a convenient position, even over a mile from the location of cable damage.

Cable repair bights are not suitable for reburial using plows, and tracked trenching machines must be appropriately sized to fit the available space. The distance between the two "arms" of the repair bight may only be between 20 and 30 feet (6 and 10 meters), two times the MBR. Other reburial techniques include remotely operated vehicles with a suitable injector, concrete mats, or rock-bags; or, if practical, the cable can be reburied using a machine to liquidize the sand beneath the cable. The MBR, which is a function of cable size and design, is set by the factory as part of the cable specifications. MBRs for cables typically range from 10 to 16 feet (3 to 5 meters). The maneuverability of a burial machine is determined by its turning radius, which is highly specific to each machine. Cable burial tools are selected based on site- and project-specific requirements, such as the MBR.

Common industry guidance for the space between cables to accommodate repair bights is three times the water depth (ICPC 2014; DNV GL 2018). However, water depths of less than about 30 feet (10 meters) require a minimum spacing width; here, the vessel freeboard and deck length, rather than the water depth, and the anchoring requirements for the vessel during installation become the deciding factors. In shallow waters, the spacing for multiple cables must also account for the anchors of work vessels or barges during cable maintenance. Table 8 presents examples from Europe of recommended cable spacings.

Table 8. International Requirements and Standards for Parallel Routing and Spacing

Recommended Cable Route Spacing	Source	Location/Notes
> 330 feet (100 meters), and after every second cable 660 feet (200 meters)	German Federal Maritime and Hydrographic Agency (BSH 2019; DNV GL 2018)	North Sea and Baltic Sea (for water depth up to 200 feet [60 meters])
165 feet (50 meters)	The Crown Estate, United Kingdom (The Crown Estate 2012; DNV GL 2018)	The Crown Estate recommends larger distances if there is a risk of repaired cable (the bight) ending up on top of another installed cable.

The width and maneuverability of the burial tool, the installation vessel (if a barge with multiple anchors is used), and a safety margin dictate the minimum cable spacing width where a cable repair bight cannot be accommodated in highly constrained waterways. Cable installation burial tools are typically up to 30 feet (10 meters) wide, although one of the largest ones, the DeepOcean T-3200 subsea trencher, reaches 43 feet (13 meters). As a general guide, DHV KEMA (2012) and DNV GL (2018) list technology-driven minimum separation distances of 66 feet (20 meters) in straight stretches and 100 feet (30 meters) in curved stretches but recommend a minimum base distance of 165 feet (50 meters) for installations in water depths up to 165 feet (50 meters), without allowance for repair bights. In shallow waters, the installation vessels are lay barges, held in place by anchors. A typical skid length (i.e., the distance the barge moves and lays cable between anchor moves) is approximately 2,000 feet (600 meters). At crossing points of a pipeline or existing buried cable, the anchors may need to be kept off the seabed with mid-line buoys, usually if the crossed pipeline or cable is buried less than 3 feet (1 meter) below the seabed. The site-specific installation approach in shallow waters may affect the lateral spacing between cables to avoid damage of adjacent cables.

Cable spacing must also consider crossings of existing linear infrastructure such as power cables, telecom cables, and pipelines. For example, both the International Cable Protection Committee and the German regulatory agency recommend crossings as close to 90 degrees as possible, and not less than 45 degrees, to minimize risk of impacts to the installed linear facilities and improve access for subsequent maintenance (ICPC 2014; BSH 2019). More lateral space may be required for cables approaching at an oblique angle to accommodate any bending necessary to cross closer to 90 degrees.

In most cases, the crossing requires protection to maintain the required vertical separation, to account for scour, or to protect it during crossing operations using protective concrete mats or other suitable methods depending on conditions. The crossing cable lies either on the seabed or is buried shallower than planned because of the existing infrastructure, and requires additional protection from potential hazards (e.g., bottom fishing gear, anchor strike, unburial because of seabed erosion). Protection could take the form of clamshell or other protective methods fitted to the cable, flexible concrete mats, or rock bags. The final crossing design depends on agreement with the owner of the existing infrastructure and necessary approvals. Crossing at small angles yields bigger crossing structures that may result in greater environmental impacts and further complicate access to both the crossed infrastructure and the crossing cable if maintenance or repairs are needed at that location. Crossings that affect federal maintained channels, designated anchorages, and other federal civil works projects requires USACE review and approval.

Other key considerations for cable spacing and crossings include:

- Strategic design of the system to meet the requirements of the system operator and redundancy.
- Consideration of key stakeholder issues related to fishermen, conservation, and navigation and the management of their interactions to preserve the ability to install and maintain the cable system, provide third-party access for cable repairs, to avoid or minimize environmental impacts, and allow for funneling of the cables close to landfalls and offshore platforms.
- Consideration of more complex seabed conditions, such as rock outcrops, large boulders, shipwrecks, and other obstructions (see Section 1.6.3, Undersea Features Affecting Siting, Construction, Operation, and Maintenance).

Vertical separation distances between cables and other linear infrastructure (such as other electric cables, pipelines, and telecommunications cables) depend on induced electrical current and heat dissipation. These conditions may affect spacing at crossings and for co-location of infrastructure, including landings for multiple cables. As noted previously, HVAC and HVDC cables can induce currents in adjacent cables and other metallic infrastructure. This effect can occur within several dozen feet and depends on the cumulative distance over which the HVAC or HVDC cable is co-located with the other cables and infrastructure. The spacing needed for suitable heat dissipation is typically on the order of several feet and increases with burial depth (Sharples 2011).

Further, vertical separation distances are affected by the anticipated need for protection of the existing infrastructure during installation and maintenance of the new crossing cable. If there is insufficient burial depth between the existing infrastructure and crossing cable, then structures may be placed before installing the crossing cable, as discussed previously. Even if there is sufficient separation, in softer sediments that may cause self-burial of the crossing cable, concrete mats may be used to form a barrier.

1.6.3 Undersea Features Affecting Siting, Construction, Operation, and Maintenance

Natural seabed features, including boulder fields and mobile bedforms, wrecks, and artificial obstructions, add complexity to cable installation and may require more space between cables. In areas with large boulders, exposed and embedded in the sediment, current installation techniques include complete avoidance, micro-routing around, and relocation depending on the spacing of the boulders and environmental resources present. Similarly, mobile bedforms, such as sand waves and large mega-ripples, affect the ability to achieve and maintain an adequate burial depth below the stable seabed level, which is generally at the elevation of the troughs of sand waves.

Seafloor clearance methods for wrecks and artificial obstructions are site-specific and first require documenting the feature and obtaining concurrence from the appropriate state and tribal historic preservation offices. Potential cultural or archaeological resources along route corridors typically must be avoided by a minimum of 164 feet (50 meters) during geotechnical investigations (i.e., sediment sampling) (NYSERDA 2017a). Buffers established for the cable installation and operation phase are generally site-specific. Wrecks are generally avoided rather than cleared because clearing is costly, and there are potential issues with sea graves, heritage, hazardous cargo, or salvage/ownership. Certain wrecks deemed as culturally significant may need to be avoided by a suitable buffer, as stated. Also, any corridor in waterbodies with known wrecks should allow for unanticipated discovery of uncharted wrecks and obstructions.

1.6.4 Landfall Site Considerations

Landfall locations generally prioritize accessibility and distance to the POI and access for construction equipment and for the HDD necessary at the transition from undersea to overland cables. HDD or other trenchless technology will likely be necessary or required at landfalls because of highly dynamic shorelines, nearshore uses, dense urban areas, crossings of existing utilities, or to protect sensitive resource areas. This transition from undersea to overland must account for the offshore profile and how close a cable lay vessel can get to the landfall point. In difficult conditions, a shallow water installation vessel lays the cable from the beach to a suitable offshore location where the main cable lay vessel makes an in-line joint. Additionally, crossing of existing infrastructure such as bulkheads and revetments requires permission from the owner of the infrastructure (whether public or private), generally in the form of an easement or legal agreement with provisions for future maintenance or removal. Although trenchless landfall technology is preferred, in limited situations, direct trenching landfall may be appropriate (e.g., within an extremely protected area not subject to extreme erosion or along a hardened shoreline).

The HDD at landfall sites requires a workspace with a length of at least 300 feet (91 meters) for suitable pullback distance behind possible landing/transition sites (NYSDPS 2021). The area required for an OSW cable depends on the length of cable to the installation vessel. Adequate workspace width is also necessary to support HDD operations and depends on factors such as equipment used and the number and spacing of cables to be brought ashore for a given landing site. HDDs must be carefully planned near existing shoreline infrastructure. Crossing under bulkheads increases the distance of an HDD, and the entry/exit points must extend farther from the shoreline to provide a bending radius compatible with the HDD casing material. For shorelines with revetments, the minimum distance is generally shorter than for bulkheads because bulkheads typically extend deeper. In addition, several hundred feet of workspace is also needed for conduit or pipe stringing and typically requires a location with water access. Transition joint bays that house cable connections cover an area of approximately 6 by 6 feet (2 by 2 meters) and have a depth of approximately 10 feet (3 meters).

For HVDC cables, the location of the converter station is a key consideration. The preferred size of the HVDC converter station is a 5-acre parcel size within 0.5 miles of an identified onshore route to handle power input of at least 1.3 GW at plus or minus 320 kV. However, due to limited space in New York City, a 2.5-acre minimum parcel within 1 mile of potential New York City routes may be needed (NYSDPS 2021).

1.6.5 Landfall Cable Installation with Horizontal Directional Drilling

Where possible, installation at landfall should be one HDD per bundled HVDC cable. In some instances, it may be necessary to separate the cables for HDD installation to ensure that the pull tension is evenly spread between each HVDC cable and mitigate the potential for damage during installation. Where HDD is not the best installation technique, a single trench is used to install bundled cables, but this should be proposed sparingly and only in instances where HDD is demonstrated as infeasible.

The use of HDD at landfall for an OSW cable ashore requires a design based on site-specific conditions, including the profile of the HDD, entry and exit points and angles, the internal diameter and material of the pipe, and length. The practical length for transmission cable installation (as individual cables, not bundles) through HDD conduits is considered 600 to 2,500 feet (200 to 800 meters), although lengths up to 1 mile (1.6 kilometers) are possible depending on geologic conditions and cable diameter (Bueno 2016). The industry practice for minimum separation distance between HDD holes is at least 33 feet (10 meters) to protect from blow-outs, elevated temperatures between cables, and inaccuracies during HDD drilling; the exact separation distance is determined during detailed design once geotechnical information is available (Tüv Süd et al. 2014).

1.6.6 Onshore Burial Depths and Separation Distances

The onshore portion of the landfall for three single-core cables requires a concrete-filled duct bank for each cable. Duct bank dimensions for the anticipated HVDC circuits of approximately 1,000 MW will be approximately 7 feet by 5 feet and installed vertically or horizontally (NYSDPS 2021). A single-circuit duct bank will be approximately 7 feet by 5 feet, and duct bank separation of 15 feet is generally assumed to maintain thermal independence for up to three parallel HVDC conduits.

The minimum cable separation distance at landfall is 30 feet (NYSDPS 2021). The distance can be less depending on onshore cable installation guidelines and the experience of the installer to drill at distances closer than 30 feet from an installed cable.

Onshore cable installation techniques include open trenches and trenchless means. Where open trench is not feasible, jack and bore or HDD will avoid impacts to environmental resources and other obstructions. Trenchless construction uses entrance and exit pits to allow for boring equipment. Soils in the underground trench provide thermal dissipation and mitigation of EMF. HDD methods will be similar to the description for undersea cables.

A typical HVDC cable trench is typically 4 to 5 feet wide at the top and 4 to 5 feet deep to achieve proper depth, based on a 345-kV line. A telecommunications cable trench is similar in dimensions, with a width of 3 feet and a depth of 3 to 6 feet. When considering temporary workspace required for trenchless crossings, a width of 150 feet is typically required at crossings for HVDC cables, based on a drill rig entry site that is 150 feet wide by 250 feet long, and pipe exit side dimensions of 100 feet wide by 150 feet long. Temporary workspace requirements for telecommunication cables can be as much as half the size of that referenced above for HVDC cables, depending on the size of the project.

Heat dissipation and EMF for underground cables on land have similar characteristics and considerations as described above for undersea cables. Underground cables, because of the insulation and surrounding environment, tend to retain the heat produced. To compensate for this, underground cables are generally bigger to reduce their electrical resistance and heat produced. How the heat produced is dissipated depends upon on whether the cables are direct buried where soil provides heat dissipation or in deep bore tunnels where forced air ventilation or water cooling provides cooling.

1.6.7 Cost Considerations for Marine- and Land-Based Transmission

The primary factors affecting costs for OSW cables are the length of the route, conditions in the local environment, mobilization of installation vessels, and costs associated with minimization and mitigation measures necessary to address impacts to resources and communities. Localized conditions include ROW access, construction in urban areas, conflicts with other utilities, permitting requirements, crossing natural or humanmade barriers, and the real estate values for the converter station. These factors result in highly variable cost estimates when calculated on a per-mile basis. The route may be longer to avoid certain local conditions or include innovative techniques or mitigation to address impacts that affect the cost of the OSW cable. Onshore routes will likely include multiple installation techniques between a landfall and POI to avoid constraints and minimize impacts, including environmental resources, topography, and utilities. Undersea HVDC cables are generally considered more cost-effective for distances greater than approximately 60 nautical miles (nm) (Levitan 2020). Distances between most of the relevant BOEM lease areas and the Upper New York Harbor or Long Island Sound exceed 60 nm. Offshore routes will have multiple types of installation methods to address conditions such as water depth (e.g., the 10-meter bathymetric contour), seabed substrate (e.g., soft sediment, hard-bottom, bedrock, boulders), anchorage/channel crossings, waterfront infrastructure, and utility crossings (e.g., cable, pipeline, tunnel). Challenging portions of an undersea route, such as bedrock, compared to less challenging conditions in the open ocean affects costs of cable installation.

Table 9 summarizes cost estimates provided in the Power Grid Study and from the ConEd Petition of Consolidated Edison Company of New York, Inc. for Approval to Recover Costs of Brooklyn Clean Energy Hub (NYSDPS 2021; ConEd 2022). Cost per mile values are primarily for illustration only, however, because of the many factors affecting costs. The significant cost difference for offshore versus onshore imply a preference for a longer in-water route to minimize costs. However, the cost per mile for offshore cables also depends on site-specific conditions and mobilization of installation vessels, which is mostly independent of the route length, and can be the most significant portion of the undersea cable cost. For the routes within the study area, mobilization includes time of transit from vessel base to site, preparing the vessel for the cable installation, loading of the cable, test runs, and standby time between each phase of construction. The mobilization costs largely consist of the vessel day rate, fuel use, and related construction activities.

Table 9. Cost Considerations for Onshore and Offshore Cable Circuit Installation (Underground)

Location	Estimated Cost Per Mile[1] (rounded, millions)	Source
Offshore	$3	NYSDPS 2021
Brooklyn Clean Energy Hub Offshore	$21	ConEd 2022
Onshore HVDC–Long Island[2]	$23	NYSDPS 2021
Onshore HVDC–New York City	$28	NYSDPS 2021
Onshore HVAC–Long Island	$19	NYSDPS 2021
Onshore HVAC–New York City	$36	NYSDPS 2021
Brooklyn Clean Energy Hub Onshore	$47	ConEd 2022

1 Assumed to include engineering/design, construction, materials, and project management (including procurement). Does not include costs of substation or other facility upgrades. Assumes negligible cost for use of public ROW.

2 Average per mile costs were developed for HVDC and HVAC cables for Long Island and New York City, using the routes in the Power Grid Study. The routes for Long Island all had landfalls on the South Shore; none of the routes came through Long Island Sound.

Further, most cost estimates do not reflect the true cost of environmental impacts and their mitigation because those factors are generally very site specific and challenging to quantify separately. The costs associated with many environmental minimization and mitigation measures are not general or typical, with the exception of some ability to estimate the cost of using HDD to avoid impacts. Certain environmental mitigation costs can be projected, however, such as mitigation for wetland impacts because of the long history of this type of mitigation and USACE regulatory requirements. Therefore, including mitigation costs, which may be greater for longer offshore routes, could also affect the apparent disparity in offshore and offshore costs per mile.

Figure 1. Study Area and Approach Areas

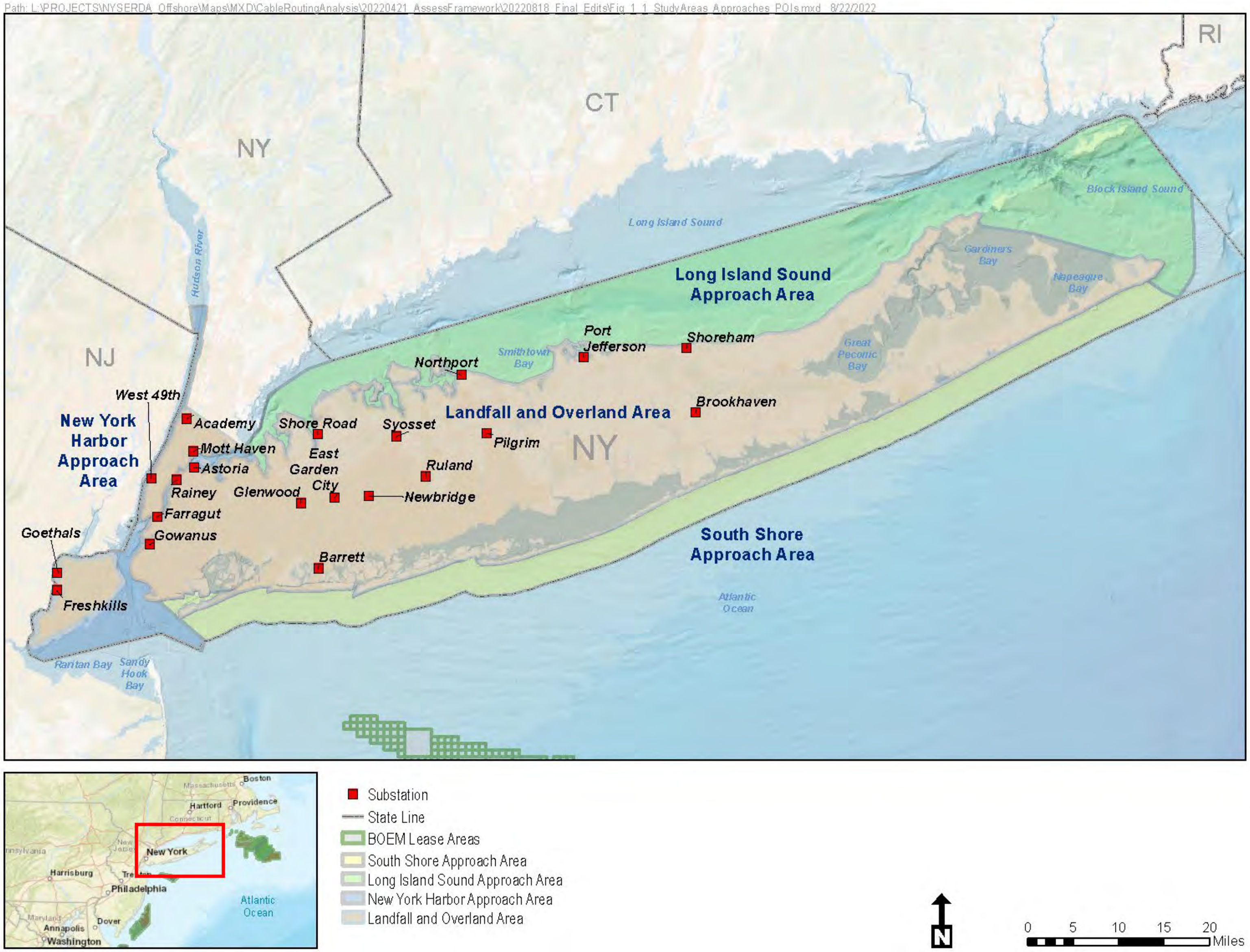
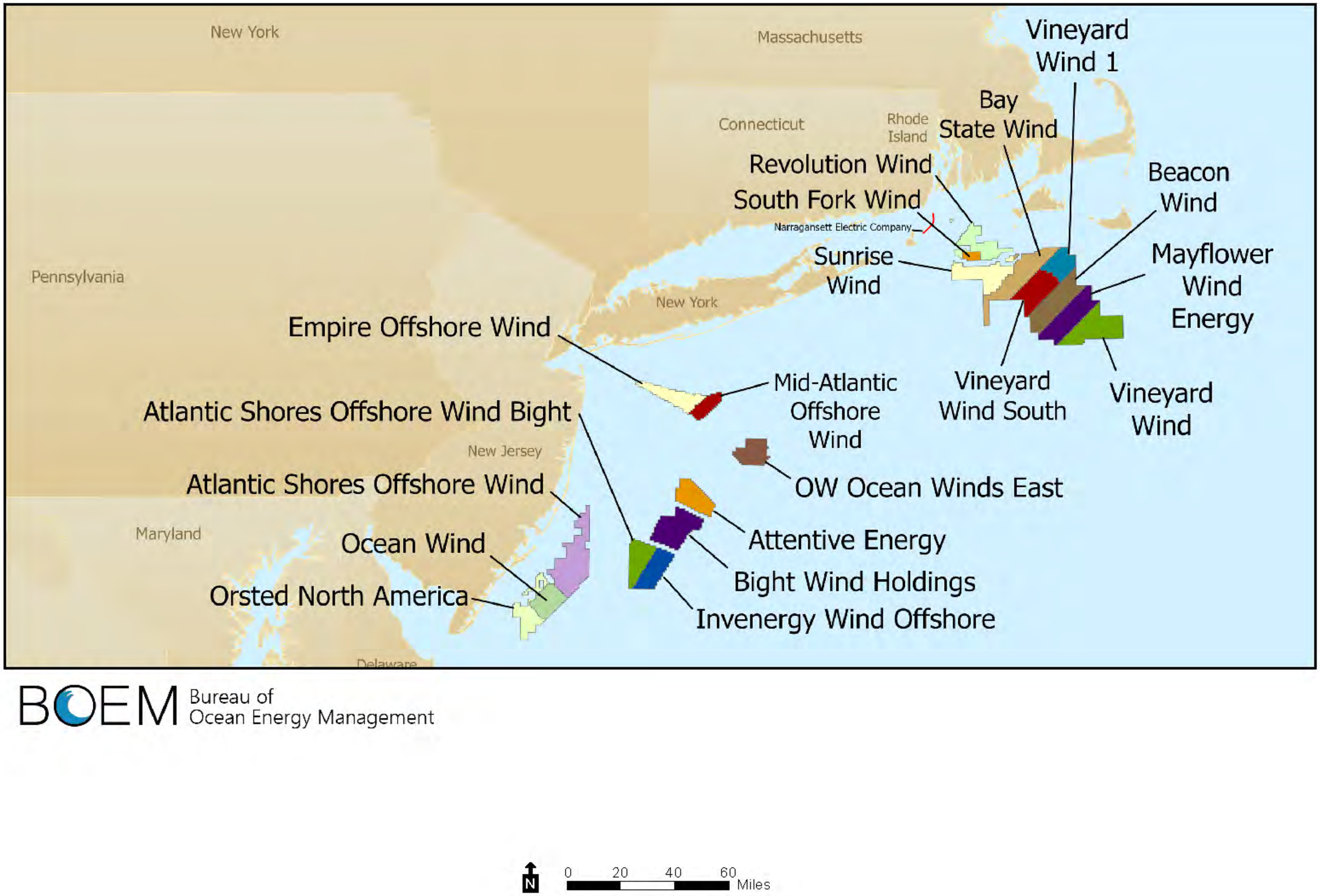


Figure 2. BOEM Lease Areas That May Interconnect in the Study Area



2 Constraints Analysis

The constraints analysis developed the criteria and process for analyzing and ranking potential constraints for OSW cable corridors by focusing on the resources with potential to affect or be affected by OSW cable siting, design, construction (i.e., installation), operation, and maintenance. The CWG evaluated the methods and results of the constraints analysis and provided guidance and direction based on available data and extensive knowledge of the resources.

The resources evaluated within the study area reflect environmental, technical, and stakeholder concerns regarding the degree to which they could affect siting of OSW cables, landing areas, and connection to onshore POIs. Available spatial data, prior studies, technical expertise, professional judgment, and other information about conditions relevant to offshore and onshore transmission cables make up the quantitative and qualitative characteristics evaluated for each resource. The assessment focuses on resources most likely to affect the feasibility of siting OSW cables rather than on all resources and potential impacts from construction, operation, and maintenance. For example, visual impacts, noise, and EMF are not analyzed in detail but are acknowledged. The effects of OSW cables on these resources will vary in degree and significance depending on location and design. The regulatory framework described in Section 1.3, Regulatory Overview for Connecting OSW to the Grid, particularly the Article VII permitting process, will ensure a thorough evaluation of all environmental impacts from OSW cables and minimization and mitigation of any adverse environmental impacts. Each resource is evaluated individually, not in comparison to each other.

2.1 Criteria and Process for Analyzing Constraints

2.1.1 Undersea Approach Areas

The selection of resources for analysis of constraints in the Undersea Approach Areas reflects significant natural, environmental, and socioeconomic resources and existing infrastructure with potential to affect or be affected by construction, operation, and maintenance of OSW cables. These resources reflect the unique nature of each Undersea Approach Area.

Table 10 lists the 13 undersea resources analyzed for potential constraints to OSW cables. The table identifies the characteristics of each resource that affect feasibility of siting an OSW cable; the qualitative criteria used to define high, medium, and low levels of constraint; and the GIS layers used for the spatial analysis. Appendix A provides the list and description of the GIS layers used in the analysis. Using a subset of these resources, the analysis identified zones and subzones within each approach area to exclude certain resources where complete avoidance is necessary, feasible, and/or preferred such as unexploded ordnance (UXO), existing and planned artificial reefs, areas of shallow water, or areas of high slope. The development of the zone and subzone boundaries generally considered the following criteria:

- Contains similar resource characteristics and constraints and may be unique from other zones.
- Avoids known areas of exceptional risk or unique value to the extent practicable.
- Proximity to POIs that are potentially suitable for interconnection to the New York Independent System Operator grid.

Table 10 shows the resulting boundaries of undersea zones and subzones for further analysis.

The shape and size of a given zone also depend on the anticipated use of the zone to facilitate where cables transit through, make landfall, or both. As Figure 3 shows, the South Shore Approach Area zones were truncated approximately 2 nm from shore to remain within the 3-nm limit New York State waters to avoid artificial reefs and borrow areas and to maximize flexibility for routing considerations. The dashed lines show the zone boundaries if the zones were extended to the limit of State waters and into the Safety Fairway (i.e., the "Long Island Fairway") proposed to run parallel to the coast of Long Island. The Coast Guard is coordinating possible establishment of fairways along the Atlantic Coast, as well as complementary port approaches and international entry and departure zones, with BOEM to minimize the impact to offshore energy leases. Use of or crossing the proposed fairways would follow general principles and regulatory requirements for routing cables, including those outside the identified zones.

The process for analyzing the degree to which these resources may pose a constraint to an OSW cable correlated the qualitative criteria shown in Table 10 to spatial distribution of GIS data and supplemented by professional judgment as appropriate for each resource. First, the overall geospatial coverage of each resource in the study area was assigned as high, medium, or low based on the range of available GIS data. For example, the density of commercial vessels as measured by automated identification systems (AIS) transits per year assigned low as 1–3,300; medium as 3,301–18,000, and high as over 18,001. Using these categories of AIS data supports a high-level analysis of criteria most likely to affect cable siting even with the limitation that not all vessels carry transponders that record AIS data. Through further GIS analysis, the percent area of a resource within a zone or subzone was calculated by dividing the areas of each resource by the area of each zone for the GIS layers associated with a resource for the entire study area. For example, percent area of anchorage areas in New York Harbor set the highest level, and all zones and subzones were measured relative to New York Harbor with respect to anchorage areas. Where more than one GIS layer represented the constraint, an overall ranking reflected the relative significance or data quality of each GIS layer. Where no GIS layer represented the resource, or information was available through unmapped sources, professional judgment informed overall ranking.

Table 10. Undersea Resources and Criteria for Analyzing Constraints for OSW Cable Corridors

Resource	Characteristics Affecting Feasibility	Qualitative Criteria	GIS Layers
NATURAL AND ENVIRONMENTAL RESOURCES			
Marine Geology and Hydrology	Shallow bedrock and/or hardbottom structure Cohesive clays in substrate Rocky shoals and boulder fields (e.g., as part of glacial moraines) Strong currents and associated seabed mobility (scour, sand waves) and added complexity for cable installation Steep slopes of the seabed	**Low:** Sandy or silty substrate without hardbottom (boulder fields, bedrock) or bedforms (sand waves). Stable seabed with gentle slopes. **Medium**: Isolated areas with hardbottom substrate (boulder fields, bedrock) and some small bedforms. Minimal erosion of the seabed; limited variability of gradient on seafloor. **High:** Extensive areas of hardbottom (bedrock, boulder fields, cemented sands) and large bedforms (sand ridges, sand waves), or soft sediment (with perhaps gas pockets). Unstable seabed with areas of erosion/scour because of strong currents or wave activity. Extended sections of steep seafloor.	Long Island Sound BluePlan Hard Bottom Data NCEI Bathymetric Data derived slope
Aquatic Biological Resources and Sensitive Habitats	Designated critical habitat, seasonal management areas (SMAs) (i.e., for whales), existing or planned artificial reefs, coldwater corals, shellfish beds, Natural Heritage Communities, submerged aquatic vegetation (SAV), designated T&E species habitat, New York City Waterfront Revitalization Program (NYCWRP) designations (Recognized Ecological Complexes [REC] and Ecologically Significant Maritime and Industrial Area), Significant Coastal Fish and Wildlife Habitat (SCFWH), hard and complex seafloor (sensitive habitat indicator)	**Low:** Sensitive habitats are not mapped or known to be within the vicinity. Listed species may be present, but transient. No artificial reefs or mapped SAV. **Medium:** Isolated areas of sensitive habitats and/or listed species (if transient/not present year-round and can be avoided through time-of-year restrictions). Potential critical life stages present like spawning during certain times of year. Areas of highly valued or unique resources that should be avoided. **High:** Presence of multiple habitats, including artificial reefs, cold-water corals, SCFWH, sensitive habitats, and/or non-transient listed species. Extensive mapped SAV.	Artificial reefs and extensions NY Statewide Seagrass North Atlantic Right Whale (NARW) SMA SCFWH–NY (NYDCR ver2) NOAA Critical Coastal Habitat Natural Heritage Communities 2018 NYCWRP REC & Sensitive Maritime and Industrial Area (SMIA) Long Island Sound Blue Plan hard and complex seafloor

Table 10 continued

Resource	Characteristics Affecting Feasibility	Qualitative Criteria	GIS Layers
Waterbody Dimensions	Depth: Draft restriction for installation vessels Width: Physical constraint of landmasses on either side of potential corridor	**Low**: Depth greater than typical cable installation vessel draft; greater than 6,000 feet wide. **Medium:** Does not allow for installation of cables without specialized equipment; between 3,000 to 6,000 feet wide. **High:** Very shallow, specialized equipment and/or alternative installation methods (e.g., HDD) required; less than 3,000 feet wide.	GIS measurement of narrowest point of zone/subzone
SOCIOECONOMIC RESOURCES			
Recreational and Commercial Fishing	Recreational and commercial fishing with particular attention to bottom-oriented fishing gear such as dredging or trawling	**Low:** Commercial and recreational fishing uncommon. **Medium:** Infrequent, small, or isolated occurrences of commercial or recreational fishing; no mapped fishing areas. **High:** Extensive and frequent use for commercial or recreational fishing; one or more mapped fishing area.	New York recreational fishing areas New Jersey prime fishing areas Designated commercial fishing areas (Communities at Sea- Large trawling [>65 feet] and small trawling [<65 feet])
Vessel Traffic	Density of commercial vessels (as measured by AIS) Designated Areas: Ferry routes	**Low:** Low density of commercial vessel traffic, posing low risk for accidental anchor strike. No special designations for marine and waterfront activities. **Medium:** Medium density of commercial vessel traffic, posing medium risk for accidental anchor strike. Some designated areas for marine and waterfront activities. **High:** High density of commercial vessel traffic (particularly large vessels), posing high risk for accidental anchor strike. Several designated areas for marine and waterfront activities.	AIS Vessel Traffic- All Vessels 2017

Table 10 continued

Resource	Characteristics Affecting Feasibility	Qualitative Criteria	GIS Layers
Navigation Areas	Federally designated navigation channels Anchorages Shipping lanes/fairways Navigation safety and security zones; danger areas	**Low:** No federal navigation channels, anchorages, or USCG Safety Zones. **Medium:** Perpendicular or oblique crossings of federal navigation channels, anchorages, or USCG Safety Zones. **High:** Significant occupation of federal navigation channels, anchorages, and USCG Safety Zones.	Anchorage areas (multi-scale merged) National Channel Framework Lines Danger Zones and Restricted Areas
Other Recreation	Recreational wreck or artificial reef diving sites; sailing race routes/areas; wildlife viewing areas	**Low:** No known occurrence of recreational sites, no sailing race routes/areas; no known occurrence of wildlife viewing areas, or water trails. **Medium:** One or two recreational sites or sailing race routes/areas; a few wildlife viewing areas, or water trails. **High:** Not applicable given the temporary nature of the activities and impacts of installation and maintenance in most cases.	New York Recreational Uses: Wildlife Viewing and Recreational Dive Sites BluePlan Recreation: Sailing Race Routes
Borrow Areas and Ocean Disposal Sites	Dredged material disposal site Offshore sand borrow areas	**Low:** No borrow area(s); no active or past disposal site(s) present. **Medium:** Potential for future borrow site(s); no active or past disposal site(s) present. **High:** Borrow site(s) and/or active or past disposal site(s) present.	Ocean Disposal Sites USACE Borrow Areas
Marine Archaeology and Cultural Resources	Shipwrecks, obstructions Potential Holocene sites Federal, state (underwater components), and local parks	**Low:** No mapped archaeological and cultural resources. **Medium:** A few scattered mapped or potential archaeological and cultural resources. **High:** Presence of at least two of the following: Dense concentrations of wrecks and/or obstructions and/or suspected submerged archaeological sites.	Automated Wreck and Obstruction Information System (AWOIS) Obstructions AWOIS Wrecks Electronic Navigational Chart (ENC) Wrecks

Table 10 continued

Resource	Characteristics Affecting Feasibility	Qualitative Criteria	GIS Layers
Waterfront Infrastructure	Areas of dense industrial marine activity such as piers or major shipping hubs Resilience projects Hardened shorelines	**Low:** Priority Marine Activity Zones (PMAZ), SMIA, and resilience projects not present and extensive areas of natural shoreline. **Medium:** Moderate presence of PMAZ, SMIA, or hardened shoreline, shoreline resilience project infrastructure. **High:** Extensive presence of PMAZ, SMIA, and/or hardened shoreline, in-water resilience project infrastructure.	NYCWRP PMAZ & SMIA NOAA Continually Updated Shoreline Product
EXISTING INFRASTRUCTURE			
Linear Utilities	Transmission cables Telecommunication cables Pipelines Sewers/outfalls Aqueducts	**Low:** No linear utilities present except for (deeply buried) aqueducts; no outfalls present. **Medium:** Orientation of existing linear infrastructure that presents a need for crossing or other mitigation/minimization measures to successfully install new cables. **High:** Dense assemblages of transmission, telecommunication, pipelines, or sewers that require multiple crossings; outfall present.	ENC Pipeline ENC Pipeline Area Empire Wind 1 & 2 Beacon Wind Sunrise Wind ENC Cable ENC Cable Area
Tunnels and Bridges	Transportation tunnels Bridges	**Low:** No transportation tunnels or a few bridges with at least 100-foot clearances present to accommodate installation vessels. **Medium:** One transportation tunnel that must be crossed perpendicularly and/or multiple bridges with one having a clearance below 100 feet with potential to impact cable installation vessel access. **High:** Two or more transportation tunnels present and two or more bridges with clearances below 100 feet.	Major Roadways Subways Railroads
Sediment Contamination and UXOs	Contaminated sediment UXOs	**Low:** Clean (anticipated NYSDEC Level A sediments); no UXOs. **Medium:** Potential for NYSDEC Level B contamination; potential for UXOs. **High:** Identified NYSDEC Level C contamination; charted UXO areas.	NYSDEC Remediation Sites UXO

The subsequent ranking of resources with potential to constrain OSW cables as high, medium, and low represents both the spatial area present in the zone relative to the study area and professional judgment. For example, although certain highly valued resources may represent a small geospatial area, application of site-specific knowledge and professional judgment could increase the ranking. Thus, a high rank signals a highly valued or unique resource that should be avoided, a high-geospatial presence resource that makes avoidance difficult, a cumulative effect of multiple resources, or a combination. Therefore, rankings of a resource are relative to the resource in the study area, but not relative to each other. Section 3: Assessment of Constraints, describes these conditions and the locations where highly valued resources should be avoided or addressed with appropriate minimization and mitigation measures.

2.1.2 Landfall and Overland Area

The landfall and overland constraints analysis assumes the use of existing ROWs for potential co-location with OSW cables due to the extent of developed land and associated spatial limitations. The four categories of existing ROWs considered include:

- Existing electric transmission lines, both aboveground and underground.
- Arterial roadways.
- Metropolitan Transportation Authority passenger lines.
- Natural gas pipelines.

Other ROWs may be suitable, for example, defunct aqueducts, although available GIS data do not address status or feasibility of reuse. Freight lines were excluded because of the increased safety and security challenges associated with siting a transmission line parallel to those lines. In addition, the ROW category for arterial roadways reflects avoidance of small roads or roads with only one lane in either direction; however, smaller roads may represent the preferred option in some cases. Within the arterial roadway category, NYSDOT identified the following parkways with requiring FHWA approval for an exception to the NYSDOT Utility Accommodation Plan for non-transportation uses that may require consultation with FHWA: Bethpage, Heckscher, Loop, Ocean, Sagtikos, Sunken Meadow, Wantagh, Meadowbrook, Northern State and Southern State Parkways, the Robert Moses Causeway, and the Long Island Expressway and Service Roads.

The analysis assumes use or expansion of existing ROWs and not the creation of new ROWs from the identified undersea landing zones to one or more POIs. Table 11 identifies the 21 POIs included in one or more of the onshore zones, which were representative substations considered potentially feasible POIs in the New York Power Grid Study analysis.

Table 11. Points of Interconnection Included in Onshore Zones

NYC and Long Island Substations Representing Potential POIs		
Academy	Glenwood	Port Jefferson
Astoria	Goethals	Rainey
Barrett	Gowanus	Ruland Road
Brookhaven	Mott Haven	Shoreham
East Garden City	Newbridge Road	Shore Road
Farragut	Northport	Syosset
Freshkills	Pilgrim	West 49th Street

Table 12 lists the resources analyzed for potential constraints to OSW cables; the characteristics of the resource that affect feasibility of siting an OSW cable; the qualitative criteria used to define high, medium, and low levels of constraint; and the GIS layers used for the spatial analysis. Appendix A provides the list and description of the GIS layers used in the analysis. Using a subset of these resources, the analysis identified boundaries of zones to optimize use of ROWs and exclude certain resources to the extent practicable, where complete avoidance is necessary or preferred, such as steep slopes, wetlands, critical species and sensitive habitats, certain land use types, and environmental justice populations and disadvantaged communities. The development of the zone boundaries generally considered the following criteria:

- Proximity to POIs as potentially suitable for interconnection to the grid.
- Use of landfall points generally coinciding with landing zones identified in the undersea constraints analysis.
- Selection of the nearest POI(s), where feasible, to minimize costs and resource impacts from a longer route and for two roughly equidistant POIs, the zone encompasses both.
- Inclusion of all existing potential ROWs with reasonable paths to the POI.

Figure 4 shows the resulting boundaries of landfall and overland zones for further analysis. Zone numbering starts from the west end of the study area (Staten Island) moving eastward, and zone names generally correspond with the landfall site.

The process for further analysis of landfall and overland zones also used available geospatial data, prior studies, technical expertise, and other information about conditions relevant to offshore and onshore transmission cables. Within each zone, the area of analysis consisted of a 250-foot buffer on either side of the centerline of any of the four categories of ROWs present in the zone, defined as:

- 75-foot separation distance off the centerline of a 345-kV transmission line. This conservative width is based on overhead lines, because, although they will likely represent a very small portion of future overland transmission cables, their separation distances represent a conservative spatial estimate.
- 150-foot-wide temporary workspace at crossings for underground cables, based on a drill rig entry site of 150 feet by 250 feet, and a pipe exit site of 100 feet by 150 feet.
- 75-foot offset from the centerline to account for the distance at which EMF values would not be exceeded for an overhead 345-kV transmission line. This was considered more conservative than offsets for underground transmission lines, which are less.
- 25-foot area to account for a review of adjacent land use.

This total width, illustrated in Figure 5, reflects a conservative area of analysis that encompasses the anticipated widths for transportation, railway, and pipeline ROWs and does not represent a site-specific or ROW-specific analysis. The conservative width ensures that the constraints analysis captures relevant geospatial data on all resources.

As described above for undersea approach area resources, the analysis correlated the qualitative criteria shown in Table 12 to geospatial distribution and professional judgment for each landfall and overland resource. First, the overall percent area of each resource in the Landfall and Overland Area was assigned as high, medium, or low based on the range of available GIS data. The percent area of each resource was calculated by dividing the areas of each resource by the area within the total ROWs within a zone for 33 GIS layers. The percent area coverage of a GIS layer for a constraint within all ROWs within each zone was ranked as high, medium, and low classifications. Where more than one GIS layer represented a resource (e.g., land use, critical species, and sensitive habitats), the overall ranking reflected the relative significance or data quality of each GIS layer.

Table 12. Resources and Criteria for Analyzing Constraints for Landfall and Overland Area

Resource	Characteristics Affecting Feasibility	Qualitative Criteria	GIS Layers by Constraint
NATURAL AND ENVIRONMENTAL RESOURCES			
Geology and Topography	Steep slopes Faults	**Low:** Stable terrain with gentle slopes. No presence of faults. **Medium:** Significant topographic variability or steep topography. Scattered faults. **High:** Significant topographic variability or steep topography and extensive faults.	Digital elevation model
Surface Water and Wetlands	Federally regulated waters (includes wetlands) State protected Article 15 waters and Article 24 freshwater wetlands and adjacent areas, and locally protected wetlands	**Low:** No federally regulated or state surface waters or wetlands. **Medium:** Scattered areas of federally regulated areas and/or state protected waters or wetlands; no crossings. **High:** Extensive areas of federally regulated waters and/or state protected waters or wetlands; multiple crossings.	National Hydrography Flowline U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) NYSDEC-regulated mapped wetlands
Critical Species and Sensitive Habitats	Federally- or state-listed endangered or threatened species or associated habitat, designated critical habitat Important Bird Areas (IBAs) NYCWRP designations Significant Coastal Fish and Wildlife Habitats (SCFWH) Natural Heritage Communities Conservation and mitigation sites	**Low:** Sensitive habitats and listed species are not located within the vicinity. No SCFWH or Natural Heritage Communities. **Medium:** Sensitive habitats and/or listed species are present. **High:** Presence of multiple habitats, including of SCFWH, sensitive habitats and/or listed species and Natural Heritage Communities. Extensive IBAs. Presence of conservation and mitigation sites.	NOAA essential fish habitat (EFH) SAV/eelgrass Audubon IBAs NYC WRP Significant Coastal Fish and Wildlife Habitats Natural Heritage Communities Long Island Sound BluePlan data

Table 12 continued

Resource	Characteristics Affecting Feasibility	Qualitative Criteria	GIS Layers by Constraint
Land Use	Federal, state or municipal-owned/managed lands Indigenous lands CEHAs Residential land use	**Low:** No federal, municipal, or indigenous lands, or CEHAs. No State Parks, Wildlife Management Areas, State Forests, Forest Preserves or Conservation Easements. Limited residential land use. **Medium:** One or two small federal, municipal, or indigenous lands, CEHAs, or State Parks. Minimal occupation of municipal parkland. Residential land use that is not extensive. **High:** Extensive areas of federal, municipal, or indigenous lands, CEHA, or State Parks. Occupies municipal parkland, Wildlife Management Areas, State Forests, Forest Preserves or Conservation Easements. Extensive residential areas.	DoD installations County parcel data New York Protected Areas Database New York State Historic Sites and Park Boundary NYSDEC Lands and Campgrounds New York State Civil Boundaries – Indian Territories CEHAs
SOCIOECONOMIC AND COMMUNITY RESOURCES			
Environmental Justice Populations and Disadvantaged Communities	Environmental justice populations Disadvantaged communities	**Low:** No environmental justice populations or disadvantaged communities. **Medium:** Small areas of environmental justice populations or disadvantaged communities. **High:** Large or extensive environmental justice populations and/or disadvantaged communities.	NYSDEC potential environmental justice areas Disadvantaged communities
Cultural Resources	Known archaeological and architectural resource sites National Register of Historic Places (NRHP) sites/districts	**Low:** No mapped archaeological and cultural resources. **Medium:** A few scattered mapped or potential archaeological and cultural resources. **High:** Large number of archaeological and cultural resources.	National Register (NR) Sites/Polygons

Table 12 continued

Resource	Characteristics Affecting Feasibility	Qualitative Criteria	GIS Layers by Constraint
Other Recreation	Recreational use and public access recreational paths, trails, routes, and areas Wildlife viewing areas, water trails, and surfing/beachgoing areas	**Low:** No known occurrence of recreational sites/paths/trails/routes/areas; no known occurrence of wildlife viewing areas, water trails, or surfing/beachgoing areas. **Medium:** One or two recreational sites/paths/trails/routes/areas; a few wildlife viewing areas and/or water trails, but no surfing/beachgoing areas. **High:** Multiple recreational sites/paths/trails/routes/areas; surfing/beachgoing areas.	NYSDEC roads and trails Parcel data queried for recreational and open space land use codes Recreational fishing Recreational surfing Wildlife viewing areas
EXISTING INFRASTRUCTURE			
Linear Utilities	Overhead and underground electric transmission cables Underground telecommunication cables Pipelines (gas and hazardous liquid) Outfalls Aqueducts	**Low:** No conflicting linear utilities present; no outfalls present. Supporting linear corridors present (e.g., potential co-location). **Medium:** Limited lines or clusters of linear infrastructure that may be crossed during one horizontal directional drill (HDD) event and/or paralleled. **High:** Dense assemblages of transmission, telecommunication, or pipelines that require multiple crossings; one or more outfall present.	Platts transmission lines and cables Homeland Infrastructure Foundation-Level Data -Electric Transmission Lines ENC pipeline areas NYC aqueducts NYC outfalls
Transportation	Non-commuter railroads State highways FHWA-funded parkways and controlled access highways	**Low:** No railroads or highway crossings; no parkways present. **Medium:** One railroad or highway crossing and one to two parkways present. **High:** Two or more railroads, highway crossings, or several parkways present.	North American Rail Lines NYS DOT Roadway Inventory

Table 12 continued

Resource	Characteristics Affecting Feasibility	Qualitative Criteria	GIS Layers by Constraint
Shoreline Protection	USACE Coastal Storm Risk Management (CSRM) projects Piers, bulkheads, shoreline restoration, rip rap, etc.	**Low:** Limited or no shoreline protection infrastructure; no USACE CSRM projects or directly impacted shoreline protection features at potential landing area(s). **Medium:** Some waterfront infrastructure or armoring, but none which cannot be reasonably accommodated and overcome or mitigated. **High:** Extensive waterfront structures, infrastructure, armoring and/or actively managed USACE CSRM project(s) with shoreline protection structures along potential landing areas which cannot be reasonably accommodated and overcome or mitigated.	USACE CSRM NOAA Continually Updated Shoreline Product
Areas of Contamination	NYSDEC remediation sites USEPA Superfund Sites	**Low:** Limited or no areas of contamination **Medium:** Some areas of contamination. **High:** Large number of areas of contamination.	NYSDEC environmental remediation sites USEPA Facility Registry Service sites

Figure 3. Undersea Zones for the Constraints Analysis

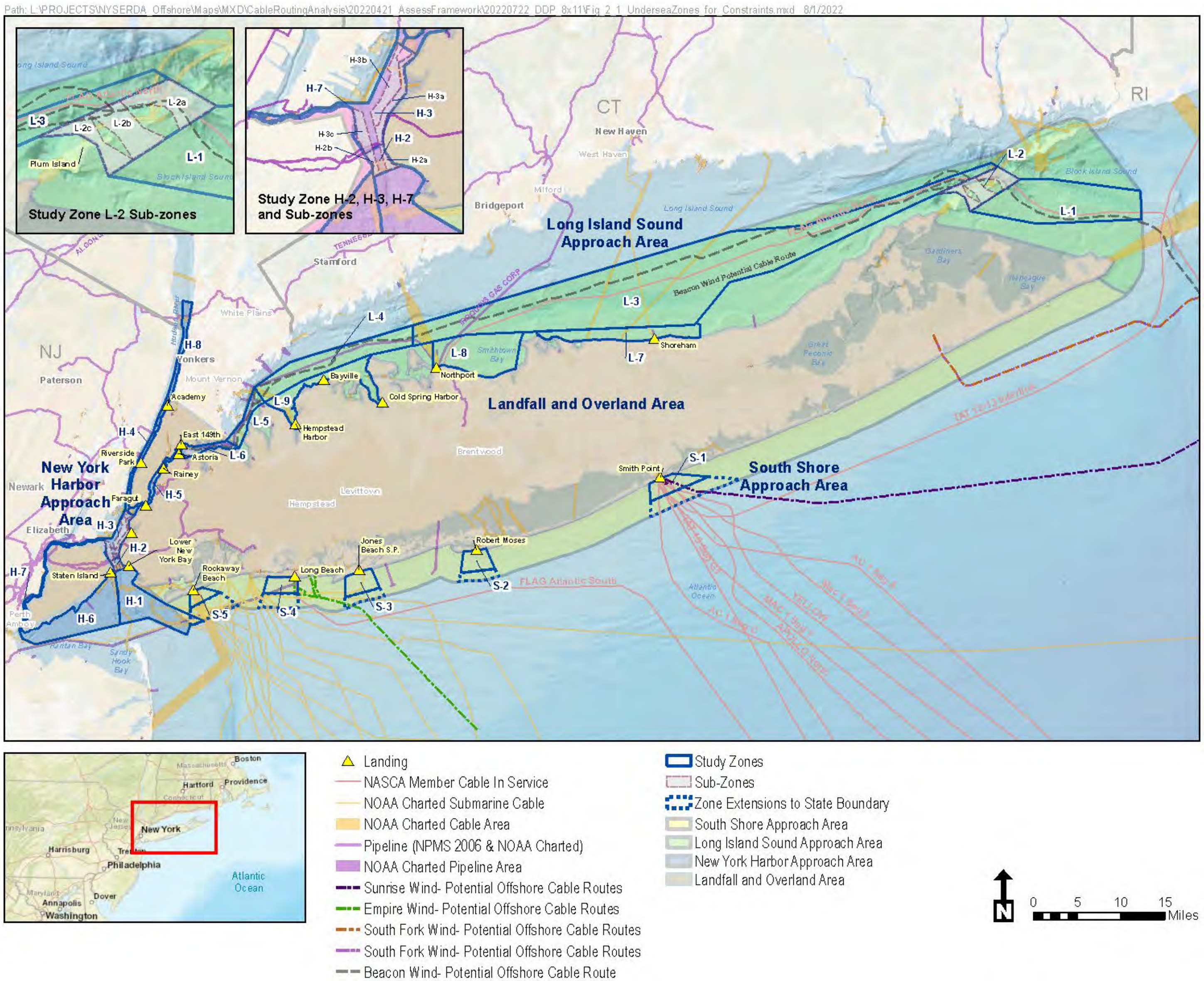


Figure 4. Overland Zones for the Constraints Analysis

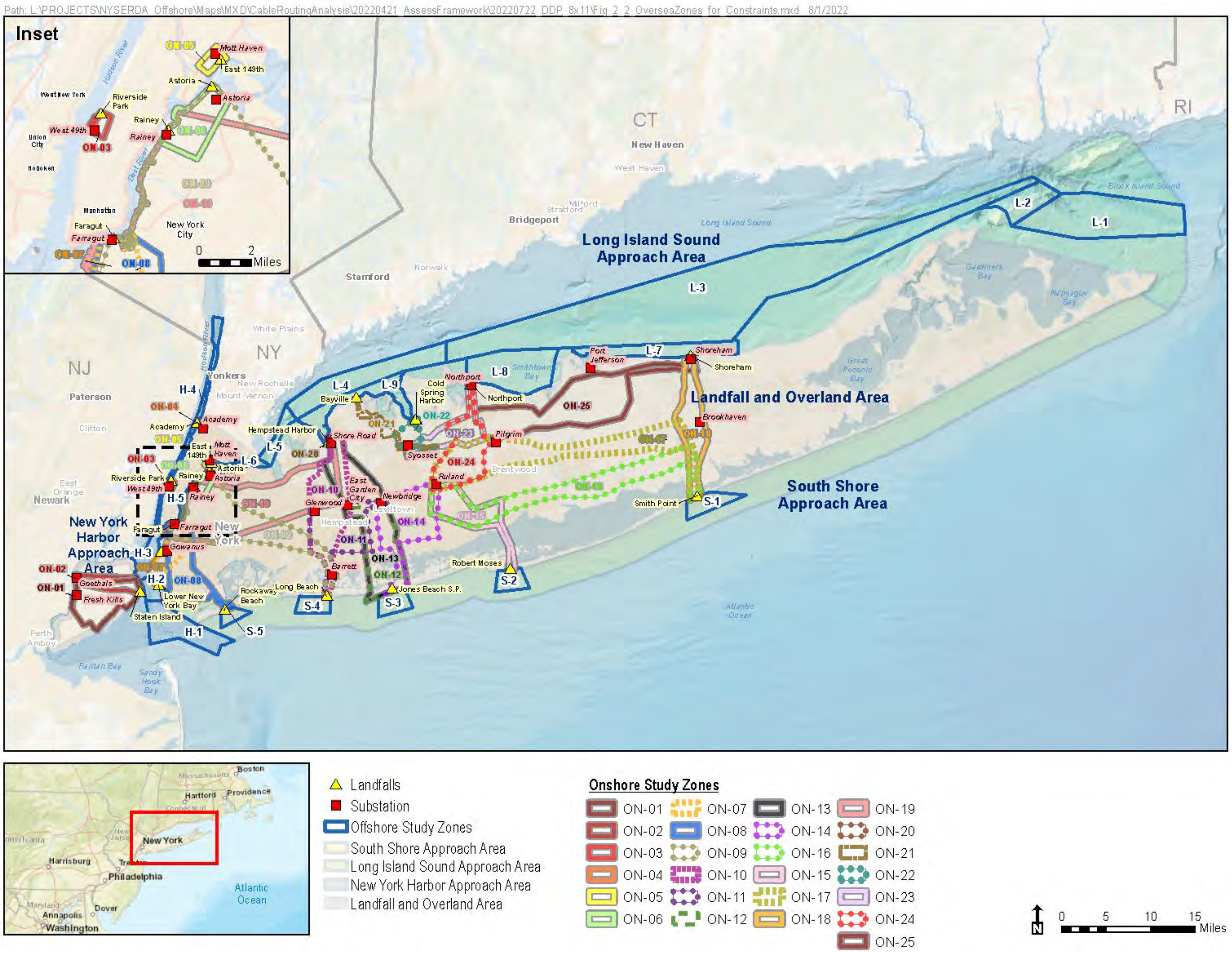
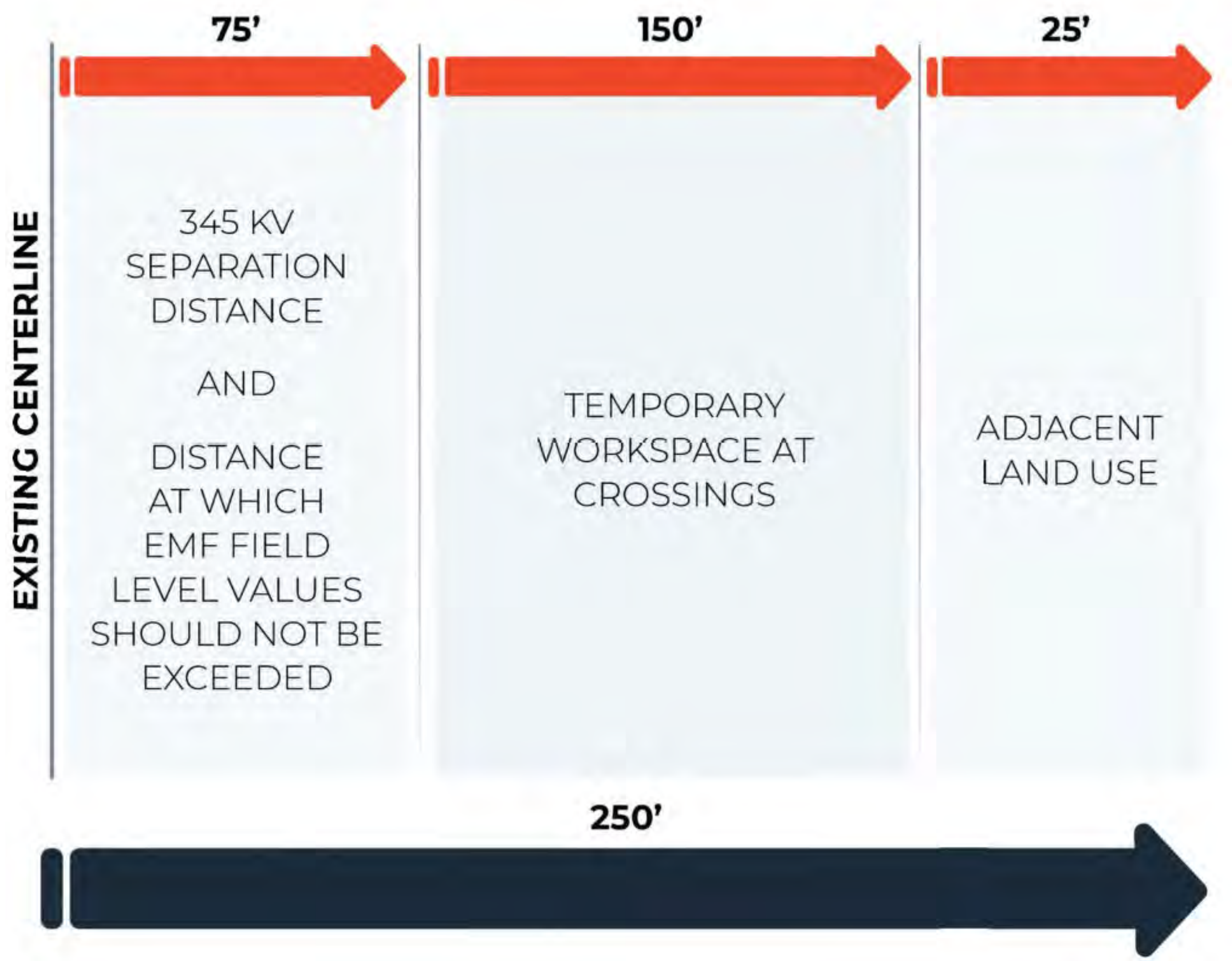


Figure 5. Schematic of Conservative 250-foot Buffer Applied for Transportation, Railway, and Pipeline ROWs



2.2 Results of the Constraints Analysis

Table 13 and Table 14 summarize the type and distribution of the ranking of resources in the study area. These rankings reflect the location and type of resources with the potential to constrain the construction, operation, and maintenance of OSW cables, independent of potential minimization and mitigation. Section 3: Assessment of Constraints of this assessment evaluates impacts to those resources in more detail and discusses avoidance, minimization, and mitigation measures.

2.2.1 Undersea Constraints Summary

As Table 13 shows, a resource often ranks high for a potential constraint across multiple zones in only one approach area. For example, recreational and commercial fishing, vessel traffic, navigation areas, marine archaeology and cultural resources, tunnels and bridges, and waterfront infrastructure rank high for multiple zones in one of the three approach areas. Further, throughout the entire undersea study area, sediment contamination and UXOs, other recreation, and borrow areas and disposal sites generally rank low because of the boundaries of the zones and the geospatial presence of these resources, although some rank medium.

The **South Shore Approach Area** contains two resources ranked high: commercial and recreational fishing and linear utilities. Commercial and recreational fishing ranks either medium or high throughout the entire South Shore Approach Area. Recreational fishing occurs in all zones. Zone S-1 Smith Point has a moderate presence of recreational fishing and activity for both large and small bottom trawling. It also has a heavy concentration of commercial pelagic fishing (squid, herring, and mackerel) along its southeast boundary, as a result, it is elevated to high for commercial and recreational fishing. Although significant amounts of trawling do not occur within Zone S-5 Rockaway Beach, it is surrounded by heavy concentrations of trawling that will have to be crossed to access the zone, which elevates its ranking for commercial and recreational fishing to high. Zone S-4 Long Beach contains a moderate number of charted cables and a high occurrence of charted pipelines, and Zone S-1 Smith Point contains a moderate number of charted cables. Zone S-5 ranks medium for sediment contamination and UXOs due to the presence of a Formerly Used Defense Site (FUDS); however, the past existence of a defense site does not definitively mean presence. Waterfront infrastructure and other recreation were given medium rankings in several zones within the South Shore Approach Area.

The **Long Island Sound Approach Area** contains seven resources ranked high, including marine geology and hydrology, aquatic biological resources and sensitive habitats, waterbody dimensions, recreational and commercial fishing, navigation areas, linear utilities, historic parks, and marine archaeology and cultural resources. Marine geology and hydrology rank high in two of the nine Long Island Sound Approach Area zones, reflecting the hardbottom and slope greater than 10 percent, and strong tidal current, shallows, areas of scour, rocky areas, and boulder fields not captured in the GIS layers. Zone L-2 Harbor Hill Moraine ranks high for aquatic biological resources and sensitive habitats in Long Island Sound. Coldwater corals either occur or are predicted to occur in Zone L-2 and Zone L-3 Eastern and Central Long Island Sound. Zones L-3, L-4, L-8, and L-9 rank high due to the presence of aquatic resources considered unique and sensitive (further described in Section 3.2, Long Island Sound Approach Area). Waterbody dimensions in the Long Island Sound Approach Area zones become a more considerable constraint the closer the zone is to western Long Island Sound. Recreational and commercial fishing occurs throughout the Approach Area with zones ranked medium or high, except in the far west zones. Zones L-5 Westernmost Long Island Sound and L-6 East River. Zone L-5 ranks high for constraints related to marine archaeology and cultural resources for a moderate percentage of obstructions and a high percentage coverage area of wrecks. Most of the zones rank medium for the relative percentage of obstructions present. Zone L-4 contains one potential submerged Holocene site, and Zone L-3 contains three such sites.

The **New York Harbor Approach Area** contains the most high and medium constraints in distribution and type. Of the 13 resources, 9 rank high for one or more zones. Most zones rank high and medium for waterbody dimensions, reflecting the narrow distances between shorelines. One or more zones of the New York Harbor Approach Area also rank high for marine geology and hydrology, aquatic biological resources and sensitive habitats, navigation, vessel traffic, recreational and commercial fishing, linear utilities, tunnels/bridges, and waterfront infrastructure. In the New York Harbor Approach Area zones, vessel traffic becomes a greater constraint as waterbodies get narrower and proximity to commercial shipping hubs and commuter ferries increases. Navigation areas constrain most New York Harbor Approach Area zones, except Zone H-1 Lower New York Bay and Zone H-8 Middle Hudson. Most of Zones H-2, H-4, H-5, and H-7 contain a federally designated navigation channel. Zone H-3 contains a high percentage of both federal navigation channel and anchorage areas. Waterfront infrastructure in the New York Harbor Approach Area zones increases with proximity to Manhattan and New York City boroughs. Few natural shorelines, as opposed to hardened shorelines (i.e., piers, bulkheads) occur in Zones H-3, H-4, H-5, and H-8. Zones H-4 and H-8 rank high for aquatic resources because of the presence of critical habitat for Atlantic sturgeon. Further, Zone H-6 ranks high for aquatic resources presence of significant hard clam areas. Some commercial and recreational fishing occurs, particularly in the zones with proximity to the Atlantic Ocean, Zones H-1 and H-6. Shellfish harvesting can occur by special license only. Zones H-4 and H-8 rank medium for sediment contamination because they include a state Superfund site for polychlorinated biphenyl (PCB) sediments; Zone H-1 includes the Fort Tilden Coastal Battery and Small Arms Ranges FUDS Property. Additionally, Zones H-2, H-3, H-6, and H-7 rank medium due to the potential for contamination as indicated in published literature.

2.2.2 Overland Constraints Summary

As shown in Table 14, potential constraints from land use, topography, and environmental justice resources occur most frequently, and species and habitats and other recreation rank high in several locations, reflecting the high value coastal resources of the south shore of Long Island. The Landfall and Overland Area zones are discussed in terms of where they connect with the New York Harbor, South Shore, and Long Island Sound Approach Areas, and have therefore been organized into those approach areas.

Land use, driven by residential parcels, rank medium or high in all 25 onshore zones, making it the most prevalent constraint throughout the Landfall and Overland Area. Potential environmental justice areas occur in 23 of the 25 onshore zones, ranking medium or high, and representing the most prevalent constraint in the New York Harbor Approach Area. Disadvantaged communities occur in 22 of the 25 onshore zones, ranking medium or high in 18 of those 22 zones. Topography and shoreline protection are the second and third most common constraints, respectively. Topography, specifically the presence of slopes greater than 15 percent, occurs in all 25 onshore zones and represents the most prevalent constraint of the Long Island Sound Approach Area. Shoreline protection occurs to some degree in 23 of the 25 onshore zones, with a greater prevalence and significance in the zones in the New York Harbor and South Shore Approach Areas.

Critical species and sensitive habitats and other recreation are most prevalent in several of the South Shore Approach Area zones near Jones Beach and Robert Moses State Park. Significant Coastal Fish and Wildlife Habitats and essential fish habitat (EFH) are associated with the intercoastal bays that are crossed by onshore Zones ON-12, ON-13, and ON-15. Other recreation occurs in the greatest abundance in the three Jones Beach Zones ON-12 through ON-14, where recreational fishing and wildlife viewing occur along the South Shore north to the mainland.

The resources least affected for the onshore as a whole are surface waters, wetlands, and linear utilities/outfalls because of the boundaries of the zones and the geospatial presence of these resources. These are also the resources that are most likely avoidable with cable routing. While surface waters occur in 16 of the 25 zones, they are present at very low spatial extents. The presence of surface waters is largely concentrated to the zones in the South Shore Approach Area and within Zones ON-1 and ON-2 on Staten Island. NWI wetlands occur in all but two of the 25 zones at a very low spatial extent. Similarly, NYSDEC-mapped wetlands occur in 19 of the 25 zones at a very low spatial extent. Wetlands as a whole, specifically NWI and/or NYSDEC-mapped wetlands, occur in every zone, but given their more scattered presence, they are likely to be avoidable. Linear utilities/outfalls as a constraint group occur in 11 of the 25 onshore zones, with most occurring in the New York Harbor Approach Area. Lastly, parkways are present in 15 of the 25 onshore zones, and controlled access highways are presented in 20 of the 25 onshore zones and many are historic Long Island Parkways.[1] Because a transmission line is a non-transportation use of a ROW, the siting of longitudinal transmission lines within the controlled access ROW is prohibited along these highways and requires FHWA review and authorization as part of the exception process to NYSDOT Utility Accommodation Plan prior to approval for installation and issuance of NYSDOT permits and a Use and Occupancy Agreement.

[1] See New York State Scenic Byway, "Corridor Management Plan for Select Historic Long Island Parkways" Nassau and Suffolk Counties, New York. New York State Department of Transportation (July 2010).

Table 13. Summary of Constraints Ranking for the South Shore Approach Area

Resource	S-1 Smith Point	S-2 Robert Moses	S-3 Jones Beach	S-4 Long Beach	S-5 Rockaway
Geology & hydrology	L	L	L	L	L
Biological resources & habitats	L	L	L	L	L
Waterbody dimensions	L	L	L	L	L
Recreational & commercial fishing	H	M	H	H	H
Vessel traffic	L	L	L	L	L
Navigation areas	L	L	L	L	L
Other recreation	L	M	M	L	L
Borrow areas & ocean disposal	L	L	L	L	L
Archaeology & cultural	L	L	L	L	L
Linear utilities	M	L	L	H	L
Tunnels & bridges	L	L	L	L	L
Waterfront infrastructure	L	L	L	M	M
Sediment contamination & UXOs	L	L	L	L	M

L	Low Constraints
M	Medium Constraints
H	High Constraints

Table 14. Summary of Constraints Ranking for the Long Island Sound Approach Area

Resource	L-1 Block Island Sound	L-2 Harbor Hill Moraine	L-2a Valiant Rock to Little Gull Isl.	L-2b Great Gull Isl. to Plum Isl.	L-2c Eastern Plum Isl. Crossing	L-3 Eastern and Central LIS	L-4 Western LIS	L-5 Westernmost LIS	L-6 East River	L-7 Wildwood to Port Jefferson	L-8 Smithtown	L-9 Oyster Bay to Hempstead Harbor
Geology & hydrology	L	H	H	H	H	M	L	M	H	L	L	M
Biological resources & habitats	M	H	H	H	H	H	H	L	L	M	H	H
Waterbody dimensions	L	L	L	L	M	L	L	M	H	L	L	M
Recreational & commercial fishing	H	M	M	L	L	H	M	L	L	M	M	M
Vessel traffic	L	L	M	L	L	L	L	L	L	L	L	L
Navigation areas	L	L	L	L	L	L	M	M	H	L	M	L
Other recreation	L	M	M	L	M	L	L	L	L	L	L	L
Borrow areas & ocean disposal	L	L	L	L		L	L	L	L	L	L	L
Archaeology & cultural	L	M	L	L	M	M	M	H	M	L	M	M
Linear utilities	L	M	M	M	M	M	M	H	H	L	L	L
Tunnels & bridges	L	L	L	L	L	L	L	L	L	L	L	L
Waterfront infrastructure	L	L	L	L	L	L	L	L	M	L	L	L
Sediment contamination & UXOs	M	L	L	L	M	L	L	M	M	L	L	M

L	Low Constraints
M	Medium Constraints
H	High Constraints

Table 15. Summary of Constraints Ranking for the New York Harbor Approach Area

Resource	H-1 Lower NY Bay/Atlantic	H-2 The Narrows	H-2a The Narrows East	H-2b The Narrows West	H-3 Upper NY Bay	H-3a Upper NY Bay Brooklyn	H-3b Upper NY Bay The Flats	H-3c Upper NY Bay Staten Island	H-4 Lower Hudson	H-5 East River	H-6 Raritan Bay	H-7 Arthur Kill/Kill Van Kull	H-8 Middle Hudson
Geology & hydrology	L	M	M	M	L	L	M	L	L	H	M	H	L
Biological resources & habitats	M	L	L	L	L	L	L	L	H	L	H	L	H
Waterbody dimensions	L	M	H	H	M	H	H	H	H	H	M	H	H
Recreational & commercial fishing	M	L	L	L	L	L	L	L	L	L	H	L	L
Vessel traffic	L	M	M	M	M	H	M	M	H	H	L	L	L
Navigation areas	L	H	M	M	H	H	H	H	M	H	M	H	L
Other recreation	L	L	L	L	L	L	L	L	L	L	M	L	L
Borrow areas & ocean disposal	M	L	L	L	L	L	L	L	L	L	L	L	L
Archaeology & cultural	L	L	L	L	L	M	L	L	M	M	L	M	L
Linear utilities	M	M	M	H	H	H	M	M	M	M	L	M	L
Tunnels & bridges	L	M	M	M	M	M	M	L	M	H	L	M	M
Waterfront infrastructure	L	M	M	L	H	H	L	H	H	H	M	M	H
Sediment contamination & UXOs	M	M	L	L	M	L	L	L	M	L	M	M	M

L	Low Constraints
M	Medium Constraints
H	High Constraints

Table 16. Summary of Constraints Ranking for the Landfall and Overland Area (South Shore Approach Area)

	ON-8	ON-9	ON-10	ON-11	ON-12	ON-13	ON-14	ON-15	ON-16	ON-17	ON-18
Resource	Rockaway	Long Beach 1	Long Beach 2	Long Beach 3	Jones Beach 1	Jones Beach 2	Jones Beach 3	Robert Moses	Smith Point 1	Smith Point 2	Smith Point 3
Topography	L	M	M	L	L	M	L	L	L	M	M
Surface waters	L	L	L	L	L	L	L	L	L	L	L
Wetlands	L	L	L	M	L	L	L	L	L	L	L
Critical species & sensitive habitats	L	M	M	M	H	M	M	M	M	M	M
Terrestrial biological resources	L	L	L	L	H	M	M	M	L	L	H
Land use	M	M	M	L	L	L	L	L	L	M	L
EJ & disadvantaged communities	H	H	M	H	M	M	L	M	M	M	H
Cultural resources	L	L	L	L	L	L	L	L	L	L	L
Other recreation	L	L	L	L	H	H	H	M	L	L	L
Linear utilities/outfalls	L	L	L	L	L	L	L	L	L	L	L
Transportation	M	M	H	H	H	H	H	H	H	H	M
Areas of contamination	L	L	L	L	L	L	L	L	L	L	M
Shoreline protection	M	M	M	M	M	L	L	L	L	L	L

L	Low Constraints
M	Medium Constraints
H	High Constraints

Table 17. Summary of Constraints Ranking for the Landfall and Overland Area (Long Island Sound Approach Area)

Resource	ON-19 Shore Road	ON-20 Hempstead Harbor	ON-21 Bayville	ON-22 Spring Harbor	ON-23 Northport 1	ON-24 Northport 2	ON-25 Shoreham
Topography	M	H	M	M	M	M	M
Surface waters	L	L	L	L	L	L	L
Wetlands	L	L	L	L	L	L	L
Critical species & sensitive habitats	L	L	L	L	L	L	L
Terrestrial biological resources	L	L	L	L	L	L	L
Land use	M	L	M	M	M	M	L
EJ & disadvantaged communities	H	L	L	L	L	L	L
Cultural resources	L	L	L	L	L	L	L
Other recreation	L	L	L	L	L	L	L
Linear utilities/outfalls	L	L	L	L	L	L	L
Transportation	H	L	L	L	L	M	M
Areas of contamination	L	M	L	L	L	L	L
Shoreline protection	M	L	L	L	M	L	L

L	Low Constraints
M	Medium Constraints
H	High Constraints

Table 18. Summary of Constraints Ranking for the Landfall and Overland Area (New York Harbor Approach Area)

	ON-1	ON-2	ON-3	ON-4	ON-5	ON-6	ON-7
Resource	Freshkills	Goethals	Riverside	Academy	East 149th St.	Astoria and Rainey	Lower NY Bay
Topography	M	M	M	M	M	L	M
Surface waters	L	L	L	L	L	L	L
Wetlands	L	M	L	L	L	L	L
Critical species & sensitive habitats	L	M	L	L	L	L	L
Terrestrial biological resources	L	L	L	L	L	L	L
Land use	M	M	M	M	L	M	M
EJ & disadvantaged communities	M	H	H	H	H	H	H
Cultural resources	L	L	L	L	L	L	M
Other recreation	L	L	L	L	L	L	L
Linear utilities/outfalls	L	L	M	L	L	L	L
Transportation	L	L	L	L	L	L	H
Areas of contamination	L	L	L	L	L	M	L
Shoreline protection	L	L	M	M	L	M	M

L	Low Constraints
M	Medium Constraints
H	High Constraints

3 Assessment of Resources Affecting Feasibility of OSW Cables

This assessment focuses on resources most likely to affect the feasibility of siting OSW cables rather than on all resources and potential impacts from construction, operation, and maintenance. A specific OSW cable could impact any of these resources identified in Section 2, as well as other resources not considered in this assessment. A thorough review of potential impacts associated with connecting OSW cables in New York State waters to the onshore transmission grid occurs primarily within the CECPN pursuant to Article VII of the New York State Public Service Law, incorporating review and approval from multiple state agencies, as described in Section 1.3: Regulatory Overview for Connecting OSW to the Grid. Development of future specific routes and preparation of the Article VII application will require extensive surveys and analysis to address site-specific conditions in the design. Publicly available GIS data provides the primary information for existing conditions and associated potential impacts, supplemented by desktop research and experience.

This constraints assessment consolidates the resources analyzed and ranked in Section 2: Constraints Analysis, using similarities in types of impacts or types of resources. Table 19 provides the cross reference for the consolidation of undersea resources. As noted previously, NOAA delineated shoreline of Long Island and New York City defines the demarcation between the Undersea Approach Areas and the Landfall and Overland Area. Section 3.1: South Shore Approach Area; Section 3.2: Long Island Sound Approach Area; and Section 3.3: New York Harbor Approach Area assess the potential constraints for undersea cable corridors. Section 3.4: Landfall and Overland Area, assesses the potential constraints for overland cables and associated landings, including the various bays and harbors along the South Shore Approach Area. Section 3.4 provides the cross reference for consolidation of onshore resource topics.

Table 19. Cross Reference for the Consolidation of Undersea Resource Topics

Section 3: Resource Topic	Resources from Section 2
1. Marine Geology and Hydrology	Marine Geology and Hydrology Borrow Areas Waterbody Dimensions
2. Marine Commercial and Recreational Uses	Recreational and Commercial Fishing Other Recreation Linear Utilities Tunnels and Bridges Waterfront Infrastructure
3. Navigation and Vessel Traffic	Vessel Traffic Navigation Areas
4. Aquatic Biological Resources and Sensitive Habitats	Aquatic Biological Resources and Sensitive Habitats
5. Sediment Contamination and Water Quality	Sediment Contamination, Ocean Disposal Sites, and UXOs
6. Marine Archaeology and Cultural Resources	Marine Archaeology and Cultural Resources

The following sections describe the existing conditions of zones and subzones, potential impacts, and avoidance, minimization, and mitigation opportunities for each Undersea Approach Area and the Landfall and Overland Area. The descriptions reflect publicly available GIS data, the CWG's knowledge of specific resources, and prior experience from permitted and proposed relevant projects. The descriptions of existing conditions provide an overview of the resources to facilitate an understanding of the unique or protected characteristics present. The level of detail reflects the high, medium, and low ranking of constraints, where resources ranked high for potential constraints are described in more detail as needed to address options for avoidance, minimization, and mitigation. Resources ranked low are not described or minimally described because careful OSW cable siting and implementing best practices are expected to avoid or minimize impacts to these resources, thereby greatly reducing the need for mitigation. As noted in Section 2: Constraints Analysis, the rankings reflect the degree to which the resource is likely to affect feasibility of siting OSW cables, and not solely the inherent or intrinsic value of a resource.

For each Undersea Approach Area and the Landfall and Overland Area, a series of gridded panel maps depicts the resources analyzed using the GIS layers identified in Appendix A. Each set begins with an index figure identifying the lettered grid squares, followed by a series of figures identifying resources present and expected to be avoided then figures identifying resources considered high constraints. The figures depict resource information only on maps for which the resource is present according to GIS data. Each figure series map contains a small inset map in the lower left corner identifying the location of the square within the approach area.

The potential impacts from cable installation, maintenance, operation, and decommissioning relevant to siting multiple OSW cables in the study area to achieve the 9 GW OSW mandate of the Climate Act are described along with associated minimization and mitigation measures or identification of the need for innovations in design, construction, and operation to address potential impacts. The descriptions of impacts focus on the locations where resources ranked high or, for consideration of cumulative potential constraints, where multiple resources ranked medium. The impacts discussed with respect to installation also address potential impacts during decommissioning. The decommissioning of OSW cables may include deenergizing and leaving in place, or removal of the cables. In cases where cables are removed, impacts similar to installation will occur, such as vessels present in the area, and disturbance of the sea floor. Complete avoidance of impacts is the primary or preferred approach for siting of OSW cables. However, construction, operation, maintenance, and decommissioning activities cannot always avoid impacts, particularly for highly constrained resources or locations, and minimization and mitigation measures provide methods for protecting and offsetting impacts to affected resources. Opportunities to avoid impacts must be fully applied and vetted before applying minimization and mitigation measures to first avoid adverse impacts, then minimize those impacts that cannot be avoided, and lastly offset or compensate for unavoidable impacts. Minimization refers to an action taken that reduces the severity of effects of an unavoidable impact to a resource. Mitigation refers to an action that compensates for (replaces or offsets) loss of resource or resource function. Collectively, these measures facilitate locating multiple cables needed to achieve the mandates of the Climate Act.

The CWG's experience, previously issued Article VII certificates, and publicly available pending applications provide an extensive inventory of minimization and mitigation measures to address many of the impacts from OSW cables. Table 20 lists the documents reviewed to compile an inventory of minimization and mitigation measures from previously issued Article VII permits and current applications as representative of the study area and informative for future projects. Previously issued permits provide a record of agency decisions and a significant inventory of acceptable measures for addressing potential constraints to OSW cables. In the case of pending applications, the measures included in applicant materials have not been approved by any regulatory agency but may be appropriate. Project-specific minimization and mitigation measures will be identified by project applicants and evaluated by relevant regulatory authorities during future project review. The OSW energy technology is rapidly evolving, as evidenced by many initiatives, including those of the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy's Wind Energy Technologies Office (Office of Energy Efficiency and Renewable Energy 2023). The Wind Energy Technologies Office conducts activities focused on improving performance, lowering costs, and reducing market barriers for U.S. wind energy and conducts various research and development activities through partners like national laboratories. Future mitigation and minimizations measures should incorporate the latest technologies and be adjusted as needed to protect the natural and socioeconomic resources to a similar extent as the measures described herein for current and reasonably foreseeable technologies.

Table 20. Documents Reviewed for Minimization and Mitigation Measures

Project Name	Document Reviewed
Champlain Hudson Power Express	PSC Order Granting Certificate and Approving Subsequent Amendments (4/18/2013) PSC 401 Water Quality Certification (1/18/2013) NYSDOS Federal Consistency Decision (6/8/2011)
South Fork Wind Farm	Exhibit 4, Environmental Impact Exhibit E-5, Effects on Communications Order Adopting Joint Proposal (3/18/2021) Order Approving Amendment to the Environmental Management and Construction (1/21/2022) PSC 401 Water Quality Certificate (11/22/2021)
Sunrise Wind[1]	Consistency with New York State CMP Policies (12/2020) Revised Exhibit E-5, Effects on Communications Exhibit E-6, Effects on Transportation Revised Exhibit 4, Environmental Impacts
Empire Wind[1]	Exhibit E-5, Effects on Communication (6/2021) Exhibit E-6, Effects on Transportation (6/2021) Exhibit 4, Environmental Impact (6/2021) CZM Consistency Statement (6/2021) Applicant's Response to Deficiencies (10/2021)
Cross Sound Cable	Opinion and Order Granting CECPN (6/27/2001)
Western Nassau Transmission Project	Opinion and Order Granting CECPN (9/19/2019)
Bayonne Energy Cable	Order Adopting Joint Proposal and Granting CECPN and 401 Water Quality Certificate (11/12/2009)
Hudson Transmission	PSC 401 Water Quality Certificate (9/16/2010) PSC Order Granting CECPN (9/15/2010) PSC Order Approving Certificate Amendments (1/12/2017) EM&CP III (7/21/2011)
Neptune Regional Transmission (Neptune)	PSC Opinion and Order Adopting Joint Proposal and Granting CECPN (1/23/2004) PSC Order Granting Amendment of CECPN (10/28/2004) EM&CP 1B (12/16/2005) EM&CP 2 (6/27/2005) EM&CP 3 (2/23/2006)

1 These are pending applications, and the measures included in the applicants' materials are still under review by regulatory agencies.

Table 21 through Table 28 organize the relevant minimization and mitigation measures by resource topics from Section 2: Constraints Analysis. In many cases, because a single measure addresses multiple resources, it occurs in more than one table. Similarly, some measures for a specific resource, such as air quality, address indirect impacts to other resources. Therefore, minimization and mitigation tables are not limited to measures exclusive to one resource topic. Additionally, multiple cables occurring in a constrained location may warrant additional minimization and mitigation measures. Throughout the development of the constraints assessment, minimization, and mitigation measures were refined to reflect current understanding and expanded with minimization and mitigation opportunities that facilitate locating multiple cables needed to achieve the mandates of the Climate Act under the Article VII process. Where applicable, expanded measures or innovative concepts to avoid, minimize, and mitigate impacts are identified for the constraints of most concern.

Table 21. Marine Geology Minimization and Mitigation Measures

Item	Marine Geology
	Minimization
1	Avoid routing the cable through areas of very high tidal current velocities.
2	Avoid boulders by micro-siting, and if not possible, minimize the relocation distance as much as possible. Boulder clearance associated with seafloor preparation is expected to have direct impacts to benthic and fishery resources in the limited areas it may be required along the cable export corridor.
3	Complete a Cable Installation Plan during the Article VII process, detailing how cable installation will be managed to ensure disruption is minimized along the cable route in NYS waters.
4	Develop a Benthic Sampling Plan, including but not limited to, SPI/PV sampling, CTD measurements, and benthic grabs. Conduct at least two years of benthic recovery monitoring pre-installation and at least two years of post-installation monitoring (as required by BOEM https://www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/BOEM-Renewable-Benthic-Habitat-Guidelines.pdf). Develop a pre- and post-installation sediment sampling plan to determine whether contaminants have been relocated to the surface following installation.
5	Develop a hierarchy of construction techniques to identify the most appropriate installation methodology for crossing sensitive resources based upon resource impacts, site-specific conditions, technical constraints, etc.
6	Identify suitable technologies for shallow-water (<30 ft) installation.
7	Require tracking of dewatering activities within aquifer recharge areas and in the vicinity of public/private drinking wells separate from other dewatering, so this can be minimized to the extent practicable.
8	Increase the nominal burial depth in the area of the sand waves to minimize the risk of exposure.
9	If crossing of borrow areas is unavoidable, site cable crossings of borrow areas on the periphery or in infrequently used portions of borrow areas. Cable burial depths should be sufficiently deep to permit continued use of the borrow area.
10	Use Dynamic Position vessels for installation of the cables to the extent practicable to minimize impacts to the seabed, compared to use of a vessel relying on multiple anchors.
11	Where target burial depth cannot be achieved in areas of fishing, limit the use of concrete mattress except where required for certain assessed crossing locations. In areas where concrete mattresses are essential, for example at asset crossings, they will be covered by another material (e.g., crushed rock). Evaluate types of protection measures and fill material (i.e., crushed rock) by location to allow for a greater integration into the marine system and create less of an effect on fishing activity. Permanent habitat conversion related to cable protection will be minimized by minimizing use of cable protection. Use cable protection in locations due to existing assets, and where assessments deem necessary, to further minimize risks of external aggressions and the effects of local sediment transport.
12	Use a Distributed Temperature Sensing system to provide real time monitoring of temperature along the submarine export cable route, which provide an alert should the temperature change, which often is the result of scouring of material and cable exposure.
13	Employ methods to minimize sediment disturbance, including but not limited to the use of midline buoys to prevent cable sweep, not side-casting materials, and removal and reuse of dredged material for backfill, or other beneficial use.

Table 21 continued

Item	Marine Geology
	Mitigation
1	Should the results of the post-dredge surveys indicate that the areas of dredging have not restored to pre-dredge contours, restore these areas to the depths depicted in the pre-dredge bathymetric surveys using clean fill to raise the elevation of the dredge areas to pre-dredging contours.
2	If multiple boulders are to be placed in new locations, consider creating new physical configurations in relation to nearby boulders. Additionally, boulder relocation may result in aggregations of boulders, creating new features that may serve as high value habitat. For example, this increased complex structured habitat may benefit juvenile lobsters and fish by providing an opportunity for refuge compared to surrounding patchy habitat. Coordinate locations with the fishing industry as well as state and federal agencies.

Table 22. Marine Commercial and Recreational Uses Minimization and Mitigation Measures

Item	Marine Commercial and Recreational Uses
	Minimization
1	Include fisheries monitoring studies in the planning phase to minimize impacts by determining where fisheries and aquatic species are. This should include a desktop survey of available data and in-water monitoring to avoid areas that have more species activity.
2	Run cables near and parallel to existing utilities where feasible to benefit fishing by limiting cable footprint and habitat fragmentation.
3	Minimize overall cable length in order to minimize electrical losses, environmental impacts, and costs.
4	Minimize the number of HDDs at the landfall site by keeping HVDC cables bundled.
5	All transitions from upland to submarine configurations within the coastal area will be accomplished by horizontal directional drilling and will be at a depth sufficient so as to not interfere with any current or future water dependent uses.
6	Complete a Cable Installation Plan during the Article VII filing, detailing how cable installation will be managed to ensure disruption is minimized along the cable route in NYS waters.
7	Develop a Benthic Sampling Plan, including but not limited to, SPI/PV sampling, CTD measurements, and benthic grabs. Conduct at least two years of benthic recovery monitoring pre-installation and at least two years of post-installation monitoring (as required by BOEM https://www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/BOEM-Renewable-Benthic-Habitat-Guidelines.pdf). Develop a pre- and post- installation sediment sampling plan to determine whether contaminants have been relocated to the surface following installation.
8	Include a preliminary Cable Burial Risk Assessment as part of COP/Article VII filing (refined in the EM&CP) to demonstrate that sufficient burial depths are technically achievable to reduce risks to the cable and ocean users.
9	Develop a Fisheries Communications Plan for construction and operation.
10	Develop and implement a Mariner Outreach Program that will include communications with mariners, commercial, recreational, and for- hire (charter) fishermen during construction, maintenance, and decommissioning to minimize potential gear conflicts and to support safe navigation through and fishing within the Project Area during construction, maintenance, and decommissioning operations.
11	Conduct early outreach with fishing and shipping industries on impacts resulting from cable installation and maintenance, as part of the project stakeholder engagement plan. The plan should demonstrate how the industries are being accommodated, not simply being informed of the developer's plans.
12	To minimize potential fishing access impacts while ensuring safety, utilize a “rolling” construction safety zone along the submarine export cable route. This results in short-term impacts to fisheries where cable installation activities occur. Once cable installation in an area is complete, marine activities, including commercial and recreational fishing, will be able to resume.

Table 22 continued

Item	Marine Commercial and Recreational Uses
Minimization	
13	Prioritize scheduling construction activities for outside the summer tourist season, which is generally between Memorial Day and Labor Day.
14	Develop a hierarchy of construction techniques to identify the most appropriate installation methodology for crossing sensitive resources based upon resource impacts, site specific conditions, technical constraints, etc.
15	Bury submarine export cables to >15 ft below the current/future authorized depth or depth of existing seabed (whichever is deeper) of federally maintained navigation features (e.g., anchorages and shipping channels). Outside of federally maintained navigation features, install cables to maximum depth achievable in a single trench using site-appropriate installation equipment (at least 6 ft depth). If sand waves are present, install cables to a max depth achievable in a single trench below the existing, stable seabed, as feasible. This does not include nearshore areas and achievable burial depths for HDD.
16	Where target burial depth cannot be achieved in areas of fishing, limit the use of concrete mattress except where required for certain asset crossing locations. In areas where concrete mattresses are essential, for example at asset crossings, they will be covered by another material (e.g., crushed rock). Permanent habitat conversion related to cable protection will be minimized by minimizing use of cable protection. Use cable protection in locations, due to existing assets, and where assessments deem necessary, to further minimize risks of external aggressions and the effects of local sediment transport.
17	The cable will be maintained at specified burial depths, and depth of burial will be verified on a periodic basis so as to not become a hazard to navigation or marine resources.
18	Use trenchless installation methods to avoid and minimize potential impacts to marinas, nearshore zones, benthic resources, water quality. Installation and burial of cables using trenchless methods, mechanical plow, jet plow, hand jet, and/or mechanical cutter, generally result in less habitat modification than trenching and dredging options. Where applicable, install temporary cofferdams to contain sediment disturbed during landfall to minimize suspended sediment and turbidity effects in nearshore habitats.
19	Install cable at a minimum burial depth of 6 feet (measured from top of cable) below the existing seabed. Should the burial depth not be achieved during the initial pass of the cable installation tool that is best suited to achieve burial depth, perform up to two additional passes with the installation tool, or another burial tool that complies with project requirements, unless (a) additional passes risk causing damage to the cable or the installation tool; or (b) due to geologic obstructions, additional passes would not increase the burial depth or risk causing cable exposure. Use best efforts to micro-route the cable within the cable corridor to achieve burial depth during installation.
20	Install the submarine cable a minimum of 6 feet below the existing seabed in finfish trawling, surf clam dredging and shellfish harvesting areas, except where utility lines or geologic or topographic features prevent burial to 6 feet.
21	To minimize smothering of the benthic community, excavated material should not be side-cast.
22	To minimize the impact of EMF on the environment by HVDC cables, install the two poles of a HVDC system, the forward and the return conductor parallel and close to each other in order to neutralize each other to the maximum extent possible.
23	Complete post-construction monitoring surveys annually following Commercial Operation, with the timing determined based on discussions with State agencies. As part of these post-construction monitoring surveys, EMF measurements will be taken at each of the locations of the EMF Study.
24	Use best efforts to remove the cable protection measures during decommissioning.
25	Avoid boulders by micro-siting, and if not possible, minimize the relocation distance as much as possible. Boulder clearance associated with seafloor preparation is expected to have direct impacts to benthic and fishery resources in the limited areas it may be required along the cable export corridor.
26	Notify mariners, recreational fishermen, and NYSDEC-licensed fishermen of any necessary boulder relocation.

Table 22 continued

Item	Marine Commercial and Recreational Uses
Mitigation	
1	Develop a Cable Maintenance and Monitoring Plan that establishes a process for maintaining cable burial depth and undertaking remedial burial when deemed necessary.
2	Ensure use of local knowledge by including fishermen in fisheries related tasks during all appropriate phases of the project (e.g., monitoring, scout vessels, fisheries liaison).
3	If multiple boulders are to be placed in new locations, consider creating new physical configurations in relation to nearby boulders. Additionally, boulder relocation may result in aggregations of boulders, creating new features that may serve as high value habitat. For example, this increased complex structured habitat may benefit juvenile lobsters and fish by providing an opportunity for refuge compared to surrounding patchy habitat. Coordinate locations with the fishing industry as well as state and federal agencies.
4	Conduct collaborative science with the commercial and recreational fishing industries prior to, during, and following construction.
5	Provide as--built information to the NOAA to support necessary updates to navigation charts in coordination with NOAA Fisheries and other stakeholders as needed.
6	Conduct fisheries monitoring studies, in consultation with Subject Matter Experts, scientists, state agencies, and the fishing community to assess the impacts associated with the Project on economically and ecologically important fisheries resources.
7	Develop a reimbursement process for demonstrated impacts from displacement of commercial fishing or gear loss directly resulting from the Project's construction and maintenance activities, including any necessary cable reburial activities, and decommissioning activities, as well as anchor or gear loss resulting from interaction with buried cables.
8	Establish a Trust solely for the purposes of protecting, restoring, and improving aquatic habitats and fisheries resources to mitigate and study the short/long- term impacts and risks to aquatic resources from construction and operation.

Table 23. Linear Utilities, Tunnels and Bridges, and Waterfront Infrastructure Minimization and Mitigation Measures

Item	Linear Utilities, Tunnels and Bridges, and Waterfront Infrastructure
Minimization	
1	Prioritize co-locating linear utilities along existing corridors.
2	Site cables to cross existing utilities and vessel routes (channels, fairways, etc.) as close to perpendicular as possible.
3	Complete a Cable Installation Plan during the Article VII filing, detailing how cable installation will be managed to ensure disruption is minimized along the cable route in NYS waters.
4	Conduct an interference study for each location where critical infrastructure is crossed or in proximity, specifying proposed minimization/mitigation measures.
5	Design cable landings and shore crossing as perpendicular as possible to the existing shoreline.
6	Prioritize co-locating linear utilities along existing corridors.
7	Prioritize scheduling construction activities for outside the summer tourist season, which is generally between Memorial Day and Labor Day.
8	Coordinate early with any directly affected waterfront facility owners/operators.
9	Develop a hierarchy of construction techniques to identify the most appropriate installation methodology for crossing sensitive resources based upon resource impacts, site specific conditions, technical constraints, etc.

Table 23 continued

Item	Linear Utilities, Tunnels and Bridges, and Waterfront Infrastructure
Minimization	
10	Use trenchless installation methods to avoid and minimize potential impacts to marinas, nearshore zones, benthic resources, water quality. Installation and burial of cables using trenchless methods, mechanical plow, jet plow, hand jet, and/or mechanical cutter, generally result in less habitat modification than trenching and dredging options. Where applicable, install temporary cofferdams to contain sediment disturbed during landfall to minimize suspended sediment and turbidity effects in nearshore habitats.
11	Minimize the number of HDDs at the landfall site by keeping HVDC cables bundled.
12	Use trenchless solutions to cross under waterfront infrastructure (e.g., bulkheads).
Mitigation	
1	Provide alternative berthing options to offset reduced operational or anchorage capacity (e.g., mooring buoys).
2	Conduct a study to determine if there may be corrosive effects on any critical infrastructure, specifying proposed mitigation measures.

Table 24. Other Recreation Minimization and Mitigation Measures

Item	Other Recreation
Minimization	
1	Design cable landings and shore crossings as perpendicular as possible to the existing shoreline.
2	Include a preliminary Cable Burial Risk Assessment as part of COP/Article VII filing (refined in the EM&CP) to demonstrate that sufficient burial depths are technically achievable to reduce risks to the cable and ocean users.
3	Meet the Tier III NO_X standard established by the International Maritime Organization (IMO), where applicable for all marine vessels constructed on or after January 1, 2016, when operating within New York state waters.
4	Prioritize scheduling construction activities for outside the summer tourist season, which is generally between Memorial Day and Labor Day.
5	Complete a Cable Installation Plan during the Article VII filing, detailing how cable installation will be managed to ensure disruption is minimized along the cable route in NYS waters.
6	Use low sulfur diesel fuel for marine where possible and be at or below the maximum fuel sulfur content requirement of 1,000 ppm established per the requirements of 40 CFR § 80.510(k), where applicable.
7	Keep construction equipment well-maintained and routinely check vehicles using internal combustion engines equipped with mufflers to ensure they are in good working order.
8	Use trenchless installation methods to avoid and minimize potential impacts to marinas, nearshore zones, benthic resources, water quality. Installation and burial of cables using trenchless methods, mechanical plow, jet plow, hand jet, and/or mechanical cutter, generally result in less habitat modification than trenching and dredging options. Where applicable, install temporary cofferdams to contain sediment disturbed during landfall to minimize suspended sediment and turbidity effects in nearshore habitats.
9	Install cable at a minimum burial depth of 6 feet (measured from top of cable) below the existing seabed. Should the burial depth not be achieved during the initial pass of the cable installation tool that is best suited to achieve burial depth, perform up to two additional passes with the installation tool, or another burial tool that complies with project requirements, unless (a) additional passes risk causing damage to the cable or the installation tool; or (b) due to geologic obstructions, additional passes would not increase the burial depth or risk causing cable exposure. Use best efforts to micro-route the cable within the cable corridor to achieve burial depth during installation.

Table 24 continued

Item	Other Recreation
Minimization	
10	Bury submarine export cables to >15 ft below the current/future authorized depth or depth of existing seabed (whichever is deeper) of federally maintained navigation features (e.g., anchorages and shipping channels). Outside of federally maintained navigation features, install cables to max depth achievable in a single trench using site-appropriate installation equipment at least 6 feet depth. If sand waves are present, install cables to a max depth achievable in a single trench below the existing seabed, as feasible. This does not include nearshore areas and achievable burial depths for HDD.
Mitigation	
1	Develop a Cable Maintenance and Monitoring Plan that establishes a process for maintaining cable burial depth and undertaking remedial burial when deemed necessary.
2	Establish a Trust solely for the purposes of protecting, restoring, and improving aquatic habitats and fisheries resources to mitigate and study the short/long- term impacts and risks to aquatic resources from construction and operation.

Table 25. Navigation and Vessel Traffic Minimization and Mitigation Measures

Item	Navigation and Vessel Traffic
Minimization	
1	Run cables near and parallel to existing utilities where feasible to benefit fishing by limiting cable footprint and habitat fragmentation.
2	Site cables to cross existing utilities and vessel routes (channels, fairways, etc.) as close to perpendicular as possible.
3	Design export cable to not contain or need dielectric cooling fluids, thus eliminating the potential for such fluids to be released into the environment.
4	Include a preliminary Cable Burial Risk Assessment as part of COP/Article VII filing (refined in the EM&CP) to demonstrate that sufficient burial depths are technically achievable to reduce risks to the cable and ocean users.
5	Complete a Cable Installation Plan during the Article VII filing, detailing how cable installation will be managed to ensure disruption is minimized along the cable route in NYS waters.
6	Conduct early outreach with maritime community and shipping industry regarding impacts resulting from cable installation and maintenance as part of the project stakeholder engagement plan.
7	Provide regular updates to the local marine community through social media, the USCG Local Notices to Mariners, and active engagement with Maritime Association of the Port of New York and New Jersey Harbor Safety, Navigation, and Operations Committee.
8	Require operational Automatic Identification Systems on all vessels associated with the construction and operation, to monitor the number of vessels and traffic patterns for analysis and compliance with vessel speed requirements.
9	To minimize potential fishing access impacts while ensuring safety, utilize a “rolling” construction safety zone along the submarine export cable route. This results in short-term impacts to fisheries where cable installation activities occur. Once cable installation in an area is complete, marine activities, including commercial and recreational fishing, will be able to resume.
10	Install cables a minimum of 500 yards from USCG Aids to Navigation to facilitate recovery of sunken buoy hulls, appendages, and moorings, conducted from USCG Side loading and Stern Loading Buoy Tenders and Small Boats utilizing the deployment of specialized grapnels for dragging and snagging for recovery.
Mitigation	
1	Provide as-built information to NOAA to support necessary updates to navigation charts in coordination with NOAA Fisheries and other stakeholders as needed.

Table 26. Aquatic Biological Resources and Sensitive Habitats Minimization and Mitigation Measures

Item	Aquatic Biological Resources and Sensitive Habitats
Minimization	
1	Design export cable to not contain or need dielectric cooling fluids, thus eliminating the potential for such fluids to be released into the environment.
2	Minimize overall cable length in order to minimize electrical losses, environmental impacts, and costs.
3	Run cables near and parallel to existing utilities where feasible to benefit aquatic resources and fishing by limiting cable footprint and habitat fragmentation.
4	Develop a hierarchy of construction techniques to identify the most appropriate installation methodology for crossing sensitive resources based upon resource impacts, site specific conditions, technical constraints, etc.
5	Develop a plan for vessels prior to construction to identify no-anchor areas to avoid documented sensitive resources.
6	Prepare and implement a Suspended Sediment and Water Quality Monitoring Plan (SSWQMP). The SSWQMP should specify that if during cable installation total suspended solids (TSS) and/or contaminant concentrations exceed determined threshold downstream of construction activities, notifications will be made to the regulatory agencies, activities will be suspended, and alternative installation techniques and/or mitigation measures will be implemented.
7	Prepare a protected species mitigation and monitoring plan that includes and describes: Exclusion and monitoring zones; Ramp-up/soft-start procedures; Shutdown procedures (if technically feasible); Qualified and NOAA Fisheries-approved Protected Species Observers; Noise attenuation technologies; Passive Acoustic Monitoring systems (fixed and mobile); Reduced visibility monitoring tools/technologies (e.g., night vision, infrared and/or thermal cameras); Adaptive vessel speed reductions; and Utilization of software to share visual and acoustic detection data between platforms in real time.
8	Develop an invasive species prevention and management plan to minimize the potential for further spread of invasive species and to limit the introduction of new invasive species occurrences.
9	Develop and implement spill response and cleanup procedures to minimize and respond to any accidental spills of petroleum producing chemicals or hazardous liquids that occur during construction.
10	Prohibit disposal of any other form of solid waste or debris in the water and implement good housekeeping practices to minimize trash and debris in vessel work areas. Ensure all crew supporting the project undergo marine debris awareness training, including use of the data and educational resources available through the NOAA Fisheries Marine Debris Program. Dispose or recycle all other trash and debris returned to shore at licensed waste management and/or recycling facilities.
11	Develop a Benthic Sampling Plan, including but not limited to, SPI/PV sampling, CTD measurements, and benthic grabs. Conduct at least two years of benthic recovery monitoring pre-installation and at least two years of post-installation monitoring (as required by BOEM https://www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/BOEM-Renewable-Benthic-Habitat-Guidelines.pdf). Develop a pre- and post-installation sediment sampling plan to determine whether contaminants have been relocated to the surface following installation.
12	Require operational Automatic Identification Systems on all vessels associated with the construction and operation, to monitor the number of vessels and traffic patterns for analysis and compliance with vessel speed requirements.
13	Adhere to all relevant Time of Year Restrictions (TOYRs) for protected species present in the area. Prepare an agency-approved construction monitoring and impact minimization plan if work must occur within TOYRs outside of work windows.
14	When work will be conducted in identified SCFWHs, it will be conducted during the timeframes provided in the SCFWH narrative.
15	Ensure all offshore construction vessels have an individual spill kit on board at all times appropriate for the volume of fuel carried by the vessel.
16	Ensure all construction and operation vessels comply with applicable International Convention for the Prevention of Pollution from Ships (IMO MARPOL), federal (USCG and the United States Environmental Protection Agency [USEPA]), and NYS regulations and standards for the management, treatment, discharge, and disposal of onboard solid and liquid wastes and the prevention and control of spills and discharges.

Table 26 continued

Item	Aquatic Biological Resources and Sensitive Habitats
Minimization	
17	Use inert biodegradable drilling solution and avoid discharging drilling fluids/materials on to the seabed.
18	Avoid boulders by micro-siting, and if not possible, minimize the relocation distance as much as possible. Boulder clearance associated with seafloor preparation is expected to have direct impacts to benthic and fishery resources in the limited areas it may be required along the cable export corridor.
19	Limit construction and operational lighting to the minimum necessary to ensure safety and compliance with applicable regulations, to minimize impacts to finfish and EFH.
20	Minimize noise impacts to rare, threatened, and endangered species by conducting in-water activities using techniques such as soft start procedures and/or bubble curtains.
21	Comply with BOEM and NOAA requirements for noise minimization and mitigation, monitoring, reporting for protected species, and speed restrictions. Report sightings of NARW to NOAA as soon as possible. Train personnel onboard project vessels in wildlife sighting, recording and reporting procedures, vessel-strike avoidance and minimum separation distances, and awareness training to emphasize individual responsibility for protected wildlife awareness and protection, as necessary. Use NOAA-approved protected species observers, following NOAA guidelines for avoidance, and training personnel on marine mammal and sea turtle awareness.
22	Conduct In-water work within 1-mile of SCFWHs during high/flood tide conditions to minimize impacts from resuspended sediment.
23	Maintain plow cables/umbilicals under constant tension to avoid an entanglement risk.
24	Use trenchless installation methods to avoid and minimize potential impacts to marinas, nearshore zones, benthic resources, and water quality. Installation and burial of cables using trenchless methods, mechanical plow, jet plow, hand jet, and/or mechanical cutter generally result in less habitat modification than trenching and dredging options. Where applicable, install temporary cofferdams to contain sediment disturbed during landfall to minimize suspended sediment and turbidity effects in nearshore habitats.
25	Install cable at a minimum burial depth of 6 feet (measured from top of cable) below the existing seabed. Should the burial depth not be achieved during the initial pass of the cable installation tool that is best suited to achieve burial depth, perform up to two additional passes with the installation tool, or another burial tool that complies with project requirements, unless (a) additional passes risk causing damage to the cable or the installation tool; or (b) due to geologic obstructions, additional passes would not increase the burial depth or risk causing cable exposure. Use best efforts to micro-route the cable within the cable corridor to achieve burial depth during installation.
26	Develop an Inadvertent Returns Plan that addresses prevention, control, and clean-up of potential inadvertent releases (IR). Drilling fluids used during HDD construction will be recirculated and recycled to the extent practicable, minimizing the required water use. Use best efforts to recover and dispose of HDD drilling fluids and cuttings.
27	To minimize the impact of EMF on the environment by HVDC cables, install the two poles of a HVDC system, the forward and the return conductor parallel and close to each other in order to neutralize each other to the maximum extent possible.
28	Employ methods to minimize sediment disturbance, including but not limited to the use of midline buoys to prevent cable sweep, not side-casting materials, and removal and reuse of dredged material for backfill or other beneficial use.
29	Use a closed environmental bucket to minimize sediment suspension at dredging site for fine grained unconsolidated sediments, when dredging contaminated sediments, and for dredging across/within Federal Navigation Channels.
30	Use Dynamic Position vessels for installation of the cables to the extent practicable to minimize impacts to the seabed, compared to use of a vessel relying on multiple anchors.
31	Bury submarine export cables to >15 ft below the current/future authorized depth or depth of existing seabed (whichever is deeper) of federally maintained navigation features (e.g., anchorages and shipping channels). Outside of federally maintained navigation features, install cables to the maximum depth achievable in a single trench using site-appropriate installation equipment at least 6 feet deep. If sand waves are present, install cables to a max depth achievable in a single trench below the existing seabed, as feasible. This does not include nearshore areas and achievable burial depths for HDD.

Table 26 continued

Item	Aquatic Biological Resources and Sensitive Habitats
Minimization	
32	Where target burial depth cannot be achieved in areas of fishing, limit the use of concrete mattresses except where required for certain asset crossing locations.
33	Use cable protection in locations of existing assets, and where assessment deems necessary to further minimize risks of external aggressions and the effects of local sediment transport.
34	In areas where concrete mattresses are essential, for example at asset crossings, cover them with another material (e.g., crushed rock).
35	Conduct TSS and water quality monitoring during jet plow embedment, excavation of the HDD exit, pre-lay grapnel run, cable installation, backfill of the HDD exit, sand wave leveling, and maintenance and decommissioning activities at transects by collecting real-time data using Acoustic Doppler Current Profiler and Optical Backscatter Sensor instrumentation and by collecting water samples at various depths for laboratory analysis of: TSS; hardness; total PCBs; total polycyclic aromatic hydrocarbons (PAHs), total mercury; total and dissolved arsenic, cadmium, copper, lead and potentially dioxin/furan according to the methods and method detection limits.
36	Monitor suspended sediments, turbidity, and water quality, prior to and during cable installation. Implement minimization strategies, such as reducing installation speed, reducing jetting pressure, etc., during installation if suspended solids or contaminant concentrations exceed the threshold established in the Certificate Conditions.
Mitigation	
1	Participate in a developer co-funded initiative to support continuation and/or development of regional surveys and studies, such as the New England Aquarium Right Whale Aerial Surveys in 2020/21.
2	Establish a Trust solely for the purposes of protecting, restoring, and improving aquatic habitats and fisheries resources to mitigate and study the short/long- term impacts and risks to aquatic resources from construction and operation.
3	Develop a Cable Maintenance and Monitoring Plan that establishes a process for maintaining cable burial depth and undertaking remedial burial when deemed necessary.
4	If multiple boulders are to be placed in new locations, consider creating new physical configurations in relation to nearby boulders. Additionally, boulder relocation may result in aggregations of boulders, creating new features that may serve as high value habitat. For example, this increased complex structured habitat may benefit juvenile lobsters and fish by providing an opportunity for refuge compared to surrounding patchy habitat. Coordinate locations with the fishing industry as well as state and federal agencies.
5	In the event of an IR, conduct upstream/downstream turbidity monitoring to verify extent of impacts and inform clean-up efforts.
6	In consultation with subject matter experts, state agencies, and the fishing community, conduct a pre- and post-energizing telemetry study to compare movement patterns of finfish and/or crustaceans during a pre-energizing monitoring event, and a post-energizing monitoring event with the same type of equipment in the same area as the pre-energizing monitoring event. Design the study to allow for integration with similar research in the area.
7	Conduct fisheries monitoring studies, in consultation with Subject Matter Experts, scientists, state agencies, and the fishing community, to assess the impacts associated with the Project on economically and ecologically important fisheries resources.
8	Complete post-construction monitoring surveys annually following Commercial Operation, with the timing determined based on discussions with State agencies. As part of these post-construction monitoring surveys, EMF measurements will be taken at each of the locations of the EMF Study.
9	Should the results of the post-dredge surveys indicate that the areas of dredging have not restored to pre-dredge contours, restore these areas to the depths depicted in the pre-dredge bathymetric surveys using clean fill to raise the elevation of the dredge areas to pre-dredging contours.

Table 27. Sediment Quality and Water Quality Minimization and Mitigation Measures

Item	Sediment Quality and Water Quality
Minimization	
1	Minimize overall cable length in order to minimize electrical losses, environmental impacts, and costs.
2	Design export cable to not contain or need dielectric cooling fluids, thus eliminating the potential for such fluids to be released into the environment.
3	Prepare and implement a SSWQMP. The SSWQMP should specify that if during cable installation TSS and/or contaminant concentrations exceed determined threshold downstream of construction activities, notifications will be made to the regulatory agencies, activities will be suspended and alternative installation techniques and/or mitigation measures will be implemented.
4	Develop and implement spill response and cleanup procedures to minimize and respond to any accidental spills of petroleum producing chemicals or hazardous liquids that occur during construction.
5	Develop an Inadvertent Returns Plan that addresses prevention, control, and clean-up of potential IR. Drilling fluids used during HDD construction will be recirculated and recycled to the extent practicable, minimizing the required water use. Use best efforts to recover and dispose of HDD drilling fluids and cuttings.
6	Ensure all offshore construction vessels have an individual spill kit on board at all times appropriate for the volume of fuel carried by the vessel.
7	Develop a Benthic Sampling Plan, including but not limited to, SPI/PV sampling, CTD measurements, and benthic grabs. Conduct at least two years of benthic recovery monitoring pre-installation and at least two years of post-installation monitoring (as required by BOEM https://www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/BOEM-Renewable-Benthic-Habitat-Guidelines.pdf). Develop a pre- and post- installation sediment sampling plan to determine whether contaminants have been relocated to the surface following installation.
8	Develop a hierarchy of construction techniques to identify the most appropriate installation methodology for crossing sensitive resources based upon resource impacts, site specific conditions, technical constraints, etc.
9	Conduct pre-installation trials of cable installation equipment in actual field conditions to test and minimize resuspension of sediments while achieving target burial depth.
10	Employ methods to minimize sediment disturbance, including but not limited to the use of midline buoys to prevent cable sweep, not side-casting materials, and removal and reuse of dredged material for backfill, or other beneficial use.
11	Monitor the progress of cable burial during jet plow operations, to allow the operator to adjust the angle of the jetting blades and the water pressure to obtain desired burial depth, while also minimizing sediment mobilization into the water column.
12	Use inert biodegradable drilling solution and avoid discharging drilling fluids/materials on to the seabed.
13	Use trenchless installation methods to avoid and minimize potential impacts to marinas, nearshore zones, benthic resources, water quality. Installation and burial of cables using trenchless methods, mechanical plow, jet plow, hand jet, and/or mechanical cutter, generally result in less habitat modification than trenching and dredging options. Where applicable, install temporary cofferdams to contain sediment disturbed during landfall to minimize suspended sediment and turbidity effects in nearshore habitats.
14	Use a closed environmental bucket to minimize sediment suspension at dredging site for sediments, when dredging contaminated sediments, and for dredging across/within Federal Navigation Channels.
15	Ensure that all construction and operation vessels comply with applicable International Convention for the Prevention of Pollution from Ships (IMO MARPOL), federal (USCG and USEPA), and NYS regulations and standards for the management, treatment, discharge, and disposal of onboard solid and liquid wastes and the prevention and control of spills and discharges.
16	Monitor suspended sediments, turbidity, and water quality, prior to and during cable installation. Implement minimization strategies, such as reducing installation speed, reducing jetting pressure, etc., during installation if suspended solids or contaminant concentrations exceed the threshold established in the Certificate Conditions.
17	In the event that a reportable spill occurs, notify the National Response Center, followed by the USEPA, USCG and NYSDEC.

Table 27 continued

Item	Sediment Quality and Water Quality
Minimization	
18	In the event of a water quality turbidity exceedance, immediately implement one or more of the following measures: changing the rate of advancement of the jet trencher; modifying or varying hydraulic jetting pressures; or implementing other reasonable operational controls that may reduce suspension of in-situ sediments, but not in a manner that materially delays the progress of work to complete the jet trencher installation procedure.
19	Do not decant barges before 24 hours of settlement within the scow.
20	Comply with USCG standards regarding ballast and bilge water management. Liquid wastes from vessels (including sewage, chemicals, solvents, and oils and greases from equipment) will be properly stored, and disposal will occur at a licensed receiving facility.
21	Prohibit disposal of any other form of solid waste or debris in the water and implement good housekeeping practices to minimize trash and debris in vessel work areas. Ensure all crew supporting the project undergo marine debris awareness training, including use of the data and educational resources available through the NOAA Fisheries Marine Debris Program. Dispose or recycle all other trash and debris returned to shore at licensed waste management and/or recycling facilities.
22	Conduct TSS and water quality monitoring during jet plow embedment, excavation of the HDD exit, pre-lay grapnel run, cable installation, backfill of the HDD exit, sand wave leveling, and maintenance and decommissioning activities at transects by collecting real-time data using Acoustic Doppler Current Profiler and Optical Backscatter Sensor instrumentation and by collecting water samples at various depths for laboratory analysis of: TSS; hardness; total PCBs; total PAHs, total mercury; total and dissolved arsenic, cadmium, copper, lead and potentially dioxin/furan according to the methods and method detection limits. Other potential contaminants may be applicable for testing depending on the area where work takes place.
23	Use Dynamic Position vessels for installation of the cables to the extent practicable to minimize impacts to the seabed, compared to use of a vessel relying on multiple anchors.
Mitigation	
1	Develop a Cable Maintenance and Monitoring Plan that establishes a process for maintaining cable burial depth and undertaking remedial burial when deemed necessary.

Table 28. Marine Archaeology and Cultural Resources Minimization and Mitigation Measures

Item	Marine Archaeology and Cultural Resources
Minimization	
1	Provide mitigation measures for heritage resource sites, archeological sites, historic structures, and underwater cultural resources by implementing location, design, removal, replacement, resource protection, and construction scheduling measures. restoration, and maintenance plan).
2	Involve Native American tribes in design, execution of the surveys, and interpretation of the results of the project.
3	Complete a Cable Installation Plan during the Article VII filing, detailing how cable installation will be managed to ensure disruption is minimized along the cable route in NYS waters.
4	Develop a Cultural Resources Management Plan in consultation with the Office of Parks, Recreation, and Historic Preservation/ Advisory Council on Historic Preservation/National Park Service (NPS)/NYSDPS, Indian tribes, and other stakeholders, to provide for the identification, evaluation, and management of historic properties within the Area of Potential Effects. The Cultural Resources Management Plan will outline how to resolve adverse effects on historic properties and provide the appropriate treatment, avoidance, or mitigation of any impacts.
5	Prepare an Unanticipated Discovery Plan in accordance with NYS and federal laws for any unanticipated discoveries during construction.
6	Develop a plan for vessels prior to construction to identify no-anchor areas to avoid documented sensitive resources.

Table 28 Continued

Item	Marine Archaeology and Cultural Resources
	Minimization
7	Use Dynamic Positioning vessels for installation of the cables to the extent practicable to minimize impacts to the seabed, compared to use of a vessel relying on multiple anchors.
8	Conduct oversight by a Qualified Marine Archaeologist during construction.
9	Employ minimum avoidance areas of 164 ft (50 m) surrounding identified MARs to reduce the chances of accidental disturbance. Evaluate temporary construction workspaces and laydown areas for archaeological sensitivity prior to the start of construction.
10	Continue outreach and engagement with the local community, relevant agencies, interested Tribes, and other stakeholders throughout the construction process.
11	Continue to respond to complaints of negative archeological impacts and to consult with appropriate parties identified in the Cultural Resources Management Plan to resolve adverse effects and determine the appropriate avoidance, treatment, or mitigation measures throughout the life of the Facility.
12	Consider a conservation fund for long-term curation if archaeological resources on State-owned underwater lands are anticipated to be recovered.
	Mitigation
1	Conduct a diving inspection by a marine archaeologist if, during construction, potential historic resources are identified, and the direct plow zone cannot be routed to avoid these targets. Diving inspection should include those targets potentially physically disturbed by cable installation and conducted to determine if they could be associated with historically significant submerged cultural resources.
2	Develop a conservation fund to offset long-term curation costs for projects that are anticipated to retrieve archeological resources on State-owned lands.

3.1 South Shore Approach Area

Figure 6 through Figure 13 identify resources ranked low as potential constraints because OSW cables are expected to completely avoid them in the South Shore Approach Area. Figure 14 through Figure 21 identify the resources with high constraint rankings: commercial and recreational fishing and linear utilities. Commercial and recreational fishing rank high in S-3 Jones Beach and S-4 Long Beach and medium in S-1 Smith Point, S-2 Robert Moses, and S-5 Rockaway. Linear utilities rank high in S-4 and medium in S-1 and S-5.

3.1.1 Marine Geology

3.1.1.1 Existing Conditions

Marine geology includes the resources analyzed with GIS data as hardbottom, slope greater than 10 percent, bathymetry, borrow areas, and waterbody dimensions. The South Shore zones all ranked low for constraints associated with marine geology.

The south shore of New York and Long Island is complex and dynamic; it largely consists of a system of long barrier islands and bluffs stretching from New York City to Montauk Point at the eastern end of Long Island. All zones have similar geological characteristics predominantly consisting of sand of glacial and recent origin (e.g., McMullen et al. 2005). Zone S-1 Smith Point contains pockets of gravelly sand. Generally, the sand on the seabed is loose in the upper few feet and increases in density with depth to very dense and cemented sand.

The seafloor generally drops gradually toward the open ocean at a low gradient. Between the Fire Island Inlet and the Watch Hill area, sand ridges extend from nearshore (water depths less than 25 feet) to approximately 10 nm offshore, with a thickness ranging between 3 and 15 feet. A series of shore-perpendicular sand waves with a wavelength of approximately 2,000 feet and a height of approximately 3 feet occurs between Southampton and Napeague (Schwab et al. 2000). The continental shelf in the region experienced several periods of ocean transgressions and regressions during the Quaternary period, causing the shelf to be exposed when sea levels were low. As a result, submerged river valleys are located at depth (referred to as paleochannels) that may have locally different sediment composition.

The South Shore Approach Area contains multiple active sand borrow sites between approximately 0.4 and 3 miles from shore (see Figure 7 through Figure 9, Figure 11 through Figure 13). Sand from these areas nourishes Long Island's nearby beaches.

3.1.1.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Given the low ranking for marine geology, OSW cable construction, operation, maintenance, and decommissioning are not expected to be constrained by the presence of geological features. Cable installation may require appropriate installation tools and approaches in denser sediments, paleochannels with different sediment compositions, and across sand waves in the area developed as part of cable routing studies and site-specific cable burial design.

The primary geological constraint relevant for routing in the South Shore Approach Area pertains to sand borrow areas. In addition, borrow sites may be needed in the future to address shoreline erosion impacts from sea level rise. Cable routing in the South Shore Approach Area at a near-perpendicular angle (perhaps greater than 60 degrees) to the shore avoids fragmentation of current and future sand borrow sites.

Table 21 summarizes minimization and mitigation measures relevant to marine geology to address the impacts from OSW cables in the South Shore Approach Area.

3.1.2 Marine Commercial and Recreational Uses

3.1.2.1 Existing Conditions

Marine commercial and recreational uses include the resources analyzed as commercial and recreational fishing, other recreation, linear utilities, tunnels and bridges, and waterfront infrastructure. Zones S-1 and S-3 through S-5 rank high for recreational and commercial fishing, and Zone S-2 ranks medium. Zones S-2 and S-3 rank medium for other recreation. Zones S-1 through S-5 host a wide variety of recreational activities including day-hiking, diving, swimming, sightseeing, wildlife viewing, surfing, and boating and fishing. Popular destinations such as Great South Beach on Fire Island (Zone S-1) and Robert Moses Beach (Zone S-2) offer a variety of recreational opportunities for local residents and tourists.

Charter fishing occurs in most South Shore zones (see Figure 15 through Figure 21). The shoreline of Long Beach and Bay Beach (Zone S-4) host recreational fishing for striped bass, bluefish, weakfish, black fish, and summer flounder. Charter fishing for striped bass, summer flounder, and black sea bass takes place in the eastern side of Zone S-3 off the coast of Jones Beach typically from March to December. Other charters depart from Moriches (near Zone S-1), Jones Inlet (near Zones S-3 and S-4), and Rockaway Inlet (Zone S-5). Bottom-oriented commercial fishing activity throughout the South Shore Approach Area includes trawl, trap, gillnet, and dredge gear. The vessels primarily target monkfish (*Lophius americanus*), groundfish, scallops, squid (*Loligo pealeii*), pelagic fish, Atlantic surf clam *(Spisula solidissima)*, and ocean quahog *(Arctica islandica)*. Commercial fishing for monkfish concentrates along the shoreline near (Zone S-1) Montauk and East Hampton. Commercial scallop fishing, pelagic species (squid, herring, and mackerel), surf clam, and ocean quahog are common throughout the South Shore Approach Area. A heavy concentration of surf clam and ocean quahog commercial fishing occurs throughout the entirety of Zones S-3 and S-4. Fishing in Zones S-3 and S-4 could result in low concentrations of bottom trawl gear and moderate concentration of gillnet gear in the western side of the zone. Additionally, there are several localized moderate concentrations of commercial scallop and pelagic fishing directly off the Jones Beach Inlet.

Linear utilities are part of the commercial uses in the South Shore Approach Area. Zone S-4 ranks high for linear utilities and Zone S-1 ranks medium. Zone S-1 contains NOAA-charted cables, including eight telecommunications cables that land at Smith Point, of which at least six are active (Figure 20). Sunrise Wind proposes to land its OSW cable bundle consisting of two cables via HDD in Zone S-1 and split near shore (Sunrise Wind 2021). Currently, Sunrise Wind is considering up to three HDD approaches due to the presence of an existing telecommunication cable (Sunrise Wind 2021). Zone S-4 contains a moderate number of NOAA-charted cables and a high number of charted pipelines (see Figure 15). Among these, the Lower New York Bay Lateral gas pipeline and high-voltage Neptune system run mostly parallel to the shoreline through most the zone. The Neptune cable consists primary of an HVDC bundle of three cables buried 4 to 6 feet. The Lower New York Bay Lateral gas pipeline extends diagonally across all of Zone S-4 before landing on the eastern end of the zone in Long Beach. Potential OSW cable landing routes for Empire Wind 2 include two in or near Zone S-4 (Empire Wind 2021).

3.1.2.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts to marine commercial and recreational uses from construction of OSW cables varies based on the location of commercial and recreational fishing activity relative to the construction zone, season during which OSW cable activities occur, and the cable installation method used. In the South Shore Approach Area, the impacts during construction, maintenance, and decommissioning potentially include short-term displacement of recreational fishermen, commercial fishermen, or other commercial and recreational ocean users. During cable installation, any commercial or recreational users need to avoid the area to allow for installation vessels and equipment to function safely and efficiently. Due to its complexity, HDD cable installation temporarily displaces users such as commercial and recreational fishermen for a longer period than traditional trench methods. The rate of the HDD from water to landfall is on the order of weeks, whereas the rate of cable installation using jet-plow methods is approximately days. However, the displacement occurs in a relatively localized area at the entry and exit points. Potential impacts to existing infrastructure during construction may include damage caused by cable installation methods or a dropped anchor from a vessel associated with cable installation. The decommissioning of OSW cables may include deenergizing and leaving in place, or removal of the cables. In the cases where cables are removed, impacts similar to installation will occur.

As Table 21 through Table 28 show, minimization and mitigation measures include both communication and methods sensitive to the commercial and recreational fishing community, including early outreach as part of the project stakeholder engagement plans, implementing a “rolling” construction safety zone along the submarine export cable route, and scheduling construction activities for outside the summer tourist season.

In Zone S-4, the parallel shore alignment of existing utilities requires crossings for any future cable routing to land ashore at Long Beach. Crossings of existing infrastructure add complexity to power cable installation and operation, including crossing structures between existing infrastructure and the crossing agreements with the owner of the existing infrastructure. In addition, applying the recommended crossing angle of 90 degrees (ICPC 2014) results in a lateral shift of the cable crossing and a locally widened footprint.

With respect to operation, potential impacts to marine commercial and recreational uses occur in the footprint of the OSW cable ROW. Damage to fishing equipment may occur if dredges or trawlers snag on cables with shallow burial depth or exposed cables, or on cable protection measures (Drew and Hopper 2009). The approved Article VII Certificate for South Fork Wind describes a burial depth in the offshore space, outside navigational areas, of 6 feet (1.2 to 1.8 meters) (NYSPSC 2021). When OSW cables cannot meet the required burial depth, they are buried to the maximum technically achievable depth often using multiple passes of the installation tool. In rare instances where substrate conditions do not allow for cable burial, it may be suitable to place cables directly on the seabed surface protected by armament, including berms and concrete mattresses installed on top of the cable. This creates a hardened surface above the seabed and a potential hazard for bottom-oriented fishing gear.

For the South Shore Approach Area, two scenarios could result in cable armament: cemented sands or insufficient space to bury a cable when crossing existing infrastructure. While cemented sands have been documented along other cable routes in the South Shore Approach Area, their extent is unknown. A site-specific alternatives analysis determines the preferred alternative installation methods to overcome cemented sands and allow for proper burial depth. Proper burial depth could occur by installing OSW cables underneath existing infrastructure if crossing agreements can be negotiated. The suitability of this alternative depends on the schedule to obtain, and the complexity of, crossing agreements. Use of extensive cable armament could exclude use of bottom-oriented fishing gear (trawl, dredge, pot, trap, and gillnet) over and around the cable area where crossings occur. For the South Shore Approach Area, affected fisheries include those targeting monkfish, shellfish, squid, and some pelagics. Where target burial depth cannot be achieved in areas of fishing, the design should limit the use of concrete mattresses except where required for certain linear infrastructure crossings. Operation of OSW cables may cause long-term displacement of recreational and/or commercial fishermen if disturbed benthic communities do not return to previous states. As Table 21 through Table 28 show, minimization and mitigation measures during operation and maintenance also include both communication and methods sensitive to the commercial and recreational fishing community, including a Fishing Community Outreach Program for communications with mariners, commercial, recreational, and for-hire (charter) fishermen to minimize potential gear conflicts and support safe navigation through and fishing. Consideration should be given to expanding project-specific outreach programs and mariner communication plans to include the commercial shipping industry, as appropriate.

Mitigation and minimization measures for cable construction impacts to marine commercial and recreational uses also include notifications of construction occurrence to other users; crossing agreements with necessary existing linear utilities; and analyses to ensure appropriate construction techniques, installation methodologies, and maintenance activities. Mitigation and minimization measures for cable operational impacts to marine commercial and recreational uses emphasize minimizing resource fragmentation by co-locating cables with existing or abandoned utilities and minimizing space between cables, demonstrating achievable burial depths and mitigating risks to users, compensating for damage to fishing equipment and/or lost fishing time/revenue, and accessing the knowledge of local fishermen during siting.

Table 22 to Table 24 summarize minimization and mitigation measures relevant to commercial and recreational fishing, other recreation, linear utilities, tunnels and bridges, and shoreline protection. The measures effectively address the impacts for marine commercial and recreational uses from OSW cables in the South Shore Approach Area.

3.1.3 Navigation and Vessel Traffic

3.1.3.1 Existing Conditions

Navigation and vessel traffic includes the resources analyzed as vessel traffic and navigation areas. The South Shore Approach Area zones all ranked low for constraints associated with navigation and vessel traffic. Recreational and commercial marine vessels transit through the offshore waters of the South Shore

Approach Area. However, major designated navigational areas and moderate or higher densities of vessel traffic are not currently present. The western portion of the South Shore Approach Area is in relative proximity to the Ambrose Channel and Lower New York Bay, which contains designated navigational areas associated with the major shipping lanes that funnel into New York Harbor. Major vessel traffic

lanes and the proposed Long Island Fairway all connect to the precautionary area that encompasses Zone S-5 (85 *Federal Register* [FR] 37034) (see Figure 6 through Figure 13). Note that the proposed rule may be adjusted based upon the recent Coast Guard Port Access Route Study reports for the Northern New York Bight, although it had not changed at the time of this Assessment (87 FR 107). However, Zone S-5 recorded only moderate vessel transit counts between 40 and 60 vessels in 2021 and higher values between 60 and 100 vessels in 2019 according to AIS data. However, AIS data are limited to those vessels carrying AIS transponders and often exclude a majority of commercial fishing and recreational vessel traffic. Zone S-5 recorded vessel traffic moving laterally between Lower New York Bay and East Rockaway Inlet. Zones S-1 and S-2 recorded vessel transit counts between 40 and 60 vessels in 2020. Zone S-2 vessel traffic occurs in and out of Fire Island Inlet, and Zone S-1 vessel traffic occurs in and out of Moriches Inlet. The majority of the vessel types in these zones are passenger vessel, tug-tow vessels, and fishing vessel travel. The proposed Long Island Fairway (85 FR 37034) parallels the southern coastline of Long Island from East Hampton to Jones Beach and spans approximately 3.6 nm (4.15 miles) in width (see Figure 6 through Figure 13). The Fairway boundaries would not interfere with Zones S-4 or S-5; however, they fall within the boundaries of Zones S-1, S-2, and S-3.

The seasonal management areas (SMAs) for North Atlantic Right Whale (NARW) on the western end of Zone S-4 require that navigation and vessel traffic greater than or equal to 65 feet (19.8 meters) in length must slow to speeds of 10 knots or less within the designated area from November 1 to April 30 (73 FR 60173).

3.1.3.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts to navigation and vessel traffic include the temporary disruption of vessel traffic and disturbance of navigational aids. However, because of the relatively low density of vessel traffic and the lack of designated navigational areas within the South Shore Approach Zones, impacts to navigation and vessel traffic could be avoided during construction, operation, and maintenance of cables.

More specifically, the absence of large ports along the South Shore Approach Zones and the relatively unconstrained geography result in dispersed vessel traffic and minimal navigation aids within State w aters outside back bays. Minimization measures would still be necessary but to a lesser degree than in other approach areas where site-specific locations contain navigation resources and vessel traffic. Table 25 summarizes minimization and mitigation measures relevant to navigation and vessel traffic that effectively address the impacts from OSW cables in the South Shore Approach Area.

3.1.4 Aquatic Biological Resources and Sensitive Habitats

3.1.4.1 Existing Conditions

Aquatic biological resources and sensitive habitats include federal, State, or local ordinance-designated or protected areas for various aquatic communities. Sensitive habitats include T&E species habitat, EFH, SMAs for whales, and artificial reefs within the South Shore Approach Area. The South Shore Approach Area zones all ranked low for constraints associated with aquatic biological resources and sensitive habitats. Because of the wide-open shoreline and relatively few opportune areas for crossing back bays to reach POIs on the mainland of Long Island, the South Shore Approach Area zones avoid most sensitive habitats, such as artificial reefs (Figure 6 through Figure 12).

Aquatic resources within the South Shore Approach Area consist of resident fish, diadromous fish that migrate between open ocean and estuaries/rivers, marine mammals, sea turtles, migratory and resident birds, and marine invertebrates. Diadromous fish local to this region include sturgeon, American shad, hickory shad, river herring, striped bass, rainbow smelt, Atlantic tomcod, American eel, sea lamprey, and sea run brook trout (NYSDEC 2017). The federal and State endangered shortnose sturgeon (*Acipenser brevirostrum*) occurs in the northwestern Atlantic but is typically found in freshwater or estuarine environments. The South Shore Approach Area is within the range of waters used year-round by the federal and State endangered and State protected Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Atlantic sturgeon have been recorded throughout the Atlantic coast of Long Island, with high aggregation periods in the western portion of the South Shore Approach Area in the spring and fall (Dunton et al. 2015, 2010). EFH for several species exists along the South Shore Approach Area (NOAA Fisheries 2021).

The federal and State listed loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and green (*Chelonia mydas*) sea turtles occur seasonally along the southern shores of Long Island (Morreale and Standora 1998, 2005); however, sea turtle average annual relative abundance is low throughout the South Shore Approach Area, with moderately low levels in the western region. Sea turtles in the South Shore Approach Area are either migrating or foraging; sea turtle nesting does not occur in the region. No critical habitats for sea turtle species exist in the vicinity of the South Shore Approach (NOAA Fisheries 2019a).

A major migratory corridor for several large whale species occurs in the South Shore Approach Area extending out to the New York Bight. Species include blue (*Balaenoptera musculus*), fin (*Balaenoptera physalus*), and humpback (*Megaptera novaeangliae*) whales. The federal and State endangered fin and NARW (*Eubalaena glacialis*) may occur year-round within the South Shore Approach Area (NOAA Fisheries 2019a). The NARW SMA, near the Silver Point County Park extends to a portion of Jones Beach and encompasses Zone S-4 and a majority of Zone S-3. A portion of the South Shore Approach Area (approximately 35 square nm) near the entrance to Lower New York Bay is within the NARW SMA from November 1 to April 30. Zones S-1, S-2, S-3, and S-4 are within a designated Biologically Important Area (BIA) for NARW migration from March to April (NOAA Fisheries 2015).

The South Shore Approach Area Zones avoid six artificial reefs: Rockaway Reef, Atlantic Beach Reef, Fishing Line Ground Reef, Fire Island Reef, Moriches Anglers Reef, and Shinnecock Reef (Figure 6, Figure 7, Figure 9, Figure 10, and Figure 12). The western extent of the South Shore Approach Area, including Zone S-5, lies within the New York City Waterfront Revitalization Program (NYCWRP) area. Though aquatic resources including T&E species habitat and EFH are present within the South Shore Approach Area zones, the areas are not considered critical habitat for threatened or endangered species and make up a small percentage of the EFH present throughout the entire South Shore Approach Area.

3.1.4.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Given the low ranking for constraints associated with aquatic biological resources and sensitive habitats, impacts to these resources are expected to be avoided during OSW cable construction, and maintenance, and decommissioning of cables by complying with time-of-year restrictions for the NARW, sea turtles, and Atlantic sturgeon. For construction and operation, monitoring studies of T&E species may be employed to document species presence and behavior over time, and to prevent a take of species during such activities.

Table 26 summarizes minimization and mitigation measures relevant to for aquatic biological resources and sensitive habitats that effectively address the impacts from OSW cables in the South Shore Approach Area.

3.1.5 Sediment Contamination, Ocean Disposal Sites, and Unexploded Ordinance

3.1.5.1 Existing Conditions

Sediment-related characteristics include sediment contamination, ocean disposal sites, and UXO. The South Shore zones all ranked low for constraints associated with sediment characteristics, with the exception of S-5 which ranked medium. Sediment quality refers to the potential for contaminated sediment or UXO to affect installation and maintenance of cables. Contaminated sediments are not generally documented along or offshore of the southern shore of Long Island partly because of the lack of historical industrial activities and from dilution to potentially undetectable levels caused by the dynamic hydrologic environment that accompanies the open ocean. A portion of a circular area of UXO, approximately 1.2 nm in diameter, lies approximately 2.2 nm offshore from eastern Jones Beach State Park and approximately 0.5 nm from the southeastern corner of Zone S-3 Jones Beach (see Figure 9). The Jones Inlet Ocean Disposal Site is located along the eastern boundary of Zone S-4 Long Beach.

Additionally, Zone S-5 overlaps with the Fort Tilden Coastal Battery & Small Arms Ranges FUDS Property, which extends offshore from the shoreline of Fort Tilden beyond the State waters boundary. FUDS are properties that may contain environmental contamination or military munitions resulting from past Department of Defense-related activities (Atilano 2021a).

Water quality refers to offshore and onshore water quality and groundwater quality as determined by regulatory standards, and the potential for water quality impacts from contaminated sediment. According to the approved 2018 list of 303(d) impaired waters for New York State, there are no impaired waters in the offshore portion of the South Shore Approach Area because the Atlantic Ocean coastline within the South Shore Approach Area is not impaired (NYSDEC 2020). The 303(d) list is a list of impaired waters that do not meet the water quality standards. States are required to prepare a 303(d) list every year per the Clean Water Act, Section 303(d).

3.1.5.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Given the low ranking for sediment contamination and UXOs for all zones but Zone S-5, OSW cable construction, operation, and maintenance of cables are not expected to be constrained by contaminated sediments or water quality impacts. However, potential impacts to water quality include sediment disturbance and associated suspension and resultant turbidity resulting from cable installation, vessel mooring systems/anchor placement, and entry and exit excavations for HDD operations. Impacts include turbidity, degradation of water quality, and exposure of organisms in the water column to contaminated water or sediment particles.

During HDD, the potential for an inadvertent release of drilling fluid exists, as does the potential for spills of hazardous materials from construction barges or support vessels or loss of fuel during fuel transfers during construction and maintenance operations. In Zone S-5, contaminated sediments and UXO in the seabed would likely be encountered at varying concentrations. Installation of cables may cause water quality or sediment quality impacts during installation, particularly during trenching using a plow. Impacts from a jet plow are higher than from a mechanical plow because a jet plow suspends greater volumes of sediment during installation. Contaminant concentrations in the seabed are typically highest in the uppermost sediment column; therefore, if HDD is used near landfalls, any encounter with contaminated sediments may be limited to the entry and exit points of the drill string, if there is contamination at these locations. Water quality impacts from cable installation (including from vessel mooring systems/anchor placement, if needed) are temporary and limited spatially to the cable construction corridor and temporally to the period of installation (OPSAR Commission 2012). Impacts to the seabed and bottom-dwelling organisms could last substantially longer if sediments brought to the seabed surface by the installation tool(s) are contaminated. The analysis may include contaminant modeling to determine if potentially mobilized contaminants exceed New York Class C thresholds.

Additionally, special installation techniques and material disposal practices may be required in areas with elevated contaminants. Sediments in Zone S-5 should be analyzed to the depth of cable installation to understand the level of contamination present and potential for presence of UXO to assist in selecting the appropriate installation approach, and cable route, to avoid or minimize impacts. Where decommissioning of OSW cables includes removal, impacts similar to installation will occur.

Table 27 summarizes minimization measures relevant to sediment characteristics that effectively address the potential indirect impacts discussed. No mitigation measures were identified from previously permitted marine cables.

3.1.6 Marine Archaeology and Cultural Resources

3.1.6.1 Existing Conditions

Marine archaeology and cultural resources include wrecks and obstructions from the NOAA Automated Wreck and Obstruction Information System (AWOIS) database, National Historic Landmarks, National Register of Historic Places (NRHP) properties, New York State parks, historic sites, and heritage areas that were analyzed with GIS data. The South Shore Approach Area ranked ow for marine archaeology and cultural resources in all zones. The NOAA AWOIS database identifies 10 submerged shipwrecks in the South Shore Approach Area, representing a collection of various types of vessels primarily related to the greater Atlantic shipping and regional trade of the mid-nineteenth century to the early twentieth century. Notable vessels include the *William C. Carnegie*, a five-masted schooner owned by J.S. Winslow & Company of Portland, Maine. The vessel was used in the shipping trade and was in service during the early twentieth century. Another identified shipwreck in the South Shore Approach Area is the *Black Warrior*, a steam-powered, side paddle wheel passenger and mail carrier built in 1852. The vessel ran aground in fog and was later destroyed in a storm in the winter of 1859.

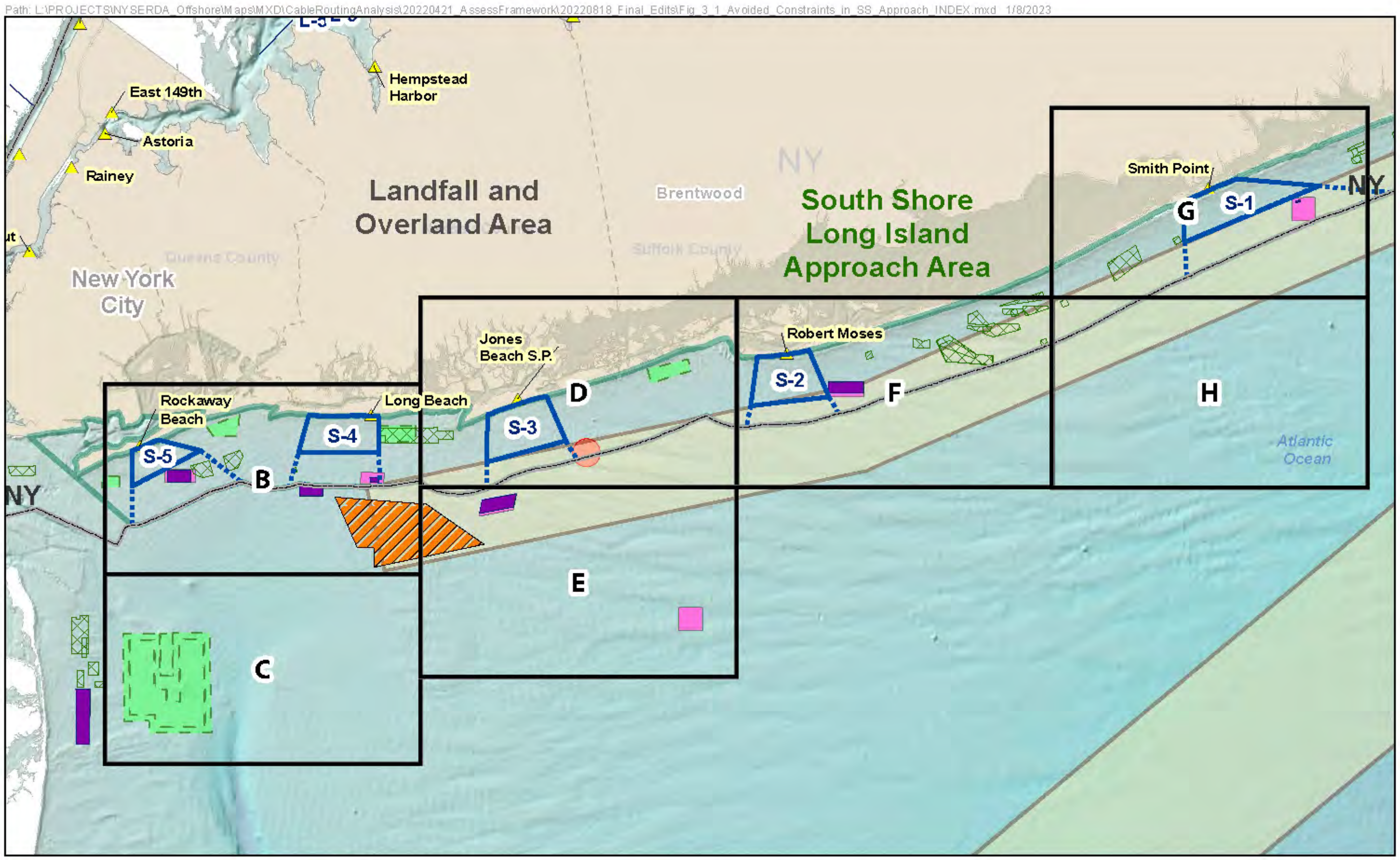
Six federally recognized Indian Nations have areas of interest that overlap with the South Shore Approach Area: the Delaware Nation; the Delaware Tribe; Cayuga; Mohican; Shinnecock; and Stockbridge-Munsee Community, Wisconsin; and one State-recognized tribe, the Unkechaug (NYSOPRHP 2018). The Mid-Atlantic Regional Council on the Ocean (MARCO) data portal also provides information pertaining to historic Native terrestrial territories. The data layer includes references to approximate historic territories of the Munsee Lenape, the Canarsie, the Lekawe (Rockaway), the Merrick, the Massapequas, the Secatoggue, the Unkechaug, the Shinnecock, and the Montaukett Nations within the South Shore Approach Area (MARCO n.d.).

3.1.6.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Given the low ranking and the small number of shipwrecks present in the South Shore zones, construction, operation, and maintenance of cables could avoid impacts to maritime cultural resources. If avoidance is not possible, during construction and operation vessels may disturb maritime archaeological resources, such as paleochannels, submerged prehistoric sites, locations with traditional cultural and religious significance to local Native Americans or other groups, and unknown or unlisted maritime archaeological sites. Construction activities include direct impacts from mooring, anchoring, and dredging that may damage or destroy a portion or an entire site. Other direct impacts to sites could include physical, visual, auditory, or socioeconomic impacts. Indirect impacts include those that may have a cumulative effect or effect on a site in the reasonably foreseeable future (ACHP 2022). Related pre-construction activities include geotechnical sampling and testing to determine the feasibility of the installation of OSW infrastructure, such as coring and drilling.

Table 28 summarizes minimization and mitigation measures relevant to marine archaeological and cultural resources that effectively address the impacts from OSW cables in the South Shore Approach Area.

Figure 6. Resources Present and Expected to be Avoided in the South Shore Approach Area (Index Map)



Map Extent

- Landing
- State Line
- Map Index
- Study Zones
- Zone Extensions to State Boundary
- Approach Area Boundary
- Landfall and Overland Area
- Active Ocean Disposal Site
- Artificial Reef
- Proposed Ambrose Anchorage Ground (USCG)
- Planned Artificial Reef
- Proposed Fairway (USGS)
- Unexploded Ordnance
- USACE Borrow Area

N

0 2 4 6 8 Miles

Note: The following map panels may display fewer layers than depicted on this index map. Individual grid map legends will only show avoided constraint resources present based on geographical data for that area.

Figure 7. Resources Present and Expected to be Avoided in the South Shore Approach Area (Map B)

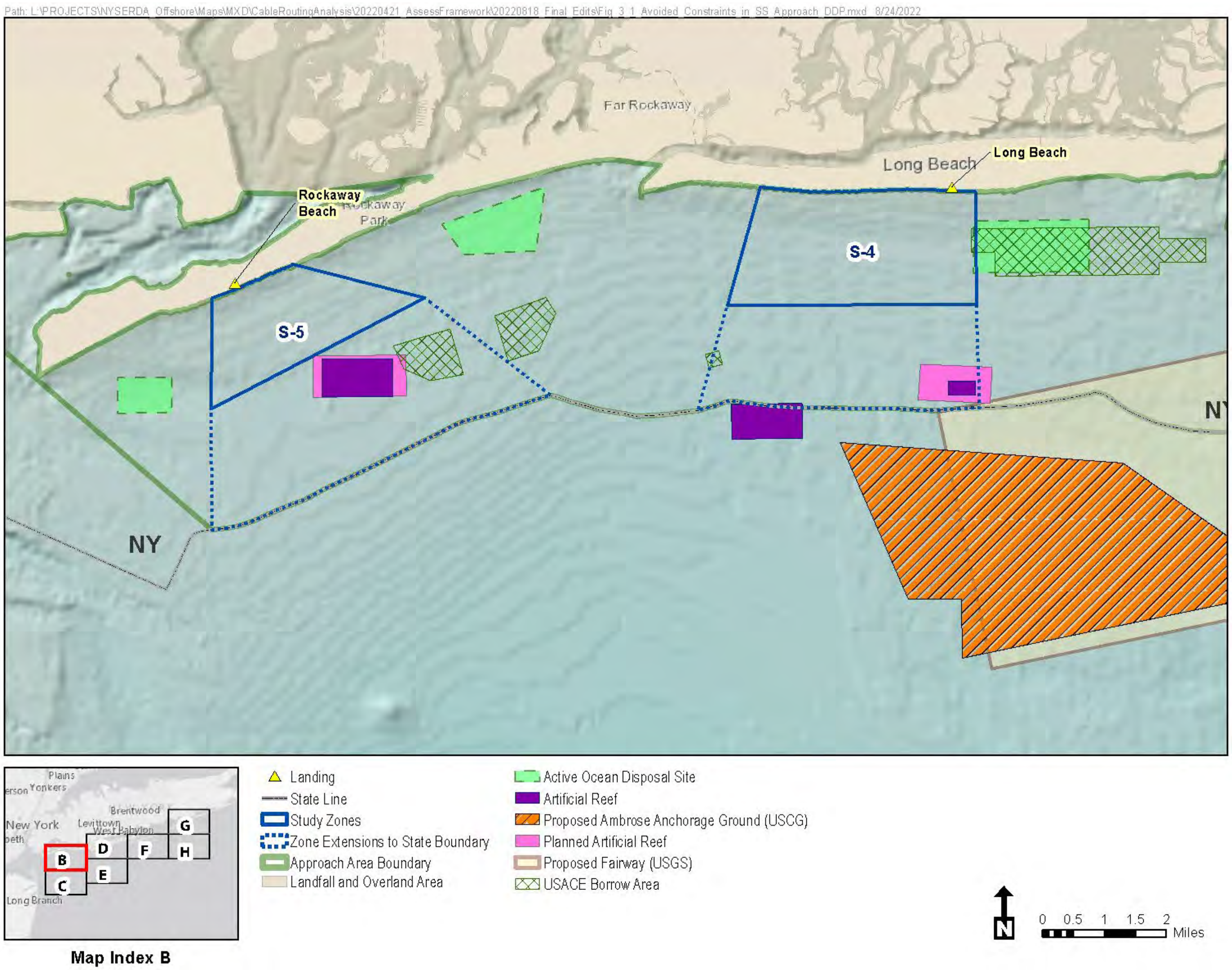


Figure 8. Resources Present and Expected to be Avoided in the South Shore Approach Area (Map C)

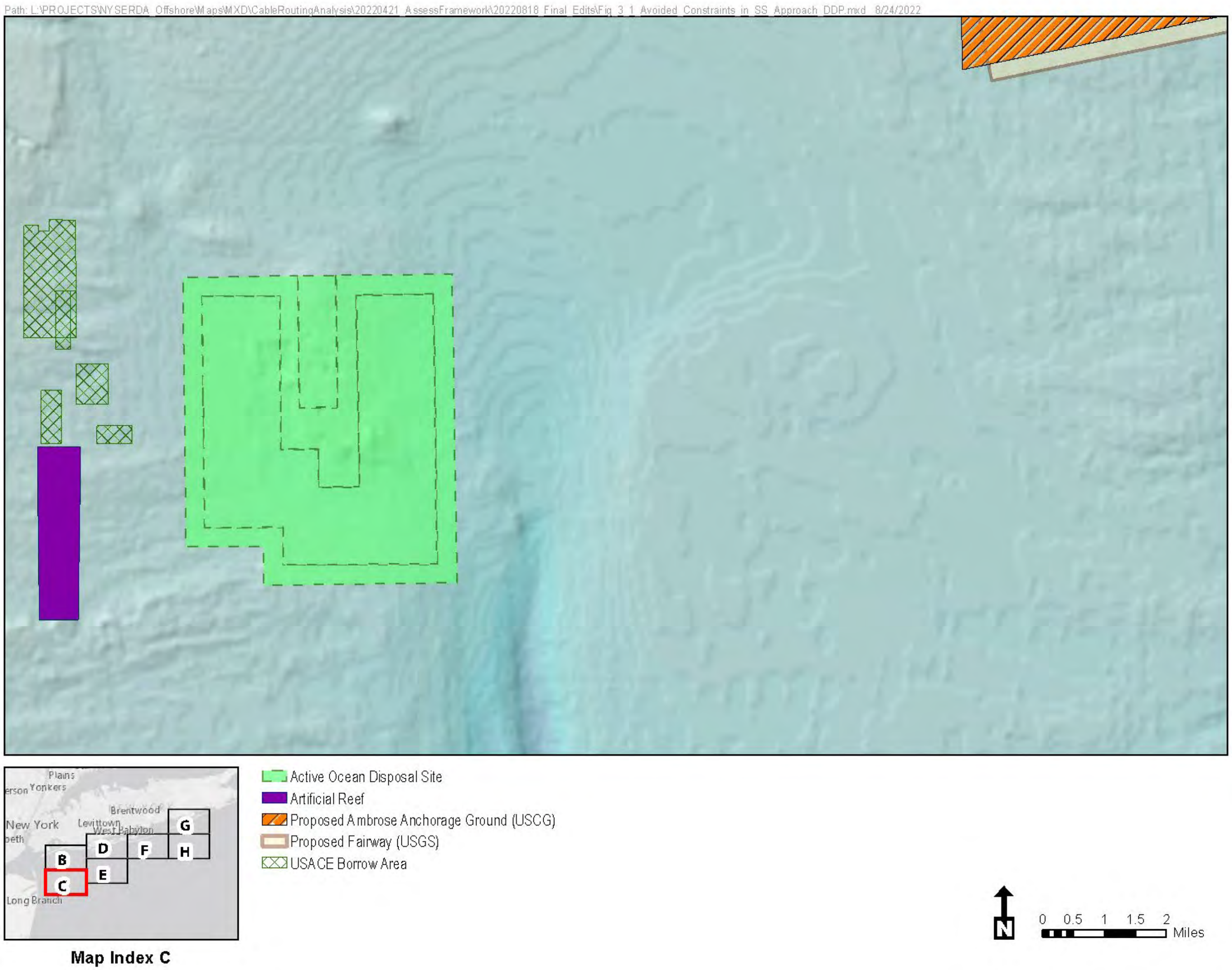


Figure 9. Resources Present and Expected to be Avoided in the South Shore Approach Area (Map D)

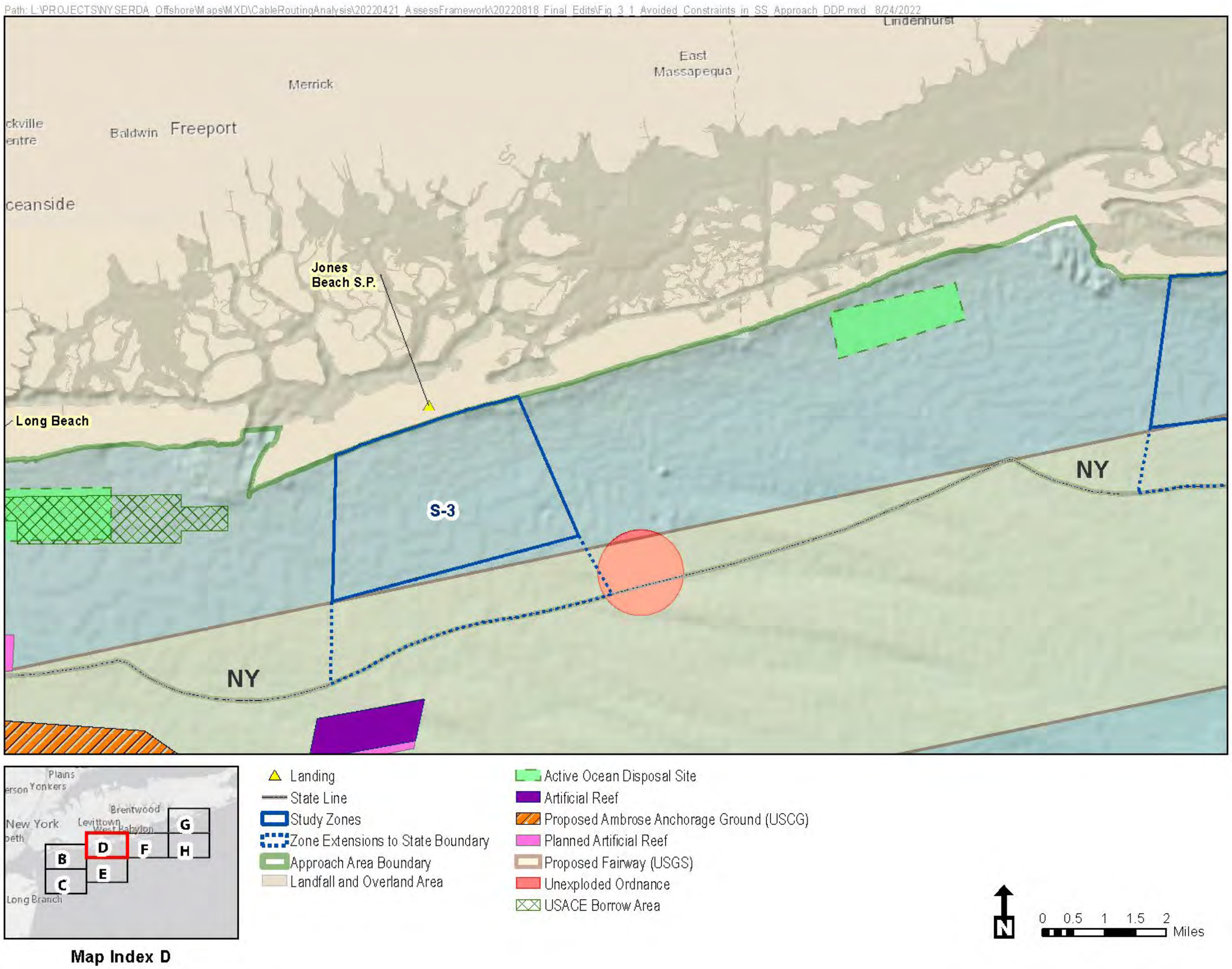
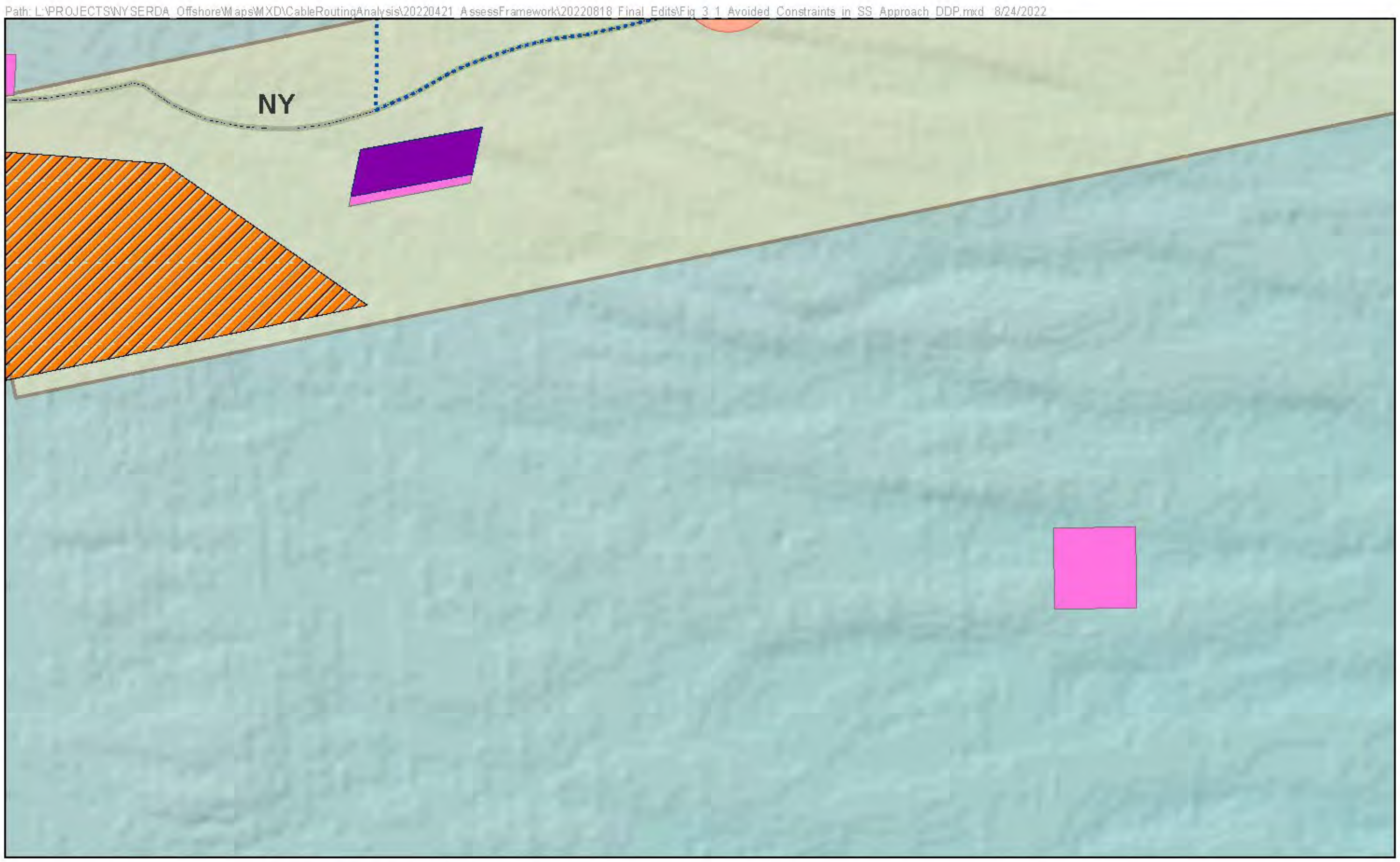
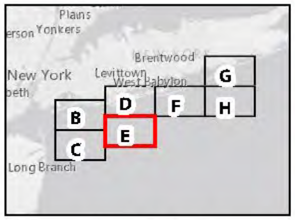


Figure 10. Resources Present and Expected to be Avoided in the South Shore Approach Area (Map E)





Map Index E

Figure 11. Resources Present and Expected to be Avoided in the South Shore Approach Area (Map F)

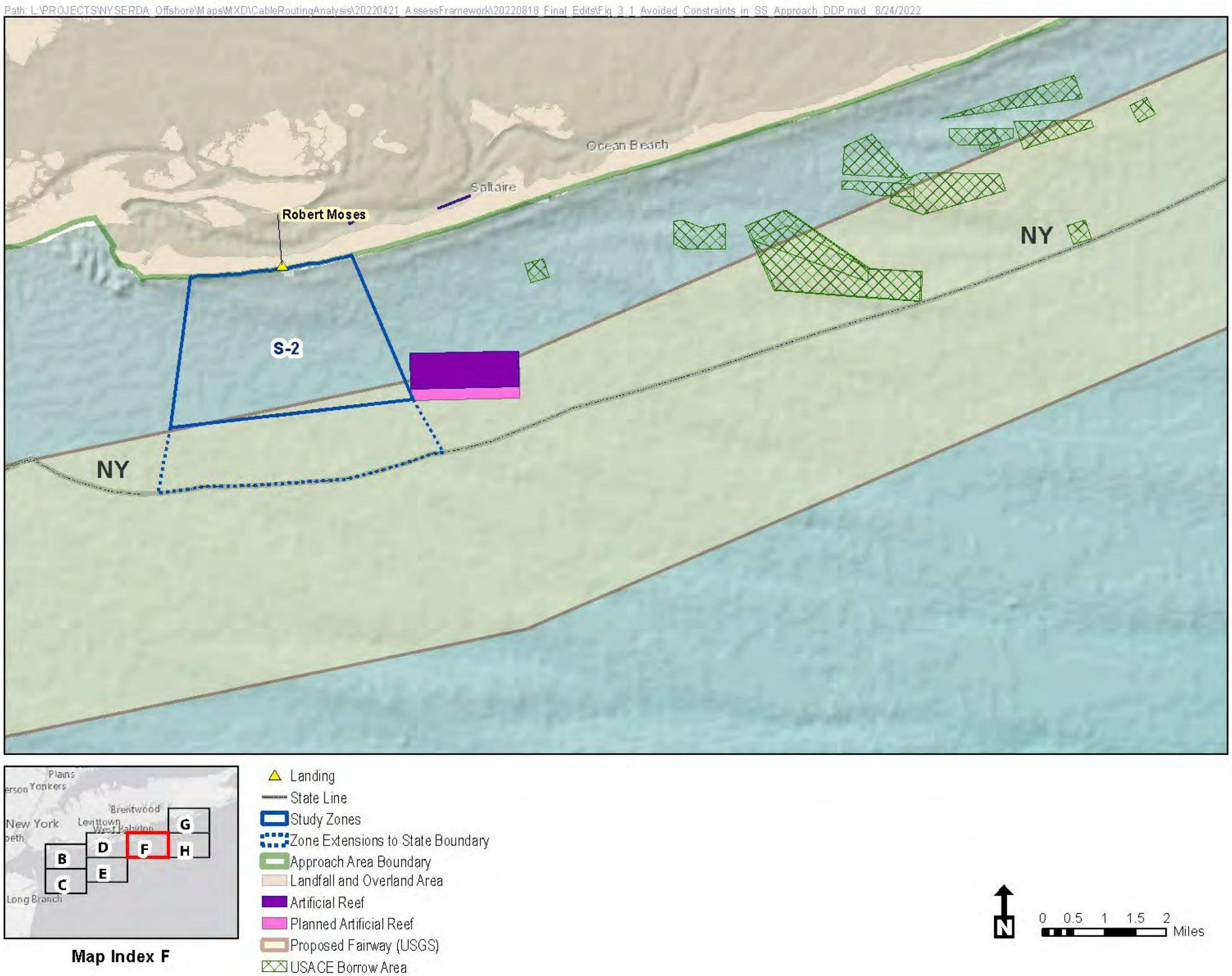


Figure 12. Resources Present and Expected to be Avoided in the South Shore Approach Area (Map G)

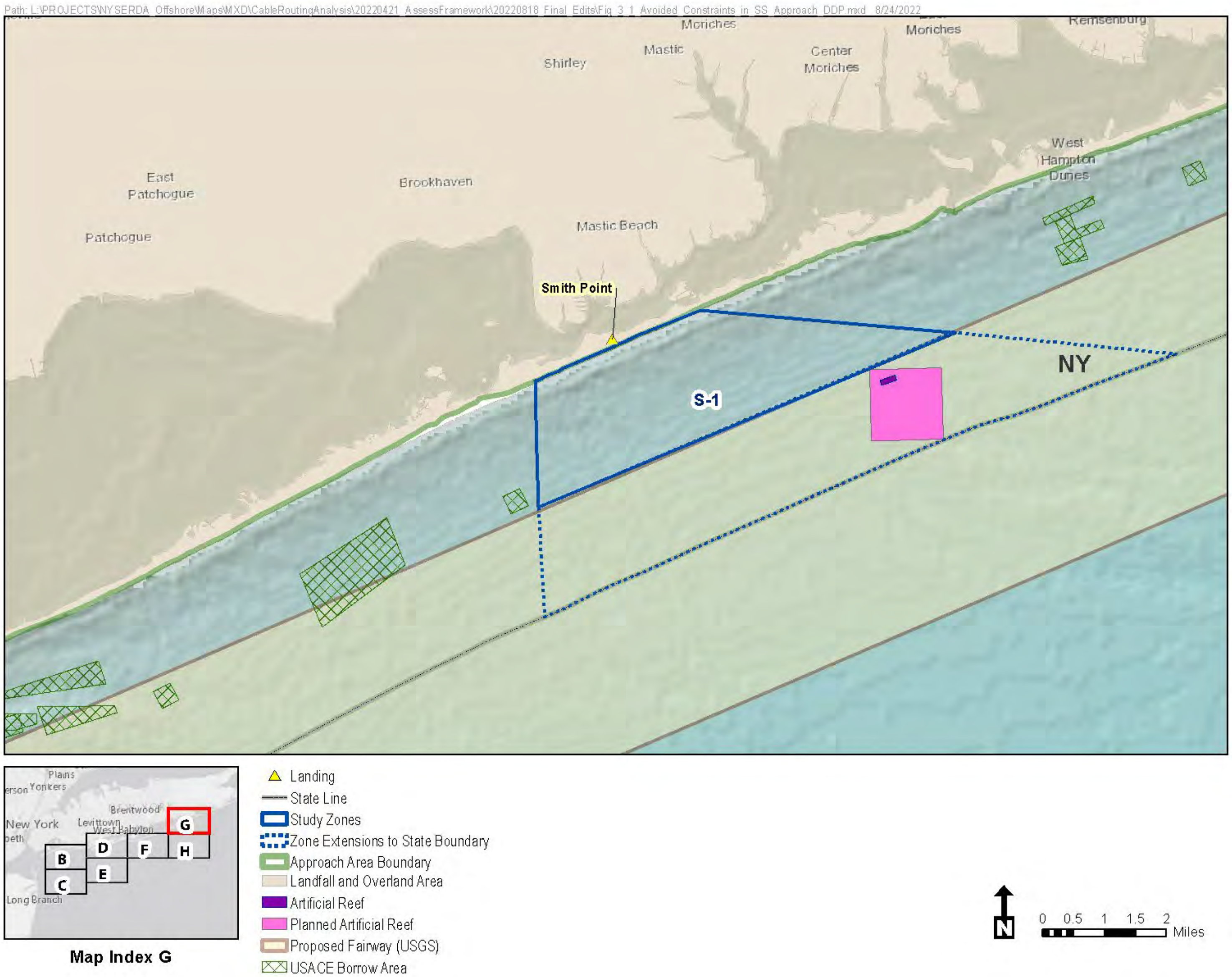


Figure 13. Resources Present and Expected to be Avoided in the South Shore Approach Area (Map H)

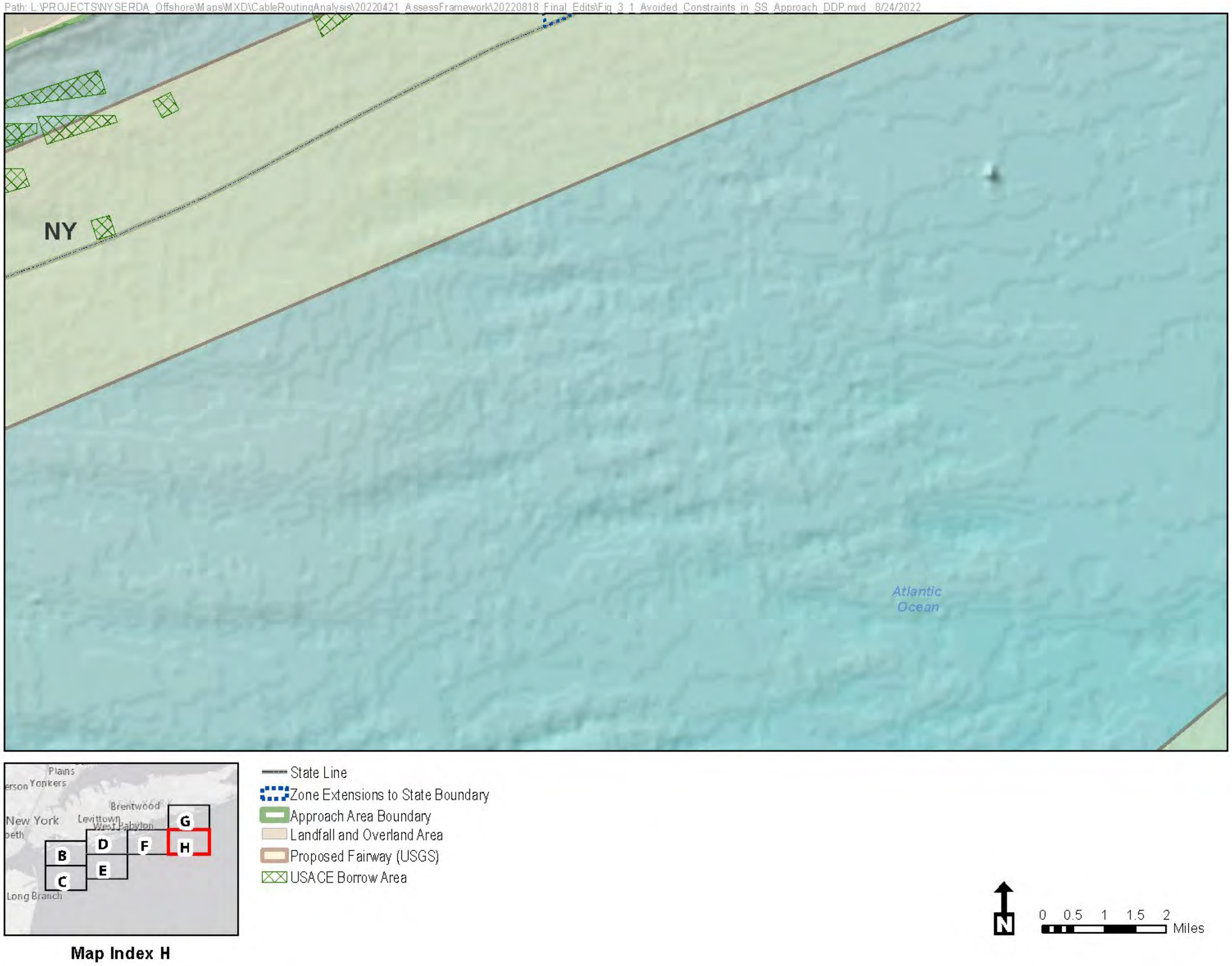
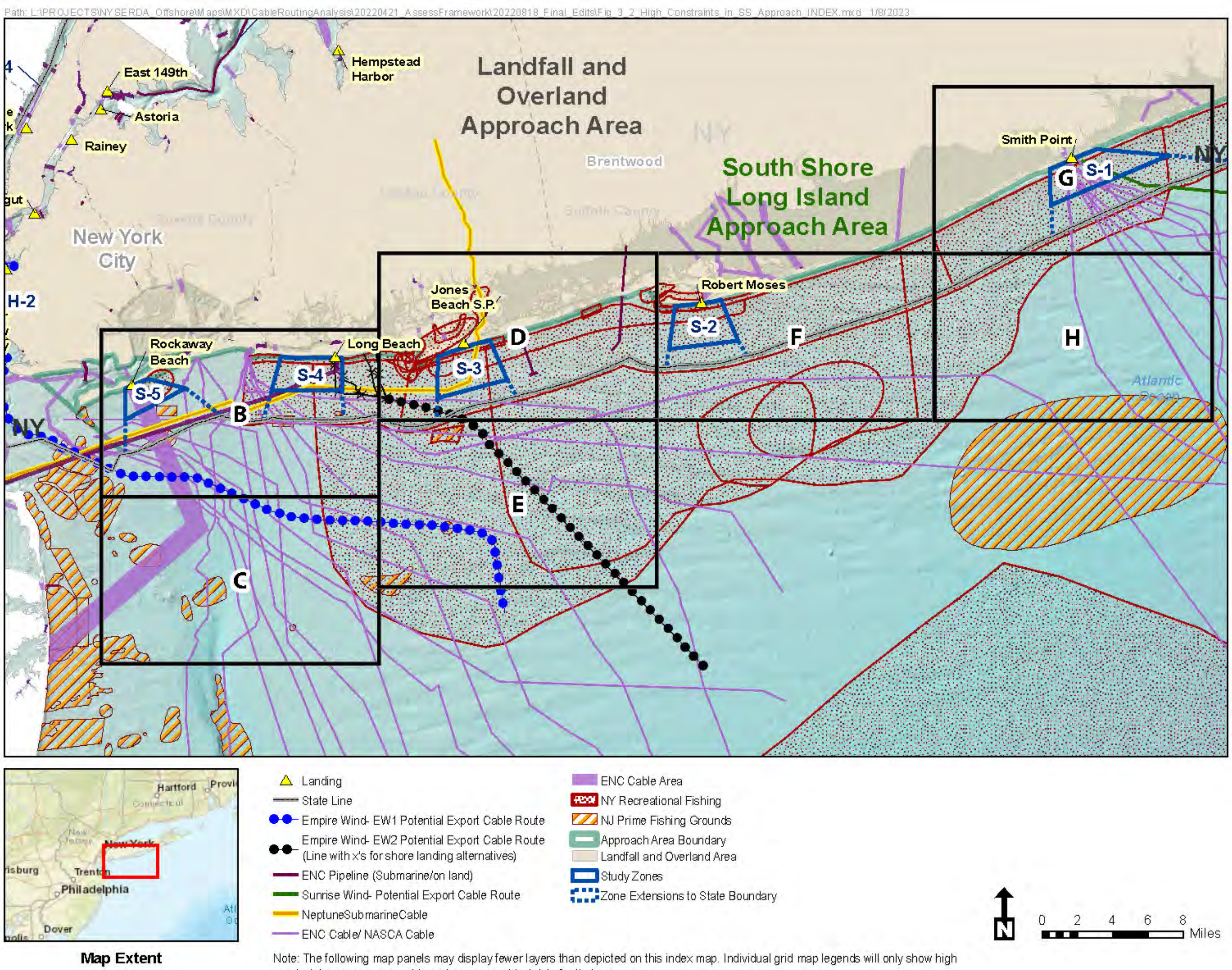


Figure 14. Resources Considered High Constraints within the South Shore Approach Area (Index Map)



Note: The following map panels may display fewer layers than depicted on this index map. Individual grid map legends will only show high constraint resources present based on geographical data for that area.

Figure 15. Resources Considered High Constraints within the South Shore Approach Area (Map B)

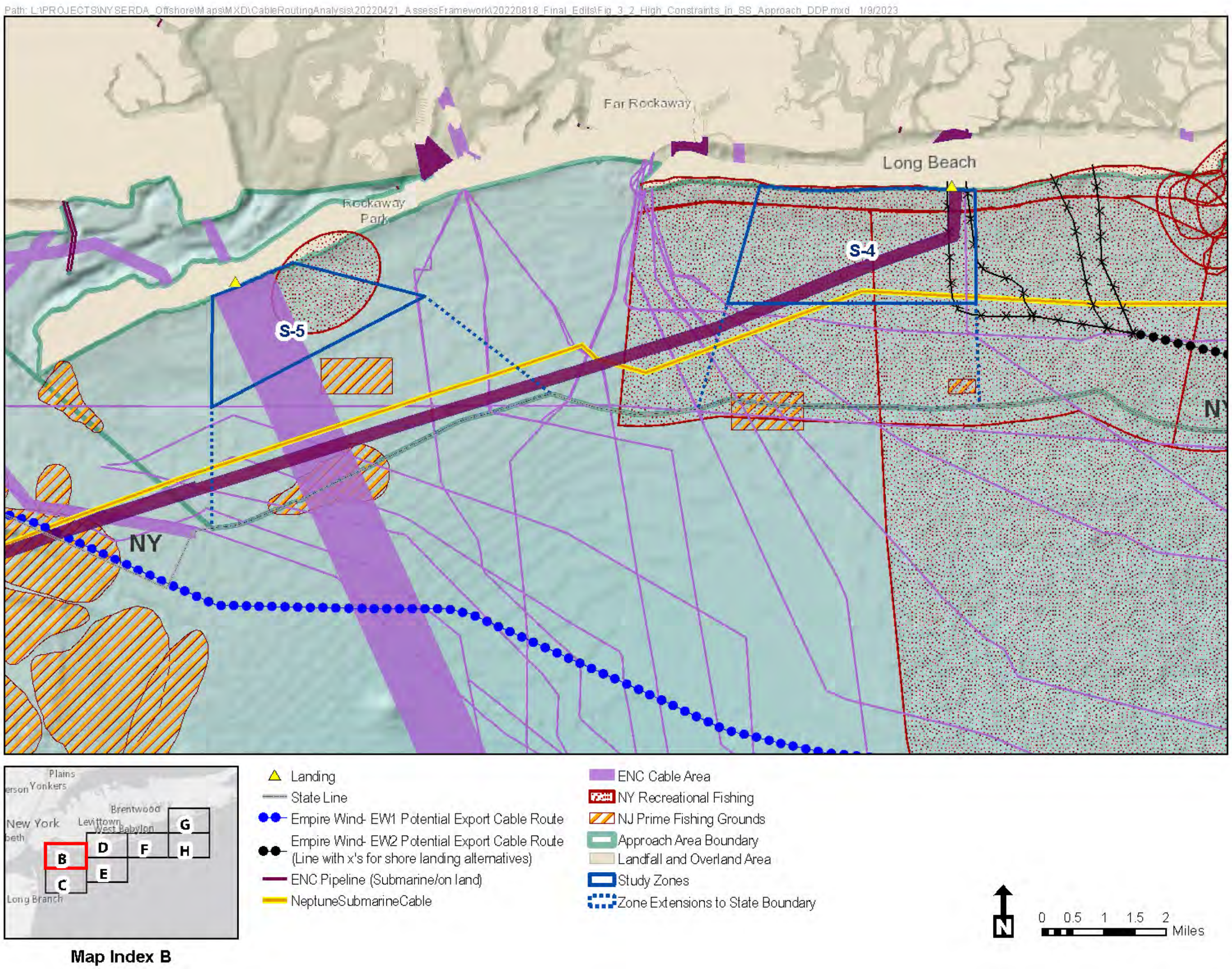


Figure 16. Resources Considered High Constraints within the South Shore Approach Area (Map C)

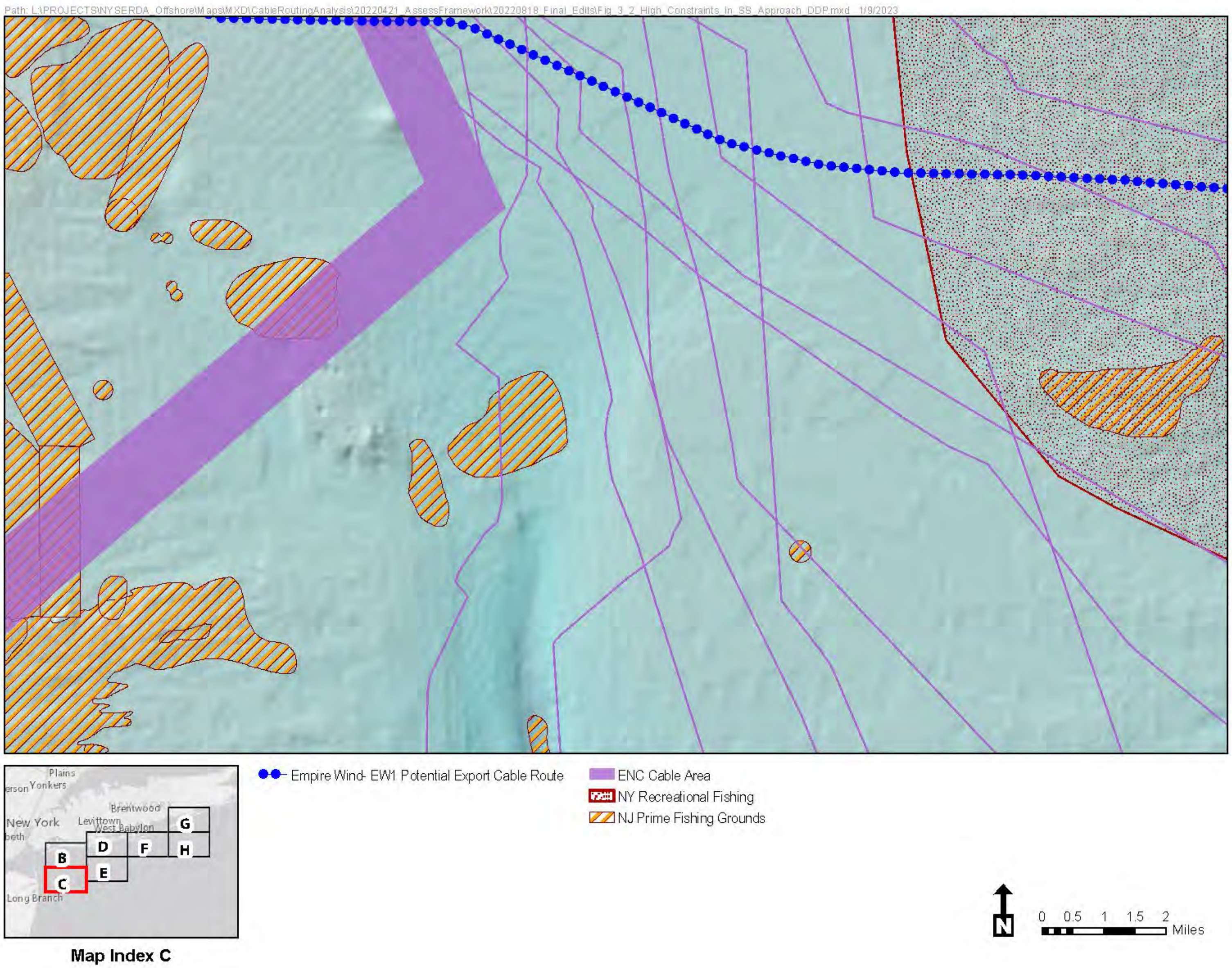


Figure 17. Resources Considered High Constraints within the South Shore Approach Area (Map D)

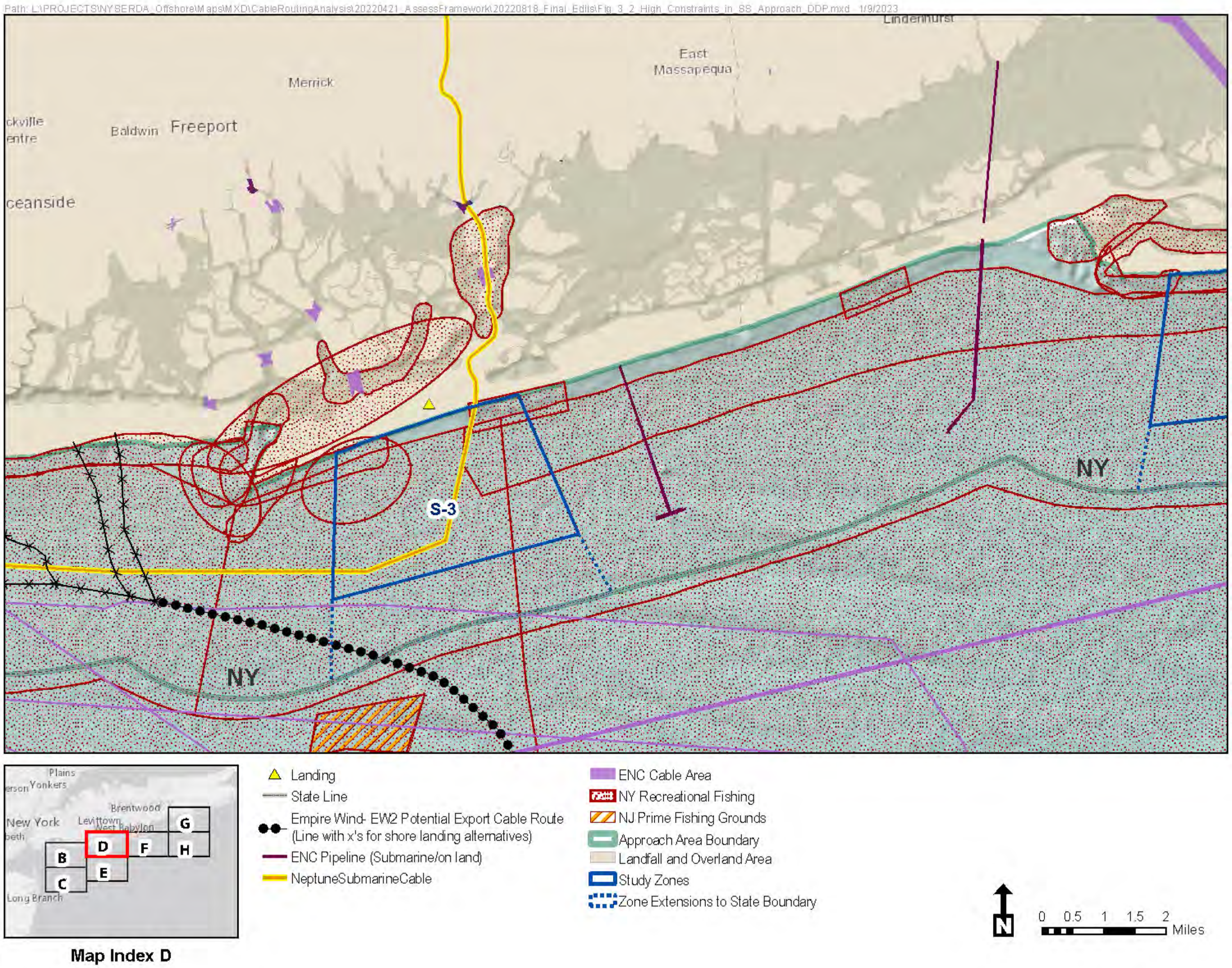


Figure 18. Resources Considered High Constraints within the South Shore Approach Area (Map E)

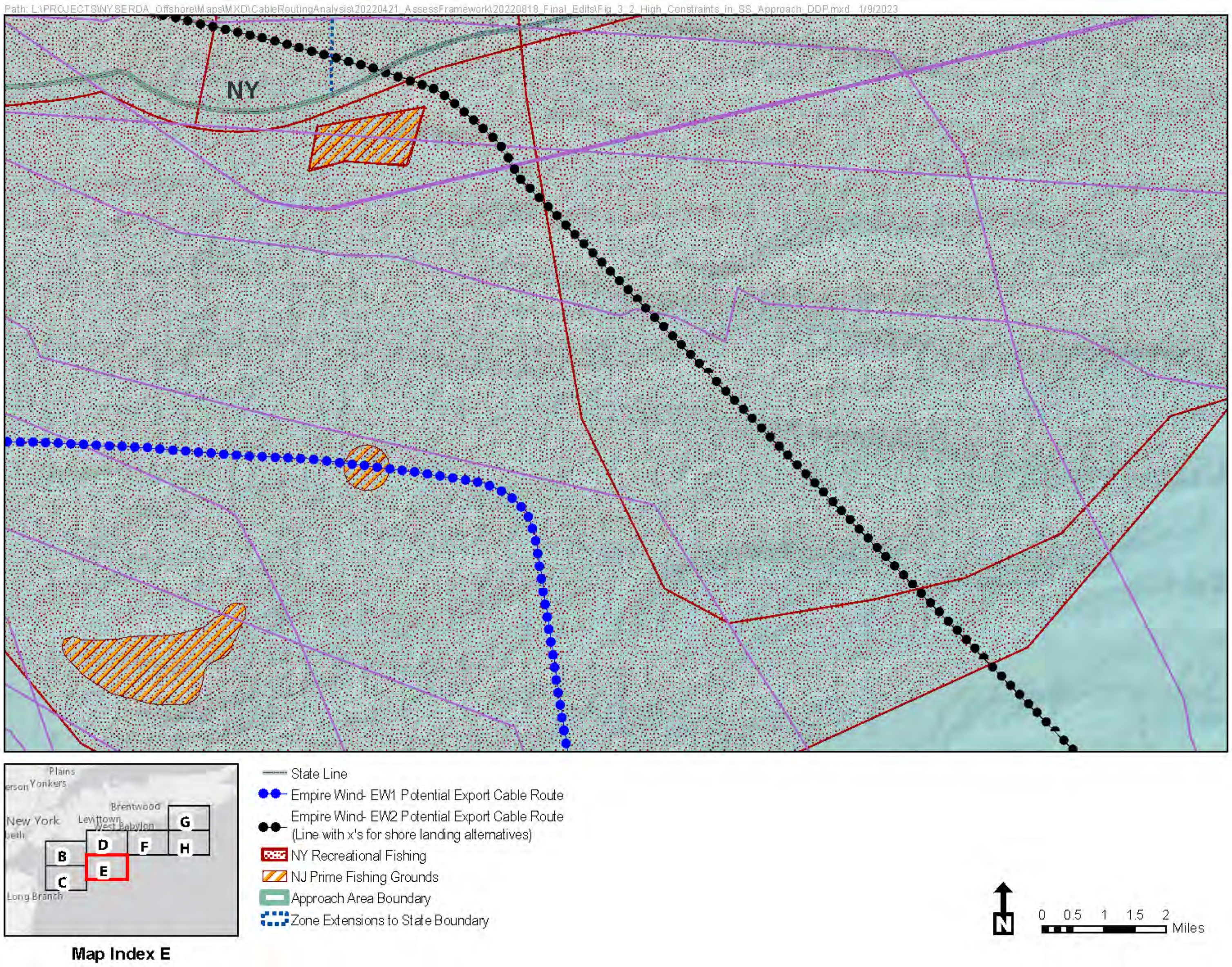


Figure 19. Resources Considered High Constraints within the South Shore Approach Area (Map F)

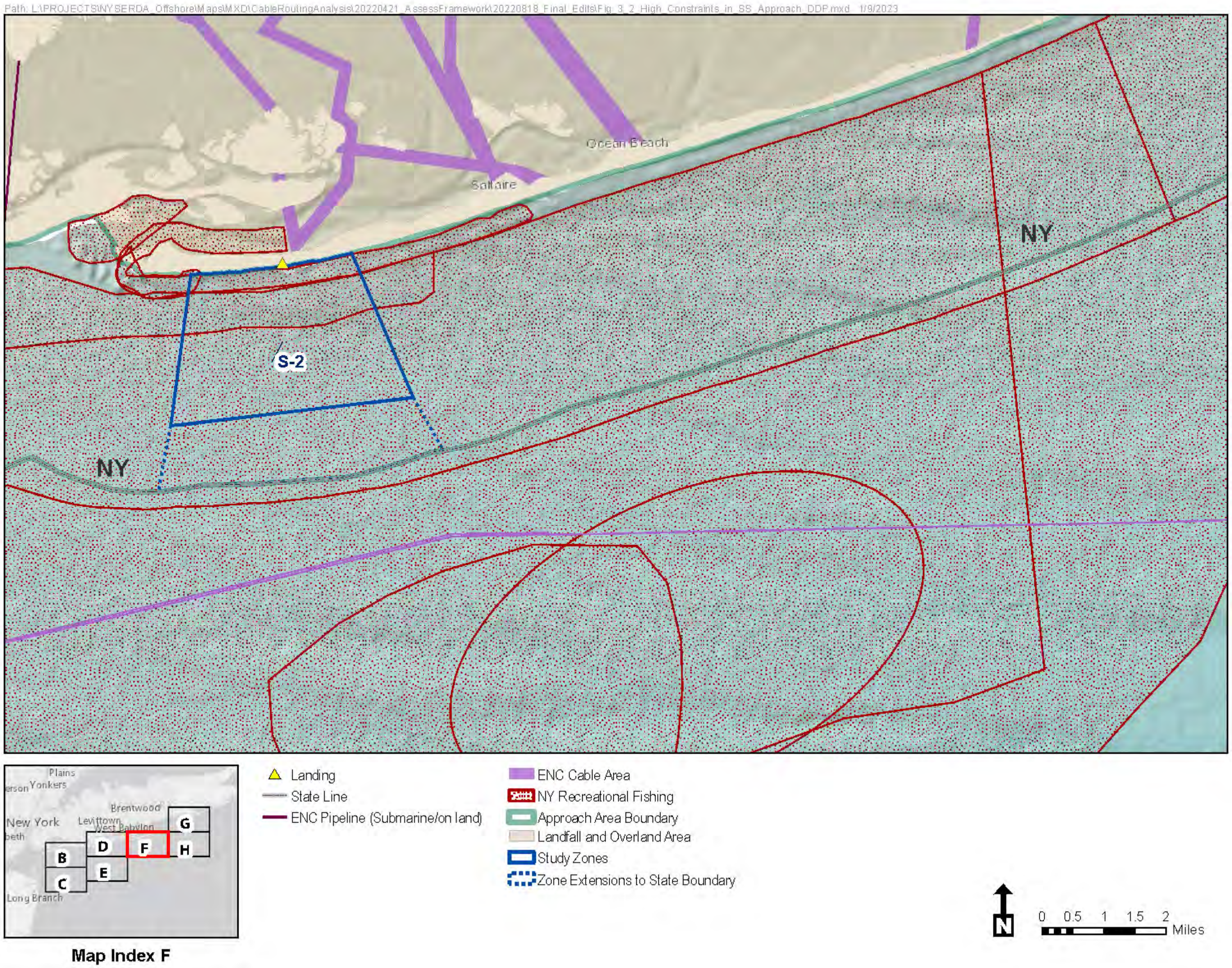


Figure 20. Resources Considered High Constraints within the South Shore Approach Area (Map G)

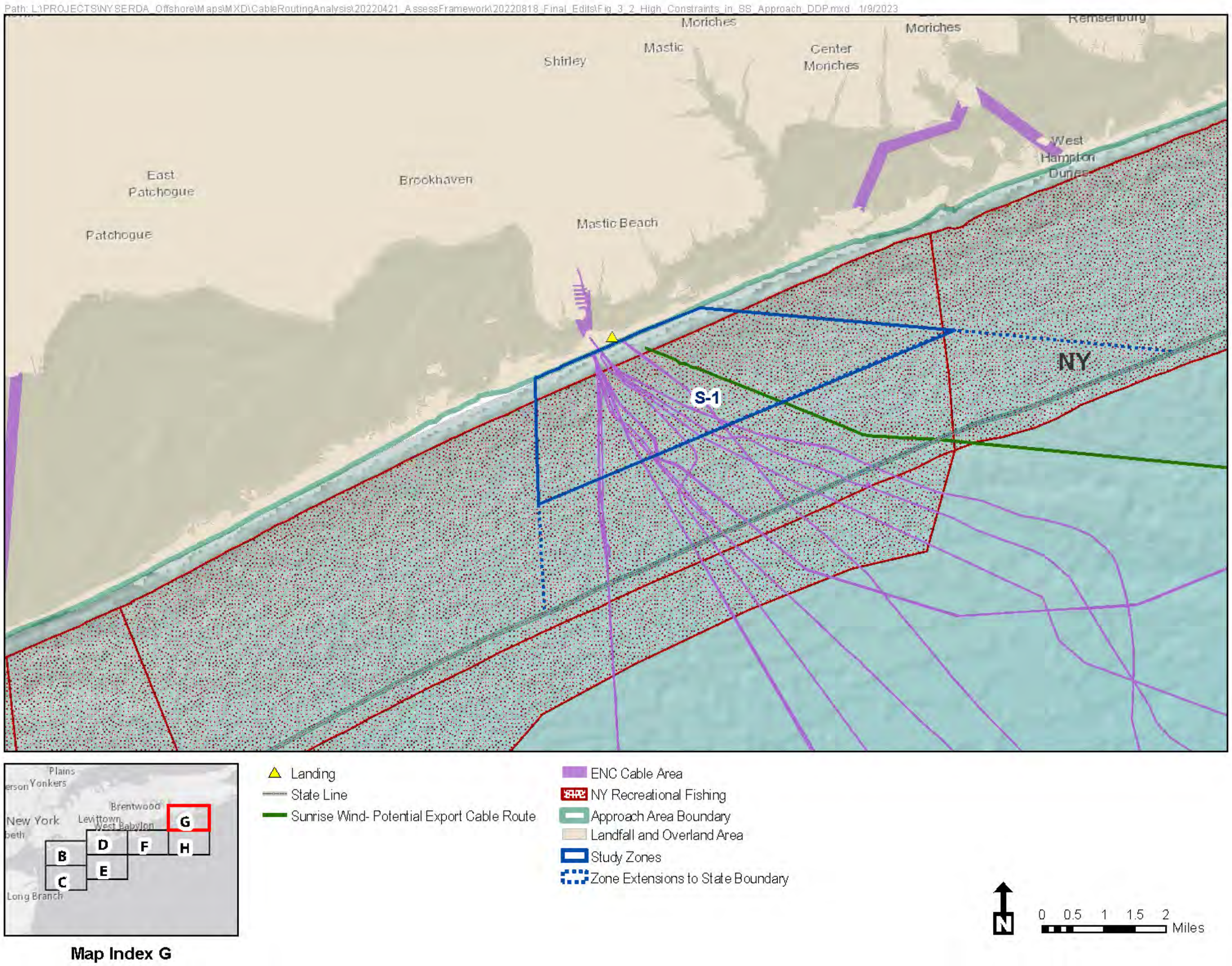
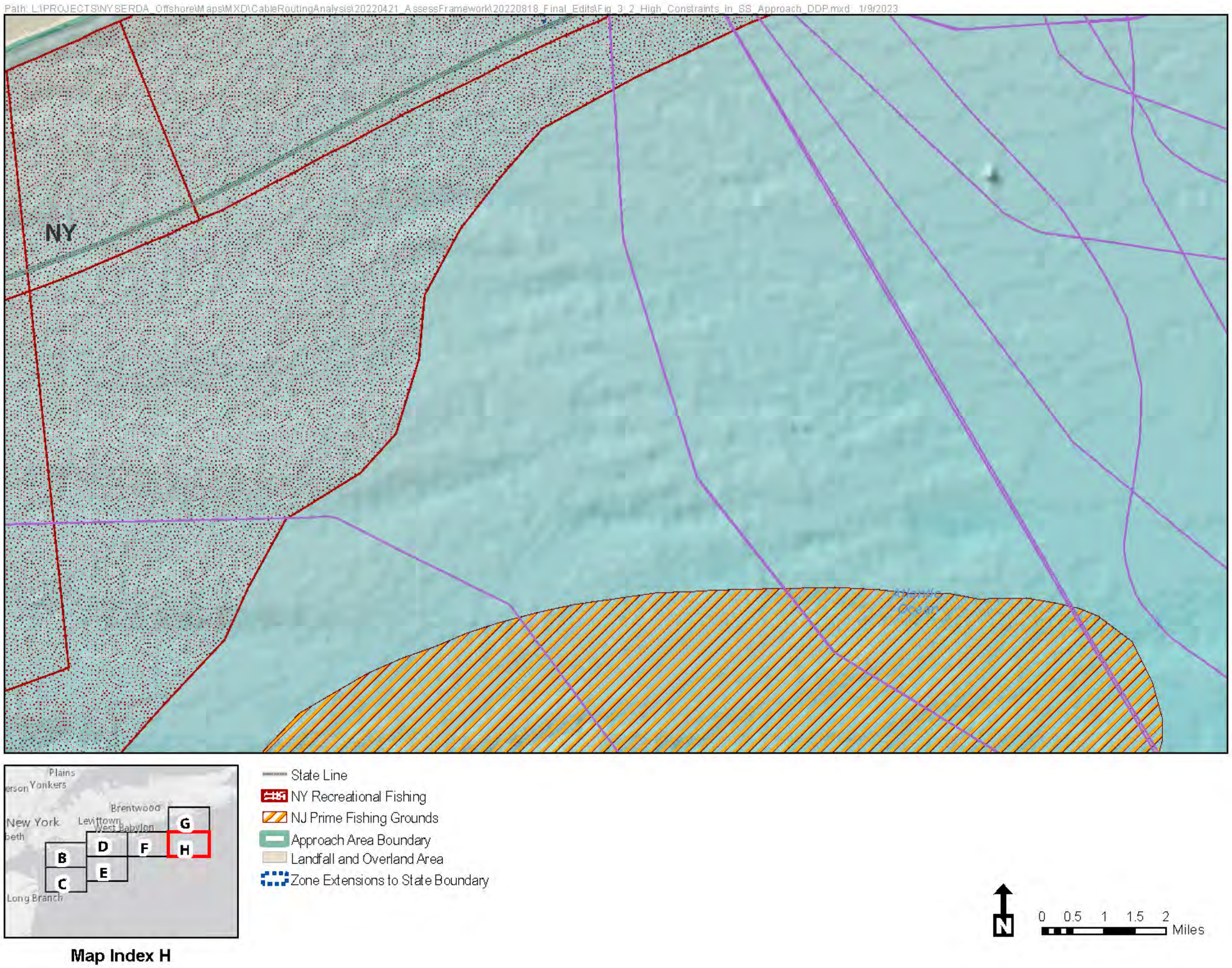


Figure 21. Resources Considered High Constraints within the South Shore Approach Area (Map H)



3.2 Long Island Sound Approach Area

Figure 22 through Figure 34 provide an overview of existing conditions in the Long Island Sound Approach Area and identifies resources ranked low as potential constraints because OSW cables are expected to completely avoid them. Figure 35 through Figure 47 identify the resources with high constraint rankings: marine geology, aquatic and biological resources, marine commercial and recreational uses, navigation areas, and marine cultural resources.

3.2.1 Marine Geology

3.2.1.1 Existing Conditions

Marine geology includes the resources analyzed as hardbottom, bathymetry, slope greater than 10 percent, borrow areas, and waterbody dimensions. The Long Island Sound zones vary in terms of constraint rankings for marine geology. Zones L-2 Harbor Hill Moraine (including all three subzones) and L-6 East River rank high for constraints associated with marine geology. Zone L-3 Eastern and Central Long Island Sound, Zone L-5 Westernmost Long Island Sound, and L-9 Oyster Bay to Hempstead rank medium. All other zones rank low for marine geology.

The Long Island Sound Approach Area includes two long glacial deposits: the Ronkonkoma Moraine at the southern margin of Block Island Sound and the Harbor Hill Moraine (Zone L-2) separating Block Island Sound from Long Island Sound. The Harbor Hill Moraine forms a topographic high and contains Plum Island, Gull Island, Little Gull Island, and the submerged shoal Valiant Rock. Strong tidal currents across the moraine have exposed and concentrated boulders on the seafloor in and near the moraine.

Water depths in much of the Long Island Sound Approach Area range between 50 and 150 feet, with scoured areas adjacent to the Harbor Hill Moraine locally reaching 350 feet, and a generally narrow band along the edges of the approach area where water depths decrease toward the shore. The width of the Long Island Sound Approach Area is relatively spacious and unconstrained, except for zones at the eastern (L-2) and western (L-5 and L-6) ends.

Zone L-2 contains boulders and scour areas, and experiences strong tidal currents. Boulders may be on the surface, embedded in the surface, or buried below the surface. Subzone L-2a between Valiant Rock and Gull Islands is comparatively deep, has a ridge of boulders in its center, and includes broad areas on both sides of the ridge scoured by the strong tidal currents. Subzone L-2b between Gull Island and Plum Island is shallow and has boulder fields and strong tidal currents. Subzone L-2c Plum Island includes the narrow eastern neck of Plum Island. Both sides of Plum Island contain boulders within a few hundred feet from shore, but tidal currents adjacent to Plum Island are considerably slower than across Subzones L-2a and L-2b because Plum Island partially blocks the flow of tidal waters. Some slope gradients exceed 10 percent in the northern portion of Subzone L-2a. Boulders, rocks, and gravelly sediment form hard substrate in much of Zone L-2.

In Long Island Sound, surface sediments change from sand and gravelly sand in eastern Long Island Sound to sand, silt, and clay in the central and western parts of the sound. Zone L-3 extends through the central part of Long Island Sound and avoids coastal areas with sensitive resources, anchorage areas, larger shoals, and Six Mile Reef. Tidal currents are strongest in the eastern part of Zone L-3 resulting in areas of erosion and fields with sand waves. Tidal currents decrease in the mid-section of the Zone L-3 and in Zone L-4 because of widening of Long Island Sound and increasing distance from the main opening of the sound to the ocean (e.g., Signell et al. 2000). Long Island Sound is fairly flat and contains a number of shoals, such as Stratford Shoal to the north of Port Jefferson in Zone L-3 (Eastern and Central Long Island Sound) and Execution Rocks and Stepping Stones in Zone L-5. Only the southern tip of Stratford Shoal is located in Zone L-3; most of the shoal is located in Connecticut waters. The shoals in Zone L-5 further reduce the width of the relatively narrow stretch of the sound. Zone L-5 also contains rocky areas, boulders, and some deeply scoured areas (over 100 feet deep).

Zone L-6, the eastern section of East River between Throgs Neck and Astoria contains charted boulders and rocky areas, particularly north of Rikers Island. Surface tidal currents through Zone L-6 regularly exceed 1.5 knots according to the New York Harbor Observing and Prediction System (Davidson Laboratory 2022). Information about the depth to bedrock in this zone was not identified.

3.2.1.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Impacts to geology from cable installation are mostly associated with boulder and rocky areas (typically with stronger currents), and potentially with bedrock. Where space is limited and these geological conditions cannot be avoided, minimizing impacts would require the use of site-specific engineering strategies. For example, siting cables through rocky areas and areas with larger sand waves requires site-specific engineering design to reach sufficient burial depth and for future cable maintenance because of cable exposure or sediment deposition that affects burial depth over time. Cerberus Shoal in Zone L-1 and Stratford Shoal in Zone L-3 should be avoided where there is adequate adjacent space. Similarly, areas with large sand waves in the eastern part of Zone L-3 (such as Six Mile Reef) should be avoided.

In Zone L-2, shallow water, strong tidal currents, and hard-bottom habitats require site-specific engineering design and impact avoidance measures. The assessment of suitable approaches and potential routing of OSW cables in Zone L-2 also requires site-specific data on geological conditions, hydrodynamics, and biological conditions. Further analysis of field data from the ongoing Long Island Sound Habitat Mapping Program (Phase II) may provide additional information. Evaluation of potential routing in Zone L-2 likely requires high-resolution survey data to inform the design, its potential effectiveness, and any residual impacts to hard-bottom substrates.

Each of the subzones of Zone L-2 present different constraints and potential engineering design options. Subzone L-2a Valiant Rock is wide and deep enough to accommodate a conventional cable lay vessel for cable installation. The strong tidal currents and boulders in the center of the channel may require wider cable spacing. In areas with large boulders that are exposed or embedded in the sediment, installation techniques include complete avoidance, routing around, routing through, or relocating depending on the spacing of the boulders and environmental resources present. Impacts to hard-bottom habitats from relocation of boulders are discussed in Section 3.2.4: Aquatic Biological Resources and Sensitive Habitats. OSW cables should avoid boulders, and if avoidance is not possible, the relocation distance should be minimized. The shallow water depths and shoals in Subzone L-2b Gull Island require a cable lay barge or jackup barge for trenching. An OSW cable in Subzone L-2c would involve trenching, HDD, or micro-tunneling; however, as discussed in Section 3.2.4, impacts to the unique aquatic and terrestrial biological species must be considered given the high constraint ranking. Detailed project-specific and site-specific high-resolution geological investigations and route siting will determine a strategy for crossing Zone L-2 that considers both marine geology constraints and potential biological impacts. Given the geological and design constraints, parallel routing of OSW cables in Zone L-2 avoids any cable crossings.

In the eastern part of Zone L-3, strong tidal currents, erosional areas, areas of sand waves also require site-specific engineering design and impact avoidance measures, based on site-specific data on geological conditions, hydrodynamics, and biological conditions in areas with hardbottom habitat. Similar to Zone L-2, the ongoing Long Island Sound Habitat Mapping Program may provide additional information, and potential routing in Zone L-3 likely requires high-resolution survey data to inform the design.

In Zone L-6, the risk of encountering shallow bedrock increases because of the potential for greater burial depth requirements when crossing navigation channels, vessel routes, and anchorage areas (see Section 3.2.3: Navigation and Vessel Traffic). In Zones L-5 and L-6, boulders also present a constraint to cable installation. In addition, the limited width of the two zones limits the number of cables that can be installed.

With respect to operation and maintenance, appropriate routing and installation techniques avoid or minimize risks from erosion and cable exposure in areas of strong currents, including Zones L-2, L-3 (eastern part), L-5, and L-6. In addition, strong currents can cause erosion that exposes cables to abrasion or to sediment deposited on top, which increases the complexity of cable maintenance.

Table 21 summarizes minimization and mitigation measures relevant to marine geology that effectively address the impacts from OSW cables in the Long Island Sound Approach Area.

3.2.2 Marine Commercial and Recreational Uses

3.2.2.1 Existing Conditions

Marine commercial and recreational uses include the resources analyzed as commercial and recreational fishing, other recreation, linear utilities, tunnels and bridges, and waterfront infrastructure. Marine commercial and recreational fishing rank high in Zones L-1 Block Island Sound and L-3 Eastern and Central Long Island Sound and medium in L-2 Harbor Hill Moraine, L-4 Western Long Island Sound, L-7 Wildwood to Port Jefferson, L-8 Smithtown, and L-9 Oyster Bay to Hempstead Harbor. Linear utilities rank high in L-5 Westernmost Long Island Sound and L-6 East River and medium in L-2, L-3, and L-4. Other recreation ranks medium in Zone L-2. Waterfront infrastructure rank medium in Zone L-6.

Commercial fishing activity in Long Island Sound includes shellfish, rod and reel, trawl, pot and trap, gillnet, pound net, charter, and party vessel fishing. Most commercial trips occur in three locations: east of Port Jefferson; off the North and South Forks of Long Island; and in central Long Island Sound, extending through the western third toward New York City. A designated commercial trawl lane sits close to the New York/Connecticut border in Zone L-3 spanning 0.5 miles across and 15 miles in length (FERC 2008). Fixed gear is not set within the trawl lane to avoid trawlers snagging set pots or traps and is used primarily in August by anywhere from two to 12 fishermen. Recreational fishing activity mostly occurs along the shoreline, except for a few offshore areas in Zones L-3 and L-4, including waters seaward of Jacobs Hill and areas to the east, parallel to the North Fork, near the New York-Connecticut state line north of Port Jefferson, and near the New York-Connecticut state line north of Huntington Bay. Recreational fishing is also common in Plum Gut (Zone L-2) (NYSDOS 2005).

Other recreational activities consist of diving and wildlife viewing. Dive areas located in the Long Island Sound Approach Area occur in Zones L-2, L-3, L-7, L-8, and L-9, with highest densities in Zone L-2. The northern and southern borders of Zone L-4 contain sailing race routes along with many sailing race areas within the zone. Recreational boating density is high in the southwestern corner with low to medium densities throughout the remainder of Zone L-4.

Linear utilities in the Long Island Sound Approach Area include the Fibre-optic Link Around the Globe (FLAG) Atlantic North telecommunication cable, the Iroquois Gas Transmission System natural gas pipeline (Iroquois pipeline), the proposed Beacon Wind export cable, the Cross Sound Cable, Y-49 cable, and several NOAA-charted cable areas. The Y-49 cable is a 345-kV grouping of four three-phase cables connecting New Rochelle and North Hempstead. Zones L-3, L4, L-5, L-7, L-8, and L-9 all contain NOAA-charted cable areas crossing from Long Island to mainland New York State or Connecticut. Beacon Wind proposes a cable route through Zone L-2a that transits the entirety of the Long Island Sound Approach Area before making landfall at the Astoria POI in Zone L-6 (Beacon Wind 2022), with a potential spur to Connecticut (New London area).

Waterfront infrastructure on the shorelines along the western end of Zone L-6 includes areas designated as Priority Marine Activity Zone (PMAZs) and Significant Maritime Industrial Areas (SMIAs) under the NYCWRP. These designations reflect the actual or planned use of the shoreline facilities for waterfront activities, such as shipping. The prevalence of PMAZs and SMIAs at the western end of Zone L-6 is the primary factor for the medium ranking for Zone L-6 in waterfront infrastructure.

3.2.2.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts to marine commercial and recreational uses from construction of OSW cables vary based on the location of commercial and recreational fishing activity relative to the construction zone, the season during which OSW cable activities occur, and the cable installation method, as described in Section 3.1.2.2: Impacts and Avoidance, Minimization, and Mitigation Measures. In the Long Island

Sound Approach Area, the impacts during construction could include short-term displacement of recreational fishermen, commercial fishermen, or other commercial and recreational ocean users, also described in Section 3.1.2.2. Impacts to existing infrastructure during construction include potential damage caused by cable installation methods or a dropped anchor from a vessel associated with cable installation.

Most construction impacts to commercial and recreational fishing can be avoided by restricting installation to outside fishing seasons when economic impacts may be greatest, or routing cables around certain fishing grounds more susceptible to cable interaction such as dredging, trawling, or pot and trap fishing. While construction timing and siting may be able to avoid impacts to some fisheries, it is impossible to avoid impacts to all fisheries. Routing around geological seabed features that attract target species may effectively avoid impacts; however, in other cases, fishing grounds shift. To avoid linear utilities, an adequate buffer around existing utilities also needs to allow room for maintenance of either utility without concern of damage to the other.

Particularly in Zones L-2, L-3, and L-4, cable installation may require specialized installation techniques such as armoring to minimize disruption or impacts to existing utilities, commercial fishing, and recreational activities. Zone L-5, OSW cables need to avoid the Iroquois pipeline and several NOAA-charted cable areas. Based on the currently available alignment, the proposed Beacon Wind cable would generally extend parallel to the Iroquois pipeline in the northern part of Zone L-5, then separates from the pipeline as it rounds the Stepping Stones shoal and continues along the eastern perimeter of the lower third of the zone. Generally parallel alignment of new OSW cables with existing linear infrastructure, where practicable, preserves adjacent open space for future OSW cables and prevents further resource fragmentation of marine commercial and recreational uses. The coordination of siting future OSW cables and the proposed Beacon Wind OSW cable would minimize potential impacts and optimize the use of the space for multiple OSW cables.

Table 22 to Table 24 summarize minimization and mitigation measures relevant to commercial and recreational fishing, other recreation, linear utilities, and waterfront infrastructure that address the impacts for marine commercial and recreational uses from OSW cables in the Long Island Sound Approach Area.

3.2.3 Navigation and Vessel Traffic

3.2.3.1 Existing Conditions

Navigation and vessel traffic in the Long Island Sound Approach Area includes federally designated navigation areas, particularly channels and anchorage areas, and vessel traffic. Navigation ranks high in Zone L-6 East River and medium in Zones L-4, Zone L-5, and L-8 Smithtown. All zones rank low for vessel traffic.

Marine vessels traffic includes pleasure boats, commercial shipping and fishing vessels, and ferry vessels. AIS vessel data show that vessel traffic mostly flows between Connecticut and New York State at Bridgeport/Port Jefferson near Zones L-3 and L-7, between New London and Old Saybrook/Orient Point, passing through Zones L-3 and L-2, and along a relatively established course that parallels the North Shore of Long Island in Western Long Island Sound extending into the East River Channel from Zones L-4 to L-6 (see Figure 35, Figure 37 through Figure 39, Figure 41, and Figure 45) (AIS 2021). For deep draft vessels, higher concentrations of vessel traffic exist between Long Island Sound and Rhode Island State waters. Within Subzone L-2a, smaller tankers and tug-barges use the route between Valiant Rock and Little Gull Island as an alternate to The Race, which relieves much of the traffic from the deeper passage at The Race (see Figure 46).

Passenger, tug-tow, and fishing vessels account for most vessels traveling within the Long Island Sound Approach Area. Many fishing vessels in Long Island Sound do not use AIS or vessel monitoring system technology; therefore, vessel traffic data may present differently with a site-specific analysis. Zone L-3 vessel traffic includes the Cross Sound and Port Jefferson ferry routes, and a small portion of the New London Orient Point ferry route, which also crosses a small portion of Subzone L-2c (Figure 38 and Figure 43 through Figure 47).

In Zones L-2, and L-4 to L-6, vessel traffic becomes denser as the widths of waterways narrow, and traffic increases upon approach to New York City (see Figure 36 through Figure 38) (AIS 2021). In 2021, the United States Coast Guard (USCG) proposed to establish a Recommended Vessel Route based on the concentration of vessel transits leading up to East River Channel and to include its boundaries on navigational charts.

The central Long Island Sound Approach Area is not generally constrained by formally designated navigation channels or anchorage areas. Landing Zones L-7, L-8, and L-9 on the north shore of Long Island contain smaller anchorage areas, and Zones L-3 and L-8 include two large anchorage areas for deeper draft vessels for Port Jefferson and Northport, respectively. Two major navigation channels occupy Zone L-6: the East River Channel and South Brother Island Channel. The East River Channel has a width of 1,000 feet and an authorized depth of 35 feet. Limited shoaling occurs in the East River Channel, particularly along the channel edges between the Bronx Whitestone Bridge and North Brother Island. The South Brother Island Channel extends south from the East River Channel immediately west of Rikers Island and connects to a maintained turning basin adjacent to the Astoria POI. This channel also has an authorized depth of 35 feet and is 400 feet wide at its narrowest section. Zone L-6 includes six anchorage areas offset from the East River Channel by approximately 150 feet or more. Most of these anchorage areas line the perimeter of Zone L-6 and only partly overlap. However, Anchorage No. 11, positioned on the northeast shoreline of Rikers Island, lies almost entirely within Zone L-6 and spans much of the width.

The USCG establishes, administers, and enforces anchorage grounds and regulations for vessels in navigable waters of the United States. Vessels use anchorage grounds for many activities, including engaging in commerce in a port, conducting maintenance and safety measures, waiting for inclement weather to pass, or waiting for berths. Informal anchorage areas exist in the Long Island Sound Approach Area; however, their mapped locations are not publicly available at this time. The anchorage areas within the boundaries of Zone L-6 are unrestricted, except for the Bowery Bay anchorage area, which is designated for special anchorage with unknown restrictions. Around LaGuardia Airport, the designated 200-yard safety and security zone requires vessels to obtain permission from the Captain of the Port to operate in these waters of Flushing and Bowery Bays.

3.2.3.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts to navigation and vessel traffic during construction of OSW cables may include the temporary disruption of vessel traffic and disturbance of navigational aid, as described in Section 3.1.3.2: Impacts and Avoidance, Minimization, and Mitigation Measures. Potential impacts vary in significance based on overall vessel traffic density and usage of the area. Wherever feasible, the use of existing navigational channels for OSW cables minimizes the impacts to navigational traffic and surrounding waters. Cable construction may require specialized installation techniques, such as perpendicular channel crossings or HDD, to minimize temporary disruptions. As shown in Table 25, minimization and mitigation measures include both communication and burial depth standards. During construction, regular updates to the local marine community through social media, the USCG Local Notices to Mariners, and active engagement with the Maritime Association of the Port of New York and New Jersey Harbor Safety, Navigation, and Operations Committee would minimize impacts. In federally maintained navigation features (e.g., anchorages and shipping channels), burial depths should reach 15 feet or more below the current or anticipated future authorized depth or depth of existing seabed, whichever is deeper.

Anchorages should be mostly avoidable in Long Island Sound Approach Area zones. However, if the anchorages are not avoided, anchor strike from navigation and vessel traffic is a risk to OSW cable operation, particularly within designated navigation channels and anchorage areas. (This constraint is discussed in more detail in Section 3.3.3.2: Impacts and Avoidance, Minimization, and Mitigation Measures, with respect to constraints in the New York Harbor Approach Area.) The presence of designated navigation channels and anchorage area crossings requires appropriate project-specific and site-specific analyses of optimal route alignment and burial depths of OSW cables. Temporary displacement and loss of anchorage areas could occur during construction and maintenance, causing overcrowding or route detours, as vessel operators seek alternate anchorage areas. If cable crossings are not minimized or sited properly, temporary loss of anchorage areas could become permanent. The USCG also noted in its comments on the Draft Assessment Framework that federal permitting requires a Navigation Safety Risk Assessment and Cable Burial Risk Assessment for OSW cables, which includes a request for any EMF impacts, individual and cumulative, on vessel compasses.

Table 25 summarizes minimization and mitigation measures relevant to navigation and vessel traffic that effectively address the impacts from OSW cables in the Long Island Sound Approach Area.

3.2.4 Aquatic Biological Resources and Sensitive Habitats

3.2.4.1 Existing Conditions

Aquatic biological resources and sensitive habitats include federal, State, or local ordinance-designated or protected areas for various aquatic communities. Sensitive habitats of Long Island Sound include T&E species habitat, Significant Coastal Fish and Wildlife Habitat (SCFWH), cold-water corals, artificial reefs, hard-bottom habitats, SAV, and EFH. Zones L-2, L-3, L-4, L-8, and L-9 rank high, and Zones L-1 and L-7 Wildwood to Port Jefferson rank medium.

The Long Island Sound Approach Area ecosystem is characterized by open estuarine and fully marine waters that connect with tributary streams and tidal marshes along the shoreline. Aquatic animal groups consist of resident fish, diadromous fish that migrate between open ocean and estuaries/rivers, marine mammals, sea turtles, and marine invertebrates. Some whale species (long-finned pilot whales [*Globicephala melas*] and minke whales [*Balaenoptera acutorostrata*]) seasonally migrate into the Block Island Sound (Zone L-1), although no resident whale populations exist (Lopez et al. 2014). The endangered NARW and fin whales (*Balaenoptera physalus*) use waters in Zones L-1 and L-2 and the eastern extent of Zone L-3 (NOAA-GARFO 2019). Adult and juvenile NARW and fin whales may occur year-round while migrating between northern foraging and southern calving grounds, with the highest occurrence between November and April. Adult and juvenile fin whales occur year-round in the mid-shelf area off the east end of Long Island. Adult fin whales may also use waters offshore of the eastern extent of the Long Island Sound (Zones L-1, L-2, and L-3) as calving grounds from October through January (NOAA-GARFO 2019). A small portion of Zone L-1 is within the NARW seasonal management area (SMA) from November 1 to April 30 and within the designated BIA for NARW migration from March to April (NOAA Fisheries 2015, 2019b). There is also an overlap with the designated BIA for fin whales for feeding from March to October (NOAA Fisheries 2015). Bottlenose dolphins (*Tursiops truncatus*) and Atlantic white-sided dolphins (*Lagenorhynchus acutus*) inhabit Long Island Sound regularly (Lopez et al. 2014). Pinnipeds present within the Long Island Sound Approach Area include harbor seals (*Phoca vitulina*), gray seals (*Halichoerus grypus*), harp seals (*Pagophilus groenlandicus*), and hooded seals (*Cystophora cristata*) (see Figure 36 through Figure 47). While previously occurring only seasonally, some seals are now present year-round within Long Island Sound; larger concentrations occur on the islands within Zone L-2 and Herod Point Shoals SCFWH in Zone L-7 (see Figure 41, Figure 42, and Figure 44) (Lopez et al. 2014; CT DEEP 2019). Harbor seals, and some gray seals, use the southern, rocky coast of Plum Island as a “haul-out”–an area for resting ashore; this area hosts more seals each winter than any other in New York State (Save the Sound et al. 2020). The Long Island Sound Approach Area does not include mapped federal critical habitats for listed species (NOAA-GARFO 2019).

Long Island Sound seasonally hosts four species of sea turtles: Kemp’s ridley sea turtle, loggerhead sea turtle, green sea turtle, and leatherback sea turtle. Migrating and foraging juvenile and adults of these turtle species occur in the Long Island Sound between May and November, with the highest concentration present from June through October (NOAA Fisheries 2019a).

Adult and subadult Atlantic sturgeon migrate and forage year-round throughout the Long Island Sound Approach Area. Additionally, adult shortnose sturgeon may migrate through the East River (Zones L-5 and L-6) and forage in the northern waters of the Sound, including the western (Zones L-4 and L-9) and eastern (Zone L-1) extents of the Long Island Sound Approach Area from April through November (NOAA-GARFO 2019).

The Long Island Sound Approach Area contains large expanses of varied topography in hardbottom areas and complex seafloor (see Figure 36 through Figure 47Figure 47) (e.g., Zajac et al. 2000; CT DEEP 2019). Changes in seafloor bathymetry that create vertical structure afford protection to biological resources from the dynamic open ocean environment and provide habitat for benthic communities (Watling and Norse 1998; Zajac et al. 2000). Hardbottom areas along the seafloor are essential to many sensitive species, including the American lobster (*Homarus americanus*) and cold-water corals. Recent details of the habitat and resources of eastern Long Island Sound (and most of Zone L-2) and Stratford Shoal are published as part of the Long Island Sound Seafloor Habitat Mapping Initiative and Long Island Sound Cable Fund at https://longislandsoundstudy.net/research-monitoring/seafloor-mapping/ under Phase II and Phase I, respectively.

Mapped occurrences of cold-water coral, specifically the northern star coral (*Astrangia poculata*), exist north and east and slightly west of Plum Island, within Zone L-2 and the eastern extent of Zone L-3, as well as in suitable habitat where models predicted their occurrence (CT DEEP 2019, NYNHP and InnerSpace 2022*)*. Cold-water corals have also been observed in and around Stratford Shoal in the western portion of Zone L-3 (CT DEEP 2019). Cold-water corals are colonial animals similar to tropical reef corals, but many species do not require sunlight for survival. Because these cold-water corals catch food from the surrounding water, they are usually found in areas with higher current velocities, including on ledges and mounds. Cold-water coral aggregations attract invertebrates and fish seeking food and shelter (CT DEEP 2019).

Artificial reefs include Matinecock Reef located in Zone L-9 and Smithtown Reef located in Zone L-8, which was approved for expansion. There are also two newly authorized artificial reef sites: Huntington-Oyster Bay, located in Zone L-4, and Port Jefferson-Mount Sinai, located in Zone L-3 (NYSDEC 2021a).

The Stratford Shoal/Middle Ground Complex is an important underwater habitat in Zone L-3 with a complex seafloor that supports infaunal and epifaunal communities of elevated species richness compared to the surrounding areas (Stefaniak et al. 2014). The Stratford/Middle Complex is characterized by a steep change in elevation in which the protruding landmass alters the surrounding hydrology and changes the sediment (Zajac et al. 2000). The apex of the shoal forms a reef composed of coarse sand and gravel that supports reef-building organisms, such as finger sponges, northern star coral (*Astriangia poculata*), blue mussels (*Mytilus edulis*), and erect bryzoans (Stefaniak et al. 2014). The benthic communities formed by this complex attract significant seasonal populations of striped bass and bluefish.

NYSDOS defines designated SCFWH as habitat areas that exhibit to a substantial degree one or more of the following characteristics:

- Essential to the survival of a large portion of a particular fish or wildlife population (e.g., feeding grounds, nursery areas).
- Supports a species that is either endangered, threatened, or of special concern.
- Supports fish or wildlife populations having significant commercial, recreational, or educational value.
- Not commonly found in the State or a coastal region of the State.
- To varying degrees difficult or even impossible to replace in kind.

Designated SCFWHs within the Long Island Sound Approach Area include Great Gull Island (Zone L-2); a small portion of Herod Point Shoals (Zone L-3); a small portion of Little Neck Bay at the southern intersections of Zones L-5 and L-6; North and South Brother Islands (Zone L-6); Herod Point Shoals, Wading River Marsh and Beach, and Port Jefferson Beaches (Zone L-7); small portions of Crab Meadows and Beach Wetlands and Beach and Nissequogue River and Inlet Beaches (Zone L-8); and Hempstead Harbor, Oyster Bay and Cold Spring Harbor, Prospect Point, and Lloyd Point (Zone L-9) (see Figure 36 through Figure 42, and Figure 44 through Figure 47) (NYSDOS 2005). While are other SCFWHs are identified within Long Island Sound and its embayments, the zones were drawn to avoid as many designated areas as possible. Designated SCFWH adjacent to the Approach Area that were avoided include The Race and Plum Gut (adjacent to but outside Zone L-2), and Roanoke Shoals, Port Jefferson Harbor, Little Neck Bay, and Manhasset Bay (in Long Island Sound) (see Figure 46).

The dynamic habitats of the Long Island Sound Approach Area support habitat for multiple fish species groups. EFH for all four life stages (eggs, larvae, juvenile, and adult) is present for bluefish, butterfish, summer flounder, windowpane flounder, winter flounder, yellowtail flounder, and longfin inshore squid. Two bivalves, the quahog and surfclam, also have EFH within Long Island Sound. Winter flounder and horseshoe crabs use Long Island Sound waters as important spawning habitat (CT DEEP 2019, Wahle and Balcom 2020). Other anadromous species use Long Island Sound as a pathway to return from offshore areas and spawn in natal rivers and streams.

Mapped SAV occurs in shallow waters, including within Zone L-2c along the northern and southern shores of Plum Island (see Figure 47), and within Zones L-7 and L-8 along the shoreline of Long Island (NYSDEC 2021b; NYNHP and InnerSpace 2022). Species observed around Plum Island include sugar kelp (*Saccharina latissimi*), eelgrass (*Zostera marina*), Irish moss (*Chondrus crispus*), and unidentified brown and red algae (NYNHP and InnerSpace 2022). The dive study confirmed established eelgrass meadows off the west side of Plum Island. According to the 2018 Natural Heritage Communities GIS data, the marine eelgrass meadow on the western side of Plum Island encompasses 9.5 acres. SAV beds act as nurseries and refuge for many species of fish and provide important habitat and feeding areas for waterfowl. SAV beds produce organic matter, reduce the likelihood of algal blooms by the uptake of nutrients through their root systems, and filter suspended sediments leading to increased water clarity. Dense SAV beds may also buffer water currents, reducing shoreline erosion. Additionally, SAV beds are a Habitat Area of Particular Concern for summer flounder (*Paralichthys dentatus*) in areas designated as EFH for this species. Summer flounder Habitat Area of Particular Concern includes all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within designated adult and juvenile summer flounder EFH (NOAA Fisheries 2021).

The onshore areas contained wholly within Zone L-2 such as Plum Island and Great Gull Island support sensitive land habitats. Both islands are important foraging and breeding areas for wading birds, waterfowl, and shorebirds and formally designated as IBAs by Audubon New York. Gull Island is one of the most important tern nesting sites in the world, with the largest breeding colony of roseate terns (*Sterna dougallii*), a federally and State endangered species, in North America and one of the largest colonies of common terns (*Sterna hirundo*), a State listed threatened species (Audubon 2022). Over 125 different avian species were detected consistently throughout all seasons over 10 years of surveys (Schlesinger et al. 2016). The upland Natural Heritage communities of Plum Island are composed of 63 acres of maritime dunes on the southern tip of the island and 45 acres of maritime beach surrounding the entire island. Other sensitive species found on Plum Island include four species of bat, a rare species of moth, and 23 species of rare plants (Schlesinger et al. 2016). Wetlands are common in the southern third of the island between the low beach ridges (Schlesinger et al. 2016).

3.2.4.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts to aquatic biological resources and sensitive habitats from construction of OSW cables vary in degree based on the season during which OSW cable activities occur and the type of cable installation method used. In the Long Island Sound Approach Area, the potential impacts during construction include short-term displacement of mobile species as well as temporary disturbance, burial, and mortality of non-mobile species or sensitive habitats (e.g., SAV), or disturbance of hard-bottom habitats.

As part of cable installation, a plow towed along the seafloor may be used to clear debris or level sand waves to create a level and unobstructed path for the cable installation tool (e.g., jet plow or controlled flow excavators). These burial techniques resuspend sediment during installation. The extent of the impact depends in part on the installation tool(s) used, time of year, and the aquatic biological resources present. For example, suspended sediment and potential changes in sediment composition could impact SAV viability. However, timing the installation during the species' latent season does not fully address these impacts. Areas of SAV should be avoided, and if impacts cannot be avoided, mitigation measures include creation of habitat to offset the loss. Additional impacts of elevated turbidity levels include mortality of eggs and less mobile larvae (e.g., winter flounder eggs in shallow waters), and decreased physical fitness or mortality of sessile, filter feeding organisms. Cable installation involving an intake of water such as jet plows or excavation of HDD pits also presents a risk of entrainment and potential mortality to small, suspended species or non-mobile benthic species. Impacts on species during vulnerable life stages also depend on the timing of cable installation. For example, winter flounder spawn in Arthur Kill/Newark Bay and Upper and Lower New York bays from January to April, with peak spawning typically occurring between February and late March (Wilber et al. 2013). Where decommissioning of OSW cables includes removal, impacts similar to installation will occur.

Potential impacts in Long Island Sound also reflect the combination of marine geology conditions (i.e., boulders, sand waves, and strong currents) and critically important habitat that represent rare ecotypes, particularly in Zones L-2 and L-3. As discussed in section 3.2.1.2, boulders should first be avoided and, if avoidance is not possible, boulder clearance or relocation should be minimized. Boulder clearance or relocation affects benthic and fishery resources. Shifting boulders removes shelter and community-building structures for species and may decrease habitat complexity and species richness of benthic communities in the affected areas. As noted in Table 26, minimization measures for impacts to aquatic biology and sensitive resources from boulder relocation includes creating new physical configurations in relation to nearby boulders because aggregations of boulders may serve as high value habitat. For example, this increased complex structured habitat may benefit juvenile lobsters and fish by providing an opportunity for refuge compared to surrounding soft bottom habitat with little vertical change. However, creation of such habitat may alter the distribution and abundance of existing marine resources, creating an impact that may not necessarily be a positive benefit. Recovery rates for benthic organisms varies. Benthic and epibenthic populations of the disturbed areas are expected to recover within less than a year to 6 years (e.g., Hemery and Rose 2020, and references therein), while slow growing, longer-lived cold-water corals are expected to have longer recovery times. Long-term or permanent impacts from habitat conversion may occur in areas where structures or armoring are installed, such as for infrastructure crossings or shore landings. Increased vessel activity during OSW cable installation can also impact marine species by increasing the underwater noise and the potential for vessel strikes.

Impacts to aquatic biological resources and sensitive habitats from operation of OSW cables could occur from cable maintenance (i.e., repair) needs and from cable operation as a result of EMF and thermal effects of the cable. Cable repair requires lifting the cable onto a vessel, adding a new section of cable, lowering the cable with the added section of cable ("repair bight") to the seabed, and then burying the repair bight with a cable installation tool. This process disturbs the seabed in a similar manner as during the initial installation of the cable. Therefore, impacts to the benthic organisms and habitat from this process are generally similar. To reduce the likelihood of this process, an appropriate cable route and appropriate burial depths that have limited risk of cable damage during the operational phase should be selected for the initial cable installation. Stretches of seabed with higher risks for cable damage include erosional as well as depositional areas (such as larger sand waves, and potentially the tidal scour holes in Zone L-2, adjacent to the central spine of the moraine), areas of active bottom fishing, and areas where anchors might be dropped (anchorages, navigation channels).

Operation of OSW cables may cause long-term displacement or attraction of species, altering nearby ecosystems. The flow of current through high-voltage cables generates EMF, and although natural levels of EMF occur in the environment, some species can be significantly affected by increases in these fields. Bilinski (2021) states that EMF impacts from HVDC on finfish are minor or short term, specifically for species that are known to sense EMF more acutely than pelagic fish species, such as elasmobranchs and benthic species. To date, the effects of EMF on invertebrate species have not been extensively studied, and studies of the effects of EMF have mostly been limited to commercially important species, such as lobster and crab (e.g., Love et al. 2017, Hutchison et al. 2020). Understanding the effects of EMF to each life stage is important. Egg volume and larvae size were shown to be depressed and deformities more prevalent in the European lobster (*Homarus Gammarus*) and edible crab (*Cancer pagurus*) after steady exposure to 2.8 millitesla (Harsanyi et al. 2022). However, impacts of EMF resulting from high-voltage cables or multiple high-voltage cables have not been well-studied in estuarine environments. Marine organisms may not exhibit behavioral or distributional changes as a result of single cables, but the cumulative effects of multiple high-voltage cables are also unknown. EMF are expected to be minor, but more research is necessary in environments specific to nearshore New York State waters. Similarly, the interaction of the static field associated with the DC current flowing in an HVDC cable and the earth's magnetic field may impact magneto-sensitive marine species; however, more research on this topic is needed to determine the effect, if any, that magnetic fields have on these species.

High-voltage cables release thermal energy into the surrounding environment. Available literature contains limited data on the potential temperature increase on and around the cables, whether or not they are buried. Factors that affect residual heat from buried OSW cables at the seabed surface (i.e., remaining heat not dissipated in the sediment) consist of burial depth, sediment characteristics, cable type, and power transmission parameters. Various marine organisms react sensitively to an even minor increase in ambient temperature; although, field studies on heat-related impacts of operational submarine cables appear to be lacking (Taormina et al. 2018).

The minimization and mitigation measures shown in Table 27 include time-of-year restrictions, appropriate burial depth and cable shielding, appropriate installation methods for the specific environments, BMPs for vessel operations, and minimizing bottom disturbance and associated sedimentation to the extent possible. Minimization and mitigation measures for impacts to aquatic biological resources and sensitive habitats from operation and maintenance of OSW cables include BMPs for vessel operations and monitoring studies to document the recovery or changes in species distribution or behavior. After the cable design incorporates all avoidance measures to the maximum extent practicable, the minimization and mitigation measures address many of the potential impacts discussed. However, given the uniqueness and extent of aquatic and biological resources present in most zones, siting of OSW cables requires additional minimization and mitigation measures appropriate for specific routes.

3.2.5 Sediment Contamination, Ocean Disposal Sites, and UXO

3.2.5.1 Existing Conditions

Sediment-related characteristics include sediment contamination, ocean disposal sites, and UXO. No zones in the Long Island Sound Approach Area rank high for these characteristics. Zones L-1 Block Island Sound, L-5 Westernmost Long Island Sound, L-6 East River, L-9 Oyster Bay to Hempstead Harbor, and Subzone L-2c Eastern Plum Island Crossing rank medium, and the remaining zones rank low. Basin-wide GIS layers with sediment contamination data were not identified in the Approach

Area; therefore, this analysis uses published literature. Zones L-5 and L-6 contain areas with contaminated sediment from domestic and industrial wastewater flows, fertilizer releases, and urban runoff from dense development and legacy industrial sites surrounding the areas (Varekamp et al. 2014; Adams et al. 1998; USACE 2015a and references therein). Contaminants include PCBs and Polycyclic Aromatic Hydrocarbons (PAHs). Some of the bays and harbors north and east of the Town of Oyster Bay located in Zone L-9 also contain contaminated sediments with similar compounds. Farther eastward along the shores of Long Island Sound, the occurrence of contaminated sediment is generally lower, although some coastal harbors may also have contamination in their sediments, such as Port Jefferson (USACE 2015a). In Zone L-2c, Plum Island is reported to contain contaminants resulting from its previous use by the Plum Island Animal Disease Center, but the extent of contamination on the island is unknown (Greater Long Island 2018). UXO may be present in Zone L-1, as discussed below.

There are almost no active dredged material disposal areas within the Long Island Sound Approach Area. Two of the active dredged material disposal sites in Long Island Sound are in Connecticut water; the third site, the Western Long Island Sound Disposal Site, is located mostly in Connecticut waters and to a small extent (approximately 25 acres, or 1.5 percent of the site) in New York State waters (see Figure 24, Figure 26, Figure 28, and Figure 30). The Oceanic Society (1982) listed two historical dredged material disposal sites within Zone L-3: the Port Jefferson site, active between 1956 and 1969 with a total of 228,600 cubic yards disposed, and the nearby Smithtown site, for which there are no data on active years and disposed amount of sediment.

Two parcels are part of the Fort H G Wright FUDS Property located north of Zones L-1 and L-2. One parcel is located west of Fishers Island, and the other is located southeast of Fishers Island. FUDS are properties that may contain environmental contamination or military munitions resulting from past Department of Defense-related activities (Atilano 2021b). The eastern parcel overlaps with Zone L-1. Additionally, there is one parcel associated with the Fort Michie FUDS Property, Michie Batters–Water Anchorage, located north of Zones L-1 and L-3 (Atilano 2021c).

The approved 2018 list of 303(d) impaired waters for New York identifies central Long Island Sound as impaired, as well as a portion of the sound in Nassau County (NYSDEC 2020). Additionally, Hempstead Harbor and Manhasset Bay and their tidal tributaries, as well as Little Neck Bay, are listed as impaired.

3.2.5.2 Impacts and Avoidance, Minimization, and Mitigation Measures

In general, installation of the cable disturbs the seabed and results in suspension of sediment into the water column as described in Section 3.1.5.2: Impacts and Avoidance, Minimization, and Mitigation Measures. The amount of sediment suspended depends on factors such as the installation tool(s) used, sediment type, and bottom currents.

In Zones L-5, L-6, and L-9, installation of cables may cause water quality or sediment quality impacts. During cable route planning and surveying, sediments in these zones should be analyzed to the depth of cable installation to understand the level of contamination present to assist in selecting the appropriate installation approach and cable route to avoid or minimize impacts. The analysis may include contaminant modeling to determine if potentially mobilized contaminants exceed New York Class C thresholds and New York State water quality standards. Additionally, special installation techniques and material disposal practices may be required in areas with elevated contaminants. Where decommissioning of OSW cables includes removal, impacts similar to installation will occur.

Table 27 summarizes minimization measures relevant to sediment-related characteristics. The extent of legacy contamination in Subzone L-2c Eastern Plum Island Crossing is unknown; however, given the aquatic and biological resources present, crossing in this subzone is unlikely without additional minimization and mitigation measures.

3.2.6 Marine Archaeology and Cultural Resources

3.2.6.1 Existing Conditions

Marine archaeology and cultural resources include wrecks and obstructions from the NOAA AWOIS database, National Historic Landmarks, NRHP properties, New York State parks, historic sites, and heritage areas analyzed with GIS data. Zone L-5 ranks high and six zones rank medium for marine archaeology and cultural resources. The NOAA AWOIS (NOAA Fisheries 2022) positively identified wrecks include the following:

- Unnamed Tugboat, AWOIS wreck 14079.
- Possibly the tugboat *Barataria* or the tugboat *Thames*, AWOIS wreck 1813.
- Lobster boat *H.G. Smith*, AWOIS wreck 7698.
- Possibly the *Lexington*, listed as AWOIS wreck 7555. The wreck is metal hulled vessel over 170 years old. Cursory research on this vessel shows that it was an early nineteenth century steam paddlewheel vessel built in 1835 and sunk in a tragic fire on January 13, 1840.
- *Thomas Tomlinson*, a cargo vessel, sunk August 3, 1942, a barge that foundered and sank off Execution Rocks Light Station. Listed as AWOIS wreck 1760.
- *Howard Danley*, a barge that sunk during hurricane Gloria in mid-September, early October 1984, listed as AWOIS wreck 8099.

Wrecks and obstructions are illustrated on Figure 36 through Figure 47.

The vessels and maritime cultural resources are likely representative of the greater trans-Atlantic shipping trade, specifically the shipping trade of the nineteenth and twentieth centuries. This route was well known for shipping between the United States and European countries, as well as for the greater influx of people during the mass immigrations in the late nineteenth century to the early twentieth century. The vessels represent the regional maritime history of working vessels (i.e., tugboats and barges) and possibly recreational vessels, such as sailing craft. These vessel types are associated with the nineteenth to twenty-first centuries.

Montauk Point State Park and the Caumsett State Historic Park Preserve both extend offshore. The Orient Point Light Station is a historic site, as is the lighthouse located on Little Gull Island.

Six federally recognized Indian Nations with areas of interest overlap with the Long Island Sound Approach Area: the Delaware Nation; the Delaware Tribe; Cayuga; Mohican; Shinnecock; Stockbridge-Munsee Community, Wisconsin; and one State-recognized Nation, the Unkechaug (NYSOPRHP 2018). The MARCO data portal also provides approximate historic territories of the Schaghticoke, the Pauguessett, the Pequonnock, the Hammonassets, the Munsee Lenape, the Wappinger, the Mohegan, the Western Nehântick, the Matinecock, the Nissaquogue, the Setalcott, the Corchaug, the Mannasett Nations within the Long Island Sound Approach Area (MARCO n.d.).

3.2.6.2 Impacts and Avoidance, Minimization, and Mitigation Measures

- Impacts during construction and operation could occur from vessels that disturb maritime archaeological resources, such as paleochannels, submerged prehistoric sites, locations with traditional cultural and religious significance to local Native Americans or other groups, and unknown or unlisted maritime archaeological sites as described in Section 3.1.6.2: Impacts and Avoidance, Minimization, and Mitigation Measures. Potential impacts to these resources from the construction of the OSW cables in Long Island Sounds are primarily based on the high percentage of wrecks and the moderate percentage of obstructions located in the area as identified through the NOAA AWOIS database. The high ranking of Zone L-5 indicates that the construction, operation, and maintenance of OSW cables requires siting and installation techniques to minimize impacts to protected marine archaeology and cultural resources appropriate for specific routes. The Cultural Resource Survey Program (CRSP) at New York State Museum (NYSM) should be consulted for any retrieved archaeological resources recovered from State-owned land. The Archaeology Laboratory at CRSP oversees the processing of all artifacts excavated during fieldwork. However, if any archaeological resources are recovered during construction and/or operation activities, consultation with NYSM is required. The Archaeology Laboratory complies with the standards of the NYSM's anthropology department and provides a thorough artifact analysis for CRSP's reports. Other museums or institutions specializing in conservation of maritime archaeological resources may also be consulted for proper curation and documentation procedures based on guidance by NYSM and the NYOPRHP.

Table 28 summarizes minimization and mitigation measures relevant to marine archaeological and cultural resources that effectively address the impacts from OSW cables in the Long Island Sound Approach Area.

Figure 22. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Index Map)

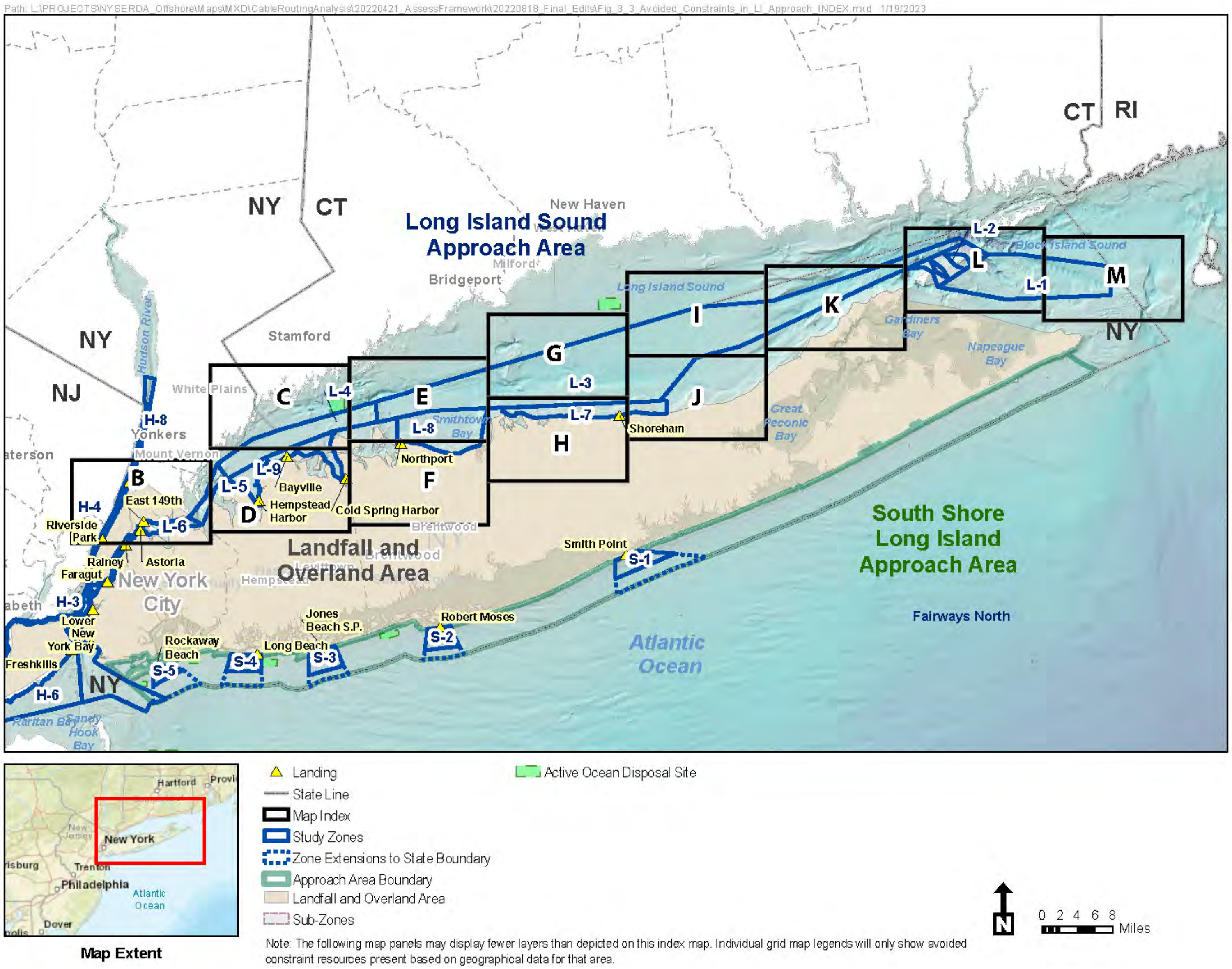


Figure 23. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Map B)

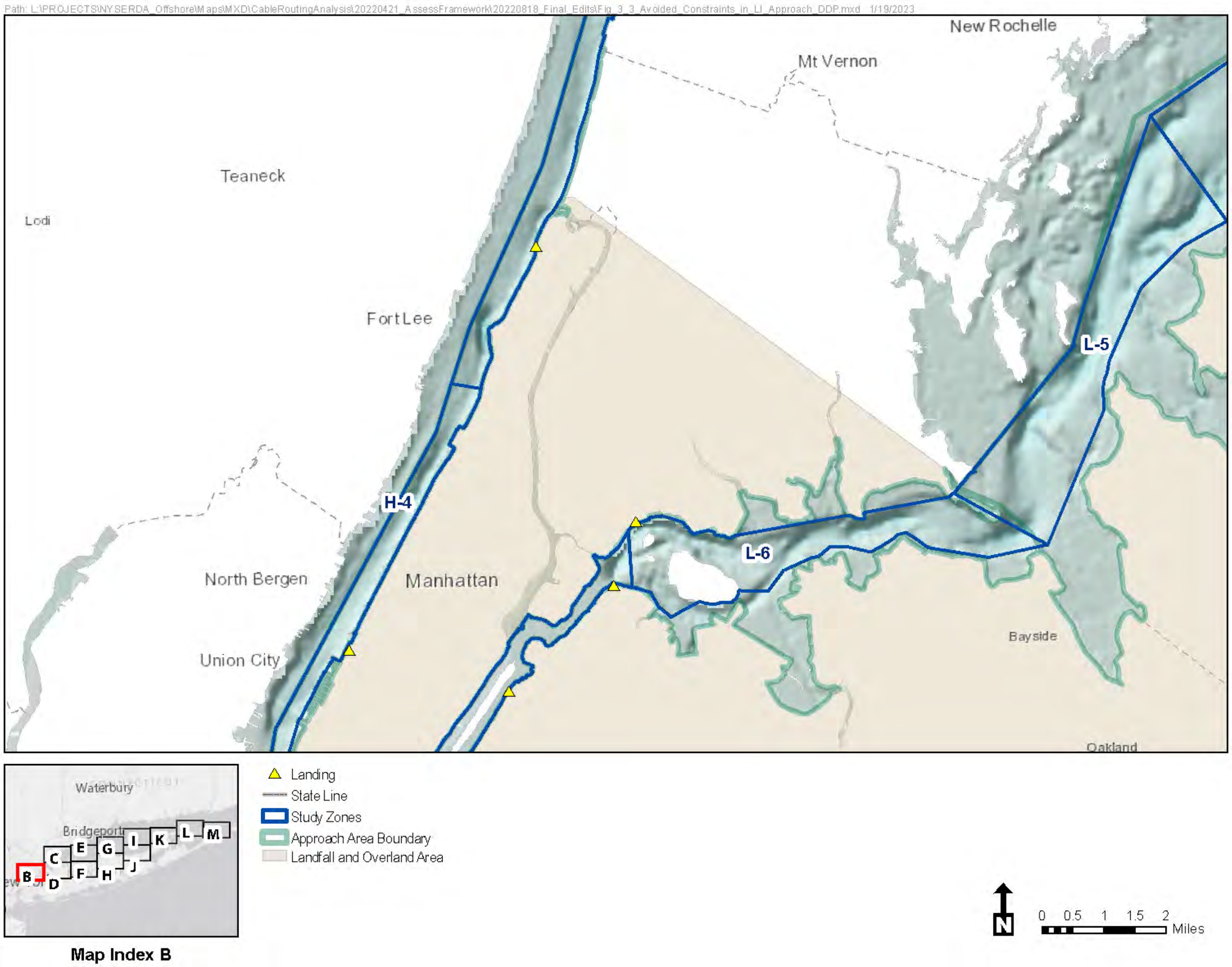


Figure 24. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Map C)

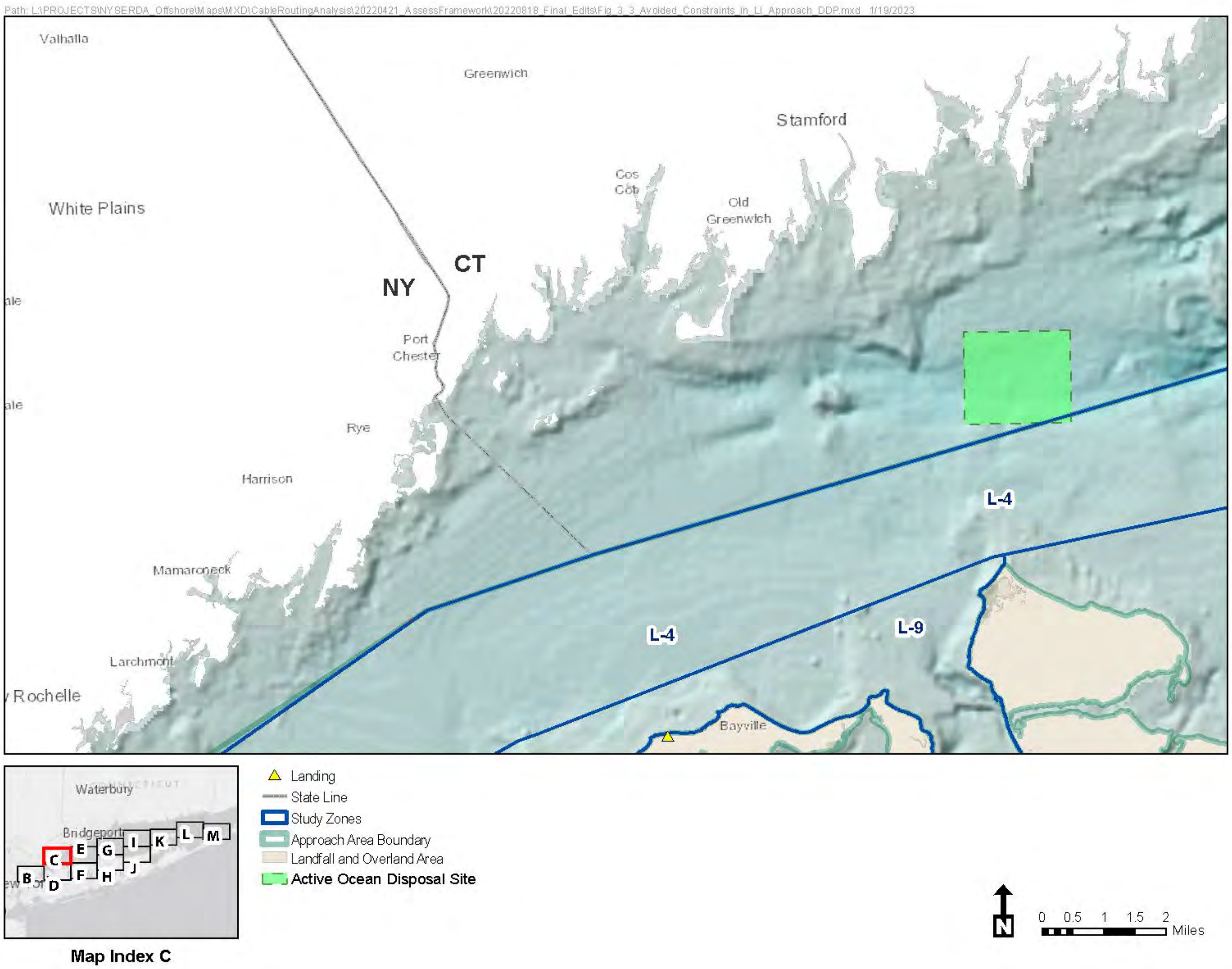
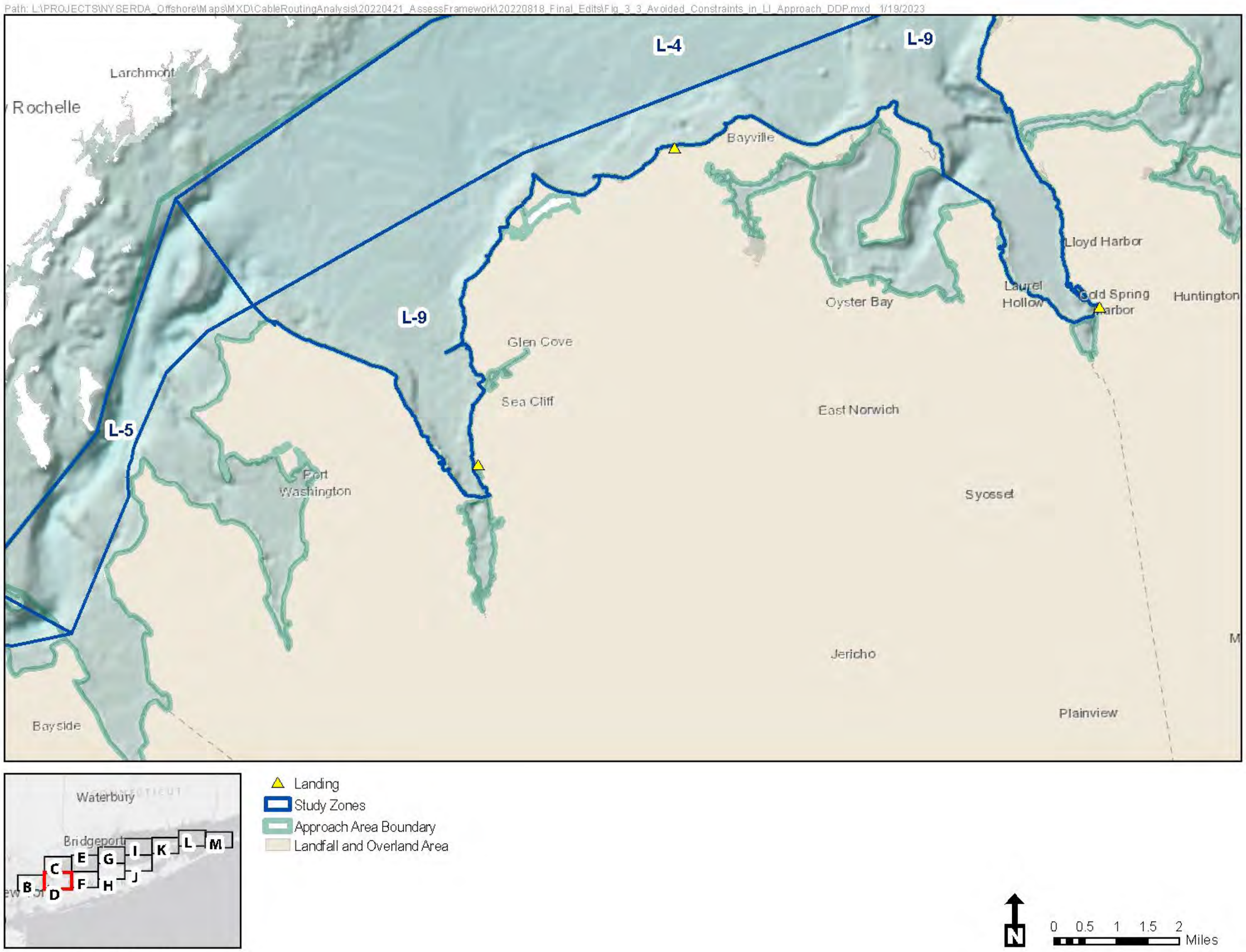


Figure 25. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Map D)



Map Index D

Figure 26. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Map E)

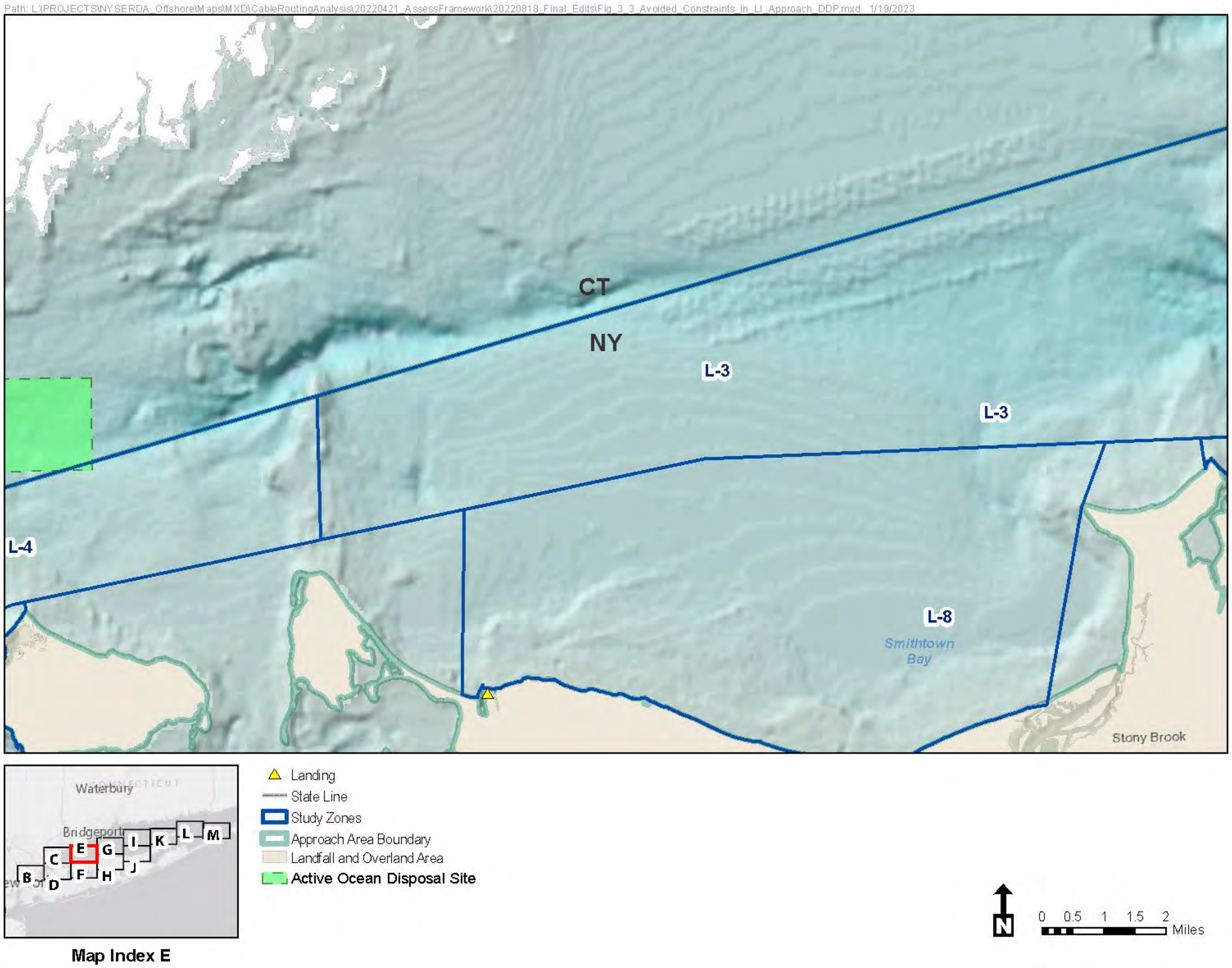


Figure 27. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Map F)

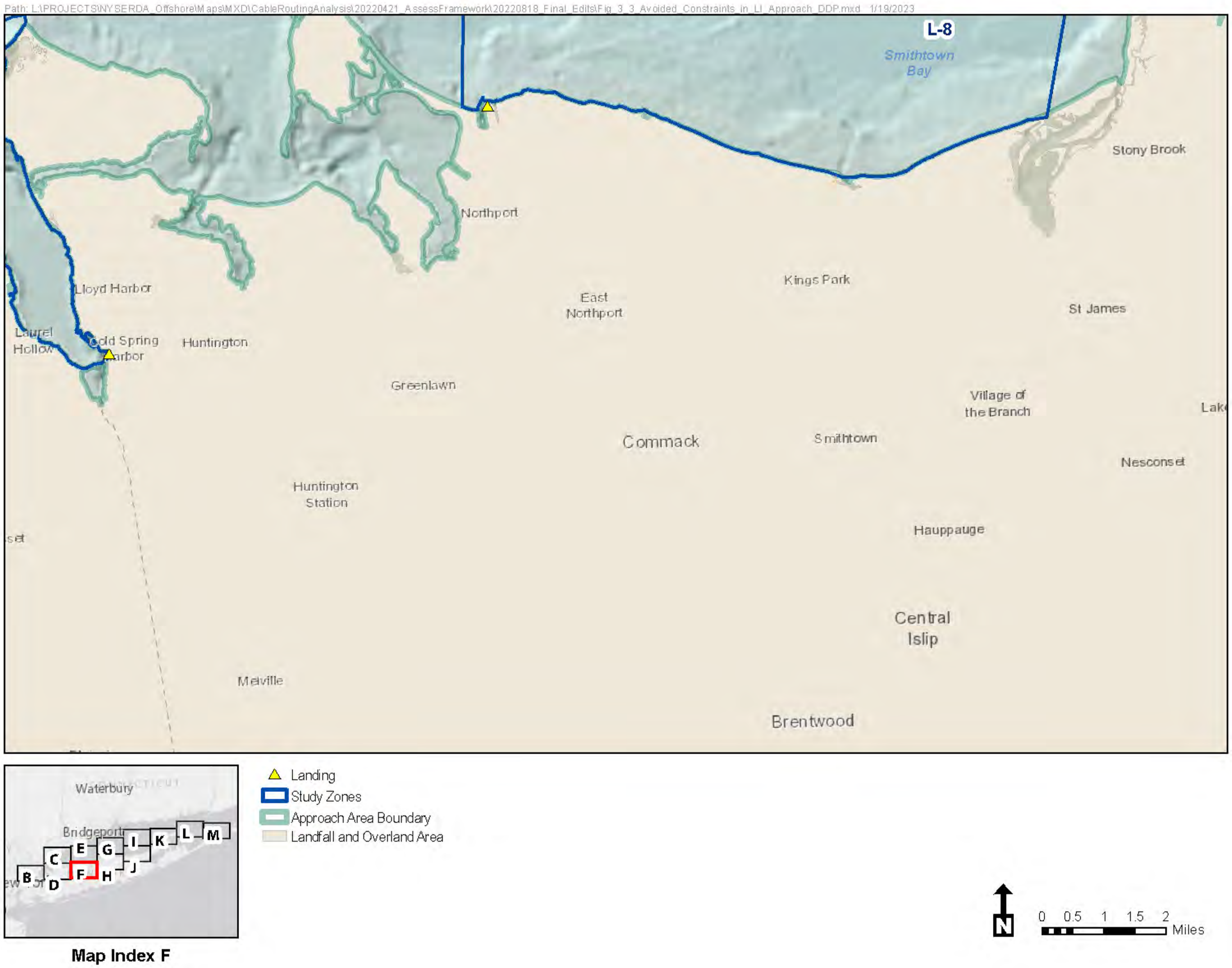


Figure 28. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Map G)

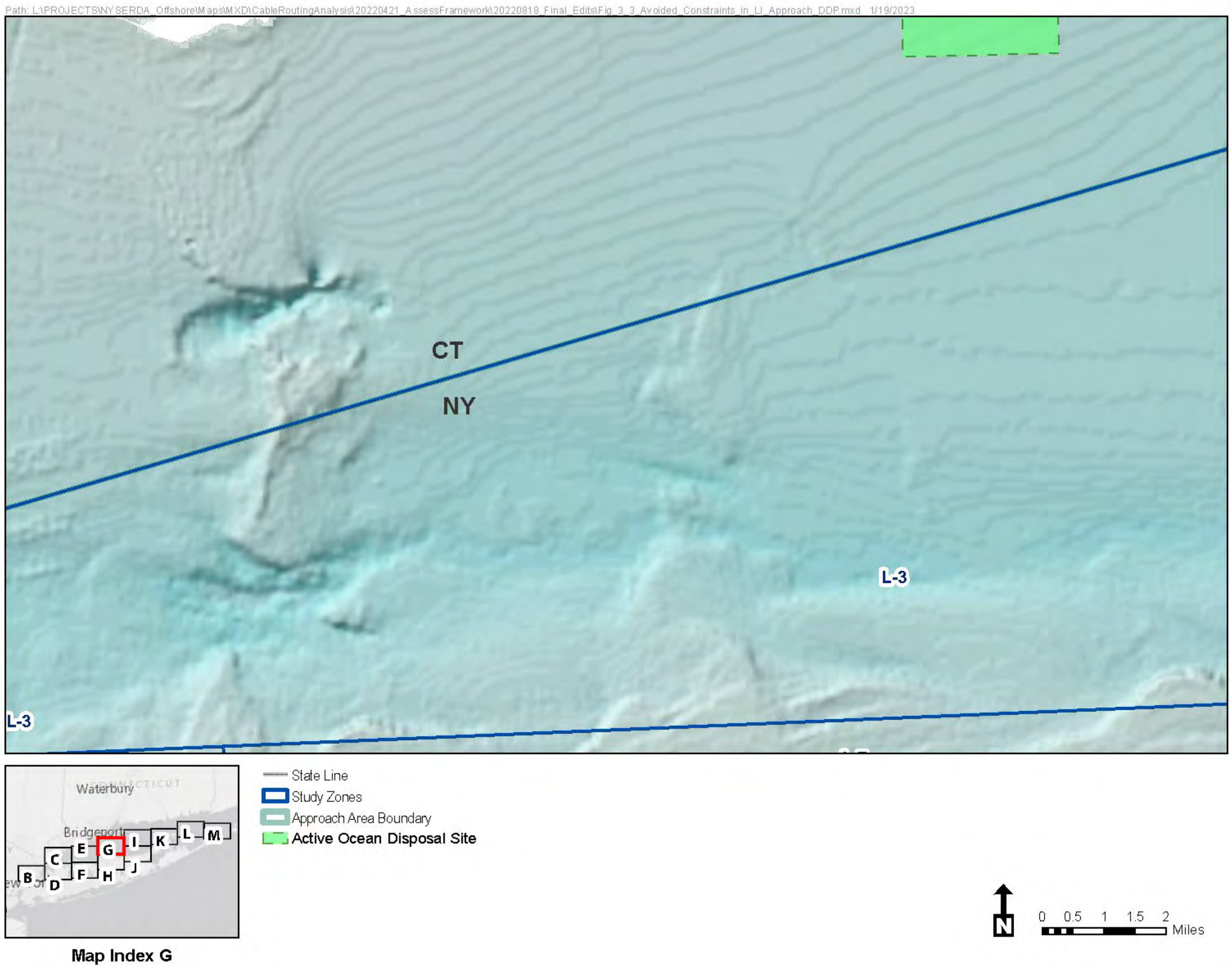


Figure 29. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Map H)

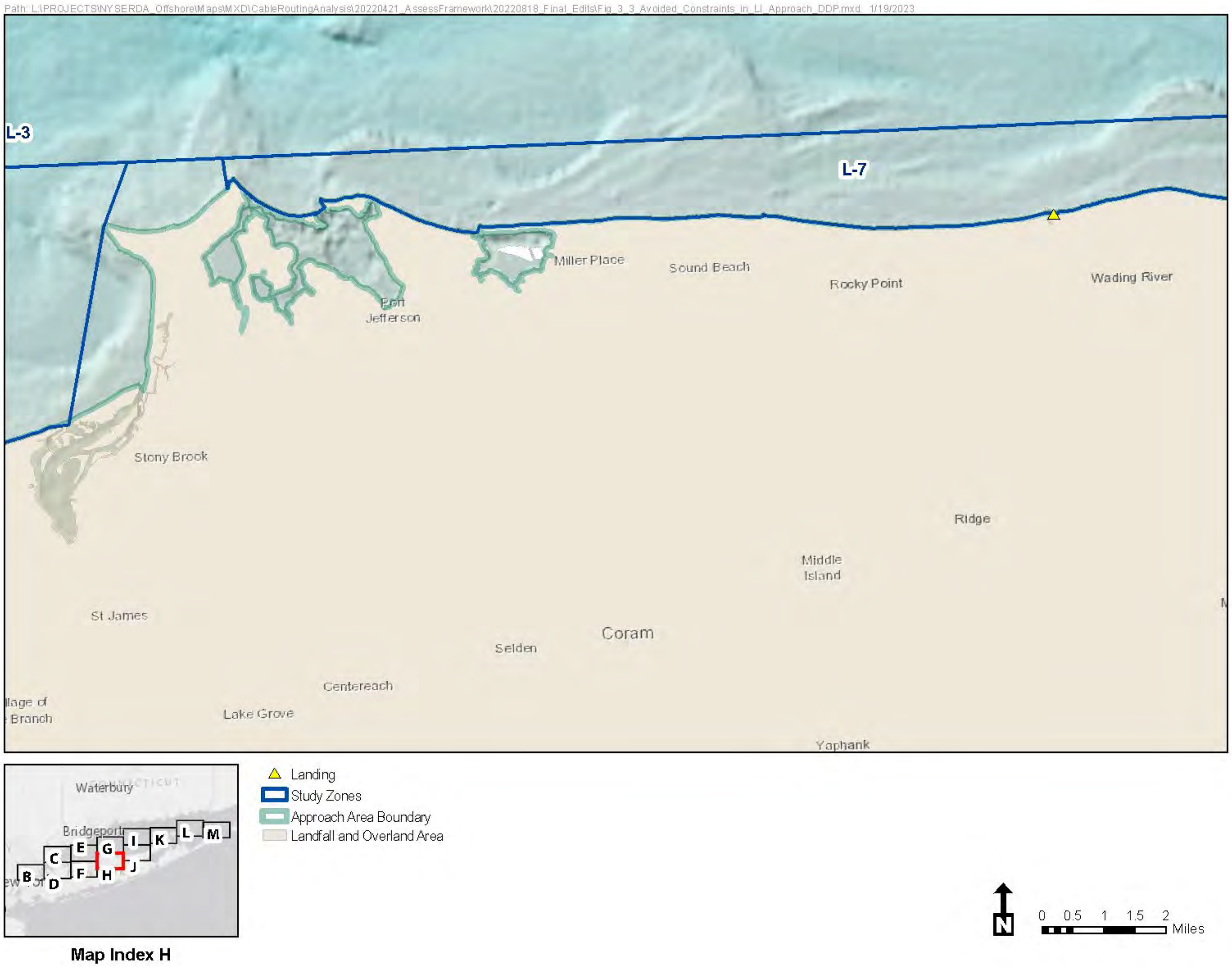


Figure 30. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Map I)

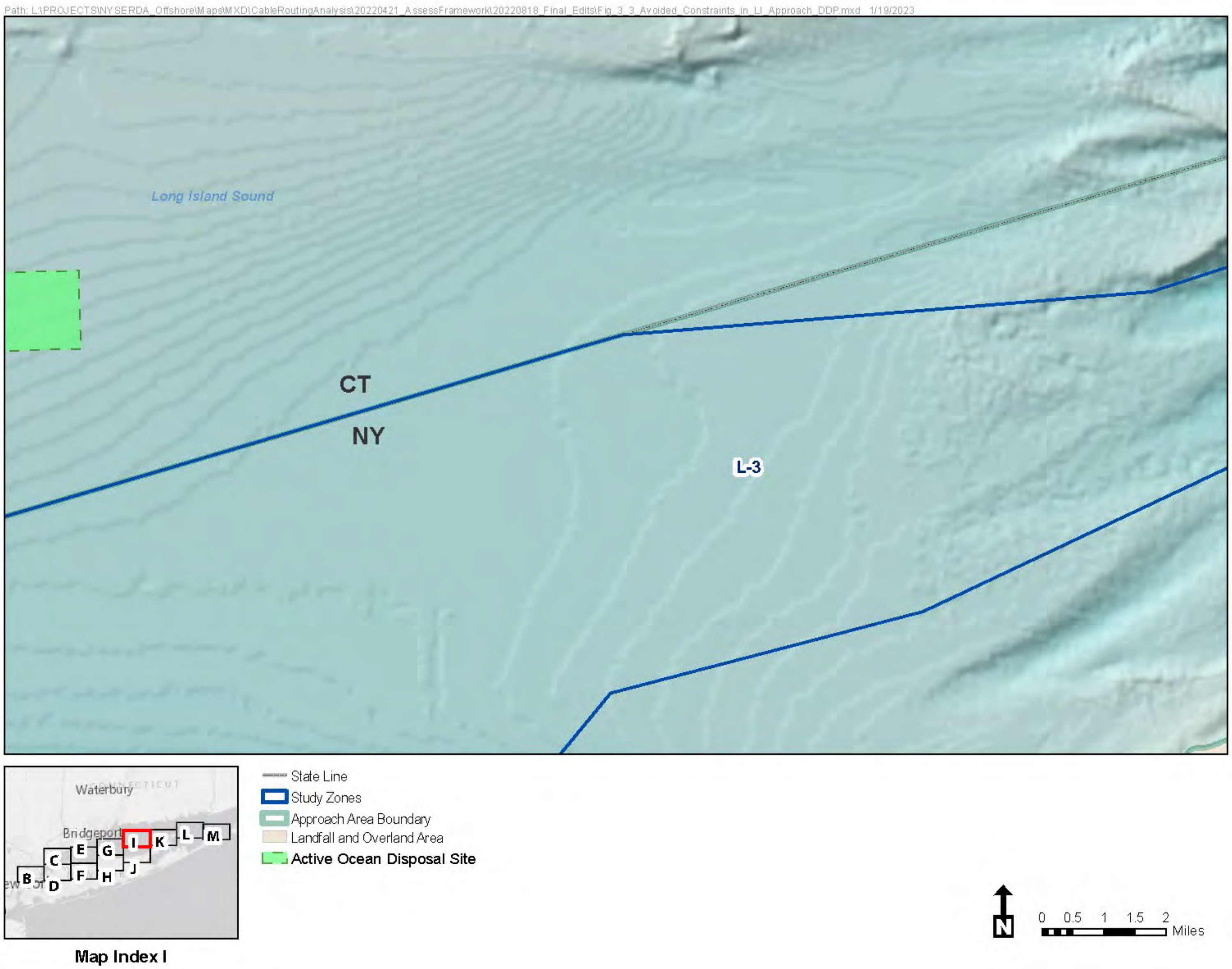
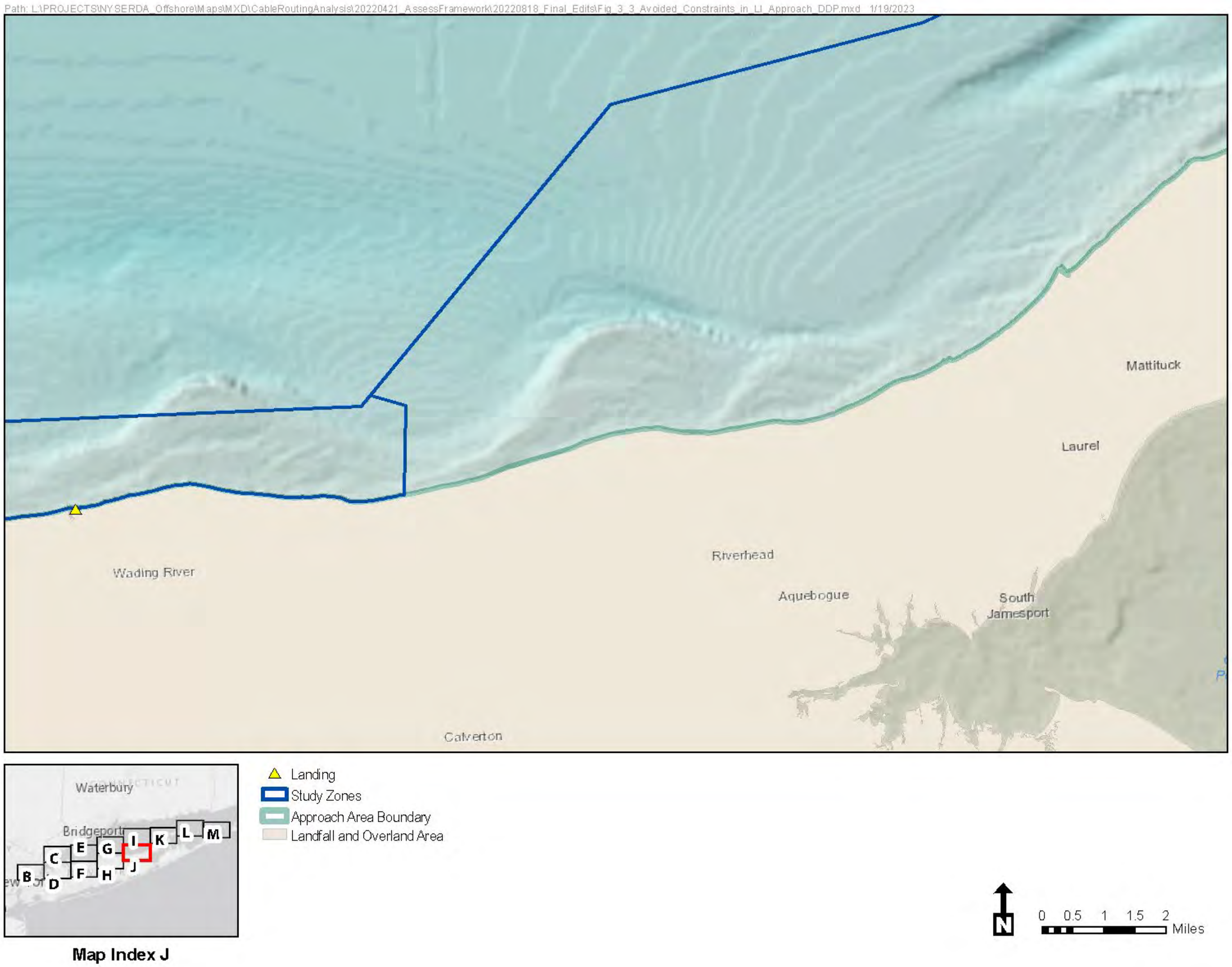


Figure 31. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Map J)



Map Index J

Figure 32. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Map K)

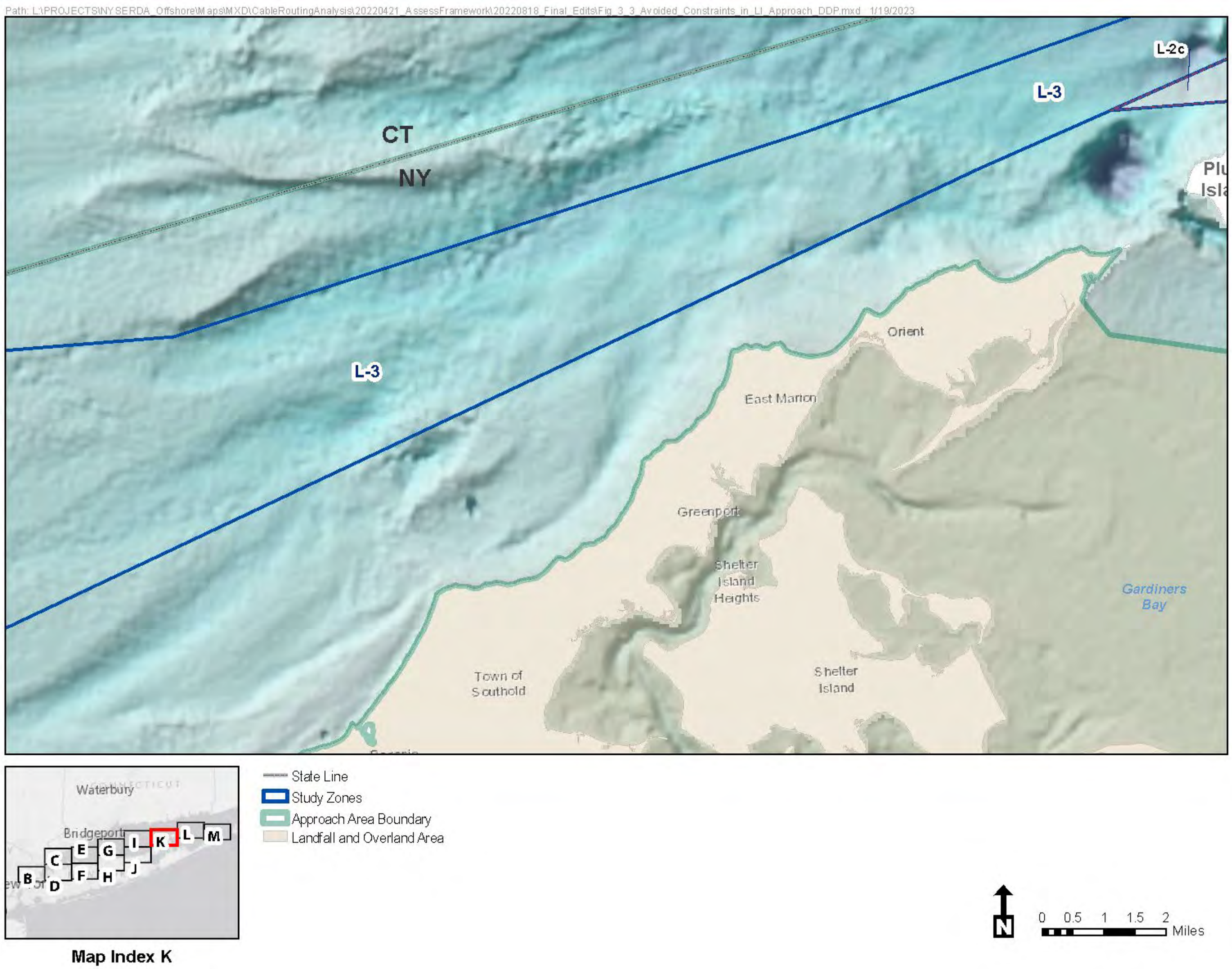


Figure 33. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Map L)

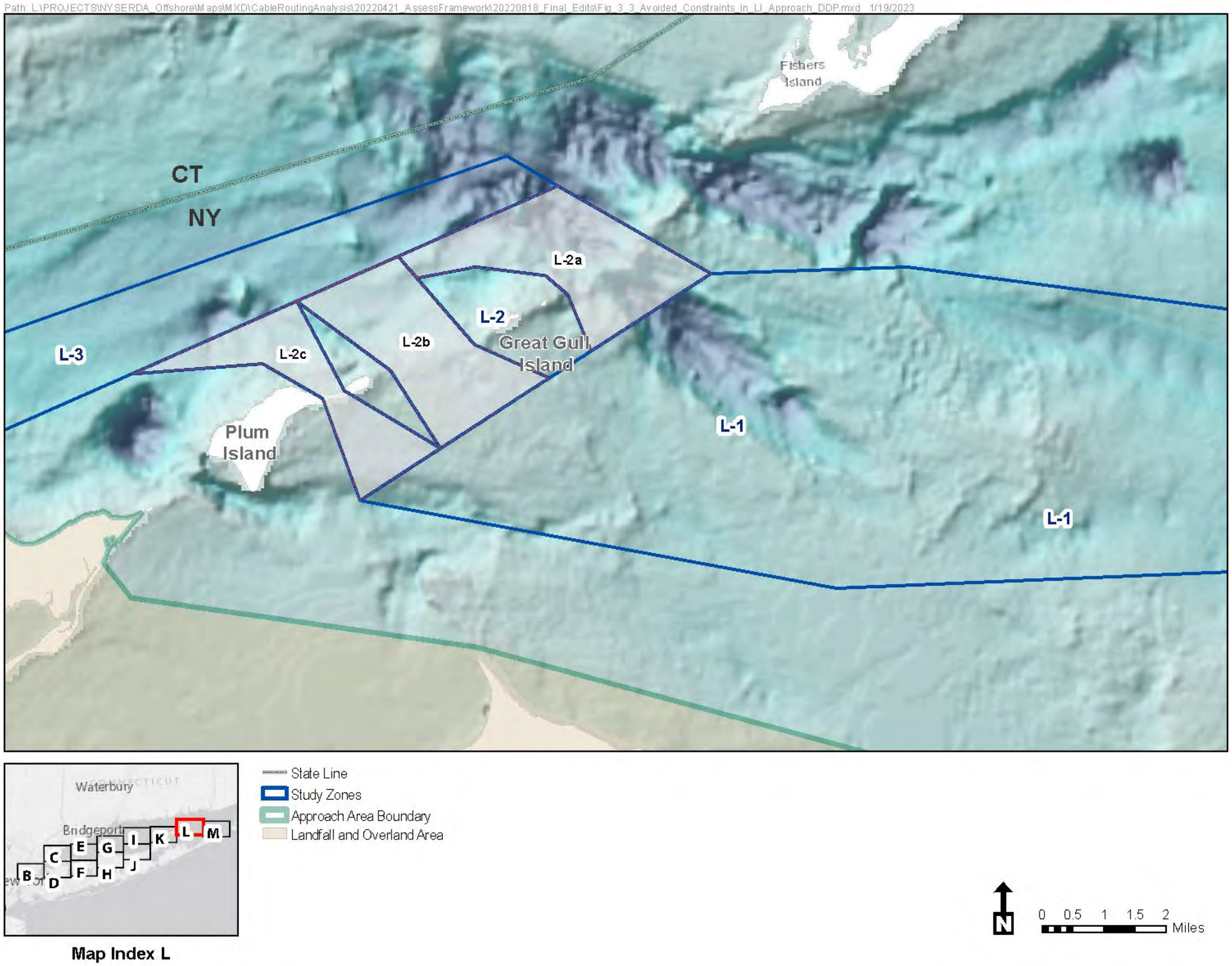


Figure 34. Resources Present and Expected to be Avoided in the Long Island Sound Approach Area (Map M)

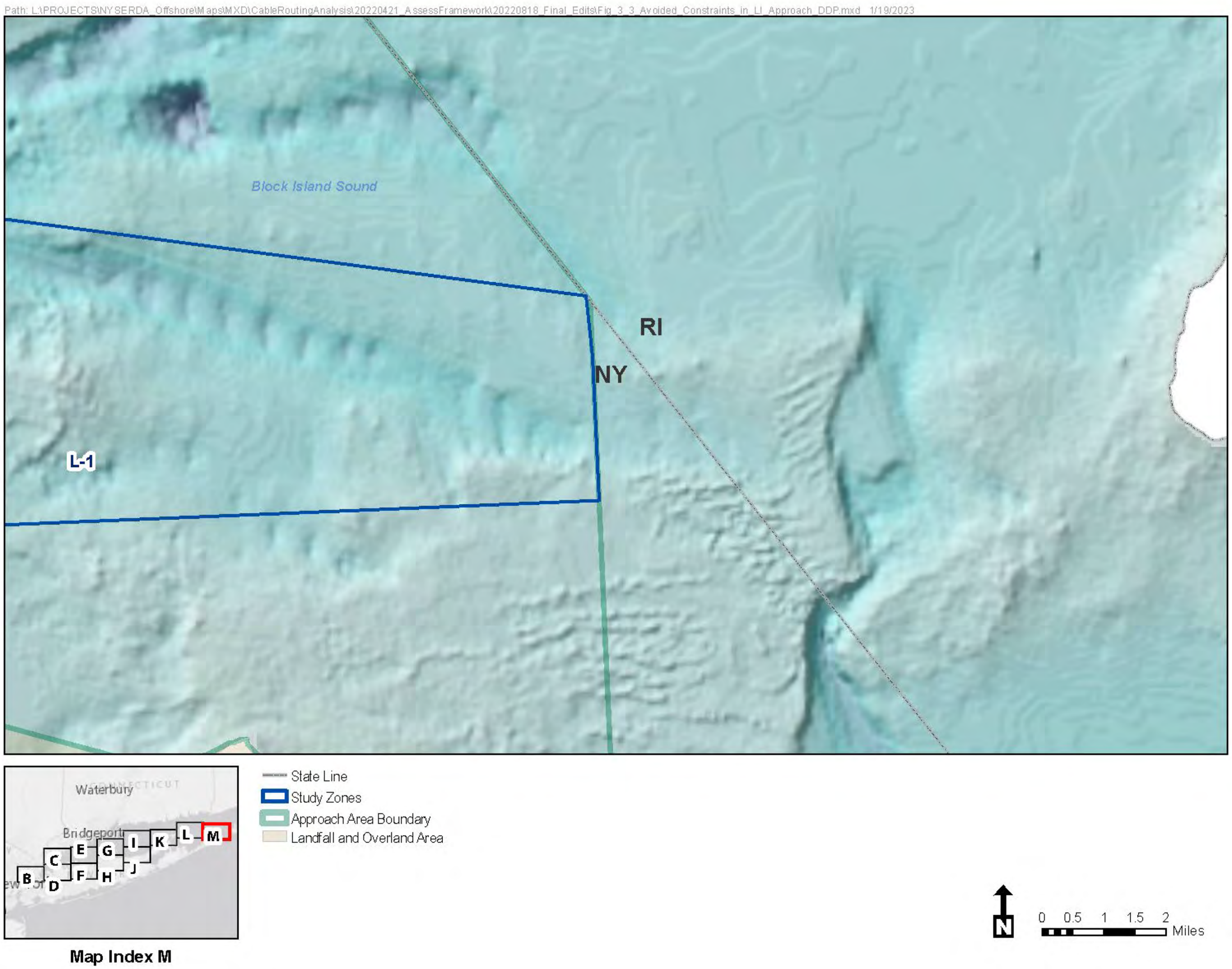
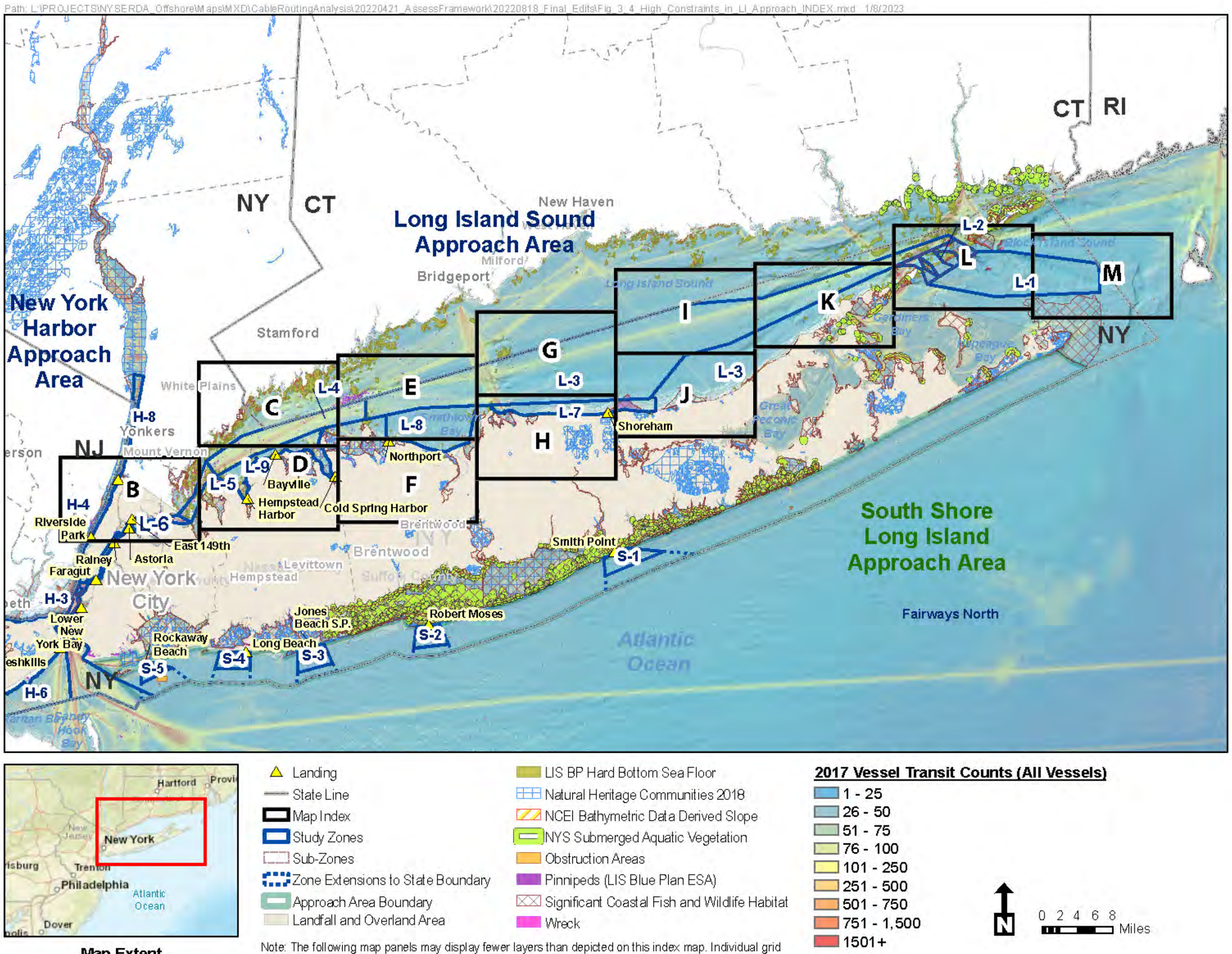


Figure 35. Resources Considered High Constraints within the Long Island Sound Approach Area (Index Map)



Note: The following map panels may display fewer layers than depicted on this index map. Individual grid map legends will only show high constraint resources present based on geographical data for that area.

Figure 36. Resources Considered High Constraints within the Long Island Sound Approach Area (Map B)

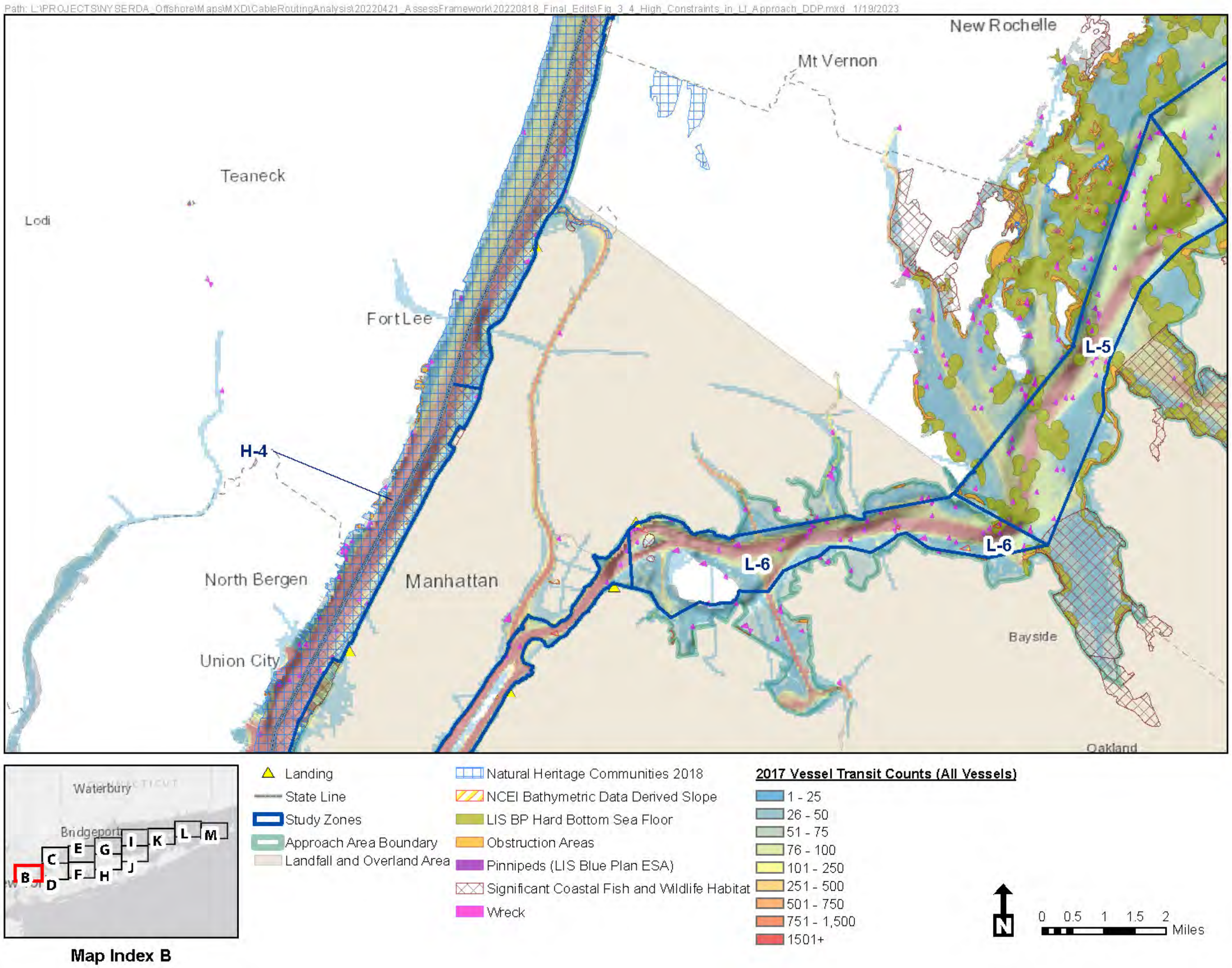


Figure 37. Resources Considered High Constraints within the Long Island Sound Approach Area (Map C)

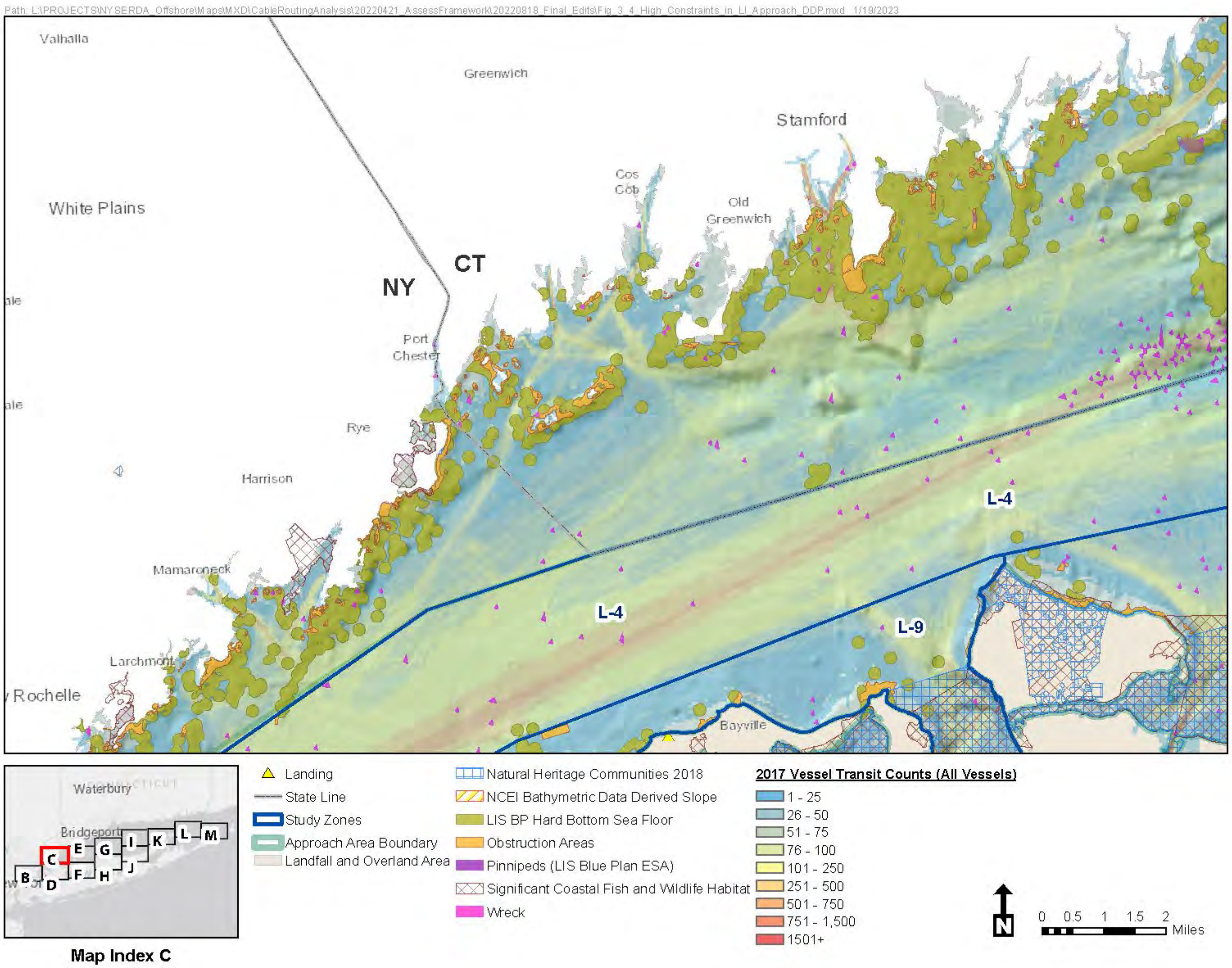


Figure 38. Resources Considered High Constraints within the Long Island Sound Approach Area (Map D)

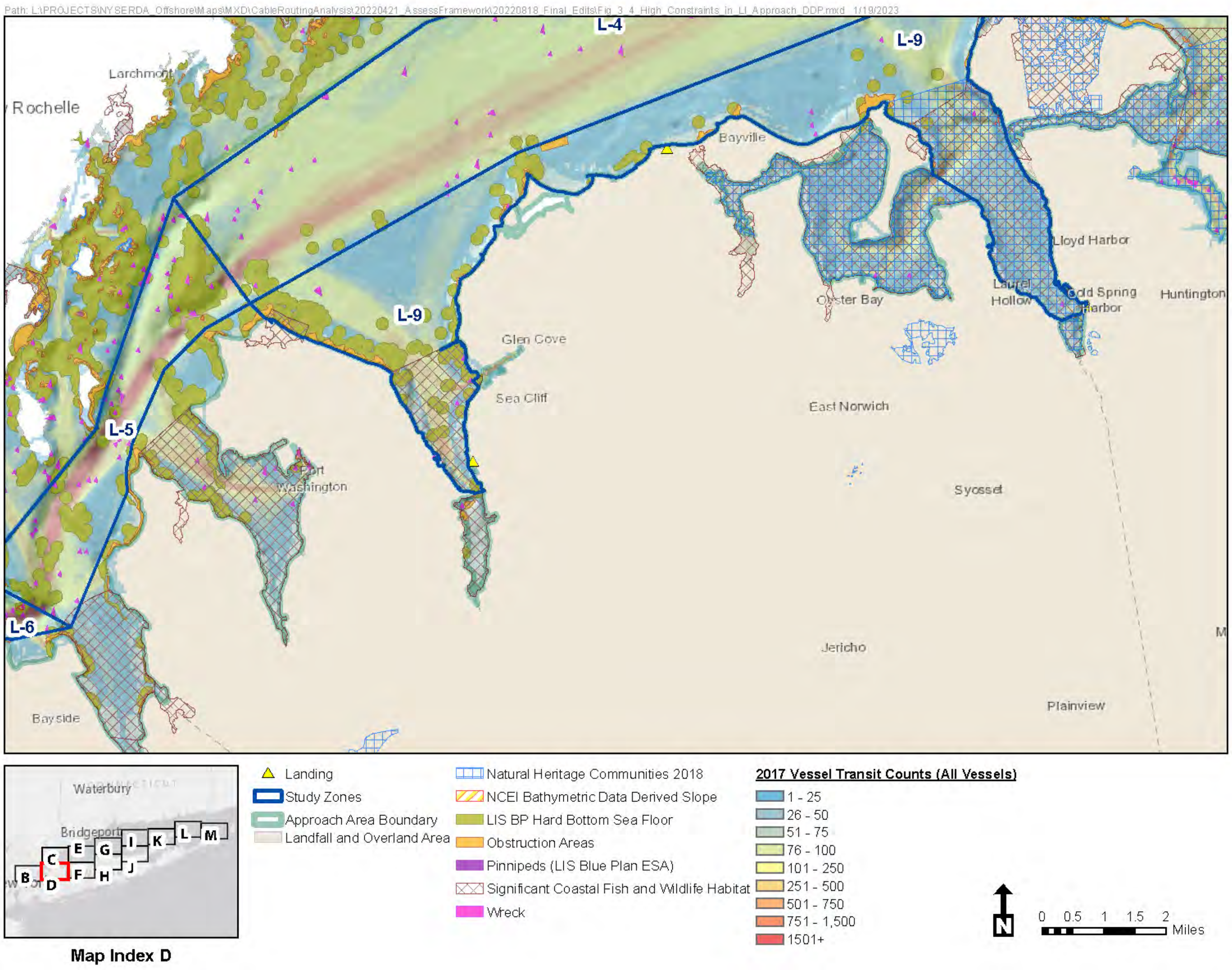


Figure 39. Resources Considered High Constraints within the Long Island Sound Approach Area (Map E)

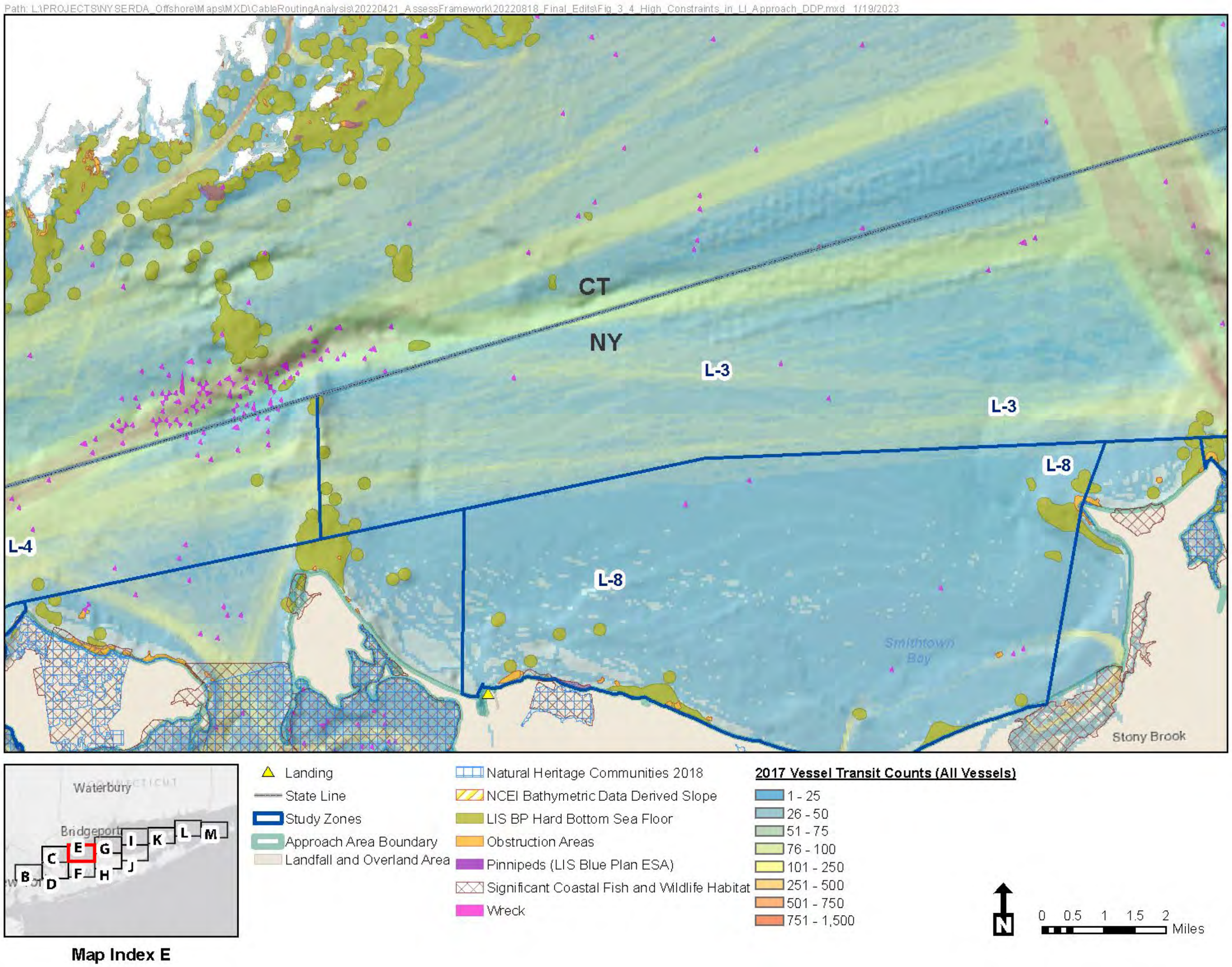


Figure 40. Resources Considered High Constraints within the Long Island Sound Approach Area (Map F)

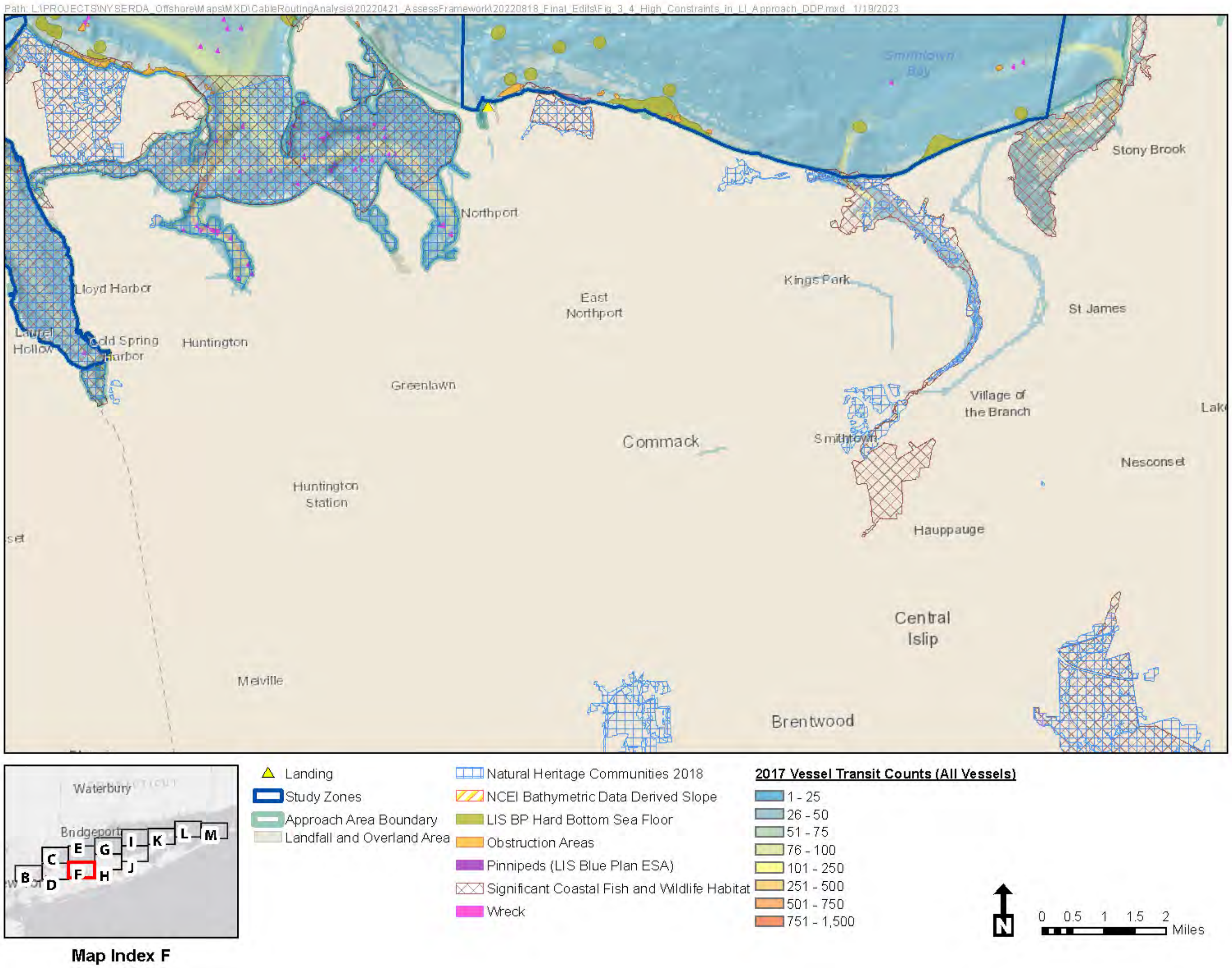


Figure 41. Resources Considered High Constraints within the Long Island Sound Approach Area (Map G)

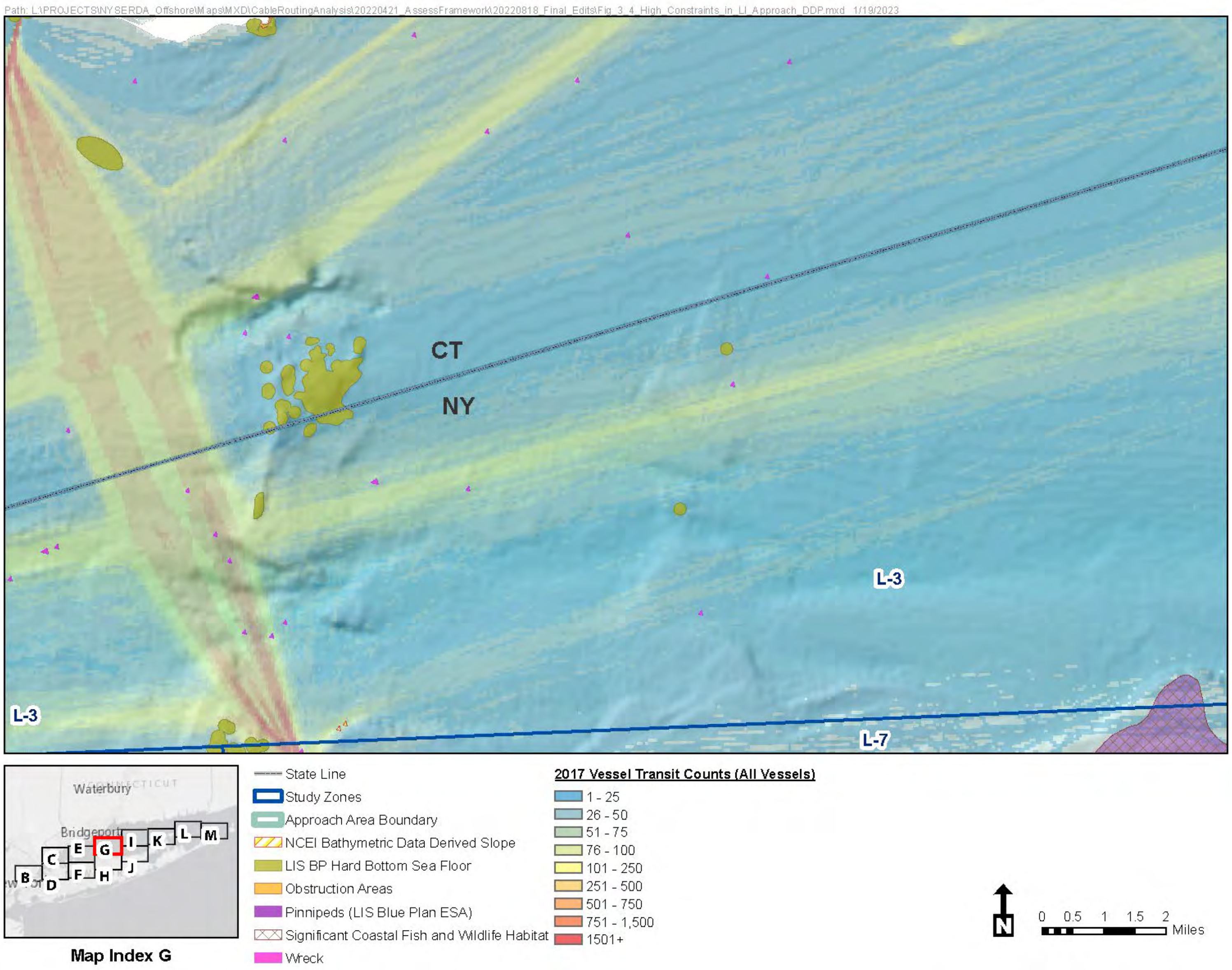


Figure 42. Resources Considered High Constraints within the Long Island Sound Approach Area (Map H)

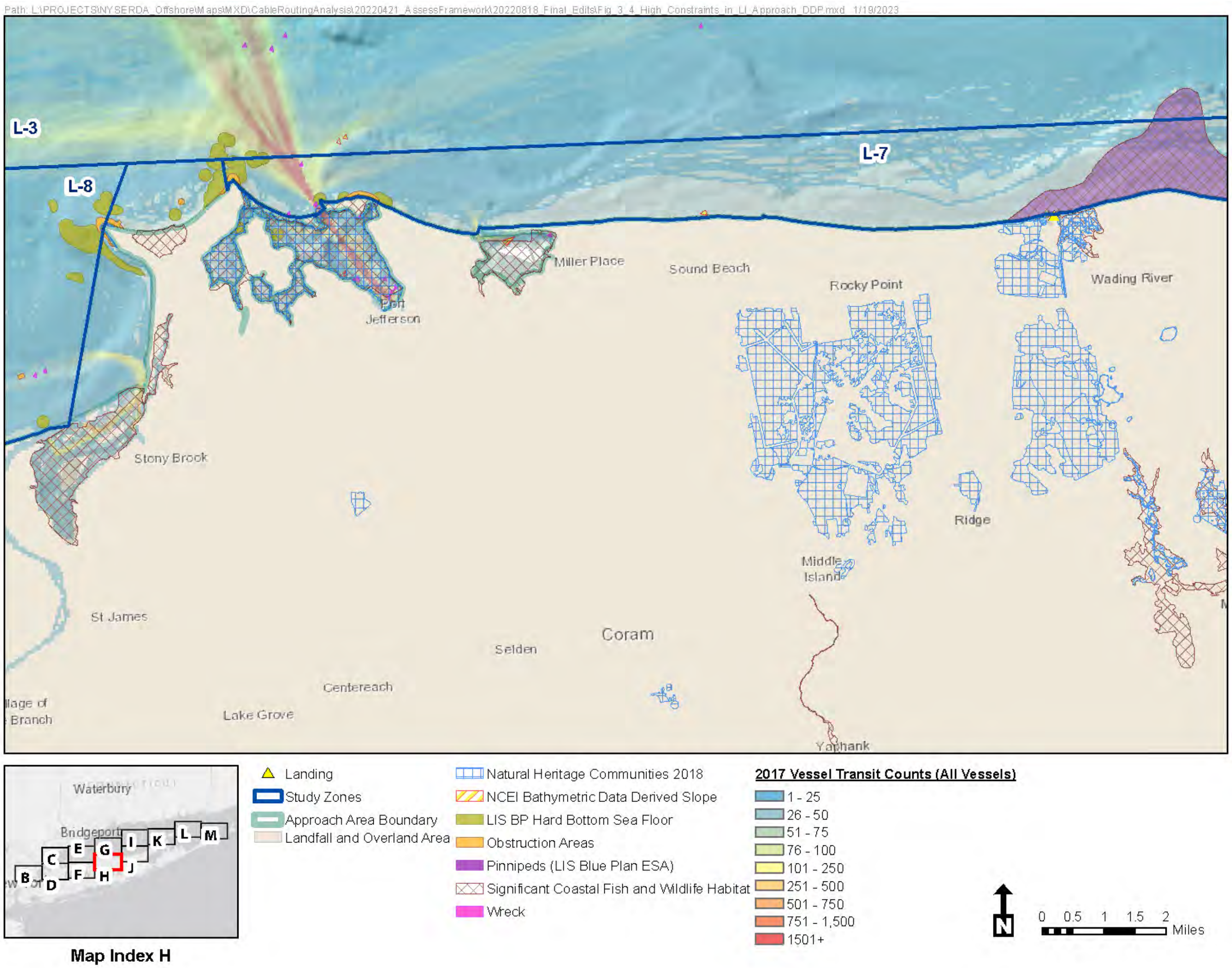


Figure 43. Resources Considered High Constraints within the Long Island Sound Approach Area (Map I)

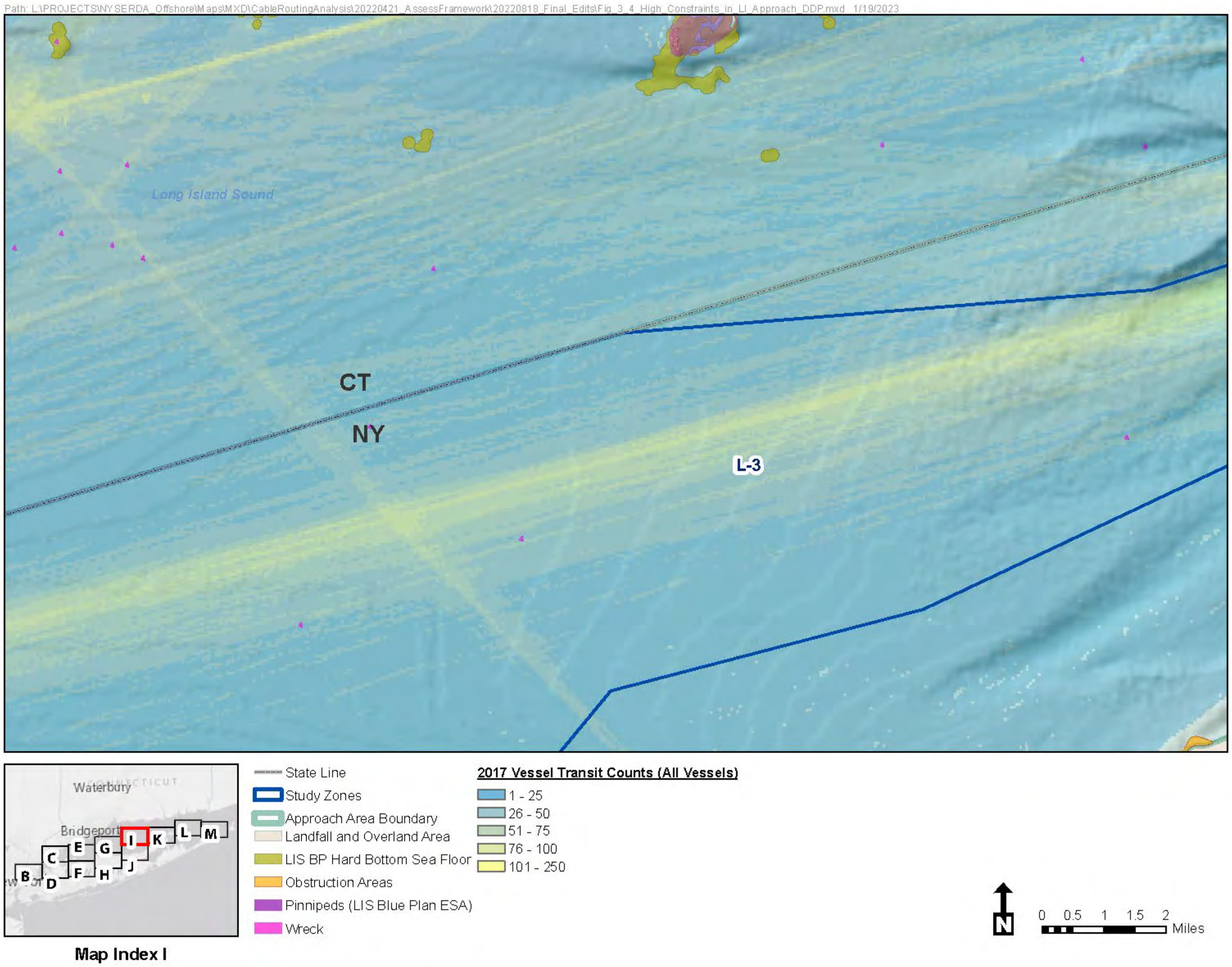
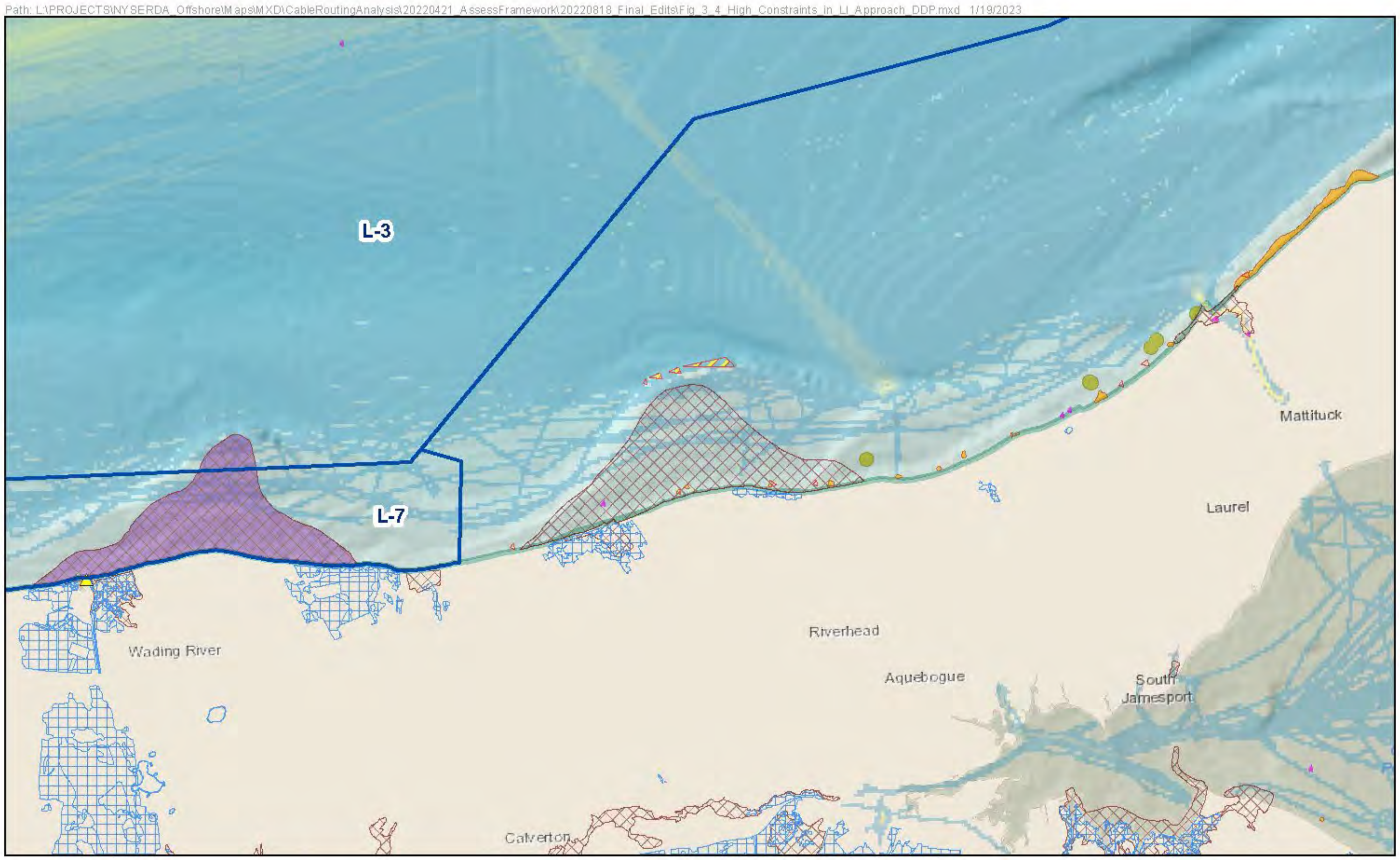
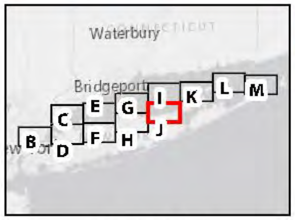


Figure 44. Resources Considered High Constraints within the Long Island Sound Approach Area (Map J)





Map Index J

Figure 45. Resources Considered High Constraints within the Long Island Sound Approach Area (Map K)

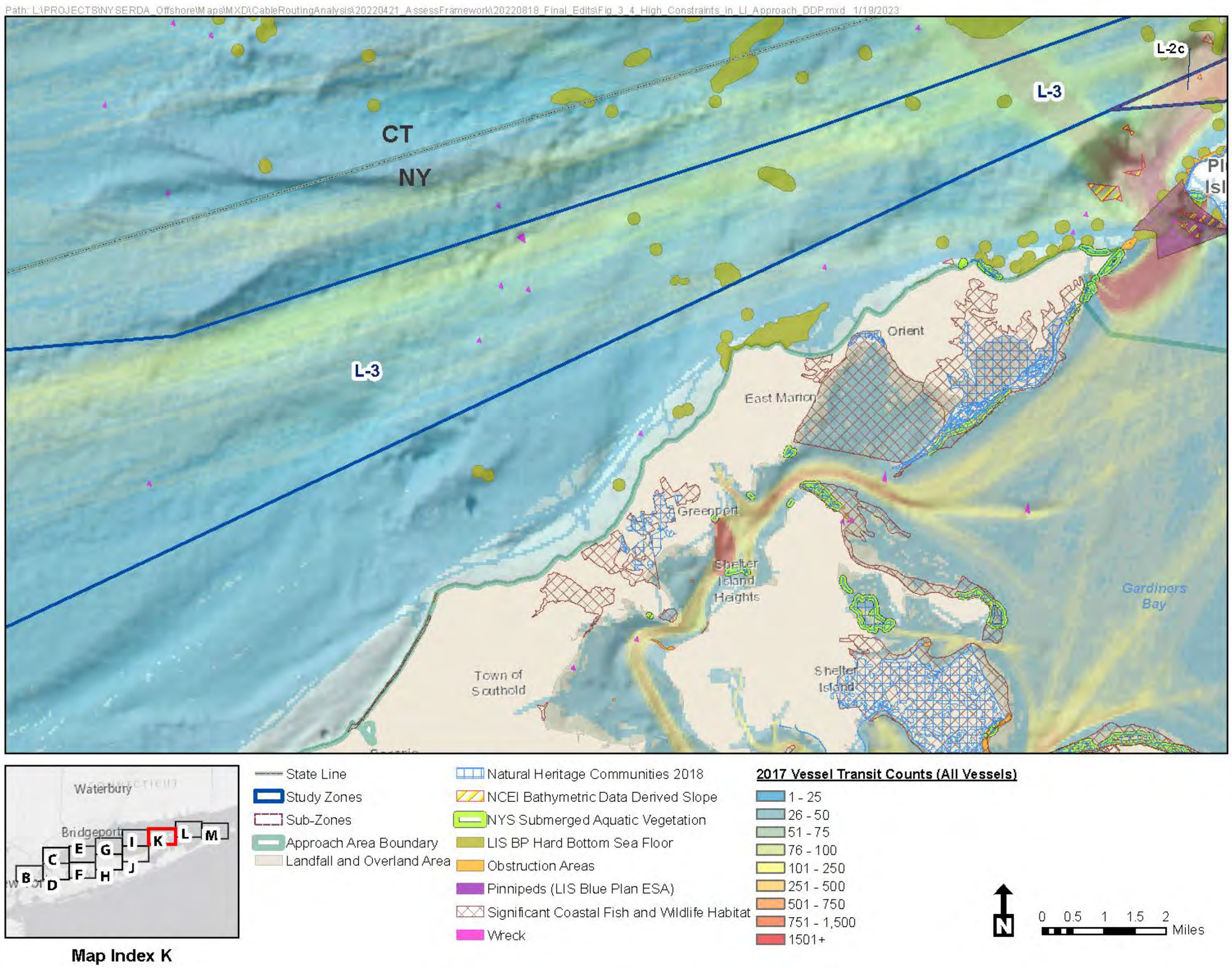
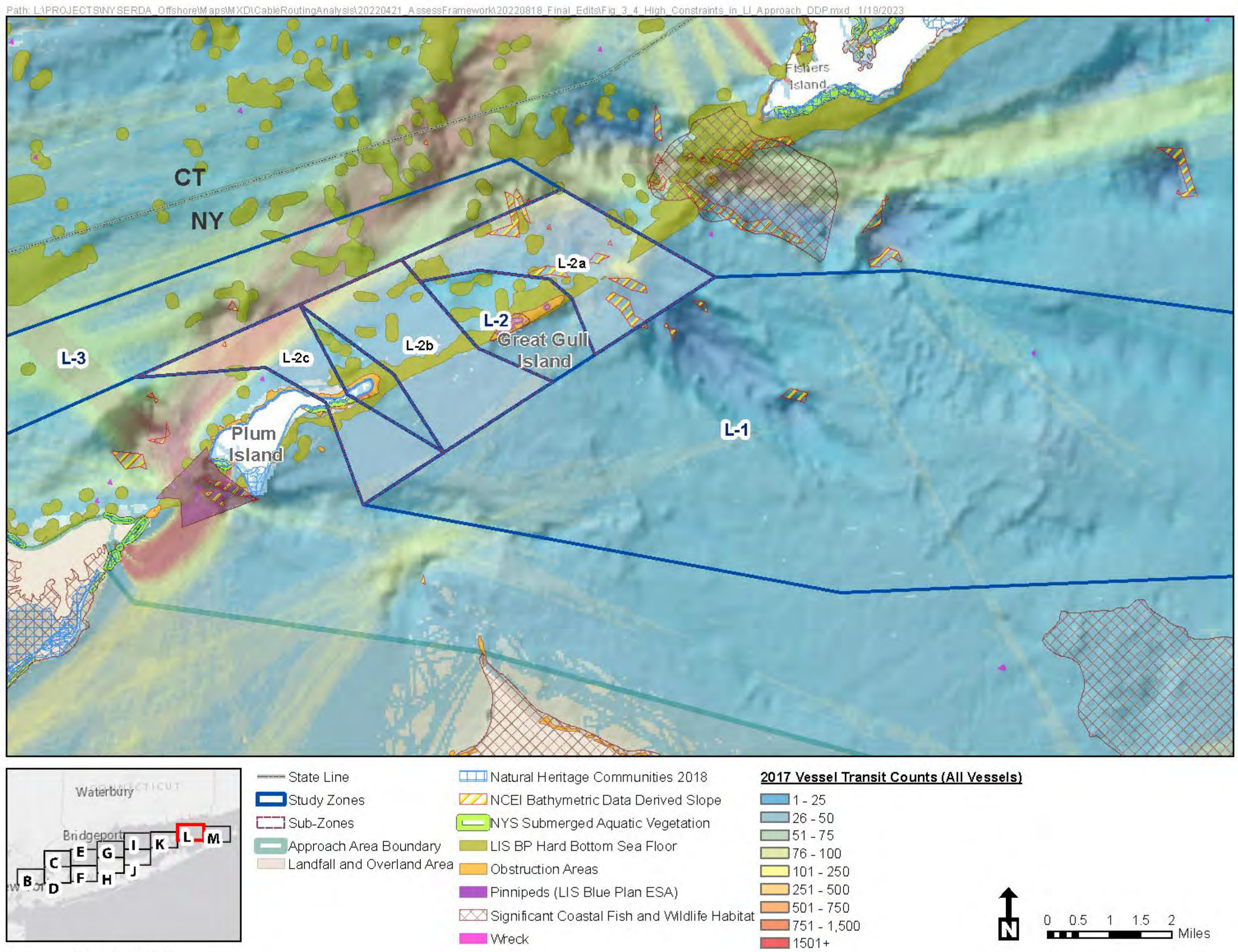
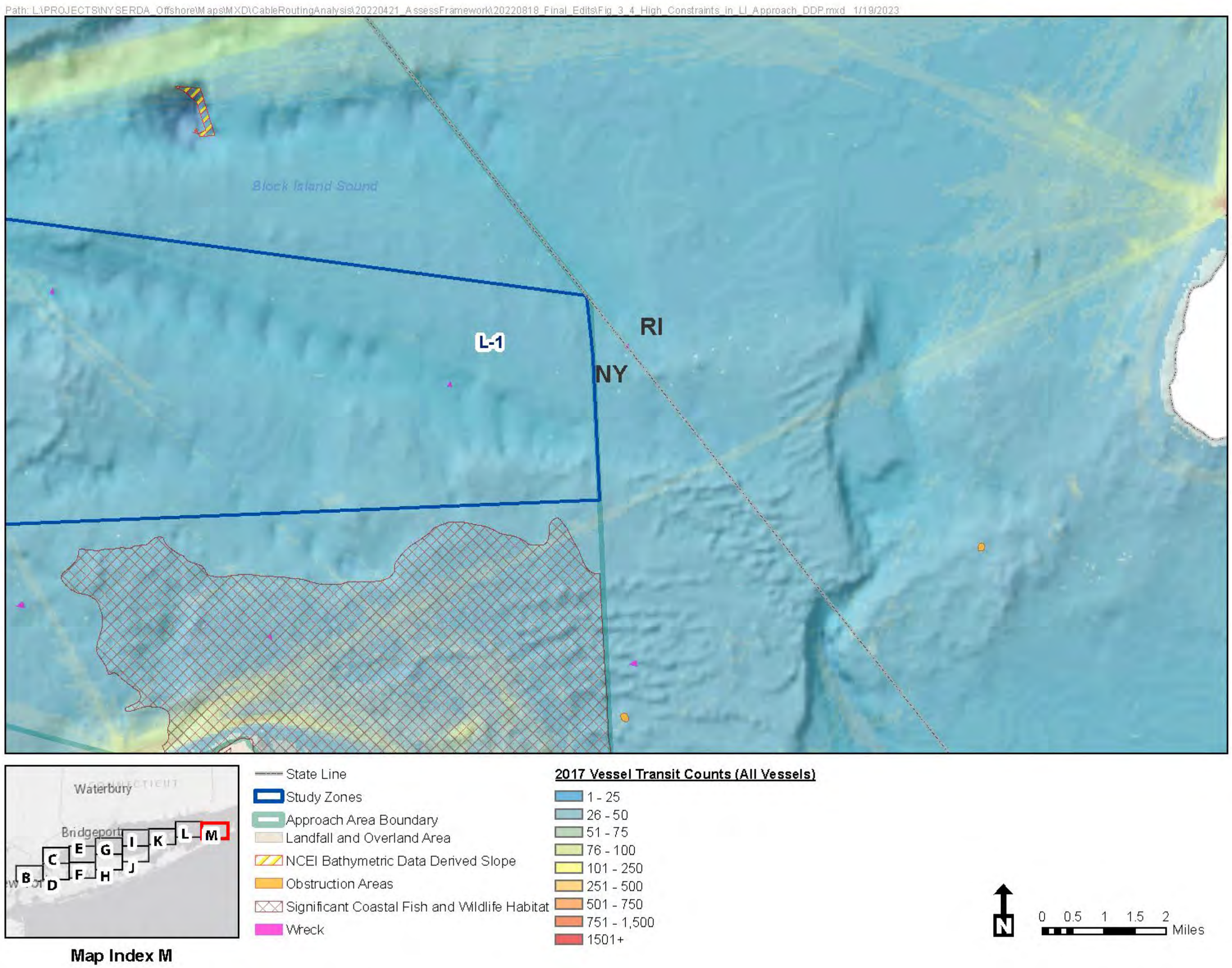


Figure 46. Resources Considered High Constraints within the Long Island Sound Approach Area (Map L)



Map Index L

Figure 47. Resources Considered High Constraints within the Long Island Sound Approach Area (Map M)



3.3 New York Harbor Approach Area

Figure 48 through Figure 58 provide an overview of existing conditions in the New York Harbor Approach Area and identify the resources ranked low as potential constraints because OSW cables are expected to completely avoid them. Figure 59 through Figure 69 identify the resources with high constraint rankings: marine geology, recreational and commercial fishing, linear utilities, navigation, vessel traffic, aquatic biological resources and sensitive habitats, waterfront infrastructure, and marine cultural resources. Navigation and vessel traffic rank either medium or high throughout most of the New York Harbor Approach Area.

3.3.1 Marine Geology

3.3.1.1 Existing Conditions

Marine geology includes the resources analyzed with GIS data as hardbottom, bathymetry, slope greater than 10 percent, borrow areas, and waterbody dimensions. Zones H-5 East River and H-7 Arthur Kill/Kill Van Kull rank high for constraints associated with marine geology and waterbody dimensions; Zones H-4 Lower Hudson and H-8 Middle Hudson rank high for waterbody dimensions. Zone H-2 The Narrows, Subzone H-3b (within H-3 Upper New York Bay), and Zone H-6 Raritan Bay rank medium for both marine geology and waterbody dimensions.

The melting ice sheet of the last glaciation deposited poorly sorted clay, silt, sand, gravel, rocks, and boulders in the Hudson River estuary and New York Harbor. The formation of the Hudson River and rise in sea level after the glaciation carried more recent fine-grained sediment into the harbor area, resulting in thick layers of silt and sand (e.g., USACE 1999a; Bokuniewicz and Fray 1979). Surface sediments consist of varying amounts of fine sand, silt, and clay in the Lower Hudson River (Zone H-4) and Upper Bay (Zone H-3), and predominantly of sand in The Narrows (Zone H-2) and the Lower Bay (Zone H-1). Surface sediments contain gravel in some locations, such as in The Narrows and southwest of Coney Island and Rockaway Point. Overall, gradients of the seabed in the New York Harbor Approach Area are low (less than 10 percent), but locally steeper gradients may exist along the slopes of dredged navigation channels or other dredged areas. Borings in Zones H-2 and H-3 indicate that depth to bedrock is more than 200 feet at some locations (USACE 2004). Zone H-5 East River contains bedrock of igneous and metamorphic rocks covered by layers of sand, silt, and clay (Baskerville 1994). Geological cross-section drawings for tunnels crossing the East River indicate that the sediment thickness (i.e., depth to bedrock) is highly variable, but shallow in some locations. For example, next to Roosevelt Island, Verdant Power reported bedrock is covered by only 2 feet of sediment (Verdant Power 2010). Sediments in Zone H-7 consist primarily of glacial till overlying metamorphic and igneous bedrock, some of which is shallow or exposed (USACE 2004).

All zones except Zone H-1 are either limited by physical dimensions or by presence of anchorage and navigation channels. Zone H-2 is primarily space-constrained; with half of its approximately 0.9-nm width consisting of navigation channels.

Tidal currents through Zones H-2, H-3, H-4, and H-5 regularly exceed 2 knots and sometimes reach 5 knots in sections of East River according to the New York Harbor Observing and Prediction System, maintained by the Stevens Institute of Technology Urban Ocean Observatory at Davidson Laboratory.

3.3.1.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Impacts to cable installation related to marine geology in the New York Harbor Approach Area are mostly associated with stronger currents and shallow bedrock. The need for deeper burial depths when crossing anchorage areas and channels increases the probability of encountering bedrock, discussed further in Section 3.3.3, Navigation and Vessel Traffic. OSW cable installation from shallow bedrock in Zones H-5 and H-7 requires more complex engineering and execution, such as HDD, blasting, and/or hydraulic hammer. Burial with rock or another type of armoring may help in some areas where bedrock limits burial depth. However, strong currents also pose installation challenges in these space-limited waterways. Any armoring or other fill material needs to withstand the erosional forces of these currents. Maintenance of cables installed via HDD and under armoring requires more effort, potentially including installing new sections of cable and increasing the width of the repair bight.

In zones with substantial space limitations, optimized routing facilitates a greater number of cable routes, whereas uncoordinated route planning may unnecessarily restrict access for future cables. This optimized routing includes parallel routing with existing cables, close cable spacing, no repair bight in Zone H-2, and avoidance of crossing other linear infrastructure. The use of HVDC cables already provides an approach to maximize use of space-constrained zones by allowing for greater (approximately 300 percent) capacity compared to HVAC cables.

Table 21 summarizes minimization and mitigation measures relevant to marine geology. Given the unique conditions in the New York Harbor, the CWG recommends additional consideration of additional minimization and mitigation measures to address impacts appropriate for specific routes.

3.3.2 Marine Commercial and Recreational Uses

3.3.2.1 Existing Conditions

Marine commercial and recreational uses include commercial and recreational fishing, other recreation, linear utilities, tunnels and bridges, and waterfront infrastructure. Zones H-2, H-3, H-4, H-5, and H-8 rank high for at least one constraint associated with marine commercial and recreational uses due to the presence of linear utilities, tunnels and bridges, and/or waterfront infrastructure. Infrastructure-related features also contribute to a medium ranking for all other zones in the New York Harbor Approach Area, except Zone H-1. Zone H-6 ranks high for recreational and commercial fishing and medium for other recreational uses.

Numerous linear utilities cross the New York Harbor Approach Area to support the large population and busy port (see Figure 59 through Figure 69). In some areas, these utilities converge and create dense assemblages of linear infrastructure. The zones of this Approach Area include in- and out-of-service NOAA-charted submarine cables, pipelines, aqueducts, bridges, and auto and rail tunnels as shown on Figure 59 through Figure 69. The proposed Empire Wind 1 cable would use Zones H-1, H-2, and H-3 and make landfall at the Gowanus substation and South Brooklyn Marine Terminal (Empire Wind 2021). Equinor plans to install two 230-kV HVAC cables buried to a minimum depth of 6 feet outside federally maintained navigation areas and 15 feet within federally maintained navigation channels and anchorage areas (Empire Wind 2021). In the southeast corner of Zone H-1, six potentially out-of-service submarine cables extend south into the Atlantic Ocean, and the 500-kV HVDC Neptune submarine transmission cable travels laterally (east/west). The Neptune cable runs roughly parallel to and within 1,600 feet of the Transco Lower New York Bay lateral gas pipeline. Zone H-3 contains the Bayonne Energy Center Cable, which winds through the middle portion of the zone. Five charted cable areas exist in Zone H-5. Between the Brooklyn Bridge and Brooklyn Navy Yard, six transmission lines cross the East River. In Zone H-7, eight NOAA—charted cable areas connect New Jersey and Staten Island in addition to an overhead line and an underground line near Sawmill Creek Marsh and the

Goethels substation. As noted in the NOAA ENC, a Transco pipeline and two Buckeye Pipeline Company L.P. pipelines cross Zone H-3 in the charted pipeline area near the border of Zone H-2. Just to the north, two charted pipeline areas contain abandoned water siphons and a replacement drinking water siphon put into service in 2015 (see Figure 65).

Multiple tunnels and bridges cross the waters of the New York Harbor Approach Area. Zone H-5 contains 13 tunnels and 5 bridges (see Figure 63). Rail or subway tunnels account for a majority (10) of the tunnels that cross under the East River. Burial depths and characteristics of overlying sediment vary, and publicly available data on these characteristics may be dated given the age of the tunnels.

Waterfront development throughout in Zones H-3, H-4, H-5, H-7, and H-8 contains designated SMIAs including South Bronx (near Mott Haven), Brooklyn Navy Yard, Red Hook (Marine Terminal), Sunset Park (including the South Brooklyn Marine Terminal), Kill Van Kull (four separate areas), and Staten Island West Shore (see Figure 62 through Figure 66). Aggregations of piers and docking/berthing facilities are also common throughout New York Harbor with multiple sites designated as PMAZs, which reflect the current or planned use of the shoreline facilities for waterfront activities such as shipping. Several New York City resiliency projects are in various phases of development in all New York Harbor Approach Area zones except Zone H-4 (NYSDOS 2022). The New York and New Jersey Harbor and Tributaries coastal storm risk management feasibility study (HATS) will also identify a plan for addressing coastal storm risk for this highly urbanized and nationally important area. A Draft Feasibility Report and Integrated Tier 1 Environmental Impact Statement are scheduled for release at the end of September 2022. Currently, USACE tentatively selected a multiple bay/basin gate and floodwalls & levee system as the preferred alternative (USACE 2022a). Resiliency projects reduce flood risk and, in some instances, provide additional green space. Four projects extend into the offshore space, and three of the four are in Zone H-5. The River Ring, Brooklyn Bridge-Montgomery Coastal Resilience, and the Financial District and Seaport Climate Resilience Master Plan designs include shoreline creation and fortifications that extend into the river, further constraining the available space outside the navigation channel.

Commercial and recreational fishing for pelagic species occurs primarily in Zone H-1, including areas identified as “sport ocean fishing grounds” based on a New Jersey survey of recreational and charter fishing stakeholders. An NYSDEC hard clam transplantation program encompassed a large portion of

Zone H-6 until harvest began declining, and closures were applied beginning in 2002 due to a quahog parasitic unknown disease outbreak (New York Sea Grant 2003; Liu et al. 2017). Although no hard clam harvest has occurred since 2013, NYSDEC may reinitiate the transplantation program in the future if economically feasible (FERC 2019).

Recreational activities considered for the recreational use category include parks, fishing, diving, and wildlife viewing. In Zone H-6 , four shore recreation areas extend into the waterways around Staten Island: Conference House Park, Mount Lorretto Unique Area, Wolfes Pond Park, and Gateway National Recreation Area. The Gateway National Recreational Area provides visitors with an opportunity to explore natural and historical areas in an urban setting. The National Park Service (NPS) manages the recreational area, and it extends, on average, 0.25 nm from the shore into the water. Fort Wadsworth is along the shore within the Staten Island unit of this park and overlooks The Narrows. Additionally, the whale watching industry is growing in and around the New York Harbor. Gotham Whale, founded in 2009, began documenting individual humpback whale presence through photo identification in 2011 (Brown et al. 2018). Since 2011, Gotham Whale has seen sightings of humpback whales increase, which has also resulted in an increase in trips per month (Brown et al. 2018).

3.3.2.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts to linear utilities, tunnels and bridges, and waterfront development of the New York Harbor Approach Area from construction of OSW cables include temporary conflicting use of space or damage to existing infrastructure. Impacts to marine commercial and recreational uses during OSW cable construction vary based on the type of installation method used and the duration of construction or distance from the resource. For safety purposes, any commercial or recreational users will need to avoid the active work area(s) during cable installation where associated vessels and equipment are operating. As discussed in Section 3.1.2: Marine Commercial and Recreational Uses, crossing agreements between developers of an OSW cable and existing utility and infrastructure owners need to address the details of the particular crossing to minimize disruption or damage to assets. The agreements address installation of OSW cables across the top of or beneath existing utilities, strategies to minimize the risk of damaging the existing utility during installation, and how to address damage should it occur. Trenchless methods to install cables under existing infrastructure are possible but typically require significantly more time and cost than installing over the top of infrastructure. Although the installation process is generally a short-term process, damage to an existing utility during installation extends the duration of construction and adds expense. As described in Section 3.3.1: Marine Geology, the combination of shallow bedrock and sediment depth could limit the ability to provide sufficient burial depth and require armoring, often with a combination of a rock berm and concrete mattresses. Future OSW cable routes should align parallel with existing infrastructure to minimize crossings and use of undersea space in constrained areas and maximize opportunities for future cables to achieve the mandated goals of the Climate Act. Crossings of existing infrastructure should be as close to perpendicular as possible.

In Zone H-6, potential impacts vary based on the location of commercial and recreational fishing activity relative to the construction zone, the season during which OSW cable activities occur, and the cable installation method, as described in Section 3.1.2.2: Impacts and Avoidance, Minimization, and Mitigation Measures. Impacts during construction potentially include short-term displacement of recreational fishermen, commercial fishermen, or other commercial and recreational ocean users, also described in Section 3.1.2.2.: Impacts to the whale watching industry during OSW cable operation include temporary disruption of activities during routine maintenance or unexpected repair. As noted previously and discussed below in Section 3.3.4: Aquatic Biological Resources and Sensitive Habitat, impacts to benthic organisms and habitat that occur during construction can be minimized with an appropriate cable route and appropriate burial depths. If avoidance is not possible, suitable burial depths and installation techniques avoid interference with the surf clam harvesting that occurs under special permit in Zone H-1.

Table 22 summarizes the minimization and mitigation measures relevant to marine commercial and recreational uses that effectively address impacts. However, the site-specific challenges in the New York Harbor Approach Area may require additional minimization and mitigation measures appropriate for specific routes.

3.3.3 Navigation and Vessel Traffic

3.3.3.1 Existing Conditions

Navigation and vessel traffic includes the resources analyzed with GIS data as vessel traffic and federally designated navigation areas. Zones H-2, H-3, H-4, and H-7 rank high for either vessel traffic or navigation, and Zone H-5 ranks high for both. These high rankings reflect the elevated level of vessel activity in New York Harbor and the spatial limitations associated with designated navigation areas.

The New York Harbor Approach Area includes 18 authorized federal navigation channels (see Figure 59 and Figure 61 through Figure 69). Ambrose Channel, the primary shipping channel in and out of the Port of New York/New Jersey, extends through the center of the Lower New York Bay and connects to the Anchorage Channel at The Narrows. It has an authorized depth of 53 feet (USACE 2020a). The Anchorage Channel extends from Zone H-2 to the Atlantic Ocean through Zone H-1 with an authorized depth of 50 feet in its southern reach and 45 feet in its northern reach (see Figure 65) (USACE 2020a). The Bay Ridge Channel, with an authorized depth of 40 feet, splits from the Anchorage Channel just north of The Narrows and runs along the southeastern side of the zone until joining with Red Hook Channel. Red Hook Channel, with an authorized depth of 40 feet, extends up the eastern side of Zone H-2 before connecting with Buttermilk Channel, with an authorized depth of 35 feet, near Governors Island (USACE 2020a). USACE maintains the 5.2-nm-long and 2,000-foot-wide Hudson Channel in this zone at a depth of 45 feet (mean low water) from the Upper New York Bay to West 40th Street (Manhattan). From West 40th Street to 59th Street, USACE maintains the Hudson Channel to a depth of 48 feet (USACE 2021a; 2020b). In addition, USACE continues to maintain the depth of the Hudson River to 40 feet for a 5.2-nm stretch farther north of the end of the designated navigational channel at West 59th Street. The remainder of the river to the north of 59th Street is navigable up to the Federal Dam at Troy, well beyond the New York Harbor Approach Area, and is maintained as a shipping channel at a minimum depth of 30 feet. In Zone H-5, the East River Channel has a typical width of 1,000 feet (ranging between 550 to 1,100 feet); its authorized depth is 40 feet (between Governors Island and Williamsburg Bridge) and 35 feet for the remainder of the channel passing west of Roosevelt Island (see Figure 63). A branch of the channel east of Roosevelt Island is maintained to 30 feet. Along many stretches in this zone, the navigation channel is within 100 feet of the shore or shore-based facilities (e.g., piers). Within Zone H-7, the navigation channel ranges from 500 to 1,200 feet wide in the Arthur Kill and from 800 to 2,000 feet wide in the Kill Van Kull (USACE 2021b). The authorized depth of the Kill Van Kull channel is 50 feet (see Figure 64 through Figure 66). The authorized depths of the Arthur Kill channel are 50 feet (1.0-mile section of the northernmost Elizabeth Reach), 40 feet (0.9-mile section of the Gulfport Reach), and 35 feet for the remainder of the channel to the southern tip of Staten Island. Portions of the navigation channels lie in New Jersey waters adjacent to Zone H-7.

Recreational and commercial marine vessels in the New York Harbor Approach Area include pleasure boats, commercial shipping and fishing vessels, and ferry vessels. Commercial vessel traffic includes numerous container ships, cargo ships, and local transportation vessels and ferries. Figure 70 shows channels and anchorage areas potentially important to siting OSW cables in New York Harbor. AIS vessel data from 2017 show vessel traffic (commercial cargo and container vessels, ferries, and water taxis) concentrated along Ambrose Channel in Zone H-1 through Zone H-2 and in multiple other channels crossing through and adjacent to Zone H-3 (see Figure 65 through Figure 66) (AIS 2021). The highest concentrations of vessel traffic occur along Red Hook Channel and Buttermilk Channel (Subzone H-3a), within the channels through the lower stretches of the Zones H-4 and H-5, and through Zone H-7 (see Figure 63 and Figure 65). Twenty-three ferry routes intersect Zone H-4, and 34 ferry routes cross Zone H-5, contributing to its high ranking. Vessels pass Roosevelt Island in H-5 primarily through the western channel.

The high volume of vessels entering and exiting the New York Harbor conduct staging and safety maneuvers in the anchorage areas throughout the Approach Area. Lower Bay Anchorage Area 25, also called the Gravesend Bay anchorage does not have vessel draft restrictions (33 CFR 110.155). Upper Bay Anchorage Area 24 extends from the northwestern end of Zone H-2 to the southwestern end of Zone H-3; vessels must be at least 800 feet long and have a draft of at least 40 feet to use this anchorage (33 CFR 110.155). Upper Bay Anchorage Areas 23A and 23B are at the western end of Zone H-3, north of Anchorage Area 24. Vessels must be at least 670 feet long to use Anchorage Areas 23A and 23B (33 CFR 110.155). Vessels using Anchorage Area 23A must also have a draft of less than 40 feet unless granted an exception by the Captain of the Port (33 CFR 110.155). Anchorage Areas 21A, 21B, and 21C are positioned in the center of Upper New York Bay (Zone H-3). There is no draft limit for vessels using Anchorage Area 21A, but vessels must have a draft of at least 10 feet and 33 feet, respectively, to use Anchorage Areas 21B and 21C.

Charted restricted zones exist adjacent to LaGuardia Airport and the Stapleton Naval Station. USCG established a 25-yard safety and security zone around the base of each bridge pier and abutment, including the Verrazano-Narrows Bridge towers. Safety and security zones are also present around Piers 86-92, above the Lincoln Tunnel, and just south of Roosevelt Island adjacent to the United Nations facilities. The Stapleton Naval Station restricted area/danger zone is listed as a transit-only area, except for vessels associated with Naval Station New York, Staten Island. An additional safety zone extends for a 110-yard radius around a point near the eastern Verrazano-Narrows Bridge tower (33 CFR 165.172). In 2011, civilian divers discovered approximately 1,500 rounds of discarded 20-millimeter ammunition in this safety zone and remain in the area (DHS 2011).

3.3.3.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts to navigation and vessel traffic include the temporary disruption of vessel traffic and disturbance of navigational aids. Impacts to navigation and vessel traffic in the New York Harbor Approach Area during OSW cable construction are likely occur within the navigation channels in and around Upper New York Bay. Impacts could be reduced or avoided by crossing perpendicular to the channels and using HDD where feasible. Disruption to vessel traffic may also occur during construction and maintenance in other areas with high-vessel traffic such as the anchorage areas in Upper New York Bay and along ferry routes. The presence of cable installation vessels and equipment in these waterways increases the probability for vessel interactions. Marine commercial and recreational vessels need to temporarily avoid the work area associated with cable installation. Similar impacts to vessel traffic may occur during routine maintenance or unexpected repair. Use of existing navigational channels limits the navigational traffic and impacts to surrounding waters. As shown in Table 24, minimization and mitigation measures include both communication and burial depth standards. During construction, regular updates to the local marine community through social media, the USCG Local Notices to Mariners, and active engagement with the Maritime Association of the Port of New York and New Jersey Harbor Safety, Navigation, and Operations Committee will minimize impacts. In federally maintained navigation features (e.g., anchorages and shipping channels), burial depths should reach 15 feet or more below the current or anticipated future authorized depth or depth of existing seabed, whichever is deeper. For example, USACE plans to deepen portions of channels leading into New York Harbor, including Ambrose Channel, Anchorage Channel, and Kill Van Kull (USACE 2022b).

Potential impacts from navigation and vessel traffic on OSW cable operation include anchor strike, particularly within designated navigation channels and anchorage areas. Anchors routinely drop in anchorage areas and may accidentally or intentionally drop in the channels in the event of a loss of power, steerage, or other unforeseen circumstances. Several factors contribute to the depth of anchor penetration in a dropped anchor scenario, including vessel size, anchor size and shape, and sediment grain size (COWI 2022a; Sharples 2011). Finer sediments allow for deeper anchor penetration than coarse grain sediments; for example, modeling of a Baldt-type anchor with a mass of at least 12,500 kilograms indicate penetration of a dropped anchor can range from approximately 3.9 feet in coarse gravel to 8.2 feet in fine mud or clay (COWI 2022a). Penetration depths increase significantly for dragged anchors (COWI 2022a; Sharples 2011). While appropriate burial depths can mitigate the anchor strike risk, areas crossed by cables may experience reduced vessel use because of the perceived risk of striking or snagging cables. Further impacts from a dropped anchor on an OSW cable include a potential loss of service, cost of cable repair or replacement, and potential loss of vessel anchor.

USCG noted potential cumulative impacts to New York Harbor anchorage grounds, federal channels, and vessel transits/maneuvering related to cable laying, operations, and maintenance. Cables installed in designated anchorage areas or navigation channels present multiple risks, including liability risks to vessel owners, risk of damage to cable owners, and loss of power for end users for the extended period for cable repair. If crossings of such navigational areas are unavoidable, the crossing should be perpendicular. The installation depth should account for the potential anchor penetration depth of the largest vessels that may anchor over the cable, including accidental or emergency deployments in navigation channels. USCG recommends that any cables be installed a minimum of 500 yards from USCG Aids to Navigation. This severely restricts cable placement in some New York Harbor and Long Island Sound zones where space is already constrained. Measures such as deeper cable burial may be necessary if this offset cannot be achieved. USCG also noted federal permitting requirements require a Navigation Safety Risk Assessment and Cable Burial Risk Assessment for OSW cables, which includes a request for any EMF impacts, individual and cumulative, on vessel compasses.

The Stapleton Naval Station restricted area/danger zone requires permission from U.S. Department of Defense to install cables through this restricted area/danger zone. The uncertain or extended schedule for obtaining this authorization also affects placement of OSW cables.

Table 25 summarizes the minimization and mitigation measures relevant to navigation and vessel traffic that address many of the impacts from OSW cables in the New York Harbor Approach Area. However, the unique challenges of the New York Harbor require consideration and development of additional minimization and mitigation measures appropriate for specific routes.

3.3.4 Aquatic Biological Resources and Sensitive Habitat

3.3.4.1 Existing Conditions

Aquatic biological resources and sensitive habitats include resident fish, diadromous fish that migrate between open ocean and estuaries/rivers; benthic organisms; marine mammals; sea turtles; and federal, state, or local ordinance-designated or protected areas for various aquatic communities. Zones H4, H-6, and H-8 rank high for concentrated areas of aquatic biological resources and sensitive habitats; Zone H-1 ranks medium.

Federally and State endangered juvenile and adult Atlantic and shortnose sturgeon use the full extent of the Hudson River year-round, including Zones H-4 and H-8 (NOAA-GARFO 2019). NOAA designated the Hudson River from the mouth to the Troy Dam as Coastal Critical Habitat for Atlantic sturgeon. Sturgeon use the estuary for migration and spawning grounds (NOAA Fisheries 2017). Essential physical features of this critical habitat include:

- hard bottom in low-salinity waters.
- aquatic habitat with a gradual downstream salinity gradient.
- waters of appropriate depth that are absent physical barriers between the river mouth and spawning grounds.
- continuous layers of the water column particularly in the bottom meter that exhibit properties that support spawning; survival of all life stages; and growth, development, and recruitment of younger life stages (NOAA Fisheries 2017).

Adult and subadult Atlantic sturgeon also migrate and forage year-round throughout the remainder of the New York Harbor Approach Area, while adult shortnose sturgeon may migrate through Zones H-2, H-5, and H-7 from April to November (NOAA-GARFO 2019). This portion of the Hudson River is also a primary nursery and overwintering area for striped bass (*Morone saxatilis*) and serves a large portion of the North Atlantic population (NYSERDA 2017b). This estuary is considered one of the most ecologically productive systems on the Northeast coast for fisheries.

The Hudson River (Zones H-4 and H-8) is a NYSDEC-designated Significant Natural Heritage Community and a NYSDOS-designated SCFWH (Lower Hudson Reach). Shooters Island, Pralls Island, and Fresh Kills are SCFWHs located on the shoreline within Zone H-7. Several NYCWRP-designated ecological resources also lie within or immediately adjacent to the New York Harbor Approach Area, including the Arthur Kill Ecologically SMIA along the northwest shoreline of Staten Island within portions of Zone H-7. Additionally, RECs are located in Gravesend Bay in Zone H-1, U Thant Island in Zone H-5, and Verrazzano Narrows/Hoffman Island/Swinburne Island in Zone H-6. Shoal areas, water shallower than 20 feet, provide primary habitat for winter flounder eggs (NEFMC and NOAA Fisheries 2017). Shoal areas are particularly prevalent in Zones H-1 and H-2.

With regard to marine mammals, endangered NARW and fin whales occur within Zones H-1, H-2, and H-6 (NOAA-GARFO 2019). A small portion of the NARW SMA located near the entrance to Lower New York Bay overlaps Zone H-1 (NOAA Fisheries 2019b). Other marine mammals known to occur in the southern portions of the New York Harbor Approach Area include harbor seals, grey seal, harbor porpoise (*Phocoena phocoena*), and humpback whale (*Megaptera novaeangliae*). Sea turtles may also be present in the New York Harbor Approach Area, and data for sea turtles just seaward of the New York Harbor Approach Area indicates a low relative annual abundance, with the peak relative abundance occurring during the summer (Menza et al. 2012).

The hard clam area in Zone H-6 occupies approximately 33 percent of the zone and contains important habitat for hard clams. This area spans much of the New York State waters outside the federal navigation channels west of Great Kills Harbor.

3.3.4.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts to aquatic biological resources and sensitive habitats from construction of OSW cables vary in degree of magnitude based on the seasonality of activities and the type of cable installation method used. In the New York Harbor Approach Area, the impacts during construction include temporary disturbance and short-term displacement of mobile species due to noise and turbidity, and short- to long-term disturbance of sensitive habitats and the benthic environment due to excavation or burial, including down-current sedimentation from resuspended sediment. Installation of OSW cables causes mortality to non-mobile species and life stages within the footprint of construction, and even relatively thin layers of sedimentation may cause mortality in egg and larval life-stages of species such as winter flounder (Berry et al. 2011). However, the benthic and epibenthic populations of the disturbed areas are expected to recover within less than one to six years (Hemery and Rose 2020). Long-term or permanent impacts from habitat conversion may occur in areas where structures or armoring are installed, such as infrastructure crossings or shore landings. Suitable burial depths and installation techniques, such as HDD, avoids interference with the surf clam harvesting that occurs under special permit in Zone H-1. Where decommissioning of OSW cables requires their removal, impacts similar to installation will occur.

Potential impacts to aquatic biological resources and sensitive habitats from operation of OSW cables are short-term impacts from maintenance activities, including physical disturbance if a cable needs repair or increases in vessel traffic. Long-term impacts from operation could include changes in presence, distribution, or behavior of marine species in response to EMF generated by OSW cables. In the long term, future OSW cable routes should align parallel with existing infrastructure to minimize use of undersea space and avoid habitat fragmentation.

Operation of OSW cables generates EMF; however, to date the effects of EMF on invertebrate species have not been extensively studied, and studies of the effects of EMF have mostly been limited to commercially important species, such as lobster and crab (e.g., Love et al. 2017; Hutchison et al. 2020). Experiments on a European bivalve that were exposed to EMF comparable to that measured near HVAC submarine cables found lower filtration rates, increased oxidative stress, and increased neurotoxicity (Jakubowska-Lehrmann et al. 2022). Animals of the same species that were exposed to a static magnetic field comparable to that measured near HVDC submarine cables also had lower filtration rates, lower energy available for production, and oxidative stress (Jakubowska-Lehrmann et al. 2022). However, no similar studies on impacts to the surfclam were found at the time of this assessment. Impacts from EMF on surf clams are expected to be minor, but more research is necessary in environments specific to nearshore New York State waters. Similarly, the interaction of the static field associated with the DC current flowing in an HVDC cable and the earth's magnetic field may impact magneto-sensitive marine species; however, more research on this topic is needed to determine the effect, if any, that magnetic fields have on these species. Table 26 summarizes minimization and mitigation measures relevant to aquatic biological resources and sensitive habitats that address the impacts from OSW cables in the New York Harbor Approach Area.

After the cable design has incorporated all avoidance measures to the maximum extent practicable, the minimization and mitigation measures shown in Table 27 include time-of-year restrictions, appropriate burial depth and cable shielding, appropriate installation methods for the specific environments, BMPs for vessel operations, and minimization of bottom disturbance and associated sedimentation to the extent possible. Minimization and mitigation measures for impacts to aquatic biological resources and sensitive habitats from operation and maintenance of OSW cables include BMPs for vessel operations and monitoring studies to document the recovery or changes in species distribution or behavior. For marine mammals and sea turtles, important mitigation measures during construction and operations include a protected species mitigation and monitoring plan that encompasses exclusion and monitoring zones, shutdown procedures, observers, reporting measures, and adaptive vessel speed restrictions.

3.3.5 Sediment Contamination, Ocean Disposal Sites, and UXO

3.3.5.1 Existing Conditions

Sediment-related characteristics include sediment contamination, ocean disposal sites, and UXO. The New York Harbor Approach Area zones H-1, H-2, H-3, H-4, H-6, H-7, and H-8 rank medium for constraints associated with sediment quality and water quality. Zone H-1 ranks medium because of the presence of a FUDS, and Zones H-4 and H-8, which rank medium as a result of the designation of the Hudson River as a State Superfund site. Zones H-2, H-3, H-6 and H-7 rank medium due to the potential for contamination as indicated in published literature. The remaining zones rank low because of the unknown extent (due to lack of spatial and published data) of that potential contamination. However, there may still be constraints present related to contamination that require consideration.

Sediments in many parts of New York Harbor contain contaminants at varying concentrations (Adams et al. 1998; Long et al. 1995). Although sediment contamination may be avoidable, it should be considered for cost and planning purposes. Sediments within Zones H-1, H-2, H-3, and H-6 may contain elevated levels of contaminants (NYSDEC Class C and/or Effects Range - Medium), especially within and near certain channels (Long et al. 1995; FERC 2019). Additionally, in Zones H-4 and H-8, the Hudson River is a Class 02 State Superfund Site for PCBs as a result of two upriver General Electric capacitor plants. Several Superfund, Brownfield, and NYSDEC remediation sites are along the shore of Zone H-5. Newtown Creek, a tributary of the East River, is a Class 02 State Superfund Site. Historically, it was used for ship building, textile production, metal smelting, and oil refining. Contaminants include PCBs, metals, PAHs, and solid waste. While Zone H-5 ranks low for sediment quality and water quality constraints due to the unknown extent of potential contamination that migrated in-water and ultimately into the sediment, the potential exists for sediment contamination in the zone.

Zone H-1 overlaps with the Fort Tilden Coastal Battery & Small Arms Ranges FUDS Property, which extends offshore from the shoreline of Fort Tilden beyond the State water boundary.

Several oil spills and direct petroleum discharges occurred in the waterways of Zone H-7. In 1990, more than a million gallons of oil discharged into the waterways and wetlands of New York Harbor from 684 spills. The majority of this discharge contaminated the Arthur Kill and Kill Van Kull (USFWS 1997), including an oil spill in January 1990 from a leak in an Exxon pipeline, spilling 576,000 gallons of diesel fuel that spread throughout much of the Arthur Kill (Hay et al. 2011). According to the NYSDEC Spills Incidents Database, over the past several years, several spills in New York Harbor waters of unknown material and unknown quantities occurred. Those spills with detailed information have been small; for example, 5 gallons of diesel spilled into Kill Van Kull in 2017 and 10 gallons of crude oil spilled into Arthur Kill in 2017 (NYSDEC 2022). Therefore, there is a high probability that sediments within this zone may contain elevated (NYSDEC Class C and/or Effects Range–medium) contaminant concentrations.

Water quality is a concern throughout the New York Harbor Approach Area because of its extensive industrial maritime uses. According to the approved 2018 list of 303(d) impaired waters for New York, the Lower New York Bay/Gravesend Bay, Raritan Bay, Arthur Kill, Upper New York Bay, Hudson River, and East River are all impaired (NYSDEC 2020).

The Rockaway Inlet Ocean Disposal Site, located just east of Zone H-1, is an active dredge material disposal site (see Figure 58). Additionally, as noted above, one area of UXO occurs in Zone H-2 in Gravesend Bay associated with discarded 20-millimeter ammunition discovered in 2011 by civilian divers. A safety zone established around that point starts from the edge of the 25-yard safety and security zone at the base of the Verrazzano-Narrows Bridge (DHS 2011).

3.3.5.2 Impacts and Avoidance, Minimization, and Mitigation Measures

In general, installation of the cable disturbs the seabed and results in suspension of sediment into the water column as described in Section 3.1.5.2: Impacts and Avoidance, Minimization, and Mitigation Measures. These impacts are generally temporary, but their spatial extent can vary substantially depending on the construction method, substrate characteristics, and current strengths. For example, turbidity plumes generated during USACE's New York Harbor dredging activities dissipated to ambient conditions within 660 feet in the upper water column and within 2,650 feet in the lower water column, even when dredging sediments were predominantly silt and clay (50 to 95 percent) (USACE 2015b).

Site-specific sediment sampling prior to cable installation can confirm sediment characteristics, including grain size and contaminant levels, as well as the potential for presence of UXO to assist in selecting the appropriate installation approach and cable route to avoid or minimize impacts. Suspended sediment modeling can estimate the extent of potential plumes and, if higher concentrations of sediment contaminants are found (e.g., exceeding New York Class C thresholds), contaminant modeling may also be required. Alternative construction equipment or methods may be necessary if modeling indicates that State water quality standards cannot be achieved with the initial proposed method(s). The Article VII certificate will require water quality monitoring to confirm modeling results and effectiveness of BMPs during cable installation. Additionally, based on contaminant concentrations in areas excavated for cable placement, proper dredged material disposal practices may necessitate upland disposal of dredged material at licensed onshore facilities. Where decommissioning of OSW cables requires their removal, impacts similar to installation will occur.

Table 27 summarizes minimization and mitigation measures relevant to sediment-related characteristics that effectively address the impacts from OSW cables in the New York Harbor Approach Area. OSW cables in Zones H-4 and H-8 may need to avoid installation in the Hudson River PCB site and certain sensitive areas within the lower Hudson River by exiting the water for burial along an overland route, consistent with the requirements for the Champlain Hudson Power Express (NYSPSC 2012).

3.3.6 Marine Archaeology and Cultural Resources

3.3.6.1 Existing Conditions

Zones H-4, H-5, and H-7 rank medium for marine archaeology and cultural resources; the remaining zones rank low. Zone H-7 contains dense concentrations of wrecks on the New York State side of the kills. AWOIS- and NOAA-charted data layers identify 43 wrecks in Arthur Kill, mostly concentrated in the south and 36 wrecks in Kill Van Kull, mostly concentrated around Shooters Island and Mariners Harbor. The Arthur Kill entrance at Perth Amboy is categorized by the New Jersey Department of Environmental Protection as "NR Eligible" for archaeology (i.e., NRHP eligible). Two sites on the outskirts of Mariners Harbor are also categorized as "NR Eligible." The Arthur Kill and Kill Van Kull Ship Graveyards closest to Zone H-7 are well known through maritime archaeological research as containing vessels that represent a wide variety of vessel types related to transportation, construction, commercial, and recreational activities (USACE 1999b). Some vessels in these ship graveyards could be historically significant, and several have been determined to be eligible for listing on the NRHP (USACE 1999b). Eligible vessels include a cluster of ship remains at the Port Johnson Sailing Center on the Bayonne, New Jersey, side of the Kill Van Kull, 8 vessels on the Staten Island side of the Kill Van Kull, and 20 vessels along the Staten Island side of the Arthur Kill (USACE 1999b).

The MARCO Portal also provides information pertaining to historic Native terrestrial territories. The data layer includes references to approximate historic territories of the Munsee Lenape, the Canarsie, the Matinecock, the Wappinger, and the Schaghticoke Nations within the New York Harbor Approach Area (MARCO n.d.).

3.3.6.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Given the low to medium ranking and the small number of shipwrecks present in the New York Harbor Approach Area zones, construction, operation, and maintenance of cables should avoid impacts to maritime cultural resources. If these resources are not avoided in space constrained locations, potential impacts during construction and operation could occur from vessels that disturb maritime archaeological resources, such as paleochannels, submerged prehistoric sites, locations with traditional cultural and religious significance to local Native Americans or other groups, and unknown or unlisted maritime archaeological sites as described in Section 3.1.6.2: Impacts and Avoidance, Minimization, and Mitigation Measures.

Table 28 summarizes minimization and mitigation measures relevant to marine archaeological and cultural resources that effectively address impacts from OSW cables. Additional measures that may be appropriate in the context of space constraints in the New York Harbor, such as monitoring plans for noise and vibration during HDD activities.

Figure 48. Resources Present and Expected to be Avoided in the New York Harbor Approach Area (Index Map)

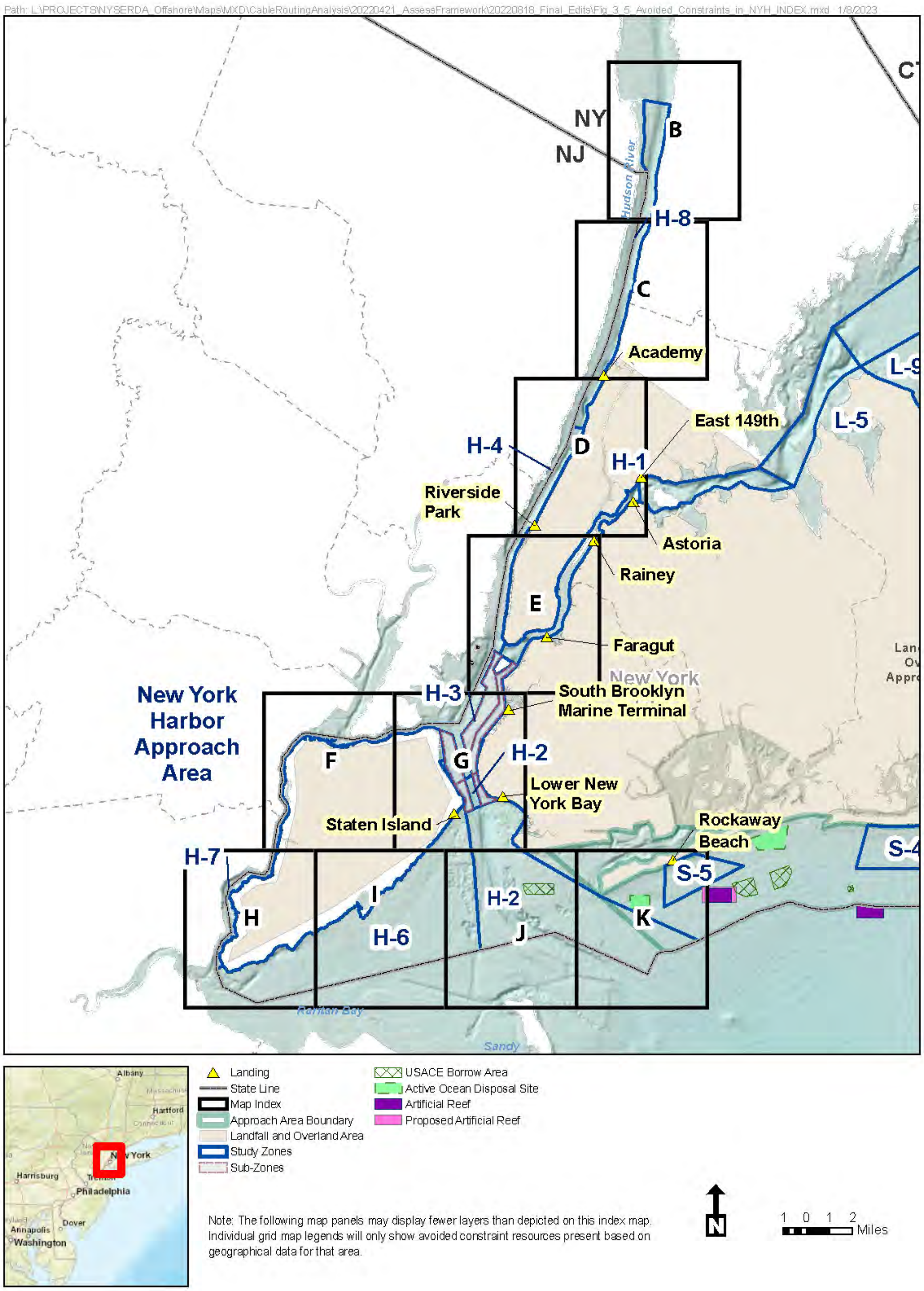


Figure 49. Resources Present and Expected to be Avoided in the New York Harbor Approach Area (Map B)

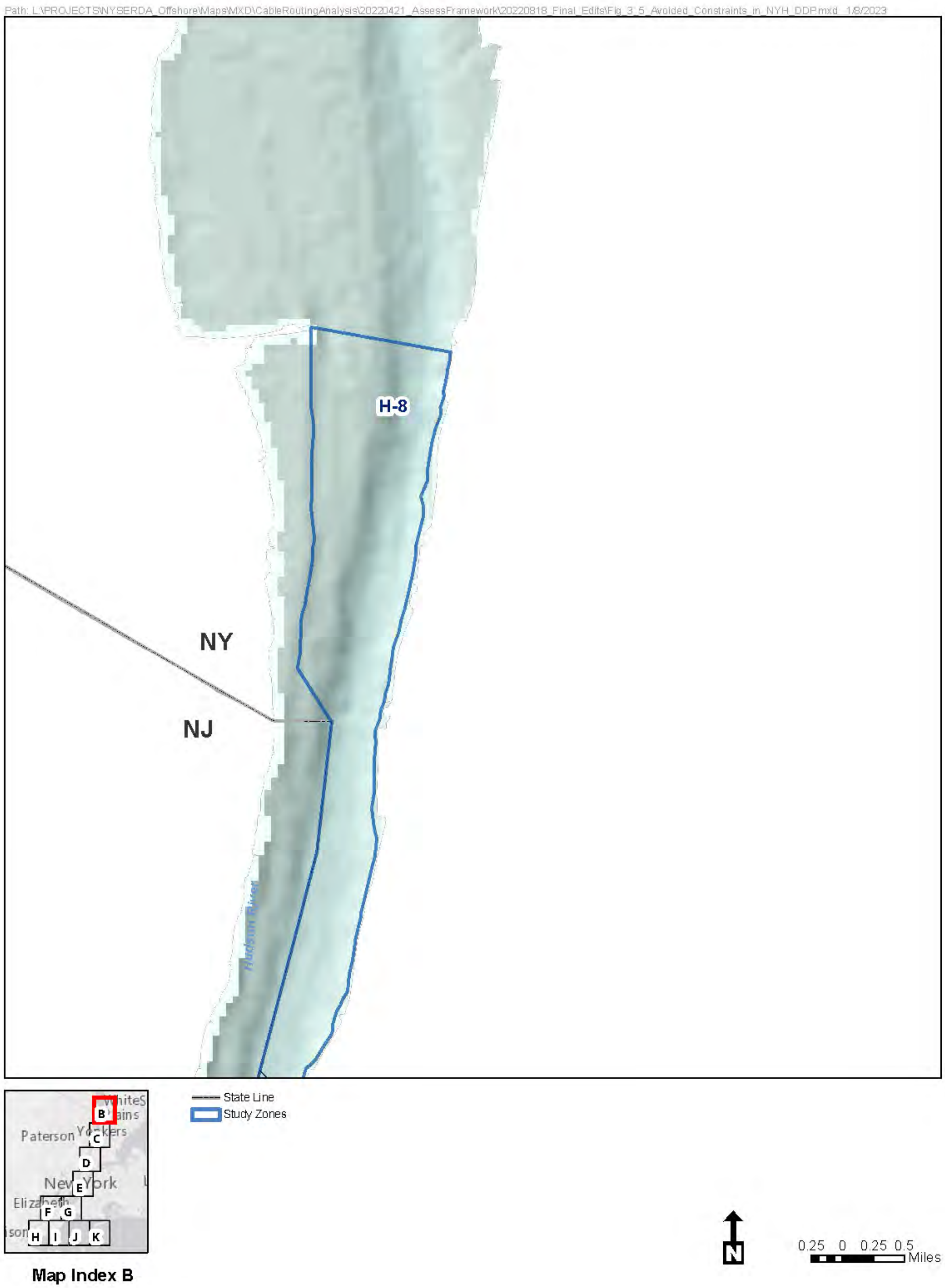


Figure 50. Resources Present and Expected to be Avoided in the New York Harbor Approach Area (Map C)

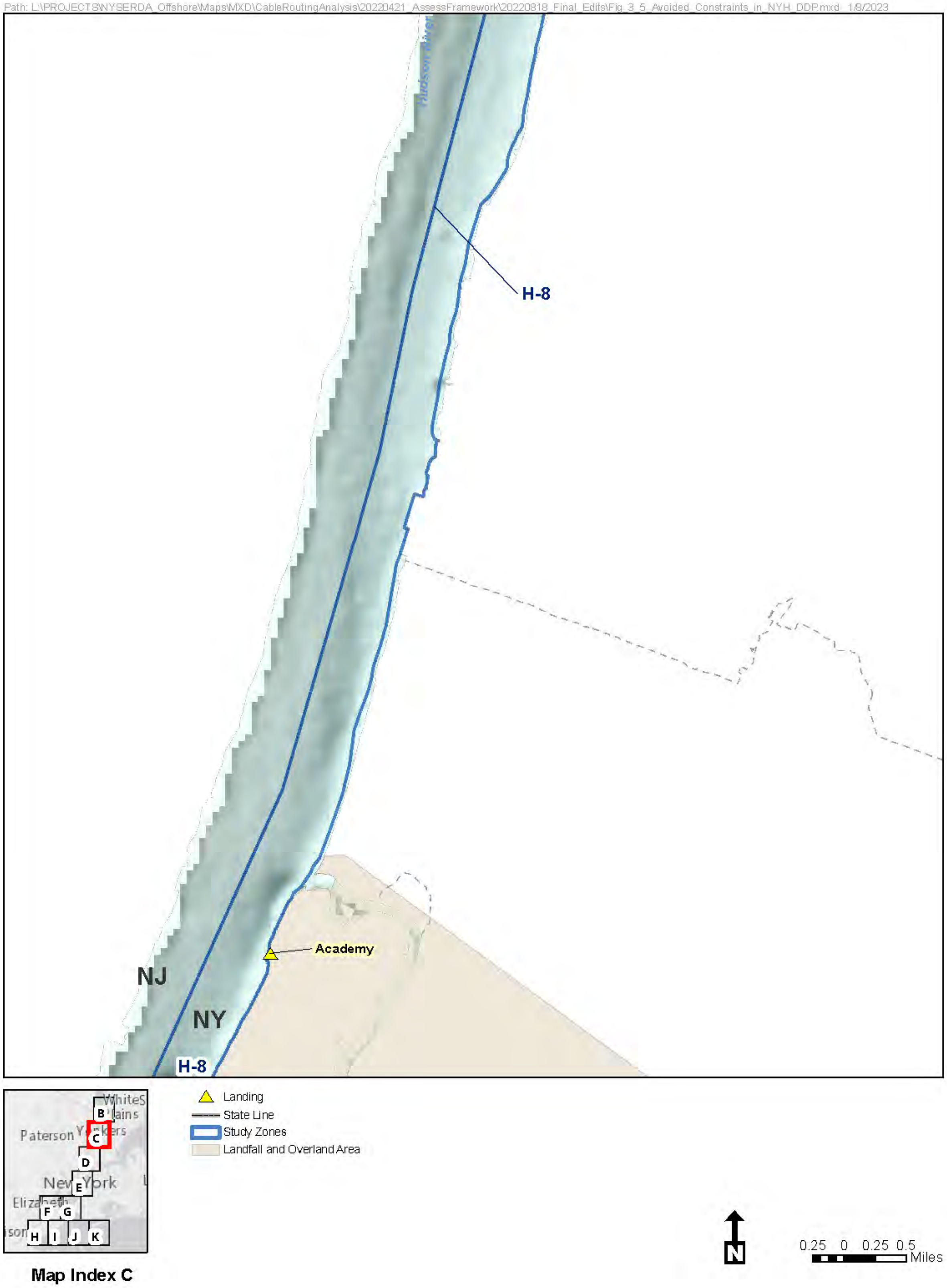


Figure 51. Resources Present and Expected to be Avoided in the New York Harbor Approach Area (Map D)

Figure 52. Resources Present and Expected to be Avoided in the New York Harbor Approach Area (Map E)

Figure 53. Resources Present and Expected to be Avoided in the New York Harbor Approach Area (Map F)

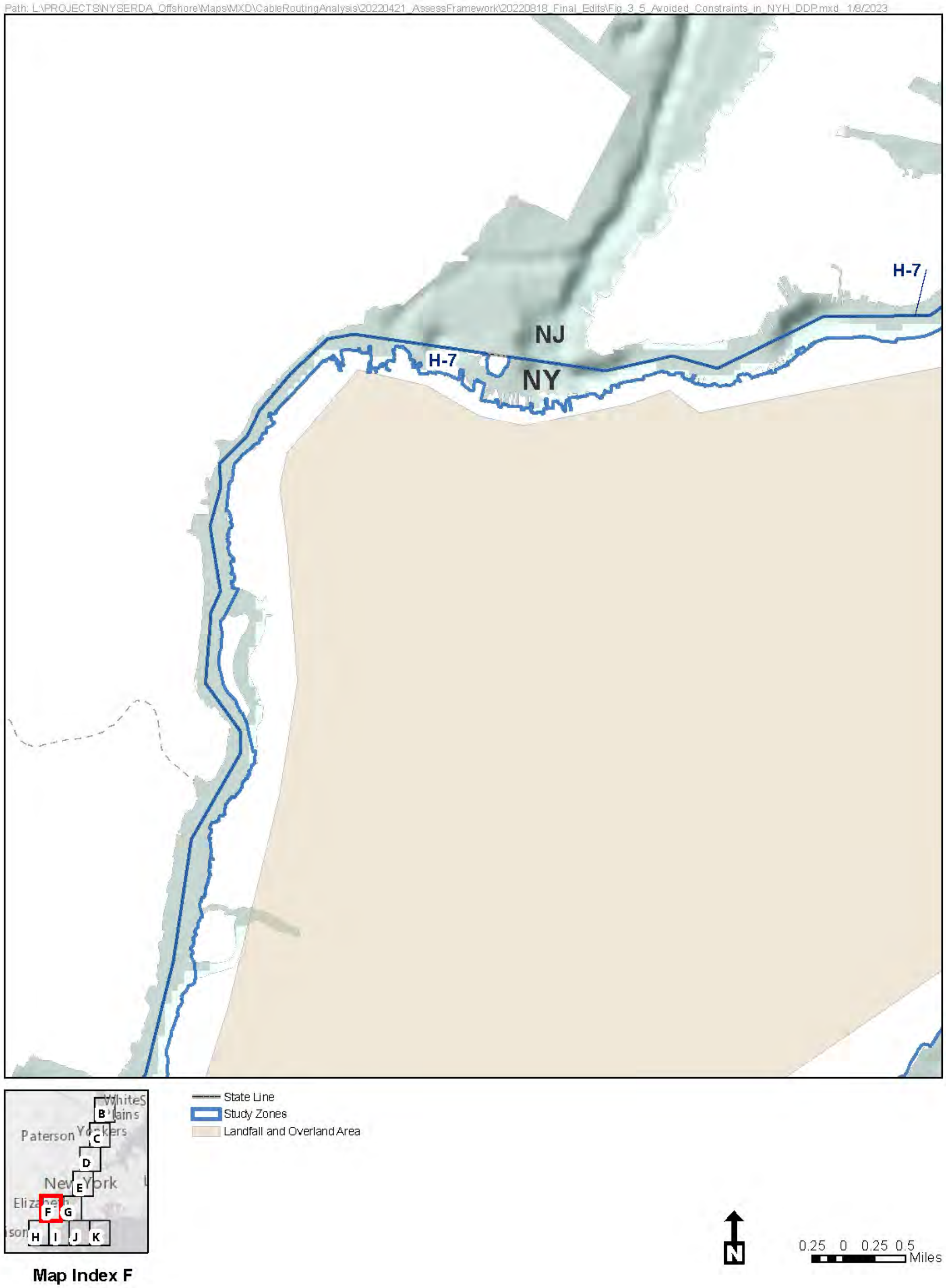


Figure 54. Resources Present and Expected to be Avoided in the New York Harbor Approach Area (Map G)

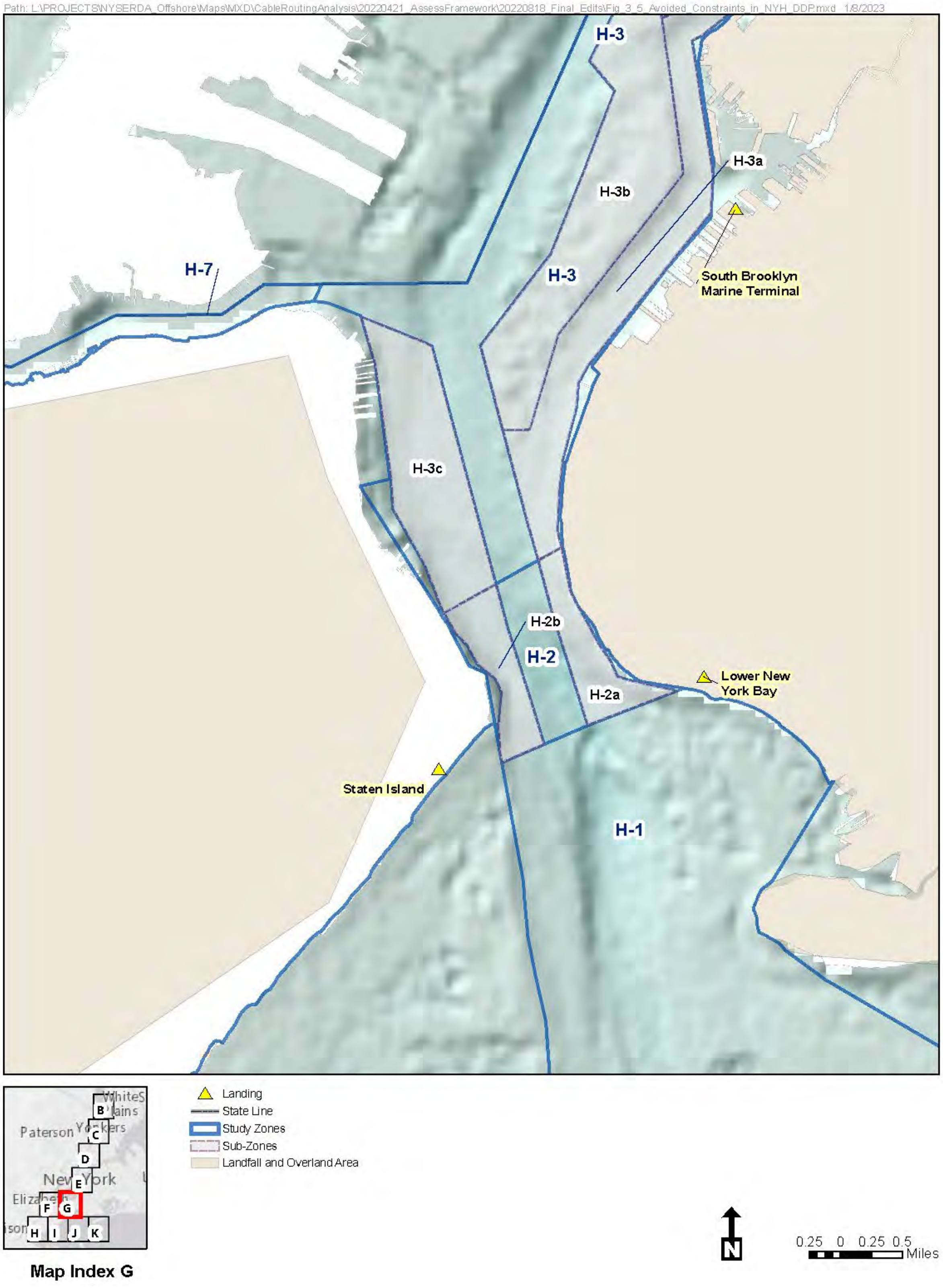


Figure 55. Resources Present and Expected to be Avoided in the New York Harbor Approach Area (Map H)

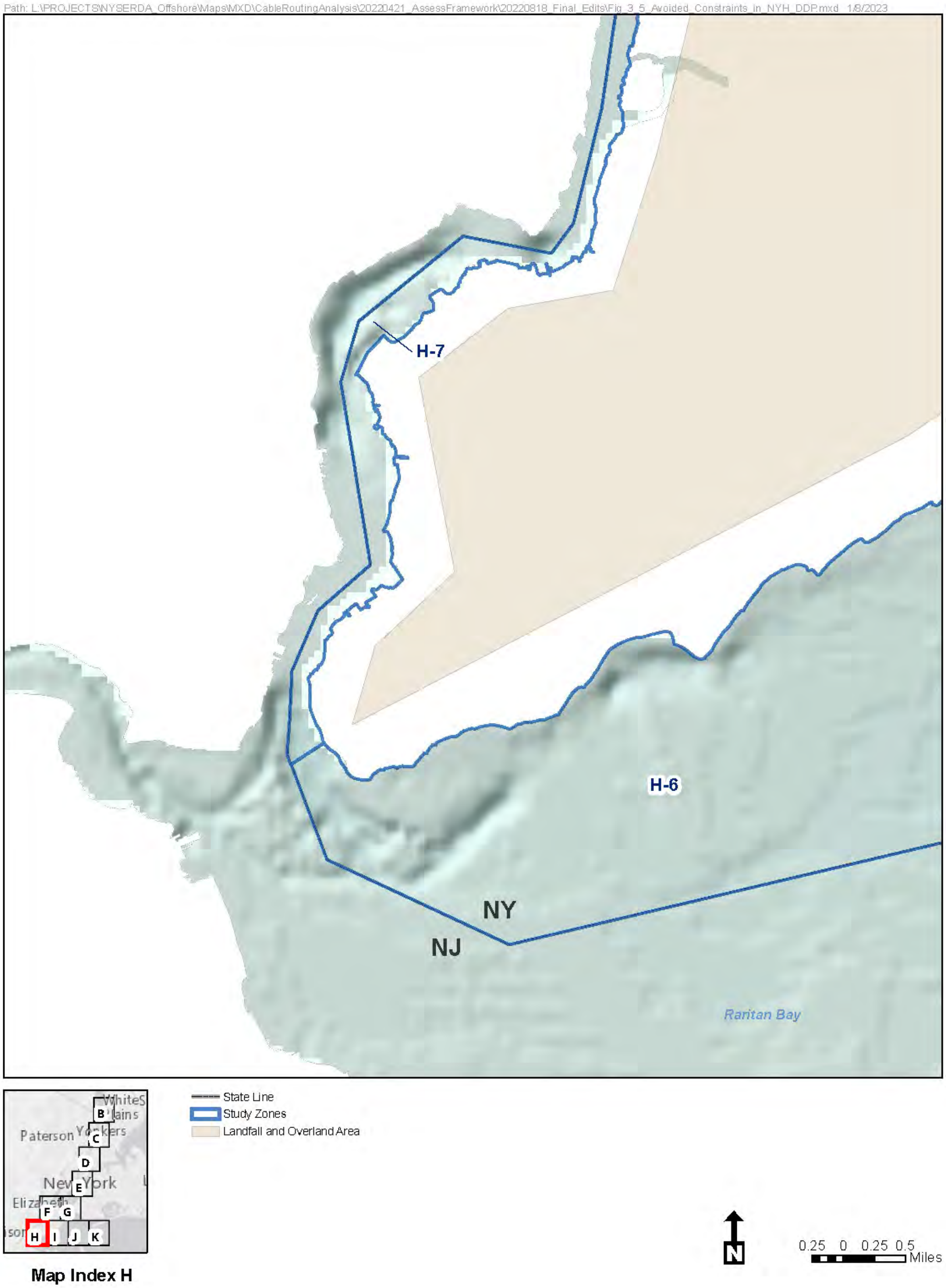


Figure 56. Resources Present and Expected to be Avoided in the New York Harbor Approach Area (Map I)

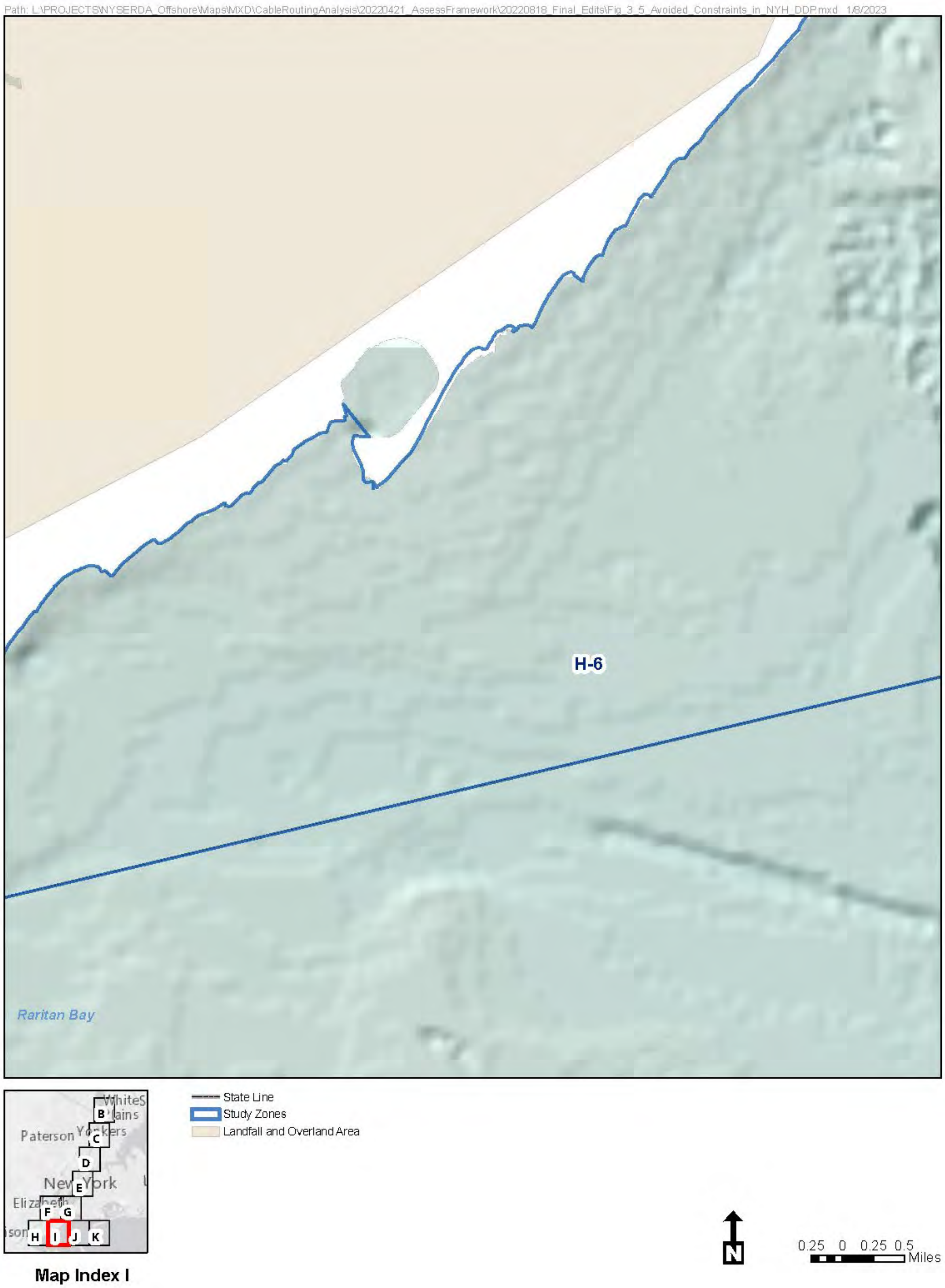


Figure 57. Resources Present and Expected to be Avoided in the New York Harbor Approach Area (Map J)

Figure 58. Resources Present and Expected to be Avoided in the New York Harbor Approach Area (Map K)

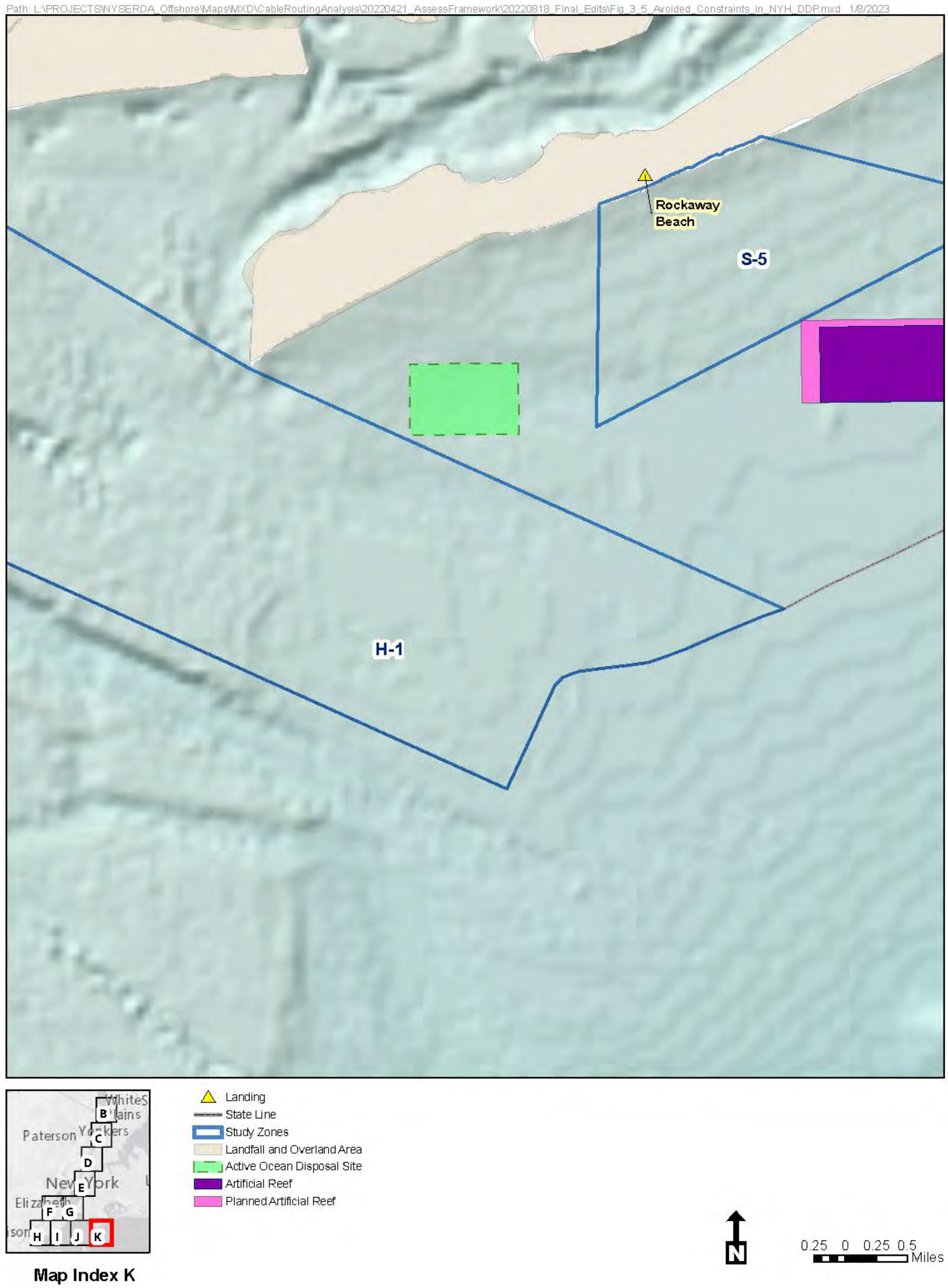


Figure 59. Resources Considered High Constraints within the New York Harbor Approach Area (Index Map)

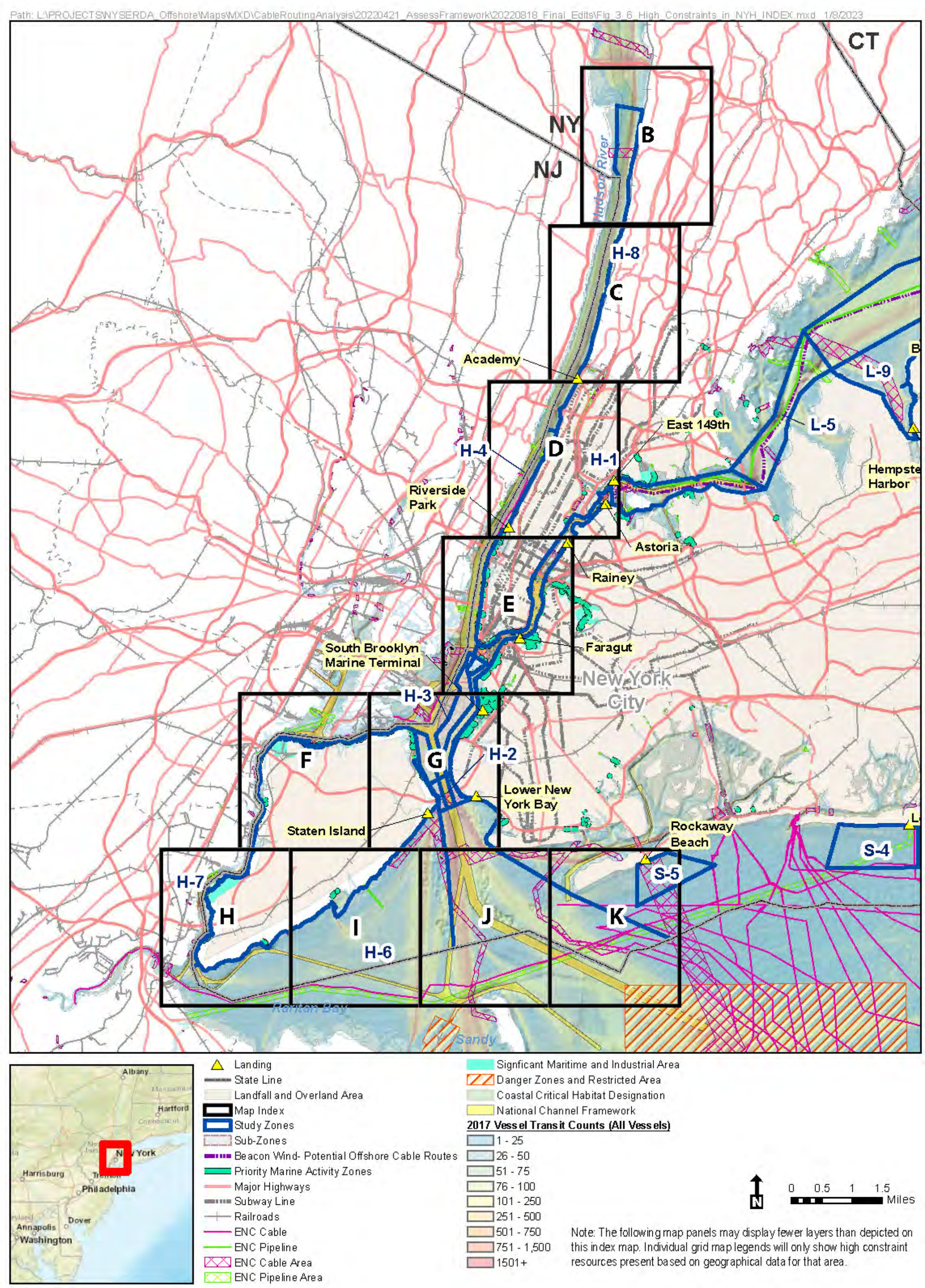


Figure 60. Resources Considered High Constraints within the New York Harbor Approach Area (Map B)

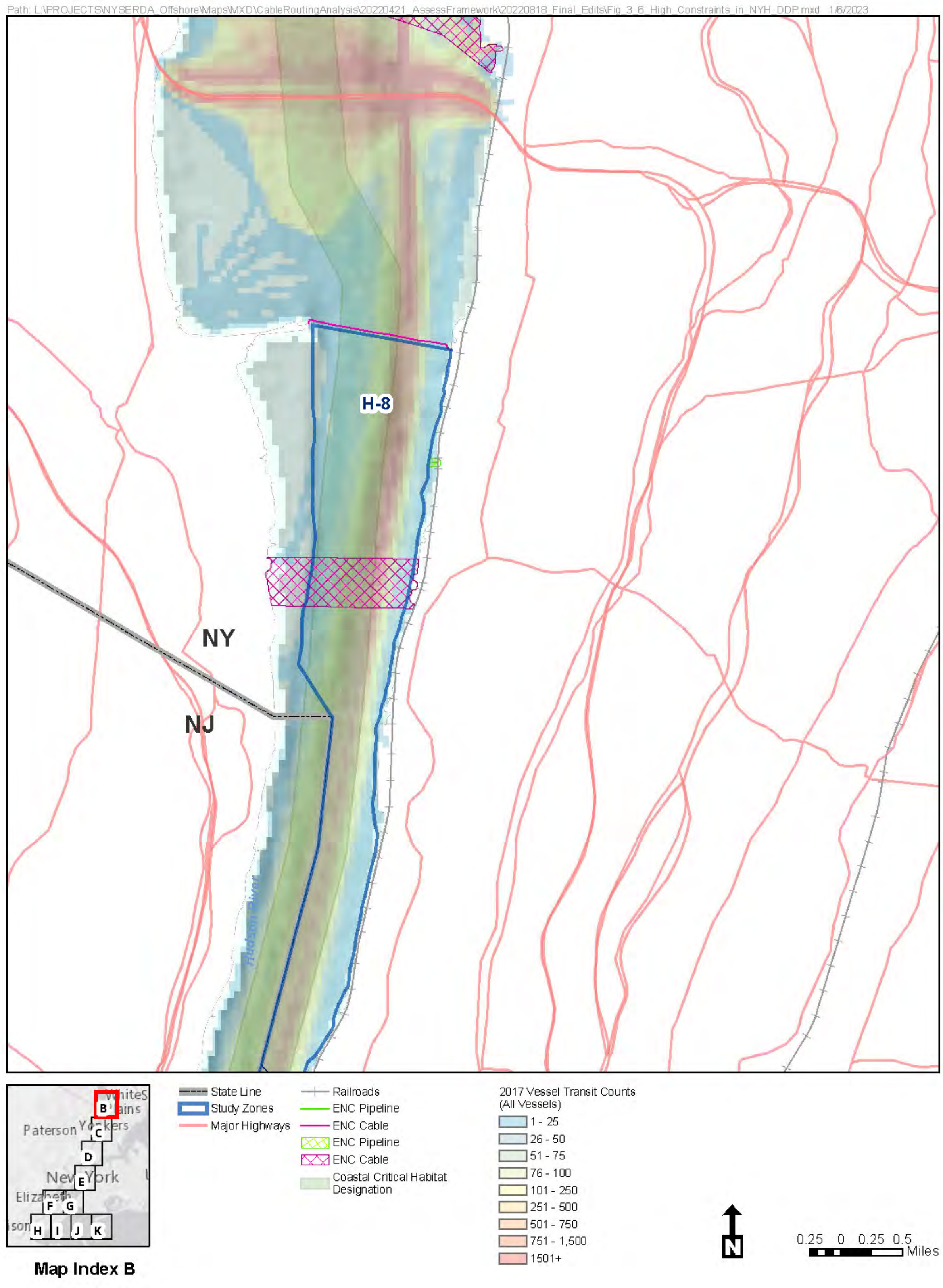


Figure 61. Resources Considered High Constraints within the New York Harbor Approach Area (Map C)

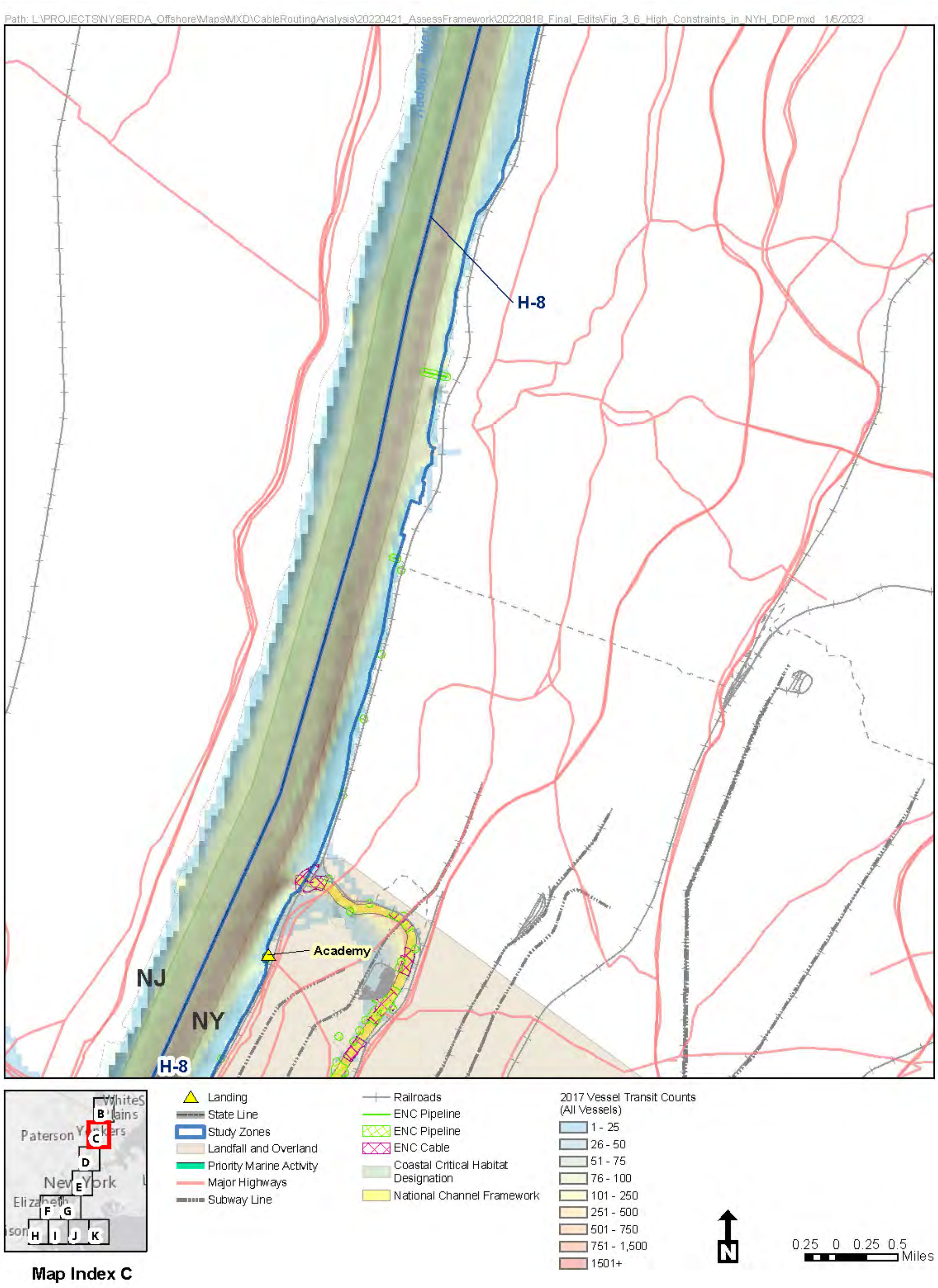


Figure 62. Resources Considered High Constraints within the New York Harbor Approach Area (Map D)

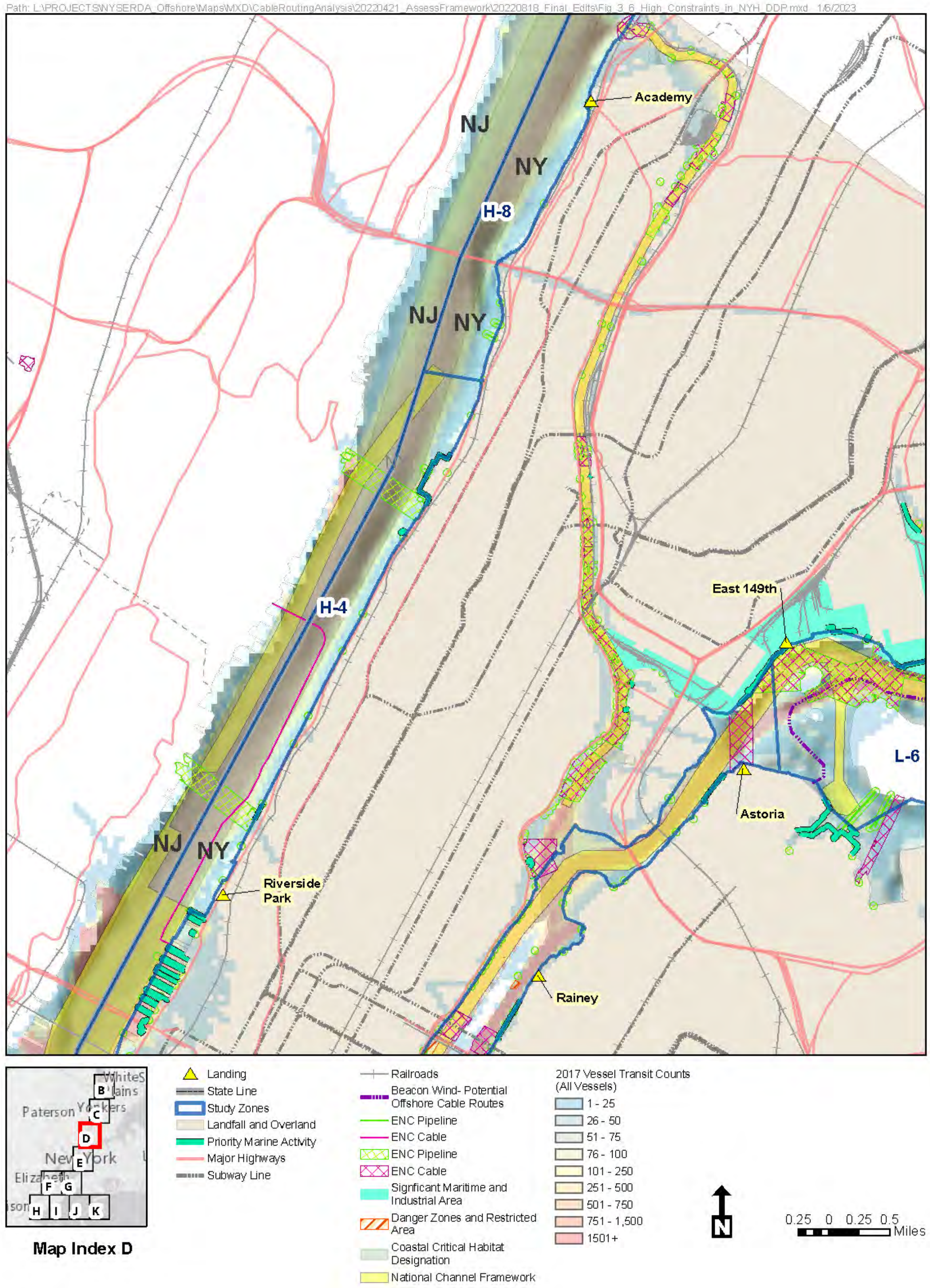


Figure 63. Resources Considered High Constraints within the New York Harbor Approach Area (Map E)

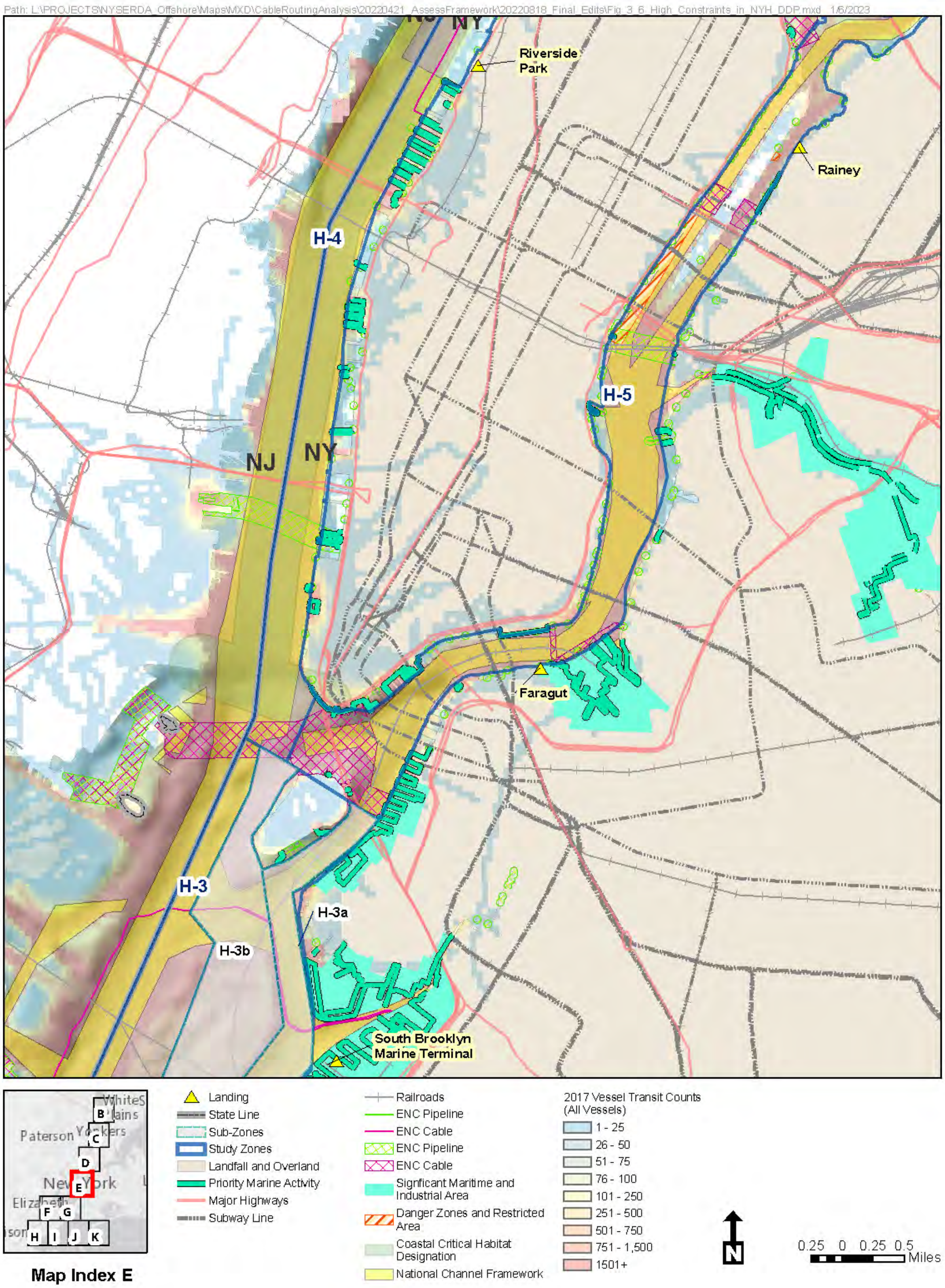


Figure 64. Resources Considered High Constraints within the New York Harbor Approach Area (Map F)

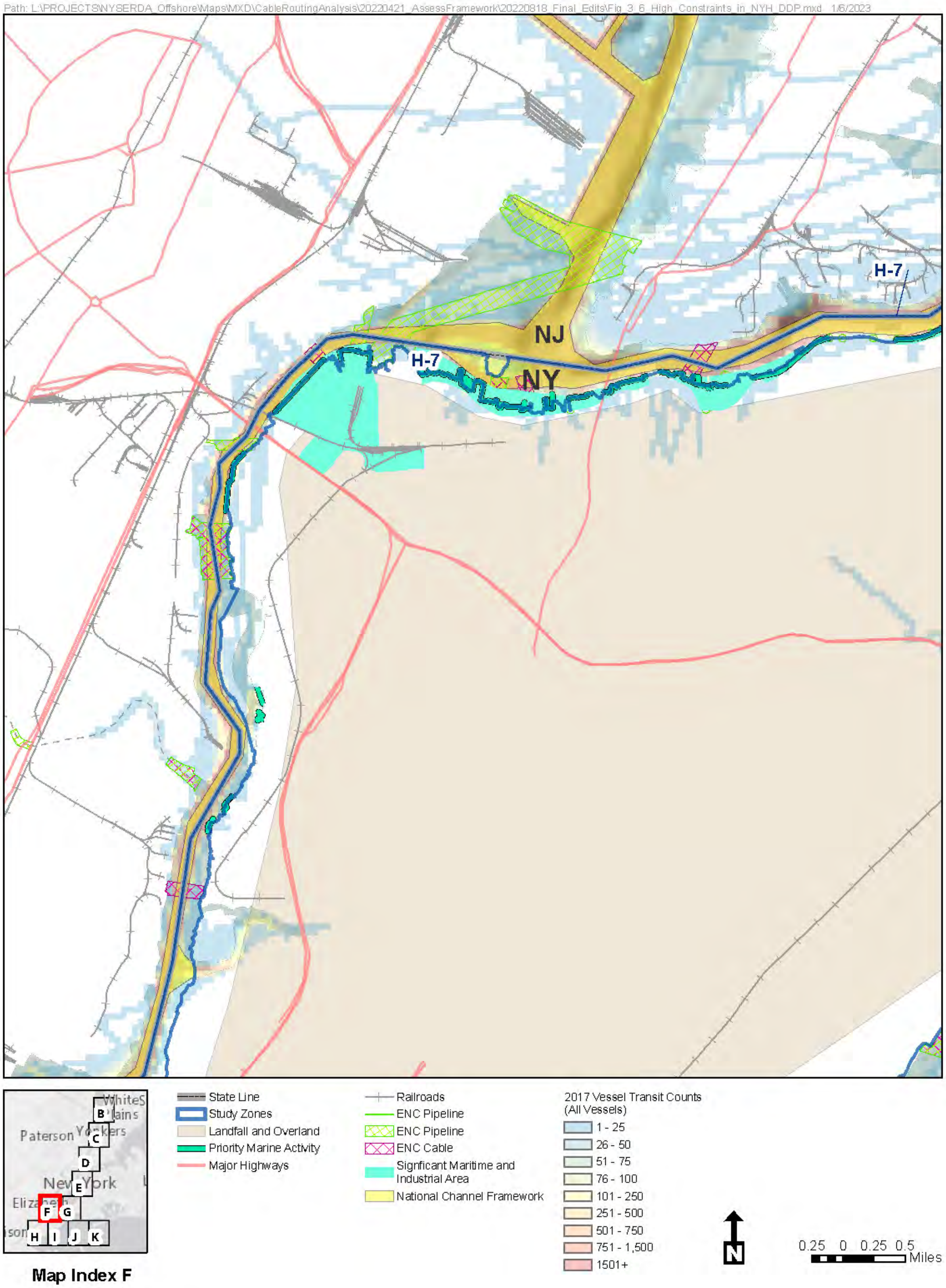


Figure 65. Resources Considered High Constraints within the New York Harbor Approach Area (Map G)

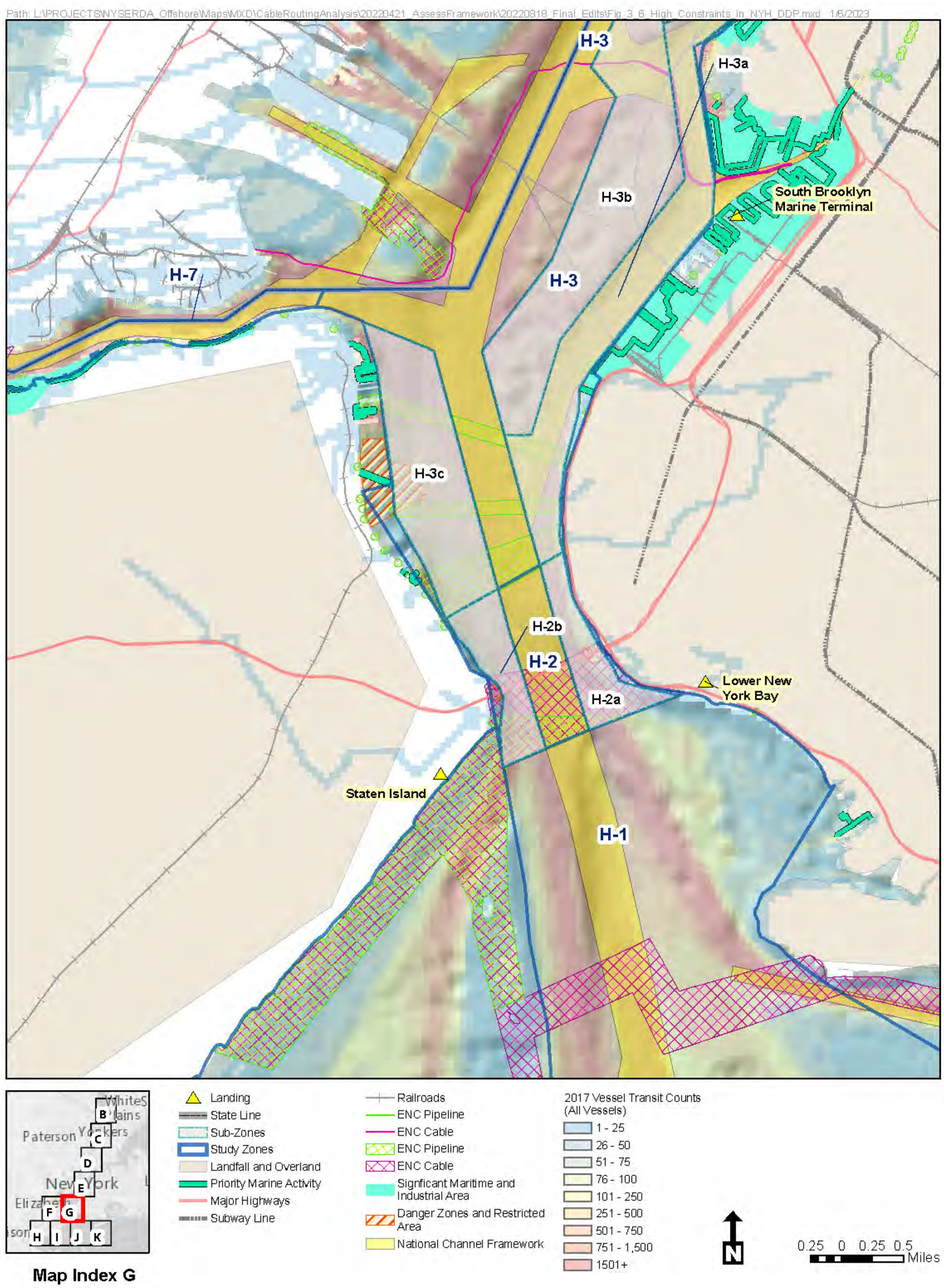


Figure 66. Resources Considered High Constraints within the New York Harbor Approach Area (Map H)

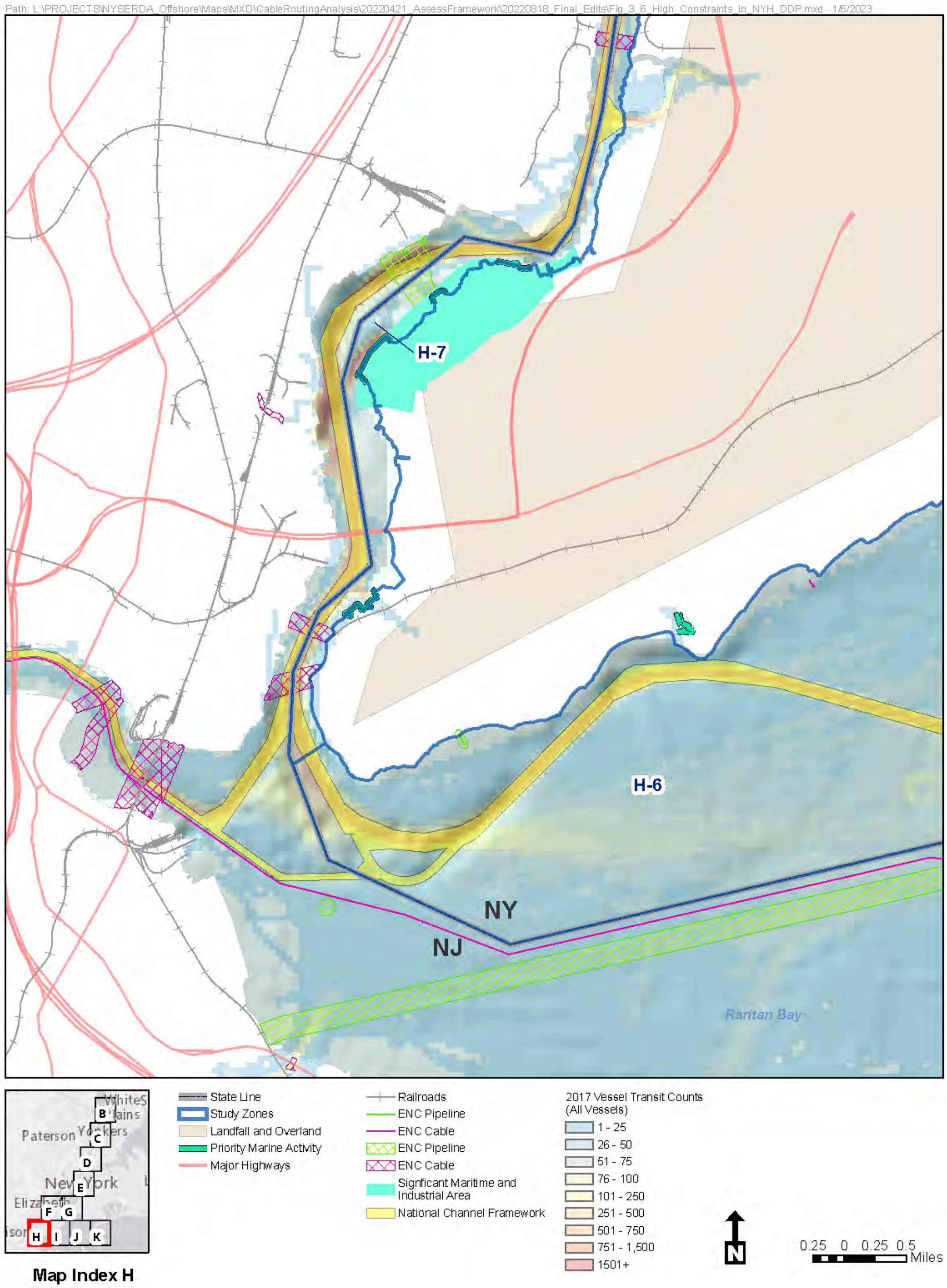


Figure 67. Resources Considered High Constraints within the New York Harbor Approach Area (Map I)

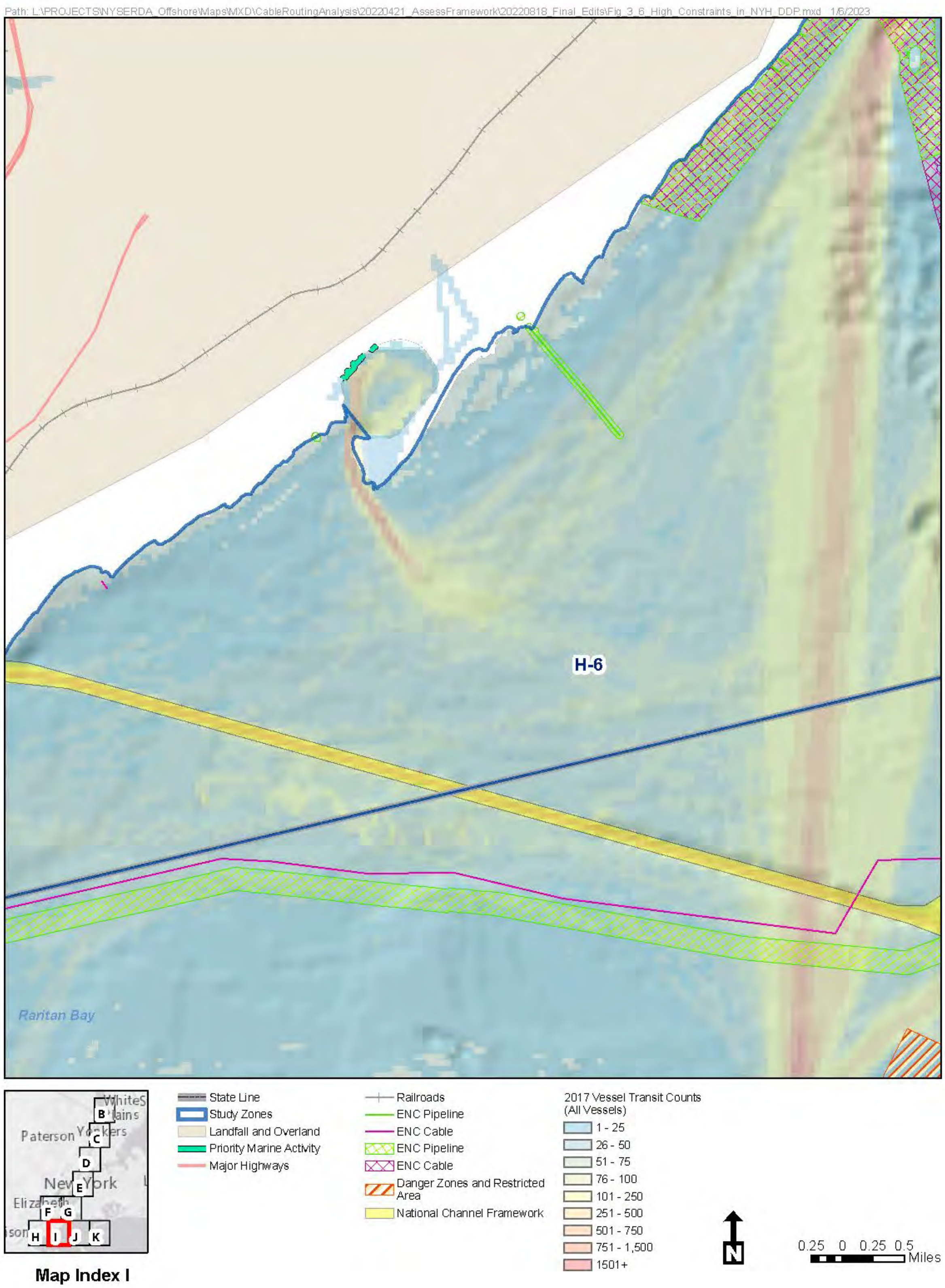


Figure 68. Resources Considered High Constraints within the New York Harbor Approach Area (Map J)

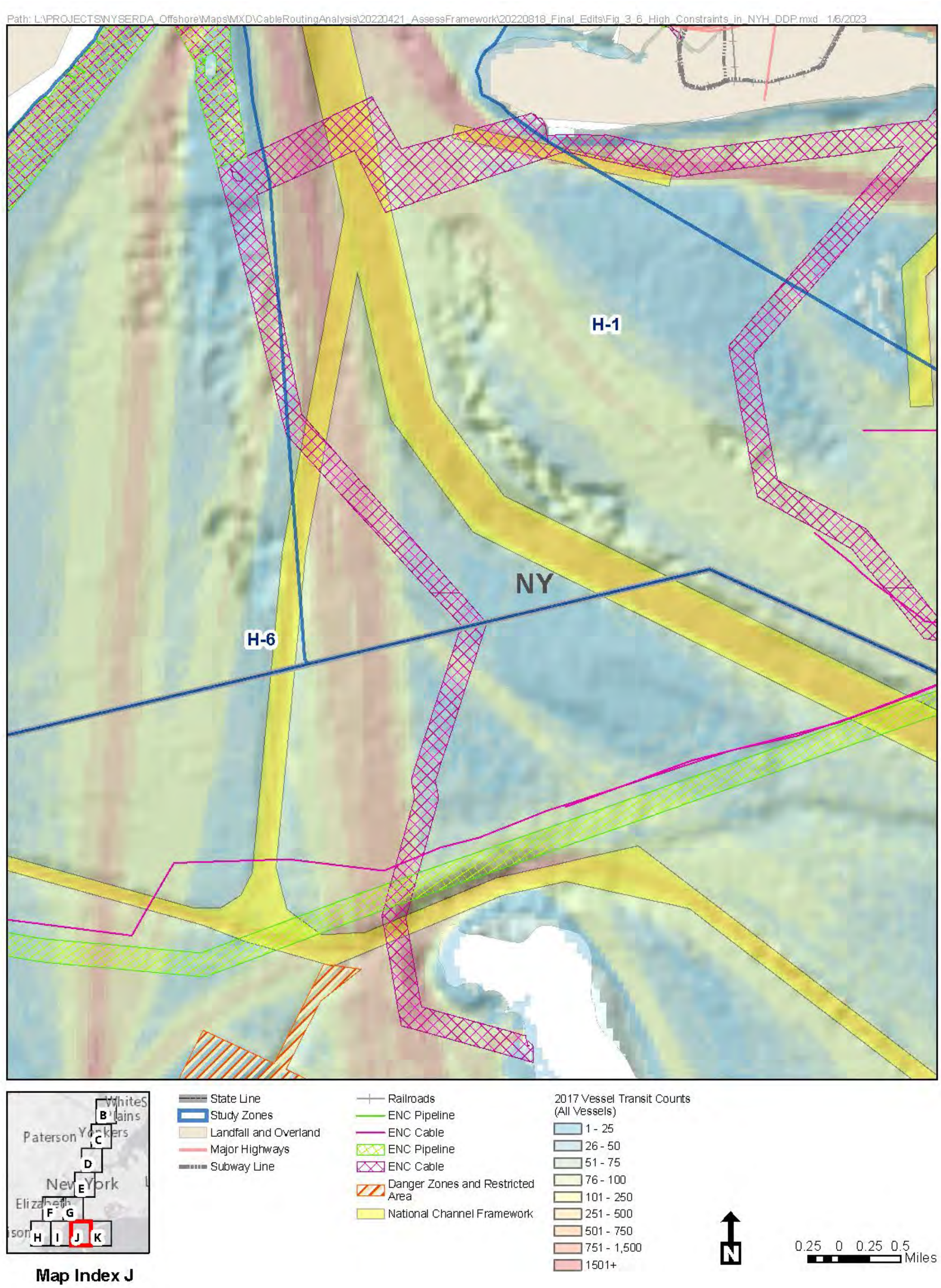


Figure 69. Resources Considered High Constraints within the New York Harbor Approach Area (Map K)

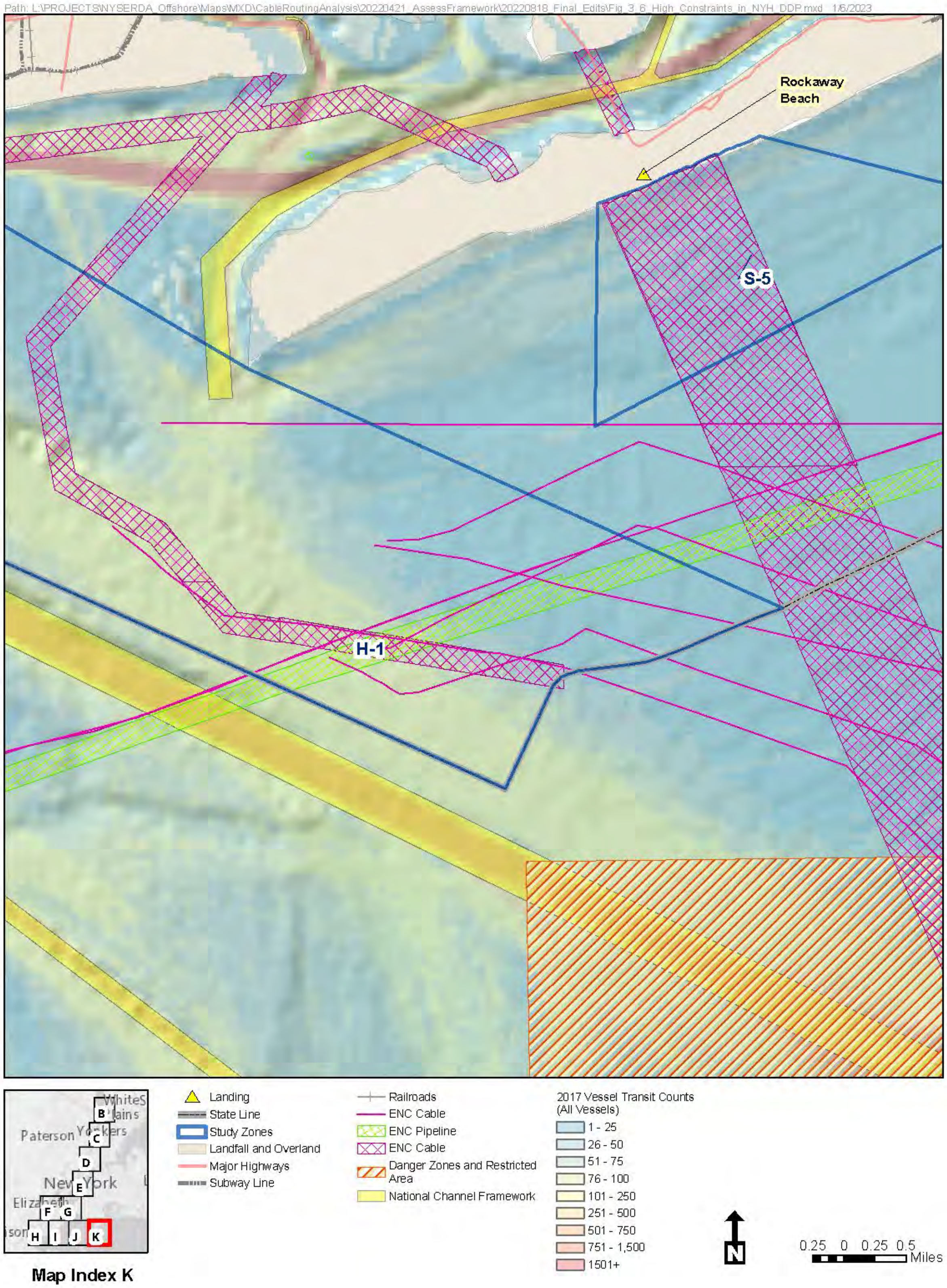
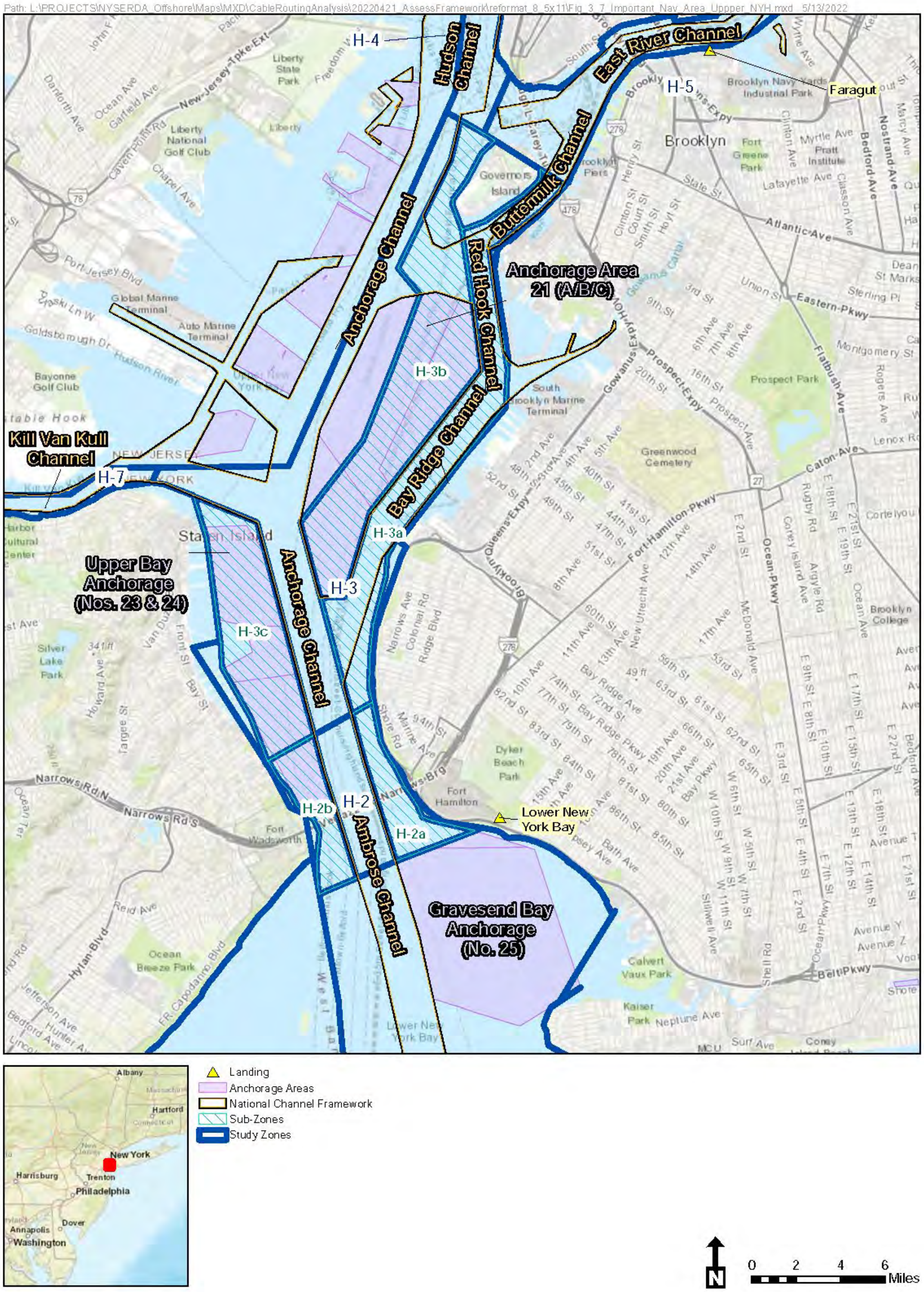


Figure 70. Important Designated Navigational Areas to OSW Cables in Upper New York Bay



3.4 Landfall and Overland Area

As discussed in the introduction to Section 3: Assessment of Constraints, this constraints assessment consolidates the resources analyzed and ranked in Section 2: Constraints Analysis, using similarities in types of impacts or types of resources. Table 29 provides the cross reference for consolidation of onshore resource topics, and this section assesses the potential constraints for overland cables and associated landings.

Table 29. Cross Reference for Consolidation and Assessment of Onshore Resources

Section 3: Onshore Resource	Section 2: Onshore Resources Included
Steep Slopes	Topography
Coastal Resources	Other Recreation Critical Species and Sensitive Habitats
Terrestrial Biological Resources	Critical Species and Sensitive Habitats
Wetlands, Surface Water, and Water Quality	Surface Water and Wetlands
Cultural Resources	Cultural Resources
Areas of Contamination	Not used in Section 2
Land Use	Land Use Linear Utilities/Outfalls Transportation Shoreline Protection
Environmental Justice Populations and Disadvantaged Communities	Environmental Justice Populations and Disadvantaged Communities

Using the same approach as the undersea analysis, the following sections describe the existing conditions of zones; potential impacts; and avoidance, minimization, and mitigation opportunities. Descriptions reflect publicly available GIS data, the CWG's knowledge regarding specific resources, and prior experience from permitted and proposed relevant projects. The descriptions of existing conditions provide an overview of the resources to facilitate an understanding of any existing unique or protected characteristics. The level of detail reflects the high, medium, and low ranking of constraints, where resources rank high for potential constraints are described in more detail as needed to address options for avoidance, minimization, and mitigation. Resources rank low are not described or minimally described because careful OSW cable siting is expected to avoid these resources. As discussed in Section 2: Constraints Analysis, rankings reflect the degree to which the resource is likely to affect feasibility of siting OSW cables and not solely the inherent or intrinsic value of a resource.

Figure 71 through Figure 83 provide an overview of existing conditions in the Landfall and Overland Area, identifying resources ranked low as potential constraints because OSW cables are expected to completely avoid them. Figure 84 through Figure 96 identifies the resources with high constraint rankings: steep slopes; coastal resources (NYCWRP designations, Significant Coastal Fish and Wildlife Habitats, recreational fishing, and wildlife viewing areas); land use (residential properties and hardened shorelines); and potential environmental justice areas and disadvantaged communities. [Note that resources with high constraint rankings include any resource ranked high for one or more zone in the entire Landfall and Overland Area.]

Potential impacts from cable installation, maintenance, and operation relevant to siting multiple OSW cables in the study area to achieve the Climate Act goals are described along with associated minimization and mitigation measures or identification of the need for innovations in design, construction, and operation to address potential impacts. Descriptions of impacts focus on the locations where resources rank high or, for consideration of cumulative potential constraints, where multiple resources rank medium. Complete avoidance of impacts is the primary or preferred approach for construction, operation, and maintenance of OSW cables. However, because design and operation cannot always avoid impacts, particularly for highly constrained resources or locations, minimization and mitigation measures provide methods for protecting and offsetting impacts to affected resources.

Table 30 through Table 40 organize the minimization and mitigation measures relevant to the Landfall and Overland Area by resource topics from Section 2; Constraints Analysis. In many cases, because a single measure addresses multiple resources, it occurs in more than one table. Similarly, some measures for a specific resource, such as air quality, address indirect impacts to other resources. Therefore, minimization and mitigation tables are not limited to measures exclusive to one resource topic. Additionally, multiple cables occurring in a constrained location may warrant additional minimization and mitigation measures. Throughout the development of the assessment, minimization, and mitigation measures were refined to reflect current understanding and expanded with minimization and mitigation opportunities that will facilitate locating multiple cables needed to achieve the mandates of the Climate Act under the Article VII process. Where applicable, expanded measures or innovative concepts to avoid, minimize, and mitigate impacts are identified for the constraints of most concern.

Table 30. Steep Slopes, Soils, and Erosion Control Minimization Measures

Item	Steep Slopes, Soils, and Erosion Control
Minimization	
1	Develop a dewatering plan.
2	Prepare a stormwater pollution prevention plan (SWPPP) for the project. Ensure that the appropriate dewatering measures are implemented during construction. The SWPPP will be used to minimize any potential impacts to existing groundwater and soils. The SWPPP will include temporary erosion control measures (e.g., silt fence, compost filter sock, straw bales) to be used during construction to reduce the risk of soil erosion, fugitive dust from exposed soils, and siltation. A Soil Handling and Erosion Control Plan will be included within the SWPPP (to include specifications for testing, stockpiling, reuse or removal from site, storage, erosion control, restoration, and compaction of backfill in trenches).
3	Where avoidance of steep slopes cannot be achieved, including within a designated CEHA, perform an assessment to identify the presence of erosion potential and erosion-prone areas utilizing desktop and site-survey methods and include, as appropriate, in construction and restoration planning.
4	Implement soil and sediment control measures early in the construction process. Install these measures prior to disturbance and maintain them in acceptable condition for the duration of the project, beginning with any clearing or earthmoving operations through to the permanent stabilization of the soil.
5	Segregate topsoil from subsoil and replace topsoil in the original horizons.
6	Stabilize disturbed areas and examine excavated soils to determine their suitability for reuse on-site; where reuse is not possible, dispose of excavated soils at an NYSDEC-permitted facility.
7	For locations where material exceeds NYSDEC standards, criteria, or identified guidance values, identify offsite sources of clean backfill.
8	Restore disturbed areas, ruts, and rills to original grades and conditions with permanent revegetation and erosion controls appropriate for those locations.
9	Restore disturbed areas of more moderate slopes to pre-construction conditions. Implement temporary stabilization measures within the temporary workspace to minimize soil erosion.

Table 31. Coastal Resources Minimization and Mitigation Measures

Item	Coastal Resources
Minimization	
1	Run cables near and parallel to existing utilities to limit cable footprint and habitat fragmentation.
2	Design cable landings and shore crossing as perpendicular as possible to the existing shoreline.
3	Confirm with the Natural Heritage Program whether any known rare, threatened, or endangered species, including plant species, occurrences are near the proposed project area prior to Article VII filing and prior to construction. Additionally, consult with NYSDEC on necessary steps to avoid and minimize impacts to these species. Develop a plan of protective measures to be implemented and a Net Conservation Benefit Plan if there will be a take of listed T&E species.
4	Prioritize scheduling construction activities for outside the summer tourist season, which is generally between Memorial Day and Labor Day.
5	Conduct an alternatives analysis to identify the most appropriate installation methodology for crossing sensitive resources.
6	Develop a hierarchy of construction techniques to identify the most appropriate installation methodology for crossing sensitive resources based on: resource impacts, site specific conditions, technical constraints, etc.
7	Adhere to all relevant TOYRs for protected species present in the area. Prepare an agency-approved construction monitoring and impact minimization plan if work must occur outside of TOYR work windows.
8	Coordinate installation of multiple projects at a single time in a single location, to the maximum extent practicable.

Table 31 continued

Item	Coastal Resources
	Minimization
9	Develop an Inadvertent Returns Plan that addresses prevention, control, and clean-up of potential IR. Recirculate and recycle drilling fluids used during HDD construction to the extent practicable, minimizing the required water use. Use best efforts to recover and dispose of HDD drilling fluids and cuttings. In the event of an IR, conduct upstream/downstream turbidity monitoring to verify extent of impacts and inform clean-up efforts.
10	Develop and implement spill response and cleanup procedures to minimize and respond to any accidental spills of petroleum producing chemicals or hazardous liquids that occur during construction.
11	Complete a cable installation plan during the Article VII filing, detailing how cable installation will be managed to ensure disruption is minimized along the cable route in NYS waters.
12	Prepare an avian management plan to avoid and minimize impacts to protected bird species. Limit onshore construction to autumn and winter to avoid impacts to the nesting and migratory activity of T&E bird species.
13	Meet the Tier III NO_x standard established by the IMO, where applicable, for all marine vessels constructed on or after January 1, 2016, when operating within New York state waters.
14	Use low-sulfur diesel fuel for marine where possible and be at or below the maximum fuel sulfur content requirement of 1,000 parts per million established per the requirements of 40 CFR § 80.510(k), where applicable.
15	Establish a noise complaint hotline to help actively address all noise-related issues.
16	Use ultra-low sulfur diesel fuel, per the requirements of 40 CFR § 80.510(b), for onshore diesel-powered construction equipment and vehicles, where applicable, and consider the use of alternative fuels, where practicable.
17	Keep construction equipment well-maintained and routinely check vehicles using internal combustion engines equipped with mufflers to ensure they are in good working order.
18	Use quieter equipment backup alarms, such as white-noise or other Occupational Safety and Health Administration (OSHA)-approved technology.
19	Use trenchless installation methods to avoid and minimize potential impacts to marinas, nearshore zones, benthic resources, and water quality. Installation and burial of cables using trenchless methods, mechanical plow, jet plow, hand jet, and/or mechanical cutter generally result in less habitat modification than trenching and dredging options. Where applicable, install temporary cofferdams to contain sediment disturbed during landfall to minimize suspended sediment and turbidity effects in nearshore habitats.
20	Install cable at a minimum burial depth of 6 feet (measured from top of cable) below the existing seabed. Should the burial depth not be achieved during the initial pass of the cable installation tool that is best suited to achieve burial depth, perform up to two additional passes with the installation tool, or another burial tool that complies with project requirements, unless (a) additional passes risk causing damage to the cable or the installation tool; or (b) due to geologic obstructions, additional passes would not increase the burial depth or risk causing cable exposure. Use best efforts to micro-route the cable within the cable corridor to achieve burial depth during installation.
21	Use trenchless crossing methods at shore crossings to minimize impacts to recreational resources.
22	Bury submarine export cables to >15 feet below the current/future authorized depth or depth of existing seabed (whichever is deeper) of federally maintained navigation features (e.g., anchorages and shipping channels). Outside federally maintained navigation features, install cables to the maximum depth achievable in a single trench using site-appropriate installation equipment at least 6 feet depth. In some nearshore areas closer to beaches, depths of 6 feet and greater may be appropriate. If sand waves are present, install cables to a maximum depth achievable in a single trench below the existing seabed, as feasible. This does not include nearshore areas and achievable burial depths for HDD.
23	Conduct HDD conduit pipe stringing on private lands (marinas, port facilities) or public roads to avoid recreational areas.
24	Operate, store, and safely contain all equipment and machinery 500 feet from nesting and foraging areas of shorebirds.

Table 31 continued

Item	Coastal Resources
	Minimization
25	Limit lighting to that which is required for safety and compliance with applicable regulations is expected to minimize impacts to avian species. Implement lighting type/timing that will limit impacts to species attracted to light (turtles laying eggs on beach).
26	Utilize environmental monitors for environmentally sensitive phases of construction in areas such as water crossings, significant wildlife, or rare plant habitats. For minimizing impacts to rare, threatened, and endangered species, environmental monitors must be qualified with the specific species.
27	Do not conduct construction activities within 500 feet of a dune or beach during time of year restriction period for nesting or migrating shorebirds and bald eagles.
28	Unless otherwise necessary for safety purposes, maintain continual pedestrian and vehicular use of and access to park amenities and all other existing public access areas.
	Mitigation
1	Establish a Trust solely for the purposes of protecting, restoring, and improving aquatic habitats and fisheries resources to mitigate and study the short- and long-term impacts and risks to aquatic resources from construction and operation.
2	Mitigate direct and indirect impacts to SAV that are unavoidable.
3	Prepare an endangered or threatened species mitigation plan and implementation agreement if any work is likely to result in an incidental take of a threatened and or endangered species; the plan must demonstrate that proposed mitigation measures will result in a net conservation benefit to that species.

Table 32. Terrestrial Biological Resources Minimization and Mitigation Measures

Item	Terrestrial Biological Resources
	Minimization
1	Run cables near and parallel to existing utilities to limit cable footprint and habitat fragmentation.
2	Confirm with the Natural Heritage Program whether any known rare, threatened, or endangered species, including plant species, occurrences are near the proposed project area prior to Article VII filing and prior to construction. Additionally, consult with NYSDEC on necessary steps to avoid and minimize impacts to these species. Develop a plan of protective measures to be implemented and a Net Conservation Benefit Plan if there will be a take of listed T&E species.
3	Site facilities primarily within previously disturbed and developed areas (e.g., roadways, ROWs, developed industrial/commercial areas) to the extent feasible, to minimize impacts to terrestrial ecology; rare, T&E plants and wildlife.
4	Develop a hierarchy of construction techniques to identify the most appropriate installation methodology for crossing sensitive resources based on resource impacts, site-specific conditions, technical constraints, etc.
5	Limit overhead utility poles to minimize impacts to birds, visual impacts, and enhance storm resiliency.
6	Install cables underground within public ROW to the maximum extent practicable and locate majority of cable underground to limit vegetation management activities during operation to only those needed for protection of the buried cable and to maintain access, where needed.
7	Develop a restoration plan which details how disturbed areas will be revegetated. The plan should also detail temporary stabilization measures that will be implemented should permanent restoration not be immediately possible (e.g., due to winter weather conditions). Use straw mulch, not hay, to minimize the spread of invasive species.
9	Adhere to all relevant TOYRs for protected species present in the area. Prepare an agency-approved (including NYSDEC) construction monitoring and impact minimization plan if work must occur outside of work windows.

Table 32 continued

Item	Terrestrial Biological Resources
	Minimization
10	Develop an invasive species prevention and management plan to minimize the potential for further spread of invasive species and to limit the introduction of new invasive species occurrences.
11	Develop a northern long-eared bat monitoring and impact minimization plan that outlines minimization measures and monitoring protocols to be implemented during onshore construction (including the sea-to-shore transition) to avoid and/or minimize impacts to the species and/or their habitats. Use the plan if the project extends outside the construction window.
12	Develop and implement spill response and cleanup procedures to minimize and respond to any accidental spills of petroleum producing chemicals or hazardous liquids that occur during construction.
13	Develop an Inadvertent Returns Plan that addresses prevention, control, and clean-up of potential IR. Recirculate and recycle drilling fluids used during HDD construction to the extent practicable, minimizing the required water use. Use best efforts to recover and dispose of HDD drilling fluids and cuttings. In the event of an IR, conduct upstream/downstream turbidity monitoring to verify extent of impacts and inform clean-up efforts.
14	Utilize environmental monitors for environmentally sensitive phases of construction in areas such as water crossings, significant wildlife, or rare plant habitats. For minimizing impacts to rare, threatened, and endangered species, environmental monitors must be qualified with the specific species.
15	Clear trees only during bat hibernation periods, which is to be confirmed by NYSDEC, to minimize construction and maintenance impacts to northern long-eared bats.
16	Apply suitable seed mixture to disturbed areas to revegetate and stabilize the cable easement. Stabilize areas in accordance with their previous and continued use.
17	Use only NYSDEC-registered pesticides and follow State and federal pesticides laws and regulations.
	Mitigation
1	Prepare an endangered or threatened species mitigation plan and implementation agreement if any work is likely to result in an incidental take of a threatened and or endangered species; the plan must demonstrate that proposed mitigation measures will result in a net conservation benefit to that species.
2	Replace cleared or damaged trees with the equivalent type of trees or shrubs.

Table 33. Wetlands, Surface Waters, and Water Quality Minimization Measures and Mitigation

Item	Wetlands, Surface Waters, and Water Quality
	Minimization
1	During project siting activities, design any activities (survey, construction, operation, and maintenance) that may affect regulated wetlands, streams, or waterbodies to avoid and if avoidance is not feasible, minimize adverse impacts while considering environmental features and functions of the regulated wetlands and adjacent area, to the maximum extent practicable, in consultation with NYSDEC.
2	Design cable trench depths to minimize potential impacts to surface and groundwater resources.
3	Confirm with the Natural Heritage Program whether any known rare, threatened, or endangered species, including plant species, occurrences are near the proposed project area prior to Article VII filing and prior to construction. Additionally, consult with NYSDEC on necessary steps to avoid and minimize impacts to these species. Develop a plan of protective measures to be implemented and a Net Conservation Benefit Plan if there will be a take of listed T&E species.
4	Consult with NYSDEC on necessary steps to avoid and minimize impacts to T&E species.
5	Develop and implement spill response and cleanup procedures to minimize and respond to any accidental spills of petroleum-producing chemicals or hazardous liquids that occur during construction.

Table 33 continued

Item	Wetlands, Surface Waters, and Water Quality
	Minimization
6	Ensure that construction, operations, maintenance, and decommissioning comply with applicable state and federal water quality laws.
7	Operate in accordance with NYSDEC Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State. Require authorization under the State SPDES program.
8	Where avoidance is not feasible, develop a wetland impact minimization and mitigation plan and delineate the boundary of regulated and tidal wetlands prior to construction, in consultation with NYSDEC. Leave markers that delineate/define the boundary of regulated freshwater and tidal wetland in place and the demarcated limits of disturbance for the Project until completion of construction activities and restoration of the impacted area.
9	Use trenchless crossings of all wetlands and streams, to the maximum extent practicable, and provide justification if this is not practicable. Identify the class of streams for all proposed crossings; avoid first-order streams to the maximum extent practicable.
10	If a trenchless stream crossing is unavoidable, prepare a stream crossing plan, in conformance with NYSDEC guidance. Re-establish stream banks to original grade immediately after stream bank work is completed and. Permanently stabilize the banks by seeding with native grasses, mulching, and, if needed, planting native shrub seedlings.
11	Develop an inadvertent returns plan that addresses prevention, control, and clean-up of potential IR. Recirculate and recycle drilling fluids used during HDD construction to the extent practicable, minimizing the required water use. Use best efforts to recover and dispose of HDD drilling fluids and cuttings. In the event of an inadvertent release, conduct upstream/downstream turbidity monitoring to verify extent of impacts and inform clean-up efforts.
12	Develop a hierarchy of construction techniques to identify the most appropriate installation methodology for crossing sensitive resources based upon resource impacts, site specific conditions, technical constraints, costs, etc.
13	Prohibit any work that may result in the suspension of sediments in all streams designated as "C(T)" and "C(TS)" streams during the trout spawning and incubation periods. Consult with NYSDEC on appropriate work windows.
14	Do not conduct construction activities within any regulated wetlands, including tidal and freshwater wetlands, or associated adjacent areas, and prohibit, equipment, or vehicles from entering such wetlands.
15	Institute precautions for movement of vehicles or equipment from an environmentally sensitive area to a suitable access area, to prevent petroleum products or hazardous materials from being released into the environment.
16	Maintain erosion and sedimentation controls until the ROW has been revegetated and/or stabilized in accordance with preexisting conditions.
17	Limit clearing of existing vegetation in wetlands or in or near waterbodies to that necessary to allow completion of construction and to allow for reasonable access for long-term maintenance.
18	To prevent discharge into wetlands or state and local-regulated wetland adjacent areas, ensure that all construction activities adhere to the 300-foot or 150 feet (if in New York City) and 100-foot wetland setbacks for tidal and freshwater wetlands, respectively.
19	Stockpile excavated material outside regulated wetland areas and dispose of all excess material in approved overland locations.
20	Discharge ready-mix concrete chute washout into appropriate containment structures for off-site disposal; do not dispose of excess concrete in the ROW.
21	Do not wash equipment or machinery in any regulated wetland or adjacent area.
22	Install sedimentation/erosion control devices to prevent sedimentation into freshwater and tidal wetlands during construction. Install these sedimentation/erosion control devices prior to construction and ensure that they remain in place while working within 100 feet of the wetland.

Table 33 continued

Item	Wetlands, Surface Waters, and Water Quality
Minimization	
23	Adhere to the 300-foot or 150-foot (if in New York City) tidal and 100-foot freshwater wetland setbacks for certain activities including concrete batch operations, repairing, and refueling equipment, equipment and machinery storage, and fuel and hazardous chemical storage.
24	If impacts to wetlands are unavoidable, complete construction through regulated wetlands or adjacent areas with tracked equipment, on temporary mats, or on geotextile/gravel access roads. Such options should be chosen in consultation with NYSDEC.
25	Store all dewatering pumps operated closer than 100 feet from wetlands or waterbodies, or within 300 feet or 150 feet (if in New York City) from tidal wetlands, within secondary containment large enough to hold the pump and accommodate refueling.
26	Monitor for resuspension of chemical constituents during underwater cable installation for exceedances of designated thresholds. If a threshold is exceeded, conduct additional water quality sampling at the location in question, as specified in DPS and NYSDEC approved sampling protocols.
27	Employ measures sufficient to prevent contamination of the waters by fuels, drilling fluids, concrete, or any other hazardous material.
28	At the end of each workday, safely secure equipment and machinery more than 100 feet landward of any wetland or waterbody, and more than 300 feet or 150 feet (if in New York City) from tidal wetlands, unless moving the equipment will cause additional environmental impact.
29	Establish and implement a program to monitor the success of wetland and stream restoration upon completion of construction and restoration activities.
Mitigation	
1	Establish a Trust solely for the purposes of protecting, restoring, and improving aquatic habitats and fisheries resources to mitigate and study the short- and long-term impacts and risks to aquatic resources from construction and operation.

Table 34. Areas of Contamination Minimization Measures

Item	Areas of Contamination
Minimization	
1	For any projects going through an area with known contamination, contact NYSDEC early in the planning process regarding what may be required.
2	If necessary, prepare a Hazardous Waste and Petroleum Work Plan to address the steps to be taken if contaminated soils or water are encountered during project excavation.
3	Develop a plan to address detection of contamination in the ground during overland construction, including measures to address contamination that will lead to volatilization or off-gassing of such contamination or chemical constituents thereof.
4	Maintain Safety Data Sheets for petroleum products and chemicals on site.
5	Follow accurate record keeping requirements as to the quantity and nature of hazardous wastes generated on site.
6	Do not allow oils, hydraulic fluids, greases, and soaps to be washed off vehicles and/or equipment onto the ground.
7	Monitor on-site construction vehicles, including contractor and employee vehicles, for leaks.
8	Perform regular preventative maintenance to reduce the risk of leakage.
9	Remove or immediately repair any equipment that is leaking oil, fuel, or hydraulic fluid.

Table 34 continued

Item	Areas of Contamination
Minimization	
10	Store petroleum products and hydraulic fluids in tightly sealed, clearly labeled containers within cabinets or on a stable working surface such as a portable trailer bed or other secure docking. Use appropriate storage and, when necessary, use NYSDOT-approved transportation containers, along with secondary containment measures.
11	If an unexpected significant volume of historic fill is encountered, handle, store, and transport impacted soils and historic fill materials in accordance with all applicable local, State, and federal regulations. If impacted material is encountered, provide applicable air monitoring and vapor mitigation. Restrict public access to any work or storage areas where impacted soil is encountered.
12	Prepare field equipment rinsate blanks and analyze to monitor the effectiveness of field decontamination procedures. Use vendor decontaminated, dedicated, disposable equipment to minimize cross contamination.
13	Dispose of all contaminated sediments excavated during construction of the project in a State-approved upland disposal site. Do not place excavated contaminated sediment back into a waterbody.
14	Prior to shipping hazardous wastes, verify that the hazardous waste transporters servicing the project have required licenses, registrations, and/or a USEPA identification number that the waste is disposed at an approved/licensed facility.

Table 35. Cultural Resources Minimization and Mitigation Measures

Item	Cultural Resources
Minimization	
1	Conduct careful site selection to limit visibility from historic properties, which may include screening and adding distance between the facility component and the historic property(ies).
2	Provide mitigation measures for cultural resource sites, archaeological sites, and historic structures by implementing location, design, vegetation management (through an approved vegetation protection, removal, replacement, resource protection, and construction scheduling measures, restoration, and maintenance plan).
3	Site project aspects using guidance from cultural resources surveys, to avoid or minimize impacts to potential terrestrial archaeological resources. Refrain from undertaking construction in areas where archaeological surveys have not been completed and not until the appropriate agencies, Indian Nations and Tribes, and other consulting parties have reviewed the results of the surveys.
4	Involve Indian Nations and Tribes in design, execution, and interpretation of the results of the surveys for the project.
5	Consider size/color of new permanent structures visible from surroundings.
6	Design buildings to minimize visibility and visual impacts, including materials that minimize glare and that are neutral in color. The design should include appropriate landscaping at the site.
7	Design exterior night lighting of buildings to provide illumination necessary for worker safety and site security purposes; consider energy conservation, glare, and the minimization of light trespass; and select and install lighting to shield the lamp filaments from direct view to the greatest extent possible (i.e., full-cutoff fixtures without drop-down optics, and use task lighting for maintenance purposes where feasible, and minimize upward lighting).
8	Limit overhead utility poles to minimize visual impacts and enhance storm resiliency.
9	Complete a cable installation plan during the Article VII filing, detailing how cable installation will be managed to ensure disruption is minimized along the cable route in NYS waters.

Table 35 continued

Item	Cultural Resources
Minimization	
10	Develop a cultural resources management plan in consultation with the appropriate agencies, Indian Nations and Tribes, and other stakeholders to provide for the identification, evaluation, and management of historic properties within the Area of Potential Effects. The cultural resources management plan will outline how to resolve adverse effects on historic properties and provide the appropriate treatment, avoidance, or mitigation of impacts, if applicable.
11	Identify existing municipality tree clearing plans. Prepare a detailed plan for tree clearing and vegetation removal for inclusion in the Erosion Management and Construction Plan that describes the process for disposal of cleared trees and other vegetation. Plan for tree clearing and vegetation removal to be completed within a reasonable amount of time following completion of construction. Tree clearing should be directed by a certified arborist and reflect preservation, to the extent feasible, of existing trees, particularly old growth, specimen, and landscape trees, and vegetative buffers to mitigate noise and visual impacts. Restore all disturbed vegetation, removed trees, and disturbed landscaping within the ROW of the project route as work is completed or within a reasonable amount of time following completion of construction.
12	Prepare an unanticipated discovery plan in accordance with NYS and federal laws for any unanticipated discoveries during construction.
13	Prepare a noise mitigation plan for noise-sensitive sites showing the locations of residential areas and other noise-sensitive areas along the proposed ROW of the OSW facility and the specific procedures to be followed to minimize noise impacts related to ROW clearing, facility construction, and operation for the facility.
14	Prepare a fugitive dust control plan to be implemented to minimize dust (visual pollution).
15	Install cables underground within public ROW to the maximum extent practicable and locate the majority of cable underground to limit vegetation management activities during operation.
16	To minimize impacts to visual resources from use of the temporary workspace areas, limit proposed vegetation clearing to an approximate 25- to 50-foot-wide area parallel to the existing, cleared ROWs.
17	Reduce the amount of E80 shoring required and the duration of construction to further reduce the noise and visual impact from construction.
18	Progress construction activities along the project route so as to expose each area for a limited amount of time, minimizing the period of visual impacts during construction in each area.
19	Maintain the aesthetic quality along the project route by installing a new underground circuit within public roadway ROW. In addition to roadway ROW, other existing utility, transportation, or linear ROWs may be utilized. Locate laydown, staging, and work areas in areas of impervious cover to avoid unnecessary ground disturbance.
20	Employ minimum avoidance areas of 164 feet surrounding known archaeological resources to reduce the chances of accidental disturbance. Evaluate temporary construction workspaces and laydown areas for archaeological sensitivity prior to the start of construction.
21	Cease all construction activities if archaeological materials are encountered during construction, stabilize the area, and protect the site from further damage. Notify and seek to consult with appropriate agencies, Indian Nations and Tribes, and other pertinent consulting parties. No ground-disturbing activities will be permitted in the vicinity until the significance of the resource has been evaluated.
22	If archaeological materials are encountered during construction, stabilize the area, cease all construction activities in the immediate vicinity of the find, and protect the site from further damage. Within 24 hours of such discovery, notify and seek to consult with appropriate agencies and Indian Nations and Tribes, and other pertinent consulting parties to determine the best course of action. Do not conduct any ground-disturbing activities in the vicinity of the archaeological materials until such time as the significance of the resource has been evaluated and the need for and scope of impact mitigation have been determined.

Table 35 continued

Item	Cultural Resources
Minimization	
23	Immediately halt all work in the vicinity of the find if human remains or evidence of human burials are encountered during construction and protect the location from further disturbance. Within 24 hours of any such discovery notify the appropriate agencies, Indian Nations and Tribes, and other pertinent consulting parties. Treat and dispose of any human remains that may be discovered in a manner consistent with the Native American Graves Protection and Repatriation Act; the Advisory Council on Historic Preservation's Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Objects (February 2007); and OPRHP's Human Remains Discovery Protocol.
24	Continue outreach and engagement with the local community, relevant agencies, interested Indian Nations and Tribes, and other stakeholders throughout the construction process.
25	Continue to respond to complaints of negative archaeological impacts and consult with appropriate parties identified in the Cultural Resources Management Plan to resolve adverse effects and determine the appropriate avoidance, treatment, or mitigation measures throughout the life of the OSW facility.

Table 36. Land Use Minimization and Mitigation Measures

Item	Land Use
Minimization	
1	To identify active agricultural land, during the acquisition of rights to use lands comprising the Construction Zone, the developer will ask the owners of such lands that appear to be either undeveloped or used as active agricultural land whether the lands are presently being used for agricultural purposes and, if so, whether the lands are being operated.
2	Promote compatibility with existing and future land use, as outlined in local municipal planning documents.
3	Comply with the 2016 New York State Open Space Conservation Plan, as practicable.
4	Avoid CEHAs with appropriate routing and engineering design.
5	Prepare a fugitive dust control plan to be implemented to minimize dust (visual pollution).
6	Prepare a noise mitigation plan for noise sensitive sites showing the locations of residential areas and other noise-sensitive areas along the proposed ROW and the specific procedures to be followed to minimize noise impacts related to ROW clearing, construction, and operation.
7	Develop a restoration plan that details how disturbed areas will be revegetated. The plan should also detail temporary stabilization measures that will be implemented should permanent restoration not be immediately possible (e.g., due to winter weather conditions). Use straw mulch, not hay, to minimize the spread of invasive species. The plan should also detail how cleared trees and shrubs will be replaced.
8	Establish a noise complaint hotline to help actively address all noise-related issues.
9	Develop and implement a public involvement plan, including regular updates to the local community through social media, public notices, the Project website, and/or other appropriate communications tools.
10	Identify and contact affected emergency response facilities.
11	Coordinate construction activities with local government officials, including schedules for road and lane closures and nighttime construction work as well as effective methods of dissemination of such information to the public.
12	Provide locations of sound mitigation measures to municipal planning and zoning officials and organizations identified in community engagement plan at least 60 days prior to the start of construction. These drawings should include sound information for all noise sources.
13	Provide adjacent landowners timely information regarding the planned construction activities and schedule.

Table 36 continued

Item	Cultural Resources
Minimization	
14	Select staging location(s) of HDD and other equipment to minimize impacts to trees.
15	Use ultra-low sulfur diesel fuel, per the requirements of 40 CFR § 80.510(b), for onshore diesel-powered construction equipment and vehicles, and consider the use of alternative fuels, where practicable.
16	Keep construction equipment well-maintained and routinely check vehicles using internal combustion engines equipped with mufflers to ensure that they are in good working order.
17	Use quieter equipment backup alarms, such as white-noise or other OSHA-approved technology.
18	Apply the following measures at residential areas and other noise sensitive locations: public outreach, appropriate work hour/work operation restrictions, temporary sound barriers, employment of equipment fitted with sound deadening materials, selection of low noise equipment and procedures, and other noise reduction work methods or devices as determined appropriate for the locale and tasks.
19	Designate parking for project construction workers in designated areas outside the NYSDOT ROW that do not interfere with normal traffic, cause a safety hazard, or interfere with existing land uses. Minimize on-site parking for workers, where practicable.
20	Locate laydown, staging, and parking areas in areas of impervious cover to the extent practicable and thus avoid unnecessary ground disturbance.
21	Implement screening to the extent feasible, to reduce potential visibility and impacts to adjacent land uses.
22	Perform construction activities in accordance with local zoning requirements or other regulatory approvals. Comply with local land use plans and policies.
23	Use trenchless installation methods to avoid and minimize potential impacts to marinas, nearshore zones, benthic resources, water quality. Install and bury cables using trenchless methods, mechanical plow, jet plow, hand jet, and/or mechanical cutter, landfall methods to minimize suspended sediment and turbidity effects in nearshore habitats, to generally result in less habitat modification than trenching and dredging options. Where applicable, install a temporary cofferdam that will contain sediment disturbed.
24	Minimize potential impacts to adjacent agricultural land by limiting vegetation clearing and ground disturbance to the construction corridor.
25	Implement provisions for minimizing the duration and extent of open excavation, traffic disruptions, and work within and adjoining public streets, public street ROWs, and bike paths.
26	Implement security measures to monitor and properly mark active construction sites, such as temporary fences, steel plates, and cones. Use appropriate signage placed to warn pedestrians and drivers of active construction during construction.
27	Backfill roadside boring and receiving pits for a distance of at least 15 feet from the travel portion of the road within one week of the facility installation unless conditions or circumstances warrant a different period.
28	Restore areas within or adjacent to vegetated areas (maintained landscaping within the ROW, parklands, recreational parks, and golf courses, and maintained lawns) to original condition or as close as reasonably possible within a reasonable amount of time following completion of construction.

Table 37. Linear Utilities Minimization and Mitigation Measures

Item	Linear Utilities
Minimization	
1	Prioritize co-locating linear utilities along existing corridors.
2	Site cables to cross existing utilities and vessel routes (channels, fairways, etc.) as close to perpendicular as possible.
3	Engineer facilities to be fully compatible with the operation of nearby electrical, gas, telecommunication, water, sewer, and related facilities and ensure proper coordination of the cathodic protection of the pipeline with the transmission structures' foundations, adjacent electric, gas, telecommunication, water, sewer, and related facilities. Take remedial measures with regard to cathodic protection system if, upon monitoring, such measures are indicated.
4	Complete a cable installation plan during the Article VII filing, detailing how cable installation will be managed to ensure disruption is minimized along the cable route in NYS waters.
5	Conduct an interference study for each location where critical infrastructure is crossed or in proximity, specifying proposed minimization/mitigation measures.
6	Conduct a study to determine if there may be corrosive effects on any critical infrastructure, specifying proposed minimization measures to decrease corrosive effects.
7	Perform construction activities in accordance with local zoning requirements or other regulatory approvals. Comply with local land use plans and policies.
8	Use trenchless installation methods to avoid and minimize potential impacts to marinas, nearshore zones, benthic resources, and water quality. Install and bury cables using trenchless methods, mechanical plow, jet plow, hand jet, and/or mechanical cutter, to generally result in less habitat modification than trenching and dredging options. Where applicable, install temporary cofferdams to contain sediment disturbed during landfall to minimize suspended sediment and turbidity effects in nearshore habitats.

Table 38. Shoreline Protection Minimization and Mitigation Measures

Item	Shoreline Protection
Minimization	
1	Design cable landings and shore crossing as perpendicular as possible to the existing shoreline.
2	Prioritize scheduling construction activities for outside the summer tourist season, which is generally between Memorial Day and Labor Day.
3	Coordinate early with any directly affected waterfront facility owners/operators.
4	Develop a hierarchy of construction techniques to identify the most appropriate installation methodology for crossing sensitive resources based on resource impacts, site-specific conditions, technical constraints, etc.
5	Use trenchless installation methods to avoid and minimize potential impacts to marinas, CEHAs, nearshore zones, aquatic resources, and water quality. Install and bury cables using trenchless methods, mechanical plow, jet plow, hand jet, and/or mechanical cutter, to generally result in less habitat modification than trenching and dredging options. Where applicable, install temporary cofferdams to contain sediment disturbed during landfall to minimize suspended sediment and turbidity effects in nearshore habitats.
6	Use non-trenching solutions to cross under waterfront infrastructure (e.g., bulkheads).

Table 39. Transportation Minimization and Mitigation Measures

Item	Transportation
Minimization	
1	Develop a traffic management plan, to be developed in coordination local municipalities and Department(s) of Transportation.
2	Develop and implement a public involvement plan, including regular updates to the local community through social media, public notices, the Project website, and/or other appropriate communications tools.
3	Coordinate work with local and State Department(s) of Transportation and meet FHWA requirements.
4	Consult with all school districts traversed by the Project Route to coordinate student transportation and pedestrian safety matters. Outreach should include informing parents and crossing guards of the construction schedule and the impacts to particular walking routes.
5	Where applicable, conduct an alternatives analysis to demonstrate there are no feasible alternatives to the longitudinal installation of a transmission cable along limited access highways with control access lines (“CAL”), which require FHWA approval (17 NYCRR Part 131; 23 CFR § 645.211 and 645.215; 23 U.S.C. § 109).
6	On a case-by-case basis, ensure that travel lane(s) remain open for traffic flow to the extent practicable in accordance with NYSDOT or local DOT permitting and standards.
7	Designate parking for project construction workers in designated areas outside the NYSDOT ROW that do not interfere with normal traffic, cause a safety hazard, or interfere with existing land uses. Minimize on-site parking for workers where practicable.
8	Coordinate construction activities with local government officials, including schedules for road and lane closures and nighttime construction work as well as effective methods of dissemination of such information to the public.
9	Coordinate construction activities with railroad operators to ensure that construction activities do not conflict with railroad operations and to ensure that appropriate railroad safety precautions are implemented.
10	If significant dewatering is required in any area where ingress and egress for property owners along the ROW will be inhibited, restricted, or prevented, notify such property owners and provide alternative means of ingress and egress to/from their properties.
11	Implement provisions for minimizing the duration and extent of open excavation, traffic disruptions, and work within and adjoining public streets, public street ROWs, and bike paths. Utility installation involving NYSDOT is done in accordance with the NYSDOT publication “Requirements for Design and Construction of Underground Utility Installations within State Highway ROW.”
12	Implement security measures to monitor and properly mark active construction sites, such as temporary fences, steel plates, and cones. Use appropriate signage to warn pedestrians and drivers of active construction during construction in accordance with NYSDOT Standard Specifications.
13	Propose full mill and overlay restoration of roads to mitigate pavement damage from construction activities.

Table 40. Environmental Justice/Disadvantaged Communities Minimization and Mitigation Measures

Item	Environmental Justice/Disadvantaged Communities
Minimization	
1	Install cables underground within public roadway, utility, rail, or other ROWs and locate majority of cable underground to limit vegetation management activities during operation.
2	Provide an analysis as to whether the Project disproportionately burdens disadvantaged communities pursuant to Section 7(3) of the Climate Act and also include an analysis of greenhouse gas emissions and co-pollutants of the Project.
3	Limit overhead utility poles to minimize visual impacts.
4	Develop a multi-lingual community engagement plan with specific communication and outreach procedures for disseminating construction-related information.
5	Commence community engagement early in the planning process using both in-person and virtual meetings.
6	Prepare a noise mitigation plan for noise sensitive sites showing the locations of residential areas and other noise-sensitive areas along the proposed ROW and the specific procedures to be followed to minimize noise impacts related to ROW clearing, facility construction, and operation.
7	Prepare a fugitive dust control plan to be implemented to minimize dust.
8	Provide adjacent landowners timely information regarding the planned construction activities and schedule.
9	Provide locations of sound mitigation measures to municipal planning and zoning officials and organizations identified in community engagement plan at least 60 days prior to the start of construction. These drawings should include sound information for all noise sources.
10	Establish a noise complaint hotline to help actively address all noise-related issues.
11	Apply the following measures at residential areas and other noise sensitive locations: public outreach, appropriate work hour/work operation restrictions, temporary sound barriers, employment of equipment fitted with sound deadening materials, selection of low noise equipment and procedures, and other noise reduction work methods or devices as determined appropriate for the locale and tasks.
12	Use ULSD fuel, per the requirements of 40 CFR § 80.510(b), for onshore diesel-powered construction equipment and vehicles, where applicable, and consider the use of alternative fuels, where practicable.
13	Limit idling vehicles and construction equipment, and limit use of personal vehicles at the site by requiring construction workers to vanpool from a common location.
14	Keep construction equipment well-maintained and routinely check vehicles using internal combustion engines equipped with mufflers to ensure they are in good working order.
15	Use quieter equipment backup alarms, such as white-noise or other OSHA-approved technology.
16	Locate high-noise generating construction equipment as far as possible from noise sensitive areas.
17	Position stationary equipment exhausts to minimize exposure to sensitive receptors.

3.4.1 Steep Slopes

3.4.1.1 Existing Conditions

Steep slopes refer to topography, and specifically slopes greater than 15 percent that may constrain OSW cable installation, operation, and maintenance. Zones ON-9 Long Beach 1, ON-10 Long Beach 2, ON-13 Jones Beach 2, ON-17 Smith Point 2, and ON-18 Smith Point 3 rank medium, and all other Onshore South Shore zones rank low for topography. Zone ON-20 Hempstead Harbor ranks high, and all other Onshore Long Island Sound zones rank medium for topography. The Onshore New York Harbor zones rank medium for topography except for ON-6 Astoria and Rainey, which ranks low.

The most prominent landforms of Long Island include the two lines of hills referred to as terminal moraines, the gently sloping plain that extends southward from the hills, the deeply eroded headlands along the north shore, and the barrier beaches along the south shore (USGS 2017). The terminal moraines reach a maximum altitude of 400 feet above sea level and include the northern line of hills, the Harbor Hill moraine, and the Ronkonkoma moraine. The Harbor Hill moraine extends eastward along the north shore of Long Island to form the North Fork, and the Ronkonkoma moraine extends eastward to form the South Fork. South of the moraines is a moderately flat surface called the outwash plain that extends southward to the coast. The elevations of the outwash plain generally begin between 100 and 150 feet above sea level and slope southward at a rate of approximately 20 feet per mile down to the coast (USGS 2017). The headlands along the north shore have deeply eroded over time, and wave erosion has steepened the northern slopes of the headlands into nearly vertical bluffs that are approximately 100 feet high in some locations (USGS 2017). Lastly, along the south shore of Long Island are the flat barrier beaches.

The Harbor Hill moraine influences the topography of Zones ON-10 Long Beach 2, ON-13 Jones Beach 2, and ON-18 Smith Point 3; and the Ronkonkoma moraine influences the topography of Zone ON-17 Smith Point 2, resulting in the medium constraint ranking because of the higher presence of slopes greater than 15 percent. Within Zones ON-10 Long Beach 2, ON-13 Jones Beach 2, and ON-18 Smith Point 3, steep slopes occur north of the Long Island Expressway, in the northernmost portions of those zones. Steep slopes in Zone ON-17 are primarily concentrated in the western third of the zone, where the overlap with the Ronkonkoma moraine is more pronounced.

The Harbor Hill moraine and the eroded headlands along the north shore, where the potential landfall locations are located, influence the topography of the Onshore Long Island Sound zones. Zone ON-20 has a higher frequency of slopes greater than 15 percent. For the Onshore New York Harbor Zones ON-3 Riverside and ON-4 Academy, localized areas of steep slopes are largely a result of the hilliness in western Manhattan. Zones ON-5 East 149th Street and ON-7 Lower New York Bay have some areas of steeper slopes. Lastly, on Staten Island, areas of steep slopes within Zone ON-1 are concentrated within the northeastern portion of the zone and along the shorelines of Richmond Creek, Fresh Kill Main Creek, and Fresh Kill. For Zone ON-2, areas of steeper slope are primarily concentrated in the eastern third of the zone, east of Slosson Avenue.

3.4.1.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts from steep slopes primarily relate to safety and stability of equipment used to bury the cables and erosion and stormwater runoff during construction. The significance of these topographic conditions requires avoidance in areas with sufficient space, and impact minimization in areas with limited space using site-specific engineering strategies. Overall, OSW cable construction, operation, and maintenance are expected to be able to avoid areas of steeper slopes.

In zones ranked high or medium for this constraint, grading and excavating trenches increases the potential for slips and erosion. Areas with steep slopes require additional workspace. Shoreline bluffs, such as those along the north shore of Long Island, are natural protective features subject to regulatory protections under CEHA Environmental Conservation Law Article 34 and associated regulations and should be avoided through best practices like HDD at landfall. As indicated in Section 3.4.7.2: Impacts and Avoidance, Minimization, and Mitigation Measures, CEHAs should be avoided with appropriate routing and engineering design. Table 30 summarizes minimization measures relevant to steep slopes that effectively address the impacts from OWS cables in the Landfall and Overland Area. Minimization measures for steep slopes are not limited to measures exclusive to one resource topic and include soils and erosion control.

3.4.2 Coastal Resources

3.4.2.1 Existing Conditions

For this assessment, coastal resources are defined as (1) coastal habitats within an approximately 1-mile buffer of the shoreline along the North Shore of Long Island and New York City and (2) uses that are dependent upon the coastal areas (beachgoing, wildlife viewing, and recreational fishing), between the southern boundary of the barrier island along the South Shore of Long Island and the mainland of Long Island. Coastal resources include SCFWH, Local Waterfront Revitalization Programs (LWRP) resource designations, EFH, SAV/eelgrass, beachgoing areas, wildlife viewing areas, and recreational fishing. In the Onshore South Shore Zones, ON-12 Jones Beach 1, ON-13 Jones Beach 2, and ON-14 Jones Beach 3, rank high, and Zones ON-9 through ON-11 Long Beach 1 through 3, ON-15 Robert Moses, and ON-16 through ON-18 Smith Point 1 through 3 rank medium. All Onshore Long Island Sound zones rank low. Zone ON-2 Goethals in the Onshore New York Harbor Area ranks medium.

Coastal and underwater habitats within the Landfall and Overland Area support diverse communities and provide foraging habitat as well as spawning and nursery grounds for a variety of species. Shellfish, such as hard clams, and fish, such as Atlantic silversides, bay anchovies, winter flounder, summer flounder, and weakfish, are among the many aquatic species that use these habitats. SAV beds occur throughout the bays, and these coastal waters provide EFH for federally managed species and migrating and foraging habitat for listed Atlantic sturgeon and sea turtles, as well as habitat of particular concern for flounder. Harbor and grey seals are frequently found in coastal bays during the winter. Additionally, the coastal shorelines are used for recreational activities, including fishing, beachgoing, and wildlife viewing. SCFWHs are designated along the coastal areas of the Landfall and Overland Area; those that overlap with overland zones are depicted in Figure 85 through Figure 96.

Eleven approved LWRPs overlap with the Landfall and Overland Area. The largest land areas covered by LWRPs are in New York City and the towns of Smithtown, Southold, and East Hampton. While coastal resources in New York City are limited because of residential, commercial, and industrial development, several New York City WRP-designated RECs are located throughout the western extent of the Landfall and Overland Area (see Figure 85). Figure 85 also shows that the western extents of both Zones ON-1 Fresh Kills and ON-2 Goethals fall within the New York City WRP-designated Arthur Kill Ecologically

SMIA. This area is conducive to industrial use but also contains one of the most extensive concentrations of intact tidal and freshwater wetlands in New York City, as well as ponds, vernal pools, meadows, grasslands, and woodland pockets that provide habitat for a variety of flora and fauna (NYC Planning 2017). Zone ON-2 Goethals also overlaps with a designated SCFWH, Significant Natural Communities, and EFH.

Significant Natural Communities occur in ROWs within the coastal bays of the Landfall and Overland Area. Significant Natural Communities include tidal river (Academy), marine back-barrier lagoon (Cold Spring Harbor), maritime dunes (Jones Beach S.P., Robert Moses, and Shoreham), and maritime beach (Robert Moses) communities (NYSDEC 2021a). Mapped SAV beds are located throughout the coastal bays in shallow areas along the shorelines (NYSDEC 2021b; NWI 2021). High concentrations of SAV occur along the south shore throughout West, Middle, and East Hempstead Bays; South Oyster Bay; the western Great South Bay; eastern Great South Bay; and Moriches Bay (NYSDEC 2021b; NWI 2021).

No designated federal critical habitats occur within the Landfall and Overland Area. Federally threatened and State endangered piping plover (*Charadrius melodus*), federal and State threatened red knot (*Calidris canutus rufa*), federal and State endangered roseate tern (*Sterna dougallii dougallii*), and federal and State threatened seabeach amaranth (*Amaranthus pumilus*) occur within the coastal areas of the Landfall and Overland Area. Piping plover, red knot, and roseate tern occur along the coastal bays and beaches in Zones ON-8 through ON-25. Seabeach amaranth only occurs in overland zones that cross south shore ocean beaches.

Suitable habitat for State listed species occurs within bays, beaches, dunes, and marshes that are present in coastal areas of Zones ON-8 through ON-25. The State threatened bald eagle (*Haliaeetus leucocephalu*s), which is also protected under the federal Bald and Golden Eagle Protection Act, forages in large bodies of water and nests in tall trees near water. State threatened least tern (*Sternula antillarum*) nest on Long Island on open sandy or gravelly beaches, dredge spoil, and other open shoreline areas. State threatened common tern (*Sterna hirundo*) nest on Long Island above the high tide line on sand and shell beaches. Black skimmer (*Rynchops niger*), a State species of special concern, nest on open sandy beaches, barrier island beaches, and dredge spoil islands and forage in shallow and tidal waters of bays, inlets, marshes, estuaries, and salt marsh pools. Salt marshes throughout the coastal areas of

Staten Island and Long Island provide breeding and foraging habitat for seaside sparrow (*Ammodramus maritimus*), a State species of special concern. State-listed plant species that occur in maritime dunes along the coast of Long Island include State threatened dune sandspur (*Cenchrus tribuloides*), State threatened Oakes' evening primrose (*Oenothera oakesiana*), and the State-rare Schweinitz's flatsedge (*Cyperus schweinitzii*) (NYNHP 2022).

Portions of designated BIAs for NARW overlap with the southern portions of the Great South Bay and Oyster Bay during their migration in March and April (NOAA Fisheries 2015). Federally listed loggerhead, green, leatherback, and Kemp's ridley sea turtles migrate through and forage in coastal waters from May through November. Federally endangered adult and subadult Atlantic sturgeon migrate and forage year-round throughout the coastal bays and tidal rivers (GARFO 2019). Sea turtles and Atlantic sturgeon occur throughout coastal waters of all zones along the Onshore South Shore, which includes the various bays along the south shore of Long Island. Sea turtles and Atlantic sturgeon may occur in bays and harbors along the north shore of Long Island; however, these northern embayments are not included in the onshore considerations in this analysis. See Section 3.2: Long Island Sound Approach Area, for the discussion of Atlantic sturgeon and sea turtles in the Long Island Sound Approach Area, and Section 3.3: New York Harbor Approach Area, for a discussion of Atlantic sturgeon and sea turtles in the New York Harbor Approach Area.

Designated EFH exists in all the coastal bays and associated tidal tributaries within the Landfall and Overland Area for various life stages of federally managed species. At least 53 species have designated EFH within the coastal waters of the Landfall and Overland Area, including highly migratory species like sharks and tuna. EFH occurs within coastal waters of all 11 onshore zones along the south shore of Long Island. Habitat Areas of Particular Concern exist within adult and juvenile summer flounder EFH that contains native species of macroalgae, seagrasses, and macrophytes. See Section 3.2.2: Marine Commercial and Recreational Uses, for a discussion of EFH in the Long Island Sound, and Section 3.3.2: Marine Commercial and Recreational Uses, for a discussion of Habitat Areas of Particular Concern for the New York Harbor.

Beachgoing, also discussed in Section 3.1.2: Marine Commercial and Recreational Uses, is a popular activity along the south shore of Long Island, as evidenced by State park annual attendance along the south shore. Jones Beach, which overlaps with Zones ON-12 Jones Beach 1, ON-13 Jones Beach 2, and ON-14 Jones Beach 3, was the State's most heavily attended park, with more than 8 million visitors in annual attendance in 2020. Robert Moses State Park, which overlaps with Zone ON-15 Robert Moses, experienced more than 4.2 million visitors in 2019 (NYSOPRHP 2021). Additionally, Captree State Park, which overlaps with ON-15, offers recreational fishing and had over 1.6 million visitors in 2021. The coastal bays and ocean beaches are also used for recreational fishing, including within eight onshore zones. Additionally, the south shore offers wildlife viewing opportunities from Long Beach eastward to Montauk Point and along the coastal areas within the overland zones associated with Jones Beach State Park, Robert Moses State Park, and Smith Point (see Figure 91, Figure 94, and Figure 96). Beachgoing is popular at all of those locations in addition to Long Beach Park, which is located within the southernmost portion of Zones ON-9 through ON-11, and Smith Point County Park, located on the Fire Island National Seashore and overlapping with Zones ON-16 through ON-18, which has more than 200,000 beach goers annually (Fire Island News 2020).

3.4.2.2 Impacts and Avoidance, Minimization, and Mitigation

Potential impacts to coastal resources from construction of OSW cables vary in degree based on the seasonality of activities and the type of cable installation method used. For crossings of intercoastal waterbodies, only installation using HDD should be considered to minimize impacts to SCFWHs. Temporary impacts associated with HDD include excavation of HDD entrance and exit pits associated with landfall points, as well as disturbance within workspaces identified for HDD conduit stringing as well as pull-back. Time-of-year restrictions for certain in-water activities may also be necessary to avoid impacts to protected species. Additionally, development and implementation of inadvertent return plans address the potential for temporary water quality impacts associated with accidental spills of HDD drilling mud or other materials.

Potential impacts to coastal resources include temporary and permanent disturbance to sensitive species and significant natural habitats from light, noise, and vibrations, including disturbance to behavior during construction. This may include short-term displacement of mobile EFH species and mortality of sessile and slow-moving benthic organisms during construction. Construction activities in coastal waters may result in increased turbidity, resuspension of contaminated sediments, inadvertent returns from HDD, and other water quality impacts. Additionally, construction activities and increased vessel traffic during OSW cable installation may result in the temporary displacement or use restrictions on public access for recreation. Areas of SAV should be avoided completely through micro-siting to the maximum extent practical, and if complete avoidance is not possible then mitigation should include SAV restoration.

NYSDOS review will ensure review of projects with coastal effects on New York State for consistency with applicable Coastal Zone Management Act (CZMA) coastal policies for projects in New York State waters. For projects with cables that cross New Jersey or Connecticut waters, the New Jersey Department of Environmental Protection and Connecticut Department of Energy and Environmental Protection will conduct a similar consistency review to ensure consistency with their state policies. Additionally, Connecticut has interstate consistency review of certain activities in New York State waters of Long Island Sound.

Compliance with time-of-year restrictions during construction, operation, and maintenance activities in the Landfall and Overland Area minimizes impacts to a number of coastal resources. Time-of-year restrictions on in-water activity avoid disturbance to sensitive life stages of aquatic species, such as winter flounder eggs and larvae and migrating Atlantic sturgeon. Additional minimization and mitigation measures included in Table 31 reduce impacts to the greatest extent feasible, specifically in sensitive habitats. Outreach to recreational fishermen and seasonal restrictions on construction, operation, and maintenance activities may avoid disruption to public use of coastal resources during peak periods for beachgoing, fishing, and wildlife viewing. Site-specific conditions may require additional mitigation and minimization techniques to reduce impacts to the greatest extent feasible, especially in sensitive habitats.

Potential impacts to coastal resources during operation of OSW cables occur primarily within the footprint of the OSW cable ROW during maintenance activities. Operation of OSW cables may cause long-term displacement, attraction, or other disruption to movement of species, altering nearby ecosystems. The flow of current through high-voltage cables generates EMF, and some species can be significantly affected by increases in these fields. As discussed in Section 1.6: Technical and Cost Considerations for Offshore Wind Cables Interconnecting to the Grid, the characteristics and strength of the magnetic field vary for the configuration of the cables, cable type (i.e., HVDC versus HVAC), and burial depth.

Table 31summarizes minimization and mitigation measures relevant to coastal resources that effectively address the potential impacts discussed for coastal resources in the Landfall and Overland Area. For zones such as ON-12 through ON-18 along the South Shore the required crossing from the barrier island to the mainland, where there are extensive SCFWH and EFH, avoidance would be unlikely. In those zones, minimization measures, such as Nos. 1, 2, 3, 6, 10, and 11, should be implemented to minimize impacts to coastal resources.

3.4.3 Terrestrial Biological Resources

3.4.3.1 Existing Conditions

Terrestrial biological resources in the Landfall and Overland Area are defined as those occurring inland of the 1-mile buffer of the shoreline along the North Shore of Long Island and New York City and landward of the boundary of the mainland of Long Island along the South Shore. Terrestrial biological resources include Important Bird Areas (IBAs) and NYSDEC Natural Heritage Communities. Note: There is some spatial overlap with these datasets between what is defined as coastal resources and what is defined as terrestrial biological resources. These data sets are discussed fully in the following section. Onshore South Shore Zones ON-12 Jones Beach 1 and ON-18 Smith Point 3 rank high for one or both of the resources analyzed, Zones ON-13 Jones Beach 2 and ON-15 Robert Moses rank medium, and the remainder rank low. Onshore Long Island Sound zones and Onshore New York Harbor zones all rank low.

Long Island includes a high level of biological diversity, as evidenced by designations of Significant Natural Communities, IBAs identified by the Audubon Society, and federally and State listed species. Zone ON-12 includes an IBA associated with the West Hempstead Bay/Jones Beach West, and Zone ON-18 includes IBAs associated with the Great South Bay, Carmans River Estuary, and the Long Island Pine Barrens. Some of these habitats are also included in discussions under Section 3.4.2: Coastal Resources.

The NYSDEC Natural Heritage Program's Significant Natural Communities spatial data provide locations of rare or high-quality wetlands, forests, streams, and other types of habitats and ecological areas. Long Island is home to a wide range of Significant Natural Communities (NYNHP 2021). Significant Natural Communities that overlap with ROWs in the Landfall and Overland Area include oak-tulip tree forest (Zones ON-1, ON-2, ON-10, and ON-19), red maple-sweetgum swamp (Zones ON-1, ON-2, ON-15, ON-16, and ON-25), serpentine barrens (Zone ON-1), maritime oak forest (Zone ON-2), coastal plain pond shore (Zones ON-10, ON-11, and ON-18), Hempstead Plains grassland (Zones ON-11, ON-12, and ON-13), coastal oak-heath forest (Zones ON-14, ON-18, and ON-25), coastal oak-hickory forest (Zone ON-25), pitch pine-oak forest (Zones ON-14, ON-16, ON-17, ON-18, and ON-25), pitch pine-scrub oak barrens (Zones ON-15, ON-16, and ON-17), pitch pine-oak-heath woodland (Zones ON-18 and ON-25), and coastal plain pond (Zone ON-17) habitats (NYSDEC 2021a). Additionally, the Central Pine barrens—known for its significant natural resources, and protected under the Long Island Pine

Barrens Protection Act—is located in portions of Zones ON-16, ON-17, and ON-18. While highly developed, New York City contains designations of Significant Natural Communities, IBAs identified by the Audubon Society, and federally and State listed species. NYSDEC-designated bird conservation areas also occur within the New York City area.

According to the USFWS Information for Planning and Consulting (IPaC) results, four USFWS-listed or candidate species occur within the terrestrial portion of the Landfall and Overland Area: federal and state threatened northern long-eared bat (*Myotis septentrionalis*); candidate for listing monarch butterfly (*Danaus plexippus*); and federal threatened and state endangered sandplain gerardia (*Agalinis acuta*) (USFWS 2021). While zones in the Landfall and Overland Area were generally delineated to avoid resources, where possible, and follow existing ROWs in mainly developed areas, the forested areas and terrestrial habitats provide potential summer roosting, foraging, and travel habitat for northern long-eared bats. Sandplain gerardia occurs in remnants of the Hempstead Plains (Zones ON-12 Jones Beach 1 and ON-13 Jones Beach 2) (NYNHP 2022). Monarch butterflies, a candidate for listing, may be found in the spring, summer, and early fall in overland zones wherever there is milkweed and other native flowering plants.

Meadows, grasslands, and forests throughout the Landfall and Overland Area provide habitat for yellow-banded bumble bee (*Bombus terricola*), a critically imperiled species in New York State. Additionally, Nature Explorer identified over 300 recently confirmed State-listed threatened, endangered, or special concern species, including mammals, birds, reptiles, amphibians, fish, insects, and plants, occurring within Nassau and Suffolk Counties (NYSDEC 2021a).

3.4.3.2 Impacts and Avoidance, Minimization, and Mitigation Measures

OSW cables are expected to be able to avoid or minimize impacts to terrestrial biological resources given the anticipated use of existing ROWs, except potentially in Zones ON-12 Jones Beach 1 and ON-18 Smith Point 3 that rank high for constraints associated with these resources. In those zones, it will be relatively challenging to avoid or minimize impacts to these resources even with appropriate siting and engineering design.

Potential impacts to terrestrial biological resources include temporary and permanent disturbance to sensitive species and significant natural habitats, including disturbance to species' behavior during construction activities and conversion of threatened or endangered species habitats. Construction activities in or near inland streams and wetlands may result in increased turbidity, resuspension of contaminated sediments, inadvertent returns from HDD, and other water quality impacts that may indirectly impact significant natural habitats. Additionally, opportunistic, non-native invasive plant species could spread or become established following ground disturbances associated with construction. However, the expected use of trenchless methods to install underground cables wherever feasible minimizes these types of ground disturbances. Sections 3.1.4: Aquatic Biological Resources and Sensitive Habitats and 3.4.4: Wetlands, Surface Waters, and Water Quality discuss potential impacts to aquatic biological resources and sensitive habitats; as well as wetlands, surface waters, and water quality, respectively.

Adherence to seasonal construction restrictions avoids disturbing breeding activity of migratory birds and T&E bird species that may use the habitats described above and may minimize impacts to those species overall. Compliance with time-of-year restrictions for tree removal, if required, for construction staging areas and temporary workspaces and/or ROW expansions, if needed, avoids impacts to northern long-eared bats. Those restrictions stipulate that tree cutting should occur between November 1 and March 31 and December 1 through February 28 for Suffolk County or as confirmed by NYSDEC. Tree cutting in areas determined to be suitable habitat outside of the tree cutting window and loss of any roost trees used by northern long-eared bats requires mitigation. All known and documented roost trees should be left uncut, as should any trees within a 150-foot radius of a documented summer occurrence. Pre-construction surveys provide the basis for avoiding or minimizing impacts to remnant stands of sandplain gerardia and large stands of unfragmented forest.

Table 32 summarizes minimization and mitigation measures relevant to terrestrial biological resources that effectively address the impacts from OSW cables in the Landfall and Overland Area.

3.4.4 Wetlands, Surface Waters, and Water Quality

3.4.4.1 Existing Conditions

Wetlands, surface waters, and water quality include federally regulated waters (including wetlands), State-protected Article 15 waters and Article 24 freshwater wetlands and adjacent areas, and potentially eligible Article 24 freshwater wetlands, Article 25 tidal wetlands and adjacent areas, and locally protected wetlands. Environmental Conservation Law Article 24 was amended in April 2022 to expand protection of freshwater wetlands. Starting in 2025, the amended law eliminates the requirement that regulated wetlands must be mapped and 12.4 acres or larger or be wetlands of unusual local importance clarifies that wetlands need not be mapped. Instead, wetland maps will be advisory only. In addition, starting in

2028, wetlands having an area of at least 7.4 acres (from 12.4 acres prior to 2028) or which are of unusual importance will be regulated and wetlands of 12.4 acres or greater will continue to be regulated, but wetlands smaller than the 12.4-acre threshold can be regulated if they are of “unusual importance” (New York Law Journal 2022). Zone ON-11 Long Beach 3 and Zone ON-2 Goethals rank medium for constraints associated with this resource, and all other overland zones rank low.

Freshwater and tidal wetlands on Long Island include federally, State, and municipally regulated wetlands. Freshwater wetlands are located throughout Long Island, including along many of the tributaries to Great South Bay (see Figure 72 through Figure 83). Large tidal wetland systems are associated with the Great South Bay and Long Island Sound (see Figure 76 through Figure 83). These systems include fresh, high, and intertidal marshes. In New York City, tidal wetland systems, primarily in the form of intertidal marshes, are associated with Jamaica Bay and some sections of the Lower Bay and East River (see Figure 73 through Figure 75).

Zone ON-11 has a slightly higher percentage of wetlands within existing ROWs than the other onshore zones because of crossings of the intercoastal bays, wetlands associated with the tributaries of the intercoastal bays, and the presence of wetlands associated with Hempstead Lake (see Figure 77 and Figure 78). Zone ON-2 has numerous State-regulated wetlands associated with Staten Island Industrial Park, Willowbrook Park, Cloves Lake Park, and other locations in the westernmost portion of the zone (see Figure 72).

Rivers located on Long Island include the Nissequogue River, Swan River, Carmans River, Peconic River, and Connetquot River. The Landfall and Overland Area includes the shorelines of the East and Hudson Rivers in New York City.

Water quality refers to surface water quality and groundwater quality as determined by regulatory standards. According to the approved 2018 list of 303(d) impaired waters for New York, 55 waterbodies have been identified as impaired across Long Island. Additionally, 10 harbors, including some tributaries, along the northern extent of Long Island are listed as impaired (NYSDEC 2020).

Three main aquifers are located on Long Island—the upper glacial aquifer and the underlying Magothy and Lloyd Aquifers. These three aquifers are the sole sources of freshwater. The Nassau/Suffolk Counties Long Island Sole Source Aquifer underlies Long Island beneath the two counties and supplies over 400 million gallons per day of freshwater from more than 1,500 public-supply wells to over 2.8 million people in Nassau and Suffolk Counties (USGS 2021a). The upper surface of the groundwater system is the water table, which is typically present between 0 to 190 feet below the ground surface (USGS 2021b). Additionally, the Kings/Queens Counties (Brooklyn-Queens) Aquifer System Sole Source Aquifer underlies Kings and Queens Counties (USEPA 2021).

3.4.4.2 Impacts and Avoidance, Minimization, and Mitigation Measures

The primarily low overall ranking of constraints associated with wetlands, surface waters, or water quality suggests that the construction, operation, and maintenance of OSW cables could avoid, minimize, or mitigate impacts to these resources through appropriate siting and engineering design. Therefore, future route selection should focus on micro-siting for avoidance of these features, to the maximum extent practicable and mitigation where avoidance is not feasible. Such micro-siting should address disturbance of vegetation in adjacent areas that may require mitigation and/or restoration/improvement. Potential indirect impacts to wetlands, surface waters, or water quality include sediment disturbance and associated suspension and resultant turbidity from cable installation through the intercoastal bays and entry and exit excavations for HDD operations. During HDD, the potential for an inadvertent release of fluid exists as does the potential for spills of hazardous materials from construction equipment. To minimize impacts, crossings of all wetlands and streams should be trenchless, to the maximum extent practicable, and justification provided if this is not possible. In cases of expansion of an existing ROW for co-location of an OSW cable, potential direct and indirect impacts to wetlands, surface waters, and water quality could occur from clearing and grading associated with construction of the ROW expansion.

Table 26 summarizes minimization and mitigation measures relevant to wetlands, surface waters, and water quality that effectively address the potential direct and indirect impacts from OSW cables in the Landfall and Overland Area.

3.4.5 Areas of Contamination

3.4.5.1 Existing Conditions

Areas of known contamination include NYSDEC remediation sites (Brownfield Cleanup Program, State Superfund, etc.) and USEPA Facility Registry Service sites and Comprehensive Environmental Response, Compensation, and Liability Act (commonly referred to as Superfund) sites. This is not an exhaustive list of contaminated sites in the Landfall and Overland Area, but includes representative data at the State and federal levels, as consistent with the New York State Offshore Wind Master Plan Cable Landfall Permitting Study (NYSERDA 2017a). Within the Landfall and Overland Area, localized areas of contamination are typically associated with former site uses (e.g., manufactured gas plants [MGPs], industrial, manufacturing). See Section 3.2.5: Sediment Contamination, Ocean Disposal Sites, and UXO, for a discussion of potential contamination within the coastal harbors along the north shore of Long Island and Section 3.3.5: Sediment Contamination, Ocean Disposal Sites, and UXO, for a discussion of in-water contamination related to the Hudson River, Newtown Creek, Arthur Kill and Kill Van Kull, and other waterbodies in the New York Harbor Approach Area. Onshore South Shore Zone ON-18 Smith Point 3, Onshore Long Island Sound Zone ON-20 Hempstead Harbor, and Onshore New York Harbor Zone ON-6 Rainey and Astoria rank medium for constraints associated with areas of contamination; the remaining Landfall and Overland Areas rank low. Areas of historic fill and potential associated contamination may also occur in the Onshore New York City zones.

Zone ON-18 contains one area of known contamination (see Figure 82). The Brookhaven National Laboratory is listed as both a federal Superfund site (USEPA 2022) and State Superfund site (NYSDEC Site Number 152009) (NYSDEC 2014a). The Brookhaven National Laboratory site consists of several operable units at various stages of the investigation and remediation process. Per the NYSDEC Environmental Remediation Database, the primary contaminants of concern are asbestos, lead, PCBs, and laboratory chemicals, including petroleum blended fuels; per- and polyfluoroalkyl substances, volatile organic compounds (VOCs), radionuclides, and pesticides have also been detected in site groundwater. Institutional controls are in place at the site, consisting of activity and use limitations to protect human health and the environment, including planning for any work at the site that may disturb a formerly remediated area.

The Hempstead Harbor landing site within Zone ON-20 is adjacent to the Former Glenwood Landing Gas Plant and Holding Station (NYSDEC Site Number V00351), which was remediated under the Voluntary Cleanup Program (see Figure 77) (NYSDEC 2014b). Contamination at the site was related to its former use as a liquid petroleum gas cracking plant (beginning in 1949) and subsequently as a natural gas regulating station, laboratory, and propane storage field; currently, it is a natural gas turbine power generation facility. Remediation of PCBs, VOCs, and metals in soils and semi-volatile organic compound and VOCs in groundwater has been completed to industrial use standards. Because there is residual contamination at the site, future site use or soil disturbance is subject to the requirements of an existing Site Management Plan.

Zone ON-6 contains numerous NYSDEC remediation sites, including the ConEd-Astoria MGP site, the Ravenswood Former MGP site, the Amtrak Sunnyside Yard site, and several smaller NYSDEC Brownfield Cleanup Program sites (see Figure 74). The ConEd-Astoria MGP site (NYSDEC Site Number 241012) is in the NYSDEC State Superfund program and according to the NYSDEC Environmental Remediation Database, is currently undergoing remediation (NYSDEC 2014c). Contaminated soil and groundwater exist throughout the site, primarily related to MGP waste (tar) and associated VOCs, PAHs, and metals as well as PCBs associated with electrical equipment. The Ravenswood Former MGP site (NYSDEC Site Number 241119) also contains contaminated soil and groundwater as a result of former MGP operations. A portion of this site was remediated under a Voluntary Cleanup Program agreement, though, per the NYSDEC Environmental Remediation Database, MGP contamination may remain at the site. Other NYSDEC remediation sites scattered throughout Zone ON-6, including the Amtrak Sunnyside Yard State Superfund site and various NYSDEC Brownfield Cleanup Program sites that intersect ROWs are typically well characterized and will be remediated under NYSDEC jurisdiction.

Adjacent to Zones ON-7 and ON-8 is a recently added Superfund site, the Dead Horse Bay (EPA ID: NYN000203786). This site was identified as having radiological contamination, and NPS is currently in the planning stages of a Comprehensive Environmental Response, Compensation, and Liability Act Remedial Investigation/Feasibility Study for the site (NPS 2022).

3.4.5.2 Impacts and Avoidance, Minimization, and Mitigation Measures

No zones rank high for constraints associated with contamination for the Landfall and Overland Area, indicating that the construction, operation, and maintenance, and decommissioning of OSW cables could avoid impacts to areas of known contamination through siting due to the overall limited spatial extent of these features in the majority of onshore zones. In Zones ON-6, ON-18, and ON-20 where OSW cables may not be able to avoid impacts to areas of known contamination during construction, requiring specialized construction techniques, including minimizing the volume of contaminated soil excavated and proper handling and disposal of contaminated media (e.g., soil and groundwater) in accordance with applicable regulations.

The Brookhaven National Laboratory Superfund Site in Zone ON-18 Smith Point 3 extends east-west across the entire zone and intersects several existing ROWs. If avoidance is not possible, site-specific minimization and mitigation measures will be determined in conjunction with EPA and NYSDEC to ensure compliance with all activity and use limitations.

The Astoria POI in Zone ON-6 is located within the CE-Astoria MGP site. Site-specific minimization and mitigation measures are outlined in NYSDEC-issued or NYSDEC-approved documents. Any construction in this area requires coordination with NYSDEC and compliance with all site activity and use limitations.

Table 27 summarizes minimization and mitigation measures relevant to areas of contamination that could effectively address the impacts to the Landfall and Overland Area.

3.4.6 Cultural Resources

3.4.6.1 Existing Conditions

Cultural resources include buildings, sites, districts, structures, objects, and general areas of archaeological sensitivity, including numerous NRHP-listed properties located in Long Island and New York City and the public version of the Cultural Resource Information System database. The analysis relies on data from the New York State GIS Clearinghouse for NYSOPRHP, NRHP site information, and the New York State Historic Sites and Park Boundary. These data do not include the location of archaeological resources due to the sensitive nature of this information. Cultural resources in all Landfall and Overland Area zones rank low, except for the Onshore New York Harbor Zone ON-7 Lower New Bay, which ranks medium.

Zone ON-7 contains 76 properties listed in the NRHP. A majority of the resources are located in the northern half of Zone ON-7 (see Figure 75). In particular, the Mott Control House, an NRHP-listed property, overlaps with multiple ROWs in the northernmost portion of this zone. Portions of Zone ON-7 also are located in archaeologically sensitive areas as depicted in the Cultural Resource Information System database.

Six federally recognized Indian Nations have areas of interest that overlap with the Landfall and Overland Area: the Delaware Nation, Oklahoma; the Delaware Tribe of Indians; the Cayuga Nation; the Mohican; the Shinnecock Indian Nation; the Stockbridge-Munsee Community, Wisconsin; and one State recognized Indian Nation, the Unkechaug Nation (NYSOPRHP 2018; HUD 2022). The MARCO data portal also provides information pertaining to historic Native terrestrial territories. This data layer, Historic Native Terrestrial Territories (not reservation boundaries), indicates approximate historic territories of Indigenous peoples (MARCO n.d.). Among the Indian Nations noted as part of this data layer and within the onshore study area are the Canarsie, the Lekawe (Rockaway), the Massapequas, the Secatogue, the Unkechaug, the Shinnecock Indian Nation, the Mannansett, the Corchaug, the Setalcott, the Nissaquogue, the Matinecock, and the Munsee Lenape (MARCO n.d.).

3.4.6.2 Impacts and Avoidance, Minimization, and Mitigation

The low ranking for constraints associated with cultural resources in most of the onshore zones, indicates that construction, operation, and maintenance of cables could avoid impacts to known or previously recorded cultural resources, particularly those located aboveground. When considering the potential for impacts to aboveground resources, unless a physical change results to the cultural resource (e.g., addition or demolition), the impact to the setting of the cultural resource typically is considered from new visual elements, or in some cases, auditory components. The setting refers to the physical environment of a resource and the character (NPS 1997). The setting within this zone includes ROWs associated with existing transmission lines; arterial roadways, including the Belt Parkway, which comprises the southern and western boundary of the zone; and Metropolitan Transportation Authority passenger lines. Because burial of OSW cables is expected to occur primarily or completely within existing ROWs, visual changes would be consistent with existing infrastructure setting. Impacts typical of construction activities (e.g., noise, presence of workers and equipment, or access changes) would be temporary.

Potential impacts could occur to previously unknown or unidentified archaeological resources in areas where ground disturbance could occur. If existing below-ground ROWs are used, the potential for impacts may be less likely because previous disturbance resulted in the identification of resources. Evaluation of impacts to previously recorded resources occurs as part of site-specific project evaluations. Potential impacts to archaeological sites varies depending on the resource type, size, location, and other defining characteristics.

Table 28 summarizes minimization and mitigation measures relevant to cultural resources that address the potential impacts within the Landfall and Overland Area.

3.4.7 Land Use

3.4.7.1 Existing Conditions

Land use considers parks, residential parcels, Department of Defense land, and CEHAs. CEHAs have natural protection feature areas, such as beaches and dunes, and structural hazard areas or lands that reduce the risk to people and property from coastal erosion and flood damage. This category also includes linear utilities, aqueducts, outfalls, and shoreline protection. Shoreline protection considers USACE Coastal Storm Risk Management (CSRM) project areas and hardened shorelines.

As discussed in Section 2.1: Criteria and Process for Analyzing Constraints, the onshore constraints analysis focused on maximizing the use of existing ROWs for potential co-location with OSW cables. Existing ROWs associated with electric transmission lines and natural gas pipelines were identified for an analysis of constraints; therefore, they are not discussed in the following subsections, which focus on the extent of the various constraints in the onshore zones. All 25 onshore zones have either existing transmission lines or a combination of existing transmission lines and natural gas pipelines. Zone ON-17 Smith Point 2 has the greatest overall length of these ROWs at 342.8 miles, and Zone ON-20 Hempstead Harbor has the least at just under 2 miles. See Section 3.4.8: Transportation, for a discussion of the other existing ROWs considered—arterial roadways and commuter railways.

Onshore South Shore Zones

The Onshore South Shore zones includes Rockaway, Long Beach 1, Long Beach 2, and Smith Point 2 (ON-08, ON-09, ON-10, and ON-17, respectively) which rank medium for land use. Rockaway, all Long Beach zones, and Jones Beach 1 rank medium for shoreline protection. All zones rank low for utilities.

Zone ON-8 Rockaway has a potential landfall point in Jacob Riis Park on the western end of the Rockaway Peninsula in Queens and crosses over Jamaica Bay via the Marine Parkway Bridge into Brooklyn where it covers largely residential neighborhoods in South and Central Brooklyn. Large areas of land dedicated to major open spaces include Jacob Riis Park, Fort Tilden, Floyd Bennett Field, Prospect Park, and Greenwood Cemetery. Jacob Riis Park, as well as Jamaica Bay, Floyd Bennet Field, and Marine Park, are all part of the NPS-managed Gateway National Recreation Area, a 27,000-acre area around the New York Harbor (see Figure 74 and Figure 75). Two New York City Department of Environmental Protection aqueducts, City Tunnel No. 1 and City Tunnel No. 2, intersect Zone ON-8. Tunnel No. 1 travels southeast from the Brooklyn Bridge towards the Gowanus Canal, where it meets

Tunnel No. 2, which cuts across Fort Greene Near Gates Avenue then turns southwest towards Red Hook (see Figure 74 and Figure 75). The coastline contains CEHAs, USACE CSRM projects, hardened shorelines, and a number of outfalls. The USACE CSRM Rockaway Beach Resiliency Construction Project includes a reinforced dune (composite) seawall and extension of 5 existing groins and new construction of 13 groins along the Atlantic Ocean shorefront. The seawall has a design berm of 60 feet and 40- to 60-foot burial depth and extends 35,00 linear feet from Beach 9th Street to Beach 149th Street (USACE 2019). The westernmost extent of the seawall overlaps with Zone ON-8. Construction is ongoing and will continue through 2026 (NYC Parks 2022). NOAA electronic navigation charts indicate one pipeline located in the Navy Yard.

Zones ON-9 through ON-11 make landfall on Long Beach, a barrier island off Nassau County. The shoreline is within a CEHA and USACE CSRM project area, and the shores around the inner bay are hardened. Multiple public open space uses include Long Beach Park, Gries Park, Flushing Meadows, Highland Park, Queensbridge Park, and Gantry Plaza State Park (see Figure 74, Figure 77, and Figure 78). ON-9 Long Beach 2 is a north/south-oriented zone between the South and North Shores of Nassau County. Open space uses in the zone include Valley Stream and Hempstead Lake State Parks; Bay, Roosevelt Preserve, and Morgan Days County Parks as well as municipal owned and managed parks. Zone ON-9 contains City Tunnel No. 1 and No. 2 as discussed above, as well as City Tunnel No. 3, which is the Queens/Brooklyn aqueduct. Zone ON-9 contains six Electronic Navigation Chart (ENC) pipelines—one between the Long Beach Peninsula and Island Park and the others in the Gowanus Canal—and it contains a couple hundred outfalls are located within existing ROWs along the coast in this zone (see Figure 74 and Figure 78). Zones ON-10 and ON-11 both contain one ENC pipeline located between the Long Beach Peninsula and Island Park. Zone ON-12 makes landfall at Jones Beach, a New York State Park and a CSRM project area. The hardened shoreline in the municipalities of Merrick and Bellmore presents potential constraints to access in this zone (see Figure 77 and Figure 78). The 26-mile Fire Island National Seashore overlaps with Zones ON-16 through ON-18. Zone ON-17 Smith Point 2 includes residential land use and a number of parks, including Robert Moses, Captree, and Belmont Lakes State Parks. There are about 80 square miles of agricultural land on Long Island according to the National Land Cover Database, and nearly all of it is within Suffolk County on the North Fork. However, ON-17 contains some pasture and cropland near Yaphank.

Onshore Long Island Sound Zones

The Onshore Long Island Sound zones ranked medium for the land use constraint category except for Zone ON-20 Hempstead Harbor and Zone ON-25 Shoreham, which rank low. All zones rank low for utilities, and only Zone ON-19 Shore Road and Zone ON-23 Northport 1 rank medium for shoreline protection.

Zone ON-19 Shore Road encompasses areas in Nassau County, Queens, and Brooklyn. Zone ON-19 contains hardened shoreline everywhere except the Tappan Beach. The zone includes various municipal parks like Cunningham Park and Flushing Meadows Corona Park in Queens, as well as town parks in North Hempstead and three county parks: Whitney, Morley, and William Cullen Bryan County Preserve. The zone also includes two state parks: Empire-Fulton Ferry State Park (in Brooklyn Bridge Park) and Gantry Plaza State Park. This zone also intersects all three New York Department of Environmental Protection aqueducts, contains 21 outfalls primarily along the East River, and 4 ENC pipelines that are located within Newtown Creek (see Figure 74 and Figure 77).

Zone ON-21 Bayville is located largely in Nassau County and spans the municipalities surrounding Oyster Bay before crossing into Syosset and Woodbury. Zone ON-21 includes Stehli Beach, which is within a CEHA. The federally managed Oyster Bay National Wildlife Refuge intersects the zone with some small municipal open spaces and a number of Nassau County local management resource areas. Land use constraints in this zone include Cold Spring Harbor State Park, Trailview State Park, Cordelia H. Cushman Preserve, and Stillwell Woods County Park (see Figure 76).

Zones ON-23 and ON-24 include the Northport power station, largely in Suffolk County but extending into Nassau County to include the Syosset POI. The Northport power station area includes a CEHA, a USACE CSRM project, and some locations of hardened shoreline. Zone ON-23 includes Trail View State Park, Stillwell Woods County Park, Froehlich County Farm, Huntington Town local parks, the Park Avenue Nature Preserve, and Steer's Park in Northport (see Figure 76, Figure 77, Figure 80). Zone ON-24 also includes some of these parks as well as the Long Island National Cemetery managed by the Department of Defense (see Figure 79 and Figure 80). Zones ON-23 and ON-24 also have ENC pipelines near the shore approach in Long Island Sound, as does ON-25.

Onshore New York Harbor Zones

The Onshore New York Harbor zones rank medium for land use except for ON-5 East 149th Street. Zone ON-3 Riverside ranks medium for utilities. Zones ON-3 Riverside, ON-4 Academy, ON-6 Astoria, and ON-7 Lower NY Bay all rank medium for shoreline protection.

Zone ON-1 Fresh Kills and ON-2 Goethals and are east/west oriented within the central region of Staten Island. ON-1 Fresh Kills spans a number of residential neighborhoods but also includes park uses including local Fresh Kills, Willowbrook, and Arden Heights Woods parks as well as a small portion of the Gateway National Recreation Area (see Figure 72).

Zone ON-3 Riverside is located in the Hell’s Kitchen and Lincoln Square neighborhoods of Manhattan, which are dense, mixed-use neighborhoods. The shoreline of this zone has is entirely hardened and highly developed with the State-owned Hudson River Greenway, city-owned Riverside Park, and several piers. Besides the open spaces along the shoreline, DeWitt Clinton Park is the largest of a number of small city-owned parks in the zone. The City Tunnel No. 3 Manhattan Section Aqueduct is located within this zone (see Figure 74). Zone ON-4 Academy is also located in Manhattan in Inwood, a neighborhood with a mix of open space, residential, and industrial uses. The dominating open space feature of the neighborhood is the city-owned Inwood Hill Park that intersects the northeastern portion of the zone. Other open space includes city-owned Fort Washington Park, the Fort Tryon Park, and Monsignor Kett Playground, and the State-owned Hudson River Greenway (see Figure 73).

Zone ON-6 Astoria and Rainey is within the Astoria and Ditmars Steinway neighborhoods of Queens, which are largely residential but have a large industrial center containing the Astoria POI and Charles Poletti and Astoria Generating power plants in the northernmost portion of the zone, and the Ravenswood Generating Station to the southwest (see Figure 74). City-owned open spaces include Astoria Park and multiple playgrounds. Nearly the entire shoreline of this zone is hardened.

Zone ON-7 Lower New York Bay covers a large area in western Central and South Brooklyn of largely residential neighborhoods, and major manufacturing and industrial corridors include the Brooklyn Navy Yard, the Sunset Park Waterfront, and the area surrounding Gowanus Canal. Zone ON-7 contains hundreds of city-owned parks, and the major destination open spaces include Brooklyn Bridge Park (which is partially State owned), Prospect Park, Bush Terminal Piers Park, and Dyker Beach Park. In

Bay Ridge at the base of the Verrazano Narrows Bridge is a Department of Defense parcel, Fort Hamilton, an active-duty military installation (see Figure 75). A number of outfalls are located in the zone including those in the Gowanus Canal and Navy Yard Basin, and the shoreline to the south of the Fort Hamilton parcel is hardened and within a CEHA.

3.4.7.2 Impacts and Avoidance, Minimization, and Mitigation Measures

In terms of land use, utilities, and shoreline protection, no zones have a high constraint ranking. All zones in the Landfall and Overland Area rank medium or low for land use, utilities, and shoreline protection, and OSW cables could likely avoid affecting these resources in many of these zones. Any CEHA should be avoided by the use of trenchless methods like HDD, as discussed further in the following section. The low ranking for constraints associated with land use, utilities, and shoreline protection for many of the Onshore South Shore zones, indicates that construction, operation, and maintenance of cables could avoid impacts to these resources.

Potential impacts to land use as a result of cable installation includes minor, short-term impacts including a short-term increase in construction vehicle traffic and activity, temporary disturbance associated with construction and staging areas, noise, and air quality. During operation, no impacts to land use are anticipated because the majority of the cables will use existing ROWs primarily underground. As such, following construction, disturbed areas will be restored. Although land use was not categorized as highly constrained, landfalls may occur in public open space in Zones ON-4, ON-6 though-18, and ON-21. To use municipally owned public open spaces for OSW cables, a municipality must convey, sell, or lease municipal parkland or discontinue its use as a park, referred to as parkland alienation. To convey parkland away or to use parkland for another purpose, a municipality must receive prior authorization from the State in the form of legislation enacted by the New York State Legislature and approved by the governor (NYSOPRHP 2017). To maintain structures on, over, or under inalienable property in the City of New York, such as parkland or within City streets and ROWs, revocable consent pursuant to Section 362(d) of the New York City Charter must be obtained. Inalienable Property means the rights of the City in and to its waterfront, ferries, wharf property, bridges, land under water, public landings, wharves, docks, streets, avenues, highways, parks, waters, waterways, and all other public places. The administering agency works with the applicant to ensure there is no interference with underground infrastructure and to minimize impacts to City property. The administering agency also notifies stakeholders and solicits feedback on the request to ensure that the cables will not impact the public use of City properties.

Additional public open spaces may be intersected by cable routes or may be needed for temporary workspace and may result in temporary loss of access to and use of public lands during construction. Consideration of the use of port facilities and existing working waterfront areas for OWS landfall can reduce potential impacts to land uses like parkland as well as residential areas.

OSW cables must avoid conflicts with existing utilities or coordinate on co-locating in a shared ROW. Generally parallel alignment of new OSW cables with existing linear infrastructure, where practicable, will preserve adjacent open space for future OSW cables and prevent further resource fragmentation.

Installation of onshore cables in Zone ON-3 requires trenchless construction methods beneath the hardened shoreline and Hudson River Greenway to make landfall. Noise and other construction-related impacts may result from this type of installation. Cable installation through CEHAs requires trenchless construction methods at a depth deep enough to minimize disturbances to beaches, dunes, or bluffs to avoid decreasing or completely removing the erosion buffering function of natural protective features.

With respect to onshore operational impacts to land use, although loss of open, undeveloped land from the placement of converter stations and potential expansions of existing ROWs may occur, use of existing ROWs will avoid and minimize any such impacts. Operational impacts to shoreline protection features are not anticipated.

Table 29 to Table 31 summarize minimization and mitigation measures relevant to land use, linear utilities, and shoreline protection that effectively address the impacts from OSW cable construction.

3.4.8 Transportation

3.4.8.1 Existing Conditions

Transportation resources include controlled access parkways, State highways including controlled access highways, and non-commuter rail lines; the latter are included due to complexities of co-locating along those lines versus commuter rail lines; these resources are depicted on Figure 85 through Figure 96. For certain major roads like controlled access parkways and highways, installation of an OSW cable is a non-transportation use of the ROW that requires review and approval on a case-by-case basis by both NYSDOT and FHWA, as described in Section 1.3.5: NYSDOT, and Section 2.1.2: Landfall and Overland Area. Within the Landfall and Overland Area for the South Shore, Zones ON-11 Long Beach 3, ON-12 through ON-14 Long Beach 1-3, ON-15 Robert Moses, and ON-16 and ON-17 Smith Point 1 and 2 all rank high for transportation constraints. The remaining zones all rank medium. For the Long Island Sound Approach Zones, ON-19 Shore Road, ON-24 Northport 2, and ON-25 Shoreham rank medium; the remainder rank low. All New York Harbor zones rank low for transportation constraints with the exception of ON-7 Lower New York Bay which ranks medium.

Zones ON-11, ON-12, ON-13, and ON-14 include multiple parkways—three for ON-11, five for ON-12, six for ON-13, and four for ON-14—and contain one to two non-commuter rail lines. In Zone ON-15, the Robert Moses Causeway connects the barrier island to the mainland; it also connects to Ocean Parkway. Additionally, one NYSDOT-owned non-commuter rail line is located within the zone, and there are controlled access roadways. Zone ON-16 Smith Point contains the Heckscher State Parkway, Robert Moses Causeway, and Southern State Parkway. Zone ON-16 also includes multiple controlled access roadways and one non-commuter rail line.

Although Zone ON-18 Smith Point 3 does contain parkways, it includes multiple controlled access roadways and one non-commuter rail line. Zones ON-7 and ON-8 contain one parkway, Ocean Parkway; multiple non-commuter rail lines; and several controlled access highways. Zone ON-9 also contains only one parkway, Southern State Parkway; multiple non-commuter rail lines, and multiple controlled access highways. Zone ON-10 contains three parkways, Meadowbrook State Parkway, Northern State Parkway, and Southern State Parkway; multiple non-commuter rail lines; and several controlled access highways. Zones ON-19, ON-24, and ON-25 each contain only one parkway. Zone ON-19 has multiple controlled access highways, Zone ON-24 has two, and Zone ON-25 has only one. Non-commuter rail lines are not as prominent in Zone ON-24 and Zone ON-25 in contrast to Zone ON-19.

3.4.8.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Because of the high constraints ranking for transportation for 8 of the 11 onshore zones in the Onshore South Shore zones, it will be challenging to avoid impacts to controlled access parkways and highways as well as non-commuter rail lines in those zones, even with appropriate siting and engineering design. Parkways and controlled access highways present in all of the onshore zones require additional review and approval for their non-transportation use (i.e., the longitudinal installation of a transmission cable) within the ROW. This review includes the exception process to the New York State Accommodation Plan and approval by NYSDOT and FHWA, as well as authorization prior to longitudinal cable installation in the ROW and a Use and Occupancy Agreement between the developer and NYSDOT, and the application for additional NYSDOT approvals, such as a Highway Work Permit. Coordination with NYSDOT will be required early during the siting process regarding such roadways. The coordination between federal and State agencies, and the criteria for approval for non-transportation use, could significantly affect the cost and schedule for OSW cable permitting and installation. Additionally, there may be constructability concerns due to transportation constraints, such as difficulty in getting materials and/or equipment onsite during construction.

In all locations, during construction, construction-related traffic, including heavy equipment and vehicles driven by construction crews, increases. Short-term impacts to local traffic may occur during active construction as a result of temporary lane closures, if needed, for cable installation that occurs along a roadway ROW or to accommodate cable stringing during installation.

Roadways may be crossed using open cut or trenchless methods. Potential impacts resulting from cable installation may include temporary lane closure (full or partial closures) during construction. Traffic control measures, including alternating traffic patterns, would be needed to minimize impacts to local traffic patterns. Coordination with NYCDOT regarding use of New York City streets for future cable installation would be required. Installation of a cable under a City street or sidewalk requires a petition for revocable consent from NYCDOT. A revocable consent is the grant of a right to an individual or organization to constrain and maintain certain structures on, over, or under the inalienable property (defined as streets and sidewalks) of the City. These are typically granted for a term of 10 years and can then be renewed (NYCDOT 2023).

Table 32 summarizes minimization and mitigation measures relevant to transportation that may address the impacts to the Land and Overland Area in most cases, although the list of measures in Table 32 is not exhaustive and all NYSDOT permitting or FHWA review is completed on a case-by-case analysis. After the cable design incorporates all avoidance measures to the maximum extent practicable, siting of OSW cables considering ROWs requiring FHWA approval for their non-transportation use may require additional minimization and mitigation measures appropriate for specific routes.

3.4.9 Environmental Justice/Disadvantaged Communities

3.4.9.1 Existing Conditions

Of the 25 Landfall and Overland zones, 11 rank high and seven rank medium for potential environmental justice areas and disadvantaged communities. Figure 85 through Figure 96 illustrate potential environmental justice areas and disadvantaged communities. Environmental justice is defined by EPA as "the fair treatment and meaningful involvement of all people regardless of race, color, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (EPA 2021)." NYSDEC defines fair treatment as meaning that "no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies." Potential environmental justice areas are defined as U.S. Census block groups of 250 to 500 households each that meet or exceed at least one of the following statistical thresholds:

- At least 52.42 percent of the population in an urban area reported themselves to be members of minority groups.; or
- At least 26.28 percent of the population in a rural area reported themselves to be members of minority groups; or
- At least 22.82 percent of the population in an urban or rural area had household incomes below the federal poverty level.

The Climate Act defines disadvantaged communities as "communities that bear burdens of negative public health effects, environmental pollution, impacts of climate change, and possess certain socioeconomic criteria, or comprise high concentrations of low- and moderate-income households." New York State's Climate Justice Working Group released draft criteria for identifying disadvantaged communities on March 9, 2022. These criteria include 45 socioeconomic, health, and environmental indicators intended to gauge relative risks and vulnerabilities faced by communities statewide. New York State's Climate Justice Working Group scored every Census tract in the State, combining the percentile ranks of the indicators for each Census tract to produce a value that measures risk and vulnerability relative to other tracts. Census tracts with combined scores in the top 35 percent compared to other tracts across the State or within their region (New York City or the rest of the State) are identified as disadvantaged communities. In addition, tracts where at least 5 percent of land is part of a federally recognized Tribal reservation or owned by a Tribe are included as disadvantaged communities (NYSDEC and NYSERDA 2022).

The New York City metropolitan statistical area, including New York City, Staten Island, and Long Island, along with other suburbs of New York City in New York State, New Jersey, and Pennsylvania, is home to a diverse population and many minority and low-income communities. According to the U.S. Census Bureau’s 2019 1-year American Community Survey estimates, an estimated 42.9 percent of the metropolitan statistical area’s population of 19.2 million people identify as a race other than white, and 25.0 percent identify as Hispanic or Latino (U.S. Census Bureau n.d.a, n.d.b). An estimated 12.8 percent of the population in the metropolitan statistical area had income below the poverty level within the previous 12 months, according to the 2017 1-year American Community Survey estimates (U.S. Census Bureau n.d.c). Noted by the Endangered Language Alliance as the “world’s most linguistically diverse metropolitan area,” the New York City area is home to speakers of over 700 language varieties and dialects (Endangered Language Alliance n.d.).

3.4.9.2 Impacts and Avoidance, Minimization, and Mitigation Measures

The high constraints ranking for environmental justice and disadvantaged communities in 11 of the onshore zones (Zones ON-3 through ON-9, Zone ON-11, Zone ON-18, and Zone ON-19) suggests that it will be relatively challenging to avoid, minimize, or mitigate impacts to those communities in those zones, even with appropriate siting and engineering design. Installation of onshore cables results in temporary impacts during construction, including noise and vibration produced by construction equipment and vehicles, emissions of air pollutants, and potential releases of hazardous materials or wastes. The use of existing public ROWs by new OSW cables is expected to provide a buffer between construction activities and residences or other sensitive receptors, such as schools, libraries, religious institutions, hospitals, nursing homes, and parks and recreational areas, including potential environmental justice areas and disadvantaged communities.

Noise and vibration generated during construction occurs temporarily, similar to noise produced by other construction or utility installation activities in urban areas. Construction generally occurs during daytime working hours. However, longer HDD operations beneath riparian areas or existing transportation or utility infrastructure may continue for up to 24 hours a day until the operation is completed because the drilling process requires continuous activity to complete. These HDD operations may result in elevated noise levels at night that could affect sensitive receptors. Because noise effects occur in the vicinity of the construction corridor, there is the potential for disproportionate noise impacts to environmental justice populations and disadvantaged communities within the zones crossed by onshore cables during construction.

Similarly, emissions of air pollutants and fugitive dust during construction also occur local to the area under construction. Minor, temporary impacts to air quality would be similar to those produced by other construction activities and transportation in urban areas. Depending on the location of a transmission corridor, construction could have disproportionate air quality impacts to environmental justice populations and disadvantaged communities. Implementing measures such as fugitive dust control plans, use of ultralow diesel sulfur fuel and lower emissions alternative equipment, limiting idling vehicles and construction equipment, and limiting use of personal vehicles at the site by requiring construction workers to vanpool from a common location will minimize impacts.

Potential impacts to wetlands, surface waters, and water quality in the Landfall and Overland Area are discussed in Section 3.4.4: Wetlands, Surface Waters, and Water Quality. Construction may affect water quality as a result of sedimentation and accidental releases of hazardous materials. However, construction is not expected to result in disproportionate impacts to environmental justice populations and disadvantaged communities as a result of impacts to water quality because of the absence of major waterbodies or crossings in zones ranked high for these communities.

Potential sources of contamination in the Landfall and Overland Area zones are described in Section 3.4.5: Areas of Contamination. Zones ON-6 Astoria and Rainey and ON-18 Smith Point 3 rank medium for areas of contamination and high for environmental justice populations and disadvantaged communities. Siting and appropriate installation technologies will avoid areas of contamination or minimize the potential for disproportionate impacts to environmental justice populations and disadvantaged communities.

Operational impacts from OSW cables include noise generated by new electrical equipment, EMF generated by buried cables and other electrical equipment, visual impacts, and disruptions to access or physical division of a community electrical equipment in converter stations or substations associated with OSW cables generate noise. These facilities are sited in suitably zoned districts and comply with applicable zoning regulations related to noise from stationary facilities. Operational noise is not likely to significantly exceed ambient noise levels at nearby sensitive receptors or result in disproportionate impacts to environmental justice populations or disadvantaged communities.

EMF effects are shielded (weakened) by most materials, including soil, buildings, trees, and human skin. OSW cables buried at the appropriate depths would likely not produce aboveground electric fields. EMF of buried 345-kV OSW cables at a height of 3 feet directly above the buried cable produces levels well below the health-based threshold for public exposure to EMF (2,000 milligauss [mG]) determined by the International Commission on Non-Ionizing Radiation Protection (Gradient 2015). The maximum magnetic field of buried OSW cables (34 mG) produces levels below the New York State guideline for magnetic fields at the edge of the ROW (200 mG) (Gradient 2015). Therefore, EMF generated by the OSW cables is not expected to pose potential health risks or have disproportionate impacts to environmental justice communities.

Onshore transmission cables buried within existing public road and utility ROWs would not divide or affect access to communities in the Landfall and Overland Area zones. As indicated in Section 3.4.8.2: Impacts and Avoidance, Minimization, and Mitigation Measures, traffic, including heavy equipment and vehicles driven by construction crews, increases during construction. Short-term impacts to local traffic may occur during active construction as a result of temporary lane closures, if needed, for cable installation that occurs along a roadway ROW or to accommodate cable stringing during installation. See Table 32 for a discussion of measures to minimize these impacts. No significant visual impacts are expected during operation. Overhead utility poles would be limited, and aboveground facilities such as converter stations or substations would be sited on properties zoned for this type of use and consistent with existing uses adjacent to the site.

If maintenance of OSW cables requires excavation, these activities could result in air emissions and impacts to water quality and contaminated areas similar to those during construction. As indicated above, air quality impacts will be minimized through the use of fugitive dust control plans, use of ultralow diesel sulfur fuel and lower emissions alternative equipment, and limiting idling vehicles and construction equipment. Impacts to water quality and contaminated areas can be avoided through appropriate siting and engineering design. Minimization measures for water quality and contaminated areas where avoidance is not feasible are included in Table 26 and Table 27, respectively.

Mitigation and minimization measures for cable construction impacts to environmental justice populations and disadvantaged communities include conducting outreach to and notifying adjacent landowners prior to and during construction, establishing a noise complaint hotline, maintaining construction equipment and installing temporary noise reduction devices and barriers, implementing a fugitive dust control plan, and placing transmission cables underground in public road ROWs.

Development of a robust, multi-lingual community engagement plan and implementation of that plan early in the planning process is important in soliciting community member feedback and making the community aware of what is planned. Mitigation and minimization measures for cable operational impacts to environmental justice populations and disadvantaged communities include installing cables underground within existing ROWs and limiting overhead poles to minimize visual impacts.

Table 33 summarizes minimization and mitigation measures relevant to environmental justice populations and disadvantaged communities. These measures, taken in concert with measures specific to related environment impacts such as surface waters and wetlands and areas of contamination, effectively address impacts for environmental justice population and disadvantaged communities in the Landfall and Overland Area.

Figure 71. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Index Map)

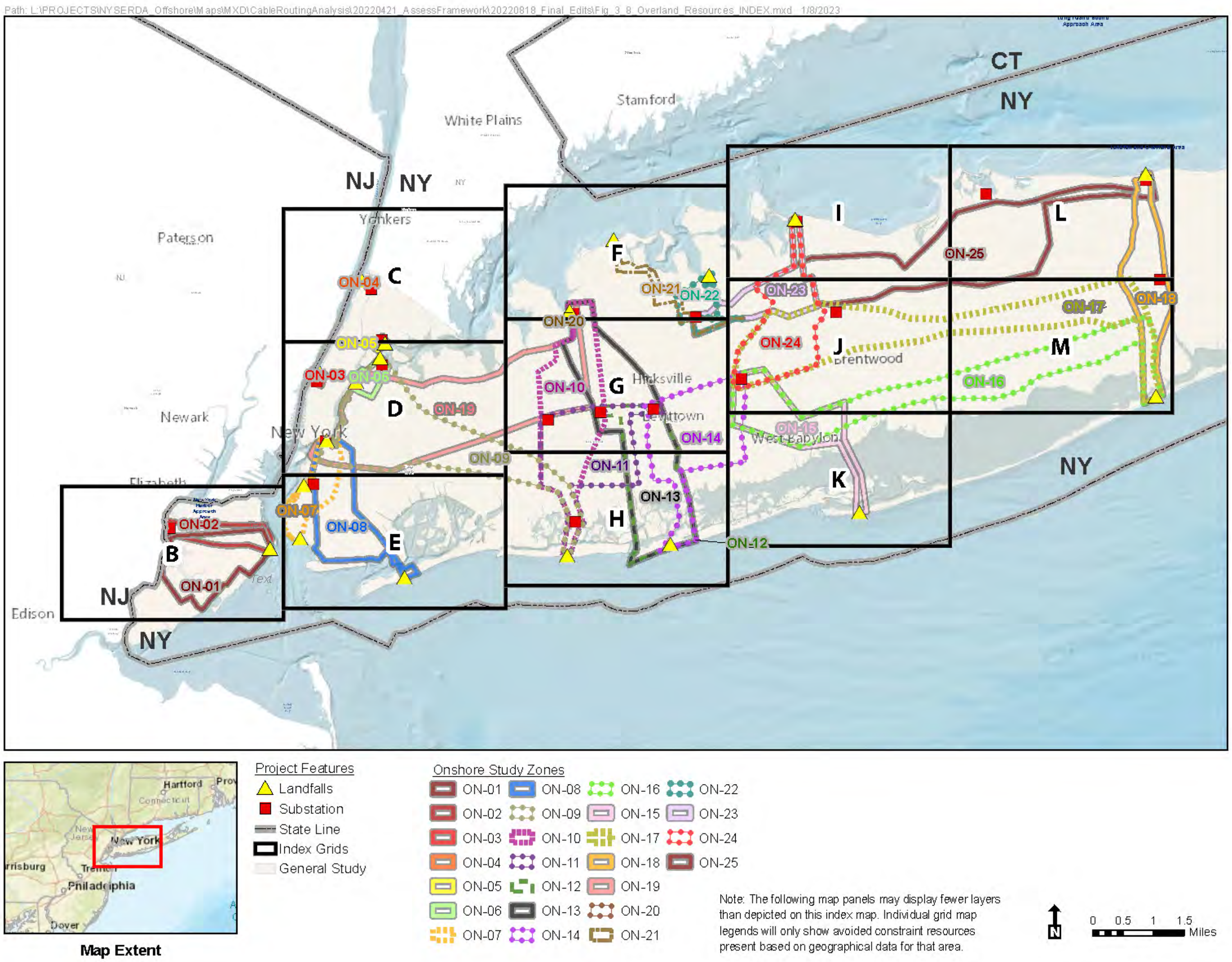


Figure 72. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Map B)

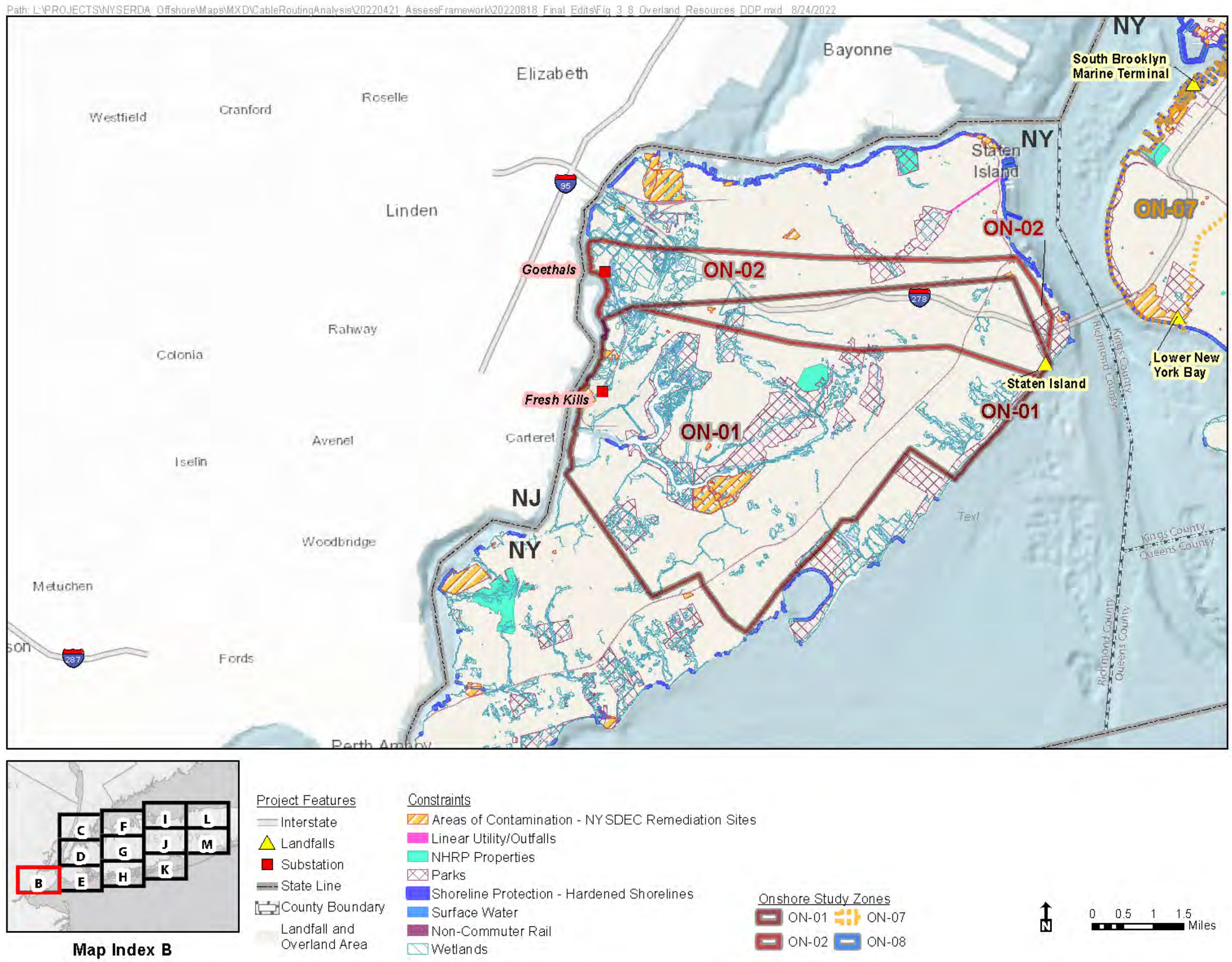


Figure 73. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Map C)

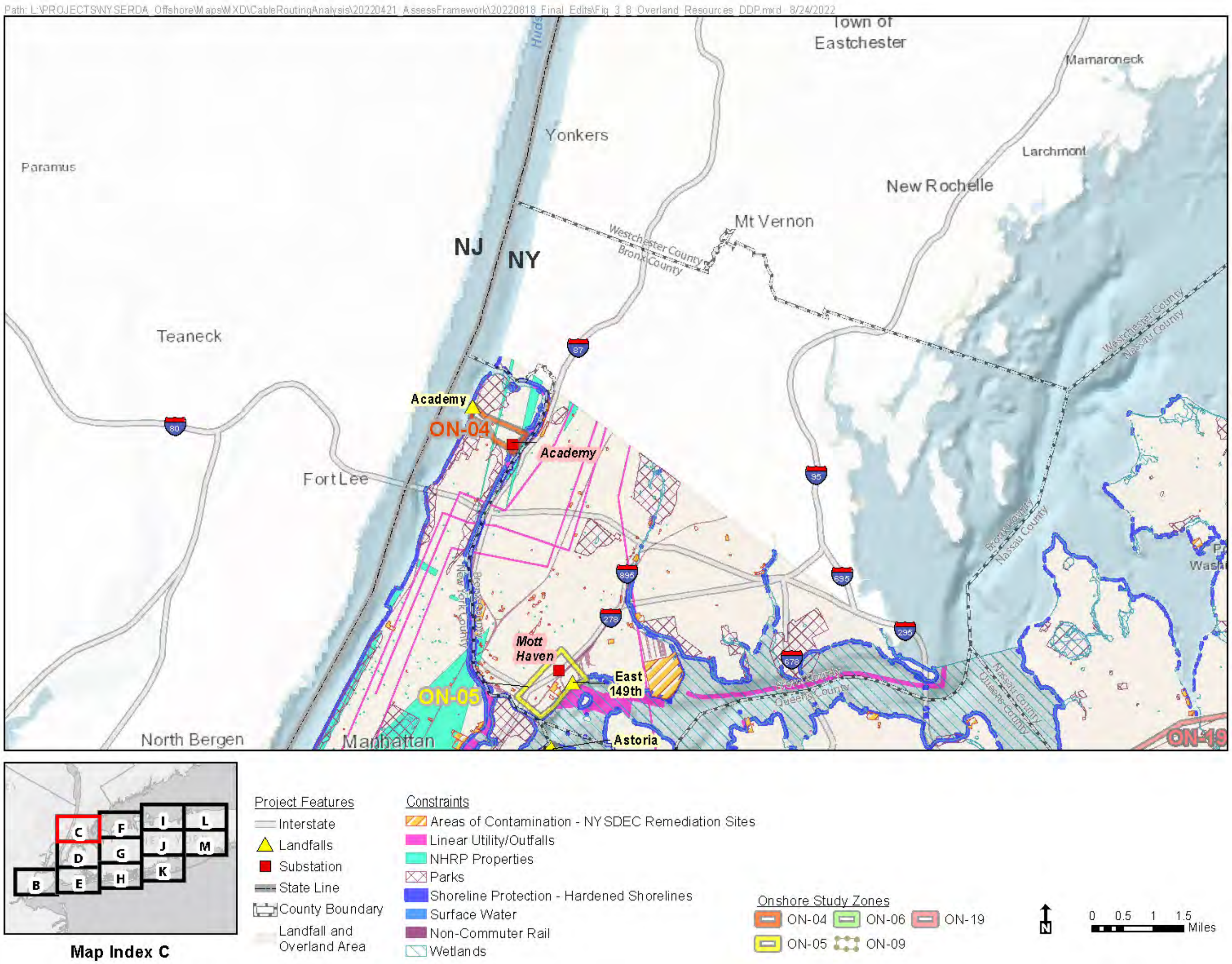


Figure 74. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Map D)

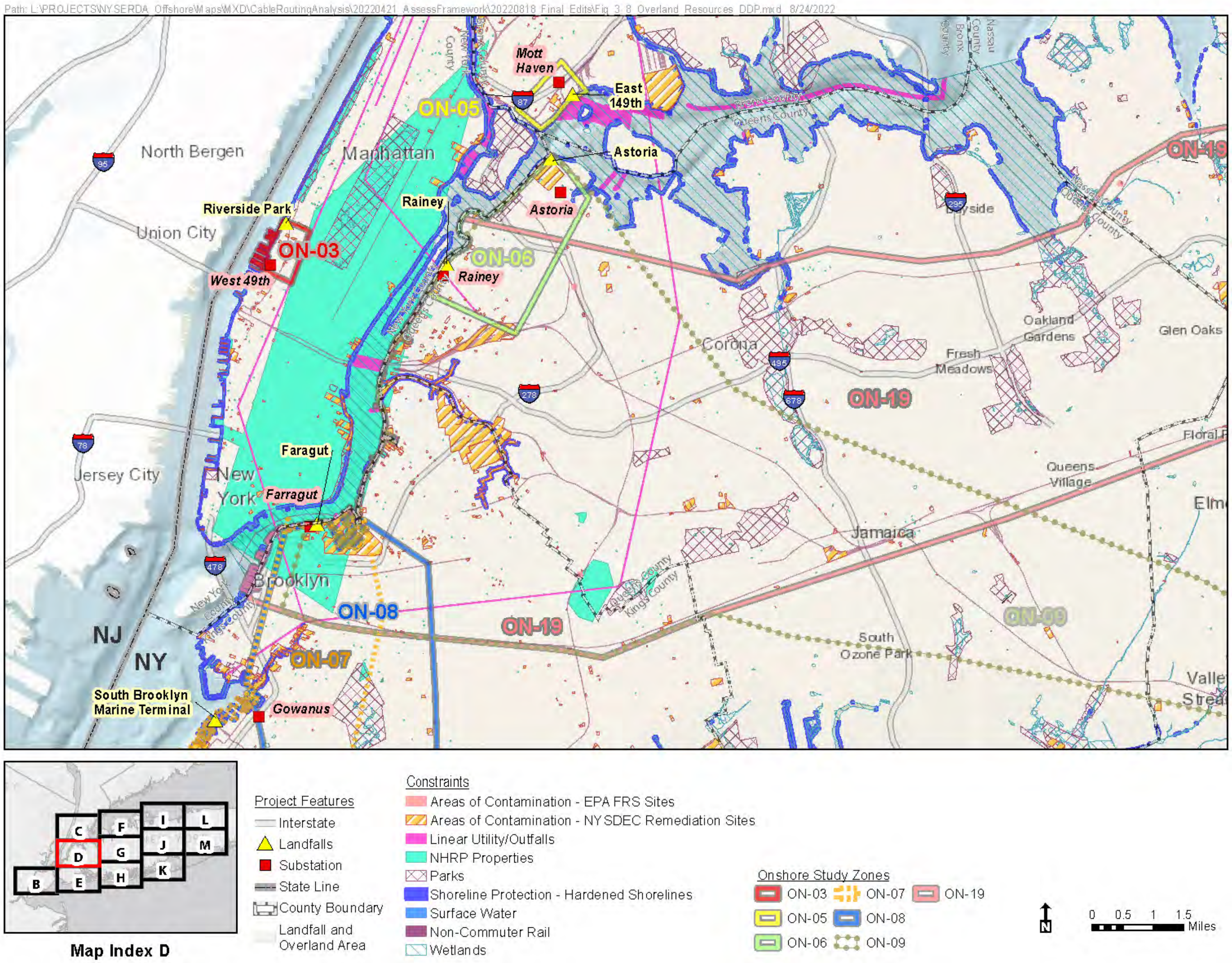


Figure 75. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Map E)

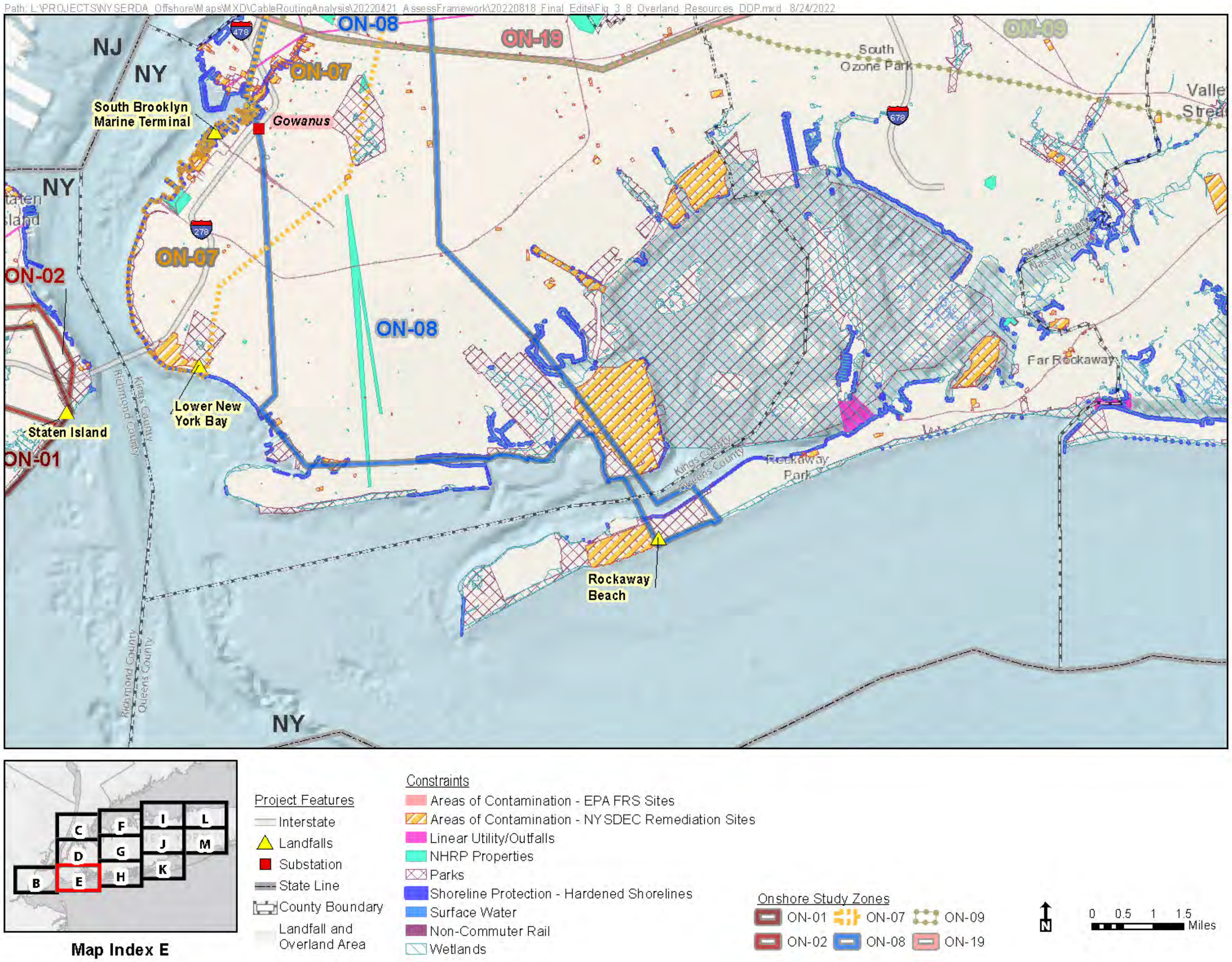


Figure 76. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Map F)

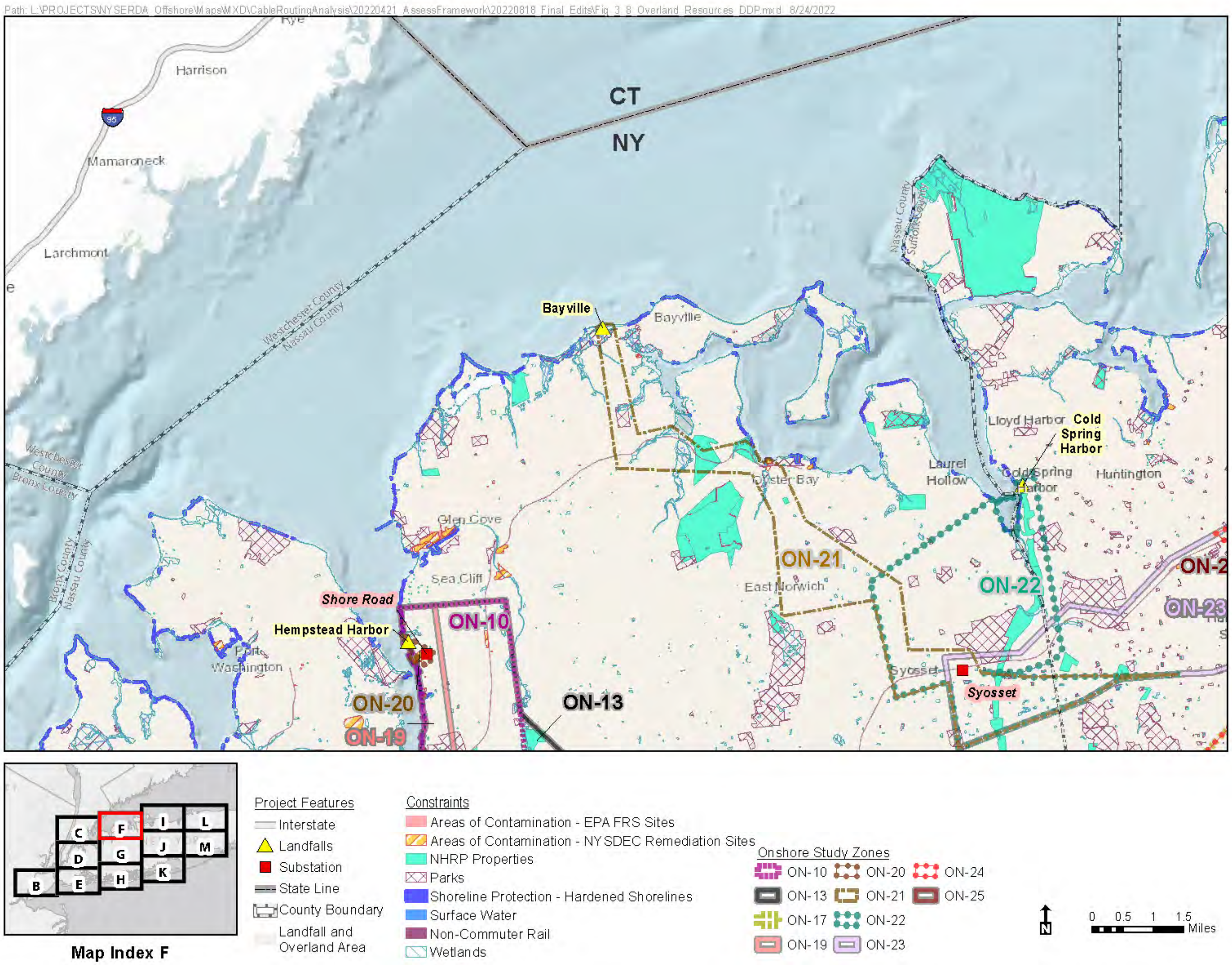


Figure 77. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Map G)

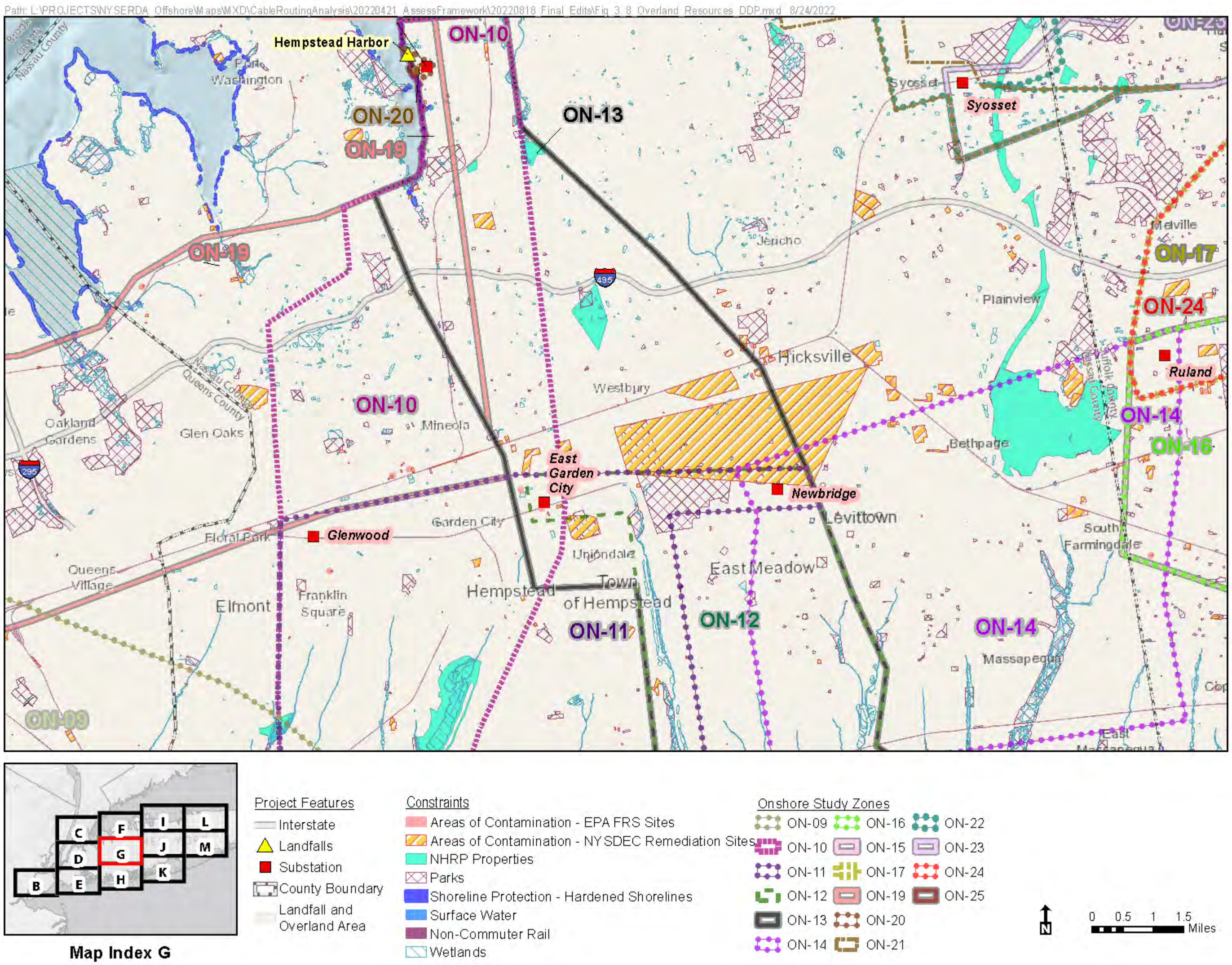


Figure 78. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Map H)

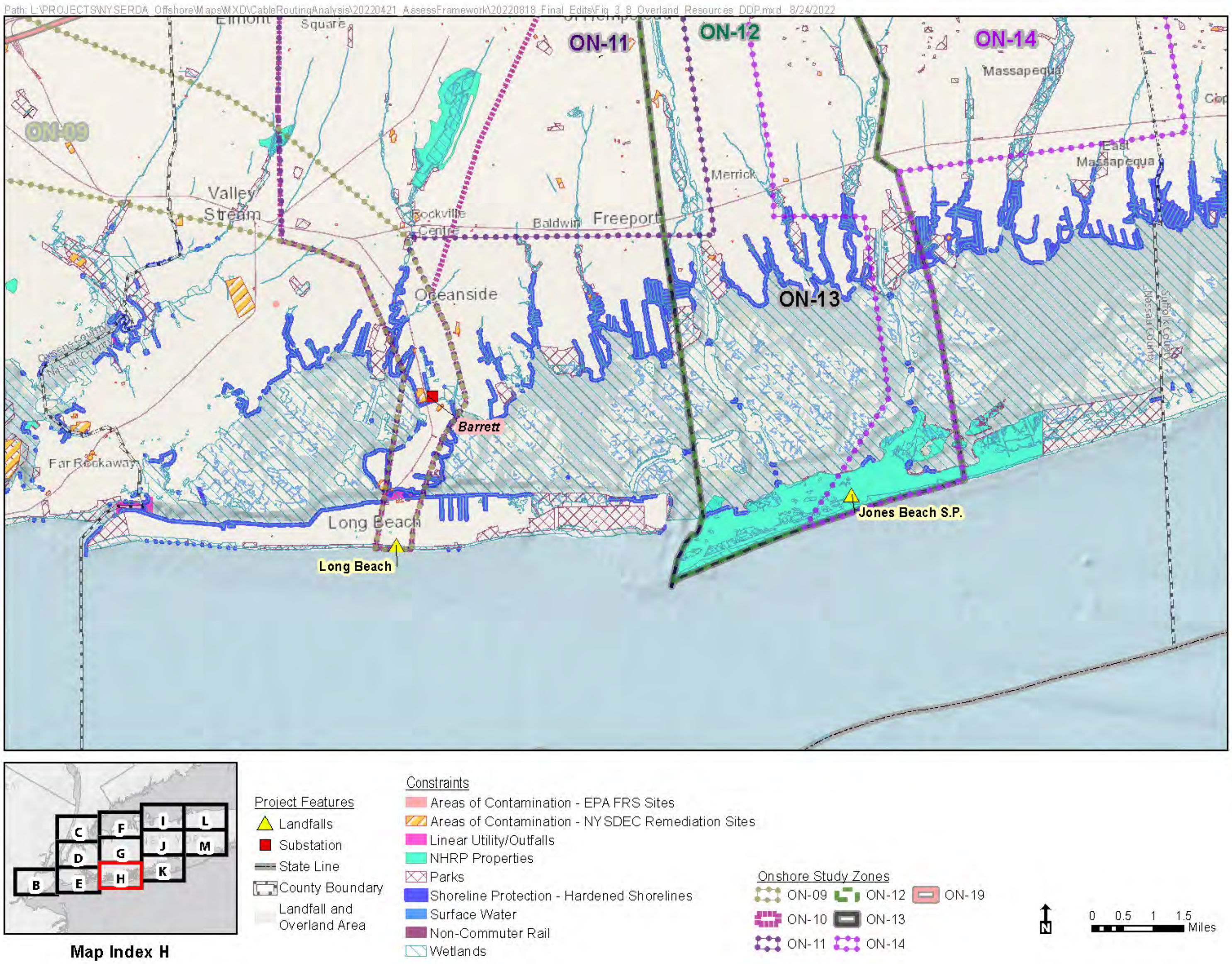


Figure 79. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Map I)

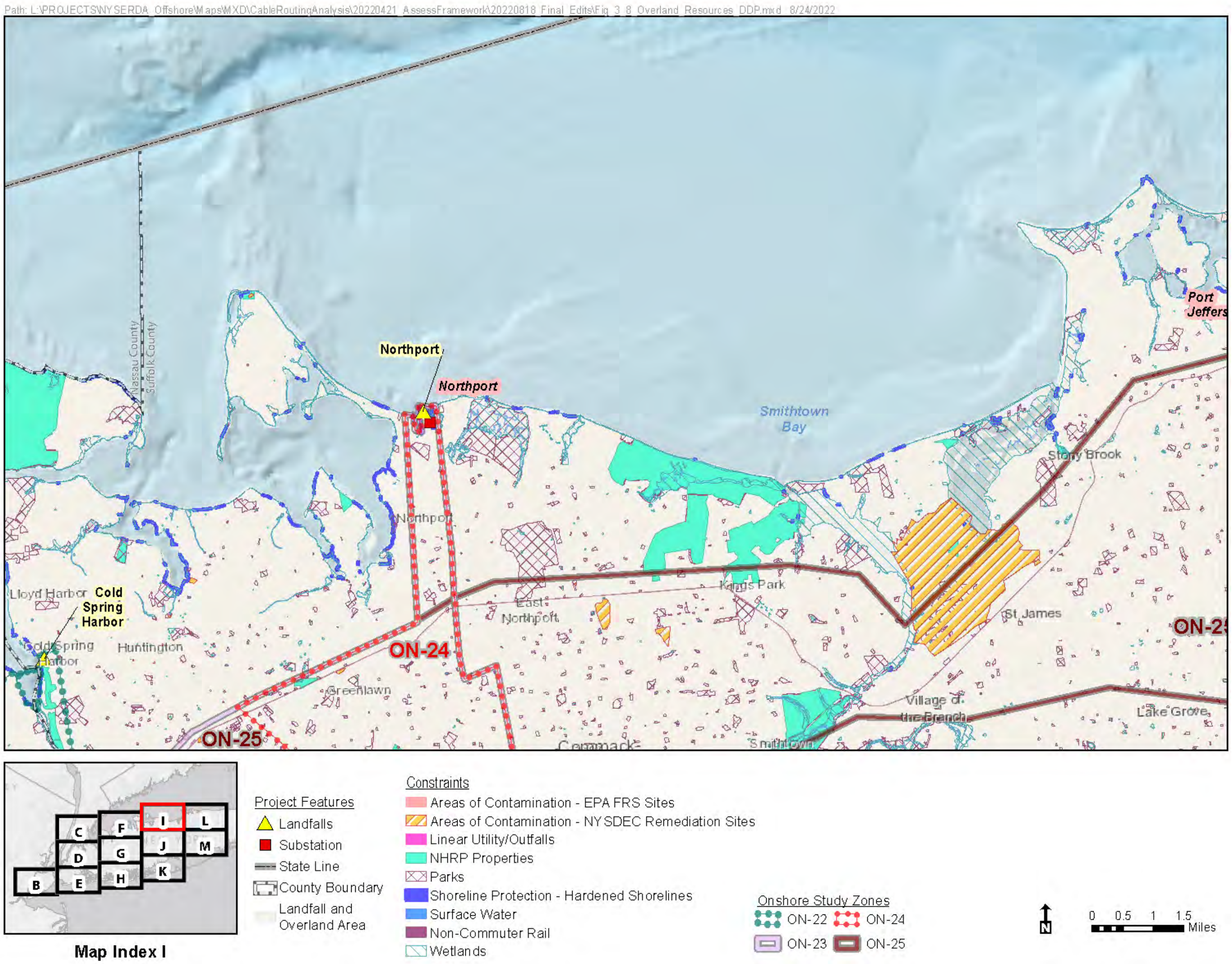


Figure 80. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Map J)

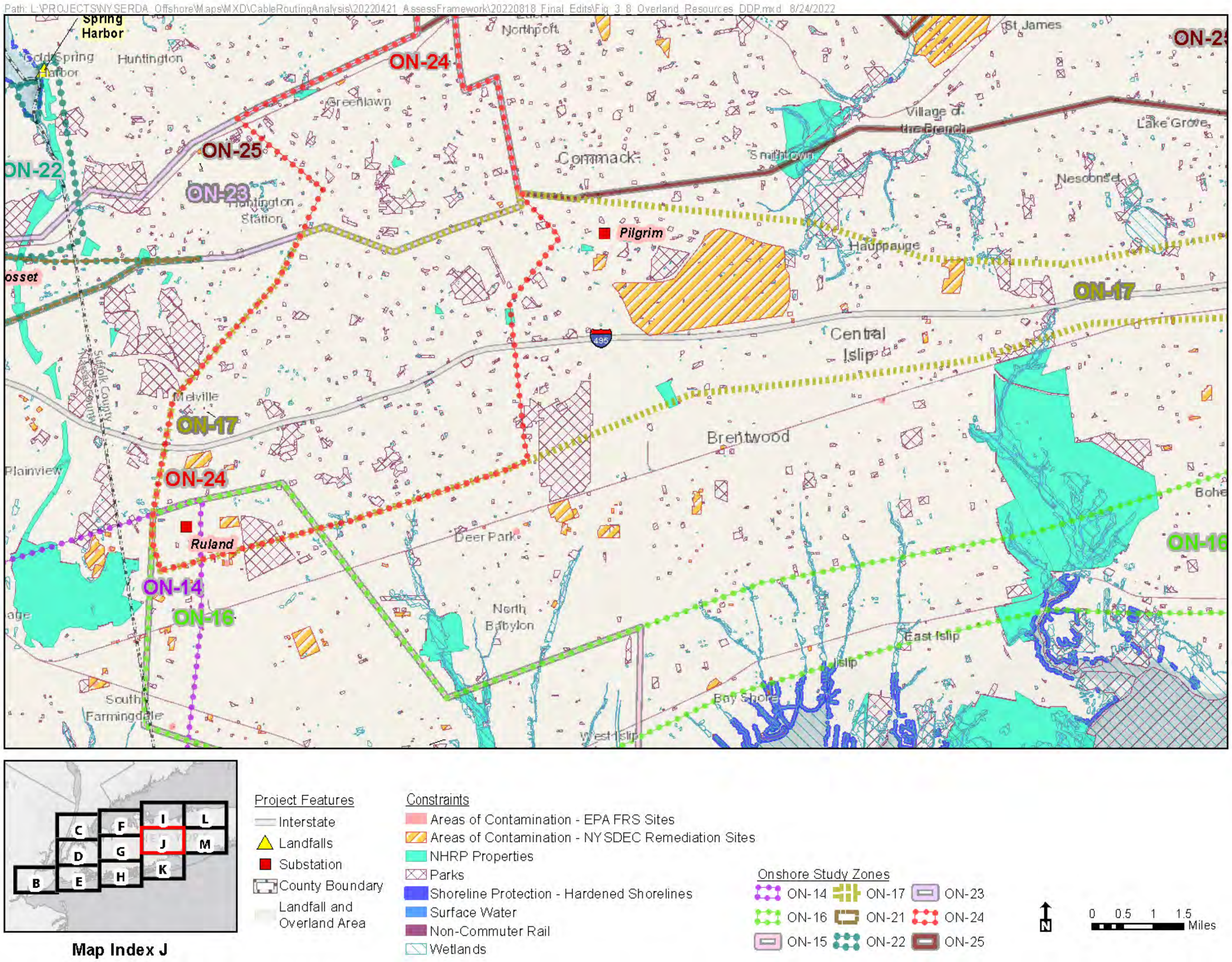


Figure 81. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Map K)

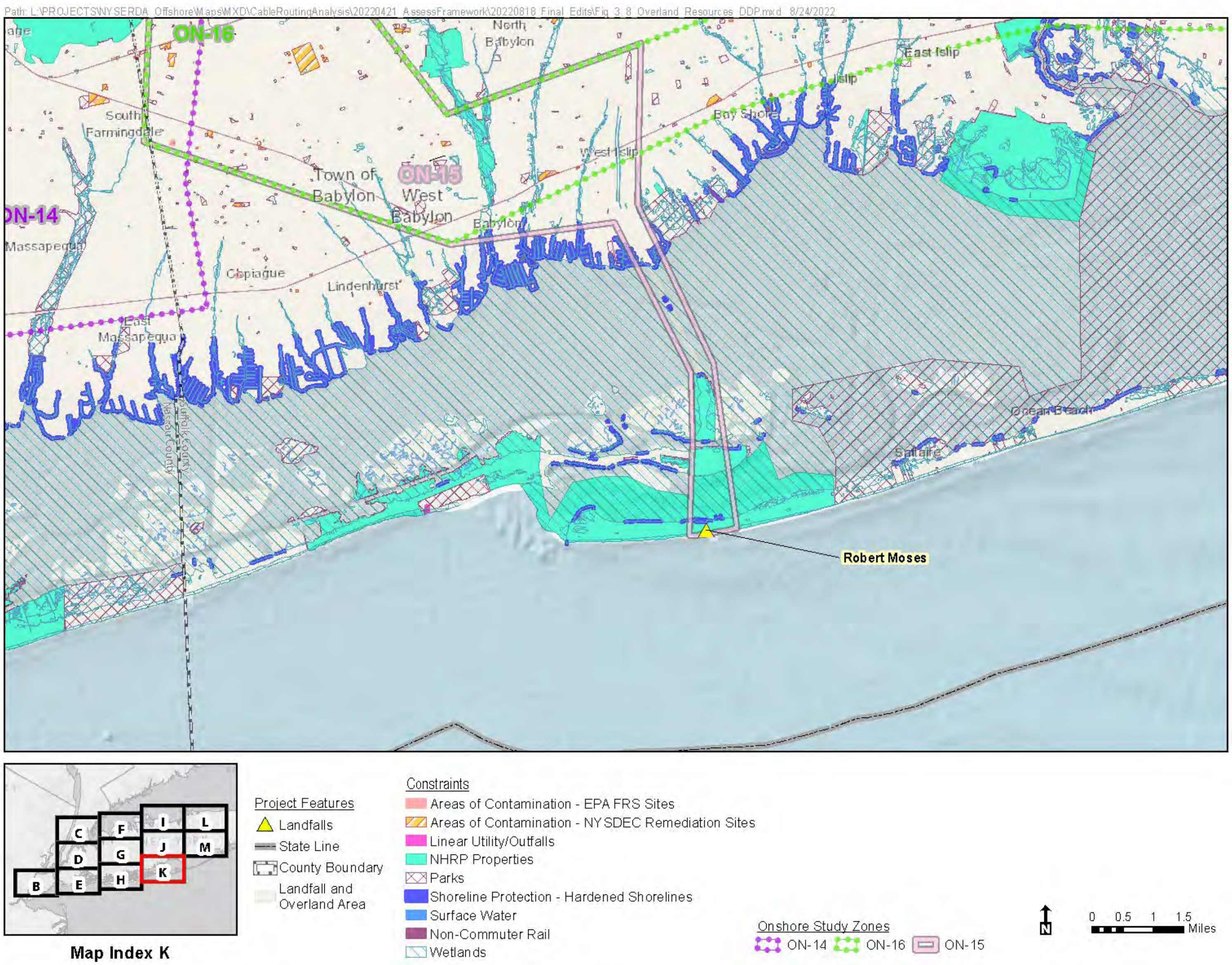


Figure 82. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Map L)

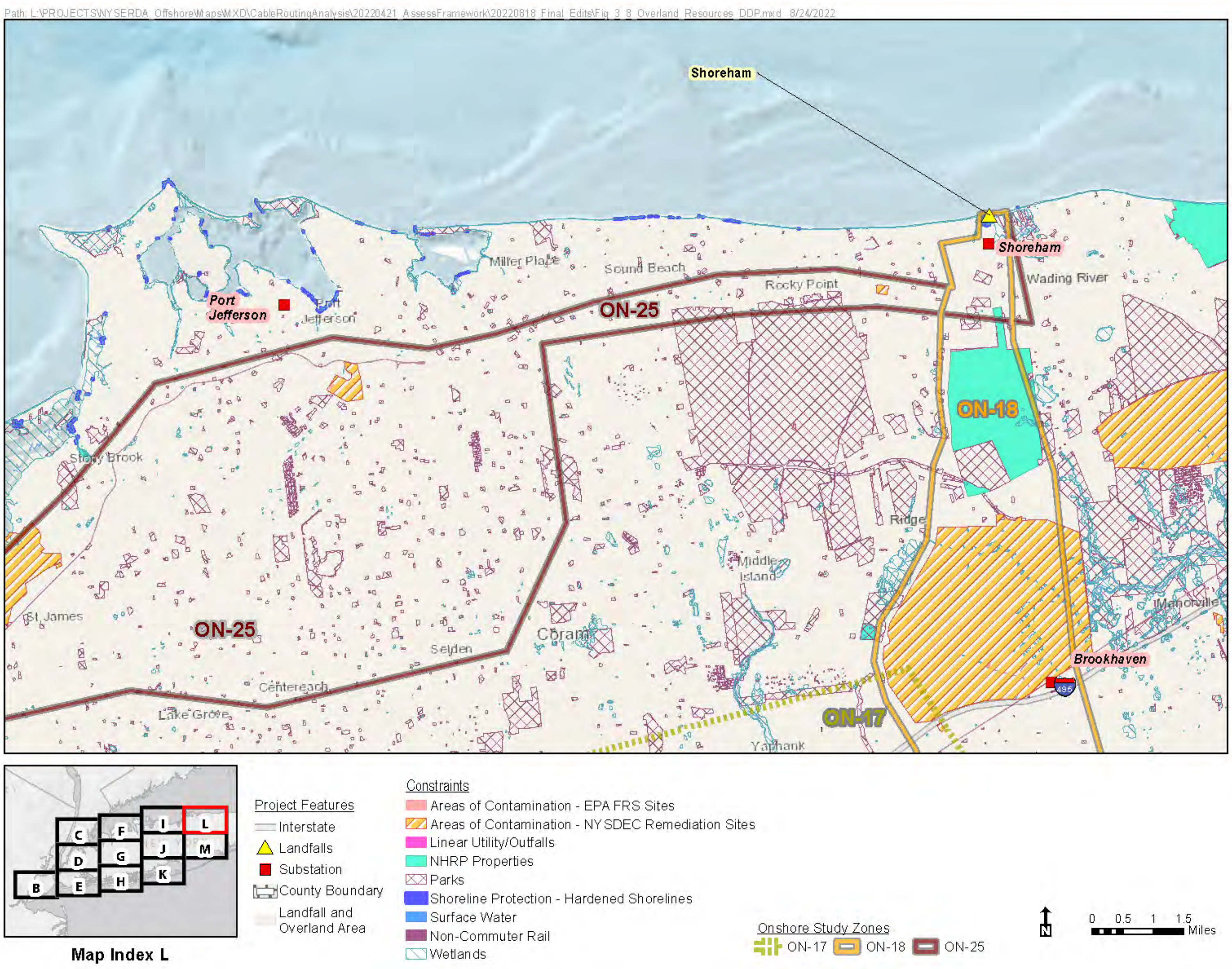


Figure 83. Resources Present and Expected to be Avoided in the Landfall and Overland Area (Map M)

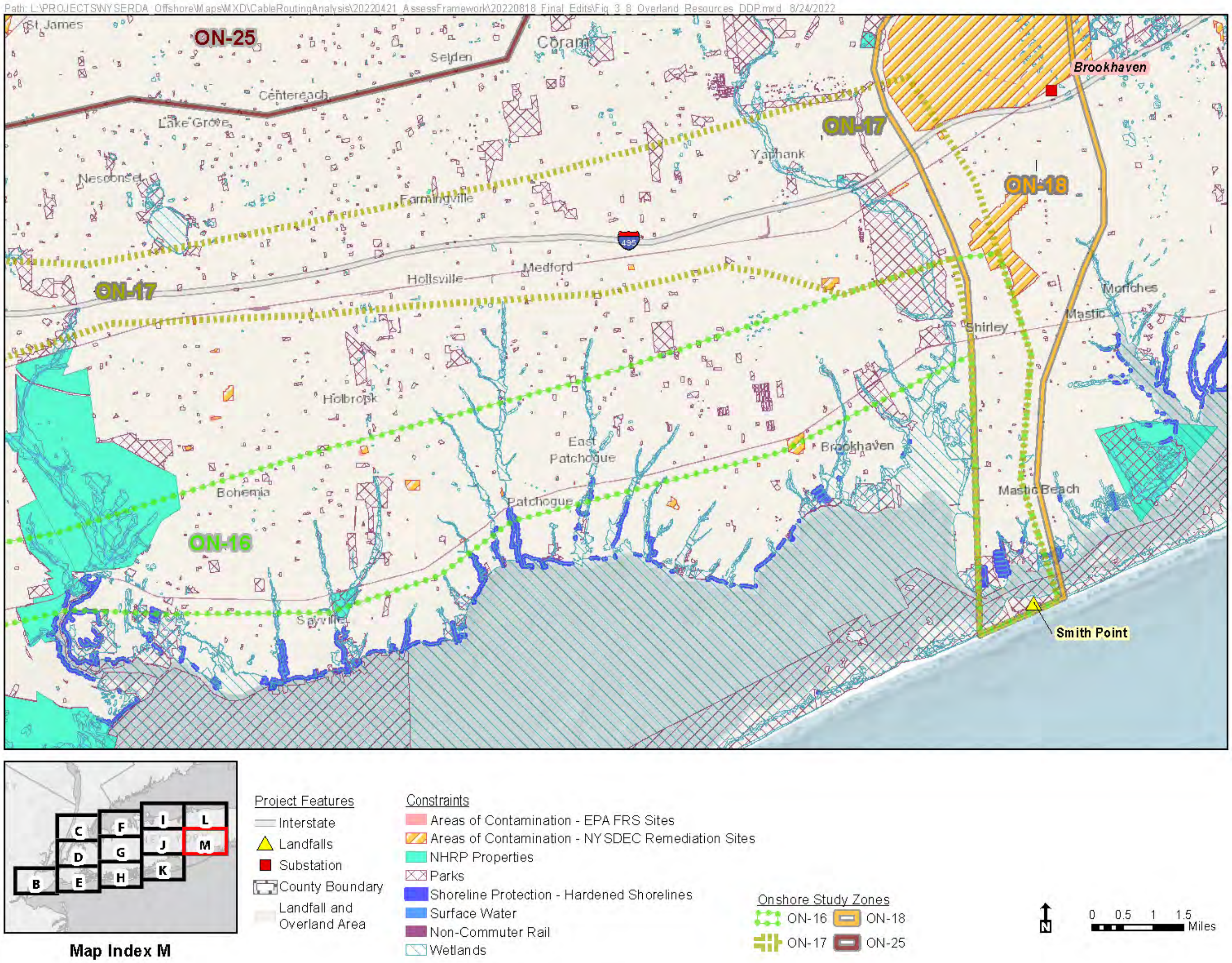


Figure 84. Resources Considered High Constraints within the Landfall and Overland Area (Index Map)

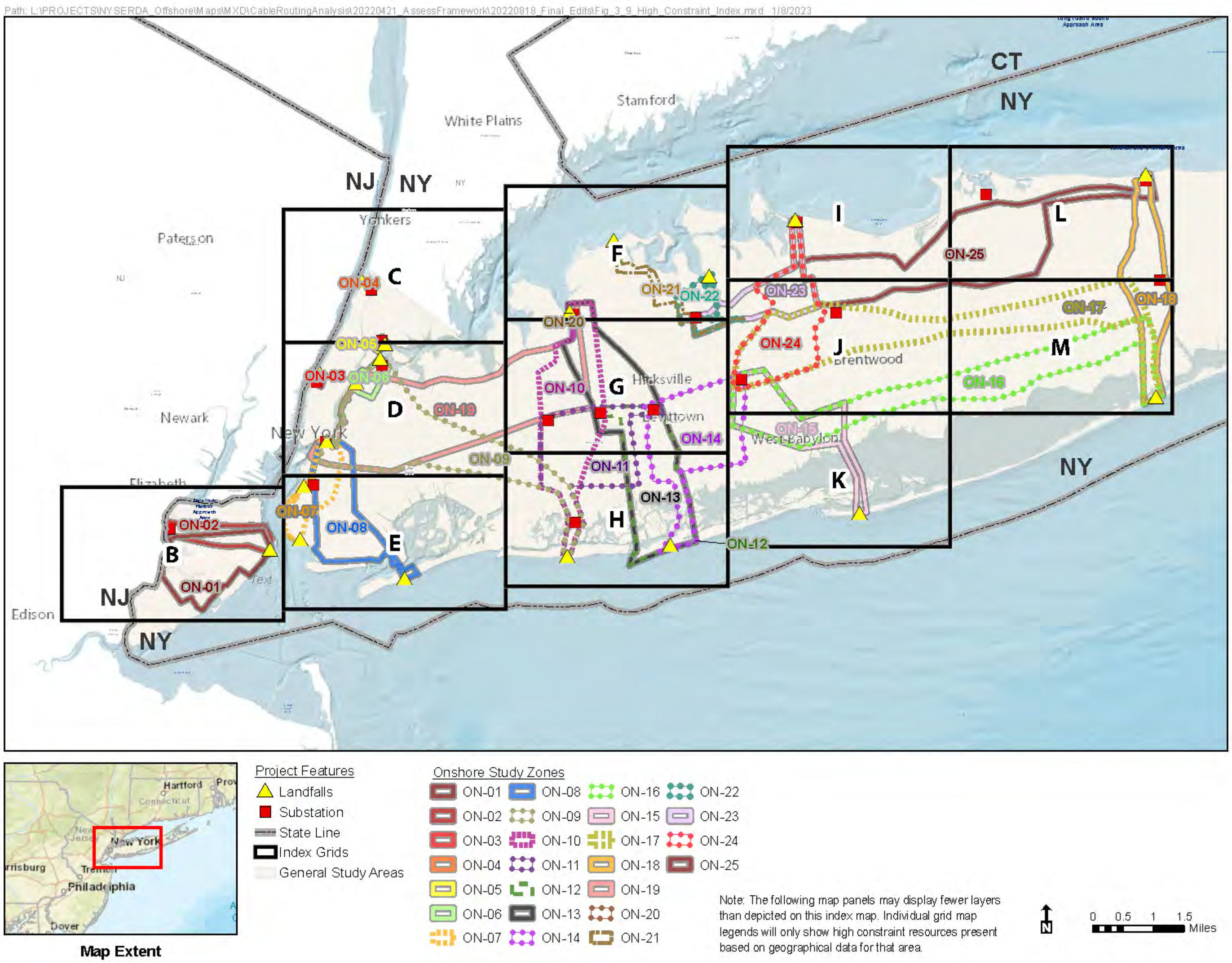


Figure 85. Resources Considered High Constraints within the Landfall and Overland Area (Map B)

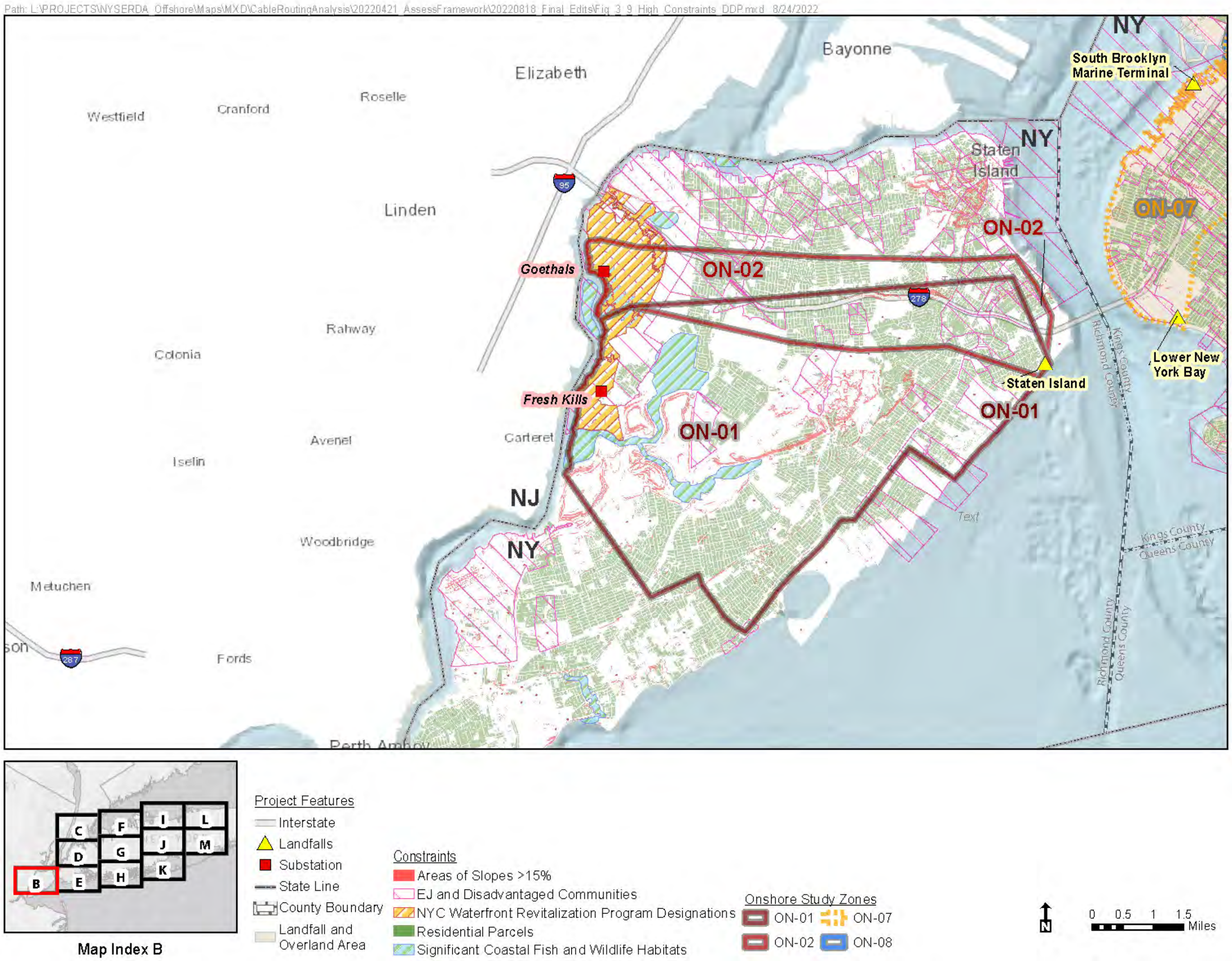


Figure 86. Resources Considered High Constraints within the Landfall and Overland Area (Map C)

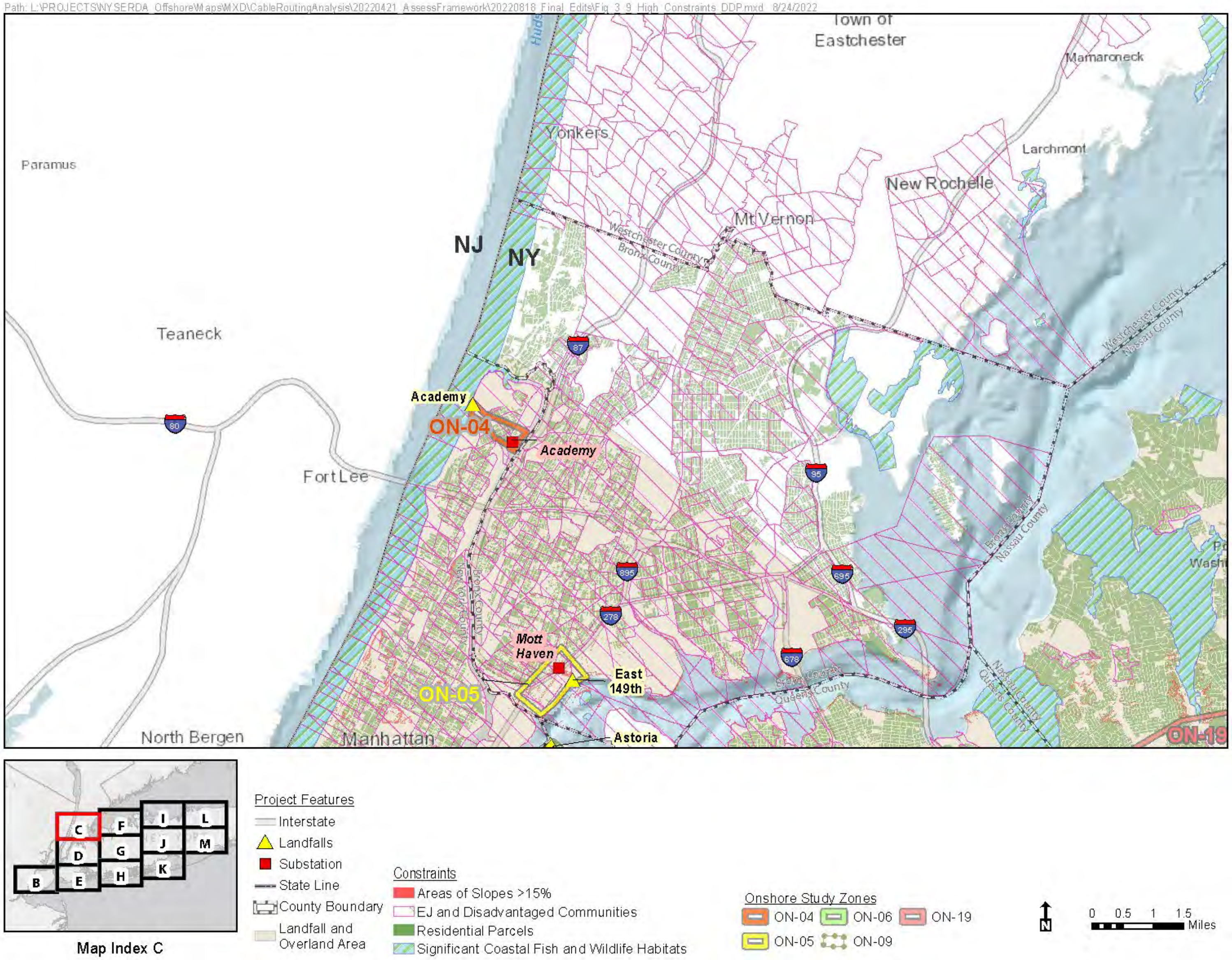


Figure 87. Resources Considered High Constraints within the Landfall and Overland Area (Map D)

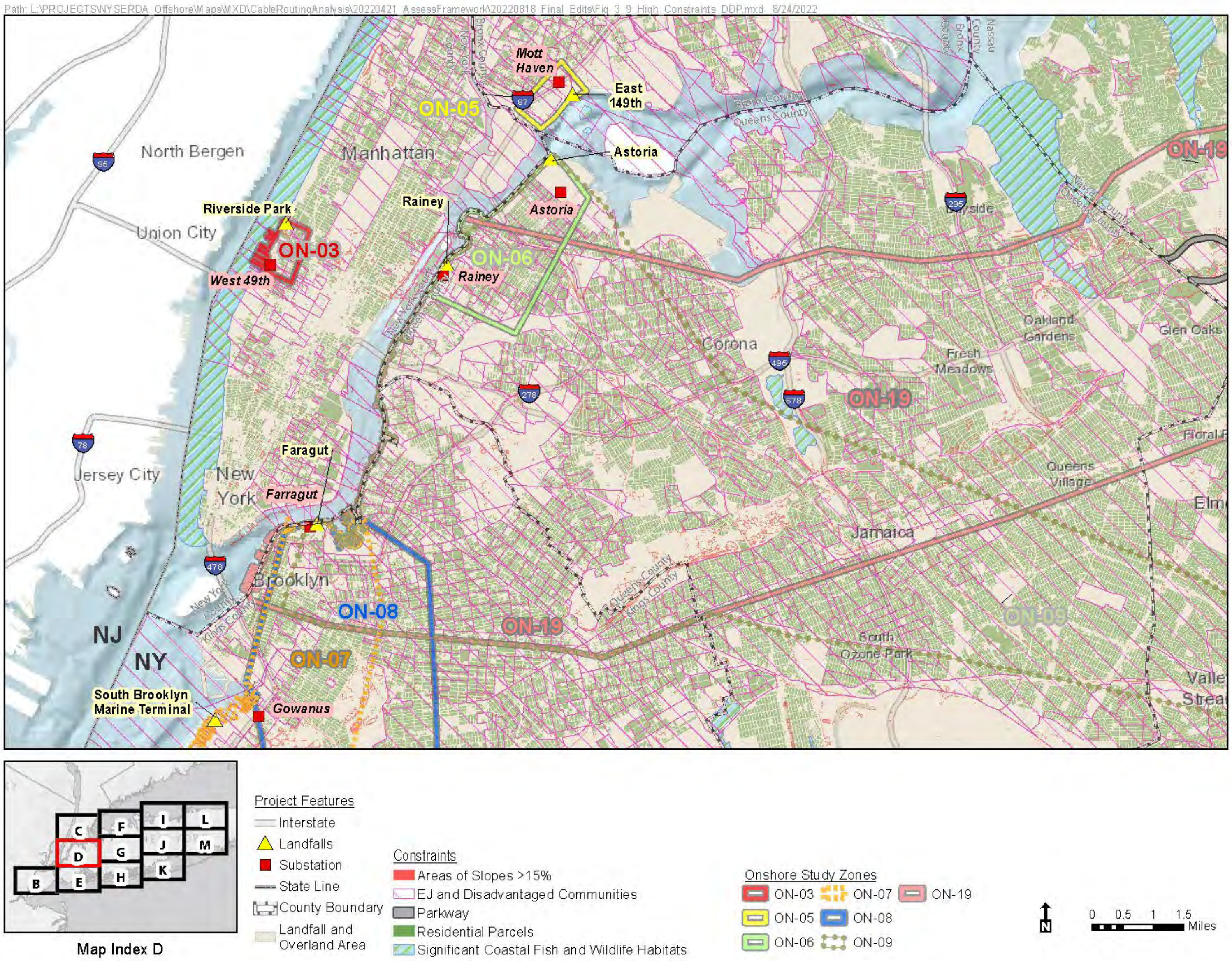


Figure 88. Resources Considered High Constraints within the Landfall and Overland Area (Map E)

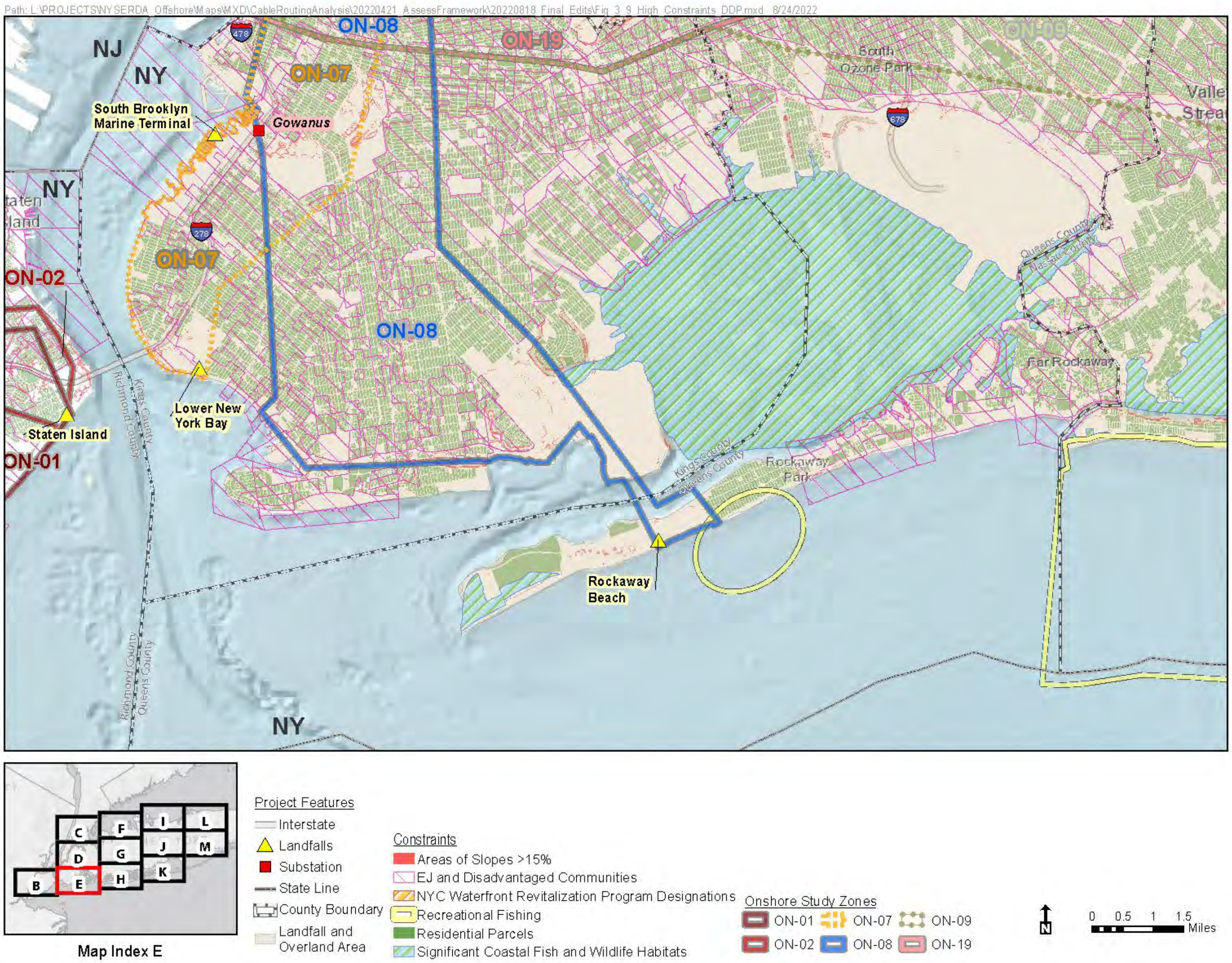


Figure 89. Resources Considered High Constraints within the Landfall and Overland Area (Map F)

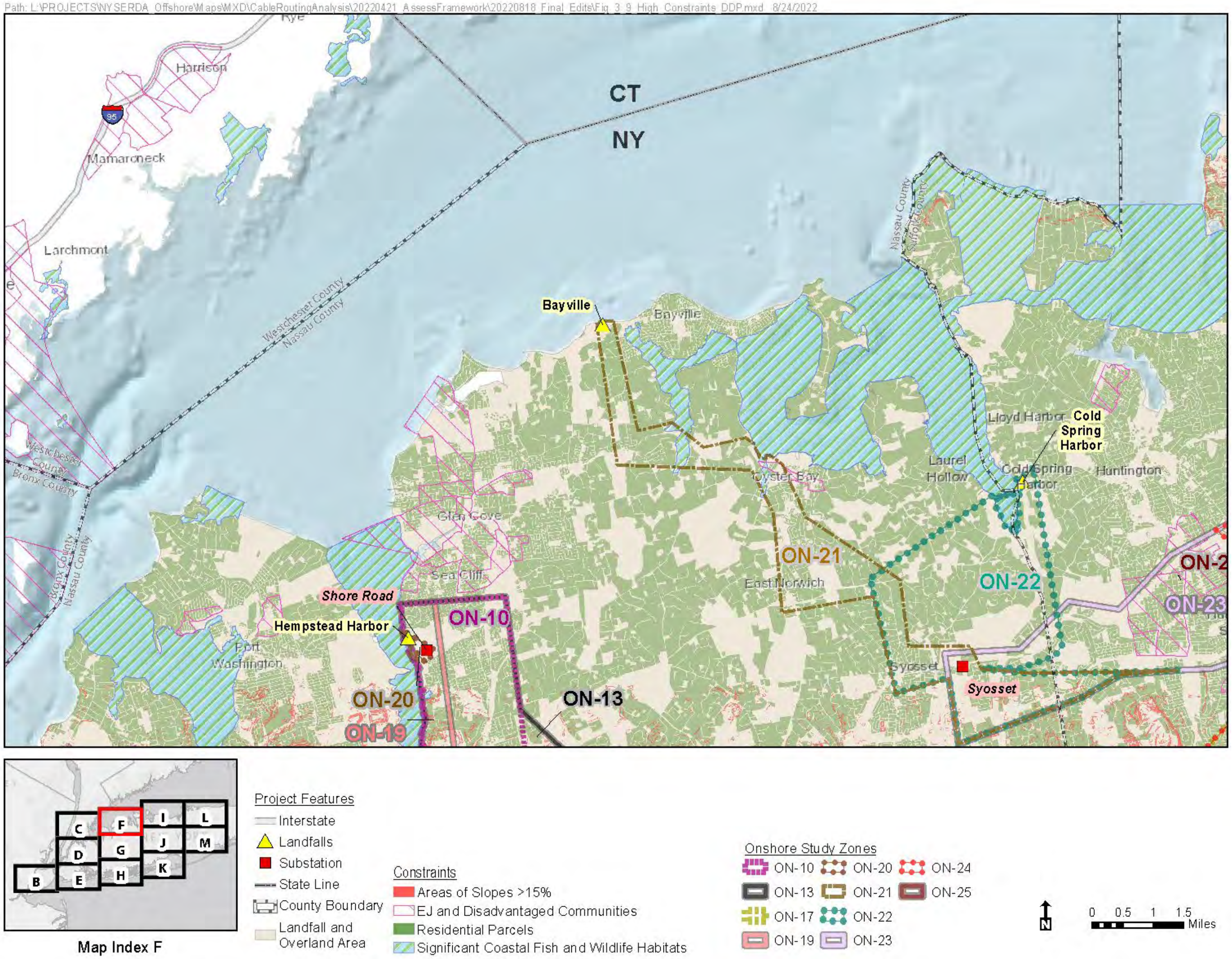


Figure 90. Resources Considered High Constraints within the Landfall and Overland Area (Map G)

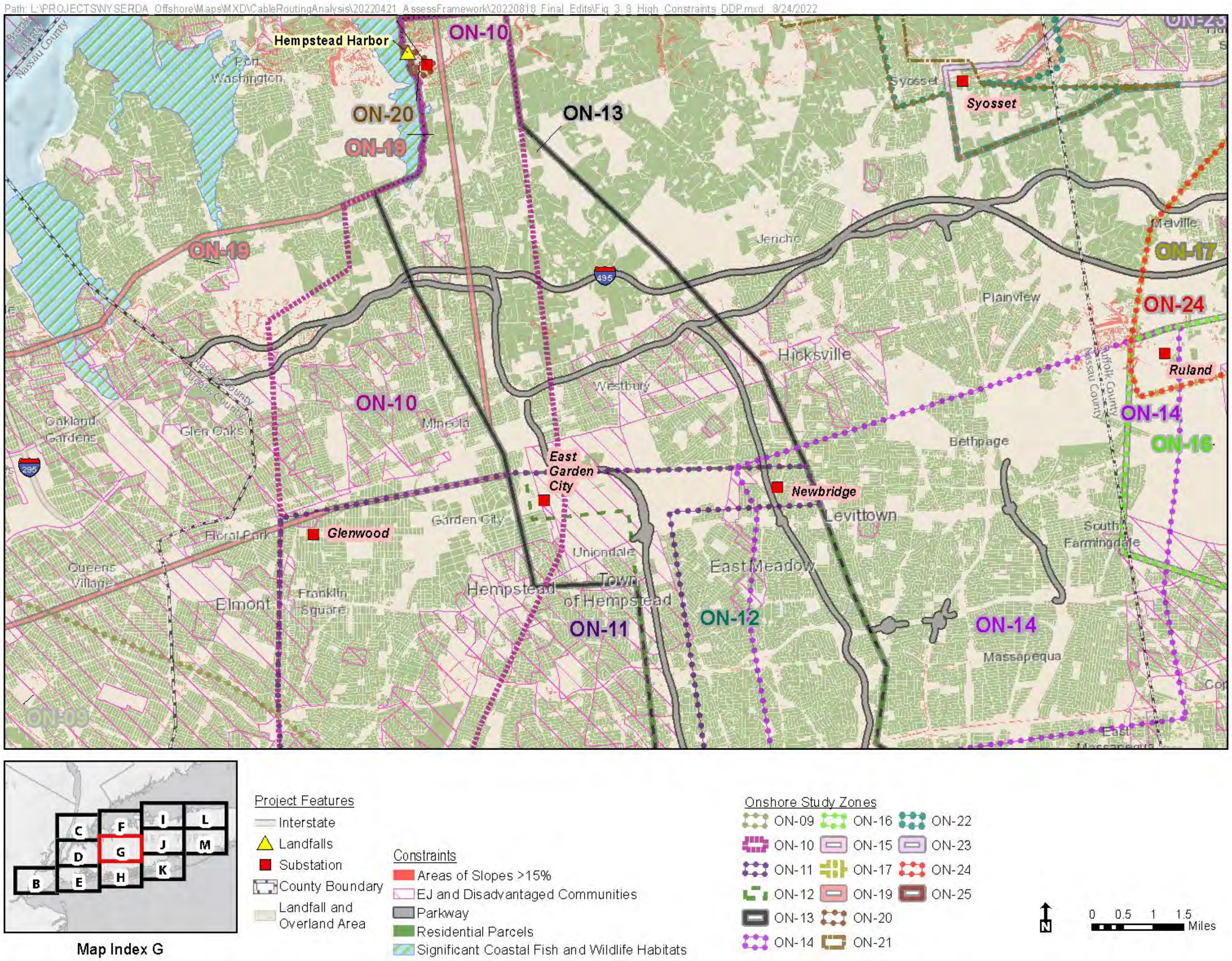


Figure 91. Resources Considered High Constraints within the Landfall and Overland Area (Map H)

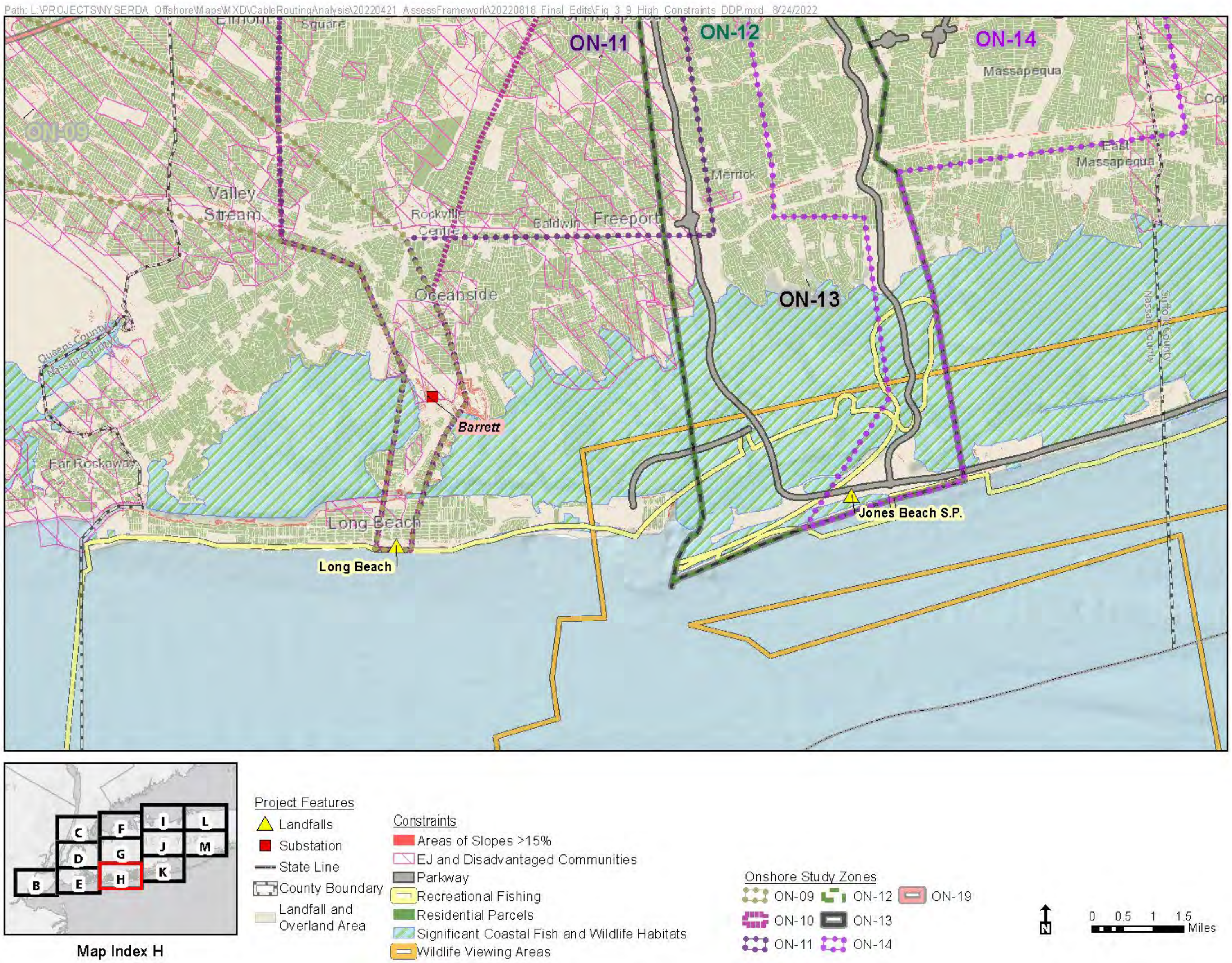


Figure 92. Resources Considered High Constraints within the Landfall and Overland Area (Map I)

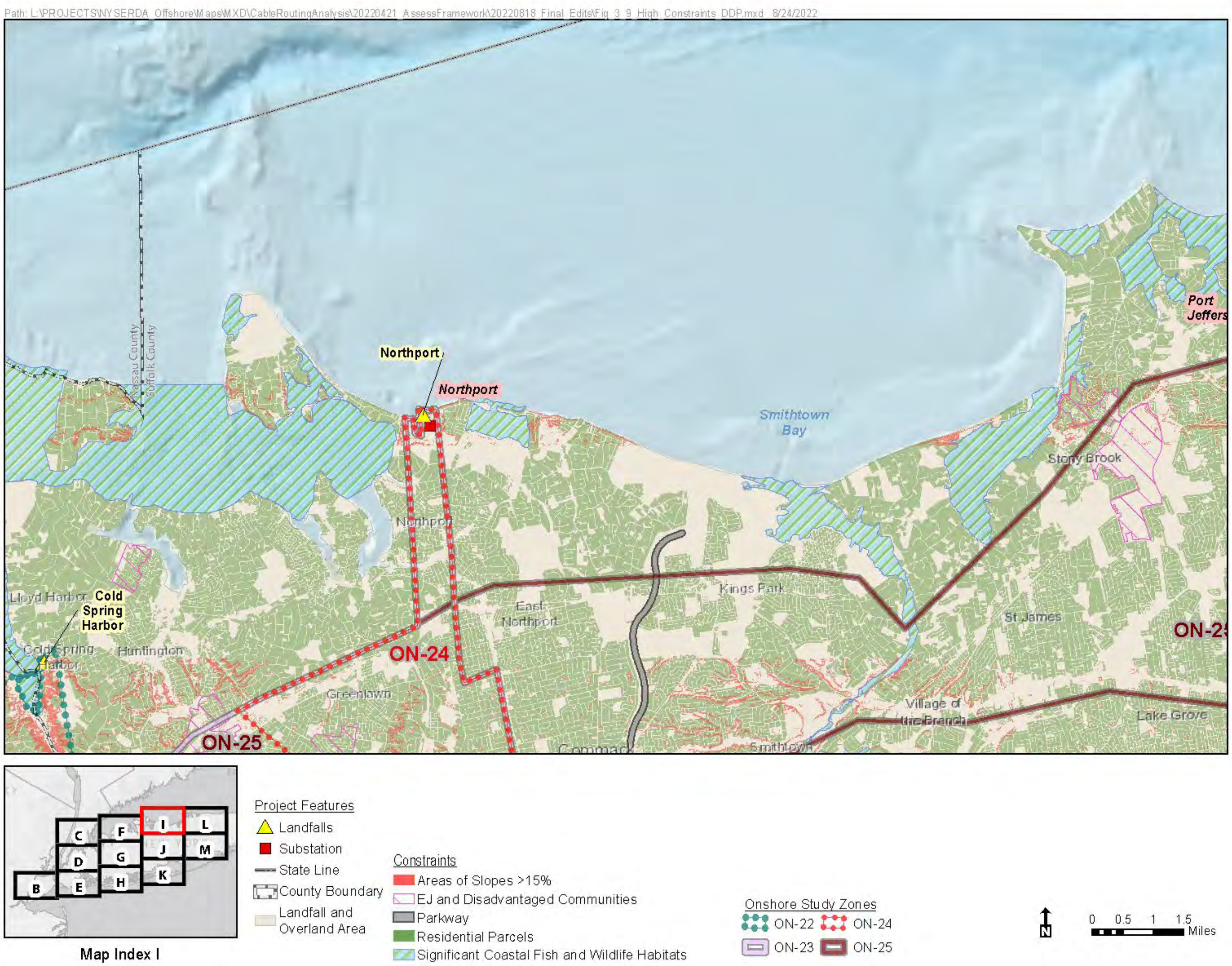


Figure 93. Resources Considered High Constraints within the Landfall and Overland Area (Map J)

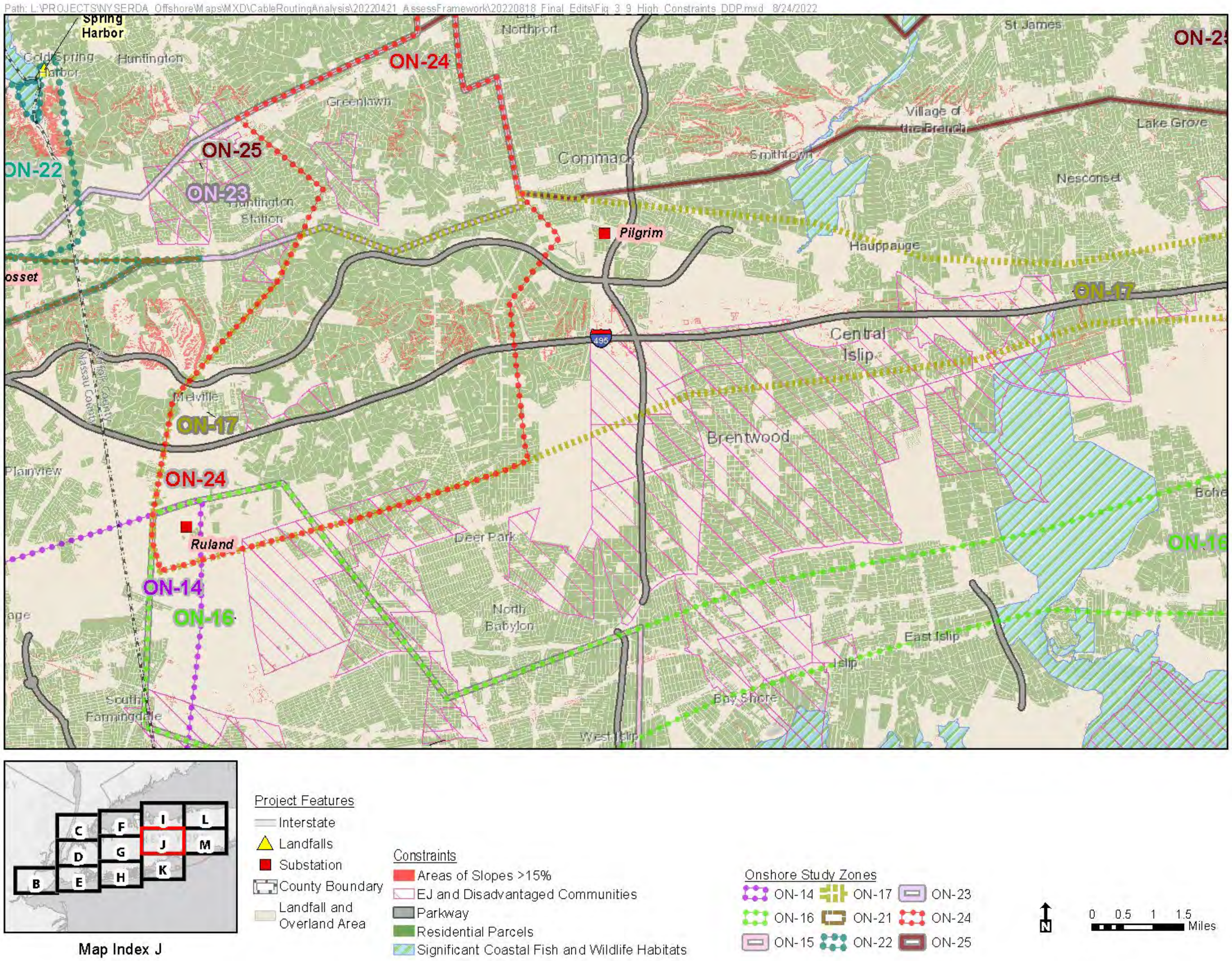


Figure 94. Resources Considered High Constraints within the Landfall and Overland Area (Map K)

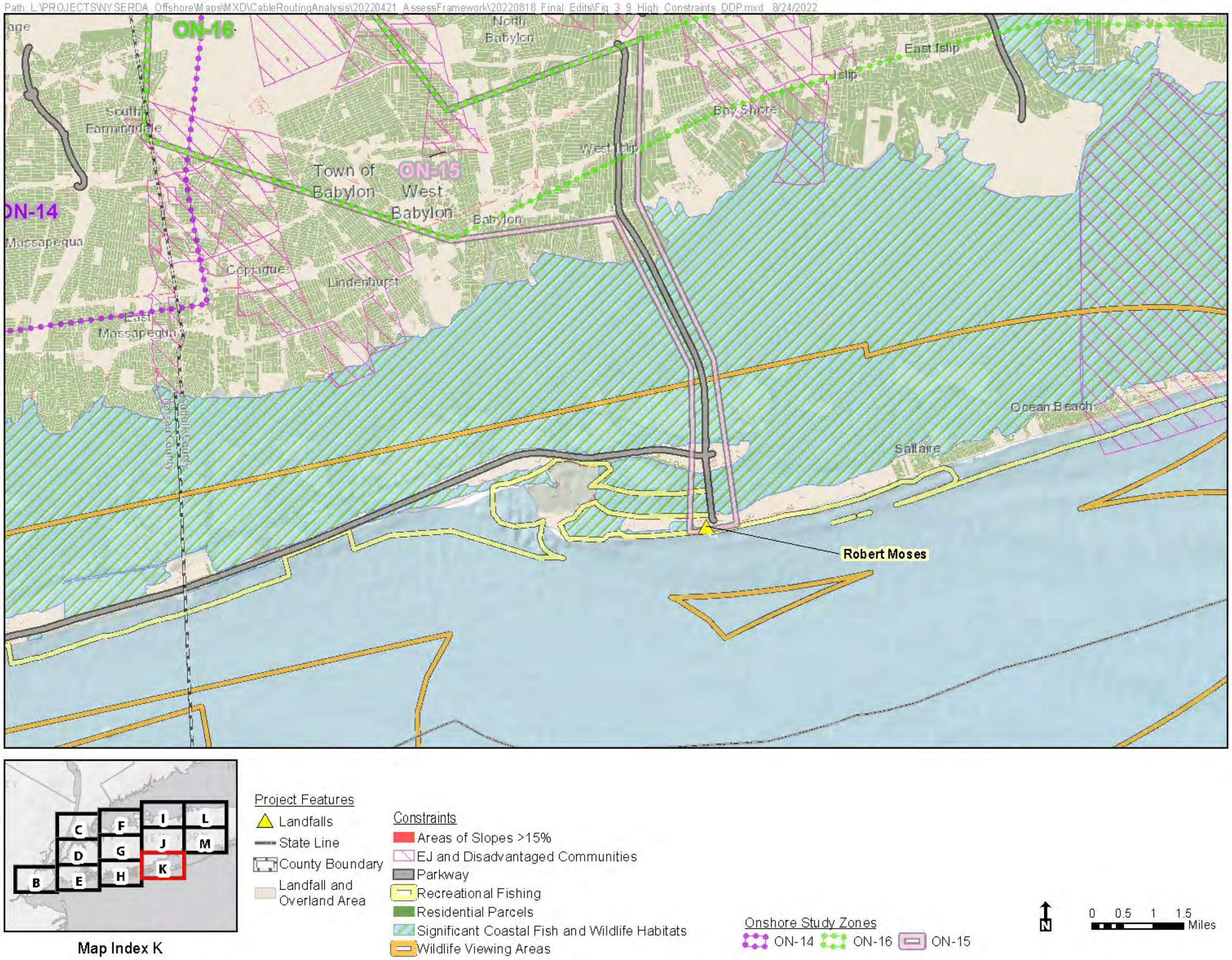


Figure 95. Resources Considered High Constraints within the Landfall and Overland Area (Map L)

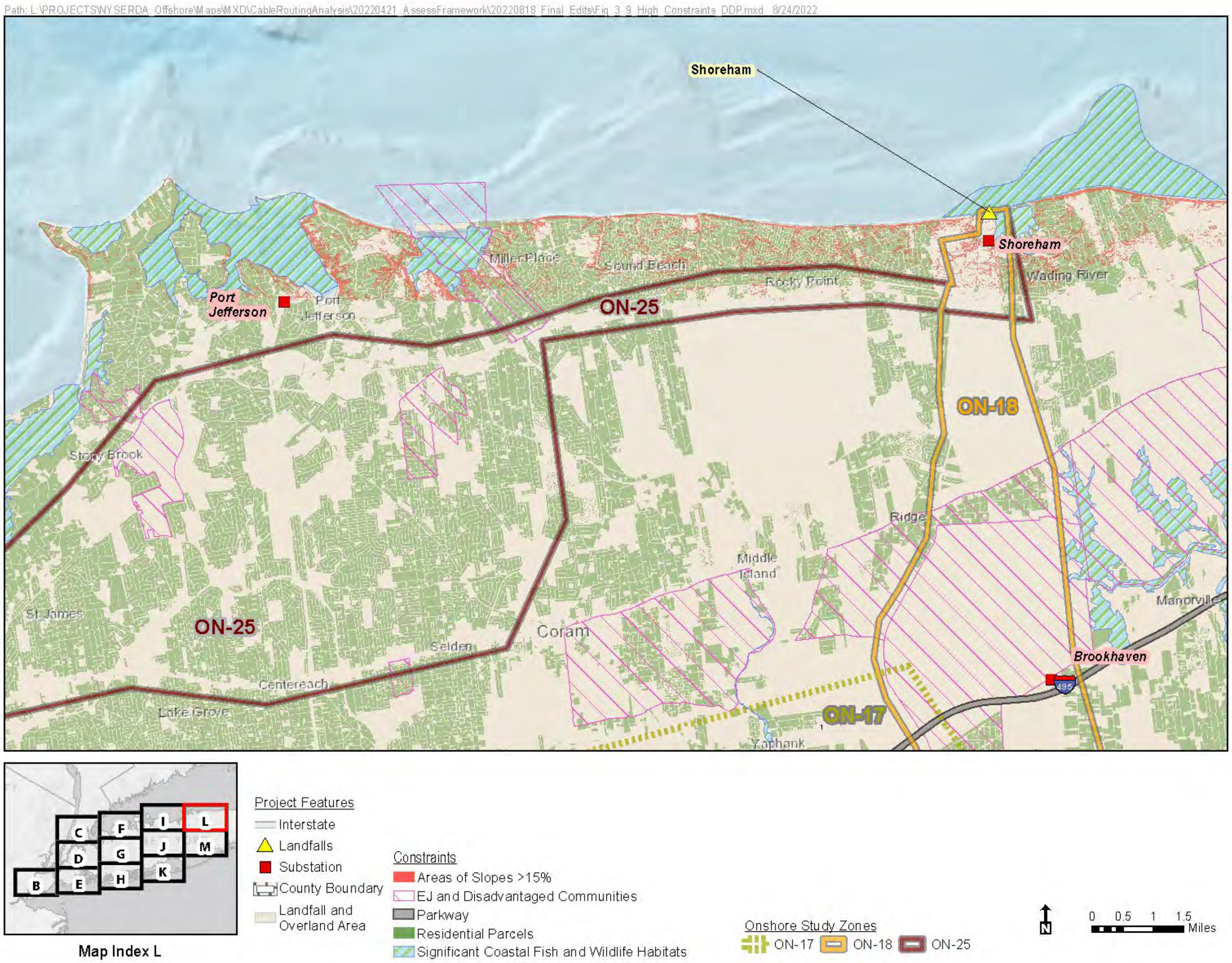


Figure 96. Resources Considered High Constraints within the Landfall and Overland Area (Map M)

4 Key Findings and Recommendations

New York State is committed to developing and advancing strategies to cost-effectively and responsibly meet New York State's Climate Act goals of 9 GW of OSW by 2035 and projections of the Climate Action Council beyond 9 GW. The Assessment is a component of that commitment and that of the State agencies that comprise the CWG. New York State acknowledges the benefits of coordinated transmission planning and will continue to evaluate options to meet the State's goals. For the transmission grid to accommodate 9 GW, the Power Grid Study concluded that interconnection of 6 GW of OSW in New York City and the remaining 3 GW on Long Island should be feasible without major transmission upgrades. Table 41 illustrates a potential combination of current, proposed, and future OSW cables through each undersea approach area. Assuming that future cables use HVDC and carry approximately 1 GW of electricity per cable circuit, this estimate reflects slightly more than 9 GW. The estimate of 1 GW per cable circuit represents an average power through an HVDC circuit from a typical OSW project and less than the maximum HVDC circuit capacity currently achievable as discussed in section 1.6.1. Thus, the allocations in Table 41 reflect conservative assumptions to support a general constraints evaluation consistent with the Power Grid Study. Actual distribution of power through a future HVDC circuit would reflect future conditions within a dynamic and extremely competitive market.

Table 41. Potential Combination of Current, Potential, and Future OSW Cables Using Each of the Undersea Approach Areas to Achieve NYS Climate Act Targets

Approach Area	Current, Potential, and Future OSW Projects	Type of Cable	Approximate Contribution to Climate Act, GW
New York Harbor	Empire Wind	HVAC	0.816
	Future	HVDC	4
		Subtotal	**~5**
Long Island Sound	Beacon Wind	HVDC	1.23
	Future	HVDC	1
		Subtotal	**~2**
South Shore	Sunrise Wind	HVDC	0.88
	South Fork Wind	HVAC	0.132
	Empire Wind 2	HVAC	1.26
	Future	HVDC	1
		Subtotal	**~3**
		TOTAL	**~10**

Note: This table is for illustrative purposes only and does not include considerations based on project-specific proposals. Nor does it consider any necessary environmental review or regulatory approvals needed.

As noted previously, the New York State Climate Action Council Draft Scoping Plan for the Climate Act projects a potential 20 GW of OSW by 2050 (New York State Climate Action Council 2021). For those projections, additional cable routes would be necessary.

The analysis and discussion in section 3 provide insights on the most significant constraints and the anticipated avoidance, minimization, and mitigation measures necessary to site OSW cables. The Assessment demonstrated two key findings relevant to achieving 9 GW or more of OSW energy:

1. Future OSW cable siting should incorporate accepted siting principles based on CWG and OSW industry experience. Siting principles support installation of multiple cables, while minimizing use of space and impacts on environmental, cultural, and social resources.
2. Innovation in design, construction, operation, and maintenance techniques will be required beyond prior projects to address the site-specific and unique constraints, opportunities, schedule, and costs for siting OSW cables.

4.1 Siting of Cables Should Follow Principles that Support Installation of Multiple Cables

Siting cables should follow principles that support installation of multiple cables to minimize the use of space and impacts to environmental, cultural, and social resources common to all approach areas to connect to the grid. The combination of environmental, cultural, and social resources requires an organized approach to optimize the routing of transmission cables in New York State waters to meet the 9 GW of OSW mandated by the Climate Act, as well as consideration for potential future OSW goals. A thoughtful approach to siting that addresses energy goals and environmental, cultural, and social considerations will reduce the overall direct, indirect, and cumulative impacts of OSW cables. The process of evaluating constraints and analyzing impacts in section 3 identified many standard industry practices in the U.S. and in Europe's OSW industry, as well as CWG experience that comprises principles for siting OSW cables. The principles to optimize routing of multiple OSW cables in New York waters include:

1. Avoid sensitive resources to the maximum extent practicable, including, but not limited to, hard bottom habitat, cold water corals, submerged aquatic vegetation, emergent aquatic vegetation/ marshlands, CEHAs, EMF-sensitive species aggregation areas and migration routes, clam beds, historic areas, T&E species habitat, and areas of potentially significant archaeological resources.
2. Limit footprint of combined linear infrastructure to minimize resource fragmentation in zones without space limitations.

3. Apply parallel routing with existing linear infrastructure (power and telecom cables, pipelines).
4. Bundle cables to minimize number of routes.
5. Limit crossings of other infrastructure and cross at right angles.
6. Avoid anchorage areas and navigation channels.
7. Minimize in-water transmission cable length to the extent that other environmental and anthropogenic resources and uses are not impacted disproportionately.

The principles to optimize routing of multiple OSW cables at landfalls and overland include:

1. Where possible, installation at landfall should be one HDD per bundled HVDC cable.
2. Where possible, use public ROWs, transmission corridors, railroad corridors, and/or local, county, and/or State roads or highways that meet the permitting requirements and FHWA approval where applicable.
3. Minimize crossings of active infrastructure and when crossings are necessary, use specialized crossing methods, including trenchless methods like HDD and jack-and-bore, at bridge crossings over water, other roadways, or railroads; existing utility crossings; intersections with a major arterial roadway, and resilience projects.
4. Avoid impacts to residential neighborhoods, environmental justice areas, disadvantaged communities, and underserved communities.
5. Avoid sensitive resources to the maximum extent practicable, including, but not limited to, state and federally regulation wetlands, Federally- or state-listed endangered or threatened species or associated habitat, designated critical habitat, Important Bird Areas, New York City Waterfront Revitalization Program designations, Significant Coastal Fish and Wildlife Habitat, Natural Heritage Communities, conservation and mitigation sites, and areas of potentially significant archaeological resources.

As the OSW industry develops and matures, these siting principles will evolve to reflect the lessons learned, and more siting principles may be appropriate, or revisions to the recommendation above may occur. As future cables are added, siting will shift to areas with more constraints and site-specific challenges. As discussed below, innovation and advances in technology will be required beyond prior projects to address site-specific and unique constraints.

4.2 Siting Constraints

To address the unique constraints of siting OSW cables, innovation in design, construction, operation, maintenance, as well as decommissioning will be required. Standards set by prior projects will not be adequate. The following sections summarize the primary constraints, opportunities, schedule considerations, and cost considerations for each approach area and the Landfall and Overland Area, including:

Most significant constraints: The most significant constraints identified in Section 3, particularly those ranked high, or where cumulative constraints may occur.

Opportunities: Opportunities for further minimizing and mitigating impacts, including CWG recommendations for innovation and ingenuity to support achieving 9 GW and more, which may include obtaining additional data and information to support avoiding and minimizing impacts.

Schedule considerations: In the context of achieving the Climate Act mandates and goals in 2030, 2035, and 2040 and the timeline for development of OSW projects, key factors affecting schedule for construction of OSW cables.

Cost considerations: Costs are an important consideration, similar to environmental, social, and cultural resources. The primary factors affecting costs for OSW cables discussed in this Assessment Report are the length of the route, installation techniques for conditions in the local environment, and minimization and mitigation measures necessary to address impacts to resources and communities. Although the cost on a per mile basis for offshore routing is significantly less than for onshore, offshore costs vary depending on site-specific conditions and mobilization costs. For example, mobilization costs for installation vessels are mostly independent of the cable length and can be a significant portion of the undersea cable installation cost. These costs also do not consider potential minimization and mitigation measure costs.

4.2.1 South Shore Approach Area

4.2.1.1 Most Significant Constraints

Commercial and recreational fishing and existing linear utilities present the most significant challenges to OSW cables throughout the entire South Shore Approach Area. Addressing these constraints includes limiting construction to outside the summer high fishing season and tourist season between Memorial Day and Labor Day and obtaining and maintaining an appropriate cable burial depth to avoid and minimize interference with fishing. Proper burial depth at crossings could occur by installing OSW cables underneath existing infrastructure if crossing agreements can be negotiated. Zone S-1 Smith Point contains areas of cemented sand, which, if not avoided, will require alternatives such as shallow burial with surface armament that would interfere with bottom oriented fishing gear. Zone S-5 Rockaway Beach overlaps with the Fort Tilden Coastal Battery & Small Arms Ranges FUDS Property, which may contain environmental contamination or military munitions resulting from past Department of Defense-related activities and should be avoided.

4.2.1.2 Opportunities

Opportunities for further minimizing and mitigating impacts include reducing the footprint and the duration of construction and maintenance activities. The existing linear utilities in the South Shore Approach Area illustrate the cumulative effects of not coordinating siting among different projects. The CWG encourages consideration of co-location of OSW cables and coordination of installation at a single time in a single location to minimize disturbance. Coordination among projects that promotes simultaneous installation of multiple cable circuits could also maximize use of areas with limited space and minimize the disturbance. Along submerged routes, for example, multiple circuits could be installed closer together in spatially constrained areas with less risk of damage to the cables compared to sequential installation. An alternative co-location strategy to simultaneous installation of multiple cable circuits could be to establish spare space in tunnels or conduits through which subsequent cables could be more easily installed (e.g., such a strategy has been used for telecommunication cable shore crossing locations). To the extent practicable, siting should consider abandoned utilities that could serve as cable corridors (e.g., telecom, pipelines, aqueducts). The CWG recommends consideration of mitigation to the commercial fishing community to compensate for impacts to fishing locations or gear and time during survey, research, construction, operations, maintenance, and decommissioning activities.

4.2.1.3 Schedule Considerations

The constraints and opportunities in the South Shore Approach Area may affect the overall duration of construction when following time of year restrictions (TOYRs) for the summer tourism season or protected species. Similarly, the coordination between developers or infrastructure owners to co-locate or install simultaneously may extend the duration of the construction period for the benefit of reduced impacts. The negotiation of crossing agreements for existing infrastructure could extend the duration of the project development. Evaluating use of abandoned utilities may require additional time during permitting and site preparation.

4.2.1.4 Cost Considerations

The construction costs for OSW cables to the South Shore Approach Area will reflect the ability to use standard construction techniques given that the relatively low constraints presented by marine geology avoid locations that require more advanced burial techniques. As noted in section 3, the CWG recommends use of HDD for landing cables on shore. In portions of the South Shore Approach Area, the extensive existing infrastructure increases the probability that OSW cables will require multiple crossing agreements with associated costs of addressing limitations, coordination, or liability for damage as well as the additional complexity of the construction methodology.

4.2.2 Long Island Sound Approach Area

4.2.2.1 Most Significant Constraints

Marine geology, marine commercial and recreational uses, navigation areas, aquatic and biological resources, and marine cultural resources present the most significant challenges to OSW cables in the entire Long Island Sound Approach Area. These conditions present significant constraints to siting cables through Long Island Sound. Addressing these constraints includes use of site-specific engineering strategies to reach sufficient burial depth at installation and during future cable maintenance. Because inadequate burial depth could lead to cable exposure from erosion or deeper burial from sediment deposition, minimization, and mitigation may include restricting installation to outside fishing and recreation seasons; routing cables around certain areas; buffers around existing utilities; communication with affected communities and industries; and avoidance of sensitive resources including anchorage areas, boulders, protected aquatic resources, and shipwreck resources. In the highly space-limited Zone L-2 Harbor Hill Moraine, Zone L-6 East River, and to a lesser extent Zone L-5 Westernmost Long Island Sound, optimized routing facilitates multiple OSW cables through these zones, whereas uncoordinated route planning may unnecessarily restrict access for future cable routes.

4.2.2.2 Opportunities

Opportunities for additional minimization and mitigation measures requires the use of site-specific engineering strategies and innovations in design and construction for the unique conditions in most zones of the Long Island Sound Approach Area. The range in conditions will require analysis and application of multiple suitable burial techniques. The CWG encourages consideration of co-location of OSW cables to minimize disturbance because of the benefit to reducing impacts on all resources, and similar alternatives and strategies such as development of tunnels or reuse of existing tunnels. Advances in cable technology will produce cables able to transmit more electricity than current designs. The CWG recommends consideration of mitigation to the commercial fishing community to compensate for impacts to fishing gear and fishing time during survey, research, construction, operations, maintenance, and decommissioning activities. Although the practices and procedures of the maritime community ensure a low probability of anchor strike, the significant consequences require consideration of approaches to reduce the risk further, if possible. In areas of Long Island Sound with higher risk to cables from anchor strike, reduced risk may occur through use of buoys and notification cable prior to anchor drop. An anchor compensation program, similar to Denmark's provision of lost anchors, may be appropriate when a vessel sacrifices the anchor to avoid damaging a cable. Given the unique habitats of the Long Island Sound Approach Area, the CWG recommends avoidance of these habitats, followed by consideration of mitigation to SAV and commercially valuable species though funding of replacement projects, such as artificial reefs. Where shipwrecks cannot be avoided, the CWG recommends development of monitoring plans for noise and vibration during construction to ensure that impacts do not occur, in consultation with NYSOPRHP. Vibrations from construction equipment may destabilize or destroy intact shipwrecks, depending on the distance and site-specific conditions and appropriate distance buffers to prevent or minimize disturbances to these resources. Finally, further opportunity for siting considerations in Long Island Sound Approach Area includes completion of Phases III and IV of the Long Island Sound Seafloor Habitat Mapping Initiative expected to provide additional valuable baseline information for future cable routing.

4.2.2.3 Schedule Considerations

The constraints and opportunities in the Long Island Sound Approach Area may affect the overall duration of construction when complying with TOYRs for the fishing and recreation seasons and protected species. Similarly, the coordination between developers and infrastructure owners to co-locate or install simultaneously may extend the duration of the construction period for the benefit of reduced impacts.

4.2.2.4 Cost Considerations

The construction costs for OSW cables to the Long Island Sound Approach Area will reflect the need to address multiple constraints. In particular, the uniqueness and extent of aquatic and biological resources present in most zones of the Long Island Sound Approach Area requires consideration of additional minimization and mitigation measures to address impacts from not only proposed cables, but cumulative impacts from multiple cables. Mitigation for aquatic biological resources and habitats within the Long Island Sound is estimated to be millions of dollars per mile depending on specific habitat resource impact and the length of the route in those locations. The marine geology conditions will require more complex installation techniques for varying conditions, including bedrock and HDD at landings depending on the route and the POI. OSW cables will need crossing agreements for existing infrastructure with associated costs addressing limitations, coordination, or liability for damage and the additional complexity of the construction methodology.

4.2.3 New York Harbor Approach Area

4.2.3.1 Most Significant Constraints

Navigation and vessel traffic present the most significant challenges to OSW cables throughout the New York Harbor Approach Area. Addressing these constraints in the space-limited zones requires optimized routing, such as perpendicular crossings to the extent feasible, to facilitate multiple OSW cables, whereas uncoordinated route planning may unnecessarily restrict access. Constraints adding to the challenge are marine geology, recreational and commercial fishing, linear utilities, aquatic biological resources and sensitive habitats, waterfront infrastructure, and shipwrecks in many zones. Addressing these constraints includes use of site-specific engineering strategies to reach sufficient burial depth, buffers around existing utilities, and communication with affected communities and industries. During construction, regular updates to the local maritime community through social media, the USCG Local Notices to Mariners, and active engagement with the Maritime Association of the Port of New York and New Jersey Harbor Safety, Navigation, and Operations Committee will minimize impacts. In federally maintained navigation features (e.g., anchorages and shipping channels), burial depths should reach 15 feet or more below the current or anticipated future authorized depth or depth of existing seabed, whichever is deeper. OSW cables in Zones H-4 Lower Hudson and H-8 Upper Hudson may need to avoid installation in the Hudson River PCB site and certain sensitive areas within the lower Hudson River by exiting the water for burial along an overland route.

4.2.3.2 Opportunities

In the New York Harbor Approach Area, opportunities for further minimizing and mitigating impacts will require the use of site-specific engineering strategies and innovations in design and construction for the unique conditions in most zones of this approach area. The range in conditions will require analysis and application of multiple suitable burial techniques. The CWG encourages consideration of co-location of OSW cables to minimize disturbance because of the benefit to reducing impacts on all resources and users, and similar alternatives and strategies described for the South Shore and Long Island Sound Approach Areas. Coordination among developers to address the space-constrained area may lead to an integrated approach and dedicated or shared space for cable maintenance or repair. In the New York Harbor, the CWG recommends consultation with local utility and transportation agencies to identify decommissioned tunnels with potential to be repurposed for OSW cable installation, identification of abandoned utilities that could serve as cable corridors and to prevent new disturbance, mooring buoys as alternative berthing options to offset reduced operational or anchorage capacity, and installation of buoys that monitor vessel data and alert vessels to the presence of cables. As noted above, where shipwrecks cannot be avoided, the CWG recommends development of monitoring plans for noise and vibration during construction, in consultation with NYSOPRHP.

4.2.3.3 Schedule Considerations

For the navigation, vessel traffic, and existing infrastructure constraints unique to the New York Harbor Approach Area, the coordination between developers, the maritime community, and infrastructure owners for cable routing, co-locating, or installing simultaneously may extend the duration of the construction period for the benefit of reduced impacts and reduced long-term risks to the cables. In addition, agencies with authority over the New York Harbor would be engaged to plan and schedule the use of the limited resources available, particularly through The Narrows. Compliance with TOYRs for the fishing, recreation, and protected species may also affect the overall duration of construction.

4.2.3.4 Cost Considerations

The construction costs for OSW cables to the New York Harbor Approach Area will reflect the varying marine geology conditions, navigation and vessel traffic, and the extensive existing infrastructure. Multiple changes in these conditions will necessitate use of more complex installation techniques in shallow water and bedrock and multiple HDD crossings depending on the route and the POI. OSW cables will also need crossing agreements for existing infrastructure with associated costs addressing limitations, coordination, or liability for damage. Agreements with bridge and tunnel infrastructure owners address the unique risk management of heavily used essential public infrastructure.

4.2.4 Landfall and Overland Areas

4.2.4.1 Most Significant Constraints

For Long Island and New York City, topography, environmental justice and disadvantaged communities, transportation, and coastal resources present the most significant challenges to OSW cables. Addressing steep slopes requires adherence to known engineering design requirements to ensure safety and prevent erosion. Minimization and mitigation measures for cable construction impacts to environmental justice populations and disadvantaged communities include developing a multi-lingual community engagement plan with specific communication and outreach procedures for disseminating construction-related information, establishing a noise complaint hotline, maintaining construction equipment and installing temporary noise reduction devices and barriers, implementing a fugitive dust control plan, and placing transmission cables underground in existing ROWs. Addressing the State and federal statutory and regulation requirements for the purpose of ensuring the safety of the traveling public in State highways, including controlled access parkways and highways as well as non-commuter rail lines, will require a detailed analysis of alternatives considering environmental, cultural, and regulatory factors. Addressing these constraints in the space-limited zones requires optimized routing, and coordination with owners of existing infrastructure.

4.2.4.2 Opportunities

The CWG encourages consideration of co-location of OSW cables to minimize disturbance because of the benefit to reducing impacts on all resources. Where the shoreline contains extensive infrastructure, innovative approaches to landfall include coordination of construction that promotes simultaneous installation of multiple cable circuits in a single trench, use of abandoned utilities that could serve as cable corridors, and host community agreements with owners and affected waterfront communities. In general, existing electric transmission ROWs represent a significant opportunity to co-locate new OSW cables connecting to the existing POIs compared to other public ROWs. Partial access or no control of access to State highways or local and county roads may present an opportunity for onshore cable routing. Where the preferred alternative for siting a cable is within the controlled access line of a control access State highway, an exception to the NYS Utility Accommodation Plan and FHWA approval is required, the CWG recommends early consultation with NYSDOT and a design and agreements that address the State and federal requirements on a case-by-case basis and analysis.

4.2.4.3 Schedule Considerations

The NYSDOT and FHWA review and approval for a non-transportation use of the controlled access highway ROW for the longitudinal installation of a utility line is anticipated to be a primary schedule driver and should be factored into the overall review timeline. Additionally, use of HDD and compliance with TOYRs associated with crossing of coastal habitats (i.e., protected species) in the intercoastal bays and suitable or occupied habitats of protected species in other areas onshore will influence onshore construction timing and duration. The coordination opportunities with co-location and existing infrastructure owners suggested above could occur as part of outreach to OSW stakeholders, and the complexity and innovation may require a greater investment of time prior to construction and a shorter overall disturbance to the environmental, social, and cultural resources.

4.2.4.4 Costs

The construction costs for OSW cables in New York City and Long Island will reflect the (1) varying topography, (2) developed land and associated spatial limitations, (3) crossing of intercoastal waterways of the South Shore, and (4) extensive existing infrastructure in the potential landfalls in New York City. Multiple changes in these conditions will necessitate use of more complex installation techniques in existing infrastructure and bedrock and multiple HDD crossings depending on the route and the POI. OSW cables will also need crossing agreements for existing infrastructure with associated costs addressing limitations, coordination, or liability for damage.

5 References

ACHP (Advisory Council on Historic Preservation). 2022. Court Rules on Definitions; Informs Agencies on Determining Effects. Accessed April 25, 2022. Available at: https://www.achp.gov/news/court-rules-definitions-informs-agencies-determining-effects; https://www.achp.gov/news/court-rules-definitions-informs-agencies-determining-effects

Adams, D.A., J.S. O'Connor, and S.B. Weisberg. 1998. Sediment Quality of the NY/NJ Harbor System. An Investigation Under the Regional Environmental Monitoring and Assessment Program (R-EMAP). Final Report.

AIS (Automatic Information System Data). 2021. AccessAIS: A BOEM, NOAA and USCG Partnership. Available at: https://marinecadastre.gov/accessais/

Atilano, John. 2021a. Colonel, U.S. Army Corps of Engineers New England District Engineer. Letter dated November 5, 2021, to New York State Department of State regarding parcel in Nassau County, NY, parcel in Queens County, NY – Fort Tilden Coastal Battery and Small Arms Ranges.

Atilano, John. 2021b. Colonel, U.S. Army Corps of Engineers New England District Engineer. Letter dated November 5, 2021, to New York State Department of State regarding parcel in Suffolk County, NY – Fort HG Wright.

Atilano, John. 2021c. Colonel, U.S. Army Corps of Engineers New England District Engineer. Letter dated November 5, 2021, to New York State Department of State regarding parcel in Suffolk County, NY – Fort Michi.

Audubon. 2022. Important Bird Areas: Gull Island New York. Accessed August 19, 2022. Available at: https://www.audubon.org/important-bird-areas/great-gull-island

Baskerville, C.A. 1994. Bedrock and Engineering Geologic Maps of New York County and Parts of Kings and Queens Counties, New York, and Parts of Bergen and Hudson Counties, New Jersey. Accessed July 8, 2021. Available at: https://pubs.er.usgs.gov/publication/i2306

Beacon Wind (Beacon Wind LLC). 2022. Beacon Wind 1 Article VII Application: Exhibit 2- Location of Facilities. Matter Master: 22-01026/22-T-0294. May 2022. Available at: https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?Mattercaseno=22-T-0294

Berry, W.J., N.I. Rubinstein, E.K. Hinchey, G. Klein-McPhee, and D. Clarke. 2011. Assessment of Dredge-Induced Sedimentation Effects on Winter Flounder (*Pseudopleuronectes americanus*) Hatching Success: Results of Laboratory Investigations. Presented at Western Dredging Association Technical Conference and Texas A&M, Nashville, TN, June 5–8, 2011. Accessed May 12, 2022. Available at: https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NHEERL&dirEntryId=232490

Bilinski, J. 2021. Review of the Impacts to Marine Fauna from Electromagnetic Frequencies (EMF) Generated by Energy Transmitted Through Undersea Electric Transmission Cables. Prepared for: NJDEP- Division of Science and Research. Available at: njdep-marine-fauna-review-impacts-from-emf.pdf

Bokuniewicz, H.J. and C.T. Fray. 1979. The Volume of Sand and Gravel Reserves in the Lower Bay of New York Harbor. Spec. Rpt. 32: Marine Sciences Research Center, State University of New York, Stony Brook, NY, 34 pp.

Brown, D.M., J. Robbins, P.L. Sieswerda, R. Schoelkopf, and E.C.M. Parsons. 2018. Humpback whale (*Megaptera novaeangilae*) sightings in the New York-New Jersey Harbor Estuary. Marine Mammal Science 34(1): 250–257. https://doi.org/10.1111/mms.12450

BSH (Bundesamt für Seeschiffahrt und Hydrographie [Federal Maritime and Hydrographic Agency of Germany]). 2019. Flächenentwicklungsplan 2019 für die deutsche Nord- und Ostsee. BSH-Nummer 7608 (Hamburg, June 21, 2020) Accessed July 8, 2021. Available at: https://www.bsh.de/DE/PUBLIKATIONEN/_Anlagen/Downloads/Offshore/FEP/Flaechenentwicklungsplan_2019.pdf?__blob=publicationFile&v=9

Unofficial English Translation: Site Development Plan 2019 for the German North Sea and Baltic Sea. Available at: https://www.bsh.de/DE/PUBLIKATIONEN/_Anlagen/Downloads/Offshore/FEP/EN-Flaechenentwicklungsplan2019.pdf?__blob=publicationFile&v=4

Bueno, S.M. 2016. Project of the Year 2016 New Installation Winner: Indian River HDD Crossing. Trenchless Technology. October 17, 2016. Accessed July 8, 2021. Available at: https://trenchlesstechnology.com/project-year-2016-new-installation-winner-indian-river-hdd-crossing/

ConEd (ConEdison). 2022. Petition of Consolidated Edison Company of New York, Inc. for Approval to Recover Costs Of Brooklyn Clean Energy Hub in CASE 20-E-0197Proceeding on Motion of the Commission to Implement Transmission Planning Pursuant to the Accelerated Renewable Energy Growth and Community Benefit Act.

COWI (BTMI Engineering, PC). 2022. Offshore Wind Ports: Vessel Traffic Risk Assessment Supplement Final Report. Prepared for New York State Energy Research and Development Authority. August 2022. New York, NY.

_________. 2022a. Maritime Technical Working Group Anchor Strike Study: Summary Report. Written for New York Department of State. Version 2.0. March 2022. New York, NY.

Crown Estate, The. 2012. Submarine Cables and Offshore Renewable Energy Installations. Proximity Study. Prepared by Red Penguin Associates, LLC. Accessed July 8, 2021. Available at: https://www.thecrownestate.co.uk/media/1784/submarine-cables-and-offshore-renewable-energy-installations-proximity-study.pdf

CT DEEP (Connecticut Department of Energy and Environmental Protection). 2019. Long Island Sound Blue Plan 2019. (September 2019). Accessed July 8, 2021. Available at: https://cteco.uconn.edu/projects/blueplan/docs/LISBluePlan_SHUA_TechnicalDocumentation_201909.pdf

Davidson Laboratory (Urban Ocean Observatory at Davidson Laboratory). 2022. Surface Currents. Stevens Institute of Technology, Hoboken, New Jersey. Accessed July 6, 2022, at NYHOPS: Urban Ocean Observatory at Davidson Laboratory (stevens-tech.edu).

DHS (Department of Homeland Security). 2011. 33 CFR Part 165. Safety Zone; Underwater Hazard, Gravesend Bay, Brooklyn, NY. Docket No. USCG-2010-1126. Accessed July 8, 2021. Available at: https://www.govinfo.gov/content/pkg/FR-2011-01-26/pdf/2011-1660.pdf

DHV KEMA. 2012. Studie zu Mindestabständen bei Seekabeln (Final version). Report number: 112 45597-P (Final). Prepared for Offshore Forum Windenergie and Stiftung Offshore-Windenergie, 49p (December 11, 2012). Accessed July 8, 2021. Available at: https://www.offshore-stiftung.de/sites/offshorelink.de/files/documents/Offshore_Stiftung_121126_Gutachten_DNV_KEMA_Seekabel_Mindestabstaende.pdf

DNV GL. 2018. Mindestabstände von Seekabeln (Minimum distances of subsea cables). Prepared for AGOW Arbeitsgemeinschaft Offshore-Windenergie e.V. Report no. 118 42328, Rev. 3 (November 14, 2018). Accessed May 25, 2021. Available at: https://bwo-offshorewind.de/studie-zu-mindestabstaenden-bei-seekabeln-ueberarbeitet/

DOE (Department of Energy). Office of Electricity. 2022. “Building a Better Grid Initiative.” Accessed June 3, 2022. Available at: https://www.energy.gov/oe/building-better-grid-initiative#:~:text=The%20Department%20of%20Energy's%20(DOE,President%20Biden's%20Bipartisan%20Infrastructure%20Law

Drew, S.C. and A.G. Hopper. 2009. Fishing and Submarine Cables: Working Together. Second Edition. International Cable Protection Committee.

Dunton, K.J., A. Jordaan, D.O. Conover, K.A. McKown, L.A. Bonacci, and M.G. Frisk. 2015. Marine Distribution and Habitat Use of Atlantic Sturgeon in New York Lead to Fisheries Interactions and Bycatch, Marine and Coastal Fisheries 7(1): 18–32, https://doi.org/10.1080/19425120.2014.986348

Dunton, K.J., A. Jordaan, K. A. McKown, D.O. Conover, and M.G. Frisk. 2010. Abundance and Distribution of Atlantic Sturgeon (*Acipenser oxyrinchus*) within the Northwest Atlantic Ocean, Determined from Five Fishery Independent Surveys. U.S. National Marine Fisheries Service Fishery Bulletin 108: 450–464.

Emeana, C.J., T.J. Hughes, J.K. Dix, T.M. Gernon, T.J. Henstock, C.E.L. Thompson, and J.A. Pilgrim. 2016. The Thermal Regime Around Buried Submarine High-Voltage Cables. Geophys. J. Int. 206, 1051–1064. Available at: https://academic.oup.com/gji/article/206/2/1051/2606019

Empire Wind (Empire Offshore Wind). 2021. Construction and Operations Plan for the Empire Wind Project (EW1 and EW 2). Submitted to the Bureau of Ocean Energy Management, July 2021. Available at: https://www.boem.gov/renewable-energy/state-activities/empire-wind-construction-and-operations-plan

Endangered Language Alliance. No date. Languages of New York City. Accessed April 22, 2022. Available at: https://languagemap.nyc/Explore/Language

EPA (U.S. Environmental Protection Agency). 2021. Learn About Environmental Justice. Last updated on September 22, 2021. Available at: https://www.epa.gov/environmentaljustice/learn-about-environmental-justice#:~:text=President%20Clinton%20signing%20the%20EJ,environmental%20laws%2C%20regulations%20and%20policies

Federal Register. 2022. Vol. 87, No. 86/Wednesday May 4, 2022/Proposed Rules. FERC Building for the Future through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection. Available at: https://www.govinfo.gov/content/pkg/FR-2022-05-04/pdf/2022-08973.pdf

FERC (Federal Energy Regulatory Commission). 2019. Northeast Supply Enhancement Project Final Environmental Impact Statement. Transcontinental Gas Pipe Line Company, LLC. Docket No. CP17-101-000. January 2019.

__________. 2008. Broadwater LNG Project. Final Environmental Impact Statement. Broadwater Energy LLC and Broadwater Pipeline LLC. FERC/EIS – 0196F. Available at: https://cms.ferc.gov/final-environmental-impact-statements-broadwater-lng-project

Fire Island News. 2020. “Smith Point: The Other Side of Fire Island.” Accessed July 15, 2022. Published on July 24, 2020. Available at: https://fireislandnews.com/smith-point-the-other-side-of-fire-island/

Frisk, N.-B., R. Gaspari, and E. Doedens. 2019. Qualification of 400 and 525 kV HVDC XLPE Cable Systems Including a Multitude of Accessory Configurations. Accessed July 1, 2022. Available at: file://corp.pbwan.net/Global/US/CentralData/USBOS500/NEEDHAM/Data/ENVIRONM/Hay/3%20-%20PROJECTS/NYSERDA/Documents/H.%20Cable%20-%20%20Heat,%20EMF,%20Capacity/Frisk%20et%20(2019)%20HVD%20C%20%202%20GW%20capacity.pdf

Gradient. 2015. Electric and Magnetic Field (EMF) Analysis for Woburn-to-Wakefield Junction Underground 345-kV Transmission Line. Prepared for Epsilon Associates, Eversource, and New England Power Company d/b/a National Grid. June 4, 2015. Available at: https://www.winchester.us/DocumentCenter/View/1612/EMF-Analysis-for-Woburn-to-Wakefield-Junction-Underground-345kV-Transmission-Line

Greater Long Island. 2018. Will Continued Research at Plum Island Result in Even More Contamination? January 15, 2018. Accessed June 15, 2021. Available at: https://greaterlongisland.com/3027-will-continued-research-at-plum-island-result-in-even-more-contamination/

Harsanyi, P., K. Scott, B.A.A. Easton, G.d.l.C. Ortiz, E.C.N. Chapman, A.J.R. Piper, C.M.V. Rochas, and A.R. Lyndon. 2022. The Effects of Anthropogenic Electromagnetic Fields (EMF) on the Early Development of Two Commercially Important Crustaceans, European Lobster, *Homarus Gammarus* (L.) and edible crab, *Cancer pagurus* (L.). Journal of Marine Science and Engineering 10: 564. https://doi.org/10.3390/jmse10050564

Hay, B.J., E. Samanns, S. Knauf, D. Stevens, G. Khan, and M. McBrien. 2011. Oil Spill Along the Arthur Kill, New York Harbor, From a 1990 Exxon Pipeline Rupture: Physical Damage Assessment and Restoration. In: Wallendorf, L., C Jones, L. Ewing, and B. Battalio (eds.). Proceedings of the 2011 Solutions to Coastal Disasters conference, Anchorage Alaska, June 25-29, 2011.

Hemery, L.G. and D.J. Rose. 2020. Changes in Benthic and Pelagic Habitats Caused by Marine Renewable Energy Devices. Available at: https://www.osti.gov/servlets/purl/1633182

HUD (U.S. Department of Housing and Urban Development). 2022. Tribal Directory Assessment Tool (TDAT). Accessed May 3, 2022. Available at: https://egis.hud.gov/TDAT/

Hutchison, Z.L., A.B. Gill, P. Sigray, H. He, and J.W. King. 2020. Anthropogenic Electromagnetic Fields (EMF) Influence the Behaviour of Bottom-Dwelling Marine Species. Scientific Reports 10: 4219. https://doi.org/10.1038/s41598-020-60793-x

ICPC (International Cable Protection Committee). 2014. ICPC Recommendation. Recommendation No. 2. Recommended Routing and Reporting Criteria for Cables in Proximity to Others. 17 pp.

INMR. 2020. Testing Extruded Cable Systems Up to 525 kV DC. Accessed July 1, 2022. Testing Extruded Cable Systems Up to 525 kV DC - (inmr.com).

Jakubowska-Lehrmann, M., M. Białowąs, Z. Otremba, A. Hallmann, S. Śliwińska-Wilczewska, and B. Urban-Malinga. 2022. Do Magnetic Fields Related to Submarine Power Cables Affect the Functioning of a Common Bivalve? Marine Environmental Research 179: 105700. https://doi.org/10.1016/j.marenvres.2022.105700

Levitan (Levitan & Associates, Inc). 2020. Offshore Wind Transmission Study. Comparison of Options. Offshore Wind Transmission Study. Prepared for New Jersey Board of Public Utilities. (December 29, 2020). Accessed July 8, 2021. Available at: https://www.nj.gov/bpu/pdf/publicnotice/Transmission%20Study%20Report%2029Dec2020%202nd%20FINAL.pdf

Liu, Q., J.L. Collier, and B. Allam. 2017. Seasonality of QPX Disease in the Raritan Bay (NY) Wild Hard Clam (*Mercenaria mercenaria*) Population. Aquaculture Research 48: 1269–1278. Accessed July 8, 2021. Available at: https://pdfs.semanticscholar.org/d9dc/9c2cbc6f481847f616d886d2f424398dbca6.pdf

Long, E.R., D.A. Wolfe, K.J. Scott, G.B. Thursby, E.A. Stern, C. Peven, and T. Schwartz. 1995. Magnitude and Extent of Sediment Toxicity in the Hudson-Raritan Estuary. National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NOS ORCA 88. Accessed June 27, 2021. Available at: https://www.nj.gov/dep/passaicdocs/docs/NJDOTSupportingCosts/HIST-DREDGING-NOAA-8-1995-ESTUARYCONTAMINATION.pdf

Lopez, G., D. Carey, J.T. Carlton, R. Cerrato, H. Dam, R. DiGiovanni, C. Elphick, M. Frisk, C. Gobler, L. Hice, and P. Howell. 2014. Biology and Ecology of Long Island Sound. In: Long Island Sound (pp. 285–479). Springer, New York, NY.

Love, M.S., M.M. Nishimoto, S. Clark, M. McCrea, and A.S. Bull, A.S. 2017. Assessing Potential Impacts of Energized Submarine Power Cables on Crab Harvests. Continental Shelf Research 151: 23–29. https://doi.org/10.1016/j.csr.2017.10.002

MARCO (Mid-Atlantic Regional Council on the Ocean). No date. Data Catalog and Map. Administrative. Indigenous Nations, Communities & Cultures. Historic Native Terrestrial Territories (Not Reservation Boundaries). Accessed July 6 and 11, 2022. Available at: https://portal.midatlanticocean.org/data-catalog/administrative/#layer-info-indigenous-nations-communities-cultures5193 and https://portal.midatlanticocean.org/visualize/#x=-73.62&y=40.80&z=9&logo=true&controls=true&dls%5B%5D=true&dls%5B%5D=0.5&dls%5B%5D=5205&dls%5B%5D=true&dls%5B%5D=0.8&dls%5B%5D=4667&basemap=ocean&themes%5Bids%5D%5B%5D=1&tab=data&legends=false&layers=true

McMullen, K.Y., V.F. Paskevich, and L.J. Poppe. 2005. GIS Data Catalog (version 2.2). In: Poppe, L.J., S.J. Williams, and V.F. Paskevich (eds.), U.S. Geological Survey East-Coast Sediment Analysis: Procedures, Database, and GIS Data. U.S. Geological Survey Open-File Report 2005-1001. Accessed July 8, 2021. Available at: http://woodshole.er.usgs.gov/openfile/of2005-1001/htmldocs/datacatalog.htm

Menza, C., B.P. Kinlan, D.S. Dorfman, M. Poti, and C. Caldow. 2012. A Biogeographic Assessment of Seabirds, Deep Sea Corals and Ocean Habitats of the New York Bight: Science to Support Offshore Spatial Planning. NOAA Technical Memorandum NOS NCCOS 141. Silver Spring, MD.

Morreale S.J. and E.A. Standora. 2005. Western North Atlantic Waters: Critical Developmental Habitat for Kemp's Ridley and Loggerhead Sea Turtles. Chelonian Conservation and Biology 4(4): 872–882.

Morreale S.J. and E.A. Standora. 1998. Early Life Stage Ecology of Sea Turtles in Northeastern U.S. Waters. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-413.

NEFMC and NOAA Fisheries (New England Fishery Management Council and National Marine Fishery Service). 2017. Omnibus Essential Fish Habitat Amendment 2, Volume 2: EFH and HAPC Designation Alternatives and Environmental Impacts. Final Report. October 2017.

New York Law Journal. 2022. Legislature Expands State's Jurisdiction over Freshwater Wetlands. Published May 11, 2022. Available at: https://www.law.com/newyorklawjournal/2022/05/11/legislature-expands-states-jurisdiction-over-freshwater-wetlands/

New York Sea Grant. 2003. QPX Disease in Hard Clams: Quahog Parasite Unknown. July 2003. Accessed July 8, 2021. Available at: http://www.seagrant.sunysb.edu/seafood/pdfs/QPX-Brochure03.pdf

New York State Climate Action Council. December 2021. Draft Scoping Plan. Accessed January 25, 2022. Available at: https://climate.ny.gov/Our-Climate-Act/Draft-Scoping-Plan

New York State Scenic Byway "Corridor Management Plan for Select Historic Long Island Parkways" Nassau and Suffolk Counties, New York. New York State Department of Transportation (July 2010). Available at: https://www.dot.ny.gov/content/engineering/Scenic-Byways/Byways-repository/LONG-ISLAND-CMP.PDF

NOAA Fisheries (National Oceanic and Atmospheric Administration) 2022. Automated Wrecks and Obstructions Database, Interactive AWOIS Map, AWOIS Wreck 7555. Accessed July 6, 2022. Available at: https://wrecks.nauticalcharts.noaa.gov/viewer/

__________. 2021. Essential Fish Habitat Mapper with Link to EFH Text Descriptions. Updated July 2021.

__________. 2019a. Greater Atlantic Region ESA Section 7 Mapper. Available at: https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=1bc332edc5204e03b250ac11f9914a27

__________. 2019b. *North Atlantic Right Whales Seasonal Management Areas Map & GIS Data*. https://www.fisheries.noaa.gov/resource/map/north-atlantic-right-whale-seasonal-management-areas-sma-map-gis-data

__________. 2017. Endangered and Threatened Species; Designation of Critical Habitat for the Endangered New York Bight, Chesapeake Bay, Carolina and South Atlantic Distinct Population Segments of Atlantic Sturgeon and the Threatened Gulf of Maine Distinct Population Segment of Atlantic Sturgeon. Federal Register, 82(158): 39160-39274. August 2017.

__________. 2015. Biologically Important Areas. Available at: https://cetsound.noaa.gov/important

NOAA-GARFO (National Ocean and Atmospheric Administration-Greater Atlantic-Regional Fisheries Office). 2019 Version 2.0. Section 7 Mapper Greater Atlantic Region. November 2019. Available at: https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=1bc332edc5204e03b250ac11f9914a27

NPS (National Park Service). 2022. Dead Horse Bay Environmental Cleanup Project. Accessed July 13, 2022. Available at: https://www.nps.gov/gate/learn/management/dead-horse-bay-environmental-cleanup-project.htm

__________. 1997. National Register Bulletin: How to Apply the National Register Criteria for Evaluation. Accessed May 9, 2022. Available at: https://www.nps.gov/subjects/nationalregister/upload/NRB-15_web508.pdf

NREL (National Renewable Energy Laboratory). 2022. Atlantic Offshore Wind Transmission Study. Accessed June 3, 2022. Available at: at: https://www.nrel.gov/wind/atlantic-offshore-wind-transmission-study.html

NWI (National Wetlands Inventory). 2021. National Wetland Inventory.

NYCDOT (New York City Department of Transportation). 2023. Revocable Consents. Accessed on January 5, 2023. Available at: https://www.nyc.gov/html/dot/html/infrastructure/revconif.shtml

NYC Planning. 2017. The New York City Waterfront Revitalization Program, Arthur Kill Ecologically Sensitive Maritime and Industrial Area (ESMIA) Guidance. February 2017.

NYNHP (New York Natural Heritage Program). 2022. Online Conservation Guides. Available at: https://guides.nynhp.org/

___________. Significant Natural Community Occurrences – Eastern New York. Revised June 2021. Accessed October 27, 2021. Available at: http://gis.ny.gov/gisdata/metadata/nysdec.natcomm_reg34_KML.xml

NYNHP and InnerSpace (New York Natural Heritage Program and InnerSpace Scientific Diving). 2022. Survey of Plum Island's Subtidal Marine Habitats. Report to Save the Sound. New York Natural Heritage Program, Albany, NY. Available at: https://www.nynhp.org/documents/177/Plum_Island_Marine_Subtidal_Habitats_March_2022.pdf

NYSDEC (New York State Department of Environmental Conservation). No date. Maps and Geospatial Information System (GIS) Tools for Environmental Justice. Accessed April 21, 2022. Available at: https://www.dec.ny.gov/public/911.html

___________. 2022. Spills Incidents Database Search Results – Spill 1702536 and Spill 1709004. Accessed May 8, 2022. Available at: https://www.dec.ny.gov/cfmx/extapps/derexternal/spills/details.cfm

___________. 2021a. NYS Natural Heritage Communities Vector Digital Data Set 2021.

___________. 2021b. NYSDEC Statewide Seagrass Map. Available at: https://www.arcgis.com/home/item.html?id=12ba9d56b75d497a84a36f94180bb5ef

___________. 2020. Final 2018 Section 303(d) List. June 2020. Available at: https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf

___________. 2017. New York Ocean Action Plan. Available at: https://www.dec.ny.gov/docs/fish_marine_pdf/nyoceanactionplan.pdf

___________. 2014a. Environmental Remediation Databases Details. Site Record for Brookhaven National Laboratory. Accessed June 6, 2022. Available at: https://www.dec.ny.gov/cfmx/extapps/derexternal/haz/details.cfm?ProgNo=152009

__________. 2014b. Environmental Remediation Databases Details. Site Record for Former Glenwood Landing Gas Plant and Holding Station. Accessed June 6, 2022. Available at: https://www.dec.ny.gov/cfmx/extapps/derexternal/haz/details.cfm?ProgNo=V00351

__________. 2014c. Environmental Remediation Databases Details. Site Record for CE – Astoria MGP. Accessed June 6, 2022. Available at: https://www.dec.ny.gov/cfmx/extapps/derexternal/haz/details.cfm?ProgNo=241012

NYSDEC and NYSERDA (New York State Department of Environmental Conservation and New York State Energy Research and Development Authority). 2022. New York State's Draft Disadvantaged Communities Criteria (Fact Sheet). Accessed July 6, 2022. Available at: https://climate.ny.gov/Our-Climate-Act/Disadvantaged-Communities-Criteria

NYSDOS (New York Department of State). 2022. Personal Communication. Laura McLean to Janine Whitken. May 11, 2022.

__________. 2005. Coastal Fish and Wildlife Habitat Assessment Form for Plum Gut. NYSDOS Division of Coastal Resources. (October 15, 2005). Accessed June 14, 2021. https://dos.ny.gov/system/files/documents/2020/03/plum_gut.pdf

NYSDPS (New York Department of Public Service). 2021. Initial Report on the New York Power Grid Study, Appendix D Offshore Wind Integration Study. New York Department of Public Service Staff New York State Energy Research and Development Authority Staff. Available at: https://www.nyserda.ny.gov/About/Publications/Energy-Analysis-Technical-Reports-and-Studies/Electric-Power-Transmission-and-Distribution-Reports/Electric-Power-Transmission-and-Distribution-Reports---Archive/New-York-Power-Grid-Study

NYSPSC (New York State Public Service Commission). 2022. Order on Power Grid Study Recommendations. January 20, 2022. Available at: https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={54121685-CF05-4E79-9237-DE6C60251A1C}

__________. 2021. Order Adopting Joint Proposal: Application of Deepwater Wind South Fork, LLC for a Certificate of Environmental Compatibility and Public Need. Available at: https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={E369B093-EA8F-4BC2-98BA-4EAAC97F40AB}

__________. 2012. Case No. 10-T-0139 – Champlain Hudson Power Express, Inc. Joint Proposal. February 24, 2012. Available at: http://chpexpresseis.org/docs/CHPE_Article_VII_Joint_Proposal.pdf

NYSERDA (New York State Energy Research and Development Authority). 2017a. NYSERDA Report 17-25 Offshore Wind Master Plan. December 2017. Accessed May 29, 2021. Available at: https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/About-Offshore-Wind/Master-Plan

__________. 2017b. New York State Offshore Wind Master Plan Fish and Fisheries Study. Available at: https://www.nyserda.ny.gov/All-Programs/Offshore-Wind/About-Offshore-Wind/Master-Plan

NYSOPRHP (New York State Office for Parks, Recreation and Historic Preservation). 2021. State Park Annual Attendance Figures by Facility: Beginning 2003. Accessed December 16, 2021. Last updated February 3, 2021. Available at: https://data.ny.gov/Recreation/State-Park-Annual-Attendance-Figures-by-Facility-B/8f3n-xj78

__________. 2018. Indian Nation Areas of Interest. Accessed November 10, 2021. Available at: https://parks.ny.gov/documents/shpo/environmental-review/IndianNationAreasofInterest.pdf

__________. 2017. Handbook on the Alienation and Conversion of Municipal Parkland. Available at: https://parks.ny.gov/documents/publications/AlienationHandbook2017.pdf

Oceanic Society. 1982. Dredging and dredged materials management in the Long Island Sound Region. Final report. Submitted to the New England Governors' Conference, Boston, MA.

Prysmian Group. 2022. Prysmian Secures Approx.€500M SuedOstLink Cable Corridor Project in Germany. Accessed July 2, 2022. Available at: https://www.prysmiangroup.com/en/press-releases/prysmian-secures-approx-euro500m-suedostlink-cable-corridor-project-in-germany

Save the Sound, Preserve Plum Island Coalition, and The Nature Conservancy. 2020. Envision. Plum Island. A Connecting Landscape of History, Nature, Research. (July) Available at: Plum+Island+Envision+Report (squarespace.com).

Schlesinger, M.D., E.L. White, S.M. Young, G.J. Edinger, K.A. Perkins, N. Schoppmann, and D. Parry. 2016. Biodiversity Inventory of Plum Island, New York. New York Natural Heritage Program, Albany, New York, and SUNY College of Environmental Science and Forestry, Syracuse, NY.

Schwab, W.C., E.R. Thieler, J.F. Denny, W.W. Danforth, and J.C. Hill. 2000. Seafloor Sediment Distribution Off Southern Long Island, New York. Accessed July 8, 2021. Available at: https://pubs.usgs.gov/of/2000/of00-243/default.htm

Sharples, M. 2011. Offshore Electrical Cable Burial for Wind Farms: State of the Art, Standards and Guidance & Acceptable Burial Depths, Separation Distances and Sand Wave Effect. Prepared for Bureau of Ocean Energy Management, Regulation & Enforcement - Department of the Interior. Accessed July 8, 2021. Available at: https://www.bsee.gov/sites/bsee.gov/files/tap-technical-assessment-program/final-report-offshore-electrical-cable-burial-for-wind-farms.pdf

Signell, R.P., J.H. List, and A.S. Farris. 2000. Bottom currents and sediment transport in Long Island Sound: A modeling study. Journal of Coastal Research 16: 551–566.

Stefaniak, L.M., Auster, P.J., and Babb, I.G. 2014. Loss of an Erect Sponge on a Rock Reef in Long Island Sound (North-West Atlantic). *Marine Biodiversity*, 7(e115): 1–6. https://doi.org/10.1017/S1755267214001109

Sunrise Wind. 2021. Construction and Operations Plan: Sunrise Wind Farm Project. Prepared by Stantec. Submitted by Orsted and Eversource. April 8, 2022. Available at: https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/SRW01-COP.pdf

Taormina, B., J. Bald, A. Want, G. Thouzeau, M. Lejart, N. Desroy, and A. Carlier. 2018. A Review of Potential Impacts of Submarine Power Cables on the Marine Environment: Knowledge Gaps, Recommendations and Future Directions. Renewable and Sustainable Energy Reviews 96: 380–391. https://doi.org/10.1016/j.rser.2018.07.026

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. Gal, R. Derrien, A. Jolivet, S. Chauvaud, V. Degret, D. Saffroy, J.-P. Pagot. and A. Barillier. 2020. Characterisation of the potential impacts of subsea power cables associated with offshore renewable energy projects. Plouzané: France Energies Marines Editions, 2020, 74p. Accessed July 1, 2022. Available at: https://tethys.pnnl.gov/sites/default/files/publications/Taormina-et-al-2021-Impacts-of-Subsea-Power-Cables.pdf

Tüv Süd, PMSS, and Red Penguin. 2014. Offshore Wind Submarine Cable Spacing Guidance. Contract # E14PC00005. U.S. Department of Interior, Bureau of Safety and Environmental Enforcement (December 2014). Available at: 722 AA (boem.gov).

USACE (U.S. Army Corps of Engineers). 2022a. NY &NJ Harbor & Tributaries Focus Area Feasibility Study (HATS). Available at: https://www.nan.usace.army.mil/Missions/Civil-Works/Projects-in-New-York/New-York-New-Jersey-Harbor-Tributaries-Focus-Area-Feasibility-Study/

__________. 2022b. New York and New Jersey Harbor Deepening Channel Improvements Navigation Study Final Integrated Feasibility Report and Environmental Assessment. USACE New York District. April 2022. Available at: https://www.nan.usace.army.mil/Missions/Navigation/New-York-New-Jersey-Harbor/NY-NJ-HDCI

__________. 2021a. Fact sheet. Hudson River Channel, NY (40 ft.). Maintenance Dredging (March 26, 2021). Accessed June 10, 2021. Available at: https://www.nan.usace.army.mil/Media/Fact-Sheets/Fact-SheetArticle-View/Article/487535/fact-sheet-hudson-river-channel-ny-40-ft/

__________. 2021b. Depth Reports and Surveys. Accessed July 8, 2021. Available at: https://www.nan.usace.army.mil/Missions/Navigation/Controlling-Depth-Reports

__________. 2020a. Report of Channel Conditions – New York and New Jersey Harbor, Ambrose Channel. August 27, 2020. Accessed June 2, 2021. Available at: https://www.nan.usace.army.mil/Missions/Navigation/Controlling-Depth-Reports/

__________. 2020b. Hudson River Channel, New York. Report of channel conditions (for channels 400 feet wide or greater). (December 16, 2020). Accessed July 8, 2021. Available at: https://www.nan.usace.army.mil/Portals/37/docs/civilworks/ConDep/CDR_2020/Dec20/Hudson%20River%20Channel%202020%20CDR.pdf?ver=FbL5JYo68D5LOVYEcj-Idg%3d%3d

___________. 2019. New York District Revised Final Report. Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement, Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet and Jamacia Bay. Available at: https://www.nan.usace.army.mil/Portals/37/docs/civilworks/projects/ny/coast/Rockaway/2020%20Update%20Report/Rock%20Jam%20Bay%20Final%20Report.pdf?ver=2020-06-01-154654-773

___________. 2015a. Final Programmatic Environmental Impact Statement for Dredged Material Management Plan. Long Island Sound, Connecticut, New York and Rhode Island. December 2015. Available at: https://www.nae.usace.army.mil/portals/74/docs/Topics/LISDMMP/LISDMMP%20Final/01a-LIS-DMMP-Main-Report-Final-Dec15.pdf

___________. 2015b. Dredge Plume Dynamics in New York/New Jersey Harbor - Summary of Suspended Sediment Plume Surveys Performed During Harbor Deepening. New York and New Jersey Harbor Deepening Project. April 2015. USACE New York District, New York, New York. Accessed May 12, 2022. Available at: http://www.nan.usace.army.mil/Portals/37/docs/harbor/Biological%20and%20Physical%20Monitoring/Total%20Suspended%20Sediments%20Monitoring/TSS%20Summary%20Report_FINAL_21April2015.pdf

___________. 2004. Limited Reevaluation Report and Environmental Assessment on Consolidated Implementation of the New York and New Jersey Harbor Deepening Project. Newark Bay Study Area. Appendix F: Geotechnical. January 2004. Available at: https://sharepoint.ourpassaic.org/Newark%20Bay%20Phase%20I%20Remedial%20Investigation%20Work%20Pla/RIWP%20Volume%201a%20of%203/Appendix%20D%20Sediment%20Data/Limited%20Reevaluation%20Report%20Appendix%20F%20Geotechnical.pdf

___________. 1999a. New York Harbor Navigation Study. U.S. Army Corps of Engineers, New York District.

___________. 1999b. Cultural Resources Summary and Preliminary Case Report – New York and New Jersey Harbor Navigation Study. October 1999. Accessed May 5, 2022. Available at: 21.pdf (nyc.gov).

U.S. Census Bureau. No date(a). 2019 1-Year American Community Survey Supplemental Estimates: Race. New York-Newark-Jersey City, NY-NJ-PA Metro Area. Accessed April 22, 2022. Available at: https://data.census.gov/cedsci/table?g=310XX00US35620&d=ACS%201-Year%20Supplemental%20Estimates&tid=ACSSE2019.K200201

U.S. Census Bureau. No date(b). 2019 1-Year American Community Survey Supplemental Estimates: Hispanic or Latino Origin. New York-Newark-Jersey City, NY-NJ-PA Metro Area. Accessed April 22, 2022. Available at: https://data.census.gov/cedsci/table?g=310XX00US35620&d=ACS%201-Year%20Supplemental%20Estimates&tid=ACSSE2019.K200301

U.S. Census Bureau. No date(c). 2017 1-Year American Community Survey Supplemental Estimates: Poverty Status in the Past 12 Months by Age. New York-Newark-Jersey City, NY-NJ-PA Metro Area. Accessed April 22, 2022. Available at: https://data.census.gov/cedsci/table?t=Income%20and%20Poverty&g=310XX00US35620&d=ACS%201-Year%20Supplemental%20Estimates

U.S. Department of Energy 2023. Office of Energy Efficiency and Renewable Energy. Next Generation Wind Technology. Accessed January 5, 2023. Available at: https://www.energy.gov/eere/wind/next-generation-wind-technology

USEPA (U.S. Environmental Protection Agency). 2021. Sole Source Aquifer Interactive Map. Accessed December 15, 2021. Available at: https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=9ebb047ba3ec41ada1877155fe31356b

___________. 2022. Superfund Site: Brookhaven National Laboratory (USDOE), Upton, NY. Accessed June 6, 2022. Available at: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0202841

USFWS (U.S. Fish and Wildlife Service). 2021. *IPaC Report for South Shore Approach*. Accessed October 27, 2021. Available at: https://ecos.fws.gov/ipac

USFWS (U.S. Fish and Wildlife Service). 1997. Significant habitats and habitat complexes of the New York Bight watershed. Accessed July 8, 2021. Available at: https://nctc.fws.gov/pubs5/web_link/text/akc_form.htm

USGS (U.S. Geological Survey). 2021a. Groundwater Sustainability – Long Island, New York. Accessed October 20, 2021. Available at: https://www.usgs.gov/centers/ny-water/science/groundwater-sustainability-long-island-aquifer-system?qt-science_center_objects=0#qt-science_center_objects

___________.2021b. Long Island State of the Aquifer. Accessed October 25, 2021. Available at: https://www.usgs.gov/centers/ny-water/science/long-island-state-aquifer-interactive-content?qt-science_center_objects=0#qt-science_center_objects

___________. 2017. Long Island Topography. Accessed May 12, 2022. Available at: https://www.usgs.gov/centers/new-york-water-science-center/science/long-island-topography?qt-science_center_objects=0#overview

Varekamp, J.C., A.E. McElroy, J.R. Mullaney, and V.T. Breslin. 2014. Metals, Organic Compounds, and Nutrients in Long Island Sound: Sources, Magnitudes, Trends and Impacts. In: J.S. Latimer et al. (eds.), Long Island Sound. Prospects for the Urban Sea. Springer Series on Environmental Management. https://doi.org/10.1007/978-1-4614-6126-5_6, p. 203–284

Verdant Power. 2010. Roosevelt Island Tidal Energy Project. FERC No. 12611. Final Kinetic Hydropower Pilot License Application. Accessed July 8, 2021. Available at: https://tethys.pnnl.gov/sites/default/files/publications/Verdant-Power-2010.pdf

Wahle, L. and N. Balcom. 2020. Living Treasures: The Plants and Animals of Long Island Sound. Connecticut Sea Grant College Program, University of Connecticut, Marine Sciences Institute, Groton.

Wilber, D.H., D.G. Clarke, J. Gallo, C.J. Alcoba, A.M. Dilorenzo, and S.E. Zappala. 2013. Identification of Winter Flounder (*Pseudopleuronectes americanus*) Estuarine Spawning Habitat and Factors Influencing Egg and Larval Distributions. Estuaries and Coasts, 36: 1304-1318.

Zajac, R.N., Lewis, R.S., Poppe, L.J., Twichell, D.C., Vozarik, J., and Digiacomo-Cohen, M.L. 2000. Relationships Among Sea-Floor Structure and Benthic Communities in Long Island Sound: a Benthoscape Prospectus. *Journal of Coastal Research*, 16(3): 627-640. West Palm Beach (Florida), ISSN 0749-0208.

Appendix A. GIS Layers Used in the Analysis

Table A-1. Offshore GIS Data Layer List. To access the geospatial layers used in this assessment, go to the New York Department of State Geographic Information Gateway and search for #NYSERDACables

Resource/Area	Year	Category	Description	Web link/ Source
North Atlantic Right Whale Critical Habitat	2019	Biological	Boundaries of the North Atlantic Right Whale Critical Habitat in ESRI shapefile format for the NOAA Fisheries Service's Greater Atlantic Regional Fisheries Office.	https://www.fisheries.noaa.gov/resource/map/north-atlantic-right-whale-critical-habitat-map-and-gis-data
North Atlantic Right Whale Seasonal Management Areas.	2019	Biological	Boundaries of the North Atlantic Right Whale Seasonal Management Area locations where regulations implement speed restrictions in shipping areas at certain times of the year along the coast of the U.S. Atlantic seaboard, in ESRI shapefile format.	https://www.fisheries.noaa.gov/resource/map/north-atlantic-right-whale-seasonal-management-areas-sma-map-gis-data
CetMap Biologically Important Areas	2015	Biological	The Cetacean Density and Distribution Mapping Working Group identified Biologically Important Areas for 24 cetacean species, stocks, or populations in seven regions within US waters. BIAs are reproductive areas, feeding areas, migratory corridors, and areas in which small and resident populations are concentrated. BIAs are region-, species-, and time-specific.	https://cetsound.noaa.gov/important

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
NOAA Critical Coastal Habitat	2018	Biological	Compilation of the NOAA NMFS and the U.S. Fish & Wildlife Service designated critical habitat in coastal areas of the United States. Critical habitat is defined as: (1) Specific areas within the geographical area occupied by the species at the time of listing that contain physical or biological features essential to conservation, which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation.	https://marinecadastre.gov/data/
Artificial Reefs	2019	Biological	These are polygon locations of Mid-Atlantic artificial reefs. They were compiled from various sources, primarily lat/long coordinates of reef corners found on public web sites.	http://portal.midatlanticocean.org/data-catalog/fishing/
NYDEC Shellfish Closures	2020 (external source)	Commercial Fishing	Shows certified, seasonally certified and uncertified shellfish growing areas on Long Island. Shellfish closures on Long Island as described in Part 41 of 6NYRR.	https://www.arcgis.com/apps/webappviewer/index.html?id=d98abc91849f4ccf8c38dbb70f8a0042
NYDEC Shellfish Closures	2015	Commercial Fishing	Shows certified, seasonally certified and uncertified shellfish growing areas on Long Island. Shellfish closures on Long Island as described in Part 41 of 6NYRR.	https://www.arcgis.com/apps/webappviewer/index.html?id=d98abc91849f4ccf8c38dbb70f8a0042
Shellfish Aquaculture Lease Sites	2014 (external source)	Commercial Fishing	Identifies operating marine aquaculture facilities based on the best available information from state aquaculture coordinators and programs. Additionally, for this analysis specific information was obtained on the Suffolk County Aquaculture Lease Program.	https://www.northeastoceandata.org/ https://gis3.suffolkcountyny.gov/shellfish/

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Significant Coastal Fish and Wildlife Habitats	2013	Biological	Statutory boundaries of Significant Coastal Fish and Wildlife Habitats as identified and recommended by Environmental Conservation and designated by Department of State.	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=318
Essential Fish Habitat	2020 (external source)	Biological	The spatial representations of fish species, their life stages and important habitats including Habitat Areas of Particular Concern.	https://www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper
Wrecks and Obstructions (NOAA AWOIS and ENC)	2020	Cultural & Demographic	The Automated Wreck and Obstruction Information System (AWOIS) is an automated file that contains information on wrecks and obstructions, and other significant charted features in coastal waters of the United States subject to NOS Hydrographic Surveys.	https://nauticalcharts.noaa.gov/data/wrecks-and-obstructions.html
NYC Aqueducts/Water Tunnels	2020	Energy, Utilities, & Disposal	NYC water Tunnels/ Aqueduct lines from the NYC H2O Hub website.	Extracted from (not readily available): https://services9.arcgis.com/jzHsRPm3d1aMJuBp/ArcGIS/rest/services/NYC_H2O_WaterSystemMap3/FeatureServer/2 https://storymaps.arcgis.com/collections/8a62c7993b4f4f40b49b3ac09671ce3c?item=1
Submarine Cables, NOAA Charted	2018	Energy, Utilities, & Disposal	These data depict the occurrence of submarine cables in and around U.S. navigable waters. The purpose of this data product is to support coastal planning at the regional and national scale. NOAA published in 2018.	https://marinecadastre.gov/data/
Submarine Cables, NASCA Members	2015	Energy, Utilities, & Disposal	These data depict the occurrence of submarine cables in and around U.S. navigable waters. The purpose of this data product is to support coastal planning at the regional and national scale. NASCA published in 2015.	https://coast.noaa.gov/arcgis/rest/services/MarineCadastre/NASCASubmarineCables/MapServer

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Pipelines	2006	Energy, Utilities, & Disposal	National Pipeline Mapping System GIS data representing the linear locations of gas/utility pipelines. Data acquired in 2006 (newer data is available). Also added a pipeline route for Lower NY Bay Lateral pipeline in Raritan Bay.	https://www.npms.phmsa.dot.gov/
NYC Subways	2021	Transportation	New York City subway lines. Data layer name: DOITT_SUBWAY_LINE_04JAN2017.	https://data.cityofnewyork.us/Transportation/Subway-Lines/3qz8-muuu
Electric Transmission Lines (PLATTS)	2011	Energy, Utilities, & Disposal	Platts Transmission lines representing the linear locations of transmission/utility lines carrying electricity.	https://www.spglobal.com/platts/en/products-services/electric-power/gis-data
Electric Transmission Lines (HIFLD)	2020	Energy, Utilities, & Disposal	This feature class/shapefile represents electric power transmission lines. Transmission Lines are the system of structures, wires, insulators, and associated hardware that carry electric energy from one point to another in an electric power system. Lines are operated at relatively high voltages varying from 69 kV up to 765 kV, and are capable of transmitting large quantities of electricity over long distances. Underground transmission lines are included where sources were available.	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-power-transmission-lines
New York City Sewer Atlas	2019	Energy, Utilities, & Disposal	New York City Sewer Atlas Data contains date for the NYC sewer system.	http://openseweratlas.tumblr.com/data
NYC Municipal Separate Storm Sewer System	2020	Energy, Utilities, & Disposal	NYC Municipal Separate Storm Sewer System (MS4) Stormwater Management Program is a multiagency effort led by the Department of Environmental Protection to reduce pollution in stormwater runoff in the MS4 Area of NYC. This MS4 Map represents the known MS4 outfalls and drainage areas as of August 1, 2020. The MS4 map only shows areas draining to the Municipal Separate Storm Sewer System.	https://data.cityofnewyork.us/Environment/Municipal-Separate-Storm-Sewer-System-MS4-Data/j57c-rqtq

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Conmap sediment grainsize	2005	Physical Environment	The purpose of the CONMAPSG sediment layer is to show the sediment grain size distributions. The maps depicted in this series are old and do not accurately depict small-scale sediment distributions or sea-floor variability. This data layer is supplied primarily as a gross overview and to show general textural trends.	https://cmgds.marine.usgs.gov/publications/of2005-1001/htmldocs/datacatalog.htm https://cmgds.marine.usgs.gov/publications/of2005-1001/data/conmapsg/conmapsg.htm
Sediment Texture Points	2005	Physical Environment	This data layer is a point coverage of known sediment samplings, inspections and probings from the usSEABED data collection and integrated using the software system dbSEABED. This data layer represents the extracted (EXT) output of the dbSEABED mining software. It contains data items which were simply extracted from the data resources through data mining. The EXT data is usually based on instrumental analyses (probe or laboratory) but may apply to just a subsample of the sediment (e.g., no large shells).	https://pubs.usgs.gov/ds/2005/118/htmldocs/data_cata.htm
Seagrass-NYOPDIG/LIS data (Long Island Sound)	2005	Physical Environment	This data layer is a point coverage of known sediment samplings, inspections and probings from the usSEABED data collection and integrated using the software system dbSEABED. This data layer represents the extracted (EXT) output of the dbSEABED mining software. It contains data items which were simply extracted from the data resources through data mining. The EXT data is usually based on instrumental analyses (probe or laboratory) but may apply to just a subsample of the sediment (e.g., no large shells).	https://pubs.usgs.gov/ds/2005/118/htmldocs/data_cata.htm

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Carbonate karst	2005	Physical Environment	This data layer is a point coverage of known sediment samplings, inspections and probings from the usSEABED data collection and integrated using the software system dbSEABED. This data layer represents the extracted (EXT) output of the dbSEABED mining software. It contains data items which were simply extracted from the data resources through data mining. The EXT data is usually based on instrumental analyses (probe or laboratory) but may apply to just a subsample of the sediment (e.g., no large shells).	https://pubs.usgs.gov/ds/2005/118/htmldocs/data_cata.htm
Sediment Texture (Long Island Sound)	2005	Physical Environment	This data layer is a point coverage of known sediment samplings, inspections and probings from the usSEABED data collection and integrated using the software system dbSEABED. This data layer represents the extracted (EXT) output of the dbSEABED mining software. It contains data items which were simply extracted from the data resources through data mining. The EXT data is usually based on instrumental analyses (probe or laboratory) but may apply to just a subsample of the sediment (e.g., no large shells).	https://pubs.usgs.gov/ds/2005/118/htmldocs/data_cata.htm

Table A-1 Continued

Resource/Area	Year	Category	Description	Web link/ Source
Soft sediments (by grain size)	2005	Physical Environment	This data layer is a point coverage of known sediment samplings, inspections and probings from the usSEABED data collection and integrated using the software system dbSEABED. This data layer represents the extracted (EXT) output of the dbSEABED mining software. It contains data items which were simply extracted from the data resources through data mining. The EXT data is usually based on instrumental analyses (probe or laboratory) but may apply to just a subsample of the sediment (e.g., no large shells).	https://pubs.usgs.gov/ds/2005/118/htmldocs/data_cata.htm
Bathymetric Contour	2020	Physical Environment	Bathymetry contours covering the project area, from NOAA Navigation Charts at varying scales	NOAA ENC Direct to GIS. https://encdirect.noaa.gov/
Tidal Wetlands	1974	Biological	New York State tidal wetlands south of the Tappan Zee Bridge, as of 1974, for tidal wetlands trend analysis	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1139
Statewide Seagrass	2018	Biological	Polygons representing coverage of New York State Seagrass areas (data exported in October 2018 from an ArcGIS REST Service)	https://services6.arcgis.com/DZHaqZm9cxOD4CWM/ArcGIS/rest/services/NYStatewideSeagrass/FeatureServer
National Hydrography Dataset Flowlines and Waterbodies	2018	Boundaries	USGS National Hydrography Dataset Flowline, linear features and waterbodies, polygon area feature. The National Hydrography Dataset is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system.	https://www.usgs.gov/core-science-systems/ngp/national-hydrography

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
National Wetland Inventory Wetlands	1979	Biological	This data set represents the extent, approximate location and type of wetlands and Deepwater habitats in the United States and its Territories. These data delineate the areal extent of wetlands and surface waters as defined by Cowardian et al. (1979).	https://www.fws.gov/wetlands/
Long Island Sound Hard Bottom Model	2014	Physical Environment	The hard bottom model is defined as an area with depth less than 9.624 meters, structural complexity greater than 0.257, LPI greater than 40.769, and sediment grain size less than 0.1157 mm. This model captures 94% known hard bottom versus 6% random locations.	The Nature Conservancy (TNC) http://maps.tnc.org/gis_data.html
Bottom Current Stress	2016	Physical Environment	Waves and currents create bottom shear stress, a force at the seabed that influences sediment texture distribution, micro-topography, and habitat. Seabed disturbance occurs as a result of bottom shear stress, the combined force waves and currents exert on the sea floor.	USEPA, Supplemental Environmental Impact Statement for the Designation of Dredged Material Disposal Site(S) in Eastern Long Island Sound, Connecticut and New York. https://www.epa.gov/sites/production/files/2016-11/documents/elis_fseis_-_full_report_with_appendices_submitted_04nov16.pdf
Aids to Navigation	2017	Transportation	Structures intended to assist a navigator to determine position or safe course, or to warn of dangers or obstructions to navigation. This dataset includes lights, signals, buoys, day beacons, and other aids to navigation.	https://marinecadastre.gov/data/
Anchorage Areas	2017	Boundaries	An anchorage area is a place where boats and ships can safely drop anchor. These areas are created in navigable waterways when ships and vessels require them for safe and responsible navigation.	https://marinecadastre.gov/data/ https://inport.nmfs.noaa.gov/inport/item/48849

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Coastal Maintained Channel	2015	Boundaries	This layer shows coastal channels and waterways that are maintained and surveyed by the U.S. Army Corps of Engineers. These channels are necessary transportation systems that serve economic and national security interests.	https://marinecadastre.gov/data/
Danger Zones and Restricted Areas	2017	Boundaries	These data represent the location of Danger Zones and Restricted Areas within coastal and marine waters, as outlined by the Code of Federal Regulations and the Raster Navigational Charts.	https://marinecadastre.gov/data/ https://inport.nmfs.noaa.gov/inport/item/48876
Ocean Disposal Sites	2018	Energy, Utilities, & Disposal	In 1972, Congress enacted the Marine Protection, Research, and Sanctuaries Act to prohibit the dumping of material into the ocean that would unreasonably degrade or endanger human health or the marine environment. Virtually all material ocean dumped today is dredged material (sediments) removed from the bottom of waterbodies in order to maintain navigation channels and berthing areas.	https://marinecadastre.gov/data/
Pilot Boarding Area	2018	Boundaries	Pilot boarding areas are locations at sea where pilots familiar with local waters board incoming vessels to navigate their passage to a destination port.	https://marinecadastre.gov/data/
Unexploded Ordnances	2018	Physical Environment	Unexploded ordnances are explosive weapons (bombs, bullets, shells, grenades, mines, etc.) that did not explode when they were employed and still pose a risk of detonation, potentially many decades after they were used or discarded.	https://marinecadastre.gov/data/
Shipping Lanes	2015	Transportation	Shipping fairways and separation zones on approach to major ports.	https://www.nauticalcharts.noaa.gov/data/gis-data-and-services.html#enc-direct-to-gis

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
USACE Borrow Areas	2018	Boundaries	US Army Corps Borrow Area locations for beach nourishment projects.	https://geospatial-usace.opendata.arcgis.com/datasets/aed16678ea814ddc8fdb5d96f723d90b
USACE Coastal Storm Risk Management Project	2018	Boundaries	USACE Coastal Systems Portfolio Initiative Project Reliability and Phase data. Coastal Risk reduction projects.	https://geospatial-usace.opendata.arcgis.com/datasets/fec7341a4b2b4e43bc1f6258057fd115
Vessel Traffic	2017	Transportation	Vessel transit counts for all vessels that carry Automatic Identification System (AIS) transponders. AIS are a navigation safety device that transmits and monitors the location and characteristics of many vessels in U.S. and international waters in real-time.	https://www.northeastoceandata.org/data-explorer/
NOAA Navigation Charts	2020	Physical Environment (External)	NOAA Navigation Chart tiles, downloaded from NOAA RNC Tile service.	https://tileservice.charts.noaa.gov/tileset.html#50000_1-locator
DOD Offshore Wind Mission Compatibility Assessments	2014	Boundaries	This data set represents the results of analyses conducted by the Department of Defense to assess the compatibility of offshore wind development with military assets and activities.	https://marinecadastre.gov/data/ https://coast.noaa.gov/arcgis/rest/services/MarineCadastre/OceanEnergy/MapServer/4
Submarine Transit Lanes	2015	Boundaries	Submarine transit lanes are areas where submarines may navigate underwater, including transit corridors designated for submarine travel.	https://www.northeastoceandata.org/data-explorer/
Naval Undersea Warfare Testing Range	2009	Boundaries	The Naval Undersea Warfare Testing Range consists of waters nearshore waters of Rhode Island Sound, Block Island Sound, and coastal waters of New York, Connecticut, and Massachusetts. The Testing Range located is an area is used for research, development, test, and evaluation of Undersea Warfare systems, and, as necessary, to support other Navy and DoD operations.	https://www.northeastoceandata.org/data-explorer/

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
DoD Operations Area	2015	Boundaries	An OPAREA is an ocean area defined by geographic coordinates with defined sea surface and subsurface training areas and associated special use airspace—and includes danger zones and restricted areas.	https://www.northeastoceandata.org/data-explorer/
Commercial Fishing Vessel Trip Report Data: Fixed Gear/Mobile Gear	2017	Commercial Fishing	These data are collected by observers through NOAA's Northeast Fisheries Observer Program. Raw data are not shared due to the confidentiality of the program. Fixed gear types include gillnets, hand lines, longlines, pots and traps. Mobile gear types include trawls, dredges, and purse seines.	https://www.northeastoceandata.org/data-explorer/
Commercial Fisheries Vessel Monitoring System Data	2015	Commercial Fishing	This dataset broadly characterizes the density of commercial fishing vessel activity for fisheries in the northeastern U.S. based on Vessel Monitoring Systems (VMS) from fishing vessels.	https://www.northeastoceandata.org/data-explorer/
New York Recreational Uses - Recreational Fishing	2014	Recreation	DOS staff worked with NOAA's Coastal Services Center (CSC) to design and develop a participatory mapping process. Leaders from 30 partner organizations and other knowledgeable individuals were invited to participate in one of five offshore use workshops conducted during the summer of 2011. At the workshops, DOS and CSC trained organizational contacts and knowledgeable individuals to work with their colleagues, constituents, and memberships to collect ocean use information.	http://portal.midatlanticocean.org/
Federal Lands	2014	Boundaries	U.S. National Atlas Federal Land Areas represents the federally owned or administered land areas (for example, National Wildlife Refuges, National Monuments, and National Conservation Areas) of the United States.	http://nationalmap.gov/small_scale/atlasftp.html

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Indian Territories	2020	Boundaries	A vector polygon GIS file of all Indian Territory boundaries in New York State.	http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=927
Federal Consistency Geographic Location Descriptions	2018	Boundaries	These data represent state geographic location descriptions for state coastal management programs.	https://inport.nmfs.noaa.gov/inport/item/51544
NY Local Waterfront Revitalization Communities	2018/ 2016	Boundaries	This data set delineates the boundaries of communities with an approved Local Waterfront Revitalization Program (LWRP) under the NYS Coastal Management Program. Including the specific boundaries for the NYC LWRP.	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1284 https://www1.nyc.gov/site/planning/data-maps/open-data.page#zoning_related\
NYC WRP's Coastal Zone Boundary Special Units	2018/ 2016	Boundaries	The Coastal Zone Boundary defines the geographic scope of New York City's Waterfront Revitalization Program (WRP). Pursuant to federal statute, the boundary encompasses all land and water of direct and significant impact on coastal waters. Federal lands and facilities are excluded from the coastal zone and consistency review in accordance with federal legislation. Special area designations of the NYC WRP's Coastal Zone Boundary include Special Natural Waterfront Areas (SNWA), Priority Marine Activity Zones (PMAZ), Significant Maritime and Industrial Areas (SMIA), Recognized Ecological Complexes (REC) and the Arthur Kill Ecologically Sensitive Maritime and Industrial Area (ESMIA).	https://www1.nyc.gov/site/planning/data-maps/open-data/dwn-wrp.page
Coastal Barrier Resource Systems Boundaries	2019	Boundaries	This map layer shows areas designated as undeveloped coastal barriers in accordance with the Coastal Barrier Resources Act, which encourages conservation of hurricane-prone, biologically rich coastal barriers by restricting federal expenditures that encourage development.	https://www.northeastoceandata.org/data-explorer/

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Submerged Lands Act Boundary	2010	Boundaries	The Submerged Lands Act boundary defines the seaward limit of a state's submerged lands and the landward boundary of federally managed OCS lands. In the BOEM Atlantic Region it is projected 3 nautical miles offshore from the baseline.	https://metadata.boem.gov/geospatial/OCS_SubmergedLandsActBoundary_Atlantic_NAD83.xml
U.S. Maritime Boundary	2013	Boundaries	Territorial sea boundary at 12 nautical miles.	https://www.nauticalcharts.noaa.gov/data/gis-data-and-services.html#enc-direct-to-gis National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Office of Coast Survey (OCS)
BOEM Lease Areas and NY Call Areas	2019	Energy, Utilities, & Disposal	Active renewable energy leasing areas on the Atlantic OCS as well as the BOEM Call Areas of New York State.	https://www.boem.gov/Renewable-Energy-GIS-Data/
BOEM NY Wind Energy Areas (WEA)	2021	Energy, Utilities, & Disposal	NY State refined Wind Energy Areas, released 3/29/2021: https://www.boem.gov/renewable-energy/state-activities/new-york-bight	https://www.boem.gov/Renewable-Energy-GIS-Data/ https://www.boem.gov/renewable-energy/state-activities/new-york-bight
BOEM Atlantic Cadastral Lease Blocks and Aliquotes	2012 / 2017	Energy, Utilities, & Disposal	Standard OCS Blocks clipped to the Submerged Lands Act (SLA) boundary on the shoreward side (2304 hectares per standard block). OCS Block 1/16 Aliquot Parts (144 hectares per standard block)	https://www.boem.gov/oil-gas-energy/mapping-and-data/atlantic-cadastral-data
Rhode Island CRMC 2018 GLD Amendment	2018	Boundaries	Amended Rhode Island Coastal Resource Management Committee's polygon for Geographic Location Description (GLD)	built manually from info in this document: http://www.crmc.ri.gov/news/pdf/RI_Amended_GLD_NOAA_Approval_120718.pdf
Mid Atlantic Wildlife Surveys	2014	Biological	study areas and track lines of recent (since 2005) wildlife surveys conducted on the Atlantic OCS.	https://www.boem.gov/renewable-energy/mapping-and-data/renewable-energy-gis-data

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Artificial Reefs NY Expansion	2021	Biological	In his 2020 State of the State address, Governor Cuomo committed to doubling New York's existing reef acreage by expanding seven of 12 existing sites and creating four new artificial reefs in Long Island Sound and the Atlantic Ocean.	http://portal.midatlanticocean.org/data-catalog/fishing/
Long Island Sound Seafloor Character	2012	Physical Environment	Gridded multibeam bathymetry covers approximately 634 square kilometers of sea floor in Block Island Sound. Although originally collected for charting purposes during National Oceanic and Atmospheric Administration hydrographic surveys H12009, H12010, H12011, H12015, H12033, H12137, and H12139, these combined acoustic data and the sea-floor sediment sampling and photography stations subsequently occupied to verify them during U.S. Geological Survey cruise 2011-006-FA (1) show the composition and terrain of the seabed, (2) provide information on sediment transport and benthic habitat, and (3) are part of an expanding series of studies that provide a fundamental framework for research and management activities (for example, wind farms and fisheries) along the Rhode Island inner continental shelf.	USGS OFR 2012-1005: Sea-Floor Character and Sedimentary Processes of Block Island Sound, Offshore Rhode Island, GIS Data Catalog
UCONN Visual and Scenic Resources	2019	Cultural & Demographic	Visual and scenic resources	http://cteco.uconn.edu/projects/blueplan/layers.htm
Working waterfronts, ports and marine commercial areas	2019	Transportation	Working waterfronts, ports, and marine commercial areas. Includes: Final data layers representing significant human uses relevant to Navigation, Transportation, Infrastructure, and Economic Activity.Commercial facilities that are water dependent or service water dependent uses on Long Island Sound, including but not limited to onshore and offshore terminals and port facilities.	http://cteco.uconn.edu/projects/blueplan/layersSHUA.htm#workingwaterfronts

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Mooring fields and anchorage areas	2019	Transportation	Moring fields and anchorage areas. Includes: Formally designated or traditional mooring fields as designated or managed by NOAA, municipal Harbor Management, or other organizations. Anchorage areas as they appear on the NOAA charts and are generally used by commercial vessels.	http://cteco.uconn.edu/projects/blueplan/layersSHUA.htm#anchorage
Areas of lightering activity	2019	Boundaries	Areas designated by the Coast Guard for ship-to-ship transfer (lightering), and other areas regularly used for such transfers.	http://cteco.uconn.edu/projects/blueplan/layersSHUA.htm#lightering
Dredged material disposal areas (active and historic)	2019	Energy, Utilities, & Disposal	Dredged material disposal sites as they appear on the NOAA charts, in the Long Island Sound Dredged Material Management Plan (DMMP), or designated by EPA. Includes areas currently and historically used. Also includes confined aquatic disposal cells.	http://cteco.uconn.edu/projects/blueplan/layersSHUA.htm#dredgedmaterial
Coastal energy generating and transmission facilities	2019	Energy, Utilities, & Disposal	Coastal energy generating and transmission facilities and associated infrastructure, including areas of Long Island Sound adjacent thereto.	http://cteco.uconn.edu/projects/blueplan/layersSHUA.htm#dredgedmaterial
Empire Wind Potential Offshore Cable Routes	2021	Energy, Utilities, & Disposal	Cable alignment digitized from the June 2021 Article VII Application filing for Case 21-T-0366.	https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterSeq=65825&MNO=21-T-0366
Beacon Wind Potential Offshore Cable Routes	2022	Energy, Utilities, & Disposal	Cable alignment digitized from the May 2022 Article VII Application filing for Case 22-T-094.	https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=22-T-0294&CaseSearch=Search
Sunrise Wind Potential Offshore Cable Route	2021	Energy, Utilities, & Disposal	Cable alignment digitized from the April 2021 Article VII Application filing for Case 20-T-0617.	https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?Mattercaseno=20-T-0617
South Fork Wind Potential Offshore Cable Route	2020	Energy, Utilities, & Disposal	Cable alignment digitized from the February 2020 updated Construction and Operations Plan.	https://www.boem.gov/renewable-energy/state-activities/south-fork

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Submerged and coastal archaeological areas	2019	Cultural & Demographic	Submerged and coastal archaeological areas. Upland (land-based) archaeological sites from the CT Office of State Archaeology. Inventory of sub-tidal archaeological sites from the CT Office of State Archaeology. Potential locations of land-based settlement ca. 9000 BP prior to those shoreline areas being submerged as Long Island Sound filled in.	http://cteco.uconn.edu/projects/blueplan/layersSHUA.htm#archaeological
Discrete areas for research, education and monitoring	2019	Biological	Discrete areas for research, education, and monitoring. Locations that generally represent significant and long-standing locations of water quality monitoring in Long Island Sound. Operating locations of buoys supporting the Long Island Sound Integrated Coastal Observation System, a subsystem of the Northeast Regional Association of Coastal and Ocean Observation Systems.	http://cteco.uconn.edu/projects/blueplan/layersSHUA.htm#discrete
Coastal public use areas	2019	Cultural & Demographic	Areas important for public access and use of Long Island Sound for recreational activities including but not limited to swimming, paddling, and wildlife watching. Includes: Individual Ocean Uses, Water Trails, Migratory Waterfowl Concentration Area, Public Access Beaches, Open Space and Public Lands.	http://cteco.uconn.edu/projects/blueplan/layersSHUA.htm#publicuse
Recreational fishing	2019	Recreation	Locations of recreational fishing activity were compiled iteratively over time by CT DEEP Marine Fisheries Division Staff and through Blue Plan participatory mapping efforts that engaged the LIS angling community.	http://cteco.uconn.edu/projects/blueplan/layersSHUA.htm#recfishing
Commercial fishing	2019	Commercial Fishing	Commercial fishing landing data from 2000-2010 as provided by the National Marine Fisheries Service.	http://cteco.uconn.edu/projects/blueplan/layersSHUA.htm#commercialfishing

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Recreational shellfish areas	2019	Recreation	Undesignated Beds under town or state jurisdiction which are not currently designated as “Natural Bed” or leased, licensed, or otherwise managed for commercial activity may be managed as “Recreational Beds” by the municipality, where water quality classification permits. These beds may or may not sustain natural shellfish populations.	http://cteco.uconn.edu/projects/blueplan/layersSHUA.htm#rec_shellfish
Commercial aquaculture locations	2019	Commercial Fishing	CT Natural Shellfish Beds, CT Aquaculture Operations, CT Seaweed Licenses, CT Aquaculture Gear Areas, CT State Shellfish Lease Beds, CT Town Shellfish Lease Beds, NY Aquaculture Sites.	http://cteco.uconn.edu/projects/blueplan/layersSHUA.htm#comm_shellfish
Hard Bottom and Complex Sea Floor	2019	Physical Environment	Areas of hard bottom are characterized by exposed bedrock or concentrations of boulder, cobble, pebble, gravel, or other similar hard substrate. Complex seafloor is a morphologically rugged seafloor characterized by high variability in neighboring bathymetry around a central point. Areas of hard bottom and complex seafloor are areas characterized singly or by any combination of hard seafloor, complex seafloor, artificial reefs, biogenic reefs, or wrecks and obstructions.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#seafloor
Submerged Aquatic Vegetation	2019	Biological	Areas where submerged aquatic vegetation, e.g., eelgrass (Zostera marina), etc., are present or have been found to be present. Submerged aquatic vegetation refers to rooted, vascular plants that occur in the shallow waters of Long Island Sound.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#sav

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Cold Water Corals	2019	Biological	Areas where cold-water corals have been observed or where habitat suitability or other scientific models predict they occur. Cold water corals are a visibly unique expression of a healthy, thriving marine ecosystem.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#corals
Coastal Wetlands	2019	Biological	Coastal wetlands generally include, but are not limited to banks, bogs, salt marshes, swamps, meadows, flats, or other lowlands subject to tidal action. Although coastal wetlands occur in environments landward of the Blue Plan policy area, they are included because of their importance as supporting habitats for the Long Island Sound ecosystem. Coastal wetlands serve as nursery grounds and nesting habitat for many species and provide ecosystem services such as wave attenuation and nutrient cycling. A more complete definition can be found in Connecticut General Statute (CGS) 22a-29 and 22a-29(2).	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#wetlands
Endangered, Threatened, Species of Concern	2019	Biological	The species listed by federal or state statutes as endangered, threatened, species of concern, or candidates for listing, and their associated habitats, (recognizing that detailed spatial data depicting the distribution and abundance are potentially unavailable), were mapped together in this single layer.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#concern

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Atlantic Sturgeon Critical Habitat	2019	Biological	The U.S. Endangered Species Act Critical Habitats—Atlantic sturgeon component of the Endangered, Threatened, Species of Concern ESA. Critical habitats for Atlantic sturgeon, one of six federally endangered species known to occur in Long Island Sound, is spatially defined under the U.S. Endangered Species Act and shown on this map.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#sturgeonhabitat
Atlantic & Shortnose Sturgeon	2019	Biological	Atlantic and shortnose sturgeon is component of the Endangered, Threatened, Species of Concern ESA. It includes Atlantic sturgeon gear restriction areas, high and medium use sturgeon areas, and Atlantic sturgeon migratory corridor.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#sturgeon
Cetaceans (Marine Mammals)	2019	Biological	Areas where cetaceans occur in higher concentrations and/or significant areas that support cetaceans (e.g., particular feeding areas, nursery grounds). Cetaceans include whales, dolphins, and porpoises.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#cetaceans
Pinnipeds (Seals)	2019	Biological	Areas where pinnipeds occur in higher concentrations and/or significant areas that support pinnipeds (e.g., particular haul-out locations, feeding areas). Pinniped species found on Long Island include Harbor, Grey, Harp, Hooded, and Ringed seals.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#seals

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Sea Turtles & Other Reptiles	2019	Biological	Areas where sea turtles and other reptiles occur in higher concentrations and/or significant areas that support sea turtles and other reptiles (e.g., particular feeding areas, nesting grounds, hibernation areas). Includes sea turtle species common in the Sound such as Loggerhead, Kemp's Ridley, and Green, as well as a different species of turtle, the Northern diamondback terrapin.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#reptiles
Key Bird Areas: Winter Roosting	2019	Biological	This shows the "key areas for roosting, foraging, wintering" expert mapping component of the Birds ESA. It depicts areas important to bird roosting, foraging, wintering identified through expert participatory mapping. Delineated by Patrick Comins, Exec Dir of CT Audubon Society in Jan 2019.	https://cteco.uconn.edu/ctmaps/rest/services/Coastal/BluePlan_ESA_Pillars/MapSer ver/23
Key Bird Areas: Nesting-Foraging	2019	Biological	This shows the "key areas for staging, nesting, and foraging" expert mapping component of the Birds ESA. It depicts areas important to bird staging, nesting, and foraging identified through expert participatory mapping. Delineated by Patrick Comins, Exec Dir of Ct Audubon Society in Jan 2019.	https://cteco.uconn.edu/ctmaps/rest/services/Coastal/BluePlan_ESA_Pillars/MapSer ver/24
Fish: Demersal High Weighted Persistence	2019	Biological	Depicts areas of high weighted fish persistence for species using seafloor habitats (i.e., demersal species) from data derived from the CT DEEP Marine Fisheries Long Island Sound Trawl Survey (LISTS). The data reflect the top quintiles for the Fall and Spring Seasons across two decades (1995-2004 & 2005-2014).	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#demersalpersistence
Mobile Invertebrates: Lobster Biomass Fall 2005-2014	2019	Biological	Areas of high biomass for American lobster from the LIS Trawl Survey. The data reflect the top quintiles for the Fall Seasons across 2005-2014.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#lobsterfall0514

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Mobile Invertebrates: Lobster Biomass Spring 2005-2014	2019	Biological	Areas of high biomass for American lobster from the LIS Trawl Survey. The data reflect the top quintiles for the Spring Seasons across 2005-2014.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#lobsterspring0514
Sessile-mollusk-dominated Communities	2019	Biological	Areas where wild, natural sessile-mollusk-dominated communities occur. Sessile-mollusk-dominated communities are assemblages of non-mobile gastropods (e.g., slipper shells) and bivalves (e.g., blue mussels, clams) that are not harvested by humans.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#mollusk
Managed Shellfish Beds	2019	Commercial Fishing	Locations of commercial and recreational shellfishing harvest areas, including shellfish restoration activities and areas closed to shellfishing. In Connecticut, shellfish are defined as oysters, clams, mussels, and scallops; either shucked or in the shell, fresh or frozen, whole or in part.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#shellfish
Areas with rare, sensitive or vulnerable species, communities or habitats Rollup	2019	Biological	The overlaps among the criteria that contribute to “Ecologically Significant Areas with rare, sensitive, or vulnerable species, communities, or habitats.” It is important to note that this represents the best available knowledge about the location of ESA, and if a map doesn’t depict ESA, it does not mean that one does not exist there. Therefore, composite maps for ESA should be viewed as the “minimum number of ESA”, so a value of 5 corresponds to at least 5 ESA present in a location.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#rollup1
Water trails	2014	Cultural & Demographic	A water trail is an officially designated water route, or blueway, that is maintained by an agency or association and typically used recreationally by paddlers in non-motorized boats such as kayaks or canoes.	http://opdgig.dos.ny.gov/#/map/0/0/-74.896,39.665,-70.277,42.095/topo/0

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Safety, Security and Regulated Zones	2014	Boundaries	The Regulated, Safety and Security Zones map layer identifies areas in which vessel access is either limited or restricted, or within which special regulations apply. The primary source material consisted of coordinates from the electronic Code of Federal Regulations (CFR),Title 33, Part 165, Subpart F, First Coast Guard District. Additional spatial information was provided by NOAA digital nautical charts in cases where the CFR provided sufficient boundary descriptions rather than specific coordinates.	http://opdgig.dos.ny.gov/#/map/0/0/-74.896,39.665,-70.277,42.095/topo/0
Proposed Ambronse Anchorage Area (USCG)	2021	Boundaries	Proposed new anchorage area by USCG.	https://www.federalregister.gov/documents/2021/04/01/2021-06521/anchorage-ground-approaches-to-new-york-ambrose-long-beach-ny?utm_campaign=subscription+mailing+list&utm_source=federalregister.gov&utm_medium=email
Proposed Long Island Fariways (USCG)	2021	Boundaries	Proposed new shipping tug Fairways by USCG.	https://www.federalregister.gov/documents/2020/06/19/2020-12910/shipping-safety-fairways-along-the-atlantic-coast
Recommended Vessel Route	2022	Boundaries	Recommended vessel routes for deep draft vessels (including tugs and barges) transiting Western Long Island Sound and the approaches to the East River. While not mandatory, deep draft commercial vessels (including tugs and barges) are requested to follow the designated routes at the master's discretion. Other vessels, while not excluded from these routes, should exercise caution in and around these areas.	https://www.charts.noaa.gov/PDFs/12364.pdf

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
CT NEER Offshore Boundary	2022	Boundaries	The Connecticut National Estuarine Research Reserve for Long Island Sound was designated on January 14, 2022, by NOAA. It extends roughly 3.1 nautical miles offshore at its greatest and spans from Westbrook to Mystic, Connecticut. The boundary was digitized from the CT NEER home page maps.	https://portal.ct.gov/DEEP/Coastal-Resources/NERR/NERR-Home-Page
Artificial Reef Locations	2019	Biological	Map and Coordinates of Artificial Reefs.	https://www.dec.ny.gov/outdoor/71702.html
Corals- Alcyonacea non-gorgonian predicted habitat	2014	Biological	Predicted likelihood of suitable habitat for deep-sea corals in the suborders Alcyoniina or Stolonifera (order Alcyonacea) in the U.S. Northeast Atlantic and Mid-Atlantic as coral habitat suitability likelihood classes derived from a categorical reclassification of the logistic output of a maximum entropy model derived from coral presence locations and environmental predictor variables at 370.65m resolution.	http://opdgig.dos.ny.gov/#/map/
USGS Observed Cold Water corals and sponges	2014	Biological	The USGS Cold-Water Coral Geographic Database provides a tool for researchers and managers interested in studying, protecting, and/or utilizing cold-water coral habitats in the Gulf of Mexico and western North Atlantic Ocean.	http://opdgig.dos.ny.gov/#/map/
Corals- Pennatulacea predicted habitat	2014	Biological	Predicted likelihood of suitable habitat for deep-sea corals in the order Pennatulacea in the U.S. Northeast Atlantic and Mid-Atlantic as coral habitat suitability likelihood classes derived from a categorical reclassification of the logistic output of a maximum entropy (MaxEnt) model derived from coral presence locations and environmental predictor variables at 370.65 m resolution.	http://opdgig.dos.ny.gov/#/map/

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Corals- Pennatulacea- suborder Subsessiliflorae predicted habitat	2014	Biological	Predicted likelihood of suitable habitat for deep-sea corals in the suborder Subsessiliflorae (order Pennatulacea) in the U.S. Northeast Atlantic and Mid-Atlantic as coral habitat suitability likelihood classes derived from a categorical reclassification of the logistic output of a maximum entropy model derived from coral presence locations and environmental predictor variables at 370.65 m resolution.	http://opdgig.dos.ny.gov/#/map/
Corals- Scleracrinia predicted habitat	2014	Biological	Predicted likelihood of suitable habitat for deep-sea corals in the order Scleractinia in the U.S. Northeast Atlantic and Mid-Atlantic as coral habitat suitability likelihood classes derived from a categorical reclassification of the logistic output of a maximum entropy model derived from coral presence locations and environmental predictor variables at 370.65 m resolution.	http://opdgig.dos.ny.gov/#/map/
Highly Migratory Fish EFH	2015	Biological	Aggregation of numerous Essential Fish Habitat spatial data products for Highly Migratory Species, fish such as tuna, sharks, and swordfish that live and migrate throughout the Atlantic Ocean and Gulf of Mexico.	http://opdgig.dos.ny.gov/#/map/
Longfin Squid Interpolated Biomass	2020	Biological	In 2019, The Nature Conservancy produced fish biomass and distribution products in partnership with OceanAdapt (a collaboration between the Pinksy Lab at Rutgers University and the National Marine Fisheries Service). These products are also bubble plots of raw observations and IDW surfaces at a 2km x 2km resolution for bottom trawl data from NEFSC during 2010-2017 (fall) and 2010-2016 (spring).	http://opdgig.dos.ny.gov/#/map/

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Scup Interpolated Biomass	2020	Biological	In 2019, The Nature Conservancy produced fish biomass and distribution products in partnership with OceanAdapt (a collaboration between the Pinksy Lab at Rutgers University and the National Marine Fisheries Service). These products are also bubble plots of raw observations and IDW surfaces at a 2 km x 2 km resolution for bottom trawl data from NEFSC during 2010-2017 (fall) and 2010-2016 (spring).	http://opdgig.dos.ny.gov/#/map/
Silver Hake Interpolated Biomass	2020	Biological	In 2019, The Nature Conservancy produced fish biomass and distribution products in partnership with OceanAdapt (a collaboration between the Pinksy Lab at Rutgers University and NMFS). These products are also bubble plots of raw observations and IDW surfaces at a 2 km x 2 km resolution for bottom trawl data from NEFSC during 2010-2017 (fall) and 2010-2016 (spring).	http://opdgig.dos.ny.gov/#/map/
Summer Flounder Predicted Relative Abundance	2014	Biological	The New York Department of State modeled the seasonal abundance groundfish species from the NOAA Northeast Fisheries Science Center's bottom trawl survey program as a function of environmental variables to support the State's offshore planning efforts.	http://opdgig.dos.ny.gov/#/map/

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Lobster Management Area	2020	Biological	This layer shows the management areas for the American Lobster fishery, which extends from Maine to Cape Hatteras, North Carolina. Lobster does not require VMS, and the management areas are included for lobster bycatch rules. This data set is from NMFS and represents areas and regulations mandated in the U.S. Code of Federal Regulations. This layer does not represent a legal definition of the Regulated Area.	https://portal.midatlanticocean.org/visualize/#x=-73.76&y=40.30&z=8&logo=true&controls=true&basemap=ocean&themes%5Bids%5D%5B%5D=4&tab=data&legends=false&layers=true
USGS Seismic Hazard	2002	Physical Environment	This map layer shows seismic hazard in the United States. The data represent a model showing the probability that ground motion will reach a certain level. This map layer shows peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 10% probability of exceedance in 50 years. Values are given in % g, where g is acceleration due to gravity.	https://www.sciencebase.gov/catalog/item/4f4e4ac9e4b07f02db67c975
Hudson River Estuary - New York Harbor Acoustic Reflectivity	2015	Physical Environment	Side-scan sonar images with 0.1 m resolution for parts of the shallows of the Upper Bay in New York Harbor.	NYS GIS Clearinghouse - http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1353
Hudson River Estuary Bathymetry 30m-grid	2008	Physical Environment	This composite data set consists of a grid showing elevation in meters off the floor of the Hudson River. The grid values were derived by merging gridded datasets originating from NOAA with a dataset originating from SUNY Stony Brook. The observations cover the Hudson River between the Verrazano Narrows and Troy	NYS GIS Clearinghouse - http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1136

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Hudson River Estuary Tidal Datums	2013	Physical Environment	These raster grids approximate the deviation of the Mean Higher High Water (MHHW) or Mean Lower Low Water Level (MLLW) tidal datum surface from the Mean Sea (River) Level (MSL) or North American Vertical Datum 1988 (NAVD88) for most of the tidal Hudson River.	NYS GIS Clearinghouse - http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1136
Hudson River Estuary Flow Model	2013	Physical Environment	Characterization of the physical environment (in this case, water levels, currents, vertical current stresses and mixing, and surface wind waves) impacting the Hudson River shoreline.	NYS GIS Clearinghouse - http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1137
Hudson River Estuary Morphology	2005	Physical Environment	Morphological units of the Hudson River Estuary from Verrazano Narrows Bridge to Troy. Areas of the Hudson River shallower then 4 meters have not been surveyed and sampled completely.	NYS GIS Clearinghouse - NYS Dept. of Environmental Conservation (DEC) - Hudson River Estuary Data and Maps
Hudson River Estuary Sediment Cores, Environment, Grabs, Profile, Imagery, Type, Sediments-Metals Sediments-PAH/ Sediments-Lead/ Sediments-Age	2005	Physical Environment	Data set that includes detailed interpretive maps of sediment distribution, grain size, bed forms, and benthic habitats	NYS GIS Clearinghouse - NYS Dept. of Environmental Conservation (DEC) - Hudson River Estuary Data and Maps
New York Harbor Bottom Type	2015	Physical Environment	e4 combined sub-bottom and side-scan datasets using manual and automatic data processes to characterize the type and extent of sediments throughout NY Harbor and the Lower Hudson River.	NYS GIS Clearinghouse - NYS Dept. of Environmental Conservation (DEC) - Hudson River Estuary Data and Maps
NJ- Bedrock-Surface Topography (1:100,000 series)	2007	Physical Environment	The bedrock-surface topography shows the elevation of the top of the bedrock or Coastal Plain formations in areas where the surficial materials are generally more than 25 feet thick.	https://gisdata-njdep.opendata.arcgis.com/datasets/bedrock-surface-topography-of-new-jersey?geometry=-74.572%2C40.569%2C-73.918%2C40.660

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
NJ- Bedrock Geology (1:100,000 series)	2007	Physical Environment	The Bedrock Geology of New Jersey consists of statewide and countywide data layers (contacts, faults, folds, dikes). The GIS data were scanned and digitized from United States Geological Survey Miscellaneous Investigations and Open-File Series 1:100,000 scale geologic maps compiled from 1984 to 1993.	https://gisdata-njdep.opendata.arcgis.com/datasets/bedrock-geology-of-new-jersey?geometry=-74.584%2C40.461%2C-74.257%2C40.507
USGS State Bedrock Geology Maps	2017	Physical Environment	Bedrock geology by state, including limited offshore areas.	https://mrdata.usgs.gov/geology/state/
Hudson River Estuary Documented Submerged Aquatic Vegetation	2020	Biological	The NYSDEC Hudson River Estuary Program in collaboration with numerous partners has supported the mapping of vegetated habitats of the Hudson River Estuary. This data set contains polygons showing the distribution of submerged aquatic vegetation (SAV) from Hastings-on-Hudson to Troy. Data are a combination of layers from the 1997, 2002, 2007, 2014, 2016, and 2018 SAV data sets, representing a culmination of all areas where SAV habitat has been documented.	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1209
Bedrock & Surficial Geology Shape Files	multiple	Physical Environment	Statewide maps of bedrock geology and surficial geology.	http://www.nysm.nysed.gov/research-collections/geology/gis

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Archaeological Site Grid of New Jersey	2020	Cultural & Demographic	Archaeological Sites are locations of prehistoric or historic occupation or activity possessing archaeological value. This dataset includes a vector grid of approximately 1/2 mile cells indicating the presence of Archaeological Districts or Sites that: 1. Are National Historic Landmarks, 2. Are included in the New Jersey or National Registers of Historic Places, 3. Have been determined Eligible for inclusion in the registers through federal or state processes administered by the HPO, 4. Have been designated as Local Landmarks or Districts by local government, or 5. Have been identified through early 20th century state-wide archaeological survey, modern cultural resource survey, or other documentation on file at the HPO.	https://njogis-newjersey.opendata.arcgis.com/datasets/0577a84f254b4494bc7d78f887e3aef7_56?geometry=-83.874%2C38.659%2C-65.582%2C41.598
Wreck Diving - NY, Atlantic Ocean	2014	Recreation	"Favored Wreck Dive Sites" as reported in NYSDOS 2013 Offshore Atlantic Ocean Study. NYSDOS gathered detailed information about the characteristics and locations of New York's offshore recreational uses. DOS staff worked with NOAA's Coastal Services Center to develop a participatory mapping process.	http://opdgig.dos.ny.gov/arcgis/rest/services/NYOPDIG/HumanUseData/MapServer http://opdgig.dos.ny.gov/#/search/browse
Recreational SCUBA Diving Areas	2015	Recreation	The Recreational SCUBA Diving Areas layer depicts activity areas mapped by participants in the Northeast Coastal and Marine Recreational Use Characterization Study, which was conducted by SeaPlan, the Surfrider Foundation, and Point 97 under the direction of the Northeast Regional Planning Body.	http://opdgig.dos.ny.gov/arcgis/rest/services/NYOPDIG/HumanUseData/MapServer http://opdgig.dos.ny.gov/#/search/browse

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Recreational Uses - Artificial Reef Diving (Artificial Reef Diving - NY, Atlantic Ocean)	2014	Recreation	NYSDOS employed participatory methods to gather detailed information about the characteristics and locations of New York State's offshore recreational uses. DOS staff worked with NOAA's Coastal Services Center to develop a participatory mapping process.	http://opdgig.dos.ny.gov/arcgis/rest/services/NYOPDIG/HumanUseData/MapServer http://opdgig.dos.ny.gov/#/search/browse
[Recreational] Fishing - Northeast Region, 2012	2014	Recreation	Locations where participants in the SeaPlan/NROC 2012 Northeast Recreational Boater Survey participated in fishing activities. Reflects random sampling of selected boat owners throughout the Northeast throughout the 2012 boating season (May 1 through October 31, 2012).	http://opdgig.dos.ny.gov/arcgis/rest/services/NYOPDIG/HumanUseData/MapServer http://opdgig.dos.ny.gov/#/search/browse
Long Island Sound Sedimentary Environments Energy	2014	Physical Environment	This file contains the results of assessing the sedimentary environments (erosion, deposition, dynamic) based on analyses performed on core samples and sub-bottom seismic data collected during Summer of 2013 and 2012 in the central Long Island Sound Pilot Area.	http://opdgig.dos.ny.gov/arcgis/rest/services/NYOPDIG/HumanUseData/MapServer http://opdgig.dos.ny.gov/#/search/browse
Shinnecock Nation Offshore Use Areas	2014	Cultural & Demographic	These data display offshore areas important to the Shinnecock Nation, located on Long Island, and are intended to support New York State's marine spatial planning efforts.	http://opdgig.dos.ny.gov/arcgis/rest/services/NYOPDIG/HumanUseData/MapServer http://opdgig.dos.ny.gov/#/search/browse
Trawl Gear Use Areas - NY Fishermen	2014	Commercial Fishing	Cornell Cooperative Extension Marine program (CCE), in collaboration with the New York Department of State (DOS), collected descriptive and spatial information from 36% for New York State's active, licensed commercial fishermen and for-hire boatmen in 2012 to identify important offshore fishing areas and inform the State's marine spatial planning efforts.	http://opdgig.dos.ny.gov/arcgis/rest/services/NYOPDIG/HumanUseData/MapServer http://opdgig.dos.ny.gov/#/search/browse

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Trawl Gear Use Areas - NY Fishermen	2014	Commercial Fishing	Cornell Cooperative Extension Marine program (CCE), in collaboration with the New York Department of State (DOS), collected descriptive and spatial information from 36% for New York State's active, licensed commercial fishermen and for-hire boatmen in 2012 to identify important offshore fishing areas and inform the State's marine spatial planning efforts.	http://opdgig.dos.ny.gov/arcgis/rest/services/NYOPDIG/HumanUseData/MapServer http://opdgig.dos.ny.gov/#/search/browse
Communities at Sea	2016	Commercial Fishing	Over two years in the making, the Portal's Communities at Sea maps (labeled in the Marine Planner mapping application as "Commercial Fishing – VTR") were created using methodology developed by Dr. Kevin St. Martin at Rutgers University. Vessel Trip Report (VTR) and permit information were integrated to create a new database that links fishing port communities to the places at sea where they spend the most time. Produced at much higher resolution than previous VTR maps, warm and cool colors are used to represent higher and lower number of days spent fishing. Portal users can click on any point on the map to activate a pop-up window that indicates which specific communities use the area. For example, clicking on an area off the New Jersey Shore may reveal that that gillnetters from Barnegat Bay or trawlers from Ocean City fish in the selected waters.	https://portal.midatlanticocean.org/visualize/#x=-74.00&y=39.00&z=7&logo=true&controls=true&dls%5B%5D=true&dls%5B%5D=0.8&dls%5B%5D=602&dls%5B%5D=false&dls%5B%5D=1&dls%5B%5D=606&basemap=ocean&themes%5Bids%5D%5B%5D=4&tab=data&legends=false&layers=true https://oceandata.rad.rutgers.edu/arcgis/rest/services/CAS_VTR_BTSmall/2011_2015/MapServer

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Prime Fishing Grounds NJ	2018	Commercial Fishing	This layer is meant to be viewed in conjunction with Artificial Reef Sites of New Jersey and Prime Fishing Grounds (Points) of New Jersey. The original “New Jersey’s Recreational and Commercial Ocean Fishing Grounds” charts were first created in 1982 with a second printing in 1984. In 2003, the Division of Fish and Wildlife's Bureau of Marine Fisheries, with funding from the Coastal Management Program, updated the map in digital format for inclusion in the Department's Geographic Information System. The updating of the map was accomplished through direct interviews with recreational fishing boat captains.	https://gisdata-njdep.opendata.arcgis.com/datasets/prime-fishing-grounds-of-new-jersey?geometry=-75.254%2C40.285%2C-72.902%2C40.651
Bottom Currents FVCOM	2016	Physical Environment	This is a climatological product based on the unstructured Finite Volume Coastal Ocean Model (FVCOM), developed by the Marine Ecosystem Dynamics Modeling Laboratory at the University of Massachusetts-Dartmouth and the Woods Hole Oceanographic Institute. A climatology is a long-term average of a given environmental variable over a certain time range. This layer shows the annual average bottom currents (m/s) vectors showing magnitude and direction from 1978 to 2013, which comprises 36 years for which FVCOM hindcast data are available.	https://oceandata.rad.rutgers.edu/arcgis/rest/services/CAS_VTR_BTSmall/2011_2015/MapServer

Table A-1 continued

Resource/Area	Year	Category	Description	Web link/ Source
Staten Island Siphon Project	2021	Energy, Utilities, & Disposal	Digitized new siphon tunnel from Staten Island to Brooklyn near The Narrows.	https://www.water-technology.net/projects/staten-island-siphon-project-new-york/
ENC Pipeline_Submarine_on_land_line (outfalls on Long Island represented in this layer)	2021	Energy, Utilities, & Disposal	Sewer outfalls on Long Island represented here by pipelines on Navigation chart in the Approach scale, layer called: Pipeline_Submarine_on_land_line	https://encdirect.noaa.gov/

Table A-2. Onshore GIS Data Layer List

Resource/Area	Year	Category	Description	Web link/ Source
Digital Elevation Model	2014	Natural and Environmental Resources	Digital elevation model showing slopes greater than 15%.	Not applicable – data derived from: https://www.ngdc.noaa.gov/mgg/inundation/sandy/sandy_geoc.html
National Hydrography Dataset Flowlines and Waterbodies	2018	Natural and Environmental Resources	USGS National Hydrography Dataset Flowline, linear features and waterbodies, polygon area feature. The National Hydrography Dataset is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system.	https://www.usgs.gov/core-science-systems/ngp/national-hydrography
National Wetland Inventory Wetlands	1979	Natural and Environmental Resources	This data set represents the extent, approximate location and type of wetlands and Deepwater habitats in the United States and its Territories. These data delineate the areal extent of wetlands and surface waters as defined by Cowardian et al. (1979).	https://www.fws.gov/wetlands/

Table A-2 continued

Resource/Area	Year	Category	Description	Web link/ Source
NYSDEC Freshwater Wetlands	1999	Natural and Environmental Resources	Regulatory Freshwater Wetland areas. These data are a set of ARC/INFO coverages composed of polygonal and linear features. Coverages are based on official New York State Freshwater Wetlands Maps as described in Article 24-0301 of the Environmental Conservation Law.	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1274
Tidal Wetlands	1974	Natural and Environmental Resources	New York State tidal wetlands south of the Tappan Zee Bridge, as of 1974, for tidal wetlands trend analysis.	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1139
Essential Fish Habitat	2020 (external source)	Natural and Environmental Resources	The spatial representations of fish species, their life stages and important habitats including Habitat Areas of Particular Concern.	https://www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper
Statewide Seagrass	2018	Natural and Environmental Resources	Polygons representing coverage of New York State Seagrass areas (data exported in October 2018 from an ArcGIS REST Service)	https://services6.arcgis.com/DZHaqZm9cxOD4CWM/ArcGIS/rest/services/NYStatewideSeagrass/FeatureServer
Submerged Aquatic Vegetation	2019	Natural and Environmental Resources	Areas where submerged aquatic vegetation, e.g., eelgrass (Zostera marina), etc., are present or have been found to be present. Submerged aquatic vegetation refers to rooted, vascular plants that occur in the shallow waters of Long Island Sound.	http://cteco.uconn.edu/projects/blueplan/layersESA.htm#sav
Significant Coastal Fish and Wildlife Habitats	2013	Natural and Environmental Resources	Statutory boundaries of Significant Coastal Fish and Wildlife Habitats as identified and recommended by Environmental Conservation and designated by Department of State.	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=318
NY Local Waterfront Revitalization Communities	2018/ 2016	Natural and Environmental Resources	This data set delineates the boundaries of communities with an approved Local Waterfront Revitalization Program (LWRP) under the NYS Coastal Management Program. Including the specific boundaries for the NYC LWRP.	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1284 https://www1.nyc.gov/site/planning/data-maps/open-data.page#zoning_related\

Table A-2 continued

Resource/Area	Year	Category	Description	Web link/ Source
Natural Heritage Communities	2019	Natural and Environmental Resources	Features represent element occurrences of significant natural communities (ecological communities), as recorded in the New York Natural Heritage Program's Biodiversity Database (Biotics).	http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1241
Important Bird Areas	2017 (external source)	Natural and Environmental Resources	The Important Bird Area Program in the US is administered by the Audubon Society in partnership with Birdlife International. This data set contains available boundaries and associated attributes for Important Bird Areas (IBAs) in the United States, identified as of September 2017.	https://www.northeastoceandata.org/
USGWS Critical Habitats	2021	Natural and Environmental Resources	Active proposed and final critical habitat for USFWS only and USFWS/NMFS threatened and endangered species.	https://ecos.fws.gov/ecp/report/table/critical-habitat.html
DOD Land		Socioeconomic and Community Resources		pending
Tax Parcels	2021	Socioeconomic and Community Resources	County tax parcel data.	https://reportallusa.com/purchase-shapefiles/New%20York
New York Protected Areas Database	2017	Socioeconomic and Community Resources	The New York Protected Areas Database is intended to be the most comprehensive geospatial dataset of protected lands in New York State. Protected lands are defined as those lands which are protected, designated, or functioning as conservation lands, open space, natural areas, or recreational areas through fee ownership, easement, management agreement, current land use, or other mechanism.	http://www.nypad.org/

Table A-2 continued

Resource/Area	Year	Category	Description	Web link/ Source
NYS State Park and Historic Sites	2018	Socioeconomic and Community Resources	State Park and Historic Site Boundaries - Data include boundaries of state park and historic site facilities. Facility types include state parks, marine parks, boat launch sites, historic sites, historic parks, and park preserves.	http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=430
DEC Lands	2019	Socioeconomic and Community Resources	Lands under the care, custody, and control of DEC, including Wildlife Management areas, Unique Areas, State Forests, and Forest Preserve.	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1114
Federal Lands	2014	Socioeconomic and Community Resources	U.S. National Atlas Federal Land Areas represents the federally owned or administered land areas (for example, National Wildlife Refuges, National Monuments, and National Conservation Areas) of the United States.	http://nationalmap.gov/small_scale/atlasftp.html
Indian Territories	2020	Socioeconomic and Community Resources	A vector polygon GIS file of all Indian Territory boundaries in New York State.	http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=927
New York State Civil Boundaries	2021	Socioeconomic and Community Resources	Data sets of boundaries for incorporated places (State, counties, cities, towns, and villages) and Indian territories in New York State. Data includes shoreline versions of the State boundary and county boundaries.	http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=927
Coastal Erosion Hazard Areas		Natural and Environmental Resources		pending
Disadvantaged Communities	2021	Socioeconomic and Community Resources	This data set identifies areas throughout the State that meet the draft disadvantaged community definition as voted on by the Climate Justice Working Group.	https://data.ny.gov/Energy-Environment/Draft-Disadvantaged-Communities-DAC-2021/xj7e-q8ja

Table A-2 continued

Resource/Area	Year	Category	Description	Web link/ Source
Potential Environmental Justice Areas	2021	Socioeconomic and Community Resources	Data set of locations of Potential Environmental Justice Areas (PEJA) and is defined in the PEJA field. PEJA's have been identified based on data from the 2014-2018 5-year American Community Survey (ACS), conducted by the U.S. Census Bureau.	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1273
New York State Heritage Areas	2012	Socioeconomic and Community Resources	New York State Heritage Areas Data include boundaries of twenty Heritage Areas designated in Parks, Recreation and Historic Preservation law.	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1188
NYS National Register Sites	2018	Socioeconomic and Community Resources	Data include buildings, structures, objects, historic districts listed in the National Register. Archeological sites and properties determined eligible for listing are not included.	http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=429
New York Recreational Uses - Recreational Fishing	2014	Socioeconomic and Community Resources	DOS staff worked with NOAA's Coastal Services Center (CSC) to design and develop a participatory mapping process. Leaders from 30 partner organizations and other knowledgeable individuals were invited to participate in one of five offshore use workshops conducted during the summer of 2011. At the workshops, DOS and CSC trained organizational contacts and knowledgeable individuals to work with their colleagues, constituents, and memberships to collect ocean use information.	http://portal.midatlanticocean.org/

Table A-2 continued

Resource/Area	Year	Category	Description	Web link/ Source
New York Recreational Uses – Surfing	2014	Socioeconomic and Community Resources	DOS staff worked with NOAA's Coastal Services Center (CSC) to design and develop a participatory mapping process. DOS staff worked with NOAA's Coastal Services Center (CSC) to design and develop a participatory mapping process. Leaders from 30 partner organizations and other knowledgeable individuals were invited to participate in one of five offshore use workshops conducted during the summer of 2011. At the workshops, DOS and CSC trained organizational contacts and knowledgeable individuals to work with their colleagues, constituents, and memberships to collect ocean use information by mapped use area.	https://portal.midatlanticocean.org/data-catalog/recreation/
New York Recreational Uses – Wildlife Viewing	204	Socioeconomic and Community Resources	DOS staff worked with NOAA's Coastal Services Center (CSC) to design and develop a participatory mapping process. DOS staff worked with NOAA's Coastal Services Center (CSC) to design and develop a participatory mapping process. Leaders from 30 partner organizations and other knowledgeable individuals were invited to participate in one of five offshore use workshops conducted during the summer of 2011. At the workshops, DOS and CSC trained organizational contacts and knowledgeable individuals to work with their colleagues, constituents, and memberships to collect ocean use information by mapped use area.	https://portal.midatlanticocean.org/data-catalog/recreation/
Electric Transmission Lines (PLATTS)	2011	Existing Infrastructure	Platts Transmission lines representing the linear locations of transmission/utility lines carrying electricity.	https://www.spglobal.com/platts/en/products-services/electric-power/gis-data

Table A-2 continued

Resource/Area	Year	Category	Description	Web link/ Source
Electric Transmission Lines – Homeland Infrastructure Foundation Level Data	2020	Existing Infrastructure	This feature class/shapefile represents electric power transmission lines. Transmission Lines are the system of structures, wires, insulators, and associated hardware that carry electric energy from one point to another in an electric power system. Lines are operated at relatively high voltages varying from 69 kV up to 765 kV, and are capable of transmitting large quantities of electricity over long distances. Underground transmission lines are included where sources were available.	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-power-transmission-lines
ENC Pipeline_Submarine_on_land_line	2021	Existing Infrastructure	Sewer outfalls on Long Island represented here by pipelines on Navigation chart in the Approach scale, layer called: Pipeline_Submarine_on_land_line.	https://encdirect.noaa.gov/
New York City Sewer Atlas	2019	Existing Infrastructure	New York City Sewer Atlas Data contains date for the NYC sewer system.	http://openseweratlas.tumblr.com/data
NYC Aqueducts/Water Tunnels	2020	Existing Infrastructure	NYC water Tunnels/ Aqueduct lines from the NYC H2O Hub website.	Extracted from (not readily available): https://services9.arcgis.com/jzHsRPm3d1aMJuBp/ArcGIS/rest/services/NYC_H2O_WaterSystemMap3/FeatureServer/2 https://storymaps.arcgis.com/collections/8a62c7993b4f4f40b49b3ac09671ce3c?item=1
Pipelines	2006	Existing Infrastructure	National Pipeline Mapping System GIS data representing the linear locations of gas/utility pipelines. Data acquired in 2006 (newer data is available). Also added a pipeline route for Lower NY Bay Lateral pipeline in Raritan Bay.	https://www.npms.phmsa.dot.gov/

Table A-2 continued

Resource/Area	Year	Category	Description	Web link/ Source
New York State Roadway Inventory System	2021	Existing Infrastructure	A roadway layer generated from NYSDOTs Roadway Inventory System showing roadway characteristics and administrative attributes. The layer covers all public owned roads. The State highway system currently includes more comprehensive attribution. The roadway data reflects conditions one year previous to the publication date.	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1302
Railways	2019	Existing Infrastructure	This Federal Railroad Administration map layer displays North America's railway system. The rail network is a comprehensive layer of North America's railway system. The data set covers Canada, Mexico, and all 50 states including the District of Columbia in the U.S.	https://hub.arcgis.com/datasets/fedmaps::north-american-rail-lines
USACE Coastal Storm Risk Management Project	2018	Existing Infrastructure	USACE Coastal Systems Portfolio Initiative Project Reliability and Phase data. Coastal Risk reduction projects.	https://geospatial-usace.opendata.arcgis.com/datasets/fec7341a4b2b4e43bc1f6258057fd115
NOAA Continually Updated Shoreline Product – Hardened Shoreline	2022	Existing Infrastructure	Includes all national shoreline that has been verified by contemporary imagery and shoreline from other non-NOAA sources. This shoreline vector only includes shoreline and alongshore features that represent shoreline (groin, breakwater, and jetty).	https://shoreline.noaa.gov/data/datasheets/cusp.html
DEC Remediation Sites	2010	Existing Infrastructure	Subset of sites which are included in one of the Remedial Programs overseen by the Division of Environmental Remediation.	https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1097
USEPA Facility Registry Service (Superfund Sites/Brownfields)	2022	Existing Infrastructure	Locations of the USEPA's list of National Priority List superfund sites and brownfields within New York State.	https://www.epa.gov/frs/geospatial-data-download-service

Appendix B. Summary of Draft Assessment Comments

B.1 Overview of Comments

NYSERDA received comments from 22 entities in response to the Request for Information (RFI 5166) released on August 30, 2022. The RFI posed four questions to help solicit feedback on the draft assessment:

1. Does the draft of Offshore Wind Cable Corridor Constraints Assessment accurately capture and describe the constraints and opportunities in a manner that is efficient and complete?
2. Do the minimization and mitigation measures address the range of conditions and issues? Are there standard measures that may be applicable to all projects? Are there additional innovative concepts/developmental technologies that should be considered?
3. Consider the design and layout of the draft assessment, particularly the figures and key findings and recommendations. Are these user-friendly tools for information transfer? What additional presentation formats might be helpful?
4. Are there specific stakeholders that may benefit from an opportunity to discuss the results and findings of the draft?

As Table B-1 shows, commenters represented a diverse cross-section of stakeholders including local, state, and federal government; non-governmental organizations; offshore wind developers; industry groups; electric transmission providers; consulting engineers; and others. Many of the comments submitted directly responded to RFI questions, and many commenters provided input on specific components of the Assessment. Table B-2 summarizes overall comment themes.

Table B-1. Commenters Submitting Written Comments on the Draft Assessment Report

• American Clean Power Association	• NextGen Highways
• ANBARIC	• NY & NJ Port Authority
• Attentive Energy	• Ørsted
• Bluepoint Wind	• Responsible Offshore Science Alliance
• Buro Happold	• Rise Light & Power LLC
• City of New York (via Couch White)	• Riverkeeper
• ConEdison Transmission	• TigerGenCo
• Connecticut DEEP	• Town of East Hampton
• ECOncrete	• United States DOI Bureau of Energy Management
• Gavin & Doherty Geosolutions Inc.	• Wildlife Conservation Society
• New York Offshore Wind Alliance	• XODUS

Table B-2. Overview of Comment Themes on the Draft Assessment Report

• Support for the concept, the need for the analysis, and the completeness of the description of constraints and opportunities. • Use of the assessment as a general tool not a site-specific/project-specific review. • Concern that local and federal regulations were not considered. • Additional outreach and coordination opportunities to other federal, State, and local agencies. • Clarifications on technical information (e.g., cable burial, cable separation distances, landfall considerations).	• Clarifications and suggested revisions of constraints analysis methodology and criteria. • Use of the minimization and mitigation measures for all projects. • Next steps as a result of the assessment. • Need for and benefits of holistic transmission planning.

B.2 Comment Categories

Comments were reviewed to create 249 distinct comments and organized by categories based on similar comment themes related to the RFI questions and sections of the draft assessment (Table B-3). Two of the resultant comment categories with the highest number of comments (constraints analysis and minimization and mitigation) related directly to the first two RFI questions and Section 2: Constraints Analysis and Section 3: Assessment of Constraints of the Draft Assessment. However, the number of the comments more often reflected the level of detail of the analysis, particularly Section 2: Constraints Analysis. Similarly, the number of comments on minimization and mitigation measures reflects the level of detail in the tables. The categories of constraints analysis, minimization and mitigation, next steps, and technical information comprise the greatest number of comments. Categories where there are fewer comments, such as next steps and key findings and recommendations, address concepts for planning for multiple transmission cables, such as holistic transmission, planning, stakeholder engagement, and innovation.

Table B-3. Comment Categories and Number of Comments

Comment Category	Examples	Number of Comments
Constraints Analysis	Question 1, ranking, database, data sources.	50
Minimization and Mitigation	Question 2, minimization and mitigation measures, content, application of measures.	50
Next Steps	Question 2, minimization and mitigation measures, additional measures, future policy, holistic transmission planning.	38
Technical Information	Question 1, design, construction, operation info, primarily in Section 1.6.	29
Impact Analysis	Question 1 accurate and complete description of constraints and opportunities, concerns or conclusions regarding the information presented.	22

Table B-3 continued

Comment Category	Examples	Number of Comments
Key Findings and Recommendations	Question 1, primarily section 4	15
Stakeholder Engagement	Question 4, specific stakeholders to discuss findings with, additional meetings	15
Scope	Question 1, what should/should not be in the report	11
General	Question 3, layout and figures, overarching, goals, support, thanks, formatting	10
Regulatory Overview	Additional regulations of relevance	9

B.3 Summary of Comments and Responses

For each of the 10 comment categories, the following sections generally follow the outline of the draft assessment and describe the comments received in each category and how they were addressed. The approach to revisions to the draft assessment includes correction of typographical, errors, omissions, or clarifications necessary to ensure the intent and understanding of the document.

B.3.1 Scope

The majority of comments on the scope of the assessment requested that NYSERDA further clarify the intent of the assessment, namely, that it is an informational tool but does not substitute for a project-specific and site-specific analysis. Other commenters expressed concerns regarding the exclusion of the Town of East Hampton within the Overland and Landfall Area and lack of consideration of cumulative impacts in that area. Additionally, a commenter suggested the inclusion of nature-based solutions as a minimization and mitigation consideration.

Sections 1.1 and 1.3 of the assessment discuss that the assessment does not substitute for a project-specific and site-specific analysis. Section 1.2 defines the study area for which the assessment addresses constraints, opportunities, and impacts of potential corridors. The onshore study area was driven by the POIs identified per the Power Grid Study as having promising performance for connection of OSW to the New York State transmission power grid. Nature-based solutions are already included in the minimization and mitigation measures.

B.3.2 Regulatory Overview

Of the nine comments in this category, a few addressed federal permitting processes and requirements in federal waters, and a few comments addressed NYSDOT permitting requirements and Federal Highway Authority (FHWA) involvement in that permitting. These commenters indicated that these processes also affect cable siting and development. Some commenters expressed concern that the assessment would be used to identify options or alternatives in the development of a specific OSW project that would conflict with the federal review processes triggered under the Outer Continental Shelf Lands Act related to the Construction and Operations Plan (COP). The COP is reviewed and approved by BOEM, and that review includes conducting an environmental review pursuant to the National Environmental Policy Act (NEPA), and the various federal statutes that are part of the NEPA review (e.g., the Marine Mammal Protection Act and the National Historic Preservation Act) that may reach different conclusions.

In response to these public comments, revisions were made in Section 1.3: Regulatory Overview, to briefly describe BOEM and refer to both the New Jersey Department of Environmental Protection and the Connecticut Department of Energy and Environmental Protection consistency review process. The Assessment focuses on state waters and state jurisdiction but recognizes the importance and significance of the many other agencies with jurisdictions relevant to the siting, design, operating, maintenance, and decommissioning of cables. The revised text also identifies the BOEM Programmatic EIS (PEIS) for Future Wind Energy Development in the New York Bight that will include components in State waters. With respect to comments regarding NYSDOT permitting and FHWA involvement in that process, section 1.3.5 and Table 3 discuss the State and federal regulations that govern the accommodation of utility facilities within State highway ROW, including FHWA’s involvement. Minor text additions were made to Table 3.

B.3.3 Stakeholder Engagement

The majority of comments regarding stakeholder engagement addressed coordination regarding shared marine resources in Long Island Sound and with agencies that have extensive experience and oversight roles on the waterways in and adjacent to New York City and community leaders and residents from communities adjacent to the path of landing for proposed cable routes. Several stakeholders requested an opportunity to continue to discuss the assessment process with the Cable Working Group (CWG).

The CWG or its members will continue to address the issues identified through many existing platforms and one-on-one meetings, such as meetings with developers and groups such as the Environmental Technical Working Group (E-TWG), Fisheries TWG (F-TWG), and Maritime TWG (M-TWG.).

B.3.4 Technical Information

The majority of comments on the technical information provided in section 1.6 identified the varying conditions affecting cable burial depth, the advances in cable capacity and technology, the data on cost of cables, preferences for the use of horizontal directional drilling (HDD) installation techniques, and the need to analyze locations for converter stations.

The assessment includes multiple references to site-specific conditions determining burial depth and the need for a Cable Burial Risk Assessment. Section 1.6.7 acknowledges many types of factors affecting costs including challenging site-specific conditions, vessel transit times, and mobilization costs, and that environmental mitigation costs are difficult to quantity. Sections 1.6.4 and 3.4 acknowledge the importance of converter stations; however, the assessment does not substitute for a site-specific analysis. Text revisions were limited to several clarifications and/or corrections. For example, revisions to section 1.6.4 clarify that HDD or other trenchless technology is preferred, but in limited situations, direct trenching landfall may be appropriate.

B.3.5 Constraints Analysis

The comments on Section 2: Constraints Analysis, addressed a range of topics, including aquatic biological resources and sensitive habitats, data, geology and hydrology, linear utilities, navigation and vessel traffic, waterbody dimensions, and ranking, among others. As noted above, the most common topics pertained to navigation and vessel traffic, linear utilities, data, and geology. Comments regarding navigation and vessel traffic included the use of AIS vessel traffic data and methodology and criteria for ranking. Comments focused on linear utilities included suggestions regarding changes in rankings due to presence of various pipeline and cable crossings. Comments regarding data include confirmation that various data were included in the constraints analysis and suggested other data sources, and lastly, comments on geology mainly pertained to constraints criteria and rankings.

The majority of public comments in this category did not result in updates or revisions to the assessment. However, in several places, the text in the assessment was clarified to acknowledge the limitations of existing data or to revise reference citations, for example.

B.3.6 Minimization and Mitigation

Many of the comments in this category expressed concerns regarding how the minimization and mitigation measures would be used for specific projects, and that mitigation measures only address population-level impacts. Other comments suggested clarifications to minimization and mitigation measures throughout Table 21 through Table 28.

As noted in Section 1.1: Introduction, and 1.3: Regulatory Overview, the assessment does not substitute for a project-specific and site-specific analysis. In response to public comments, the introduction to Section 3: Assessment of Constraints, was augmented to provide additional emphasis to the hierarchy of avoidance of impacts, followed by minimization and mitigation and further explanation of the purpose of the minimization and mitigation measures as examples representative of the study area and impacts identified in section 3, and therefore, informative for future projects. New York State and the CWG will continue to evaluate measures appropriate to OSW cables through stakeholder engagement and review of project-specific applications. The revised language underscores that project-specific measures will be proposed by project applicants and evaluated by relevant regulatory agencies during project review. Various minor edits and text additions were made to respond to comments regarding clarifications of minimization and mitigation measures, as appropriate.

B.3.7 Impact Analysis

Most comments on the impacts analysis in section 3 identified species or site-specific impacts considered important to the commenter, the importance of avoiding impacts to individual species, cumulative impacts, and recommendations to improve the use of the figures in each section.

As noted in the assessment, the purpose of the analysis was to consider the resources most likely to constrain cable siting, design, installation, operation, maintenance, and decommissioning. Many other important resources and topics will be considered in a project- and site-specific analysis. The assessment looks at the impact of multiple cables. For example, potential impacts to marine mammals and their prey are reflected in multiple constraints, including biological resources and habitats, sediment contamination, recreational and commercial fishing, and vessel traffic. Similarly, as noted in section 3, the descriptions of impacts focus on the locations where resources ranked high or, for consideration of cumulative potential constraints, where multiple resources ranked medium. In several cases, clarifications or minor text additions were made (e.g., section 3.4.8 was augmented to discuss potential impacts to NYC roadways resulting from cable installation and revisions were made to the introduction of section 3 regarding the purpose of the minimization and mitigation measures included in the assessment).

Lastly, in response to the comments on the figures, the revised assessment includes a summary of how the figures were developed and additional notes were added on each figure regarding the constraints that appear in the legend.

B.3.8 Key Findings and Recommendations

Most comments in this category expressed concern about the use of 1 GW as the capacity of future cables in Table 41 and the resulting allocations for Long Island Sound, and the need for and recognition of innovation to facilitate cable siting. Commenters were concerned the assumed capacity of “approximately 1 GW” was unreasonable or misleading in a market where technology continues to evolve rapidly. Another comment recommended acknowledging the Department of Energy OSW energy technology database as a source for current and reasonably foreseeable technologies to support the development of appropriate minimization and mitigation measures.

In response to these comments, revisions to section 4 provide additional text to explain further that the 1 GW estimate does not represent the actual power routed through a cable from a given wind farm. Section 1.6.1 acknowledges these cable sizes and that the first contracts for extruded HVDC cable systems at 525 kV awarded for the SuedOstLink project in Germany, rated at 2 GW, and several suppliers are in the latter stages of pre-qualifying extruded submarine DC cable systems at 525 kV, which will have a similar or greater rating. Revisions to section 3 identify the Department of Energy OSW energy technology database.

B.3.9 Next Steps

Most comments in the category of next steps expressed recommendations for holistic transmission planning, data sharing, and further stakeholder engagement. Several commenters identified benefits of holistic transmission planning; current initiatives relevant to transmission planning; and potential for an additional study, for example, congestion studies. In response to these public comments, the end of Section 4 was augmented to include a discussion that New York State is committed to developing and advancing strategies to meet the Climate Leadership and Community Protection Act directive of 9 GW of offshore wind by 2035 and projections of the Climate Action Council beyond 9 GW. The Assessment is a component of that commitment and that of the State agencies that comprise the CWG. New York State acknowledges the benefits of coordinated transmission planning and will continue to evaluate options to meet the State's goals. No further changes were made in the assessment in response to these comments. New York State acknowledges the benefits of coordinated transmission siting to achieve these directives and will continue to evaluate options to meet the State's directives. Responses also acknowledge that the CWG and or members of the CWG will continue to address the issues identified through many existing platforms and one-on-one meetings, such as meetings with developers and groups such as E-TWG, F-TWG, and M-TWG.

NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean-energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975.

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New York State Energy Research and Development Authority

17 Columbia Circle
Albany, NY 12203-6399

toll free: 866-NYSERDA
local: 518-862-1090
fax: 518-862-1091

info@nyserda.ny.gov
nyserda.ny.gov