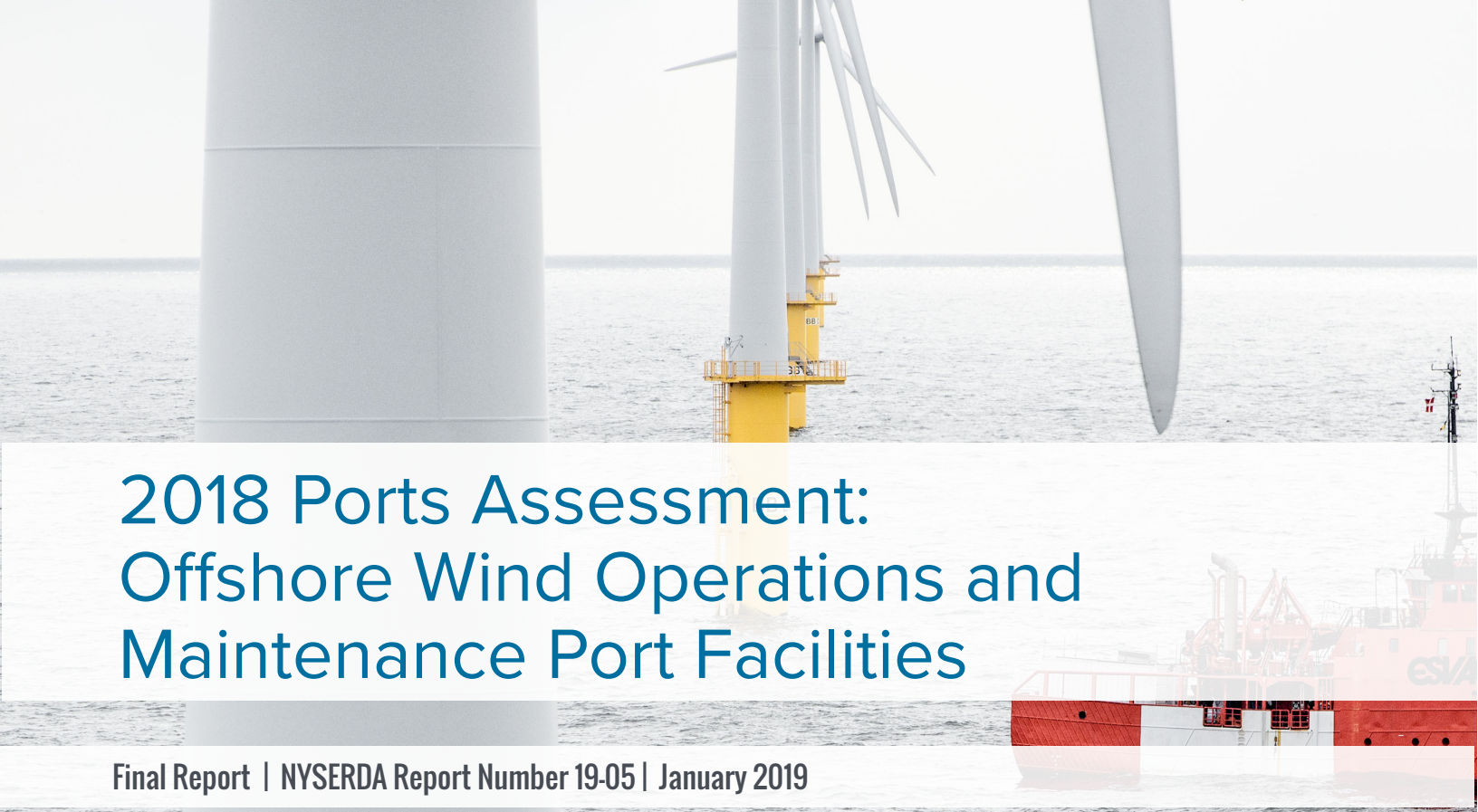

2018 Ports Assessment: Offshore Wind Operations and Maintenance Port Facilities

Final Report | NYSERDA Report Number 19-05 | January 2019

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2018 Ports Assessment: Offshore Wind Operations and Maintenance Port Facilities

Final Report

Prepared for:

New York State Energy Research and Development Authority

Albany, NY

Prepared by:

COWI North America, Inc.

New York, NY

NYSERDA Report 19-05 NYSERDA Contract 111670 January 2019

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Acronyms and Abbreviations

COWI	COWI North America Inc.
CTV	Crew Transfer Vessel
ft	Feet
ha	Hectare
IMR	Inspections, Maintenance, and Repairs
m	Meter
MLLW	Mean Low Lower Water
nm	Nautical Mile
NYSERDA	New York State Energy Research and Development Authority
O&M	Operations and Maintenance
OSV	Offshore Service Vessel
SWATH	Small Waterplane Area Twin Hull
WEA	Wind Energy Area

Executive Summary

The Offshore Wind Operations and Maintenance (O&M) Port Facilities Siting Catalog is one of a series of reports prepared on behalf of New York State as a part of the 2018 Ports Study. The 2018 Ports Study builds upon the Assessment of Ports and Infrastructure (COWI, 2017) completed in support of the New York State Offshore Wind Master Plan (NYSERDA, 2017). The objective of the 2018 study is to determine typical site characteristics of facilities intended to support O&M vessels as well as to highlight several waterfront sites in the State which may potentially serve as O&M facilities through the service lifetime of offshore wind farms.

As part of the New York State Offshore Wind Master Plan, the Workforce Study (BVG Associates, Stantec, GLWN, 2017) found that New York is ideally suited for sustained offshore wind workforce opportunities. According to the study, New York can realize nearly 5,000 new jobs in manufacturing, installation, and operation of OSW facilities, with a regional commitment to scale development of the resource. Nearly 2,000 of these jobs are in O&M, providing sustained career opportunities for New Yorkers as the average OSW facility life span is at least 25 years. The key to realizing this potential is to ensure that the shore-based O&M facilities are developed in New York.

The report is divided into two sections. The first section contains an overview of two primary types of O&M waterfront port support facilities as well as recommended geographic and site attributes. This information will be used to solicit potential sites and site information to be included in the O&M Site Catalog. The second part contains a catalog of geographic areas, existing marine facilities, and other waterfront sites which may potentially be developed for offshore wind O&M. The site catalog is not meant to be a definitive limiting list of sites, but rather an initial set to which sites can be added and information updated as more stakeholder input is received. The intent of this information is to inform the offshore wind industry and other stakeholders of O&M opportunities and reduce the lead time associated with developing offshore wind O&M facilities in New York State.

1 Introduction

The offshore wind industry in New York is poised for rapid expansion. In his 2019 State of the State Address, Governor Andrew M. Cuomo announced an expansion of the State's Clean Energy Standard from 50 percent to 70 percent renewable electricity by 2030. As part of that announcement, New York also increased its commitment to offshore wind from 2,400 MW by 2030 to 9,000 MW by 2035.

New York is ideally suited for sustained offshore wind workforce opportunities. According to the Workforce Study in the Offshore Wind Master Plan (BVG Associates, Stantec, GLWN, 2017), New York can realize nearly 5,000 new jobs in manufacturing, installation, and operation of OSW facilities, with a regional commitment to scale development of the resource. Nearly 2,000 of these jobs are in operations and maintenance (O&M), providing sustained career opportunities for New Yorkers as the average OSW facility life span is at least 25 years. The key to realizing this potential is to ensure shore-based O&M facilities are developed in New York.

NYSERDA retained BTMI Engineering, P.C. to solicit and catalog site information from local stakeholders on potential operations and maintenance sites so that it may serve as a resource to offshore wind developers. BTMI has full access to the engineering staff and resources of COWI North America, Inc. in providing engineering services (BTMI and COWI are collectively referred to as "COWI").

The report is divided into two sections. The first part contains an overview of two primary types of O&M waterfront port support facilities as well as recommended geographic and site attributes. This information will be used to solicit potential sites and site information to include in the O&M Site Catalog. The second section contains a catalog of geographic areas, existing marine facilities, and other waterfront sites, which may potentially be developed for offshore wind O&M. The site catalog is not meant to be a definitive limiting list of sites, but rather an initial catalog that can be modified and updated as more stakeholder input is received. The intent is to inform the offshore wind industry and other stakeholders of the opportunities as well as reduce the lead time associated with developing offshore wind O&M facilities in New York State.

2 Operations and Maintenance

Offshore wind farms have O&M requirements to ensure facilities function at peak efficiencies and maximize energy generation. In addition to the routine maintenance these complicated facilities require, they exist in high-energy environments subject to constant wind, wave, current, corrosion and other forces that can stress and advance maintenance schedules for turbine and foundation components. To maintain equipment lifespans and overall reliability of the system, O&M operations complete planned and unplanned inspections, maintenance, and repairs (IMR). O&M facilities are intended to serve as a base of operations for remote monitoring and IMR of offshore wind turbines.

While the development of O&M infrastructure represents a small portion of the initial offshore wind capital investment, over the long-term (25-year life cycle), O&M make up a larger portion of the overall cost of energy. Operating expenses can comprise up to 30-40% of the overall cost of energy [4]. Hence, early planning of O&M strategies and identification of suitable O&M infrastructure can make a significant difference to a project's economic viability.

To conduct O&M operations, technicians, parts, and equipment must access the OSW farm. Traditional access to the offshore turbines is provided by O&M vessels. While other alternatives exist for access, such as heliports, these are not considered in the scope of this document.

An O&M waterfront port facility supports O&M activity by providing crew and equipment staging as well as O&M vessel berthing for voyages to the WEAs. There are two main types of O&M vessels, daily voyages for IMR supported by Crew Transfer Vessels (CTV) and long-term overnight voyages for IMR supported by Operations Service Vessels (OSV). Like other offshore wind related port facilities, O&M facilities must meet certain geographic criteria as well as operations criteria to effectively service a wind farm.

2.1 CTV Facility

The Crew Transfer Vessel (CTV) Facility may serve as a local headquarters for managing day-to-day O&M. Continuous remote monitoring and service visits are launched and managed out of the CTV facility, as are more thorough periodic major maintenance and overhauls. An operations and maintenance facility will operate for the duration of the project.

The primary function of the CTV is the daily transportation of technicians and light supplies to the offshore wind farm for O&M. The primary siting parameter of a CTV O&M facility is efficient access to the offshore wind farm. Daily voyages will be conducted from this facility to the project area, and the transit costs associated with offshore maintenance are, therefore, directly related to the distance the service vessels must travel. By minimizing travel distance, the O&M team can more readily respond to emergency repair situations and minimize operational costs.

2.1.1 Crew Transfer Vessel

CTVs may be monohull, catamaran, or a small waterplane area twin hull (SWATH) type and typically carry two crew and 12 technicians. While federal and state regulations may cause vessel characteristics to vary slightly in the U.S., it can be expected that the U.S. will employ predominantly similar vessels. CTVs are available for hire and purchase through various brokers and manufactures in Europe. The U.S. CTV inventory is limited; however, U.S. manufacturers are capable of building CTVs to meet the potential demand.

Figure 1. Atlantic Wind Transfers M/V Atlantic Pioneer Servicing Block Island Wind Farm
Source: atlanticwindtransfers.com

Table 1 provides a general guide of typical CTV characteristics. Note that these characteristics are typical of existing vessels and new vessels can be built to satisfy local site demands.

Table 1. Typical CTV Characteristics

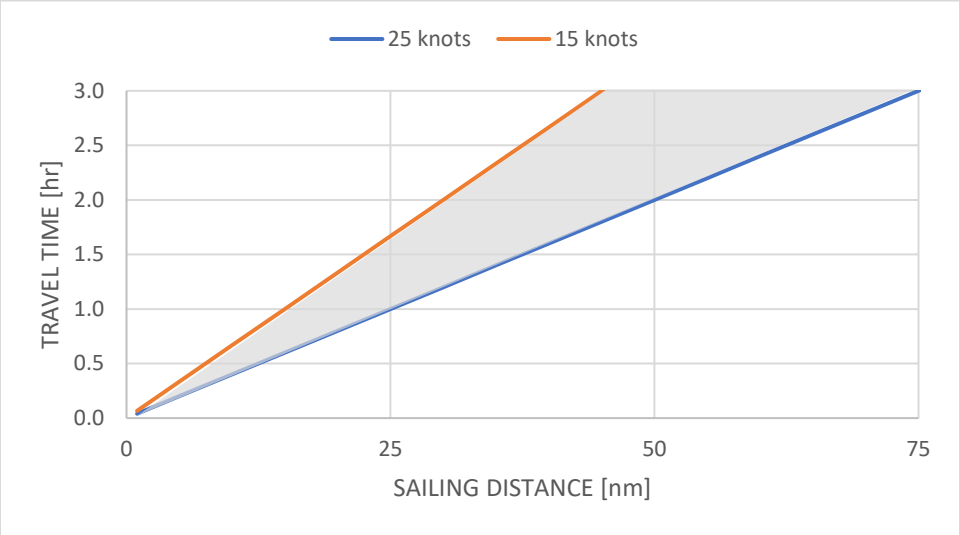
CTV Vessel	Dimension
LOA	19–30 m (629–99 ft.)
Beam	89–12 m (259–40 ft.)
Draft	1 m–3 m (39–9 ft.)
Vessel Speed	15–25kn
Crew Capacity	~12
Cargo Payload	<5 ton

2.1.2 CTV Geographic Criteria

Efficient access to a wind energy area (WEA) is the primary site criteria for a CTV facility. Land-based crew performing daily O&M work require frequent vessel trips between the CTV facility and the offshore wind farm. Consequently, marine facilities having a close distance to a WEA are generally preferable.

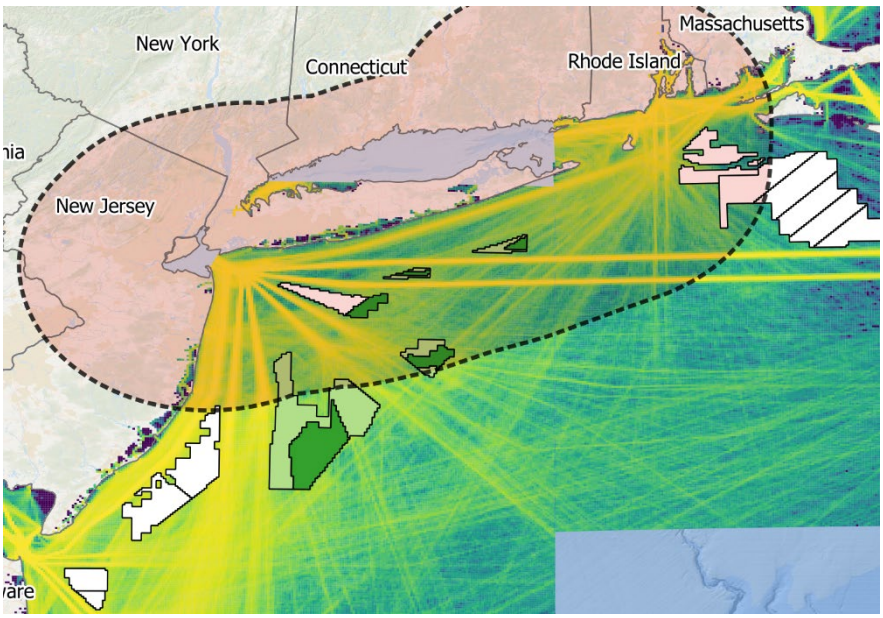
For economical working times in the wind farm, one-way transit times between port and OWF area (furthest turbine) are recommended to not exceed 1.5 to 2 hours. Sailing time is a function of sailing distance and vessel speed. Vessel speeds are often variable with slower speeds within inland waterway that may contain no wake zone and faster speeds within the open deeper waters. Additionally, adverse weather conditions can reduce vessel speeds.

Figure 2. Typical CTV Transport Times



Based on an average CTV speed between 15 and 25 knots and the recommended one-way travel time, a CTV facility is within 50 nm of the offshore wind farm is recommended. Therefore, according to this criterion, multiple CTV facilities will be needed to provide access to the planned New York WEAs. Figure 3 provides a reference of the WEAs that can be serviced by a CTV port facility in New York. The CTV facility may support one or more CTVs depending on the local OSW project demand for O&M vessels.

Figure 3. 50nm Buffer from NY Shoreline



In addition to WEA proximity, there needs to be adequate navigation access for CTVs. Restrictions to navigation include shallow water and low overhead obstructions. A minimum depth of 2.5 m and a minimum air draft of 10 m is recommended.

Table 2. CTV Geographic Recommendations

Travel Time to OWA	< 2 hours
Approx. Distance to OWA	< 50 nm
Water Depth	> 2.5 m (8 ft.)
Air Draft	> 10 m (33 ft.)

A CTV port facility can also provide transport to the offshore wind farm for unplanned visits, which may be necessary due to failure, impacts, or other emergencies. In the case of unplanned deployment, rapid access for personnel to the O&M CTV facility can be facilitated via local airports and helicopter pads. Travel distance from an airport or helicopter pad to an O&M CTV facility should be limited to 30 minutes.

2.1.3 CTV Operations Criteria

The operations site criteria for an O&M CTV facility are less stringent relative to other OSW support facilities, particularly manufacturing and staging facilities. As the primary purpose of the CTV is to transport personnel from a land base to the OWA, heavy equipment and loading is not required at the facility. A floating or fix dock that provides access to waterways with sufficient water depth and air draft are recommended. Adequate parking is needed for the crew. An adjacent upland office space to

monitor and support CTVs is also recommended. Supplies may be loaded at the CTV site using light-duty cranes or the CTV may be able to obtain supplies from local commercial waterfront facilities.

2.2 OSV Facility

As projects move further offshore and transit time becomes a limiting factor on CTV efficiency, long-term O&M campaigns may be launched and managed out of the OSV facility consisting of periodic major maintenance and overhauls. The primary function of the OSV is to be a self-contained project site consisting of crew, materials, and equipment capable of being at the project site for extended periods of time.

Whereas proximity to a WEA is the primary requirement for a CTV facility, the actual site capabilities are the primary requirement for an OSV facility. The site capabilities, such as wharf length and staging area, are needed to meet the operational demands of berthing large vessels and transporting massive parts and equipment offshore for O&M.

OSVs spend most of their time at the offshore areas and perform regular port calls once every 10 to 30 days. An OSV port facility does not need to be near WEAs, relative to CTV ports. The longer sailing distances capable of OSVs allow for a wider range of sites to be eligible for OSW facilities, including those in the inner bay areas of New York Harbor.

2.2.1 Offshore Service Vessel

OSVs are large ocean-going ships that support a variety of offshore industries. They can be categorized according to the operations they perform: seismic survey, platform supply, anchor handling tugs, anchor handling tug and supply, offshore construction, remote operated vehicle support, dive support, stand-by, inspection, and maintenance and repair. OSVs supporting offshore wind may include a variety of combinations of these types.

Figure 4. OSV with Helipad
Source: www.wartsila.com

The table below provides a general guide of typical OSV characteristics. Note that these characteristics are typical of existing vessels and that new vessel can be built to satisfy local site demands.

Table 3. Typical OSV Characteristics

OSV Vessel	Dimension
LOA	50 m–125 m (165–410 ft.)
Beam	15 m–30 m (50–100 ft.)
Draft	3 m–5 m (10–16 ft.)
Vessel Speed	10–20kn
Crew Capacity	~100
Cargo Payload	>100 ton

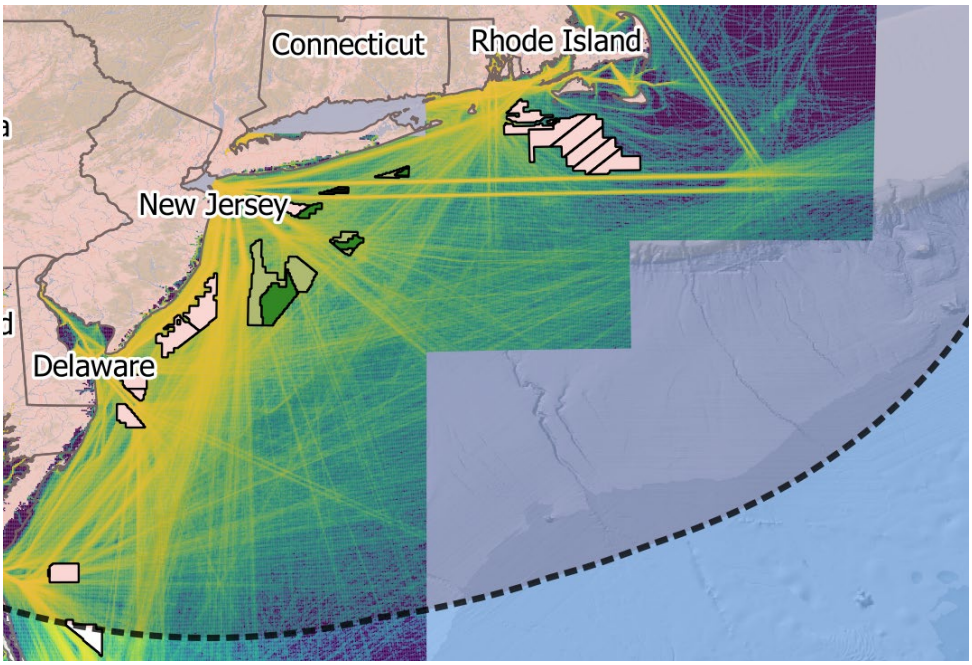
2.2.2 OSV Geographic Criteria

Land-based crews performing long-term O&M operations will require periodic vessel trips between the OSV facility and the offshore wind farm. Sufficient berthing and navigational access to the offshore wind farm is the primary siting criteria for an OSV facility.

Restrictions to navigation includes shallow water and low air draft restrictions. Relative to CTVs, the OSV are larger and require greater water depths and air drafts.

Due to the infrequency of voyages from ports, marine facilities having a close distance to the OWF not required but are encouraged. An OSV port facility located in the waters of New York can service both the State WEAs as well as other regional WEAs with typical travel times less than one day (depending on conditions and vessel speed). This leads to a possibility that sites in the inner bay and river areas of New York may be suitable.

Figure 5. 250nm Buffer from Port of NY/NJ Entrance



The following table provides a summary of the OSV geographic criterion. Restrictions to navigation include shallow water and low overhead obstructions. A minimum depth of 5 m and a minimum air draft of 40 m is recommended.

Table 4. OSV Facility Recommendations

Travel Time to OWA	**1-2 Day**
Approx. Distance to OWA	< 250 nm
Water Depth	> 5 m (16 ft.)
Air Draft	> 40 m (131 ft.)

2.2.3 OSV Operations Criteria

OSVs are typically based offshore in the OWF areas and perform regular port calls once a month or every fortnight. Due to their size, they require higher port criteria for berthing and operations. A commercial port facility is required for OSV. Table 5 provides a list of recommended facility attributes.

Table 5. OSV Operations Criterion Summary

Wharf Length	~ 150 m (~4902 ft.)
Wharf Load	~25 tons per square meter
Upland Area	~ 7000–10,000 square meters of land suitable for development of: Office + Car Park, Warehouse, & External storage
Additional Features	• Access to stevedoring (especially quayside crane and forklifting of containers) and other port services (pilotage, waste handling etc.) • Ability to securely fence the site and create a dedicated access. • Local transport links, services and supply chain also to be considered

3 Operations and Maintenance Site Catalog Overview

This O&M Site Catalog is meant to serve as a repository of potential O&M sites in New York to support the Offshore Wind Industry. This is a live document where site data can be added/updated and new site can be added to the list. Unless otherwise notes, facility owners/operators were not contacted for this phase of study.

3.1 General Waterfront Area

The first level of the O&M Site Catalog provides a general description of the waterfront area.

Table 6. Waterfront Area Description

Location	Approximate location of the waterbody reported in latitude and longitude.
Distance to nearest WEAs	Approximate distance from the main waterway access point to the nearest Wind Energy Area measured in nautical miles.
Navigable Depth	Approximate depth at the entrance to the waterbody as well as within the waterbody based on NOAA charts and reported relative to MLLW in meters (feet).
Waterfront Land Use	General description of existing waterfront land uses.

3.2 Individual Site Catalog

The second level of the O&M Site Catalog provides potential development sites within the waterway. The individual site catalog listing will be updates as potential site are identified. General site information outlined in Table 7 has been provided based on publicly available information. Unless otherwise noted, these facilities have not been contacted.

Table 7. Potential Site Development

Location	Upland address
Ownership	Ownership type and names of owners if available
Upland Area [ha]	Estimated existing upland area calculated in GIS
Water Frontage [m]	Estimated length of waterfront calculated in GIS
Existing Depth [MLLW] as per NOAA Chart	Estimated water depth per local NOAA chart
Limiting Air Draft Restriction	List of name, type, and air draft for bridges
Existing Land Use	Description of existing land use
Notes	Additional site information and observations

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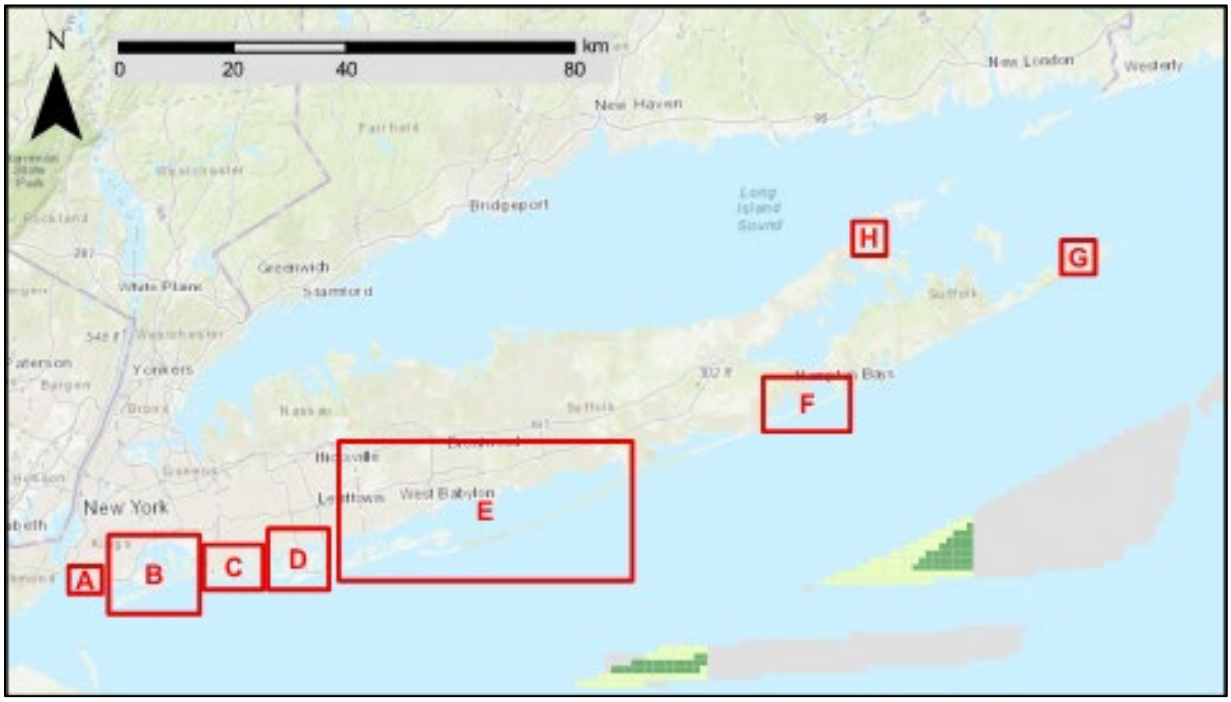
Appendix A. Operations and Maintenance Site Catalog

Figure 6. Sites and Geographies Included in the O&M Site Catalog
Source: ESRI



A. Gravesend Bay
B. Jamaica Bay
C. Hempstead Bay
D. East Bay
E. Great South Bay
F. Shinnecock Bay
G. Montauk Harbor and Lake Montauk
H. Greenport

Gravesend Bay

Gravesend Bay is in Brooklyn between the Verrazano-Narrows Bridge to the north and Coney Island to the south and gives vessels access to the Atlantic Ocean via the Ambrose Channel. The steaming distance to the nearest WEA. Navigable depths within the Bay range from 4 m (13 ft.) to 7 m (23 ft.). Depth to the Atlantic Ocean exceed 10 m (33 ft.) and air draft is unrestricted. The shorelines consist of a park to the north and commercial and light industrial areas to the south.

Two potential development sites have been identified in Gravesend Bay: A.1 Marine Basin Marina and A.2 Bayside Oil Terminal.

Figure 7. Gravesend Bay Site Map
Source: ESRI

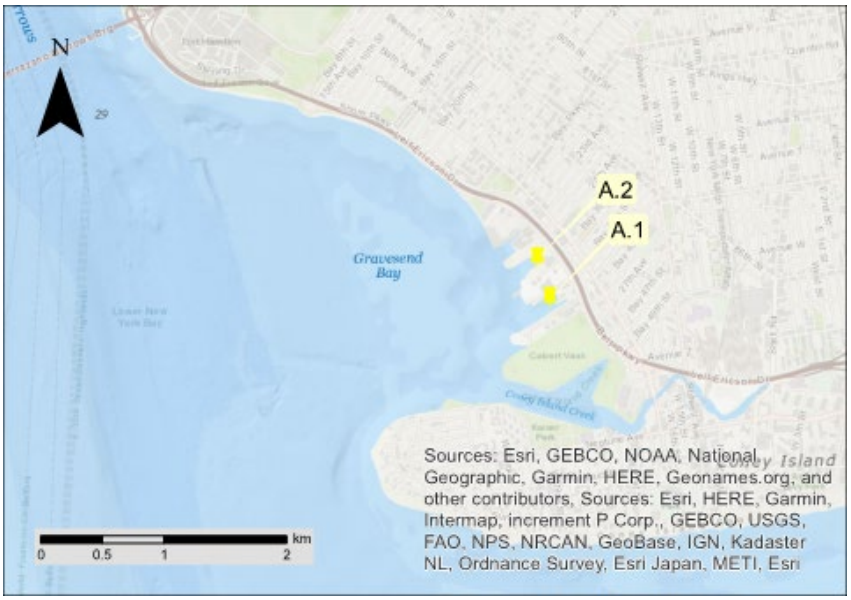


Table 8. Gravesend Bay

Location	Latitude: 40.590 N Longitude: 74.008 W
Distance to nearest WEAs	26 nautical miles
Navigable Depth	4 m (13 ft.) to 7 m (23 ft.)
Waterfront Land Use	Commercial and parks west of the Shore/Belt Parkway with mixed use (residential and commercial) east of the Shore/Belt Parkway. Parks along the at the north and south shoreline border commercial, recreational, and light industrial waterfront users.

Figure 8. Marine Basin Marina
Source: ESRI

Table 9. Marine Basin Marina

Location	1900 Shore Parkway, Brooklyn, NY 11214
Ownership	1900 Shore LLC (Mel Gagliano, a partner at the Marine Basin Marina)
Upland Area [ha]	2.7
Water Frontage [m]	610
Existing Depth [MLLW] as per NOAA Chart	Site: 1-2 m (3-7 ft.) Channel (in vicinity of site): 5-10 m (16-33 ft.)
Limiting Air Draft Restriction	None
Existing Land Use	Marina
Notes	

Figure 9. Bayside Oil Terminal
Source: ESRI

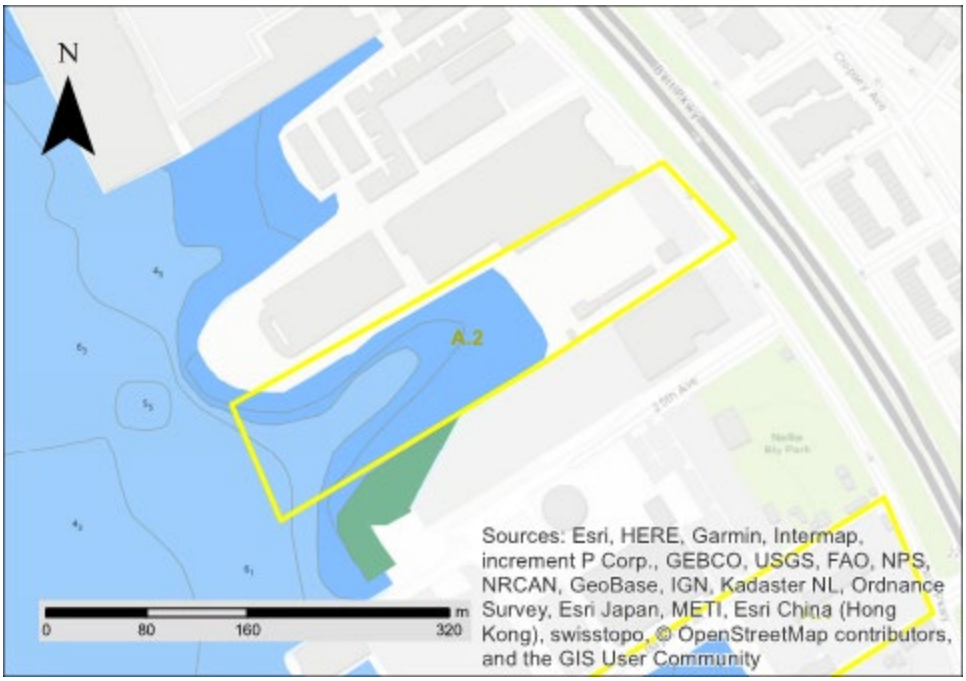


Table 10. Bayside Oil Terminal

Location	1772 Shore Parkway, Brooklyn, NY 11214
Ownership	Shore Parkway Property
Upland Area [ha]	1.5
Water Frontage [m]	80
Existing Depth [MLLW] as per NOAA Chart	Site: 0-5 m (0-16 ft.) Channel (in vicinity of site): 5-10 m (16-33 ft.)
Limiting Air Draft Restriction	None
Existing Land Use	Historical site of Bayside Oil Terminal (no longer active)
Notes	Potential development site for apartments/condos.

Jamaica Bay

The Rockaway inlet separates Manhattan Beach in Brooklyn, NY from Breezy Point, and gives vessels access to Jamaica Bay from the Atlantic Ocean. The mouth of the inlet is 22 nautical miles to the nearest WEA. The channel through the inlet is authorized to a project depth of 5.5 m (18 ft.). The entrance channel passes under the Gil Hodges Memorial Lift Bridge, which has a horizontal clearance of 145 m (475 ft.) and a vertical clearance of 16.8 m (55 ft.) when closed. The channels within the bay navigate between numerous salt marsh islands.

One potential development site has been identified outside of Jamaica Bay in Manhattan Beach; B.1 Kingsborough Community College.

Figure 10. Jamaica Bay Site Map
Source: ESRI

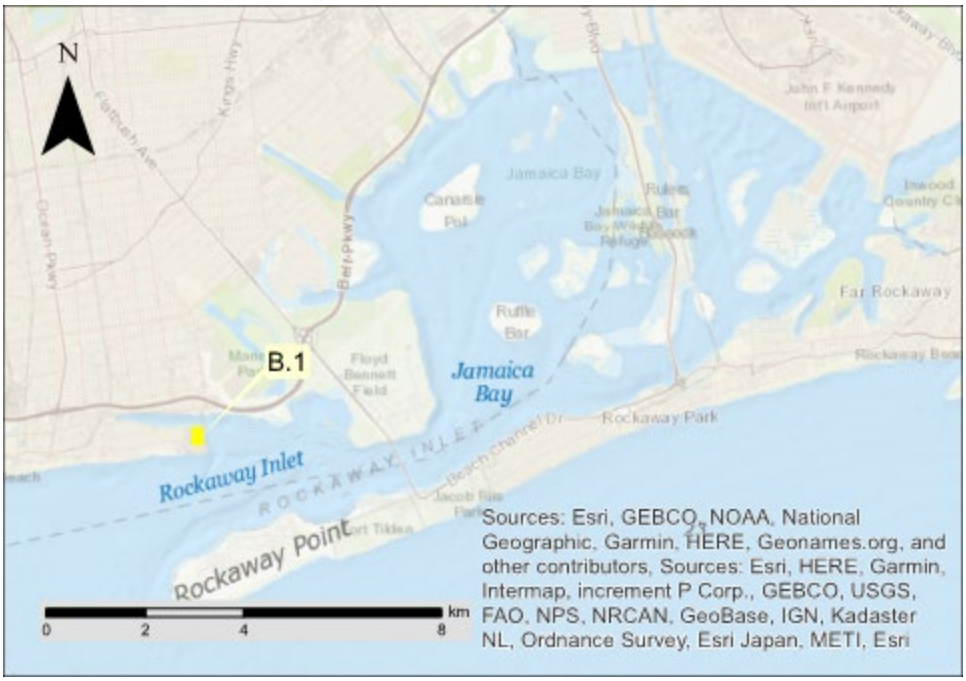


Table 11. Jamaica Bay

Location	Latitude: 40.610 N Longitude: 73.862 W
Distance to WEAs from mouth of Harbor	22 nautical miles
Navigable Depth	1 m (3 ft.) to 10 m (33 ft.)
Waterfront Land Use	Residential, light industrial and commercial, airports and uninhabited marshland.
Comments	Navigation in the center of the bay may be constrained due to the area being populated with salt marsh islands.

Figure 11. Kingsborough Community College Site Map

Source: ESRI

Table 12. Kingsborough Community College

Location	2001 Oriental Blvd, Brooklyn, NY 11235
Ownership	City University Of New York
Upland Area [ha]	25.3
Water Frontage [m]	1,420
Existing Depth [MLLW] as per NOAA Chart	Site: 0-2 m (0-6 ft.) Channel (in vicinity of site): 4-6 m (13-20 ft.)
Limiting Air Draft Restriction	None
Existing Land Use	Community College

Hempstead Bay

The East Rockaway inlet separates Far Rockaway in Queens, NY from Atlantic Beach, and gives vessels access to Hempstead Bay from the Atlantic Ocean. The mouth of the inlet is 16 nautical miles from the nearest WEA. The channel through the inlet is authorized to a project depth of 3.7 m (12 ft.) and is 76.2 m (250 ft.) wide. The channel is approximately 0.9 miles long and passes under the Atlantic Beach Bascule Bridge, which has a horizontal clearance of 38 m (125 ft.) and a vertical clearance of 7.6 m (25 ft.) when closed. Vessels then travel approximately 4.8 km to 5.8 km (3 to 3.6 miles) east through the Reynolds Channel before turning north into the Broad Channel or the Hog Island Channel to access Hewlett Bay at the northern extent of Hempstead Bay. The channels within the bay navigate between numerous salt marsh islands.

The Outer Barrier shoreline, south of Reynolds Channel, is densely populated with residential properties. The western extent of Hempstead Bay is non-traversable marshland. The eastern and northern coastlines of Hempstead Bay comprise private residences, the EF Barrett Generation Station, light industrial and commercial properties, multiple golf courses, and small vessel facilities.

Two potential development sites have been identified in Hempstead Bay: C.1 Silver Point County Park and C.2 Washington Ave Island Park.

Figure 12. Hempstead Bay Site Map
Source: ESRI

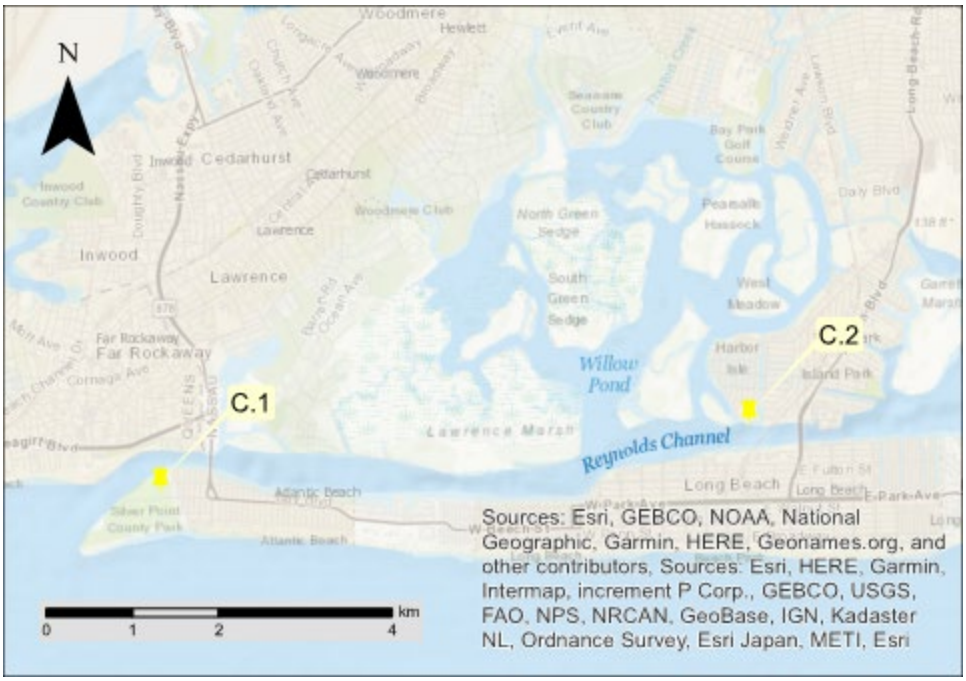


Table 13. Hempstead Bay

Location	Latitude: 40.606 N Longitude: 73.679 W
Distance to WEAs from mouth of Harbor	16 nautical miles
Navigable Depth	Channel: 3.7 m (12 ft.)
Waterfront Land Use	Residential, light industrial and commercial, golf courses and uninhabited marshland.
Comments	Navigation in the western half of the bay may be constrained due to the area being populated with salt marsh islands.

Figure 13. Silver Point County Park

Source: ESRI

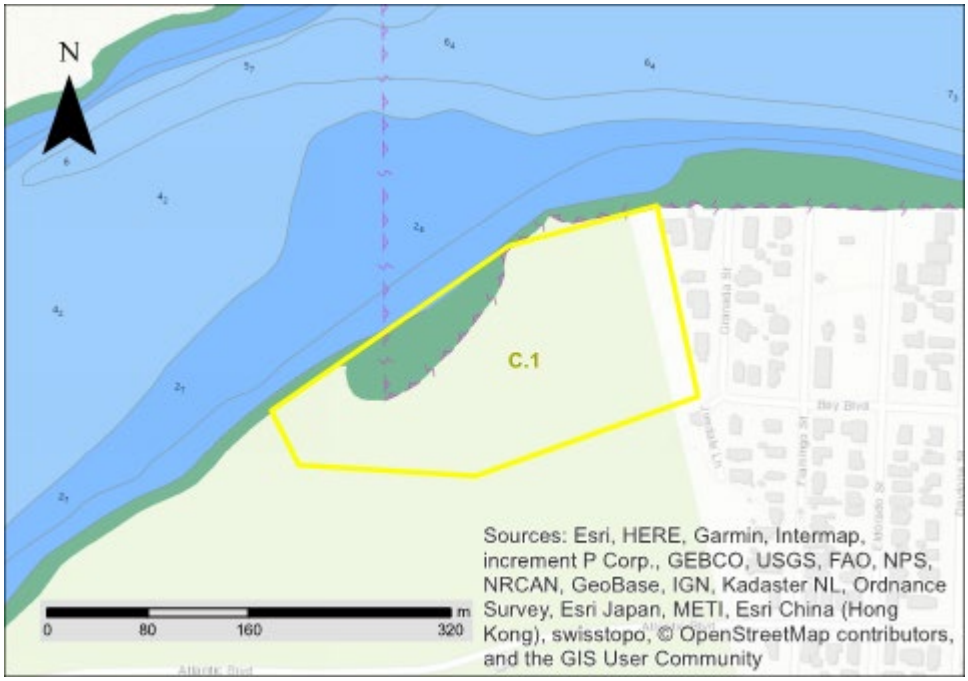


Table 14. Silver Point County Park

Location	2001 Oriental Blvd, Brooklyn, NY 11235
Ownership	Atlantic Beach Development Corp (as per most up-to-date publicly available land records dated from 2006)
Upland Area [ha]	4.3
Water Frontage [m]	350
Existing Depth [MLLW] as per NOAA Chart	Site: 0–2 m (0–6 ft.) Channel (in vicinity of site): 4–6 m (13–20 ft.)
Limiting Air Draft Restriction	None
Existing Land Use	The site appears to be undeveloped and unused based upon aerial imagery, although part of a public park
Notes	

Figure 14. Washington Ave Island Park
Source: ESRI

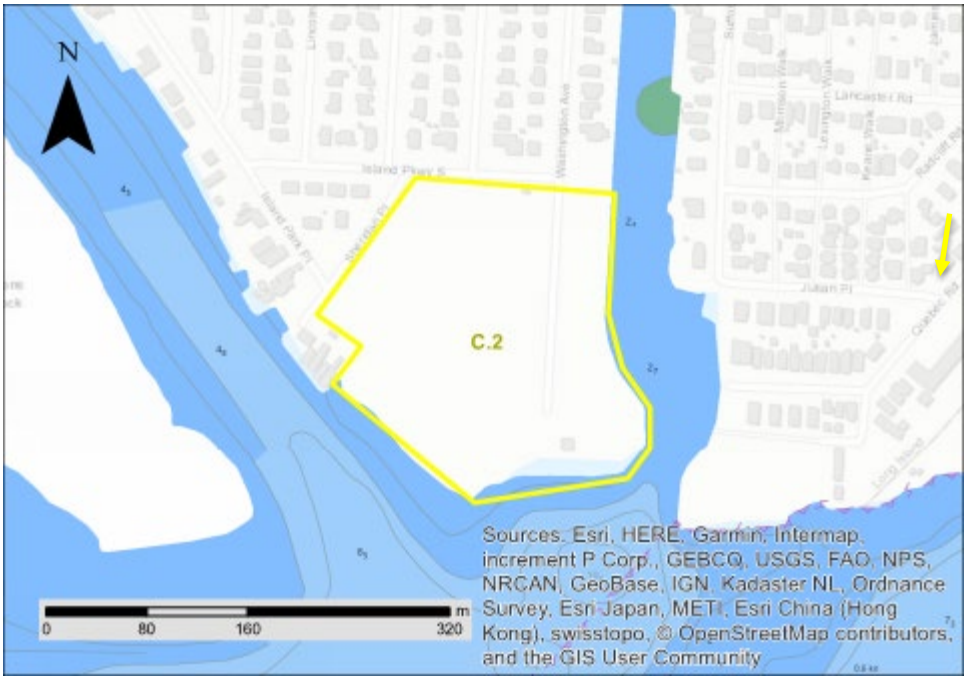


Table 15. Washington Ave Island Park

Location	15 Island Parkway South, Island Park, NY 11558
Ownership	Cibro South Shore Terminal Corp (as per most up-to-date publicly available land records dated from 2006)
Upland Area [ha]	4.9
Water Frontage [m]	510
Existing Depth [MLLW] as per NOAA Chart	Site: 0-2 m (0–6 ft.) Channel (in vicinity of site): 3–11 m (11–36 ft.)
Limiting Air Draft Restriction	Atlantic Beach Bascule Bridge: Horizontal Clearance 38 m (125 ft.) Vertical clearance of 7.6 m (25 ft.)
Existing Land Use	The site appears to be a historic commercial that is currently unmaintained and unused based upon aerial imagery. Surrounding land use is primarily residential
Notes	The site consists of two parcels

East Bay

Jones Inlet is in Nassau County, Long Island, NY, and provides vessel access to East Bay (sometimes referred to as East Hempstead Bay) from the Atlantic Ocean. Due to frequent changes in channel conditions, vessel operators should obtain local knowledge before navigating through the inlet, which is 14 nautical miles to the nearest WEA. The Jones Inlet Coast Guard Station is located on the Outer Barrier, east of the inlet. To reach East Bay, vessels follow the Sloop Channel east along the Outer Barrier and under the Meadowbrook State Parkway Bascule Bridge, which when closed, restricts vessel traffic with a vertical clearance of 6.4 m (21 ft.) and a horizontal clearance of 22.9 m (75 ft.)—the horizontal clearance is 15.2 m (50 ft.) when open. Vessels then travel north through the channels either between East Crow Island and Snipe Island, or past the Field 10 Fishing Pier between Snipe Island and Green Island to enter East Bay.

The northern shoreline of East Bay consists of multiple rivers, creeks, and inlets heavily populated with residential properties. East Bay is bounded by Meadowbrook State Parkway to the west, Jones Beach Parkway to the east, and marshland and undeveloped islands to the south.

Four potential development sites have been identified in East Bay: D.1 Area Adjacent to Coast Guard Station, Jones Beach; D.2 Jones Beach Work Docks; D.3 Freeport Industrial Area; and D.4 Hempstead Public Works Area.

Figure 15. East Bay Site Map
Source: ESRI

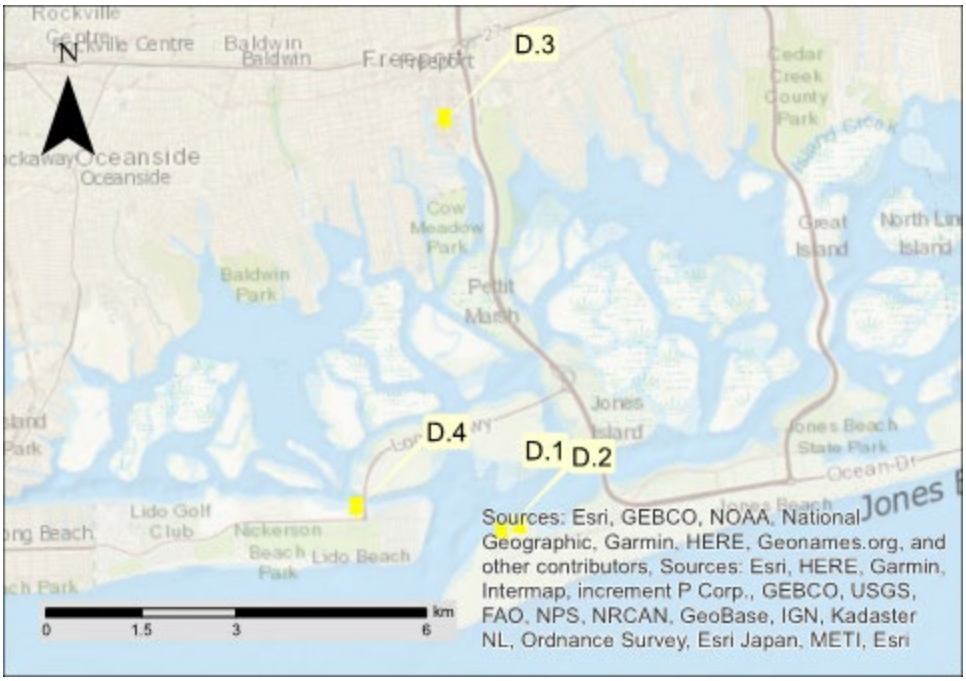


Table 16. East Bay

Location	Latitude: 40.613 N Longitude: 73.558 W
Distance to WEAs from mouth of Harbor	14 nautical miles
Navigable Depth	Channel: As per NOAA Chart 12352: "The buoys and soundings in this inlet are not charted because of continual change"
Waterfront Land Use	Primarily residential
Comments	NOAA encourages procurement of local knowledge before navigating the area due to frequently changing bottom conditions

Figure 16. Area Adjacent to Coast Guard Station, Jones Beach
Source: ESRI

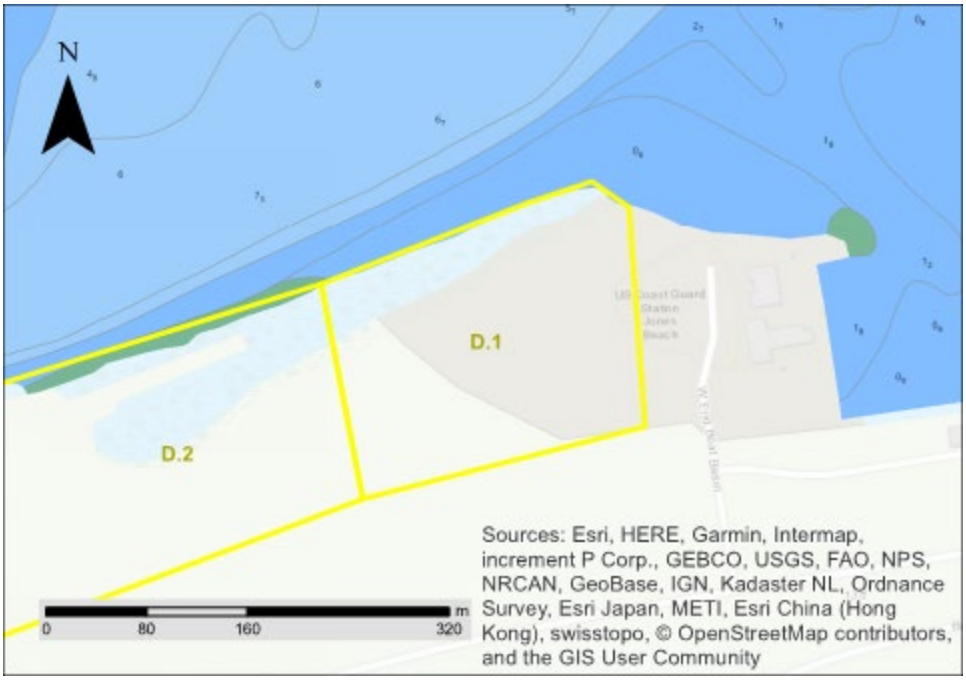


Table 17. Area Adjacent to Coast Guard Station, Jones Beach

Location	Bay Parkway, Wantagh, NY 11793
Ownership	New York State Parks, Recreation and Historic Preservation
Upland Area [ha]	4.5
Water Frontage [m]	270
Existing Depth [MLLW] as per NOAA Chart	Site: 0–2 m (0–6 ft.) Channel (in vicinity of site): 3–10 m (10–33 ft.)
Limiting Air Draft Restriction	None
Existing Land Use	The site is part of the Jones Beach State Park—the adjacent Coast Guard Station is active
Notes	This site could potentially be combined with D.2 Jones Beach "Work Docks"

Figure 17. Jones Beach "Work Docks"
Source: ESRI

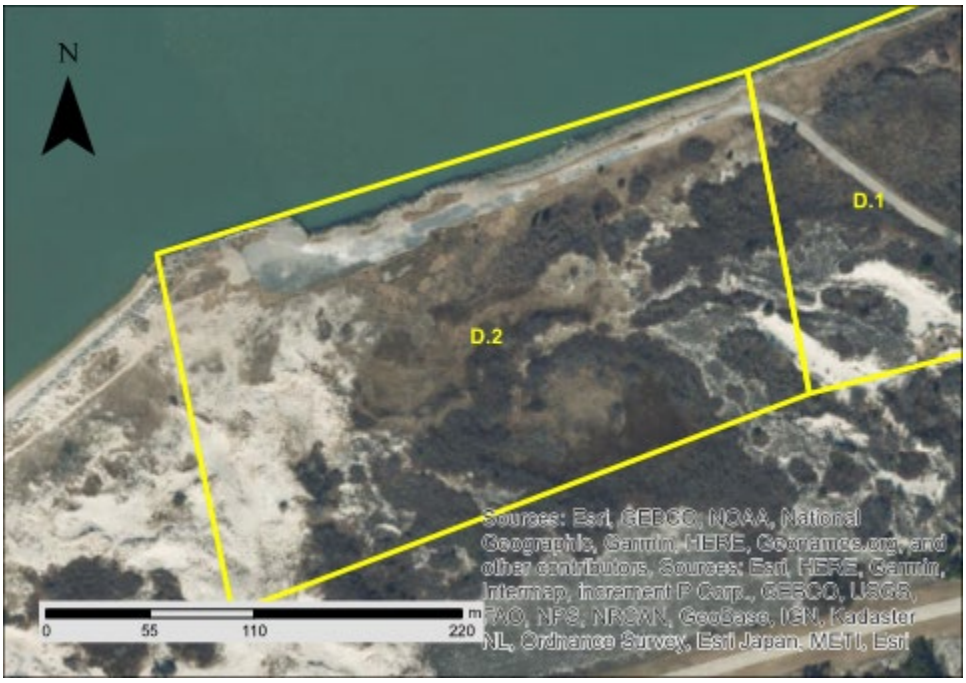


Table 18. Jones Beach "Works Docks"

Location	Bay Parkway, Wantagh, NY 11793
Ownership	New York State Parks, Recreation and Historic Preservation
Upland Area [ha]	6.0
Water Frontage [m]	330
Existing Depth [MLLW] as per NOAA Chart	Site: 0–2 m (0–6 ft.) Channel (in vicinity of site): 3–10 m (10–33 ft.)
Limiting Air Draft Restriction	None
Existing Land Use	The site is part of the Jones Beach State Park and contains a parking lot and riprap shoreline
Notes	This site could potentially be combined with D.2 Jones Beach "Work Docks"

Figure 18. Freeport Industrial Area
Source: ESRI

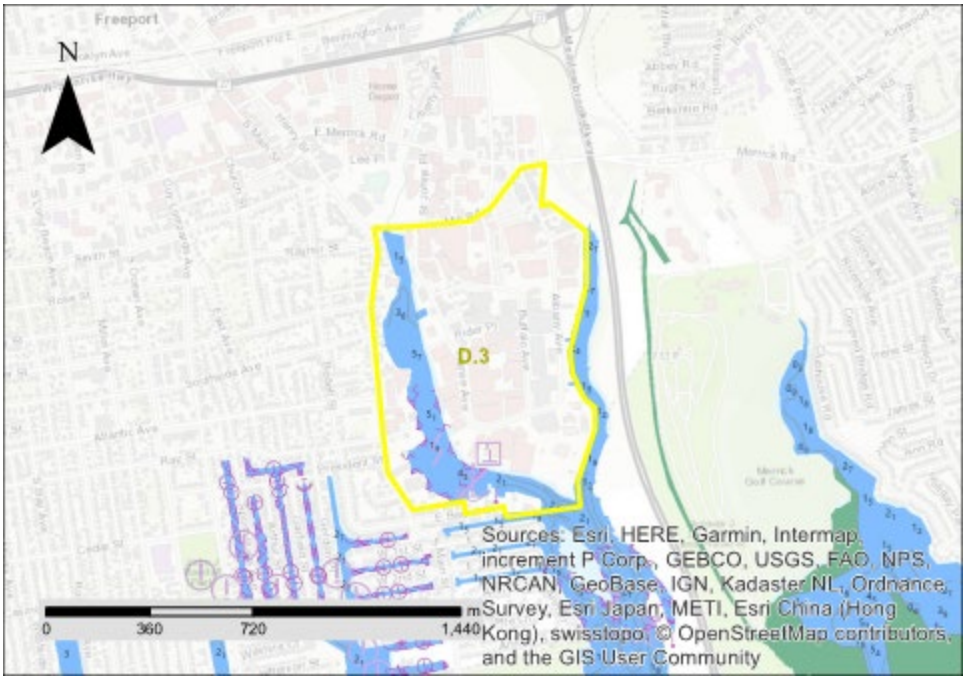


Table 19. Freeport Industrial Area

Location	Buffalo Ave/Albany Ave/S Main St, Freeport, NY 11520
Ownership	Various Owners
Upland Area [ha]	73.1
Water Frontage [m]	3,820
Existing Depth [MLLW] as per NOAA Chart	Site: 1–5 m (3–16 ft.) Channel (in vicinity of site): 2–7 m (7–23 ft.)
Limiting Air Draft Restriction	Bascule Bridge: • Horizontal Clearance 23 m (75 ft.) • Vertical clearance of 15 m (50 ft.) open
Existing Land Use	Existing commercial and light industrial facilities with waterfront users
Notes	This site contains numerous parcel and owners

Figure 19. Hempstead Public Works Area
Source: ESRI

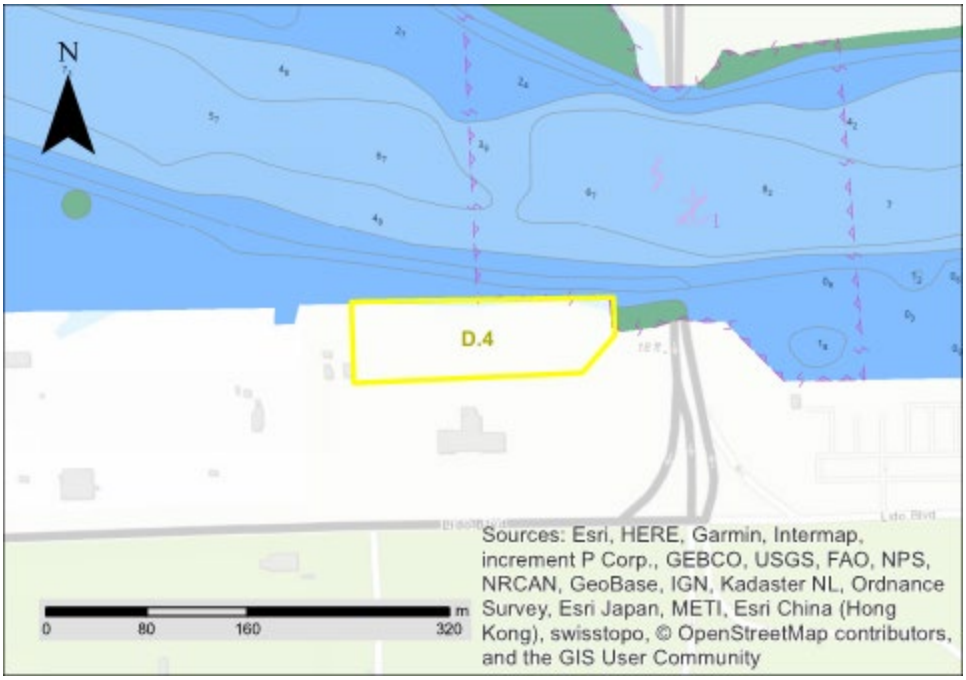


Table 20. Hempstead Public Works Area

Location	1401 Lido Blvd, Point Lookout, NY 11569
Ownership	Town of Hempstead
Upland Area [ha]	1.2
Water Frontage [m]	240
Existing Depth [MLLW] as per NOAA Chart	Site: 0–2 m (0–6 ft.) Channel (in vicinity of site): 4–6 m (13–20 ft.)
Limiting Air Draft Restriction	Fixed Bridge: Horizontal Clearance 9 m (30 ft.) Vertical clearance of 6 m (20 ft.)
Existing Land Use	Existing public works facility adjacent to commercial and light industrial facilities with waterfront uses

Great South Bay

Great South Bay is the largest bay along the south shore of Long Island, occupying approximately 243 square kilometers (151 square miles). For this assessment, Great South Bay includes Nicoll Bay, Patchogue Bay, and Bellport Bay.

Vessels access Great South Bay from the Atlantic Ocean by traveling north through the Fire Island Inlet. Due to frequently changing channel conditions, vessel operators should obtain local knowledge before navigating through the inlet; mariners are warned of extreme tidal turbulence in the inlet. The mouth of the inlet is 18 nautical miles to the nearest WEA. Vessels traversing the Fire Island Inlet pass under the southern span of the Robert Moses Causeway Bridge, which restricts air draft to 19.8 m (65 ft.) for the middle 141 m (646 ft.) of the center span. Vessels then navigate east through the Farm Shoals Channel before entering the main bay by either heading north through the West Channel or east through the East Channel. Navigation within the bay is marked by buoys and beacons maintained by State and local agencies.

The main body of Great South Bay extends west from Heckscher State Park to the Nassau Shores in East Massapequa. The northern shoreline is populated with numerous inlets, coves, and creeks and is predominantly occupied by residential properties. Multiple waterfront facilities along the northern coastline include various marinas, yacht clubs, and fishing charters. The southern shoreline along the Outer Barrier comprises residential properties, Robert Moses State Park, and multiple undeveloped islands and marshland areas. The bay is crossed by the northern span of the Robert Moses Causeway Bridge, which has an authorized vertical clearance of 18.3 m (60 ft.) for the middle 140.2 m (460 ft.). West of the bridge, navigation becomes complicated as severe shoaling is frequently reported.

Two potential development sites have been identified in Great South Bay; E.1 Unnamed Parcel—Town of Babylon and E.2 Captree State Park—Land Adjacent to Captree Boat Basin.

Figure 20. Great South Bay Site Map
Source: ESRI

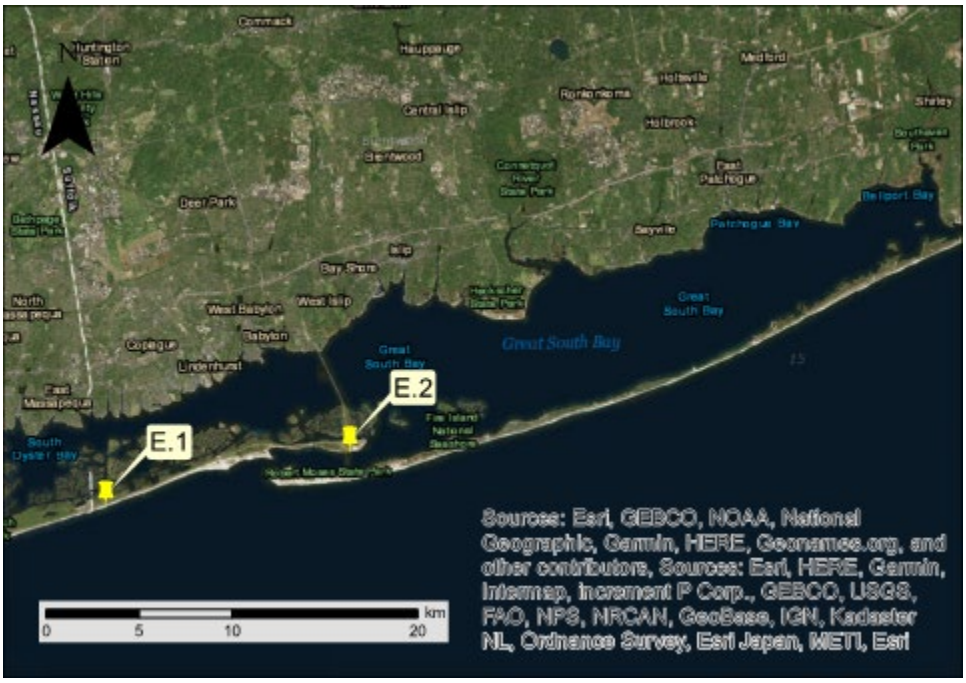


Table 21. Great South Bay

Location	Latitude: 40.677 N Longitude: 73.155 W
Distance to WEAs from mouth of Harbor	18 nautical miles
Navigable Depth	Channel Varies: 1.5 m (5 ft.) Bellport Bay Reach and Long Island Intracoastal Waterway
Waterfront Land Use	Residential, light commercial, park, recreational, undeveloped, wildlife refuge
Comments	Severe shoaling is frequently reported in the Great South Bay—vessel navigation is not recommended through Bellport Inlet

Figure 21. Unnamed Parcel: Town of Babylon
Source: ESRI

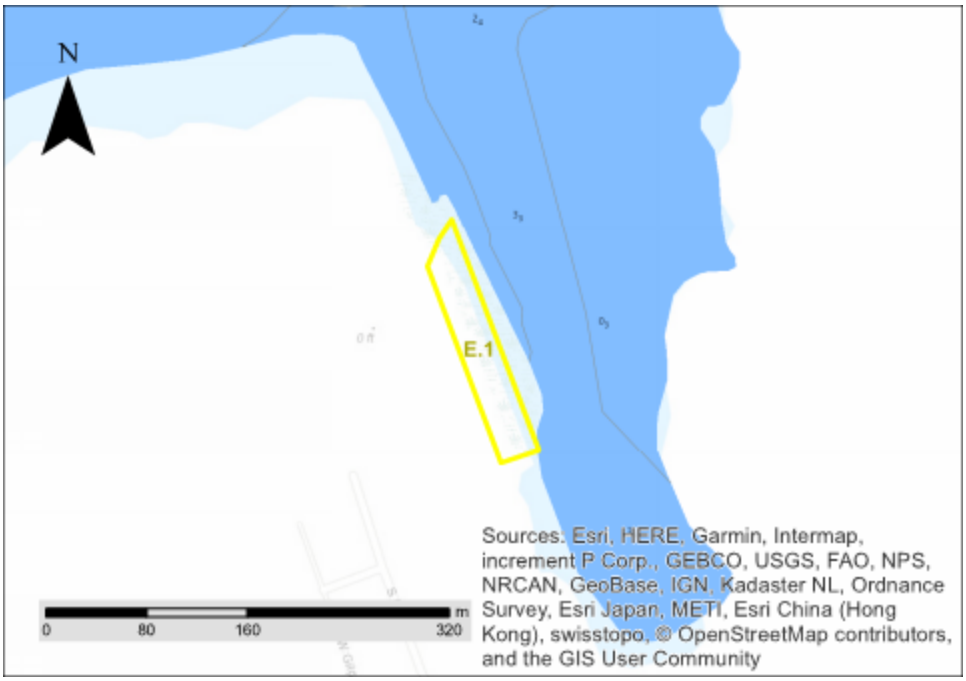


Table 22. Unnamed Parcel – Town of Babylon

Location	Gilgo Beach, Babylon, NY 11702
Ownership	Unknown: Not publicly available
Upland Area [ha]	0.6
Water Frontage [m]	200
Existing Depth [MLLW] as per NOAA Chart	Site: ~3 m (~10 ft.) Channel (in vicinity of site): 2–5 m (8–16 ft.)
Limiting Air Draft Restriction	Robert Moses Fixed Bridge: • Horizontal Clearance 141 m (464 ft.) • Vertical clearance of 20 m (65 ft.) Bascule Bridge: • Horizontal Clearance 30 m (100 ft.) • Vertical clearance of 9 m (29 ft.)
Existing Land Use	Undeveloped.
Notes	Site termed as 'Unqua Corinthian Yacht Club' in 2017 Ports Study. Significant inshore distance (~14 miles from mouth of inlet) to reach site.

Figure 22. Captree State Park: Land Adjacent to Captree Boat Basin
Source: ESRI

Table 23. Captree State Park – Land Adjacent to Captree Boat Basin

Location	East Ocean Parkway, Babylon, NY 11702
Ownership	New York State Parks, Recreation and Historic Preservation
Upland Area [ha]	4.3
Water Frontage [m]	280
Existing Depth [MLLW] as per NOAA Chart	Site: ~3 m (~10 ft.) Channel (in vicinity of site): 2–5 m (8–16 ft.)
Limiting Air Draft Restriction	Robert Moses Fixed Bridge: Horizontal Clearance 141 m (464 ft.) Vertical clearance of 20 m (65 ft.)
Existing Land Use	Undeveloped. Adjacent to recreational dock and boat ramp, both of which are in use.

Shinnecock Bay

Located at the western extent of the South Fork of Long Island, Shinnecock Bay has two access points from open water. The Shinnecock Inlet faces south, breaching the Outer Barrier, which is south of Long Island and runs 161 km (100 miles) from New York City to South Hampton, NY. The inlet was created by the Hurricane of 1938 and gives vessels direct access to the Atlantic Ocean. Shinnecock Inlet frequently exhibits strong currents and frequent changes in channel conditions. Vessels leaving the inlet have a distance of 15 nautical miles to the nearest WEA.

Shinnecock Bay may also be accessed through the Shinnecock Canal, which faces north into Great Peconic Bay. The canal is approximately 1,400 m (4,700 ft.) long and is spanned by multiple bridges and overhead power cables, as detailed from south to north in Table 24. The Shinnecock Locks further restrict vessel traffic to a width of 12.5 m (41 ft.) and a length of 76.2 (250 ft.). Vessels leaving the northern mouth of the canal have 62 nautical miles to the nearest WEA. The controlling depth at mean lower low water was 1.8 m (6 ft.) as of August 1978. Multiple marinas and waterfront facilities occupy the shoreline along the canal.

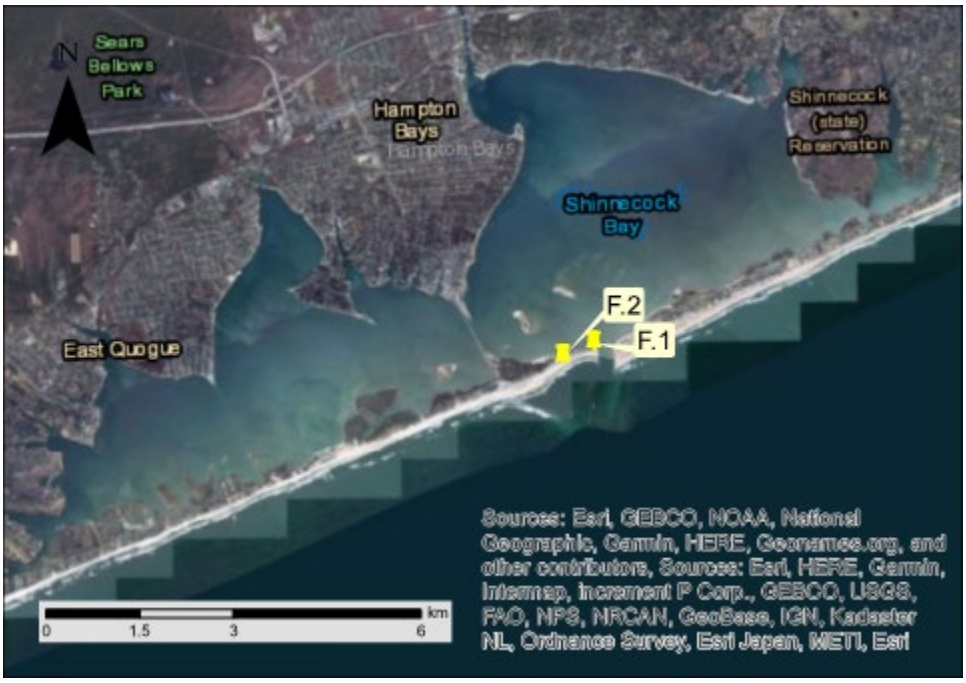
Table 24. Air Draft Restrictions along Shinnecock Canal

Crossing (Listed South to North)	Vertical Clearance above MHW
Overhead Power and TV Cables	10.4 m (34 ft.)
Montauk Highway Fixed Bridge	7.6 m (25 ft.)
Shinnecock Railway Bridge	6.7 m (22 ft.)
Overhead Power Cables	13.4 m (44 ft.) and 11.6 m (38 ft.)
Sunrise Highway Fixed Bridge	7.0 m (23 ft.)

Shinnecock Bay is spanned by the Ponquogue Bridge, which connects Hampton Bays to Ponquogue Beach on the Outer Barrier. The bridge restricts vessel traffic with a vertical clearance of 16.8 m (55 ft.) and a horizontal clearance of 30.8 m (101 ft.). Navigation along the Long Island Intracoastal Waterway is further restricted by a federal project depth of 1.5 m (5 ft.); NOAA recommends obtaining local knowledge before navigating the waterway due to frequent shoaling reports. The U.S. Coast Guard Station Shinnecock is adjacent to the northern extent of the bridge facing east into Shinnecock Bay. West of the bridge, the Shinnecock Bay shoreline is predominantly composed of residential properties and undeveloped marshland. A non-encompassing list of waterfront facilities west of Ponquogue Bridge includes Hampton Landing Marina, Ponquogue Marine Basin, Ponquogue Marina in Hampton Bays, and Aldrich Boat Yard in East Quogue.

Two potential development sites have been identified in Shinnecock Bay: F.1 Charles F. Altenkirch County Park, Alternative 1 and F.2 Charles F. Altenkirch County Park, Alternative 2.

Figure 23. Shinnecock Bay
Source: ESRI



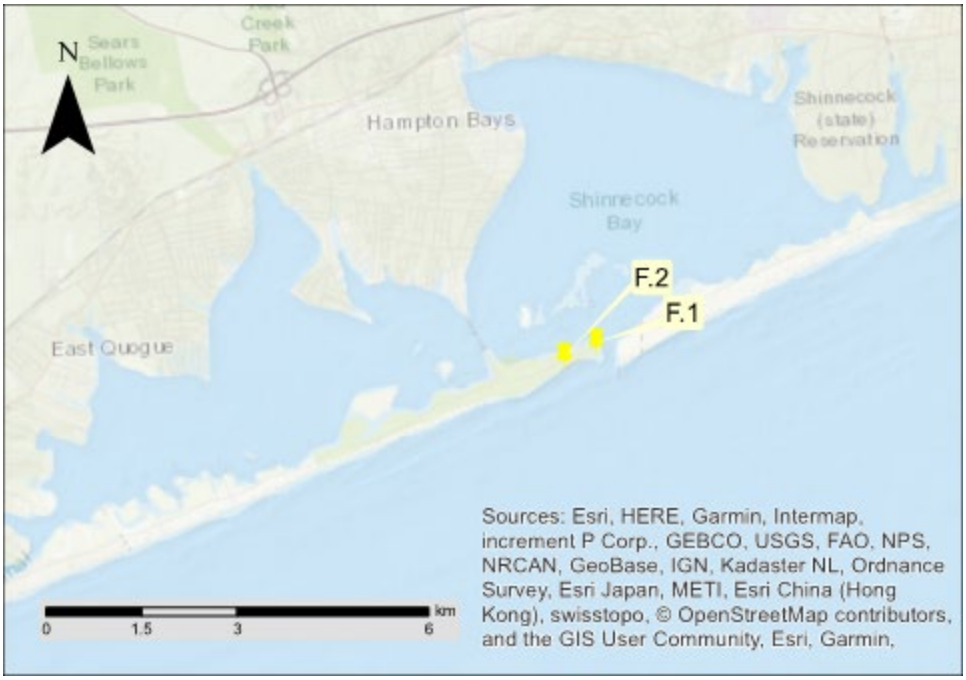


Table 25. Shinnecock Bay

Location	Latitude: 40.859 N Longitude: 72.484 W
Distance to WEAs from mouth of Harbor	15 nautical miles (62 nautical miles through the Canal)
Navigable Depth	Channel: 1.8 m (6 ft.) as of 1978
Waterfront Land Use	Residential, light commercial, parks
Comments	Due to frequent changes in channel conditions, vessel operators should obtain local knowledge before navigating through the inlet

Figure 24. Charles F. Altenkirch County Park, Alternative 1

Source: ESRI

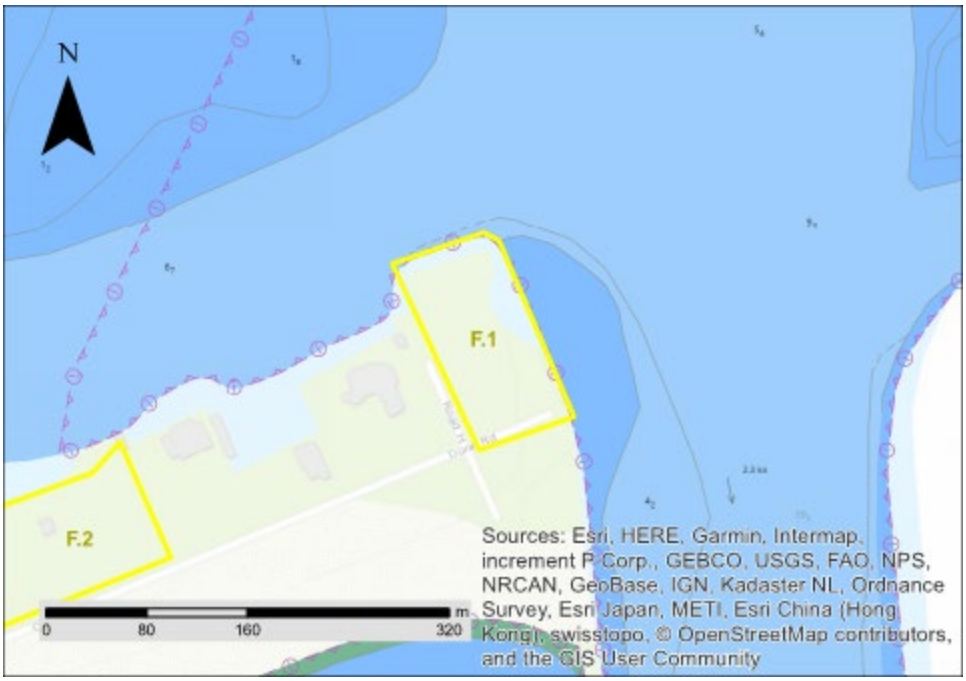


Table 26. Charles F. Altenkirch County Park, Alternative 1

Location	373 Dune Road, Southampton, NY 11968
Ownership	Suffolk County, New York
Upland Area [ha]	1.3
Water Frontage [m]	240
Existing Depth [MLLW] as per NOAA Chart	Site: 0–6 m (0–22 ft.) Channel (in vicinity of site): 2–10 m (7–33 ft.)
Limiting Air Draft Restriction	None
Existing Land Use	Public area, adjacent to commercial businesses (restaurants, marinas), a parking lot, and sandy land. Revetment outlines the site.
Notes	

Figure 25. Charles F. Altenkirch County Park, Alternative 2

Source: ESRI

Table 27. Charles F. Altenkirch County Park, Alternative 2

Location	Dune Road, Southampton, NY 11968
Ownership	Suffolk County, New York
Upland Area [ha]	4.7
Water Frontage [m]	490
Existing Depth [MLLW] as per NOAA Chart	Site: 0–6 m (0–22 ft.) Channel (in vicinity of site): 2–10 m (7–33 ft.)
Limiting Air Draft Restriction	None
Existing Land Use	Site appears to be in use based on aerial imagery. Consists of a boat slip, recreational docks, a parking lot, and undeveloped land. Adjacent to commercial businesses (restaurants, marinas).

Lake Montauk

Lake Montauk is an approximate 3.6 square km (1.4 square miles) saltwater lake located at the eastern extent of the South Fork of Long Island. The entrance to the inlet faces north into Block Island Sound and is restricted by a navigable width of 45.7 m (150 ft.) and navigable depth of 3.7 m (12 ft.). There are no published air draft restrictions based upon the NOAA navigation chart; however, the nearby Montauk Airport may affect air draft restrictions if tall components are moved to the area. Montauk Harbor occupies the northern extent of the lake between Lake Montauk and the inlet. Navigable draft in outer parts of Lake Montauk range typically from 3.0 m to 4.6 m (10 ft to 18 ft.). Draft in Lake Montauk past Star Island and the Gone Fishing Marina is limited to 1.8 m to 2.4 m (6 ft to 8 ft.). Vessels departing Montauk Harbor have approximately 34 nautical miles to the nearest WEA.

Montauk Harbor and Lake Montauk are home to multiple yacht clubs, charters, and marinas. The area is an active recreational and commercial fishing location. Private residences comprise much of the shoreline of the lake. However, multiple government and commercial properties occupy the shoreline of Montauk Harbor. The lake is active with recreational summer activities in June, July, and August. There are multiple fuel and mechanical facilities in the harbor. The commercial and charter fishing industries remain active in Montauk through early December. During the offseason, the area is mostly empty of recreational vessels.

One potential development site has been identified in Lake Montauk; G.1 Nine-Acre Compound for Sale.

Figure 26. Lake Montauk Site Map
Source: ESRI

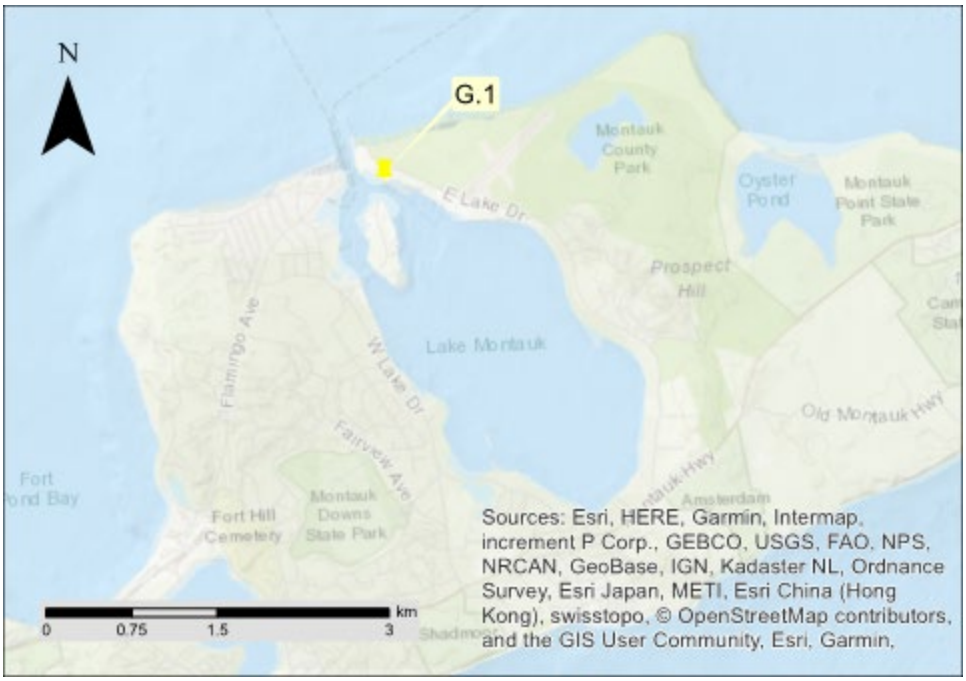


Table 28. Lake Montauk

Location	Latitude: 41.062 N Longitude: 71.921 W
Distance to WEAs from mouth of Harbor	34 nautical miles
Navigable Depth	Channel: Reach A (east): 3.7 m (12 ft.); Reach B (west, boat basin): 3 m (10 ft.)
Waterfront Land Use	Residential, commercial, marinas, government
Comments	Montauk Harbor comprises the area at the northern extent of Lake Montauk including the inlet and Channel Reaches A and B.

Figure 27. 9-Acre Compound for Sale
Source: ESRI

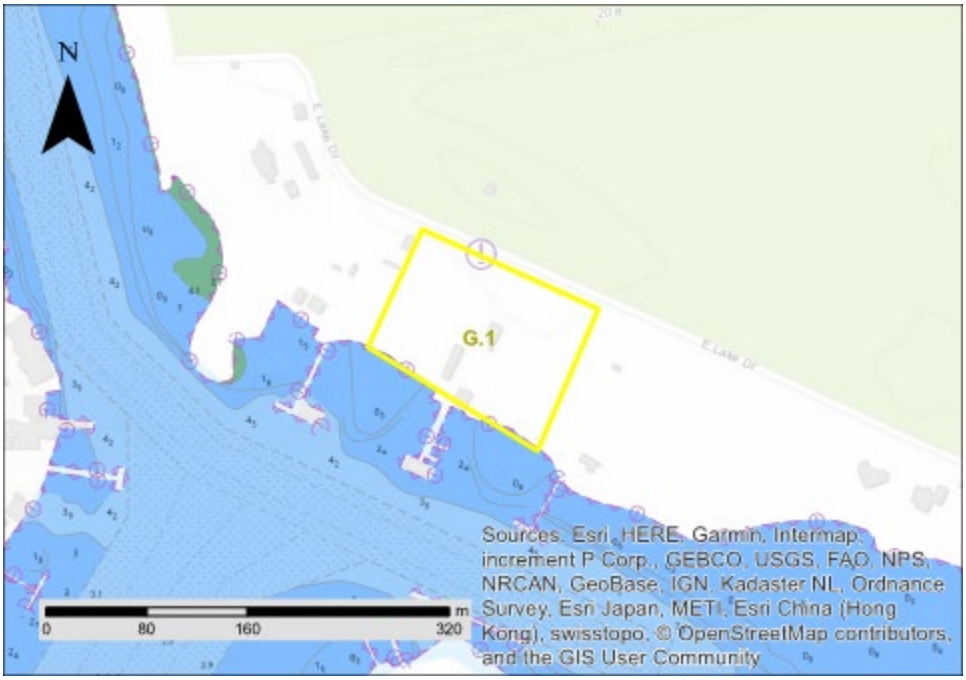


Table 29. Nine-Acre Compound for Sale

Location	521 East Lake Drive, Montauk, NY 11954
Ownership	Entenmann's Family (as reported by East Hampton Harbormaster)
Upland Area [ha]	1.7
Water Frontage [m]	160
Existing Depth [MLLW] as per NOAA Chart	Site: 0–3 m (0–10 ft.) Channel (in vicinity of site): 3-4 m (10–12 ft.)
Limiting Air Draft Restriction	Montauk Airport
Existing Land Use	Residential/commercial with waterfront dock. Adjacent to commercial businesses (restaurants, marinas)
Notes	Site is advertised to be composed of four parcels that are for sale, deep water docks, and zoned as residential and commercial

Greenport

Greenport Village is located in the town of Southhold, Suffolk County on the south shore of the North Fork of Long Island. Its railroad terminal is the eastern terminus of the Long Island Railroad. Greenport Village is approximately 3.1 square kilometers (1.2 square miles) in size. In order to reach open water, vessels depart Greenport harbor, transiting east Gardiners Bay. From there, vessels may turn north into Long Island Sound, or continue east into Block Island Sound and then South around Montauk Point into the Atlantic Ocean.

Water depth within Greenport Harbor typically ranges from 2.4 to 4.6 m (8 to 15 ft.). Water depth in the channel from Gardiners Bay is typically 10.7 to 24.4 m (35 to 80 ft.), though is limited to a navigational depth of approximately 6.1 to 7.6 m (20 to 25 ft.) due to the shoal off Cleaves Point. The channel is federally maintained, though does not require frequent maintenance. There are no published air draft or horizontal clearance restrictions. The average maximum ebb and flood current is approximately 1.6 knots.

Greenport Village Center is home to a variety of older, larger waterfront infrastructure supporting several uses, including yacht and shipbuilding, ferry landing, recreational boating, restaurants and shops. The shoreline west of the center is less developed, with two fixed wooden piers, along with residential docks, bulkheads and sandy beaches. East of the village center is Stirling Basin, which is comprised of numerous recreational marinas that accommodate vessels up to approximately 27.4 m (90 ft.).

Figure 28.Greenport Village Site Map

Source: ESRI

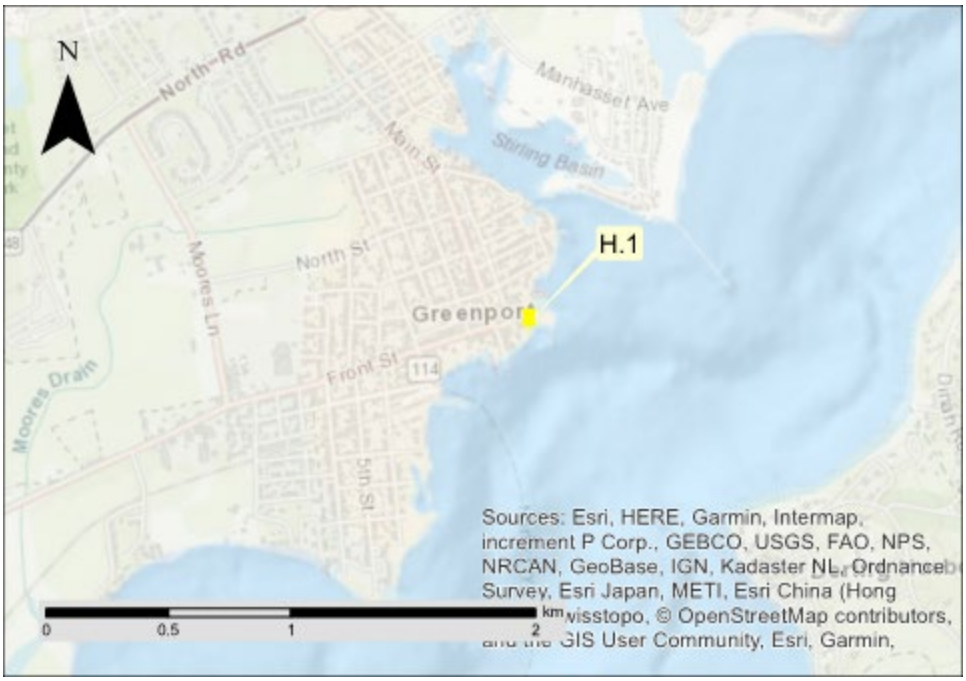


Table 30. Greenport Village

Location	Latitude: 41.103 N Longitude: 72.358 W
Distance to WEAs from mouth of Harbor	47 nautical miles
Navigable Depth	Harbor: 2.4–4.6 m (8–15 ft.) Entrance Channel: 6.1–7.6 m (20–25 ft.)
Waterfront Land Use	light commercial, recreational, marina, residential
Comments	General community support to preserve working waterfront

Figure 29. Greenport Yacht and Ship Building Company
Source: ESRI

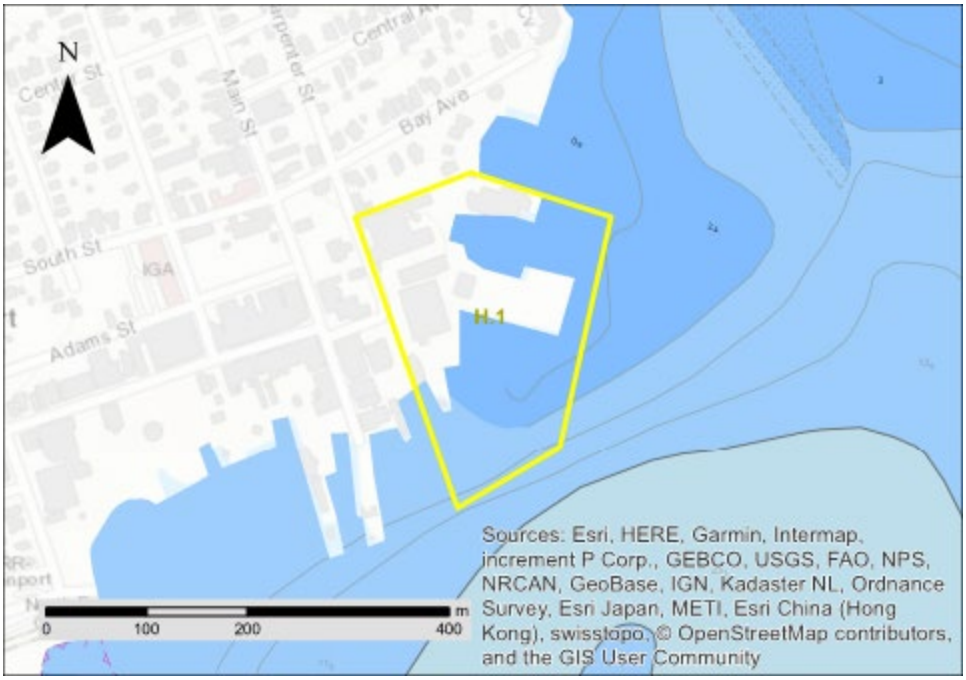


Table 31. Greenport Yacht & Ship Building Company

Location	201 Carpenter Street, Greenport, NY 11944
Ownership	Greenport Yacht And Shipbuilding Co
Upland Area [ha]	2.3
Water Frontage [m]	650
Existing Depth [MLLW] as per NOAA Chart	Approx. 2.4 m (8 ft.)
Limiting Air Draft Restriction	None
Existing Land Use	Residential/commercial with waterfront dock. Adjacent to commercial businesses (restaurants, marinas)
Notes	Zoned waterfront commercial Stidd Systems, Inc. (marine supplier) is located on the property

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