Offshore Wind Cable Corridor Constraints Assessment Framework

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Acronyms and Abbreviations

AIS	automated identification system
AWOIS	Automated Wreck and Obstruction Information System
BIA	Biologically Important Area
CWG	Cable Working Group
CEHA	Coastal Erosion Hazard Areas
Climate Act	Climate Leadership and Community Protection Act
CRIS	Cultural Resource Information System
CSRM	Coastal Storm Risk Management
CZM	Coastal Zone Management
DEC	New York State Department of Environmental Conservation
DOS	New York Department of State
DOT	New York Department of Transportation
DPS	New York Department of Public Service
EFH	Essential Fish Habitat
EMF	electric and magnetic fields
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
FLAG	Fiber-optic Link Around the Globe
GIS	geographic information systems
GW	gigawatt
HDD	horizontal directional drilling
IBA	important bird area
IPaC	Information for Planning and Consulting
LWRP	Local Waterfront Revitalization Program
NARW	North Atlantic right whale
NEFMC	New England Fishery Management Council
nm	nautical mile
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NYCWRP	New York City Waterfront Revitalization Program
NYSERDA	New York State Energy Research and Development Authority
OGS	New York Office of General Services
OPRHP	New York State Office of Parks, Recreation and Historic Preservation
OSW	offshore wind
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
POI	points of interconnection
Power Grid Study	New York Power Grid Study

ROW	right-of-way
SAV	submerged aquatic vegetation
SCFWH	Significant Coastal Fish and Wildlife Habitat
SMA	seasonal management area
SNWA	Special Natural Waterfront Area
T&D	transmission and distribution
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UXO	unexploded ordnance

Glossary

Approach Area	The three offshore marine approaches (South Shore, Long Island, and New York Harbor) and overall land-based approaches to points of interconnection
Corridor	Area of consideration for cable siting
Study Area	All onshore and offshore areas in New York State where cables may connect offshore wind projects with points of interconnection
Subzone	Portion of a zone with unique constraints requiring further evaluation and discussion
Zone	Location within a potential corridor with constraints of similar type and significance

Executive Summary

The New York State Energy Research and Development Authority (NYSERDA) is developing an offshore wind (OSW) cable corridor constraints assessment (Assessment) to better understand the constraints of 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 inform what actions New York State may consider to ensure maximum benefits of renewable OSW energy while minimizing conflicts and impacts on activities and infrastructure. The Assessment seeks to advance 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 will also coordinate 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 allow for commercial innovation. Finally, the Assessment will include ongoing and earnest collaboration with New York State agencies, including the Department of Environmental Conservation (DEC), Department of State (DOS), Department of Transportation (DOT), Office of General Services (OGS), Department of Public Service (DPS), and interested stakeholders. NYSERDA seeks to gather information on a number of resources with the most relevance in determining the feasibility of a corridor.

Section 1 of the Assessment report will provide an overview of the purpose of the Assessment, the interconnection to the electrical grid, OSW energy leases, undersea and overland cable installation and operations technologies and implications, previous studies, the process for agency and stakeholder engagement, and the study area. The study area includes four approach areas for bringing OSW to New York City and Long Island: (1) the South Shore Approach Area, defined as the south shore of Long Island seaward to the 3-nautical-mile (nm) limit of State waters; (2) the Long Island Sound Approach Area to Long Island and New York City through the Long Island Sound; (3) the New York Harbor Approach Area, defined as the Upper New York Bay into New York City with extensions into the East and Hudson Rivers; and (4) the Landfall and Overland Area, defined as Long Island and New York City for the purpose of connecting to the electrical grid at existing substations, or POIs. The study area consists of the waterbodies and underlying submerged lands through which transmission cables may be installed, the potential landfall points, overland routes, and the onshore components of a cable to the substation POIs to the electrical grid.

Section 2 of the Assessment report will quantitatively and qualitatively analyze attributes or characteristics of the potential cable corridors that may be constraints to successful siting, permitting, installation, and maintenance of a cable. The process and results will characterize the environmental,

technical, and stakeholder constraints, as well as opportunities, concerns, impacts, and risks of potential undersea and overland cable corridors and associated connections to potential onshore POIs. The analysis will apply the qualitative and quantitative criteria, available geographic information systems data layers, and subject matter expertise to analyze potential corridors. The potential corridors will be divided into zones with similar characteristics and subzones with unique characteristics, with the level of constraint assigned a numerical ranking for high, medium, and low levels. The evaluation of constraints for undersea and overland cable corridors is presented separately, reflecting their unique and spatially different characteristics. This screening will provide insights on locations with the greatest constraints, identify the types of resources most affected, and ensure appropriate stakeholders are engaged to discuss avoidance, minimization, and mitigation measures that can facilitate siting. This screening will also identify areas that are relatively unconstrained and do not require more detailed analysis to meet the goals of the Assessment.

This assessment framework describes, at a high level, the existing conditions for the resources being evaluated and the types of impacts that may occur from survey, construction, operation, maintenance, and decommissioning of a transmission cable. Section 3 of the Assessment report will continue the assessment of constraints for zones and subzones, the locations of greatest constraint identified in Section 2, including existing conditions, stakeholder input, and avoidance, minimization, and mitigation measures for potential impacts for locations where significant constraints were identified. The Assessment report will summarize stakeholder input on constraints and discussion of avoidance, minimization (on-site), and mitigation (off-site) opportunities, reflecting the unique or protected characteristics of the areas where significant constraints may be identified.

Section 4 of the Assessment report will summarize key findings from Section 3 with respect to the locations with the most significant constraints and the opportunities, impacts, risks, costs, and mitigation discussed, including where appropriate, the relative costs and schedule impacts associated with the options identified. This section focuses on the aspects of the constraints analysis that support potential future actions to ensure maximum benefits of renewable OSW energy while avoiding and/or minimizing conflicts and impacts.

1 Overview of the Assessment

1.1 Assessment Goals and Objectives

The Climate Leadership and Community Protection Act (Climate Act), enacted in 2019, commits New York State to a zero-emission electricity system by 2040, and a minimum of 9 gigawatts (GW) of offshore wind (OSW) by 2035, a reduction of greenhouse gas emissions to 85 percent below 1990 levels by 2050. In support of implementing the Climate Act and the associated Accelerated Renewable Energy Growth and Community Benefit Act, the New York State Energy Research and Development Authority (NYSERDA) supported the development of the New York Power Grid Study (Power Grid Study), which concluded that 9 GW of OSW by 2035 is achievable but will require ongoing collaboration and planning with New York State agencies, including the Department of Environmental Conservation (DEC), Department of State (DOS), Department of Transportation (DOT), Office of General Services (OGS), Department of Public Service (DPS), and interested stakeholders to identify feasible solutions to address transmission cable routing limitations.

Building on the two overarching goals for the Assessment summarized below, this section discusses the steps that will be taken to achieve those goals through the assessment process:

- Goal 1: 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.
- Goal 2: Inform potential future policy actions that maximize the benefits of OSW and minimize conflicts and impacts in a timeframe to support achieving the 9 GW of OSW by 2035 mandated by the Climate Act.

The scope of this Assessment will not address all aspects of potential cable corridors. The scope of the study will not:

- Identify complete routes or corridors
- Rank or prioritize various route or landfill options
- Describe potential routes for cables from OSW project lease areas to State waters
- Address whether the cables in State waters will connect to radial, meshed, or backbone transmission concepts
- Assess capacity of points of interconnection (POIs) or upgrades that may be necessary at any location

1.2 Overview of Offshore Wind Interconnection to the Grid

Electric transmission and distribution (T&D) infrastructure will play a critical role in meeting the Climate Act mandates by connecting new renewable resources to the grid and transmitting and delivering energy

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

This section will provide an overview of the interconnection of OSW to the New York electrical grid, including background on the Power Grid Study, technology primer, and supporting information for a general understanding of the analysis. This section will present additional information on technical characteristics of cable systems and cable installation technologies, including discussion of high-voltage direct current and high-voltage alternating current features and parameters, especially as they relate to cost, installation, operation, maintenance, and decommissioning.

This section will also provide an overview of the key processes and approvals required to connect an OSW energy facility to New York State's electrical grid. The New York State Public Service Commission issued Certificates of Environmental Compatibility and Public Need for transmission lines pursuant to Article VII of the New York State Public Service Law, supported by DPS, which includes input from other State agencies that are parties to the proceedings. Under the Coastal Zone Management Act, DOS requires that transmission cable(s) have a coastal consistency concurrence, and the OGS requires an easement to cross State-owned submerged lands. The DOT requires permits for use of parkway and highway rights-of-way (ROW). In addition, other State agencies will review onshore transmission lines, including but not limited to, DEC; the Federal Highway Administration; and the New York State Office of Parks, Recreation and Historic Preservation (OPRHP).

1.3 Previous Studies and Data Collection

This section will provide a detailed summary of previous studies, ongoing studies, and data collection relevant to the Assessment report. The analysis will rely on available data, prior studies, and technical expertise, and no field surveys or delineations will be performed. A summary of recently conducted studies that provide context and information is provided in the following section.

Port Uses and Navigational Assessment (Ongoing): The goal of this Assessment is to provide greater 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 industry. The study team will assess the cumulative impacts of current and anticipated future uses of port infrastructure in service of New York

State's OSW mandates. Then, the team will develop a traffic density model for New York State's currently active OSW-related ports. Ultimately, using the results of the vessel traffic model, the team will select several "hot spot" areas in which the vessel traffic density shows changes due to the introduction of OSW traffic and prepare risk assessments specific to each selected hot spot area.

Power Grid Study (January 2021): The Power Grid Study determined that integrating 9 GW of OSW generation by 2035 is achievable without major onshore bulk transmission upgrades beyond expanding Long Island bulk transmission links and likely local upgrades in New York City. The Power Grid Study also 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. However, overcoming cable routing limitations in New York Harbor, spatial constraints in substations on Manhattan, and permitting complexities in both the New York Harbor and along the Long Island coastline (including approaches to New York City through the Long Island Sound) will require careful planning of OSW transmission cable routes and POIs. In addition, the Power Grid Study prepared cost estimates, including procurement and installation for cables, that will inform additional consideration of how costs affect siting of potential corridors.

Offshore Wind Master Plan – Cable Landfall Permitting Study (December 2017): This study characterized existing nearshore and onshore resources, identified potential areas of opportunities and constraints associated with future cable landfall sites, and presented an overview of the regulatory requirements for the various resources. This study focused on two geographic study areas:

- Study Area 1: Long Island/Rockaway Peninsula
- Study Area 2: Hudson and East Rivers/New York City

1.4 Agency and Stakeholder Input

This section will summarize the process for obtaining agency and stakeholder engagement throughout the development of the Assessment. The key findings and input from the engagement process will be integrated throughout the discussion of constraints for undersea and overland corridors in Section 3, Assessment of Constraints. This section will describe the contributions of the Offshore Wind Cable Working Group comprising representatives from each of the New York State agencies associated with OSW development in New York and the surrounding areas (Cable Working Group or CWG). Specifically, CWG includes representatives from New York State agencies, including DEC, DOS, DOT, OGS, DPS, and NYSERDA. Other New York State agencies are included in the overall Assessment as work aligns with their jurisdictions, or upon request.

Given the jurisdiction of certain submerged lands is shared with Connecticut and New Jersey, this section will report on any outreach to these states to discuss coordination and information exchange.

In addition, NYSERDA is requesting input from the public and other interested stakeholders to inform the Assessment. Stakeholders include non-governmental organizations, academic institutions, the maritime community, the OSW industry, environmental organizations, and other potentially affected parties. The feedback from CWG and stakeholders is integral to understanding the constraints, concerns, and relative risks associated with OSW undersea cables, as well as overland transmission corridors.

1.5 Study Area

The study area consists of four areas for bringing OSW to New York City and Long Island POIs, around which the Assessment will be organized as described below and as shown on Figure 1:

- **South Shore Approach Area:** The south shore of Long Island seaward to the 3-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 on the south (e.g., Smith Point [Fire Island], Robert Moses State Park, Long Beach, Jones Beach) and northwestern shores of Long Island, as well as landfalls in New York City after following the East River to the Mott Haven POI. This area also includes the Ruland Road, East Garden City, Syosset, Farragut, Rainey, and West 49th Street POIs.

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

Figure 1. Study Area and Approach Areas

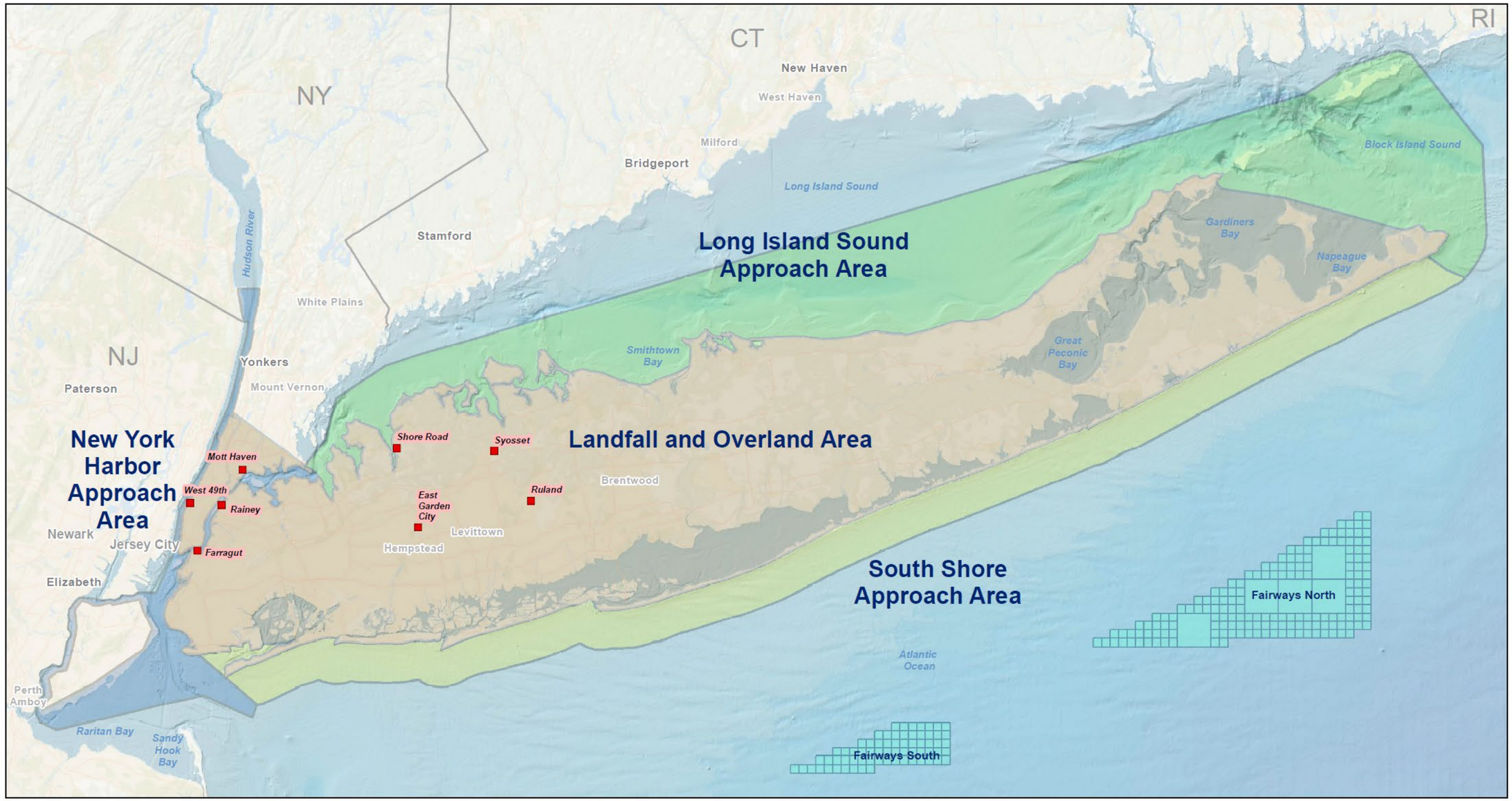

Figure 1
Study Area and Approach Areas
Draft Cable Corridor
Constraints Assessment Framework

2 Constraints Analysis

Section 2 of the Assessment report will quantitatively and qualitatively analyze attributes or characteristics of the potential cable corridors that may constrain development of a cable corridor. The process and results will characterize the environmental, technical, and stakeholder constraints, as well as opportunities, concerns, impacts, and risks of potential undersea cable corridors and overland and associated landings areas to potential onshore POIs. The evaluation of constraints for undersea and overland areas is presented separately, reflecting their unique and spatially different characteristics.

Section 2.1 describes the criteria and process for analyzing potential constraints for undersea cable corridors, and Section 2.2 describes the criteria and process for analyzing potential constraints for overland cables and associated landings. The criteria and their quantitative and qualitative characteristics are based on available data, prior studies, technical expertise, and other available information regarding conditions relevant to the siting and installation of power cables. The distinguishing characteristics for the criteria allow quantitative or semi-quantitative ranking as high, medium, and low relevant to the potential for a corridor to be highly constrained or successfully developed, permitted, and constructed. These criteria do not reflect all possible criteria associated with impacts; the analysis will focus on criteria with the potential to affect feasibility of a corridor or a location within a corridor and independent of potential mitigation. The results of the analysis will identify where discussion of avoidance, minimization, and mitigation measures can facilitate the goals of the Assessment.

2.1 Undersea Cable Constraints Criteria

Table 1 lists the criteria and the qualitative and quantitative characteristics for analyzing constraints for undersea cable corridors. Tier 1 screening will consider the constraints with the potential to affect feasibility of locating cables to identify where complete avoidance is the primary or preferred option in the cable siting process. Mitigation may be possible, but would face significant environmental, social, cost, safety, or physical disadvantages. Constraints where complete avoidance is most likely the primary or preferred option include areas such as unexploded ordnance, existing artificial reefs, extremely high density vessel traffic, federal navigation channels, areas of shallow water, or areas of high slope. Using data on these types of constraints, the Approach Areas will be divided into zones with similar characteristics and subzones with unique characteristics for further analysis. Tier 2 screening will evaluate the zones and subzones using the criteria in Table 1, available geographic information systems (GIS) data layers, and subject matter expertise.

2.2 Overland Cable Constraints Criteria

Table 2 lists the criteria and the qualitative and quantitative characteristics for evaluating site-specific portions of overland cables. Tier 1 screening will consider the constraints with the potential to affect feasibility of locating cables to identify where complete avoidance is the primary or preferred option in the cable siting process. Mitigation may be possible, but would face significant environmental, social, cost, safety, or physical disadvantages. Constraints where complete avoidance is most likely the primary or preferred option include, but are not limited to, areas such as habitat for protected species (e.g., bats and eagles), wetlands, cultural resources, areas of high slope, or extremely high-density residential areas. Using data on these types of constraints, zones will be identified for the landfall and overland areas that present opportunities for further analysis. For example, existing public ROW, transmission corridor, highways, or railways present an opportunity to avoid other types of constraints. Tier 2 screening will evaluate the zones using the criteria in Table 2, available GIS layers, and subject matter expertise.

2.3 Summary of Analysis of Constraints

This section presents the findings from the evaluation of constraints for undersea and overland cable corridors. This screening will provide insights on locations with the greatest constraints; the types of resources most affected; and where stakeholders were engaged to discuss avoidance, minimization, and mitigation measures that can facilitate siting and associated costs and schedule for implementation. This screening also identifies areas relatively unconstrained and do not require more detailed analysis to meet the goals of the Assessment.

Table 1. Constraints Analysis Criteria for Evaluation of Undersea Cable Corridors

Resource	Characteristics Affecting Feasibility	Qualitative/Quantitative Criteria
NATURAL AND ENVIRONMENTAL RESOURCES		
Marine Geology and Hydrology	Shallow bedrock and/or hardbottom structure Cohesive clays in substrate Boulder fields (e.g., as part of glacial moraines) Sand waves indicating mobile seabed Strong currents and associated scour 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/wave). Unstable seabed with areas of erosion/scour because of strong currents. Extended sections of steep seafloor.
Sensitive Habitats	Designated critical habitat, seasonal management areas (SMAs) (i.e., whales), artificial reefs, coldwater corals, shellfish beds, Natural Heritage Communities, submerged aquatic vegetation (SAV), designated threatened and endangered species habitat, New York City Waterfront Revitalization Program (NYCWRP) designations (Recognized Ecological Complexes and Ecologically Significant Maritime and Industrial Area), Significant Coastal Fish and Wildlife Habitat (SCFWH)	**Low:** Sensitive habitats and listed species are not mapped or known to be within the vicinity. No artificial reefs and no SCFWH. SAV not present. **Medium:** Isolated areas of sensitive habitats and/or listed species. Small areas of mapped SAV. **High:** Presence of multiple habitats, including artificial reefs, coldwater corals, SCFWH, sensitive habitats, and/or listed species. Extensive mapped SAV.
Sediment Contamination and Unexploded Ordnance (UXOs)	Contaminated sediment UXOs	**Low:** Clean (anticipated New York State Department of Environmental Conservation [DEC] Level A sediments); no UXOs. **Medium:** Potential for DEC Level B contamination; potential for UXOs. **High:** Identified DEC Level C contamination; charted UXO areas.
Waterbody Dimensions	Depth: The general convention is to space cables at a minimum of two times the water depth, draft restriction of 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 and 6,000 feet wide. **High:** Very shallow, specialized equipment and/or alternative installation methods (e.g., horizontal directional drilling [HDD]) required; less than 3,000 feet wide.
SOCIOECONOMIC RESOURCES		
Recreational and Commercial Fishing	New York recreational fishing areas New Jersey prime fishing areas Designated commercial fishing areas	**Low:** Commercial and recreational fishing restricted/prohibited. **Medium:** Infrequent, small, or isolated occurrences of commercial or recreational fishing; no mapped fishing areas or fishing under special license only.

Resource	Characteristics Affecting Feasibility	Qualitative/Quantitative Criteria
		High: Extensive and frequent use for commercial or recreational fishing; fishing not restricted; one or more mapped fishing area.
Vessel Traffic	Density of commercial vessels (as measured by automated identification systems [AIS]) Designated Areas: NYCWRP Marine Activity Zones Significant Maritime and Industrial Area 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.
Navigation Areas	Federally designated navigation channels Anchorages Shipping lanes/fairways Navigation safety and security zones; danger areas	**Low:** No federal navigation channels, anchorages, or U.S. Coast Guard (USCG) Safety Zones. Perpendicular or oblique crossings of shipping lanes/fairways. **Medium:** Perpendicular or oblique crossings of federal navigation channels, anchorages, or USCG Safety Zones. Limited lateral occupation of shipping lanes/fairway. **High:** Significant occupation of federal navigation channels, anchorages, or USCG Safety Zones. More extensive crossings/lateral occupation of shipping lanes/fairway.
Other Recreation	Offshore: Recreational wreck or artificial reef diving sites; sailing race routes/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:** Multiple recreational sites or sailing race routes/areas.
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.
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:** Large number of archaeological and cultural resources.
EXISTING INFRASTRUCTURE		
Linear Utilities	Transmission cables Telecommunication cables Pipelines	**Low:** No linear utilities present except for aqueducts; no outfalls present. **Medium:** Single lines or clusters of linear infrastructure that may be crossed during one HDD event and/or paralleled for less than half a mile.

Resource	Characteristics Affecting Feasibility	Qualitative/Quantitative Criteria
	Sewers/outfalls Aqueducts	**High:** Dense assemblages of transmission, telecommunication, pipelines, or sewers that require multiple crossings and some of which would be paralleled for half a mile or more; outfall present.
Tunnels and Bridges	Transportation tunnels Bridges	**Low:** No transportation tunnels or a few bridges with at least 100-foot clearances present. **Medium:** One transportation tunnel and/or multiple bridges with one having a clearance below 100 feet. **High:** Two or more transportation tunnels present and two or more bridges with clearances below 100 feet.
Turbines	Underwater turbines or associated cables with the project	**Low:** No underwater turbine projects. **High:** Multiple underwater turbines at multiple locations present.

Table 2. Constraints Analysis Criteria for Evaluation of Overland and Landfall Areas

Resource	Characteristics Affecting Feasibility	Qualitative/Quantitative Criteria
NATURAL AND ENVIRONMENTAL RESOURCES		
Geology, Soils, and Topography	Shallow bedrock and/or boulder fields Cohesive and/or shrink swell clays Steep slopes Unconsolidated sands Faults	**Low**: Suitable substrate for construction without boulder fields or shallow bedrock; stable terrain with gentle slopes. **Medium**: Largely suitable substrate for construction with isolated areas with boulder fields or shallow bedrock; limited areas of unstable terrain, significant topographic variability or steep topography. **High**: Extensive areas of substrate deemed unsuitable or problematic for construction; boulder fields, shallow bedrock, significant area of unstable terrain, significant topographic variability or steep topography.
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 protected 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.
Critical Species and Sensitive Habitats	Federally- or State-listed endangered or threatened species or associated habitat, designated critical habitat Important Bird Areas (IBAs) New York City Waterfront Revitalization Program (NYCWRP) designations 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.
Land Use	Federal, State or municipal-owned/managed lands Indigenous lands Coastal Erosion Hazard Areas (CEHAs)	**Low:** No federal, municipal, or indigenous lands, or CEHAs. No State Parks, Wildlife Management Areas, State Forests, Forest Preserves or Conservation Easements. **Medium:** One or two small federal, municipal, or indigenous lands, CEHAs, or State Parks. Minimal occupation of municipal parkland. **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.

Resource	Characteristics Affecting Feasibility	Qualitative/Quantitative Criteria
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.
Cultural Resources	Known archaeological and architectural resource sites National Register of Historic Places 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.
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.
EXISTING INFRASTRUCTURE		
Linear Utilities	Overhead and underground electric transmission cables Underground telecommunication cables Pipelines (gas and hazardous liquid) Sewers/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, pipelines, or sewers that require multiple crossings; one or more outfall present.
Transportation	Transportation tunnels Bridges Railroads Highways (parkways, State, U.S., Interstate)	**Low**: No transportation tunnels, railroads, or highway crossings; a few bridges present. **Medium**: One transportation tunnel, railroad, or highway crossing, and/or several bridges. **High**: Two or more transportation tunnels, railroads, or highway crossings present and/or multiple bridges crossed.

Resource	Characteristics Affecting Feasibility	Qualitative/Quantitative Criteria
Water-dependent Development	U.S. Army Corps of Engineers (USACE) Coastal Storm Risk Management (CSRM) projects Piers, bulkheads, shoreline restoration, rip rap, etc.	**Low:** Limited or no water-dependent infrastructure; no USACE CSRM projects or directly impacted water-dependent 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.

3 Assessment of Constraints

Section 3 of the Assessment report will continue the assessment of constraints for zones and subzones, the locations of greatest constraint identified in Section 2, to coordinate agency and stakeholder engagement on the constraints of most concern. Section 3 will provide descriptions of the existing conditions; summarize stakeholder input on constraints; and summarize the avoidance, minimization, and mitigation opportunities, reflecting the unique or protected characteristics of the areas where significant constraints are identified. Where appropriate, the relative costs and schedule impacts associated with avoidance, minimization, and mitigation opportunities will also be discussed.

As noted previously, for the purposes of the Assessment, the NOAA-delineated shoreline of Long Island and New York City defines the demarcation between the undersea Approach Areas and the Landfall and Overland study areas, with the exception of the north shore of Long Island where northern embayments are not generally included in the onshore considerations. For the south shore, the undersea Approach Area is seaward of the shoreline, and the Landfall and Overland includes the various bays and harbors along the south shores.

3.1 South Shore Approach Area

The descriptions of existing conditions provide a general overview of the resources present in the South Shore Approach Area to facilitate an understanding of the unique or protected characteristics of the potential corridors where significant constraints may be identified. The Assessment report will include more detailed information at the locations where significant constraints are identified.

3.1.1 Marine Geology

3.1.1.1 Existing Conditions

The South Shore of Long Island is complex and dynamic, consisting of a system of barrier islands and bluffs stretching from New York City to Montauk Point at the eastern end of Long Island. Surface sediments consist mostly of sand with pockets of gravelly sand offshore of the midpoint of the shoreline, near Smith Point. The seabed includes sand ridges ranging in thickness from 20 feet to less than 3 feet (Foster et al. 1999). Beaches along the south shore consist of sand, except around Montauk Point where beaches include gravel and boulders. For a discussion of CEHAs, see Section 3.4.7 Land Use. To the north, the barrier beaches are separated from the mainland by a system of several broad and shallow lagoons, including (from east to west) Shinnecock Bay, Moriches Bay, Great South Bay, and Jamaica Bay. The largest bay, Great South Bay, is approximately 30 miles long, up to 5 miles wide, and on

average, 4 feet deep. Some areas of the lagoon system are covered by tidal marshes, particularly in the western section along the south shore. Multiple bridges cross the lagoon system to provide access to the barrier beaches.

3.1.1.2 Summary of Stakeholder Input

This summary of stakeholder input, as it pertains to this resource area, will reflect the discussion of constraints, concerns, and relative risks where the resource presents a significant constraint to a potential corridor.

3.1.1.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This section will describe potential impacts to geological resources within the South Shore Approach Area, particularly where marine geology presents a significant constraint, and will describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. The potential impacts may include:

- Current and potential future sand borrow sites allowed for beach nourishment and shore protection measures along the south shore. The need for such measures may increase in the future with sea level rise.
- Challenges of installation and potential risk of exposure of offshore cables from migrating sand ridges in offshore waters.

3.1.2 Marine Commercial and Recreational Uses

3.1.2.1 Existing Conditions

The South Shore Approach Area contains the Fiber-optic Link Around the Globe (FLAG) Atlantic South telecommunication cable, multiple in-service submarine cables, one pipeline with two Long Island landfalls, one high-voltage transmission cable (NYSERDA 2017a), and 10 out-of-service submarine cables, as shown in Figure 2. Other existing infrastructure includes sewer outfalls between Jones Beach and Fire Island Inlet, each extending approximately 2.2 to 2.5 nautical miles (nm) from shore. Nearshore marine waters within the South Shore Approach Area support high levels of commercial and recreational fishing (NYSERDA 2017a). Recreational activities include diving, surfing, and wildlife viewing. Eleven recreational wreck diving sites are dispersed throughout the South Shore Approach Area, with seven wrecks concentrated in the western end. Eighteen mapped artificial reef diving sites are present on four of the artificial reefs along the South Shore Approach Area. The South Shore Approach Area is popular for viewing shorebirds and seabirds, marine mammals, and other wildlife. Surfing is a common recreational activity along Gilgo and Robert Moses beaches, as well as along the Hamptons to the South Fork. The

South Shore Approach Area does not contain any designated Significant Maritime and Industrial Areas or Priority Marine Activity Zones. Recreational and commerce boating are discussed in Section 3.1.3 Navigation and Vessel Traffic.

3.1.2.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.1.2.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This section will describe potential impacts on marine commercial and recreational uses within the South Shore Approach Area, particularly where marine commercial and recreational uses present a significant constraint. It will also describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. The potential impacts include the following:

- Short-term displacement of recreational and/or commercial fishermen.
- Short-term loss of access for other recreational user groups (e.g., beach goers, surfers, and boaters) during construction at the landfall site.
- Short-term interaction with static fishing gear (e.g., pots and traps) during surveys and cable installation.
- Long-term displacement of recreational and/or commercial fishermen due to potential stock changes resulting from habitat alterations and ecological regime shifts.
- Long-term displacement of recreational and/or commercial fishermen if target species avoids cables due to electric and magnetic fields (EMF).
- Damage if dredges or trawlers snag near surface, on exposed cables, or on cable protection measures.
- Damage of existing infrastructure (cables, pipelines, sewers/outfalls, and bridges).
- Loss of wildlife viewing opportunities and areas due to short- and/or long-term displacement of wildlife, such as birds, marine mammals, and sea turtles.
- Loss of dive sites if cable placement affects artificial reefs or wreck sites.

3.1.3 Navigation and Vessel Traffic

3.1.3.1 Existing Conditions

High concentrations of recreational and commercial marine vessels are present in the offshore waters of the South Shore Approach Area and increase approaching New York Harbor (NYSERDA 2017b). Within the Great South Bay and adjacent nearshore waters, recreational watercraft and fishing boats use maintained channels (NYSERDA 2017c). Six inbound- and outbound-designated shipping lanes branch out like spokes on a wheel from the precautionary area at the entrance to the Ambrose Channel and Lower New York Bay. The proposed Long Island Fairway (85 *Federal Register* 37034) parallels the southern coastline of Long Island from East Hampton to Jones Beach. The Naval Undersea Warfare Testing

Range, designated by the Department of Defense, exists in the eastern half of the South Shore Approach Area.

3.1.3.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.1.3.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This section will describe potential impacts to navigation and vessel traffic within the South Shore Approach Area, particularly where navigation and vessel traffic present a significant constraint. It will also describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. The potential impacts include the following:

- Disruption of vessel traffic during installation and operation and maintenance events.
- Damage to cables from anchor drops.

3.1.4 Aquatic Biological Resources and Sensitive Habitats

3.1.4.1 Existing Conditions

Aquatic biological resources and sensitive habitats include artificial reefs, designated critical habitat, seasonal management areas (SMAs) for whales, Natural Heritage Communities, SAV, wetlands and mitigation sites, threatened and endangered species habitat, IBAs identified by the Audubon Society (landfalls and onshore), NYCWRP designations (Recognized Ecological Complexes and Ecologically Significant Maritime and Industrial Area), and SCFWH. The six artificial reefs within the South Shore Approach Area are Shinnecock Reef, Moriches Anglers Reef, Fire Island Reef, Fishing Line Ground Reef, Rockaway Reef, and Atlantic Beach Reef. A portion of the South Shore Approach Area (approximately 35 square nm) near the entrance to Lower New York Bay is within the North Atlantic right whale (*Eubalaena glacialis*) (NARW) SMA from November 1 to April 30. Sea turtle average annual relative abundance in the area of the South Shore Approach Area is low throughout, with moderately low levels in the western portion. The endangered Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) has been recorded throughout the South Shore Approach Area with high aggregation periods in the spring and fall (specific dates depending on location) (Dunton et al. 2015). Approximately three-quarters of this area is also designated a Biologically Important Area (BIA) for NARW migration from March to April (NOAA 2015). Essential Fish Habitat (EFH) exists along the South Shore Approach Area for 13 highly migratory species, including 10 species of shark and three species of tuna (NOAA Fisheries 2021). EFH also exists for 23 other non-highly migratory species. Nearly the entire length of the South Shore Approach Area is designated as one of various IBAs identified by the Audubon Society (Audubon

Society 2017). Other resources that will be considered and identified within the approach based on available data include rocky/shoal areas, cold-water corals, and shellfish growing areas.

3.1.4.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.1.4.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This section will describe potential impacts on aquatic biological resources and sensitive habitat within the South Shore Approach Area, particularly where aquatic biological resources and sensitive habitat present a significant constraint. It will also describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. The potential impacts include the following:

- Increased vessel interactions with endangered and/or sensitive species, such as marine mammals, sea turtles, and/or Atlantic sturgeon.
- Short-term avoidance or potential changes to behavior of endangered and/or sensitive species, such as marine mammals, sea turtles, and/or Atlantic sturgeon resulting from direct impacts from construction, such as trenching.
- Short-term avoidance of the area by marine mammals, sea turtles, and/or Atlantic sturgeon due to noise (physical installation or dredging to prepare area for installation) or EMF.
- Loss or shifts of benthic resources from short- or long-term disturbance.
- Accidental releases of fuel or other hazardous materials from vessels during installation and operation and maintenance that could threaten or kill biological resources.
- Conversion of soft-bottomed to hard-bottomed sediments if cable burial is not possible, decreasing soft-bottom habitat for marine species that have key life processes associated with soft-bottom habitats, and creating a potential barrier for mobile benthic species.

3.1.5 Sediment Quality and Water Quality

3.1.5.1 Existing Conditions

Sediment quality refers to the potential for contaminated sediment, including UXO, to affect installation and maintenance of cables. Contaminated sediments are not generally documented along or offshore the southern shore of Long Island because of the lack of historical industrial activities along that portion of Long Island. 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.

Water quality refers to offshore and onshore water and groundwater quality as determined by regulatory standards. According to the approved 2018 list of 303(d) impaired waters for New York, there are no

impaired waters in the offshore portion of the South Shore Approach Area (DEC 2020). The 303(d) list is a list of impaired waters that do not meeting the water quality standards. States are required to prepare a 303(d) list every year per the Clean Water Act, Section 303(d). The Atlantic Ocean coastline within the South Shore Approach Ares (i.e., east of the Rockaway Inlet) is not impaired.

3.1.5.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.1.5.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This section will describe potential impacts related to sediment and water quality in the South Shore Approach Area, particularly where sediment quality and water quality present a significant constraint. It will also describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. The potential impacts may include the following:

- Sediment disturbance and suspension/turbidity
- Resuspension of contaminated sediments
- Use of HDD for cable installation and HDD drilling fluid loss
- Spills of hazardous materials during construction or loss of fuel during fuel transfers

3.1.6 Cultural Resources

3.1.6.1 Existing Conditions

The NOAA Automated Wreck and Obstruction Information System (AWOIS) database identifies 10 submerged shipwrecks in the South Shore Approach Area. Through the agency and public review process, any additional archaeological resources identified by the State Historic Preservation Office will be included in the Assessment.

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 (OPRHP 2018). The Assessment will identify, through data and literature reviews, any cultural resources, including State and National Register of Historic Places (NRHP) resources, in the portions of the potential corridors where significant constraints are identified.

3.1.6.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.1.6.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This section will describe potential impacts to archaeology and cultural resources within the South Shore Approach Area, particularly where cultural resources, including archaeological, present a significant constraint, and will describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. The potential impacts include the following:

- Vessel collisions during surveys, construction activities, and the inadvertent disturbance of submerged marine cultural resources.

3.1.7 Coastal Habitats

3.1.7.1 Existing Conditions

The U.S. Fish and Wildlife Service (USFWS) and NOAA are responsible for designating Critical Habitat under the Endangered Species Act for federally listed threatened and endangered species. The USFWS designates Critical Habitat for terrestrial species and NOAA designates Critical Habitat for marine species. The South Shore Approach Area does not contain coastal habitats identified as designated USFWS or NOAA Critical Habitat. While no designated Critical Habitat overlaps with the South Shore Approach Area, there is the still the potential for federal and State-listed threatened and endangered species to occur within this approach. Section 3.1.4.1 discusses threatened and endangered species that may be present in the coastal zone and their habitats.

Five approved local waterfront revitalization plans (LWRP) overlap geographically with the Southern Shore Approach Area: the NYC WRP; the village of Ocean Beach LWRP; the town of Smithtown LWRP; the town of Southold LWRP; and the town of East Hampton LWRP. The NYC WRP includes five types of special area designations: Special Natural Waterfront Areas (SNWA), the Significant Maritime and Industrial Areas, the Arthur Kill Ecologically Sensitive Maritime and Industrial Area, the Priority Marine Activity Zones, and the Recognized Ecological Complexes. Significant Maritime and Industrial Areas and Priority Marine Activity Zones are discussed further in Section 3.1.2.1. Only one of these special designated areas, the Jamaica Bay SNWA, is within the geographic overlap of the South Shore Approach Area. The Jamaica Bay SNWA is discussed further in Section 3.4.2 Coastal Resources.

Federal and State managed lands, including wildlife refuges are discussed in Section 3.4.7 Land Use.

3.1.7.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.1.7.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This section will describe potential impacts to coastal habitats within the South Shore Approach Area, particularly where coastal habitats present a significant constraint. It will also describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. The potential impacts may include the following:

- Construction activities, such as those that increase turbidity, that may lead to contravention of State water quality standards and may be inconsistent with the applicable coastal policies.
- Resuspension of contaminated sediments.
- Inadvertent returns from HDD.
- Spills of hazardous materials during construction from barges or support vessels or loss of fuel during fuel transfers.
- Temporary use restrictions on public access for recreating or commercial fishing.

3.2 Long Island Sound Approach Area

The descriptions of existing conditions provide a general overview of the resources present in the Long Island Sound Approach Area to facilitate an understanding of the unique or protected characteristics of the potential corridors where significant constraints are identified.

3.2.1 Marine Geology

3.2.1.1 Existing Conditions

Remnants of two terminal moraines, the Ronkonkoma moraine at the southern end of Block Island Sound and the Harbor Hill moraine, separating Block Island Sound from Long Island Sound, exist in the Long Island Sound Approach Area, which form shoals and islands and harbor significant marine habitats. The Harbor Hill moraine extends approximately 9 nm from Valiant Rock in the east to Orient Point in the west, and it forms a well-defined geological boundary between Block Island Sound and Long Island Sound. Islands and shoals exist along the moraine. The moraine consists of boulders, rocks, and unsorted till, and bottom stress occurs because of strong tidal currents between the islands. The southern end of Block Island Sound between Montauk Point and Block Island is a shoal that is bisected by Block Channel, a narrow, naturally formed channel. Sediments on Montauk Point Shoals consist of sand and gravel (Poppe et al. 2000, McMullen et al. 2005). The seabed has rocky outcrops, boulders, and sand waves.

In eastern Long Island Sound, sediments consist predominantly of sand; however, tidal currents are strong and create seabed features in some locations that include bedrock outcrops, boulder deposits of submerged moraines, sand-wave fields, and gravel pavement Between the western-most Long Island

Sound and the East River, the seafloor topography is highly variable and includes channels, shoals, bedrock outcrops, and low northeast-trending knolls. For a discussion of CEHA, see Section 3.4.7 Land Use.

3.2.1.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.2.1.3 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.1.3, in addition to impacts unique to the Long Island Sound Approach Area, which include those associated with cable installation in bedrock via drilling or removal by blasting, trenching, and/or hydraulic hammer.

3.2.2 Marine Commercial and Recreational Uses

3.2.2.1 Existing Conditions

The Long Island Sound Approach Area contains the FLAG Atlantic North telecommunication cable, the Iroquois Gas Transmission System natural gas pipeline (Iroquois pipeline), and several NOAA charted cable areas as shown in Figure 2. The cable area between Montauk Point and Block Island is believed to contain out-of-service telegraph cables.

Commercially and recreationally important shellfish resources of Long Island Sound (except lobster) occur in shallow nearshore waters. Commercial fishing activity is moderate to high throughout the area, including otter trawl, pot and trap, gillnet, charter, and party vessel trips. Most commercial trips occur east of Port Jefferson, off both the North and South Forks of Long Island, and in the western third of Long Island Sound toward New York City. Recreational fishing activity mostly occurs along the shoreline, except for a few general areas, including Jamesport and to the east, parallel to the North Fork, toward the New York-Connecticut state line from Port Jefferson, and toward the New York-Connecticut state line from Huntington Bay.

Recreational activities include diving and wildlife viewing. Many dive areas are located in the Long Island Sound Approach Area—about half of them are nearshore and the other half are near the State line mostly along the eastern and western perimeters of Long Island Sound. Montauk Point and Camp Hero State Park are popular surfing locations. Wildlife viewing is also common from the shore and from vessels off the North and South Forks of Long Island.

3.2.2.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.2.2.3 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.2.3.

Figure 2. Existing and Proposed Infrastructure in the Study Area

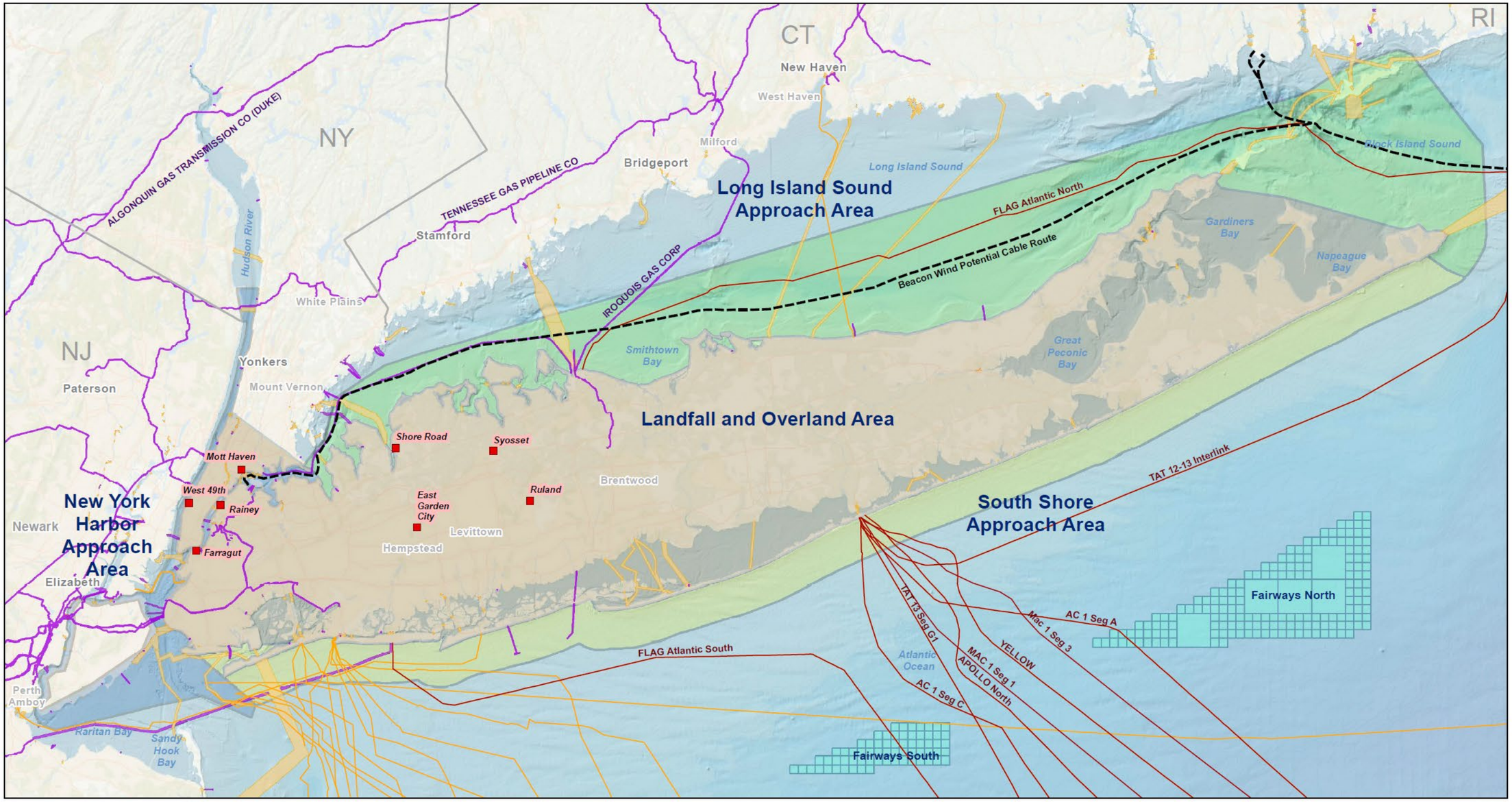

Figure 2
Existing and Proposed Infrastructure in the Study Area
Draft Cable Corridor Constraints Assessment Framework

3.2.3 Navigation and Vessel Traffic

3.2.3.1 Existing Conditions

Recreational and commercial marine vessels present in the Long Island Sound Approach Area include pleasure boats, commercial shipping and fishing vessels, and ferry vessels. AIS vessel data show that vessel traffic in this approach mostly flows back and forth from Connecticut to New York at Bridgeport/Port Jefferson, and New London and Old Saybrook/Orient Point, and in concentrated transit lanes that parallel the North Shore as Long Island Sound nears New York City. The eastern half of the Long Island Sound Approach Area includes the Naval Undersea Warfare Testing Range.

3.2.3.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.2.3.3 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.3.3.

3.2.4 Aquatic Biological Resources and Sensitive Habitats

3.2.4.1 Existing Conditions

The Long Island Sound Approach Area includes aquatic biological resources and sensitive habitats reflective of the unique waterbody. Artificial reefs include Matinecock Reef and Smithtown Reef (which is proposed for expansion), and three proposed new artificial reef sites, Huntington-Oyster Bay, Port Jefferson-Mount Sinai, and Mattituck (DEC 2021). A small portion of the Long Island Sound Approach Area offshore of Montauk Point is within the NARW SMA from November 1 to April 30 and designated BIA for NARW migration from March to April (NOAA 2015, 2019). There is also an overlap with designated BIA for fin whales (*Balaenoptera physalus*) for feeding from March to October (NOAA 2015). Several threatened, endangered, or sensitive species are found in the Long Island Sound Approach Area. Near Orient Point, there are cold-water corals (east of Plum Island), SAV (in the northwest corner of Plum Island and northeast corner of Orient Point), roseate tern (Great Gull Island is a globally important IBA for nesting), Atlantic/shortnose sturgeon, concentrations of pinnipeds (Little Gull Island, Great Gull Island, southeastern shore of Plum Island, and a 0.75-square-nm area between Plum Island and Orient Point), concentrations of cetaceans, and sea turtles/other reptiles (around Great Gull and Plum Island) (CT DEEP 2019). Within the more central portion of the Long Island Sound Approach Area, there are cold-water corals (eastern end and north of Northport), roseate tern, Atlantic/shortnose sturgeon

(eastern half), concentrations of pinnipeds (surrounding Wading River), sea turtles/other reptiles (along shoreline), cetaceans (from Mattituck to offshore of Orient Point), and American lobster.

EFH exists along the Long Island Sound Approach Area for highly migratory species, including shark and tuna. EFH also exists for other non-highly migratory species, particularly the winter flounder. The entire Long Island Sound Approach Area falls within designated shellfish growing areas.

3.2.4.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.2.4.3 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.4.3. A unique impact within this approach could include disturbance of cold-water corals.

3.2.5 Sediment Quality and Water Quality

3.2.5.1 Existing Conditions

Published data regarding sediment contamination for most of the Long Island Sound Approach Area is lacking; contamination is documented in the western-most portion of the approach area. Some of the bays and harbors north and east of the town of Oyster Bay contain contaminated sediment above NOAA guideline values (including polychlorinated biphenyls [PCBs] and polycyclic aromatic hydrocarbons [PAHs]) (e.g., Varekamp et al. 2014). Additionally, domestic and industrial wastewater flows, fertilizer releases, and urban runoff from dense development and legacy industrial sites surrounding the area from approximately Manhasset Neck west toward the East River resulted in areas with contaminated sediment (including heavy metals, PCBs, and PAHs) (Varekamp et al. 2014). Dredged material disposal sites that fall within the Long Island Sound Approach Area will be discussed in this section.

According to the approved 2018 list of 303(d) impaired waters for New York, the central Long Island Sound is impaired, as is a portion of the sound in Nassau County (DEC 2020). Additionally, Hempstead Harbor and Manhasset Bay and their tidal tributaries, as well as Little Neck Bay, are listed as impaired. See Section 3.1.5.1 for a discussion of the Long Island Sole Source Aquifer and contamination sites.

3.2.5.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.2.5.3 Impacts and Avoidance, Minimization, and Mitigation Measures

The potential impacts include those listed in Section 3.1.5.3. A unique potential impact within this Approach Area would include sediment effects on cold-water corals.

3.2.6 Cultural Resources

3.2.6.1 Existing Conditions

The NOAA AWOIS database identified four well-dispersed shipwrecks present in Block Island Sound, in the eastern portion of the Long Island Sound Approach Area. Additionally, more than 100 shipwrecks are generally widely scattered throughout Long Island Sound. A high concentration of wrecks exists between Eatons Neck Point and the Cable and Anchor Reefs. The southern half of Long Island Sound includes four potential, submerged Holocene sites, and according to NOAA charts, numerous uncharted wrecks. Numerous charted shipwrecks are along the western-most portion of the Long Island Sound Approach Area.

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, the Unkechaug (OPRHP 2018).

3.2.6.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.2.6.3 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.6.3.

3.2.7 Coastal Habitats

3.2.7.1 Existing Conditions

The Long Island Sound is bounded to the south by Long Island and to the north by Connecticut and extends for approximately 110 miles from east to west. The Long Island Sound Approach Area does not contain coastal habitats identified as designated USFWS or NOAA Critical Habitat. While no designated Critical Habitat overlaps with the South Shore Approach Area, there is still the potential for federal and

State-listed threatened and endangered species to occur within this approach. Section 3.2.4 discusses threatened and endangered species that may be present in the coastal zone and their habitats.

Five approved LWRPs overlap geographically with the Long Island Sound Approach Area: the village of Bayville LWRP; the village of Greenport LWRP; the village of Head of the Harbor/Nissequogue LWRP; the village of Lloyd Harbor LWRP; the village of Sag Harbor LWRP; the town of Smithtown LWRP; and the town of Southold LWRP. Additionally, the Long Island Sound Coastal Management Program overlaps with the Long Island Sound Approach Area, and this specific plan is bounded by the shorelines of Westchester County, New York City to the Throgs Neck Bridge, Nassau County, and Suffolk County.

The Long Island Sound Approach Area includes the Peconic Estuary and the Long Island Sound. SCFWHs are located within Long Island Sound Approach Area including Lake Montauk, Orient Harbor, Port Jefferson Harbor, and Caumsett State Park. Federal and State-managed lands, including wildlife refuges, are further discussed in Section 3.4.7 Land Use.

3.2.7.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.2.7.3 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.7.3.

3.3 New York Harbor Approach Area

The descriptions of existing conditions provide a general overview of the resources present in the New York Harbor Approach Area to facilitate an understanding of the unique or protected characteristics of the potential corridors where significant constraints are identified.

3.3.1 Marine Geology

3.3.1.1 Existing Conditions

The bathymetry in the New York Harbor Approach Area is variable, in part because of dredged navigation channels, previous borrow areas, and sand-wave areas formed by swift currents. The substrate throughout most of the New York Harbor Approach Area consists of sediment (sand, silt, and clay); however, there are some locations with shallow bedrock. Sediments in the Lower New York Bay consist of a thick layer of glacial outwash sands (Bokuniewicz and Fray 1979). Glacial sediments in the Lower

New York Bay are at least 65 feet (20 meters) thick, while the Upper New York Bay contains sediments that are generally more than 200 feet thick (USACE 2004). Surface sediments in this zone consist mostly of sand-clay/silt and sand-silt/clay. Much of the surface sediments in this zone are categorized as "dynamic" (Nitsche et al. 2004). The Lower Hudson River west of Manhattan is underlain by rocks covered with sediments up to several hundred feet thick, composed of mostly silt, clay, and sandy silt. The sediments are largely classified as being in some state of erosion or dynamic shifting. Bedrock in the East River is overlaid by sediments consisting of sand, silt, and clay, and sediment thickness (i.e., depth to bedrock) is highly variable, but bedrock can be shallow in some locations.

In Raritan Bay, sediments consist of thick deposits of mostly sand and silty sand, and the uppermost sediments include large patches of mud (silt and clay), particularly in the western portion of the bay within the New York Harbor Approach Area (Kastens et al. 1978). Sediments in Arthur Kill and Kill Van Kull consist primarily of glacial till overlying shallow bedrock.

For a discussion of CEHA, refer to Section 3.3.9.1.

3.3.1.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.3.1.3 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.1.3, in addition to impacts unique to the New York Harbor Approach Area, which include those associated with cable installation in bedrock via drilling or removal by blasting, trenching, and/or hydraulic hammer.

3.3.2 Marine Commercial and Recreational Uses

3.3.2.1 Existing Conditions

The New York Harbor Approach Area includes numerous in- and out-of-service NOAA charted submarine cables, pipelines, aqueducts, bridges, and auto and rail tunnels as shown in Figure 2. The Roosevelt Island Tidal Energy project, which is a pilot project due to operate until 2022, consists of three marine hydrokinetic turbines located on the eastern side of Roosevelt Island in the East River.

A large portion of Raritan Bay in the New York Harbor Approach Area was part of a DEC hard clam transplantation program 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). No hard clam

harvesting has occurred in this area since 2013, but the DEC may reinitiate the transplantation program in the future if economically feasible (FERC 2019).

Recreational activities include parks, fishing, diving, and wildlife viewing. The Gateway National Recreational Area provides visitors with an opportunity to explore natural and historical areas in an urban setting. The National Park Service 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. If a corridor is established on the western side of the channel, it would pass through the offshore section of the park. Designated recreational fishing grounds and recreational snorkeling and scuba diving areas are located within Queens County, New York (FERC 2019). 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 New York Harbor Approach Area includes the South Bronx and Mott Haven designated as Significant Maritime and Industrial Areas and multiple areas of Priority Marine Activity Zones within the New York Harbor Approach Area.

3.3.2.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.3.2.3 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.2.3.

3.3.3 Navigation and Vessel Traffic

Recreational and commercial marine vessels present in the New York Harbor Approach Area include pleasure boats, commercial shipping and fishing vessels, and ferry vessels. AIS vessel data show that the areas of highest vessel densities are entering and exiting the Port Authority of New York and New Jersey extending seaward through the Ambrose Channel into the Atlantic Ocean, aligned with the East River navigation channel. Higher concentrations of traffic also flow into and out of Flushing Bay.

The New York Harbor Approach Area includes numerous anchorage areas and authorized navigation channels, including Ambrose Channel, Chapel Hill Channel, a small federal channel along the southwestern side of Coney Island, Anchorage Channel, Bay Ridge Channel, Red Hook Channel, Buttermilk Channel, Raritan Bay East and West Reaches, Sequine Pont Bend, Red Bank Reach, Ward

Point Bend East Reach, Ward Point Secondary Channel, Great Kills Harbor Channel, the East River Channel, Kill Van Kull Channel, Arthur Kill Channel, and the South Brother Island Channel. Restricted zones are adjacent to LaGuardia Airport and the Stapleton Naval Station, and safety and security zones are established around the base of each tower of the Verrazano-Narrows Bridge, Piers 86-92, above the Lincoln Tunnel, and just south of Roosevelt Island related to the United Nations.

3.3.3.1 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.3.3.2 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.3.3.

3.3.4 Aquatic Biological Resources and Sensitive Habitat

3.3.4.1 Existing Conditions

Aquatic biological resources and sensitive habitats in the New York Harbor Approach Area include a small portion of the approach near the entrance to Lower New York Bay within the NARW SMA (NOAA 2019). Annual and seasonal abundance 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). NOAA has designated the entire lower Hudson River estuary as Coastal Critical Habitat for Atlantic sturgeon, a federally endangered species; the estuary is used for migration and spawning grounds (NOAA Fisheries 2017). 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 2017a). This estuary is one of the most ecologically productive systems on the northeast coast for fisheries. EFH exists within the New York Harbor Approach Area for three highly migratory species—smooth dogfish, sandbar shark, and bluefin tuna. EFH also exists for 12 other non-highly migratory species (NOAA Fisheries 2021). Shoal water areas (shallower than 20 feet) of New York Harbor provide primary habitat for winter flounder eggs (NEFMC 2017).

3.3.4.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.3.4.3 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.4.3. A unique impact in this approach could include disturbance of winter flounder or anadromous fish species during sensitive life stages and processes.

3.3.5 Sediment Quality and Water Quality

3.3.5.1 Existing Conditions

Sediments in New York Harbor contain contaminants at varying concentrations (e.g., Adams et al. 1998, Long et al. 1995). Sediments may contain elevated (DEC Class C and/or Effects Range - Medium) levels of contaminants, especially within and near certain channels (Long et al. 1995, FERC 2019). The New York Harbor waterways, particularly the kills, have historically been subject to oil spills and direct petroleum discharges. The industrial developments along the kills, including refineries and oil storage facilities, provide continued risk for contamination. The Hudson River is a Class 02 State Superfund site as a result of two upriver General Electric capacitor plants and the release of PCBs. Several federal Superfund, federal brownfield, and DEC remediation sites (i.e., Brownfield Cleanup Program and State Superfund Program) are present along the shore of the East River. Additionally, Newtown Creek is a Class 02 State Superfund site.

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 (DEC 2020).

3.3.5.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.3.5.3 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.5.3.

3.3.6 Cultural Resources

3.3.6.1 Existing Conditions

The NOAA Electronic Navigation Chart and AWOIS database documented wrecks in Raritan Bay and within the Arthur Kill and Kill Van Kull. The Arthur Kill entrance at Perth Amboy is categorized as eligible for the NRHP.

Six federally recognized Indian Nations with areas of interest overlap with the New York Harbor Approach Area: the Delaware Nation; the Delaware Tribe; Cayuga; Mohican; Shinnecock; Stockbridge-Munsee Community, Wisconsin; and one State-recognized, the Unkechaug (OPRHP 2018).

3.3.6.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.3.6.3 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.6.3.

3.3.7 Coastal Habitats

3.3.7.1 Existing Conditions

The Hudson River north of the southern tip of Manhattan is mapped as NOAA Critical Habitat for Atlantic sturgeon. There are no additional coastal habitats identified as designated USFWS or NOAA Critical Habitat within the New York Harbor Approach Area. There is the still the potential for federal and State-listed threatened and endangered species to occur within this approach. Section 3.3.4.1 discusses threatened and endangered species that may be present in the coastal zone and their habitats. A request to the DEC Natural Heritage Program will be made, and results included in the final Assessment.

As noted in Section 3.1.7.1, the NYC WRP includes five types of special area designations. Significant Maritime and Industrial Areas and Priority Marine Activity Zones are discussed further in Section 3.3.2.1. The New York Harbor Approach Area includes SNWA, Recognized Ecological Complexes, and the Arthur Kill Ecologically Sensitive Maritime and Industrial Area. The Assessment will consider other approved LWRP plans that overlap geographically with the New York Harbor Approach Area.

The New York Harbor Approach Area includes the New York/New Jersey Harbor and Hudson River Estuary. According to the NYDOS, 18 SCFWHs are located within the New York Harbor (DOS 2014). Examples include Lower Hudson Reach, Lemon Creek, Breezy Point, North and South Brother Islands, and Manhasset Bay. Federal and State managed lands, including wildlife refuges are further discussed in Section 3.4.7 Land Use.

3.3.7.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.3.7.3 Impacts and Avoidance, Minimization, and Mitigation Measures

Potential impacts include those listed in Section 3.1.7.3.

3.4 Landfall and Overland Area

The descriptions of existing conditions provide a general overview of the resources present in the Landfall and Overland Area to facilitate an understanding of the of the unique or protected characteristics of significant constraints between landfall points and where opportunities exist for connections with POIs. The Assessment report will include more detailed information at the locations where significant opportunities are identified; for example, existing ROW.

3.4.1 Sediment, Soil Types, and Steep Slopes

3.4.1.1 Existing Conditions

The Assessment will identify sediment types in the shoreline area and based on a review of soil types, areas with steep slopes will be identified. Soil types relevant to installation and maintenance of buried cables will also be considered. Potential steep slopes are located in Southampton and Islip on Long Island and limited in New York City (Ecology and Environment Engineering, P.C. 2017).

3.4.1.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.4.1.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This discussion will describe potential impacts on locations where opportunities exist to connect landfall to POIs, particularly where these present a significant constraint. It will also describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. Potential impacts may include the following:

- Potential for erosion, especially in areas of higher slopes.
- Additional consideration of construction techniques due to lack of consolidated material.

3.4.2 Coastal Resources

3.4.2.1 Existing Conditions

There are 13 approved LWRPs and special designated areas that overlap with the Landfall and Overland Area, as indicated in Sections 3.1.7.1, 3.2.7.1, and 3.3.7.1. The Landfall and Overland Area includes the

South Shore Estuary Reserve and the Peconic Estuary, managed cooperatively by the DEC and other State, local, and federal agencies. On Long Island, along the south shore barrier island in the vicinity of Jones Beach, endangered nesting shorebird habitat exists. Additionally, the back-barrier lagoon areas are classified as New York State SCFWH and contain unique emergent tidal marsh and eelgrass meadow habitats. There are multiple additional SCFWHs designated throughout Long Island, including the West Hempstead Bay, East Hempstead Bay, Great South Bay, Connetquot River, Carmans River, and many others.

Beachgoing is a popular activity along the South Shore of Long Island, as is evident by State park annual attendance for several parks along the South Shore. Jones Beach was the most heavily attended park, with more than 8 million in annual attendance in 2020. Robert Moses State Park was also heavily used with over 4.2 million in annual attendance in 2019. Orient Beach State Park had more than 180,000 in annual attendance in 2019, and Amsterdam Beach had just under 14,000 (OPRHP 2021).

3.4.2.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.4.2.3 Impacts and Avoidance, Minimization, and Mitigation

This discussion will describe potential impacts on locations where opportunities exist to connect landfall to POIs, particularly where coastal habitats present a significant constraint. It will also describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. The potential impacts may include the following:

- Construction activities, such as those that increase turbidity, that may lead to contravention of State water quality standards and may be inconsistent with the applicable coastal policies.
- Resuspension of contaminated sediments.
- Inadvertent returns from HDD.
- Temporary use restrictions on public access for recreation, including beachgoing.
- Temporary displacement of public access for recreation, including beachgoing.

3.4.3 Terrestrial Biological Resources

3.4.3.1 Existing Conditions

Long Island includes a high level of biological diversity, reflected in designations of significant natural communities, IBAs identified by the Audubon Society, and federally and State listed species. The DEC 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. Significant natural

communities are protected under regulatory programs, such as regulatory freshwater wetlands and tidal wetlands. Additionally, most of these communities overlap with federally, State, or locally owned seashores, parks, forests, and recreational areas. Long Island is home to a wide range of significant natural communities (New York Natural Heritage Program 2021), including. But not limited to, brackish interdunal swales, high and low salt marsh, maritime dunes, coastal plain Atlantic white cedar swamp, dwarf pine plains, freshwater tidal marsh, highbush blueberry bog thicket, pine barrens shrub swamp, and successional maritime forest. IBAs identified by the Audubon Society and DEC-designated bird conservation areas are located throughout all Long Island.

While highly developed, New York City still has biological diversity, reflected in designations of significant natural communities, IBAs identified by the Audubon Society, and federally listed species. IBAs and DEC-designated bird conservation areas also occur within the New York City area. According to the USFWS Information for Planning and Consulting (IPaC) results, seven USFWS-listed or candidate species occur within the Landfall and Overland Area: Indiana bat (*Myotis sodalist*), northern long-eared bat (*Myotis septentrionalis*), piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), roseate tern (*Sterna dougallii dougallii*), monarch butterfly (*Danaus plexippus*), sandplain gerardia (*Agalinis acuta*), and seabeach amaranth (*Amaranthus pumilus*) (USFWS 2021). Additionally, Nature Explorer has identified more than 200 State-listed species occurring within Nassau and Suffolk Counties (DEC 2021).

3.4.3.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.4.3.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This discussion will describe potential impacts on locations where opportunities exist to connect landfall to POIs, particularly where terrestrial biological resources present a significant constraint. It will also describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. Potential impacts may include the following:

- Temporary and permanent disturbance to sensitive terrestrial resources (i.e., conversion of threatened or endangered species habitats; behavioral disturbances from construction activities).
- Degradation of sensitive and significant natural habitats.

3.4.4 Wetlands, Surface Waters, and Water Quality

3.4.4.1 Existing Conditions

Both freshwater and tidal wetlands are located on Long Island; these are a combination of federally, State, and municipally regulated wetlands. For state-regulated wetlands, the adjacent areas of freshwater wetlands extend 100 feet from the wetland boundary, and for tidal wetlands, they extend up to 300 feet inland from the wetland boundary outside of New York City, and in New York City, the adjacent area extends up to 150 feet inland. The regulatory limits of federally regulated wetlands are the wetland boundary; there are no associated regulated adjacent areas or buffers. The regulatory limits of municipally regulated wetlands vary. Large tidal wetland systems are associated with the Great South Bay, as well as Long Island Sound. These systems include fresh, high, and intertidal marshes. Freshwater wetlands are located throughout Long Island, including along many of the tributaries to Great South Bay. In New York City, tidal wetland systems are associated with Jamaica Bay, the Lower Bay, and the East River. These are predominantly intertidal marshes. Freshwater wetlands are very limited. The Assessment will consider and map USFWS National Wetland Inventory and DEC freshwater and tidal wetlands relevant to the constraints analysis.

There are several rivers located on Long Island, including the Nissequogue River, Swan River, Carmans River, Peconic River, and Connetquot River. The Assessment will also consider and map surface waters – streams, rivers, lakes, and ponds relevant to the constraints analysis. The Landfall and Overland Area includes the shorelines of the East and Hudson Rivers.

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 (DEC 2020).

Three main aquifers are on Long Island—the upper glacial aquifer and the underlying Magothy and Lloyd aquifers. These three aquifers comprise the sole source of freshwater. The Nassau/Suffolk Counties Long Island Sole Source Aquifer underlies Long Island beneath the two counties and supplies more than 400 million gallons per day of freshwater to1,500 public-supply wells for approximately 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 and 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 (EPA 2021). Contamination sites on Long Island, including federal

and State Superfund sites, Resource Conservation and Recovery Act corrective action sites, brownfield sites, and former locations of petroleum and chemical spills, could affect groundwater quality.

3.4.4.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.4.4.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This discussion will describe potential impacts on locations where opportunities exist to connect landfall to POIs, particularly where these resources present a significant constraint. It will also describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. The potential impacts may include the following:

- Sediment disturbance and suspension/turbidity.
- Use of HDD for cable installation and HDD drilling fluid loss.
- Spills of hazardous materials during construction.
- Clearing and grading activities associated with the establishment of a ROW.

3.4.5 Areas of Contamination

3.4.5.1 Existing Conditions

Areas of historical contamination in New York City include the DEC Remediation Sites Astoria manufactured gas plant, the Gowanus Canal, the Brooklyn Navy Yard Industrial Park, and Newtown Creek. Areas of contaminated sediments in New York City, such as those containing polyfluoroalkyl substances, PCBs, and heavy metals are generally localized. Additionally, there are numerous other sources of contamination, in the form of federal and State Superfund sites, brownfield sites, and other remediation sites. Potential sources of contamination also exist throughout Long Island in the form of federal and state Superfund sites, brownfield sites, and other remediation sites. Larger Superfund sites (e.g., Northrop Grumman) exist on Long Island. Onshore DEC remediation sites are found along the coast closer to the East River.

3.4.5.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.4.5.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This discussion will describe potential impacts on locations where opportunities exist to connect landfall to POIs, particularly where contamination presents a significant constraint. It will also describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. The potential impacts may include disturbance and need for disposal of contaminated sediments.

3.4.6 Cultural Resources

3.4.6.1 Existing Conditions

The NRHP lists multiple historic resources in Long Island and New York City. The Assessment will consider any additional archaeological or historic sites/districts, including those on the State Register of Historic Places, from the Cultural Resource Information System (CRIS) database relevant to the constraints analysis. General areas of archaeological sensitivity, as identified in the CRIS database, will be identified.

Six federally recognized Indian Nations have areas of interest that overlap with the Landfall and Overland Area: the Delaware Nation; the Delaware Tribe; Cayuga; Mohican; Shinnecock; Stockbridge-Munsee Community, Wisconsin; and one State recognized, the Unkechaug (OPRHP 2018). The Assessment will identify, through data and literature reviews, any cultural resources, including State Register of Historic Places as well as NRHP resources.

3.4.6.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.4.6.3 Impacts and Avoidance, Minimization, and Mitigation

This discussion will describe potential impacts on locations where opportunities exist to connect landfall to POIs, particularly where cultural resources, including archaeology, present a significant constraint. It will also describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. The potential impacts may include:

- Inadvertent identification and/or disturbance of archaeological and cultural resources.
- Appearance of overhead transmission or converter stations of the overland route on the views, viewsheds, and/or setting of onshore (terrestrial) architectural or other built resources, landscapes, seascapes, and traditional cultural properties, if applicable.

3.4.7 Land Use

3.4.7.1 Existing Conditions

Long Island and New York City consist of densely developed urban and suburban areas. Open, undeveloped areas are generally protected and preserved intentionally. For the purposes of siting potential cable corridors, land use will focus on opportunities to use existing ROWs. Bridge crossings over water, other roadways, or railroads, and existing utility ROWs present opportunities for minimizing impacts. For example, parkway and highway ROWs on Long Island and in New York City may present a relatively wide corridor that could be used for installing onshore cables, with approval from both DOT and the Federal Highway Administration, which partially funds these major roads. Additionally, OPRHP owns Long Island parkways. Other land use factors include the number of municipal jurisdictions, and whether the land use is primarily residential, commercial, or industrial.

Existing infrastructure includes waterfront structures, tunnels, bridges, cables, pipelines, and outfall structures. New York City includes an extensive amount of existing infrastructure. Infrastructure on Long Island is less extensive, with bridges largely concentrated along the south shore, connecting places like the Rockaway Peninsula, Jones Beach, and the Fire Island National Seashore with the remainder of Long Island. Additionally, bridges in the western portion of Long Island provide connections from Brooklyn to Staten Island and Manhattan. Additional infrastructure in the form of cables, pipelines, and sewer outfalls exist along the south shore of Long Island. A majority of the existing transmission lines on Long Island are alternating current overhead lines. The ROWs for existing infrastructure including transmission corridors, railways, highways, and parkways will be evaluated for potential connection between a landfall and POI.

Portions of the Landfall and Overland Area include CEHAs with 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. The Landfall and Overland Area also includes many state-owned parcels of land as well as numerous local, county, and State parks. Additionally, the Central Pine Barrens, known for its significant natural resources, is located in the central-eastern part of Suffolk County and is comprised of portions of eastern Brookhaven Town, western Southampton Town and southern Riverhead Town. The Central Pine Barrens are protected under the Long Island Pine Barrens Protection Act and development is regulated under the Act as well as the Central Pine Barrens Comprehensive Land Use Plan. Multiple federal lands are located within the Landfall and Overland Area; for example, the Fire Island National Seashore, the Oyster Bay National Wildlife Refuge, and the Brookhaven National Laboratory.

See Section 3.4.5 Areas of Contamination for information on contaminated sites in the study area. Section 3.4.5 Cultural Resources identifies the four federally recognized Indian Nations in the study area. This section will include information relevant to indigenous lands, particularly where opportunities exist to connecting landfall to POIs using existing ROWs.

3.4.7.2 Crossing of existing infrastructure. Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.4.7.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This discussion will describe potential impacts on locations where opportunities exist to connect landfall to POIs, particularly where land use presents a significant constraint. It will also describe avoidance, minimization, and mitigation measures and opportunities determined through agency and stakeholder engagement. The potential impacts may include the following:

- Loss of open, undeveloped land due to placement of converter stations.
- Loss of open, undeveloped land from expansions of existing ROWs.
- Disturbances to beaches, dunes, or bluffs that may decrease or completely remove the erosion buffering function of natural protective features.
- Loss of access to public lands during construction and operation of facilities.

3.4.8 Environmental Justice/Disadvantaged Communities

3.4.8.1 Existing Conditions

Environmental justice is defined 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." DEC 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." 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- to moderate-income households." New York State's Climate Justice Working Group is currently in the process of establishing criteria for disadvantaged communities. This section will discuss environmental justice populations and disadvantaged communities within Landfall and Overland Area for the general locations of the anticipated landfall and potential corridors.

3.4.8.2 Summary of Stakeholder Input

See Section 3.1.1.2 for an overview of the discussions that will be summarized here.

3.4.8.3 Impacts and Avoidance, Minimization, and Mitigation Measures

This section will describe impacts associated with the constraints evaluated and the potential for disproportionate impacts on environmental justice populations and disadvantaged communities.

4 Summary of Assessment

Section 4 of the Assessment report will summarize key findings from Section 3 with respect to the locations with the most significant constraints and opportunities, the associated impacts, risks, and mitigation discussed, including where appropriate, the relative costs and schedule impacts associated the options identified. The summary will catalogue the outcomes of the screening and analysis in Section 2, and the review and discussion of the associated impacts, risks, and mitigation discussed with the CWG, stakeholders, and the public. This section will focus on the aspects of the constraints analysis that support potential future actions to ensure maximum benefits of renewable OSW energy while avoiding or minimizing conflicts and impacts.

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