ESSENTIAL FISH HABITAT (EFH) ASSESSMENT

APPENDIX

NASSAU COUNTY BACK BAYS COASTAL STORM RISK MANAGEMENT FEASIBILITY STUDY

PHILADELPHIA, PENNSYLVANIA

APPENDIX G3

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Nassau County Back Bays Study

U.S. Army Corps of Engineers
Philadelphia District

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LIST OF ACRONYMS

EFH	Essential Fish Habitat
CFR	Code of Federal Regulation
CI	Critical Infrastructure
CSRM	Coastal Storm Risk Management
ERDC	Engineering Research and Design Center
FMP	Fishery Management Plans
FWOP	Future Without Project
GMFMC	Gulf of Mexico Fisheries Management Council
HAPC	Habitat Areas of Particular Concern
HEC-FDA	Hydraulic Engineering Center – Flood Damage Reduction Analysis
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSL	Mean Sea Level
NACCS	North Atlantic Coast Comprehensive Study
NAVD88	North Atlantic Vertical Datum of 1988
NCBB	Nassau County Back Bays
NMFS	National Marine Fisheries Service
NNBF	Natural and Nature-Based Features
NOAA	National Oceanic and Atmospheric Administration
NS	Non-structural
NYSDEC	New York State Department of Environmental Conservation
SAV	Submerged Aquatic Vegetation
SLC	Sea Level Change
TSP	Tentatively Selected Plan
USACE	United States Army Corps of Engineers
WWTP	Wastewater Treatment Plant

1.0 Introduction

Pursuant to Section 305 (b)(2) of the Magnuson-Stevens Fishery Conservation &

Management Act, the U.S. Army Corps of Engineers (USACE) is required to prepare an

Essential Fish Habitat (EFH) Assessment for the Nassau County Back Bays (NCBB) Coastal Storm Risk Management (CSRM) Feasibility Study. The NCBB CSRM Study investigates CSRM problems and solutions to reduce damages from coastal flooding that affects population, critical infrastructure, critical facilities, property, and ecosystems. The purpose of the NCBB CSRM Feasibility Study is to identify a plan for implementation of comprehensive CSRM strategies to increase resilience and to reduce risk from future storms and compounding impacts of sea level change (SLC).

The Atlantic Coast of New York is fronted by an effective Federal CSRM program (USACE, 2013). However, the NCBB back bay region currently lacks a comprehensive CSRM program. As a result, the NCBB region experienced major impacts and devastation during Hurricane Sandy and subsequent coastal events, thus damaging property and disrupting millions of lives owing to the low elevation of the landscape and the presence of highly developed residential and commercial infrastructure along the coastline.

The NCBB is one of nine focus areas identified in the North Atlantic Coast Comprehensive Study (NACCS), whose goals are to:

a. Provide a risk management framework, consistent with National Oceanic and Atmospheric Administration (NOAA)/USACE Infrastructure Systems Rebuilding Principles; and

b. Support resilient coastal communities and robust, sustainable coastal landscape systems, considering future sea level and climate change scenarios, to reduce risk to vulnerable populations, property, ecosystems, and infrastructure.

While the NACCS provides a regional scale analysis, the NCBB CSRM Study will employ NACCS outcomes and apply the NACCS CSRM Framework to formulate a more refined and detailed watershed scale analysis to include potential municipal or community level implementation opportunities, strategies and measures to assist in enabling communities to understand and manage their short-term and long-term coastal risk in a systems context.

1.1 Role of National Marine Fisheries Service (NMFS) in Essential Fish Habitat

Congress enacted amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (PL 94-265) in 1996 that established procedures for identifying EFH and required interagency coordination to further the conservation of federally managed fisheries. Rules published by the NMFS (50 Code of Federal Regulation [CFR] 600.805–600.930) specify that any Federal agency that authorizes, funds, or undertakes, or proposes to authorize, fund, or undertake an activity that could adversely affect EFH is subject to the consultation provisions of the above-mentioned act and identifies consultation requirements. EFH is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” EFH is separated into estuarine and marine components. The estuarine component is defined as “all estuarine waters and substrates (mud, sand, shell, rock, and associated biological communities); subtidal vegetation (seagrasses and algae); and adjacent intertidal vegetation (marshes and mangroves).” The marine component is defined as “all marine waters and substrates (mud, sand, shell, rock, and associated biological communities) from the shoreline to the seaward limit of the Exclusive Economic Zone" (Gulf of Mexico Fisheries Management Council [GMFMC], 2004). Adverse effect to EFH is defined as, "any impact, which reduces quality and/or quantity of EFH…" and may include direct, indirect, site specific or habitat impacts, including individual, cumulative, or synergistic consequences of actions.

The Nassau County Back Bays have been designated as EFH for a variety of life stages of fish managed under the New England Fishery Management Council, the Mid-Atlantic Fishery Management Council and NOAA/NMFS. Species designated in the NCBB area include Mid-Atlantic, New England, and highly migratory species as well as a number of sharks.

The NMFS and fishery management council roles in EFH are described in 67 FR 2343. Through Subpart J, fishery management councils must identify Fishery Management Plans (FMPs) EFH for each life stage of each managed species in the fishery management unit. The regulations also provide that councils should organize information on the habitat requirements of managed species using a four-tier approach based on the type of information available; identify as EFH those habitats that are necessary to the species for spawning, breeding, feeding, or growth to maturity; describe EFH in text and must provide maps of the geographic locations of EFH or the geographic boundaries within which EFH for each species and life stage found; identify EFH that is especially important ecologically or particularly vulnerable to degradation as "habitat areas of particular concern" (HAPC) to help provide additional focus for conservation efforts; and must evaluate the potential adverse effects of fishing activities on EFH and must include in FMPs management measures that minimize adverse effects to the extent practicable. Additionally, councils must identify other activities that may adversely affect EFH and recommend actions to reduce or eliminate these effects.

Through Subpart K, "NMFS will make available descriptions and maps of EFH to promote EFH conservation and enhancement. The regulations encourage Federal agencies to use existing environmental review procedures to fulfill the requirement to consult with NMFS on actions that may adversely affect EFH, and they contain procedures for abbreviated or expanded consultation in cases where no other environmental review process is available. Consultations may be conducted at a programmatic and/or project-specific level. In cases where adverse effects from a type of actions will be minimal, both individually and cumulatively, a General Concurrence procedure further simplifies the consultation requirements. The regulations encourage coordination between NMFS and the Councils in the development of recommendations to Federal or state agencies for actions that would adversely affect EFH. Federal agencies must respond in writing within 30 days of receiving EFH Conservation Recommendations from NMFS. If the action agency's decision is inconsistent with NMFS' EFH Conservation Recommendations, the agency must explain its reasoning and NMFS may request further review of the decision. EFH Conservation Recommendations are non-binding."

1.2 Study Area

The study area covers Nassau County (east to west) along the south shore of Long Island, directly east of New York City (Figure 1). The study area encompasses the areas that are tidally influenced bays and estuaries hydraulically connected to the south shore of Nassau County on the Atlantic Ocean. Specifically, the towns within the study area in Nassau County include East Massapequa, Long Beach, Bellmore, Oceanside, East Rockaway, Massapequa, Atlantic Beach, Merrick, Island Park, Lynbrook, Seaford, Lido Beach, Freeport, Rockville Center, Hewlett, Jones Beach, Wantagh, Baldwin, West Hempstead, Woodmere, Cedarhurst, Lawrence, Far Rockaway, Inwood, Valley Stream, and West Hempstead. The back bay area of Nassau County has hydraulic connections to areas to the west in Queens County, NY, and Suffolk County NY to the east. Upland areas in the vicinity of the Project have been committed to residential, commercial and recreational development. Near shore and upper beach areas in the Project area are heavily utilized for beach recreation (USACE 2015).

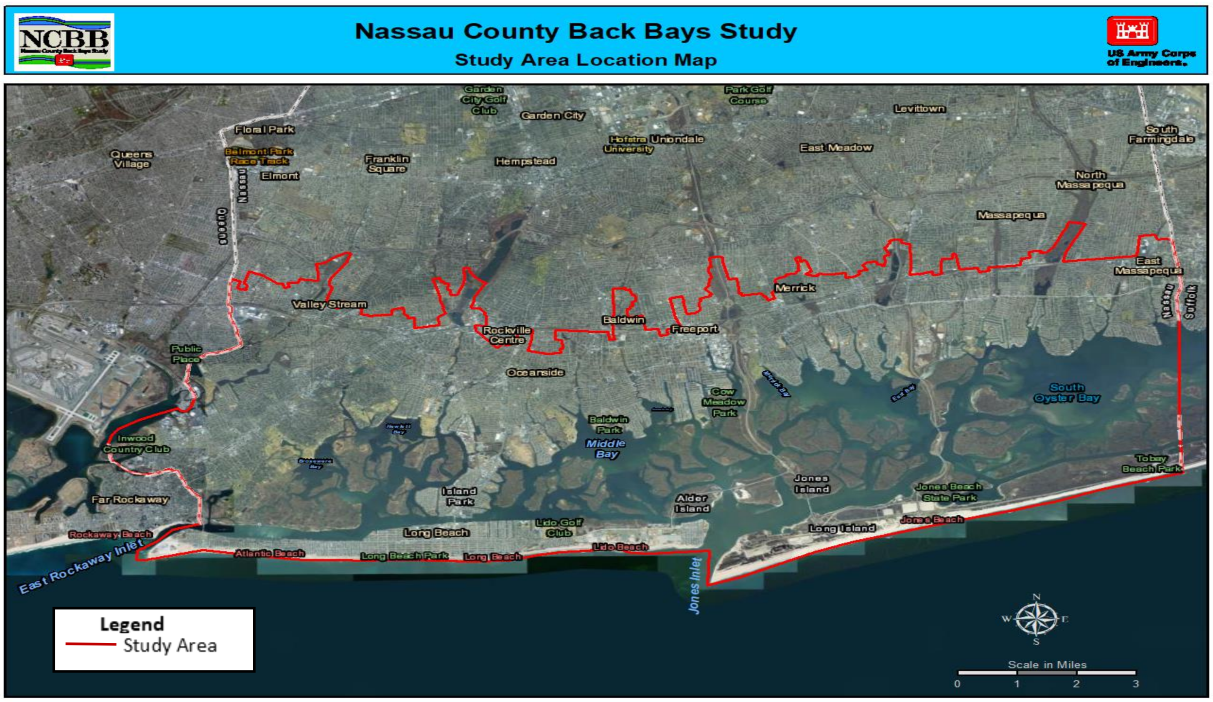


Figure 1: Study Area

The study area is located in the Atlantic Coastal Plain Physiographic Province (Pickman 1993). Topography is low-lying, flat terrain with elevations less than 100 feet above MSL, but primarily less than 20 ft above MSL. Dominant landforms consist of shallow brackish lagoons and low relief sandy barrier islands and associated dunes.

The action area included in this assessment is defined as all areas that may be affected directly or indirectly by the Federal action and not limited to merely the immediate area of the Study Area. It encompasses the geographic extent of environmental changes (i.e., the physical, chemical and biotic effects) that will result directly and indirectly from the action.

1.3 Alternatives Considered

Alternative development started with the consideration of management measures:

- Structural: floodwalls (permanent, deployable or crown walls), levees, bulkheads, storm surge barriers (inlet closures and cross bay barriers), beach nourishment, seawalls and revetments;
- Non-structural: Physical non-structural measures (buyout/acquisition, dry flood proofing, wet flood proofing, elevation and relocation), and non-physical, non-structural measures (evacuation plans, flood emergency preparedness plans, floodplain mapping, land use regulation, risk communication, zoning, flood Insurance and flood warning systems); and

- NNBF: living shorelines, reefs, wetland restoration, submerged aquatic vegetation (SAV) restoration and green stormwater management.

The draft Environmental Impact Statement provides the full plan formulation description. After extensive alternatives formulation and evaluation, a focused array of alternatives was determined.

1.3.1 No Action Alternative

The forecast of the future without-project (FWOP) condition reflects the conditions expected during the 50 period of analysis (2030-2080) and provides the basis from which alternative plans are formulated and impacts are assessed. The most likely future without project condition is considered to be if no NCBB action is taken, and is characterized by CSRM projects and features, and socio-economic, environmental, and cultural conditions. This condition is considered as the baseline from which future measures will be evaluated with regard to reducing coastal storm risk and promoting resilience. It documents the need for Federal action to address the water resources problem.

A base year of 2030 has been identified as the year when USACE projects associated with the

NCBB CSRM Feasibility Study will be implemented or constructed. Several trends have been identified for the NCBB Region which are projected to continue into the future and will likely affect the future without-project condition for this study. It is anticipated that the study area will continue to experience damages from coastal storms, and that the damages may increase as a result of more intense storm events. These coastal storm events will likely continue to affect areas of low coastal elevations within the study area with pronounced localized effects in some areas.

In the future without project condition, it is anticipated that sea level is increasing throughout the study area, that shorelines are changing in response to sea level change, and historic erosion patterns will continue and accelerate. It is anticipated that there will continue to be significant economic assets within the NCBB region and that population and development will continue to increase. Based on a desktop inventory of structures compiled for the HEC-FDA model, the Nassau County Back Bay study area would experience a total of $1.01 billion in FWOP Average Annual Damages over the 50-year period of analysis with Intermediate SLC (see Appendix F).

Climate change and natural variability have been resulting in changes in the Northeast Shelf Ecosystem over the past 30-40 years and are expected to continue (NMFS 2016). These changes include increases in air and ocean temperatures, and associated ocean acidification and decreases in dissolved oxygen. These changes can impact organisms, federally managed fish and their habitats, including EFH. Populations of marine organisms are changing as a result of indirect effects of climate change such as ocean acidification, predator-prey relationships, and shifts in distributions of a large number of species. Some examples of the impact of climate change on EFH and federally managed species include:

- changes in distribution of diadromous fish benthic and prey habitat,
- changes in the timing of migration cues and streamflow on fish migration and associated effect of the conditions on early life stages
- changes in fish and shellfish productivity (NMFS 2016).

Coastal wetlands can adapt and keep pace with sea level rise through vertical accretion and inland migration but must remain at the same elevation relative to the tidal range and have a stable source of sediment. Under intermediate and high sea level rise scenarios, marsh accretion at a rate of 4 mm per year would not keep pace with sea level rise. Estuarine wetlands may transition to another habitat type such as brackish wetlands, palustrine emergent wetlands, unconsolidated shore, or open water.

In the FWOP, during the 2030 – 2080 study period, vegetated wetlands in the NCBB Study Area are projected to increase by approximately 404 acres under the intermediate SLC scenario and decrease by 3,444 acres under the high sea level rise scenario. High marsh will experience the most significant changes with a loss of 2,349 under the intermediate SLC scenario and 7,388 under the high SLC scenario (Clough et al. 2104).

In response to sea level rise, unvegetated intertidal habitats could experience increased inundation and/or their tidal regimes could change from intertidal to subtidal. Some habitats may transition to unconsolidated shoreline. Distributions of intertidal and subtidal shellfish beds could change.

The FWOP condition or no-action alternative would see no additional federal involvement in storm damage reduction as outlined within this study. Current projects and programs that the USACE conducts in conjunction with other Federal and non-Federal entities would continue and would be constructed by 2030.

The FWOP condition does consider those projects that have been completed (existing), are under construction, or have been authorized for construction and are anticipated to be constructed by2030. Any proposed projects, which are not yet authorized for construction, are not considered part of the FWOP conditions for analysis.

1.3.2 Non-Structural (NS) Countywide Plan

The *Non-Structural Countywide Plan* (NS plan) includes:

- Elevation of 14,183 residential structures to the modeled 1% AEP non-structural design water surface elevation (which includes intermediate sea level change projected to 2080) (Figure 2), and
- Dry flood proofing of 2,667 industrial/commercial (non-residential) structures will be floodproofed with an assumed vertical construction of 3 feet for floodproofing measures (Figures 3 and 4).

This is the Tentatively Selected Plan (TSP).

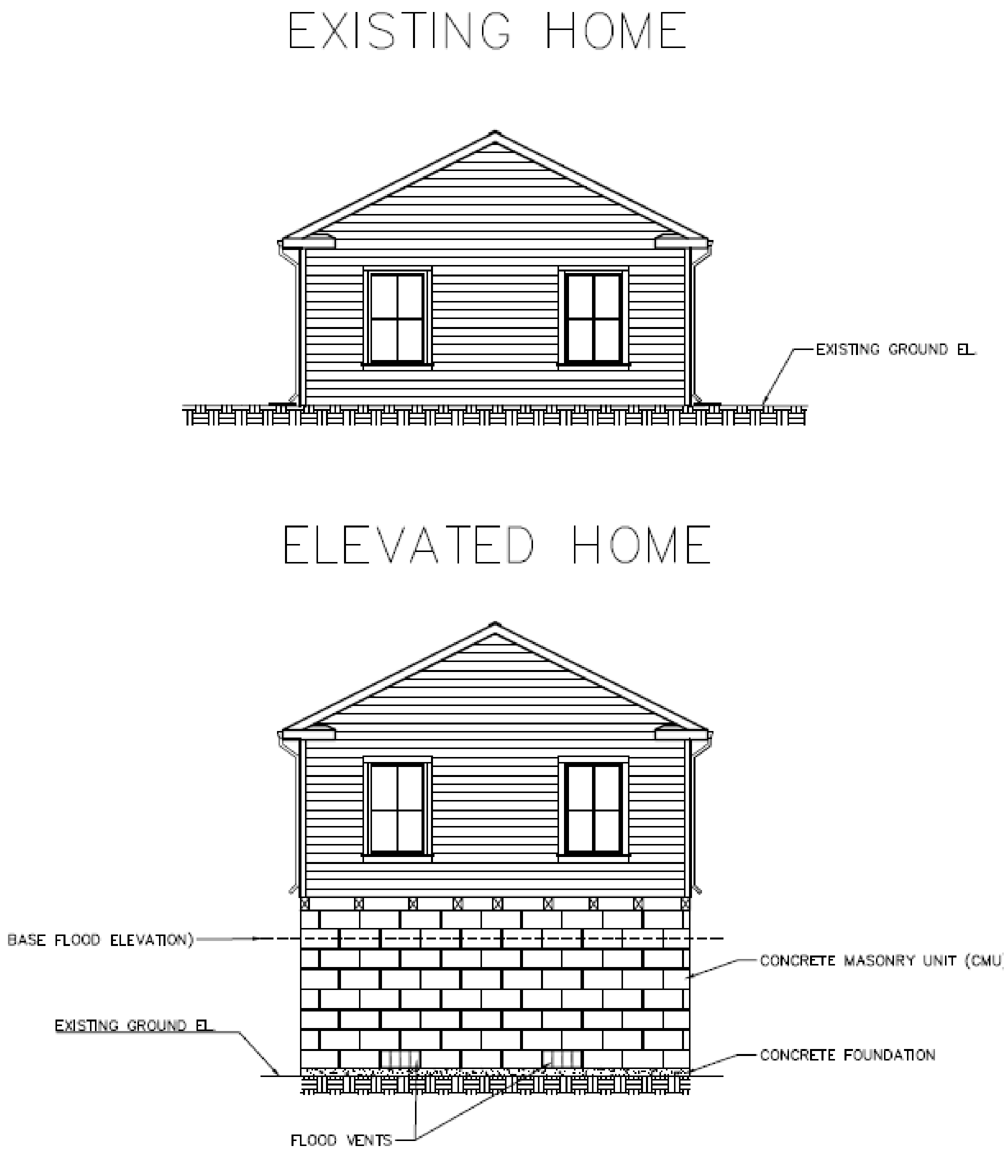


Figure 2: Example Residential Structure Elevation

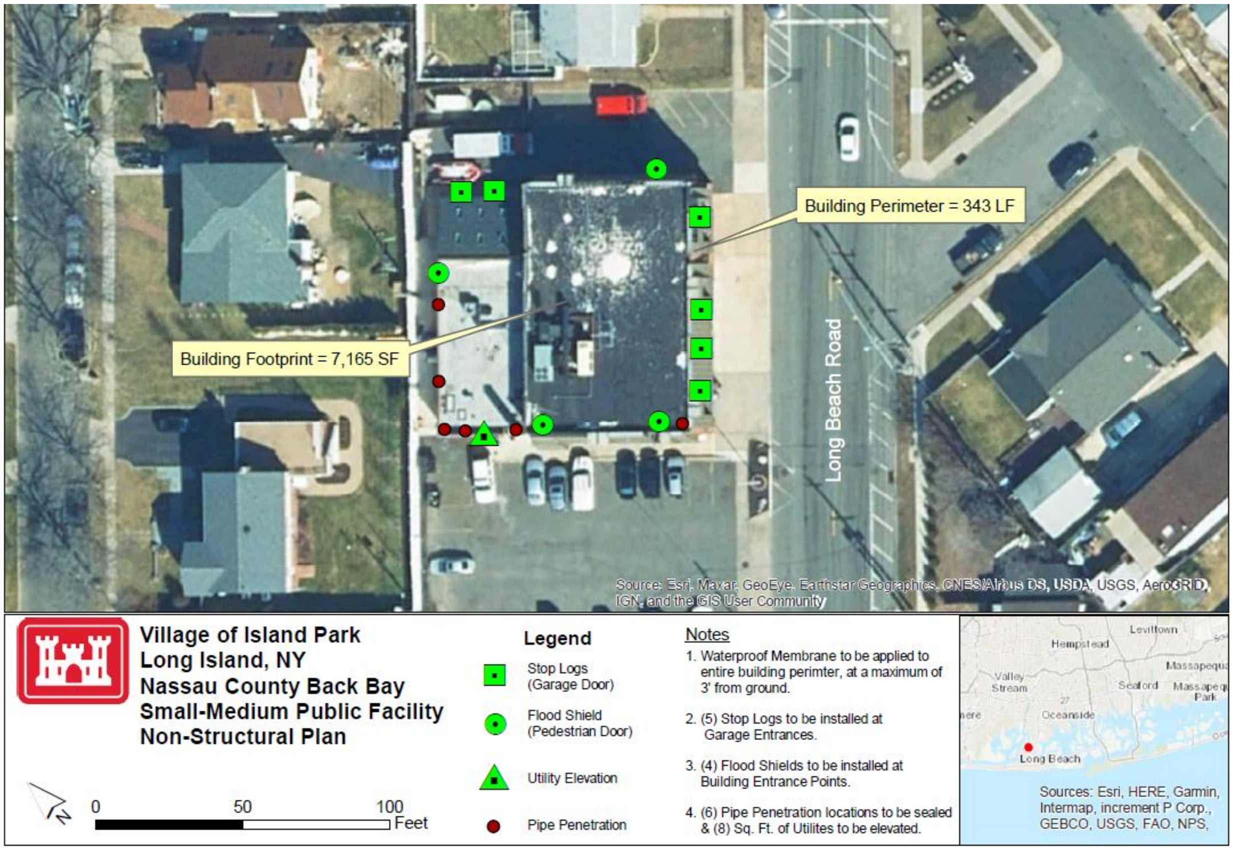


Figure 3: Plan View Example of Dry Flood Proofing

Figure 4: Street View Example of Dry Flood Proofing

1.3.3 Comprehensive Structural Highly Vulnerable Area (HVA) & NS Plan

Alternative 3 adds a structural measure to protect HVA to the NS Plan:

- Comprehensive Floodwall at the City of Long Beach
  - 46,400 linear feet of floodwall construction at elevation +16 feet NAVD88
  - Floodwall Type – Type B & Type C
- 5 miter gates at elevation +16 feet NAVD88
- 4 road & 1 rail closure gate at elevation +16 feet NAVD88
- Elevation of 14,183 residential structures to the modeled 1% AEP non-structural design water surface elevation (which includes intermediate sea level change projected to 2080).
- Dry flood proofing of 2,667 industrial/commercial (non-residential) structures from the ground surface up to 3 feet above ground.

This alternative was screened out due to economics and is not carried forward in this evaluation.

1.3.4 Localized Structural Critical Infrastructure & Non-Structural Plan

The non-structural portion of the 1.3.4 Localized Structural Critical Infrastructure & Non-Structural Plan (CI & NS Plan) includes elevating and floodproofing structures, as described above in Section 1.3.2 The structural portion of the CI & NS Plan includes localized floodwalls around large-scale critical infrastructure, sluice gates, railroad closure gates, and road closure gates. Specific measures and locations are described in the following sections.

a. Far Rockaway

Structural measures that are being considered in order to protect critical infrastructure in the vicinity of Far Rockaway (Figure 5) include the following to protect Evacuation Route No. 1:

- 7,000 linear feet of floodwall construction at elevation +16 feet North Atlantic Vertical Datum of 1988 (NAVD88) of a Floodwall Type C
- 4 road closure gates at elevation +16 feet NAVD88
- 1 sluice gate at elevation +16 feet NAVD88

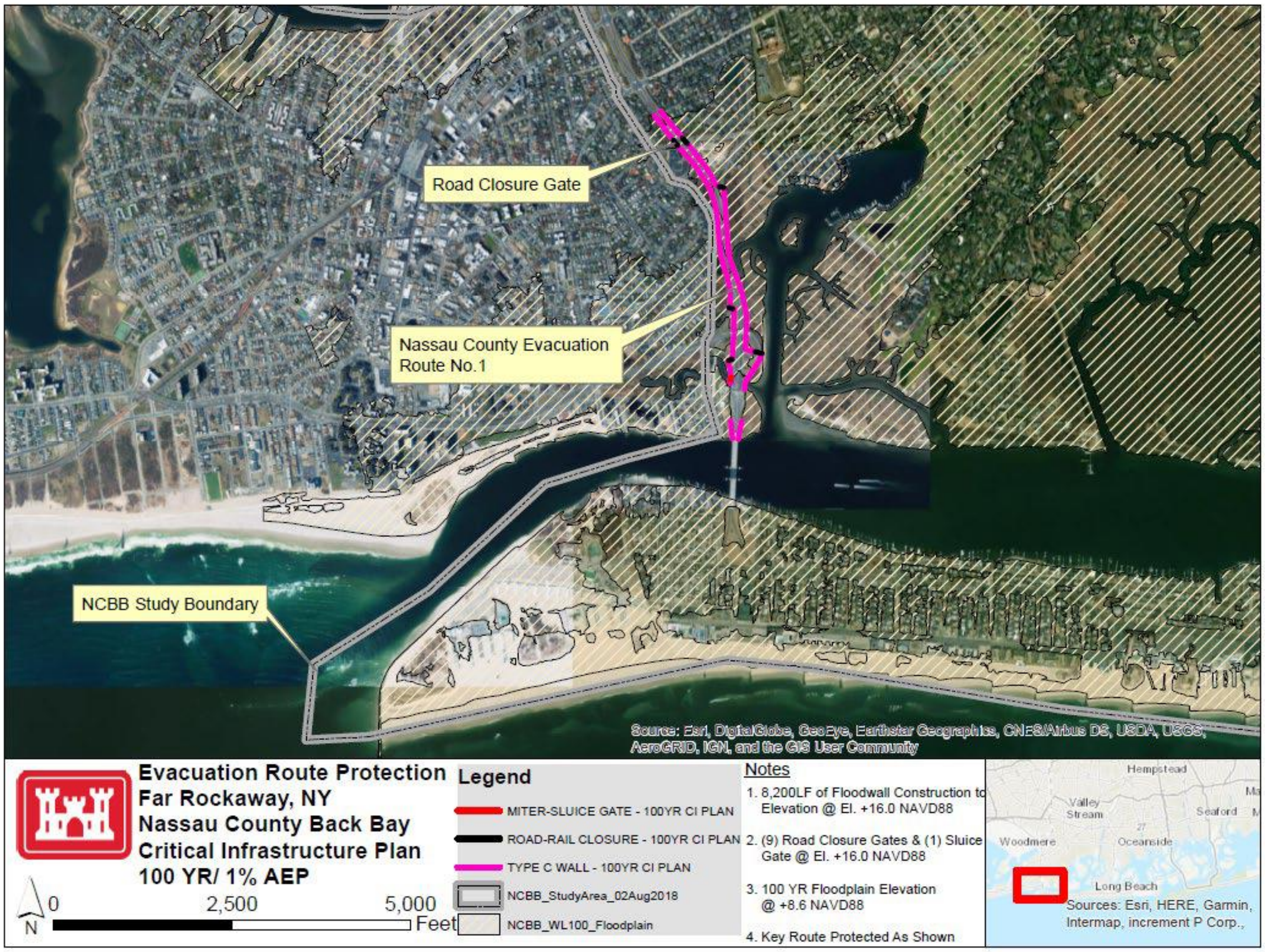


Figure 5: Evacuation Route (1) Protection in Far Rockaway

b. Freeport

Structural measures that are being considered in order to protect critical infrastructure in the vicinity of Freeport (Figure 6) include the following:

- 12,250 linear feet of floodwall construction at elevation +16 feet NAVD88
- 2 road closure gates at elevation +16 feet NAVD88

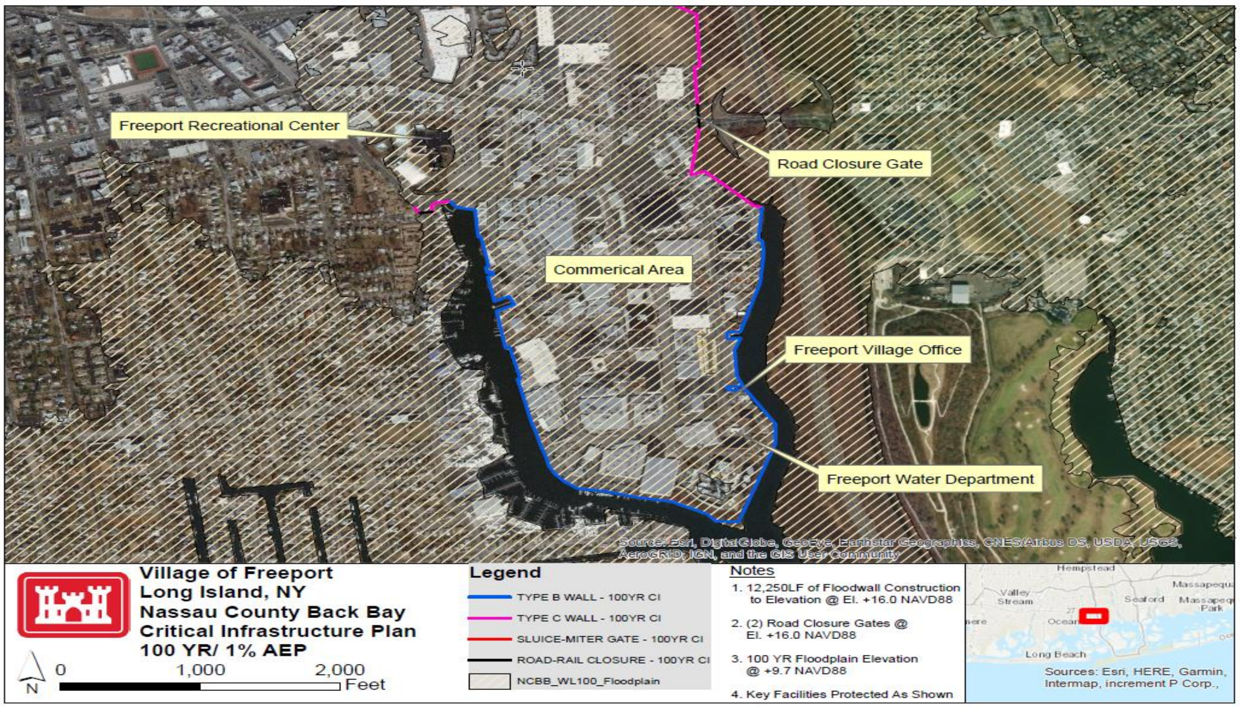


Figure 6: Local Floodwall in Village of Freeport

c. Island Park

Structural measures that are being considered in order to protect critical infrastructure in the vicinity of Island Park (Figure 7) include the following:

- 6,950 linear feet of floodwall construction at elevation +16 feet NAVD88
- 2 sluice gates at elevation +16 feet NAVD88
- 2 road closure gates at elevation +16 feet NAVD88

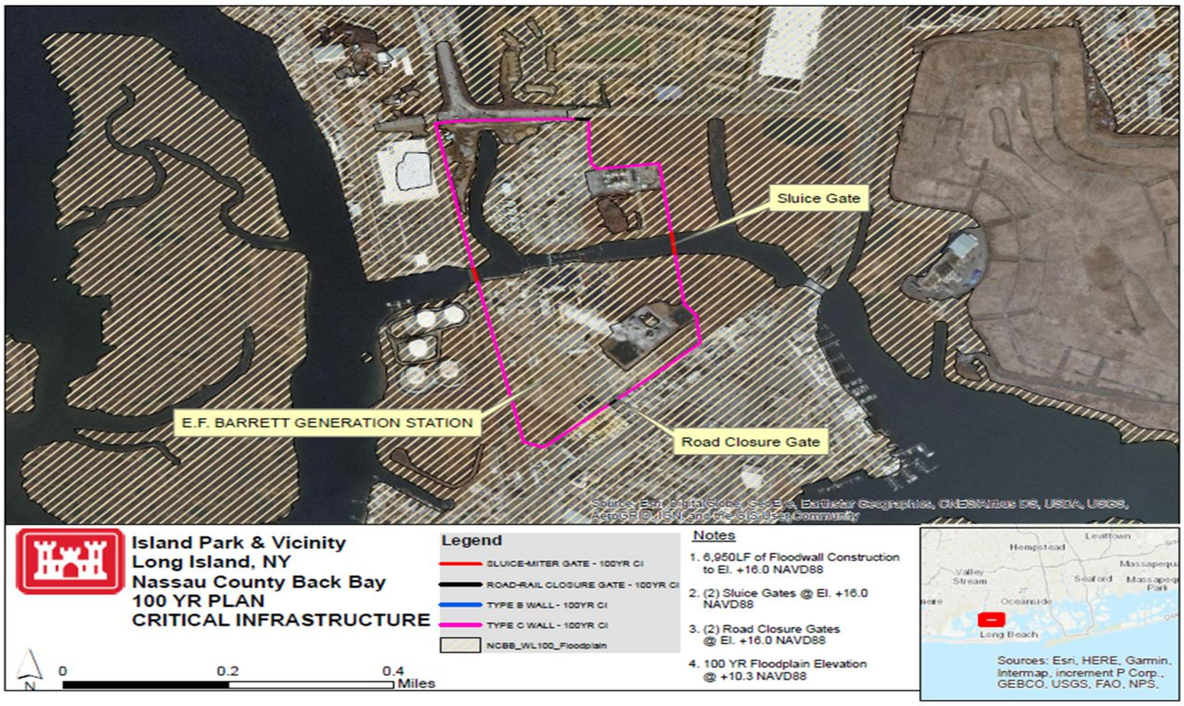


Figure 7: Local Floodwall in Island Park & Vicinity

d. Long Beach

Structural measures that are being considered in order to protect critical infrastructure in the vicinity of Long Beach (Figure 8) include the following:

- 10,260 linear feet of floodwall construction at +16 feet NAVD88
- 3 road and 1 railroad closure gates at +16 feet NAVD88

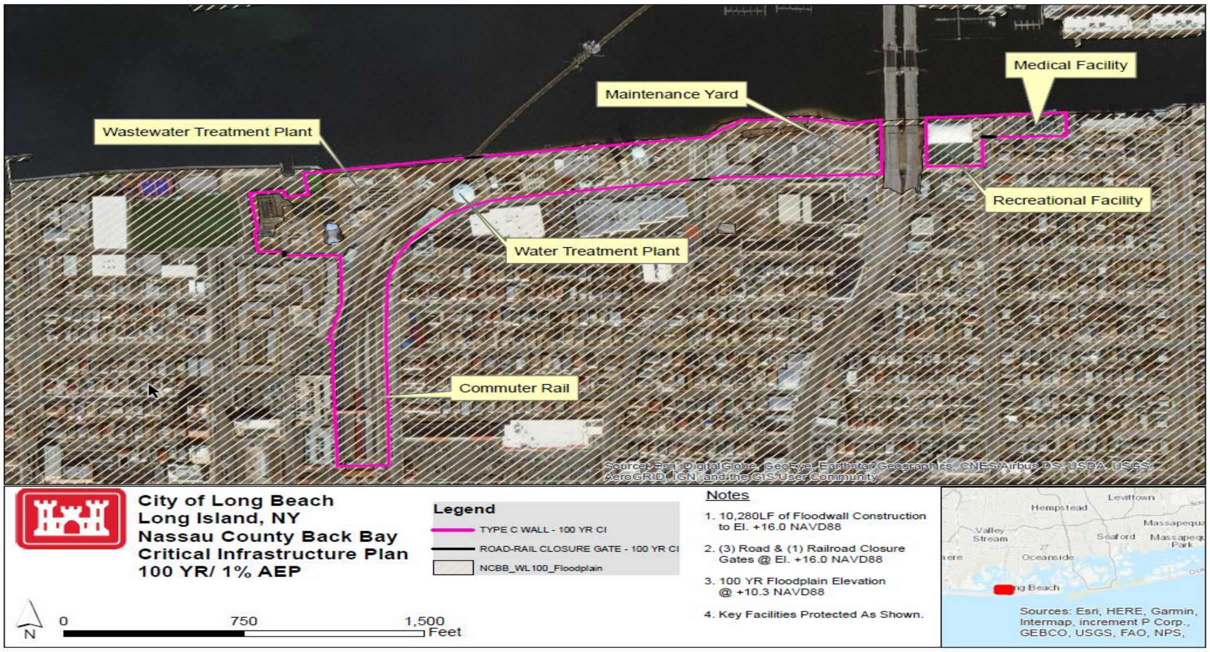


Figure 8: Local Floodwall in the City of Long Beach

e. Wantagh

Structural measures that are being considered in order to protect critical infrastructure in the vicinity of Wantagh (Figures 9 and 10) include the following:

Protection of Cedar Creek Wastewater Treatment Plant (WWTP) -

- 6,000 linear feet of floodwall construction at elevation +16 feet NAVD88
- 1 road closure gate at elevation +16 feet NAVD88

Protection of Evacuation Route No. 4 -

- 800 linear feet of floodwall construction at elevation +16 feet NAVD88
- Floodwall Type – Type C

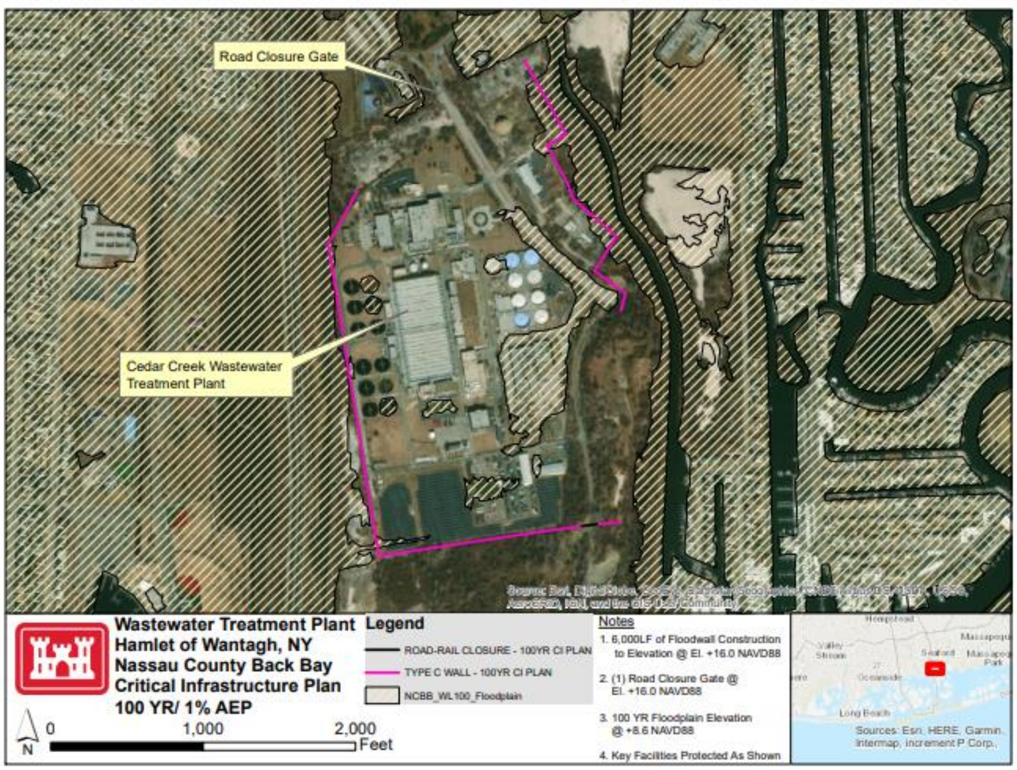


Figure 9: Local Floodwall in the Hamlet of Wantagh

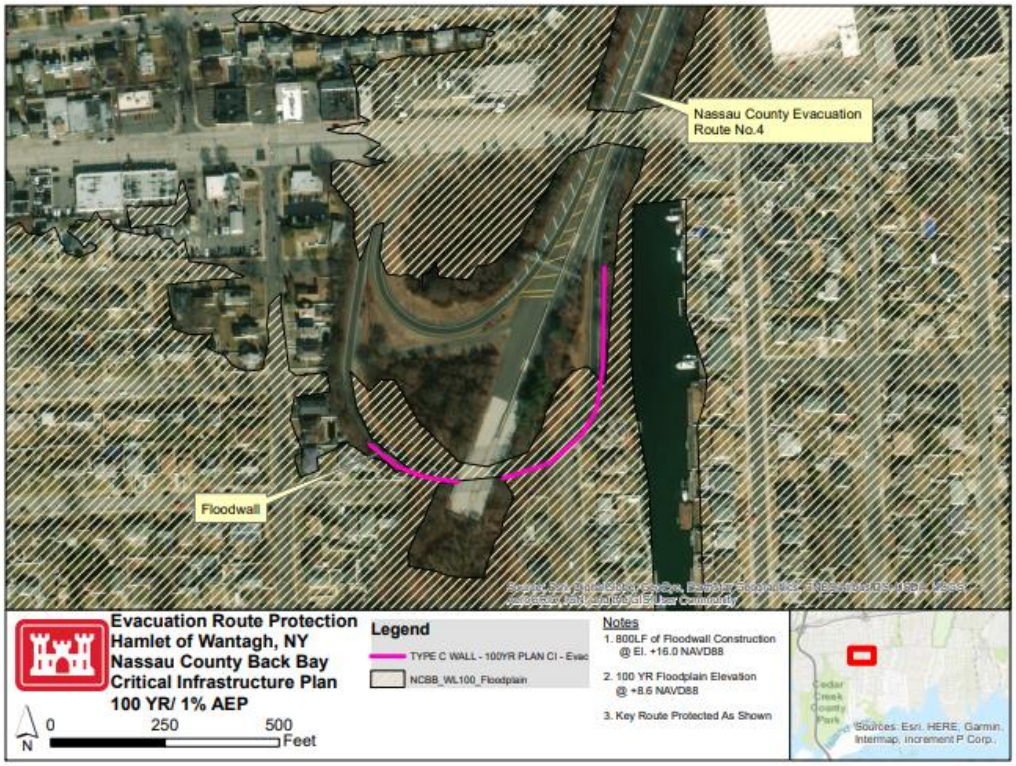


Figure 10. Evacuation Route (4) Protection in Wantagh

1.3.5 Natural and Nature-Based Features

Natural and Nature Based Features (NNBF) are intended to be complementary measures to attenuate surge and waves by increasing both elevation and roughness, per lessons learned from the New Jersey Back Bays (NJBB) CSRM Study's modeling efforts. NNBF will be evaluated in greater detail during feasibility-level design and plan optimization. Thus far, opportunities for wetland restoration and conservation have been considered through an identification of at-risk wetlands. Specific NNBFs include living shorelines, reefs, and wetland and submerged aquatic vegetation (SAV) Restoration.

1.3.6 Tentatively Selected Plan

The NS Plan was selected as the Tentatively Selected Plan (TSP) for the Nassau County Back Bays Coastal Storm Risk Management Feasibility Study. The NS Plan was selected as the TSP because it is the plan that reasonably maximizes National Economic Development benefits. In addition, all plans in the focused array (except for the No Action Plan) provided positive Regional Economic Development, Other Social Effects and Environmental Quality benefits by providing consistent CSRM benefits to residential and industrial/commercial structures.

1.3.7 Alternatives with Further Analysis Warranted

While the TSP is the NS Plan, USACE will also continue to evaluate impacts of the CI & NS Plan because of its high potential to increase community resilience and minimize environmental degradation by more effectively reducing damages and/or disruption to large-scale critical infrastructure. USACE will also continue to pursue opportunities to implement NNBF measures to improve ecosystem to support CSRM.

2.0 Essential Fish Habitat

As stated in Section 1.1, EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". Regulations further clarify EFH by defining "waters" to include aquatic areas that are used by fish and may include aquatic areas that were historically used by fish where appropriate. A purpose of the act is to "promote the protection of essential fish habitat in the review of projects conducted under federal permits, licenses, or other authorities that affect, or have the potential to affect such habitat." An EFH assessment is required for a federal action that could potentially adversely impact essential fish habitat.

Managed fish species are those species that are managed under a federal fishery management plan. Managed fish species for New York are listed in the Guide to Essential Fish Habitat Designations in the Northeastern United States Volume IV prepared by the National Oceanographic and Atmospheric Administration (NOAA, 1999). This guide is often used to evaluate the fish species that might be adversely affected by proposed developments within a project area. The coastal estuarine habitats of the project area have been designated as habitat for a number of managed species and their specific life history stages of concern.

EFH assessments also examine the potential effects on prey species for the managed fish species potentially occurring within the area. Prey species are defined as being a forage source for one or more designated fish species. They are normally found at the bottom of the food web in a healthy environment. Prey species found in the project area estuaries include killifish, mummichogs, silversides and herrings. Actions that reduce the availability of prey species, either through direct harm or capture, or through adverse impacts to the prey species' habitat may also be considered adverse effects on EFH.

The study area is designated as EFH for species with FMPs and their important prey species. The NOAA National Marine Fisheries Service EFH Mapper was utilized to identify EFH within the NCBB study area (NMFS 2021). Point data and EFH species lists were generated by using both the EFH view tool and Data Query Tool. Other sources on EFH were obtained through the NOAA EFH portal or other outside sources. NMFS has identified EFH within 10 minute X 10 minute squares (10x10 Squares). Figure 12 provides a key of the geographic areas encompassing EFH in the study area, and written descriptions of the EFH geographical areas are provided in Table 1. A total of thirty-one Federally managed fish species may be found within the study area and are listed in Table 2. Not all areas of the Nassau County Back Bays are EFH for the species in Table 2. The numbers in Table 2 correspond to the numbered squares in Figure 11. Table 2 identifies the life stage of the EFH species listed within that each of the EFH 10 x10 Squares depicted in Table 2. Several of these species, including the highly migratory species, primarily inhabit marine offshore habitats throughout their lives and are not of major concern since they are largely outside of the back bays study area for all or part of their life stages. A large number of the remaining fish species can be found within inshore habitats and estuarine mixing zones during at least part of their life cycle.

Figure 11: NCBB EFH 10 Minute x 10 Minute Square Key

Table 1. NCBB EFH 10x10 Squares

SQUARE NUMBER	SQUARE COORDINATES (LAT/LONG)	SQUARE DESCRIPTION
1	**40.59, -73.71**	The waters within the square that covers the westernmost 1/4 of Hempstead Bay, East Rockaway Inlet at Atlantic Beach, Atlantic Beach, the westernmost portion of Reynolds Channel, Bannister Bay, Hewlett Bay, and Willow Pond. CI measure locations within this square include the Far Rockaway and Long Beach.
2	**40.60, -73.57**	The waters within the square that covers the central section of Hempstead Bay, Reynolds Channel, Middle Bay, East Bay, Jones Inlet and Long Beach. CI measure locations within this square include Long Beach, Island Park, and the Freeport.
3	**40.60, -73.43**	The waters within the square that covers the South Oyster Bay, and Jones Beach Island. CI measure locations within this square include the Wantagh.

Table 2. Species and Life Stages with EFH Designated in the NCBB Study Area

	EFH 10x10 Minute Square			
SPECIES	**10X10 SQUARE #1 LIFE STAGE(S)**	**10X10 SQUARE #2 LIFE STAGE(S)**	**10X10 SQUARE #3 LIFE STAGE(S)**	**MANAGEMENT COUNCIL**
Summer Flounder (Mid Atlantic)	HAPC	N/A	N/A	MAFMC
Atlantic Butterfish	J	J	J	Mid-Atlantic
Atlantic Mackerel	E, L, J, A	E, L, J, A	E, L, J, A	Mid-Atlantic
Atlantic Surfclam	N/A	J, A	J, A	Mid-Atlantic
Black Sea Bass	J, A	J, A	A	Mid-Atlantic
Bluefish	J, A	J, A	J, A	Mid-Atlantic
Longfin Inshore Squid	E, J	E, J	E, J	Mid-Atlantic
Scup	J, A	J, A	J, A	Mid-Atlantic
Spiny Dogfish	S, A	N/A	N/A	Mid-Atlantic
Summer Flounder	J, A	J, A	J, A	Mid-Atlantic
Atlantic Cod	A	L E	L E	New England
Atlantic Herring	J, A	J, A	J, A	New England
Little Skate	J, A	J, A	J, A	New England
Monkfish	E, L, A	E, L	E, L	New England
Ocean Pout	N/A	E, A	E, A	New England
Pollock	J	E, J	E, J	New England
Red Hake	A	A	A	New England
White Hake	N/A	J	J	New England
Windowpane Flounder	E, L, J, A	E, L, J, A	E, L, J, A	New England
Winter Flounder	E, L, J, A	E, L, J, A	E, L, J, A	New England
Winter Skate	J, A	J, A	J, A	New England
Yellowtail Flounder	A	N/A	N/A	New England
Bluefin Tuna	J	J	J	Secretarial
Sand Tiger Shark	N, J	N/A	N/A	Secretarial
Sandbar Shark	J, A	J	J	Secretarial
Skipjack Tuna	A	A	A	Secretarial
Smoothhound Shark Complex (Atlantic Stock)	ALL	N/A	N/A	Secretarial
White Shark	N, J, A	N, J, A	N, J, A	Secretarial
Common Thresher Shark	ALL	ALL	ALL	Secretarial
Dusky Shark	N	N	N	Secretarial
Key: E = Eggs, L = Larvae, N = Neonates, J = Juvenile, S = Subadult, A = Adult, ALL = All life stages, HAPC = Habitat Areas of Partic				

2.1 Habitat Areas of Particular Concern

HAPC are areas of EFH that are judged to be particularly important to the long-term productivity of populations of one or more managed species, or to be particularly vulnerable to degradation (NOAA, 1999a). HAPC for summer flounder (*Paralicthys dentatus*) was identified using the EFH Mapper Tool in EFH 10x10 Square 1 only, however, SAV beds are mapped in EFH Square 3, and therefore should also be considered as HAPC. HAPC within the study area for summer flounder includes all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH.

SAV habitats are among the most productive ecosystems in the world and perform a number of irreplaceable ecological functions which range from chemical cycling and physical modification of the water column and sediments to providing food and shelter for commercial, recreational, as well as economically important organisms (Stephan and Bigford, 1997). Larvae and juveniles of many important commercial and sport fish such as bluefish (*Pomatomus saltatrix*), summer flounder, spot (*Leiostomus xanthurus*), Atlantic croaker (*Micropogonias undulatus*), herrings (Clupeidae) and many others appear in eelgrass beds in the spring and early summer (Fonseca et al, 1992 as reported in NMFS, 2016).

Studies from the lower Chesapeake Bay found that SAV beds are important for the brooding of eggs and for fishes with demersal eggs, and as habitat for the larvae of spring-summer spawners such as anchovies (*Anchoa* spp.), gobies (*Gobiosoma* spp.), weakfish and silver perch (*Bairdiella chrysoura*) (Stephan and Bigford 1997 as reported in NMFS, 2016). Heckman and Thoman (1984) concluded that SAV beds are also important nursery habitats for blue crabs. According to Perterson (1982), in Kentworthy (1988) (as reported in NMFS, 2016) shallow dwelling hard clams may be protected from predation by the rhizome layer of seagrass beds.

SAV beds exist in localized areas of the Nassau County Back Bay estuarine system. Known SAV beds are located in the study area to the east of East Island in East Bay, as well as in and around South Oyster Bay; however, no SAV beds are located in or near proposed work areas. Figure 12 depicts available mapping of SAV beds in the back bays system of the study area. The most extensive beds within the project area are located along the border of Nassau County and Suffolk County. Eelgrass (*Zostera marina*) is the dominant meadow forming perennial seagrass in New York estuaries, while widgeongrass (*Ruppia maritima*) is a smaller annual species of SAV that can also be found occasionally in some brackish (less salty) and estuarine waters around NY (NYSDEC, 2021).

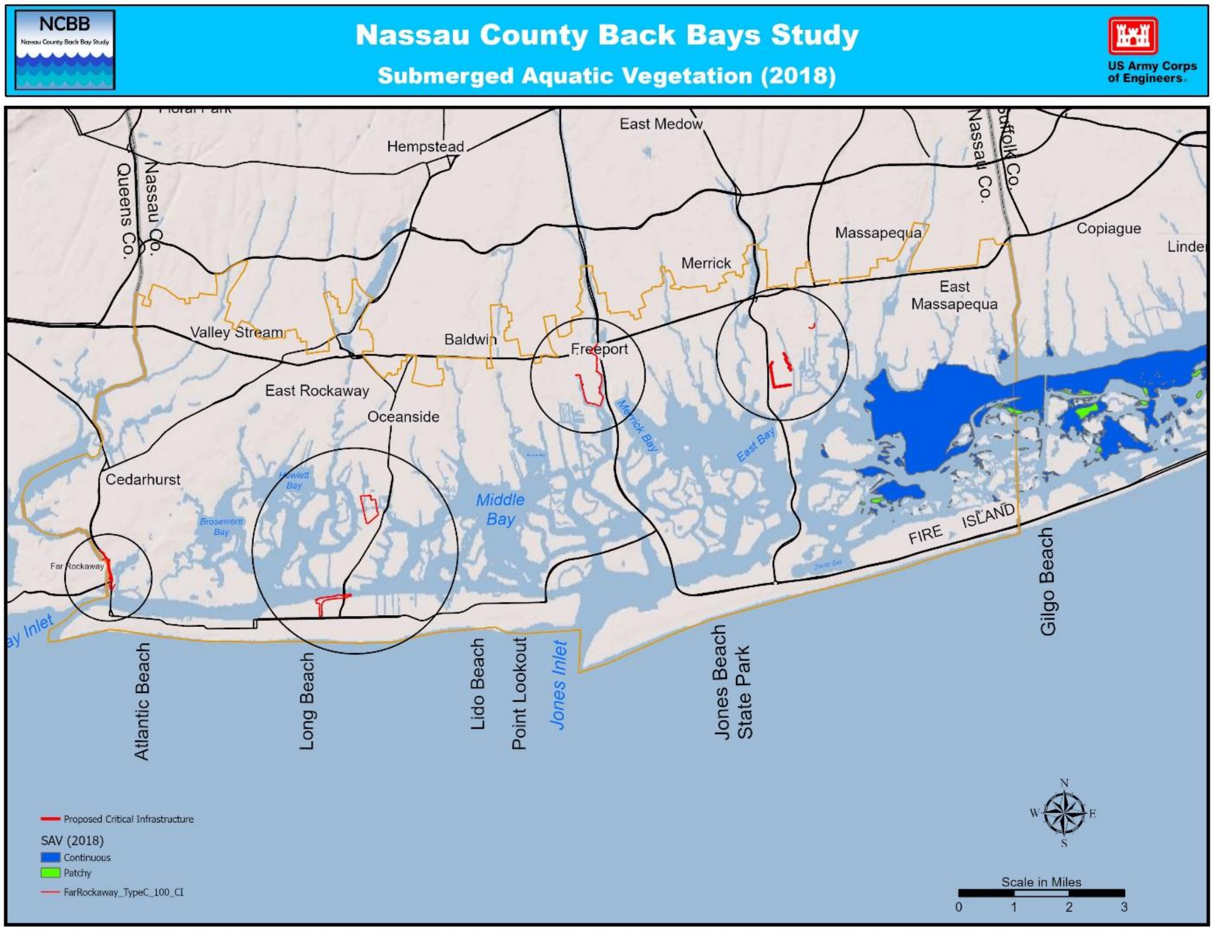
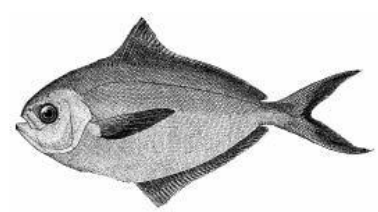


Figure 12. Available SAV Mapping in NCBB Study Area

2.2 Mid-Atlantic Species

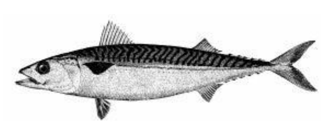
2.2.1 Atlantic Butterfish (*Peprilus triacanthus*)



The project area (including 10 x10 Squares 1, 2, and 3) is designated as EFH for Atlantic butterfish juveniles. The habitat parameters for this life stage are as follows:

Juvenile: Generally, juvenile butterfish are pelagic, and occur in water depths between 10 and 365 meters, water temperatures between 3°C and 28°C, and a salinity range of 3 to 37%. Butterfish prey on jellyfish, crustaceans, worms and small fishes.

2.2.2 Atlantic mackerel (*Scomber scrombrus*) (NMFS, 1999)



The project area (including 10 x10 Squares 1, 2, and 3) is designated as EFH for Atlantic mackerel eggs, larvae, juveniles, and adults. The habitat parameters for the applicable life stages are as follows:

Eggs: Eggs are pelagic, in salinities over 34%, and can be found floating in surface waters above the thermocline or in the upper 10 – 15 meters of the water column at a mean temperature of 11°C.

Larvae: Larvae are pelagic, in salinities over 30%, and can be found in the upper 10 – 130 meters of the water column at a temperature range of 6 – 22°C.

Juveniles: Juveniles are pelagic, in salinities of less than 25%, and can be found in the upper 0 – 320 meters of the water column at a temperature range of 4-22°C.

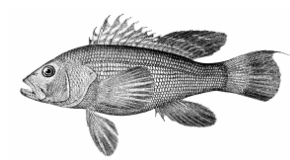
Adults: Adults are pelagic, in salinities of greater than 25%, and can be found in the upper 0 – 380 meters of the water column at a temperature range of 4 – 16°C. Adults are opportunistic feeders and can filter feed or select individual prey. Major prey are crustaceans, pelagic mullosks, polychaetes, squid, and fish.

2.2.3 Atlantic Surfclam (*Spisula solidissima*) (NMFS, 1999)

Parts of the project area (including 10 x10 Squares 2 and 3) are designated as EFH for Atlantic surfclam juveniles and adults. The habitat parameters for the applicable life stages are as follows:

Juveniles and Adults: Some of the affected area of the NCBB is designated as EFH for juvenile and adult Atlantic surfclam, which is primarily located within Atlantic Ocean continental shelf waters in fine to medium sands in turbulent waters just beyond the breakers in depths of 8 to 66 m. Juvenile and adult Atlantic surfclams are benthic, and are primarily found in salinities greater than 28%, and are susceptible to low dissolved oxygen. Because of their habitat requirements, this species is more likely to be found in high energy inlet ebb and flood shoal complexes of inlets within the study area.

2.2.4 Black Sea Bass (*Centropristus striata*) (NMFS, 2007)

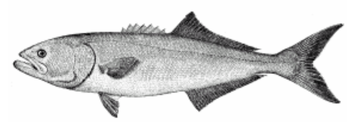


The project site is designated as EFH for black sea bass juveniles and adults (juveniles and adults in EFH 10 x10 squares 1 and 2, adults only in EFH 10 x10 square 3). The habitat parameters for the applicable life stages are as follows:

Juveniles: Juvenile black sea bass are demersal, and are usually found in association with rough bottom, shellfish and eelgrass beds, and man-made structures in sandy-shelly areas. Typical conditions are: water temperatures less than 6°C, water depths between 1 and 38 meters, and salinities less than 18%. Juveniles, which are diurnal, visual predators, prey on benthic and epibenthic crustaceans (isopods, amphipods, small crabs, sand shrimp, copepods, mysids) and small fish.

Adults: Adult black sea bass are demersal on structured habitats including rocky reefs, cobble and rock fields, stone coral patches, exposed stiff clay, and mussel beds and man-made structures. Sand and shell are usually the substrate preference of adult black sea bass. Typical conditions are: water temperatures less than 6°C, water depths between 20 and 50 meters, and salinities less than 20%. Adult black sea bass are generalist carnivores that feed on a variety of infaunal and epibenthic invertebrates, especially crustaceans (including juvenile American lobster *Homarus americanus*, crabs, and shrimp) small fish, and squid.

2.2.5 Bluefish (NMFS, 2006)

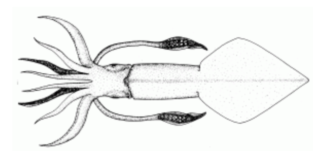


The project site is designated as EFH for bluefish juveniles and adults (including 10 x10 Squares 1, 2 and 3). The habitat parameters for the applicable life stages are as follows:

Juveniles: Generally juvenile bluefish are pelagic in habitats and occur in estuaries from May through October. Typical conditions for juveniles are: water temperatures between 19°C and 24°C and salinities between 23 and 36%. Juvenile bluefish have a very widespread and varied diet of invertebrates and fishes.

Adults: Adult bluefish are pelagic, and found in Mid-Atlantic estuaries from April through October. Typical conditions for adults are: water temperatures from 14°C to 16°C and salinities greater than 25%. Adult bluefish have a very widespread and varied diet of invertebrates and fishes.

2.2.6 Long finned inshore squid (*Loligo pealei*) (NMFS, 2005)

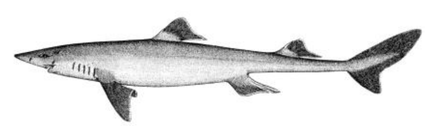


The project site is designated as EFH for long finned inshore squid eggs and juveniles (including 10x10 Squares 1, 2 and 3). The habitat parameters for the applicable life stages are as follows:

Eggs: Egg masses are demersal in polyhaline waters <50 m in depth and 10 – 23°C and are commonly found attached to rocks and small boulders on sandy/muddy bottom and on aquatic vegetation.

Juveniles: Pre-recruits are pelagic and inhabit the upper 10 m of the water column at depths of 50-100 m on continental shelf. Pre-recruits are found in coastal inshore waters in spring/fall, offshore in winter. Typical conditions for pre-recruit juveniles are found at water temperatures between 10°C and 26°C and salinities between 31.5 and 34%. Juveniles may feed on euphausiids, arrow worms, small crabs, polychaetes and shrimp.

2.2.7 Spiny dogfish *(Squalus acanthias)* (NMFS, 2007)



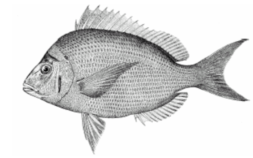
EFH 10 x10 Square 1 is designated as EFH for spiny dogfish sub-adult males, sub-adult females, adult males and adult females. The habitat parameters for the applicable life stages are as follows:

Sub-adult males and sub-adult females: Spiny dogfish are demersal by day, but may vertically migrate at night to feed. Spiny dogfish prefer muddy/silty and sandy bottoms in polyhaline baymouths and conteninental slope waters in depths of 1 – 500 m. Summer and fall bring seasonal migrants into outer estuaries where the water is cooler and more saline. North-south migrations of spiny dogfish are also documented.

Spiny dogfish adults: Spiny dogfish adult males and females have similar habitat requirements to sub-adults.

Prey: Flatfishes, blennies, sculpins,capelin, ctenophores, jellyfish, polychaetes,sipunculids, amphipods, shrimps, crabs, snails, octopods, squids, and sea cucumbers off the U.S. east coast.

2.2.8 Scup (*Stenotomus chrysops*) (NMFS, 1999)



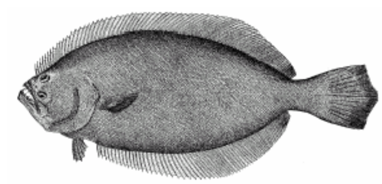
The project area (including 10 x10 Squares 1, 2 and 3) is designated as EFH for scup juveniles, and adults. The habitat parameters for the applicable life stages are as follows:

Juveniles: In general, juvenile scup during the spring and summer are found in estuaries and bays, and are demersal in association with various sands, mud, mussel, and eelgrass bed type substrates, between the shore and water depths of 38 meters. Typical conditions are: water temperatures above 7°C (45°F) and salinities greater than 15%.

Adults: Adult scup are common residents in the Middle Atlantic Bight from spring to fall and are generally demersal, and found in schools on a variety of habitats, from open sandy bottom to structured habitats such as mussel beds, reefs or rough bottom. Smaller-sized adult scup are common in larger bays and estuaries but larger sizes tend to be in deeper waters. Generally, adult scup are found in water temperatures above 7°C, water depths between 2 and 185 meters, and salinities greater than 15%. Seasonally, wintering adults (November through April) are usually offshore.

Prey: Juveniles primarily eat: polychaetes (e.g., maldanids, nephthids, nereids, and flabelligerids), epibenthic amphipods and other small crustaceans, mollusks, and fish eggs and larvae. Adult scup are also benthic feeders and forage on a variety of prey, including small crustaceans (including zooplankton), polychaetes, mollusks, small squid, vegetable detritus, insect larvae, hydroids, sand dollars, and small fish.

2.2.9 Summer flounder (NMFS, 1999)



The project area (including 10 x10 Squares 1, 2 and 3) is designated as EFH for summer flounder larvae, juveniles, and adults. The habitat parameters for the applicable life stages are as follows:

Larvae: In general, summer flounder larvae are pelagic in habit, and most abundant nearshore at water depths between 10 and 70 meters, in water temperatures between 9°C (48 °F) and 12°C (53°F), and salinities between 23 – 33‰. From October to May, larvae and postlarvae migrate inshore, entering coastal and estuarine nursery areas to complete transformation.

Juveniles: In general, juveniles are demersal in habit (mud and sandy substrates), and use several estuarine habitats as nursery areas, including salt marsh creeks, seagrass beds, mudflats, and open bay areas in water temperatures greater than 11°C (52°F), water depths from 0.5 – 5 meters, and salinities ranging from 10 – 30%.

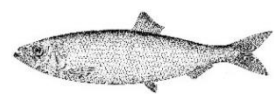
Adults: Generally, summer flounder are demersal in habit (mud and sandy substrates), and occur in water depths between the shore and 25 meters. Seasonally, they inhabit shallow coastal and estuarine waters during warmer months and move offshore on the outer Continental Shelf at depths of 150 meters in colder months.

Prey: Larval and postlarval summer flounder initially feed on zooplankton and small crustaceans**.** Smaller juvenile flounder (usually <100 mm) appear to focus on crustaceans and polychaetes while fish become a little more important in the diets of the larger juveniles. Adult summer flounder are opportunistic feeders with fish and crustaceans making up a large part of their diet, which include: windowpane, winter flounder, northern pipefish, Atlantic menhaden, bay anchovy, red hake, silver hake, scup, Atlantic silverside, sand lance, bluefish, weakfish, mummichog, rock crabs, squids, shrimps, small bivalves, small gastropods, sand dollars, and marine worms.

HAPC: HAPC for summer flounder was identified in EFH 10 x10 Square 1 only. HAPC for summer flounder includes all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH is HAPC. Seagrass is mapped only in EFH 10 0x10 Square 3 of the project area.

2.3 New England Species

2.3.1 Atlantic Sea Herring (*Clupea harengus*) (NMFS, 2005) (NEFMC, 2017)



The study area is designated as EFH for Atlantic sea herring juveniles and adults. The habitat parameters for the applicable life stages are as follows:

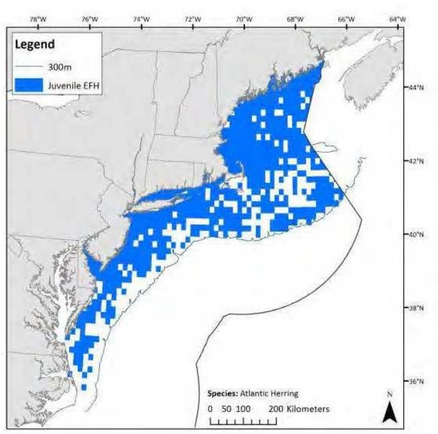


Figure 13. Atlantic Sea Herring Juvenile EFH Locations

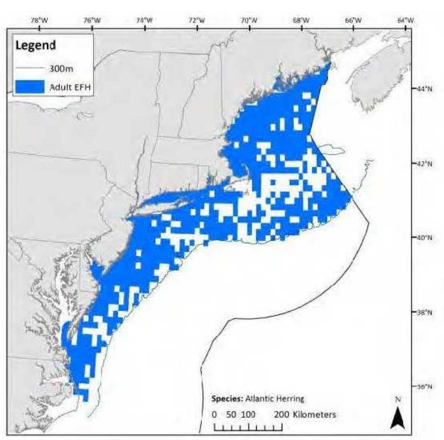


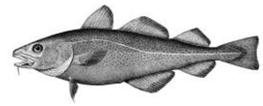
Figure 14. Atlantic Sea Herring Adult EFH Locations

Juveniles: Intertidal and sub-tidal pelagic habitats to 300 meters throughout the region including the NY inland bays and estuaries. One and two-year old juveniles form large schools and make limited seasonal inshore-offshore migrations. Older juveniles are usually found in water temperatures of 3 – 15°C (37 – 59°F) in the northern part of their range and as high as 22°C (72°F) in the Mid-Atlantic. Young-of-the-year juveniles can tolerate low salinities, but older juveniles avoid brackish water.

Adults: Sub-tidal pelagic habitats with maximum depths of 300 meters throughout the region including the NY inland bays and estuaries. Adults make extensive seasonal migrations between summer and fall spawning grounds on Georges Bank and the Gulf of Maine and overwintering areas in southern New England and the Mid-Atlantic region. They seldom migrate beyond a depth of about 100 meters and – unless they are preparing to spawn – usually remain near the surface. They generally avoid water temperatures above 10°C (50°F) and low salinities. Spawning takes place on the bottom, generally in depths of 5 – 90 meters on a variety of substrates.

Prey: Juveniles feed on up to 15 different groups of zooplankton; the most common are copepods, decapod larvae, barnacle larvae, cladocerans, and molluscan larvae (Sherman and Perkins 1971). Adults have a diet dominated by euphausiids, chaetognaths, and copepods (Bigelow and Schroeder 1953; Maurer and Bowman 1975). In addition, adults also consume fish eggs and larvae, including larval herring, sand lance, and silversides.

2.3.2 Atlantic Cod *(Gadus morhua)* (NMFS, 2004)



The affected area has a limited designation as EFH for Atlantic cod eggs, larvae and adults. EFH for Atlantic cod eggs and larvae is mapped in EFH 10x10 Squares 2 and 3 only. EFH for Atlantic cod adults is mapped in EFH 10 x10 square 1 only. The habitat parameters for the applicable life stages are as follows:

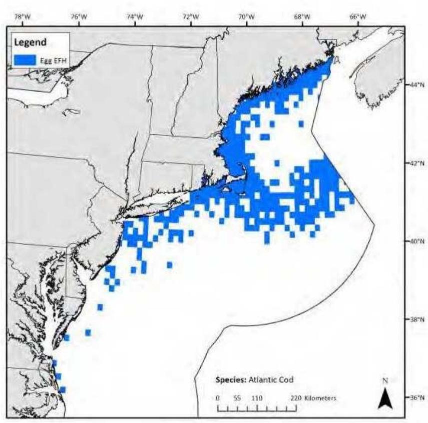


Figure 15. Atlantic Cod Egg EFH Locations

Eggs: Atlantic cod eggs are pelagic with wide distribution in offshore and coastal waters from the Gulf of Maine to Cape Hatteras.

Larvae: Atlantic cod larvae are pelagic, and occur from near-surface to depths of 75 m, and they move deeper with growth as they transform into a more bottom-oriented fish. Atlantic cod larval distribution is similar to the egg distribution.

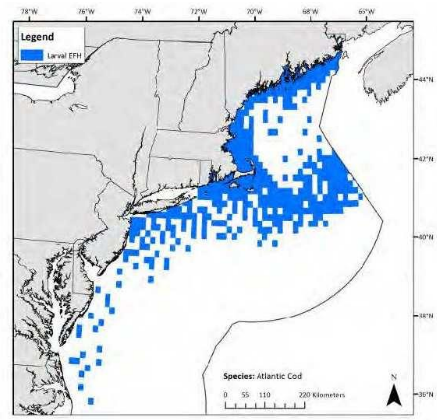


Figure 16. Atlantic Cod Larvae EFH Locations

2.3.3 Ocean Pout (*Macrozoarces americanus*) (NMFS, 1999) (NEFMC, 2017)

EFH Squares 2 and 3 only are designated as EFH for ocean pout eggs and adult. The habitat parameters for the applicable life stages are as follows:

Eggs: Ocean pout eggs are demersal in offshore and high salinity zones of bays and estuaries. Spawning occurs on hard bottom protected habitats, such as rock crevices and man-made artifacts, where eggs are deposited in guarded nests. **Adults:** Generally are demersal in subtidal benthic habitats 20 to 140 meters in depth, but can be found in high salinity zones of bays and estuaries. Associated with mud and sandy bottoms that have structure such as shells, gravel or boulders.

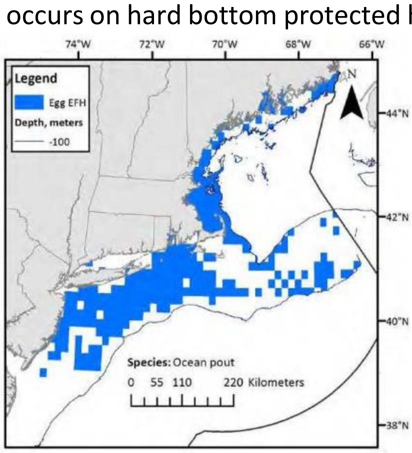


Figure 17. Ocean Pout Egg EFH Locations

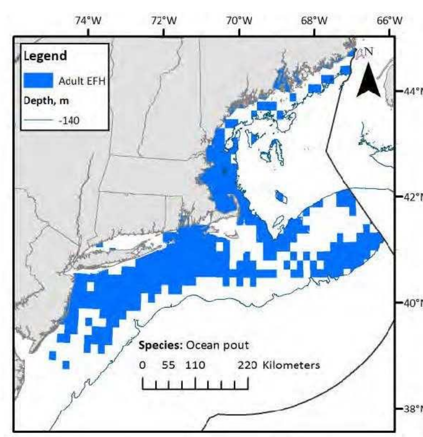
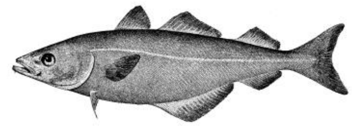


Figure 18. Ocean Pout Adult EFH Locations

Prey: Principal prey items are benthic invertebrates consisting primarily of mollusks and crustaceans.

2.3.4 Pollock (*Pollachius virens*) (NEFMC, 2017) (NMFS, 1999)

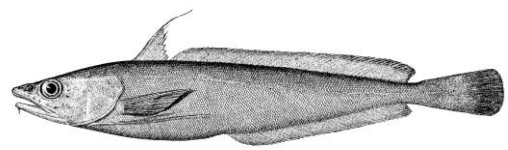


The study area is designated as EFH for pollock eggs and juveniles. EFH is mapped for juvenile pollock in all three EFH 10 x10 Squares. EFH is mapped for pollock eggs in EFH 10 x10 squares 2 and 3 only. The habitat parameters for the applicable life stages are as follows:

Juveniles: Juvenile pollcok are found in association with bottom habitats with aquatic vegetation or a substrate of sand, mud or rocks. Typical conditions are: water temperatures less than 18°C, water depths between 0 and 250 meters, and salinities between 29% and 32%. The intertidal zone may be important nursery area for juvenile pollock. Juveniles are present in the shallow intertidal zone at all tide stages throughout summer. Subtidal marsh creeks are also seasonally important as nursery.

Eggs: Pollock eggs are found in pelagic waters. Typical conditions are: water temperatures less than 17°C, water depths between 30 and 270 meters, and salinities between 32% and 32.8%. Their seasonal occurrence is from October to June, and peaks in November to February.

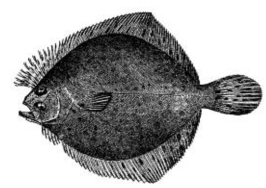
2.3.5 White hake (*Urophycis tenuis*) (NMFS, 1999) (NEFMC, 2017)



Portions of the study area are designated as EFH for white hake juveniles (EFH 10x10 Squares 2 and 3 only). The habitat parameters for the applicable life stages are as follows:

Juveniles: Juvenile white hake are found in pelagic waters from May to September, and demersal waters thereafter. During their demersal stage, they are found in bottom habitat with seagrass beds or substrate of mud or fine-grained sand. Further parameters for juvenile white hake habitat include temperatures below 19°C and water depths between 5 and 225 meters.

2.3.6 Windowpane Flounder *(Scopthalmus aquosus)* (NMFS, 1999) (NEFMC, 2017)



The study area is designated as EFH for windowpane eggs, larvae, juveniles, and adults. The habitat parameters for the applicable life stages are as follows:

Eggs and Larvae: Pelagic habitats on the continental shelf from Georges Bank to Cape Hatteras and in mixed and high salinity zones

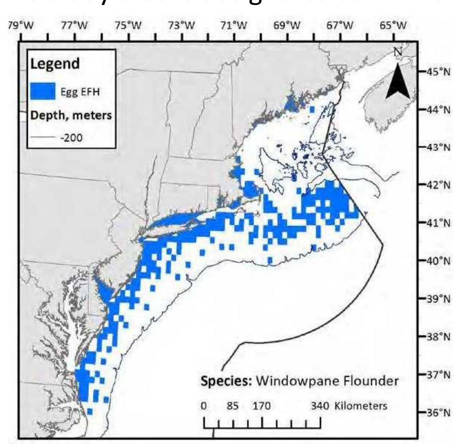


Figure 19. Windowpane Egg EFH Locations

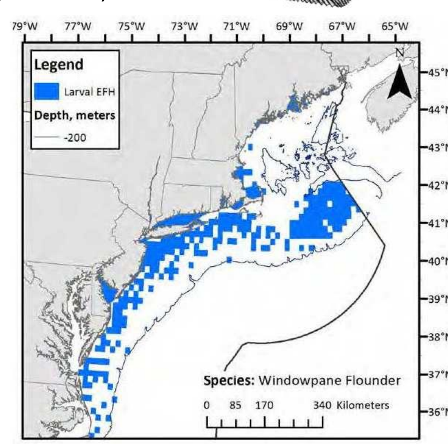


Figure 20. Windowpane Larvae EFH Locations

of coastal bays and estuaries throughout the region.

Juveniles: Intertidal and sub-tidal benthic habitats in estuarine, coastal marine, and continental shelf waters from the Gulf of Maine to northern Florida, including mixed and high salinity zones in the bays and estuaries. EFH for juveniles is found on mud and sand substrates and extends from the intertidal zone to a maximum depth of 60 meters. Young-of-the-year juveniles prefer sand over mud.

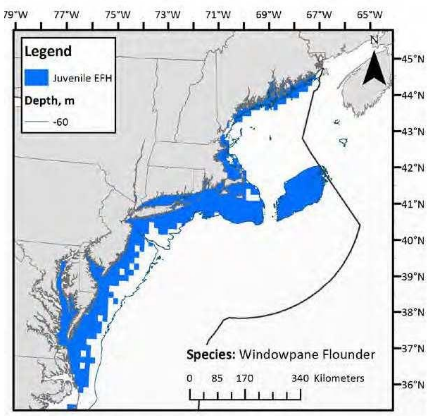


Figure 21. Windowpane Juvenile EFH Locations

Adults: Intertidal and sub-tidal benthic habitats in estuarine, coastal marine, and continental shelf waters from the Gulf of Maine to Cape Hatteras including mixed and high salinity zones in the bays and estuaries. Essential fish habitat for adults is found on mud and sand substrates and extends from the intertidal zone to a maximum depth of 70 meters.

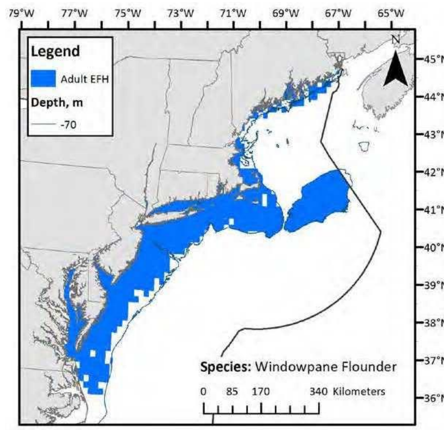
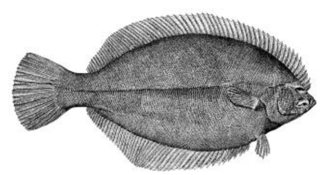


Figure 22. Windowpane Adult EFH Locations

Prey: Small crustaceans (e.g., mysids and decapod shrimp) and various fish larvae including hakes and tomcod, as well as their own species.

2.3.7 Winter flounder (*Pleuronectes americanus*) (NMFS, 1999) (NEFMC, 2017)



The study area is designated as EFH for winter flounder eggs, larvae, juveniles, and adults. The habitat parameters for the applicable life stages are as follows:

Eggs: Sub-tidal estuarine and coastal benthic habitats from mean low water to 5 meters from Cape Cod to Absecon Inlet (39° 22′ N), and as deep as 70 meters on Georges Bank and in the Gulf of Maine including mixed and high salinity zones in the bays and estuaries. The eggs are adhesive and deposited in clusters on the bottom. Essential habitats for winter flounder eggs include mud, muddy sand, sand, gravel, macroalgae, and SAV. Bottom habitats are unsuitable if exposed to excessive sedimentation which can reduce hatching success.

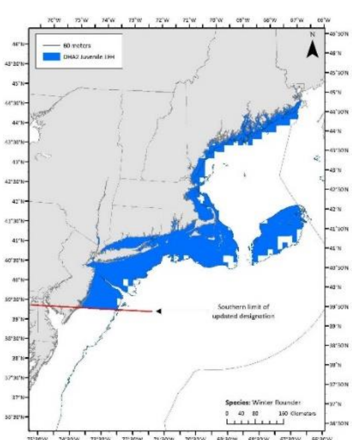


Figure 23. Winter Flounder Egg EFH Locations

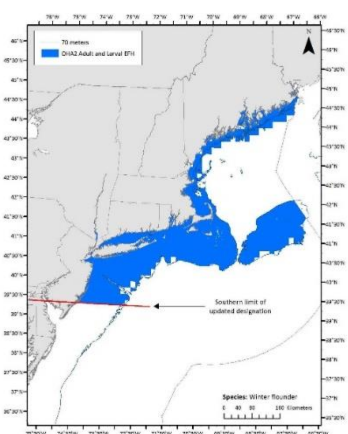


Figure 24. Winter Flounder Larvae and Adult EFH Locations

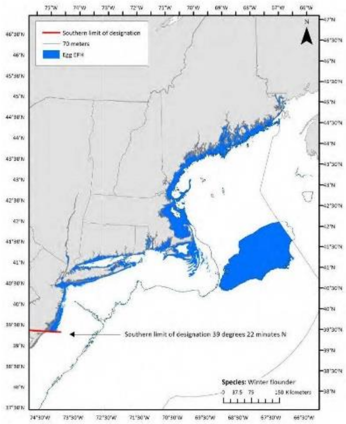


Figure 25. Winter Flounder Juvenile EFH Locations

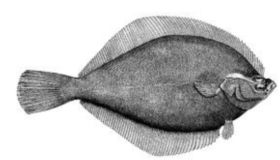
Larvae: Pelagic. Estuarine, coastal, and continental shelf water column habitats from the shoreline to a maximum depth of 70 meters from the Gulf of Maine to Absecon Inlet (39° 22’ N), and including Georges Bank including mixed and high salinity zones in the bays and estuaries. Larvae hatch in nearshore waters and estuaries or are transported shoreward from offshore spawning sites where they metamorphose and settle to the bottom as juveniles. They are initially planktonic, but become increasingly less buoyant and occupy the lower water column as they get older.

Juveniles: Estuarine, coastal, and continental shelf benthic habitats from the Gulf of Maine to Absecon Inlet (39° 22’ N), and including Georges Bank, and in mixed and high salinity zones in the bays and estuaries. EFH for juveniles extends from the intertidal zone (mean high water) to a maximum depth of 60 meters and occurs on a variety of bottom types, such as mud, sand, rocky substrates with attached macroalgae, tidal wetlands, and eelgrass. Young-of-the-year juveniles are found inshore on muddy and sandy sediments in and adjacent to eelgrass and macroalgae, in bottom debris, and in marsh creeks. They tend to settle to the bottom in soft-sediment depositional areas where currents concentrate late-stage larvae and disperse into coarser-grained substrates as they get older.

Adults: Estuarine, coastal, and continental shelf benthic habitats extending from the intertidal zone (mean high water) to a maximum depth of 70 meters from the Gulf of Maine to Absecon Inlet (39° 22’ N), and including Georges Bank, and in mixed and high salinity zones in the bays and estuaries. EFH for adults occurs on muddy and sandy substrates, and on hard bottom on offshore banks. In inshore spawning areas. EFH includes a variety of substrates where eggs are deposited on the bottom.

Prey: Larvae- nauplii, harpacticoids, calanoids, polychaetes, invertebrate eggs, and phytoplankton. Juveniles and adults - Polychaetes and crustaceans (mostly amphipods) generally make up the bulk of the diet, but also include bivalves, capelin eggs and fish.

2.3.8 Yellowtail flounder (Limanda ferruginea) (NMFS, 1999) (NEFMC, 2017)



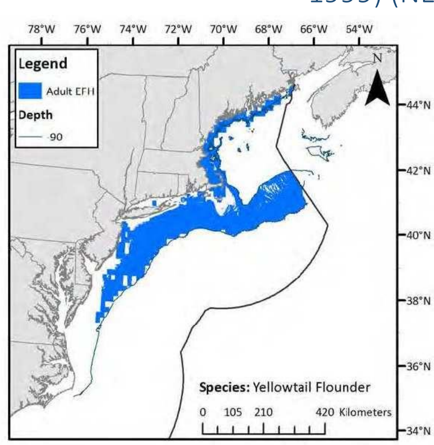


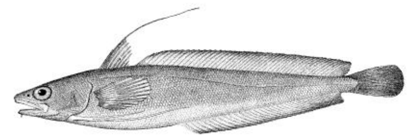
Figure 26. Yellowtail Flounder Adult EFH Locations

Part of the study area (EFH 10 x10 Square 1 only) is designated as EFH for yellowtail flounder adults. The habitat parameters for the applicable life stage are as follows:

Adults: Sub-tidal benthic habitats in coastal waters in the Gulf of Maine and on the continental shelf on Georges Bank and in the Mid-Atlantic including the high salinity zones of the bays and estuaries. Essential fish habitat for adult yellowtail flounder occurs on sand and sand with mud, shell hash, gravel, and rocks at depths between 25 and 90 meters.

Prey: The diet of yellowtail flounder are primarily benthic macrofauna consisting of amphipods and polychaetes. Juveniles primarily prey on polychaetes whereas, adults primarily prey on crustaceans.

2.3.9 Red hake (Urophycis chuss) (NMFS, 1999) (NEFMC, 2017)



The study area is designated as EFH for red hake adults. The habitat parameters for the applicable life stage are as follows:

Adults: Red hake adults utilize benthic habitats in the Gulf of Maine and the outer continental shelf and slope in depths of 50 – 750 meters and as shallow as 20 meters in a number of inshore estuaries and embayments as far south as Chesapeake Bay. Shell beds, soft sediments (mud and sand), and artificial reefs provide essential habitats for adult red hake. They are usually found in depressions in softer sediments or in shell beds and not on open sandy bottom. In the Gulf of Maine, they are much less common on gravel or hard bottom, but they are reported to be abundant on hard bottoms in temperate reef areas of Maryland and northern Virginia.

Prey: Adults prey upon crustaceans, but also consume a variety of demersal and pelagic fish and squid.

2.3.10 Monkfish *(Lophius americanus)* (NMFS, 1999) (NEFMC, 2017)

The study area is designated as EFH for monkfish eggs, larvae and adults. EFH for monkfish eggs and larvae is mapped in all three EFH 10 x10 Squares, while EFH for monkfish adults is mapped only in EFH 10 x10 Square 1. The habitat parameters for the applicable life stages are as follows:

Eggs and Larvae: Pelagic habitats in inshore areas, and on the continental shelf and slope throughout the Northeast region. Monkfish eggs are shed in very large buoyant mucoidal egg "veils." Monkfish larvae are more abundant in the Mid-Atlantic region and occur over a wide depth range, from the surf zone to depths of 1,000 – 1,500 meters on the continental slope.

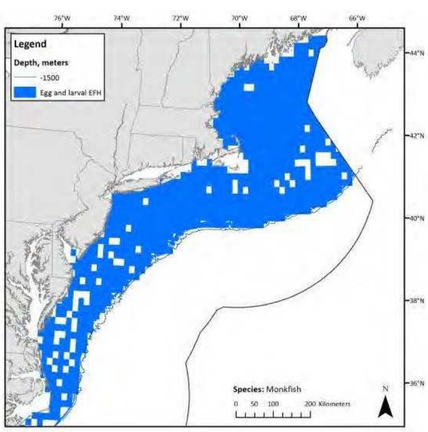
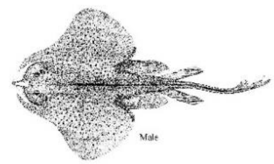


Figure 27. Monkfish Egg and Larvae EFH Locations

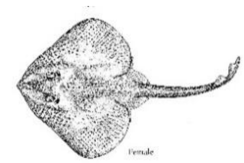
Adults: Adult monkfish are found in Bottom habitats with substrates of a sandshell mix, algae covered rocks, hard sand, pebbly gravel, or mud. They live in waters of less than 15°C, 29.9-36.7% salinity, and depths of 25 – 200 meters.

Prey: Larvae feed on zooplankton, including copepods, crustacean larvae, and chaetognaths. Small juveniles (5 – 20 cm TL) start eating fish, such as sand lance, soon after they settle to the bottom, but invertebrates, especially crustaceans and squid are a large part of their diet. Adult monkfish prey primarily on fish, shrimp, squid, crustaceans, and mollusks.

2.3.11 Little skate (*Raja erinacea*) (NMFS, 2003) (NEFMC, 2017)



The study area is designated as EFH for little skate juveniles and adults. The habitat parameters for the applicable life stages are as follows:



Juveniles: Intertidal and sub-tidal benthic habitats in coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank, extending to a maximum depth of 80 meters, and including high salinity zones in the bays and estuaries. EFH for juvenile little skates occurs on sand and gravel substrates, but they are also found on mud.

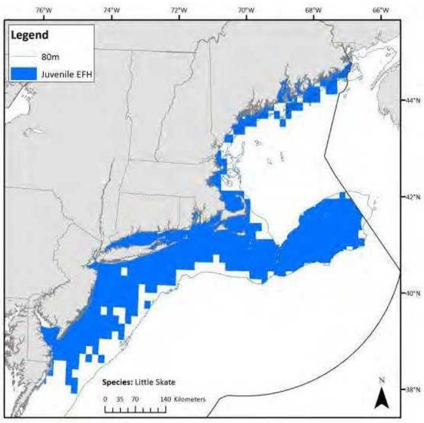


Figure 28. Little Skate Juvenile EFH Locations

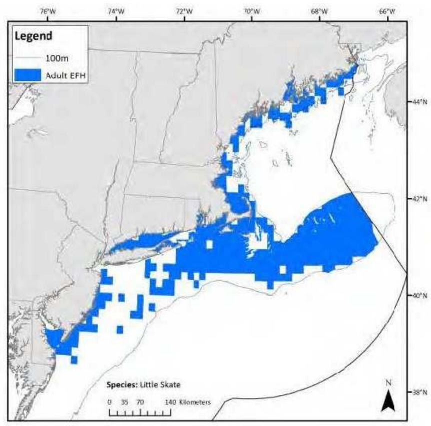
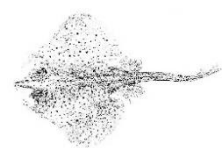


Figure 29. Little Skate Adult EFH Locations

Adults: Intertidal and sub-tidal benthic habitats in coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank, extending to a maximum depth of 80 meters, and including high salinity zones in the bays and estuaries. EFH for juvenile little skates occurs on sand and gravel substrates, but they are also found on mud.

Prey: Benthic macrofauna primarily decapod crustaceans, amphipods and polychaetes.

2.3.12 Winter skate (*Raja ocellata*) (NMFS, 2003) (NEFMC, 2018)



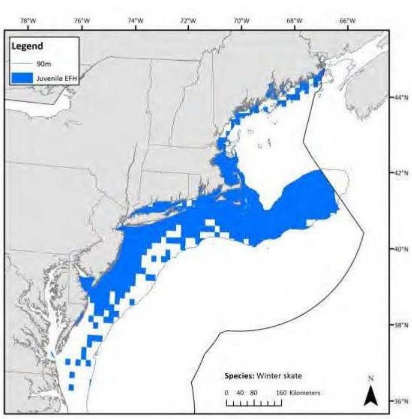


Figure 30. Winter Skate Juvenile EFH Locations

The study area is designated as EFH for winter skate juveniles and adults. The habitat parameters for the applicable life stages are as follows:

Juveniles: Sub-tidal benthic habitats in coastal waters from eastern Maine to Delaware Bay and on the continental shelf in southern New England and the Mid-Atlantic region, and on Georges Bank, from the shoreline to a maximum depth of 90 meters including the high salinity zones of the bays and estuaries. EFH for juveniles occurs on sand and gravel substrates, but they are also found on mud.

Adults: Sub-tidal benthic habitats in coastal waters from eastern Maine to Delaware Bay and on the continental shelf in southern New England and the Mid-Atlantic region, and on Georges Bank, from the shoreline to a maximum depth of 90 meters including the high salinity zones of the bays and estuaries. EFH for juveniles occurs on sand and gravel substrates, but they are also found on mud.

Prey: Polychaetes and amphipods are the most important prey items in terms of numbers or occurrence, followed by decapods, isopods, bivalves, and fishes.

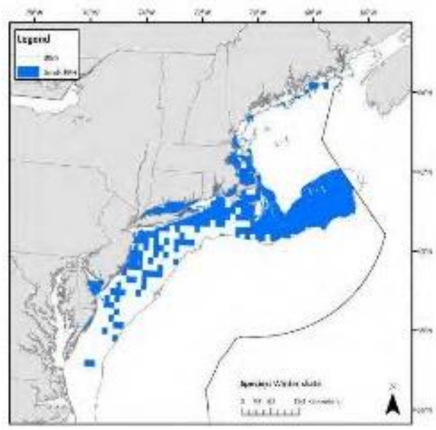


Figure 31. Winter Skate Adult EFH Locations

2.4 Highly Migratory Species

Bluefin Tuna (*Thunnus thynnus*) (NMFS, 2017)

The study area (EFH 10 x10 Square 1, 2, and 3) is designated as EFH for bluefin tuna juveniles. The habitat parameters for juvenile bluefin tuna are as follows:

Juveniles: Juvenile bluefin tuna are found in waters off North Carolina, south of Cape Hatteras, to Cape Cod. All inshore and pelagic surface waters warmer than 12°C of the Gulf of Maine and Cape Cod Bay, MA from Cape Ann, MA (~42.75° N) east to 69.75° W (including waters of the Great South Channel west of 69.75° W), continuing south to and including Nantucket Shoals at 70.5° W to off Cape Hatteras, NC (approximately 35.5° N), in pelagic surface waters warmer than 12° C, between the 25 and 200 m isobaths; also in the Florida Straits, from 27° N south around peninsular Florida to 81° W in surface waters from the 200 m isobath to the EEZboundary.

Prey: Logan et al*.* 2011 found that juvenile bluefin tuna (60 – 150 cm curved fork length (CFL)) fed mainly on zooplanktivorous fishes and crustaceans. Sand lance was the main prey of young bluefin in the mid-Atlantic bight.

2.4.1 Skipjack Tuna (*Katsuwonus pelamis*) (NMFS, 2017)

The study area is designated as EFH for skipjack tuna adults. The habitat parameters for the applicable life stages are as follows:

Adults: Skipjack tuna are circumglobal in tropical and warm-temperate waters, generally limited by the 15°C isotherm. In the western Atlantic skipjack tuna range as far north as Newfoundland (Vinnichenko, 1996) and as far south as Brazil (Collette and Nauen 1983). Skipjack tuna are an epipelagic and oceanic species and may dive to a depth of 260 m during the day. Skipjack tuna is also a schooling species, forming aggregations associated with hydrographic fronts (Collette and Nauen 1983). Adults occur in coastal and offshore habitats between Massachusetts and Cape Lookout, North Carolina and localized areas in the Atlantic off South Carolina and Georgia, and the northern east coast of Florida. Aggregations of skipjack tuna are associated with convergences and other hydrographic discontinuities. Skipjack tuna also associate with birds, drifting objects, whales, sharks and other tuna species (Colette and Nauen, 1983). The optimum temperature for the species is 27 ºC, with a range from 20 to 31° C (ICCAT, 1995).

Prey: Skipjack tuna is an opportunistic species, which preys upon fishes, cephalopods, and crustaceans (Dragovich 1969 and 1970b; Dragovich and Potthoff 1972; Collette and Nauen 1983; ICCAT 113 1997).

Skipjack tuna are believed to feed in surface waters; however, they are caught as bycatch on longlines at greater depths. Stomach contents often include *Sargassum* or associated species (Morgan et al. 1985).

2.5 Sharks

2.5.1 Sand Tiger Shark (*Carcharias taurus*) (NMFS, 2017)

Part of the study area (EFH 10 x10 Square 1 only) is designated as EFH for sand tiger sharks: neonates and juveniles. The habitat parameters for the applicable life stages are as follows:

Neonates/YOY and juveniles: Neonate EFH ranges from Massachusetts to Florida, specifically the PKD bay system, Sandy Hook, and Narragansett Bays as well as coastal sounds, lower Chesapeake Bay, Delaware Bay (and adjacent coastal areas), Raleigh Bay and habitats surrounding Cape Hatteras. Juvenile EFH includes habitats between Massachusetts and New York (notably the PKD bay system), and between mid-New Jersey and the mid-east coast of Florida. EFH can be described via known habitat associations in the lower Chesapeake Bay and Delaware Bay (and adjacent coastal areas) where temperatures range from 19 – 25 °C, salinities range from 23 – 30 ppt at depths of 2.8 – 7.0 m in sand and mud areas, and in coastal North Carolina habitats with temperatures from 19 to 27 °C, salinities from 30 to 31 ppt, depths of 8.2 – 13.7 m, in rocky and mud substrate or in areas surrounding Cape Lookout that contain benthic structure.

Prey: The species is a generalized feeder, consuming a variety of teleost and elasmobranch prey (Gelsleichter et al., 1999).

2.5.2 Common Thresher Shark (*Alopias vulpinus*) (NMFS, 2017)

The study area is designated as EFH for all life stages of common thresher sharks. The habitat parameters for the applicable life stages are as follows:

Neonates/YOY, Juveniles and Adults: At this time, insufficient data is available to differentiate EFH between the juvenile and adult size classes; therefore, EFH is the same for those life stages. EFH is located in the Atlantic Ocean, from Georges Bank (at the offshore extent of the U.S. EEZ boundary) to Cape Lookout, North Carolina; and from Maine to locations offshore of Cape Ann, Massachusetts. EFH occurs with certain habitat associations in nearshore waters of North Carolina, especially in areas with temperatures from 18.2 – 20.9 °C and at depths from 4.6 – 13.7 m (McCandless et al. 2002). Thresher sharks are found in both coastal and oceanic waters, but according to Strasburg (1958), it is more abundant near land, with some seasonal abundance and north-south migrations along the U.S. East Coast (Castro, 2011), particularly in the offshore and cold inshore waters during the summer months (Gervelis and Natanson 2013).

Prey: Thresher sharks feed on invertebrates such as squid and pelagic crabs as well as small fishes such as anchovy, sardines, hakes, and small mackerels (Preti et al. 2004).

2.5.3 Dusky Shark (*Charcharinus obscurus*) (NMFS, 2017)

The study area is designated as EFH for dusky shark neonates. The habitat parameters for the applicable life stages are as follows:

Neonates/YOY: Dusky shark neonates often inhabit nursery areas in coastal waters. EFH in the Atlantic Ocean includes offshore areas of southern New England to Cape Lookout, North Carolina. Specifically, EFH is associated with habitat conditions including temperatures from 18.1 – 22.2 °C, salinities of 25 – 35 ppt and depths at 4.3 – 15.5 m. Seaward extent of EFH for this life stage in the Atlantic is 60 m in depth.

Prey: Dusky shark prey on a variety of fish and invertebrates, including herring, grouper, sharks, skates, rays, crabs, squid, and starfish.

2.5.4 Sandbar Shark (*Charcharinus plumbeus*) (NMFS, 2017)

The study area is designated as EFH for sandbar shark juveniles and adults. EFH for juvenile sandbar shark is found in all three EFH 10 x10 Squares. EFH for adult sandbar shark is found in EFH 10 x10 Squares 2 and 3 only. Sandbar sharks are bottom-dwellers found in relatively shallow coastal waters 18 – 61 meters (60 – 200 feet) deep on oceanic banks and sand bars with smooth, sandy substrates. The adults can also occasionally be found in estuaries in turbid waters with higher salinity (Florida Museum of Natural History, 2009). Further habitat parameters for the applicable life stages are as follows:

Juveniles: For late juveniles/subadults, EFH includes offshore southern New England and Long Island, both coastal and pelagic waters; also, south of Barnegat Inlet, New Jersey, to Cape Canaveral, Florida, shallow coastal areas to the 25–meter (82-foot) isobath; also, in the winter, in the Mid-Atlantic Bight, at the shelf break, benthic areas between the 100- and 200-meter (328- and 656-foot) isobaths; also, on the west coast of Florida, from shallow coastal waters to the 50–meter (164-foot) isobath, from Florida Bay and the Keys at Key Largo north to Cape San Blas, Florida**.**

Adults: For adults, EFH is on the east coast of the United States, shallow coastal areas from the coast to the 50-meter (164-foot) isobath from Nantucket, Massachusetts, south to Miami, Florida; also, shallow coastal areas from the coast to the 100-meter (328-foot) isobath around peninsular Florida to the Florida panhandle near Cape San Blas, Florida, including the Keys and saline portions of Florida Bay. The sandbar shark is the most common gray shark along the Mid-Atlantic Coast (Chesapeake Bay Program, 2009). From late May to early June, females head to the inlets and coastal bays of Virginia to give birth to litters of between 6 and 13 pups. The pups remain in the area until September or October, when they school and migrate south, along with the adults, to the warmer waters of North Carolina and Florida. The sharks begin to return to the coastal waters of Virginia around April.

Prey: Pups and juveniles feed primarily on crustaceans, graduating to a more diverse diet of fish from higher in the water column, as well as rays skates, mollusks, and crustaceans near or in the benthic layer.

2.5.5 Smoothhound Shark (*Mustelus sp.*) (*Mustelus canis*) (NFMS, 2017)

Part of the study area (EFH 10 x10 Square 1 only) is designated as EFH for smoothhound shark neonates/YOY, juveniles, and adults. Although there are EFH designations for *Mustelus mustelus*, information pertaining to their habitat preferences in the NCBB study area could not be found. Information generally describes that this species mainly occurs in waters of the northeastern Atlantic (Europe) and southeastern Atlantic (Africa). However, NMFS (2017) identifies three species of *Mustelus* as the "smoothhound complex" within the western Atlantic and Gulf of Mexico waters. The smooth dogfish, *Mustelus canis*, was identified within the affected area. The habitat parameters for the applicable life stages of smoothhound dogfish are as follows:

Neonates/YOY, Juveniles and adults (*Mustelus canis*): At this time, available information is insufficient for the identification of EFH for this life stage, therefore all life stages are combined in the EFH designation. Smoothhound shark EFH identified in the Atlantic is exclusively for smooth dogfish. EFH in Atlantic coastal areas ranges from Cape Cod Bay, Massachusetts to South Carolina, inclusive of inshore bays and estuaries (e.g., Pamlico Sound, Core Sound, Delaware Bay, Long Island Sound, Narragansett Bay, etc.). EFH also includes continental shelf habitats between southern New Jersey and Cape Hatteras, North Carolina.

Prey: In Delaware Bay, smooth dogfish fed on invertebrates with larger sharks shifting to large crabs and teleosts (McElroy 2009).

2.5.6 White Shark (Carcharodon carcharias)

The study area is designated as EFH for white sharks: neonates, juveniles and adults. The habitat parameters for the applicable life stages are as follows:

Neonate/YOY: EFH includes inshore waters out to 105 km from Cape Cod, Massachusetts, to an area offshore of Ocean City, New Jersey.

Juveniles, and Adults:

Known EFH includes inshore waters to habitats 105 km from shore, in water temperatures ranging from 9 – 28 °C, but more commonly found in water temperatures from 14 – 23 °C from Cape Ann, Massachusetts, including parts of the Gulf of Maine, to Long Island, New York, and from Jacksonville to Cape Canaveral, Florida.

3.0 Potential Impacts to EFH

The EFH final rule published in the Federal Register on January 17, 2002 defines an adverse effect as: "any impact which reduces the quality and/or quantity of EFH." The rule further states that: "An adverse effect may include direct or indirect physical, chemical or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat and other ecosystems components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from action occurring within EFH or outside EFH and may include site-specific or habitat-wide impacts including individual, cumulative, or synergistic consequences of actions."

Direct impacts are either temporary or permanent. For the purposes of this assessment, permanent impacts are assumed to be a permanent (or long-term) loss of a habitat or conversion to another habitat. Permanent losses of habitats may arise from direct displacement of a habitat resulting from construction activities such as filling in an aquatic habitat with permanent fill and/or a structure. This impact could extend horizontally and vertically. For purposes of this impact assessment, direct impacts are quantified by displacement in acres, which includes the vertical water column (if applicable) above an affected substrate.

The TSP for this project would be entirely in uplands and have no impact on EFH.

Further analysis will be conducted for CI & NS Plan and could result in the CI Plan being included in the final recommended plan. Given that implementation of the CI Plan would entail impacts to EFH, the CI Plan is included in this impact assessment.

For some CI measures, permanent, direct impacts are expected that would result in the loss of shallow subtidal; intertidal marsh; and shoals, bars, and mudflat habitat across 4 of the 5 sites. Temporary, direct impacts may occur during construction activities for the CI & NS Plan, which may include temporary de-watering, placement of de-watering structures, equipment access fills, temporary dredging, and other habitat disturbances where these disturbances may occur until the cessation of construction activities. In some cases, temporary, direct impacts may require restoration such as return to original grades, substrates, vegetation, and implementing best management practices for sediment and erosion control.

Indirect impacts can be fairly complex as they may involve physical, chemical or biological alterations that may not necessarily be immediate or constant, but can result in cascading effects through an ecosystem. An example of this could be a physical change in flow patterns that cause a physical change in sediment deposition resulting in a different tidal regime (subtidal to intertidal). A change in tidal regime could cause a shift in the benthic community that may affect predator/prey interactions of a higher consumer such as a fish. None of the proposed measures are expected to result in significant indirect impacts, such as a change in tidal regime.

3.1 No Action/ FWOP

Under the No-Action Alternative there would be no direct impacts to EFH resources. Existing EFH and HAPC (including estuarine water column, estuarine mud and sand bottoms [unvegetated estuarine benthic habitats], estuarine shell substrate [oyster reefs and shell substrate], estuarine emergent wetlands, seagrasses, marine water column, unconsolidated marine water bottoms, and natural structural features) would continue to be available to Federally managed species for which EFH has been designated (managed species).

The main significance of the predicted global climate change is its possible contribution to increasing sea levels, coastal flooding, changing estuarine salinity regimes, and biological communities. Indirect impacts due to climate change stressors (sea level rise, temperature increases, salinity changes, and wind and water circulation changes), storm severity and frequency, and dredging and maintenance dredging operations would impact the aquatic communities. Trends of tidal wetland loss are expected to continue. Increased development, hydrologic alterations, drought, flooding, and temperature extremes could affect wetlands. Sea level rise and climate change, including changes to hydrology, nutrient inputs, and flood or tide timing and intensity could have a variety of impacts on wetlands.

Although wetlands throughout Nassau County are declining and would likely continue this trend as sea level rise continues, there is a potential for wetlands to migrate farther inland where the elevation and topography are conducive for establishment in response to rising sea levels (Borchert et al., 2018; Guannel et al., 2014; Murdock and Brenner, 2016; Scavia et al., 2002). In recent years (1974 to 2008), wetland loss has occurred at the edges of the marsh islands throughout the back backs ecosystem (LI Trends Report). This trend would be expected to continue if the marsh islands are not able to maintain their elevations in the face of rising sea levels.

3.2 Effects by Alternative

3.2.1 Tentatively Selected Plan

The measures that make up the TSP include only non-structural measures and do not have the potential to result in direct and indirect effects to EFH.

3.2.2 CI & NS Plan

While not part of the tentatively selected plan, it was determined that the CI & NS Plan warranted further analysis. The structural measures that protect critical infrastructure (CI measures) include floodwalls, sluice gates, railroad tide-gates, and road closure gates. Floodwalls and sluice gates have the potential to result in direct and indirect effects to EFH.

To determine aquatic impacts, the NYSDEC Tidal Wetlands spatial layer used for Regulatory determinations was utilized to determine overlap between the proposed plan footprints and shallow water habitats and wetlands. The "Wetland Habitats" categories includes fresh marsh, high marsh, intertidal (low) marsh, dredged spoil sites, formerly connected wetlands, littoral zone (shallow subtidal), and shoals, bars, and mudflats. The location of the CI measures relative to tidal wetland resources are shown in Figure 32.

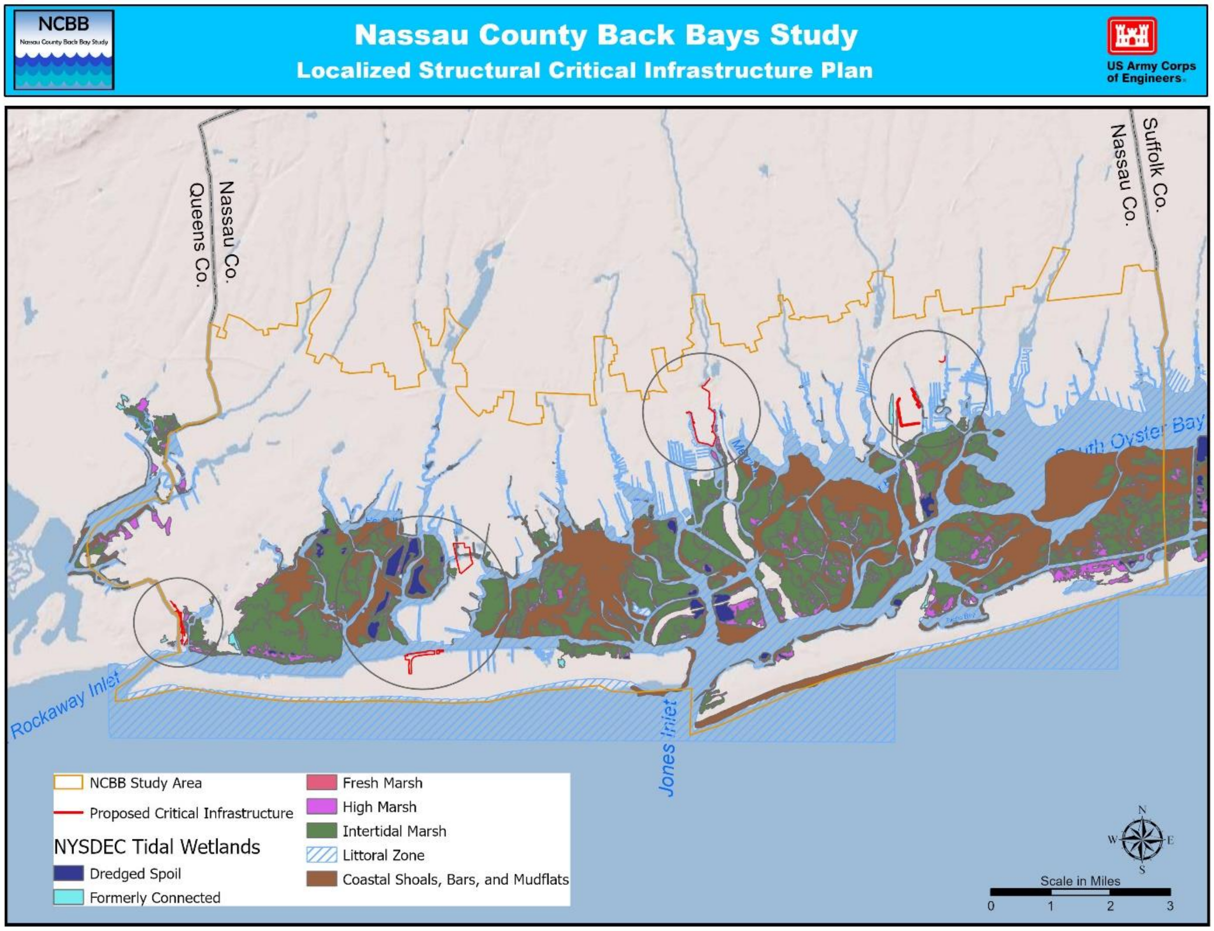


Figure 32: Locations of Critical Infrastructure Protection Measures

It should be noted that, to date, no jurisdictional wetland delineations have been conducted along any of the preliminary CI Plan alignments. Therefore, these impact estimates may be modified and refined based on a higher level of design detail that include surveyed wetland jurisdictional lines, and mitigation measures that first employ avoidance and minimization. However, it is assumed that for unavoidable wetland and aquatic habitats, compensatory mitigation would be required based on habitat modeling.

The CI measures would have permanent and direct impacts to EFH as shown in Table 3 from loss of these habitats within the project footprint. Impacts would occur to the littoral zone (shallow subtidal); intertidal marsh; and shoals, bars, and mudflat habitat across 4 of the 5 sites. Total permanent, direct impacts are 3.6 ac with the majority of impacts to shallow subtidal bottom. Temporary direct impacts are shown in Table 4 that total to 3.95 ac, with the majority of the impacts to shallow subtidal bottom. Temporary, direct impacts include disruptions within the area of disturbance during construction. Nearly all but 1 acre of the total permanent, direct and 1 acre of the total temporary, direct impacts are associated with the Freeport CI Plan.

Table 3. Permanent Impacts to Habitats as a Result of the CI & NS Plan

	Shallow Subtidal (LZ)	**Shoals, Bars, and Mudflats (SM)**	**Intertidal Marsh (IM, E2EM1P, FC)**	**Palustrine Forested (PFO1Ad)**
Far Rockaway	0.03	0.01	0.06	0.00
Freeport	2.64	0.00	0.04	0.00
Island Park	0.19	0.04	0.07	0.00
Long Beach	0.09	0.41	0.00	0.00
Wantagh	0.00	0.00	0.00	0.00
Total Impacts	**2.97**	**0.46**	**0.17**	**0.00**

Table 4. Temporary Impacts to Habitats as a Result of the CI & NS Plan

	Shallow Subtidal (LZ)	**Shoals, Bars, and Mudflats (SM)**	**Intertidal Marsh (IM, E2EM1P, FC)**	**Palustrine Forested (PFO1Ad)**
Far Rockaway	0.02	0.01	0.11	0.00
Freeport	2.64	0.00	0.08	0.01
Island Park	0.11	0.04	0.06	0.00
Long Beach	0.17	0.70	0.00	0.00
Wantagh	0.00	0.00	0.00	0.00
Total Impacts	**2.94**	**0.75**	**0.25**	**0.01**

The locations of wetlands and subtidal habitats located in the vicinity of each of the CI measures are depicted in the figures below. The Freeport, Island Park, and Long Beach CI measures are located in EFH 10 x 10 square 2 (see Figure 11). As a result, all but minimal impacts are isolated to EFH of square 2. Further, the areas that would be impacted by CI measures are adjacent to highly developed landscapes that have a long history of alteration.

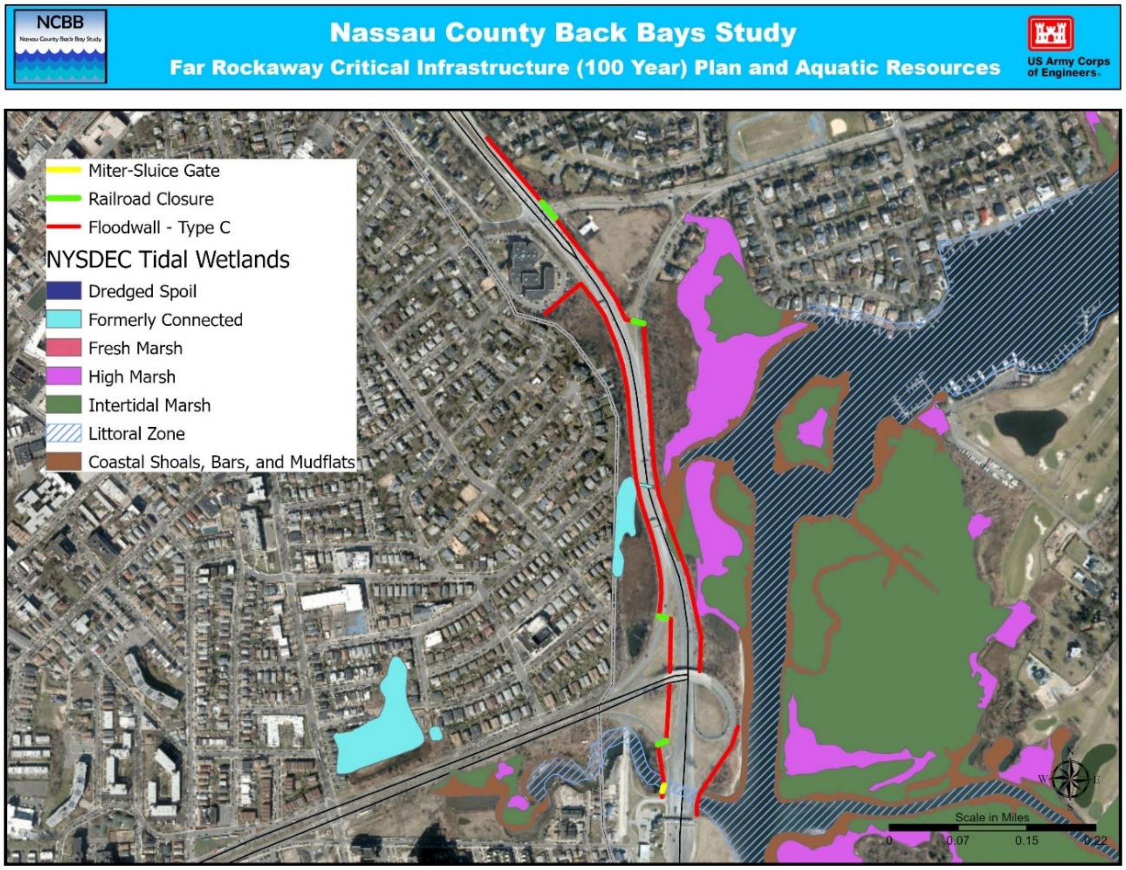


Figure 33: Aquatic Resources in the Vicinity of the Far Rockaway CI Plan

- Localized floodwall around Evacuation Route No. 1 (Far Rockaway, NY) as shown in Figure 33.
    - 7,000 linear feet of floodwall construction at elevation +16 feet NAVD88
    - Floodwall Type – Type C
    - 4 road closure & 1 sluice gate at elevation +16 feet NAVD88

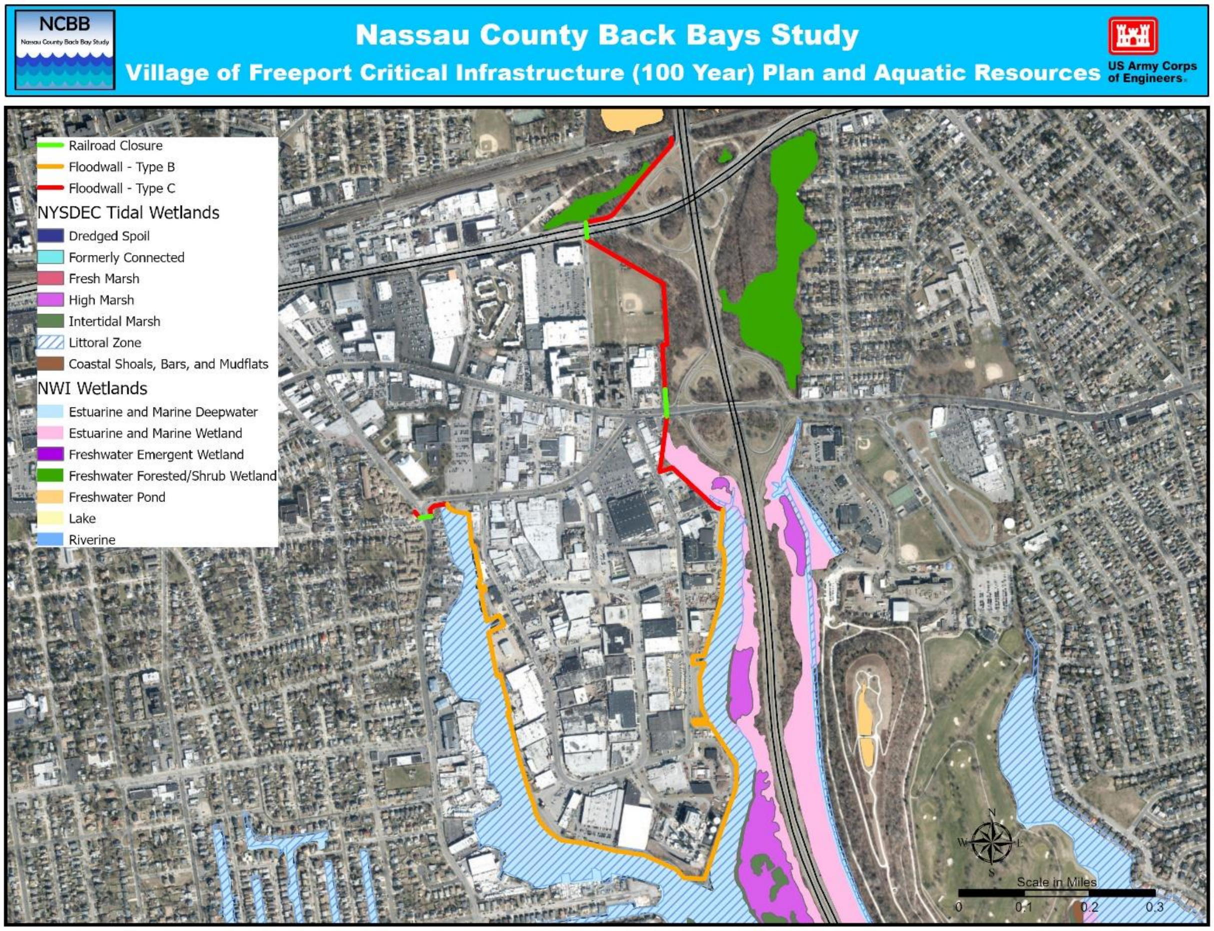


Figure 34: Aquatic Resources in the Vicinity of the Freeport CI Plan

- Localized floodwall around critical infrastructure in the Village of Freeport as shown in Figure 34.
    - 12,250 linear feet of floodwall construction at elevation +16 feet NAVD88
    - Floodwall Type – Type B & Type C
    - 3 road closure gates at elevation +16 feet NAVD88

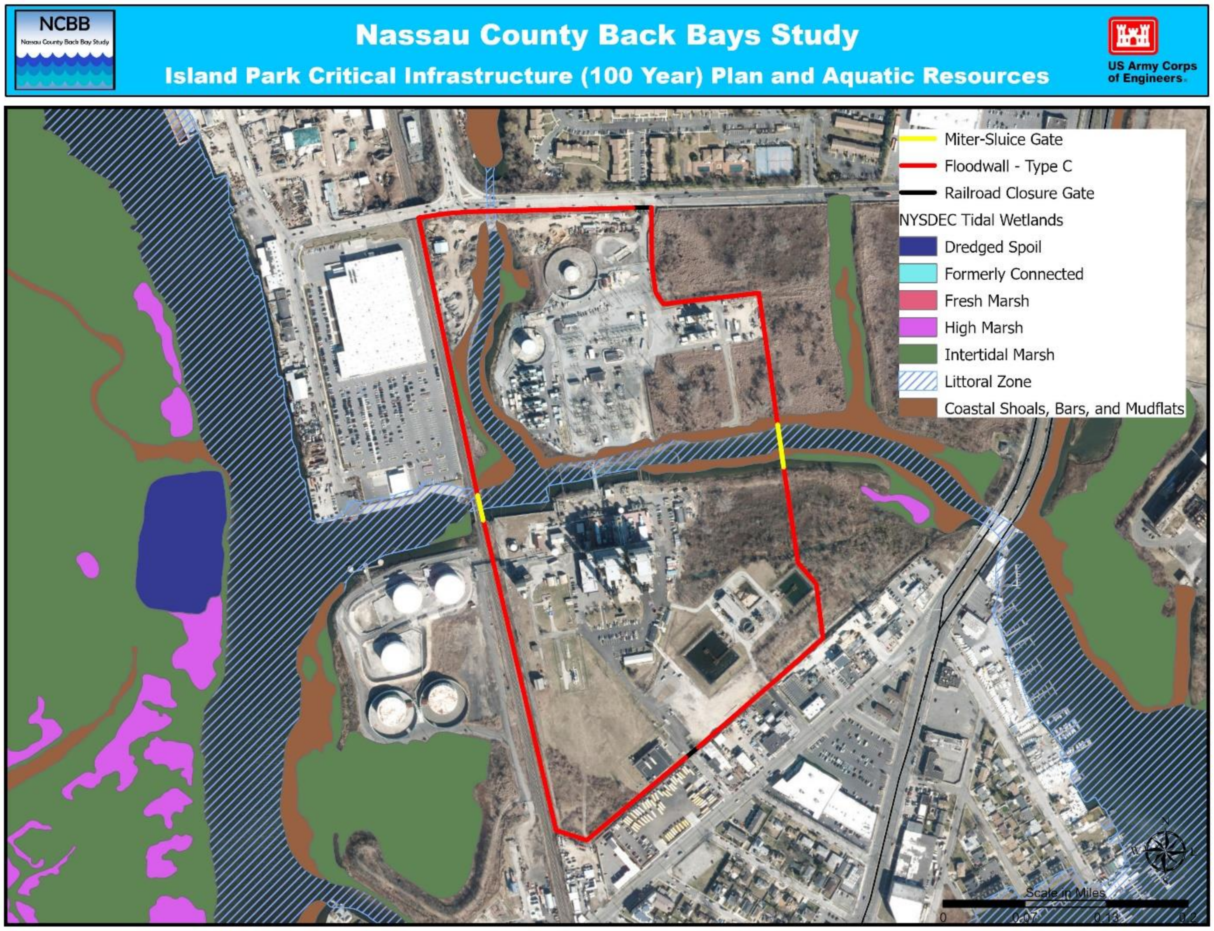


Figure 35: Aquatic Resources in the Vicinity of the Island Park CI Plan

- Localized floodwall around critical infrastructure in Island Park & vicinity as shown in Figure 35.
    - 6,950 linear feet of floodwall construction at elevation +16 feet NAVD88
    - Floodwall Type – Type C
    - 2 road closure gates at elevation +16 feet NAVD88
    - 2 sluice gates at elevation +16 feet NAVD88

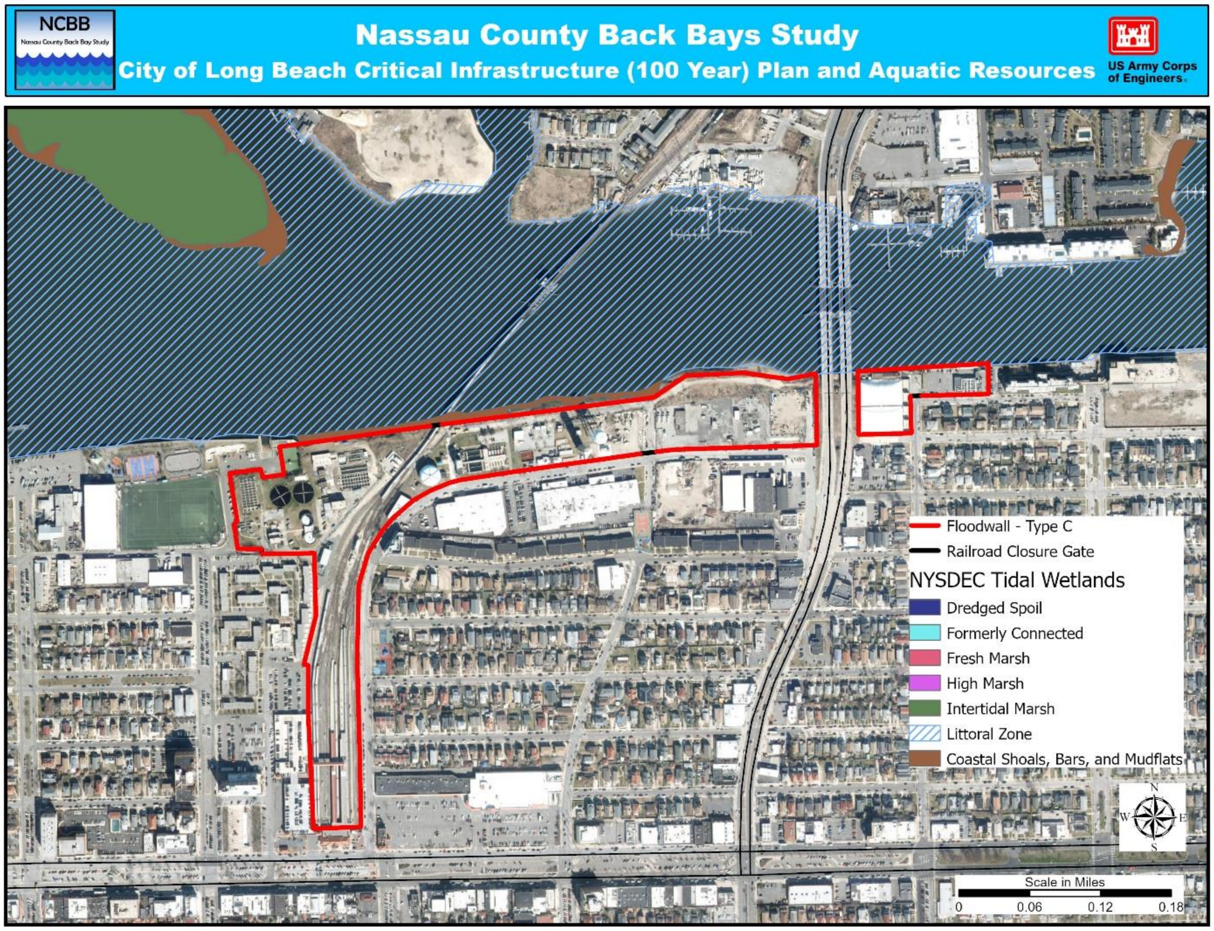


Figure 36: Aquatic Resources in the Vicinity of the City of Long Beach CI Plan

- Localized floodwall around critical infrastructure in the City of Long Beach as shown in Figure 36.
  - 10,280 linear feet of floodwall construction at elevation +16 feet NAVD88
  - Floodwall Type – Type C
  - 3 road & 1 rail closure gates at elevation +16 feet NAVD88

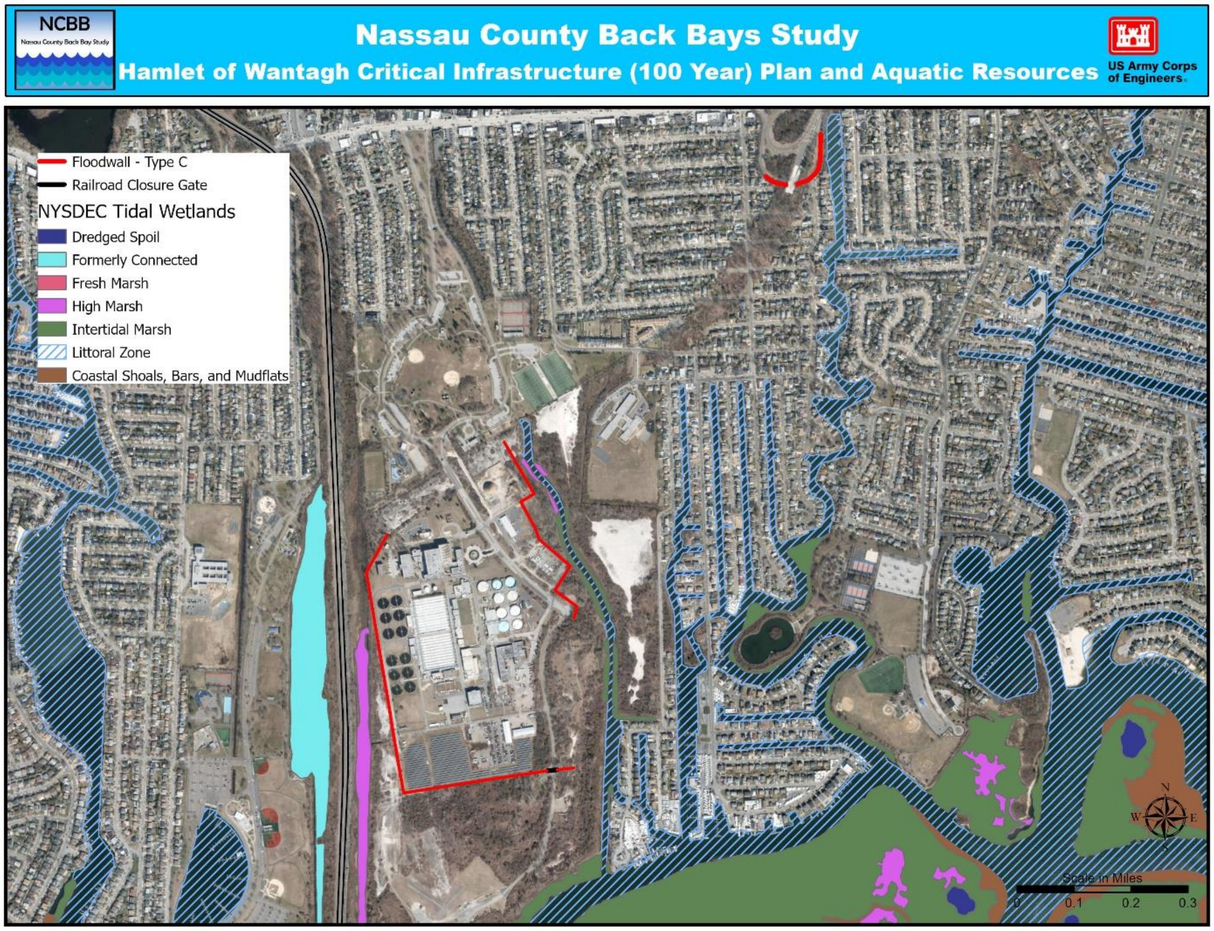


Figure 37: Aquatic Resources in the Vicinity of the Wantagh CI Plan

- Localized floodwall around Cedar Creek WWTP and Evacuation Route No. 4 (Wantagh, NY) as shown in Figure 37. The
    - 800 linear feet of floodwall construction at elevation +16 feet NAVD88
    - Floodwall Type – Type C

3.2.2.1 Open Ocean

The CI & NS PLan will have no effects to open ocean, as no open ocean is present in the vicinity of the project areas.

3.2.2.2 Estuarine Open Waters and Subtidal Habitats

Far Rockaway

At Far Rockaway, the CI & NS Plan has the potential to permanently impact 0.03 acre of shallow subtidal area, and to have temporary impacts to 0.02 acre of subtidal area.

Freeport

At Freeport, the CI & NS Plan has the potential to permanently impact 2.64 acres of shallow subtidal area and temporarily impact 2.64 acres of subtidal areas.

Island Park

At Island Park the CI & NS Plan has the potential to permanently impact 0.19 acre of shallow subtidal area and temporarily impact 0.11 acre of subtidal area.

Long Beach

At Long Beach, the CI & NS Plan has the potential to permanently impact .09 acre of subtidal area and temporarily impact 0.17 acre of subtidal area.

Wantagh

The proposed CI protection plan at Wantagh has no potential to impact subtidal areas, as it would occur entirely in uplands.

3.2.2.3 SAV

The NYSDEC Statewide Seagrass Map (2018) depicted in Figure 12 shows no mapped SAV in or near any of the potential CI work areas. No SAV surveys have been conducted along the alignments.

3.2.2.4 Mudflats, Shoals, and Bars

Far Rockaway

At Far Rockaway, the CI & NS Plan has the potential to permanently impact 0.01 acre of shoal, bar, or mudflat and to have temporary impacts to 0.01 acre of shoal, bar, or mudflat.

Freeport

No impacts are proposed to areas of shoal, bar, or mudflat at the Freeport CI location.

Island Park

At Island Park, the CI & NS Plan has the potential to permanently impact 0.04 acre of shoal, bar, or mudflat and to have temporary impacts to 0.04 acre of shoal, bar, or mudflat.

Long Beach

At Long Beach, the CI & NS Plan has the potential to permanently impact 0.41 acre of shoal, bar, or mudflat and to have temporary impacts to 0.70 acre of shoal, bar, or mudflat.

Wantagh

No impacts are proposed to areas of shoal, bar, or mudflat at the Wantagh CI location, as the work at this location is entirely in uplands.

3.2.2.5 Wetlands

Far Rockaway

At Far Rockaway, the CI & NS Plan has the potential to permanently impact 0.06 acre of intertidal marsh, and temporarily impact 0.11 acre of intertidal marsh.

Freeport

At Freeport, the CI & NS Plan has the potential to permanently impact 0.04 acre of intertidal marsh, and temporarily impact 0.08 acre of intertidal marsh.

Island Park

At Island park, the CI & NS Plan has the potential to permanently impact 0.07 acre of intertidal marsh, and temporarily impact 0.06 acre of intertidal marsh.

Long Beach

At Long Beach, the CI & NS Plan has no potential to impact wetlands, as no wetlands are present in the project area at this location.

Wantagh

No impacts to wetlands are proposed at the Wantagh CI location, as the work at this location is entirely in uplands.

3.2.3 Natural and Nature-Based Features

3.2.3.1 Open Ocean Waters

The NNBF plan will have no effects to open ocean, as no open ocean is present in the vicinity of the project area.

3.2.3.2 Estuarine Open Water and Subtidal Habitats

Elements of the NNBF work that is being considered would occur in or in the vicinity of subtidal habitats and estuarine open water. Wetlands restoration and conservation efforts as well as potential living shoreline and/or reef that are developed by additional analyses within EFH for the NNBF features would ultimately be beneficial to EFH.

3.2.3.3 Intertidal Habitats

Elements of the NNBF work that is being considered would occur in or in the vicinity of intertidal habitats. Wetlands restoration and conservation efforts as well as potential living shoreline and/or reef that are developed by additional analyses within EFH for the NNBF features would ultimately be beneficial to EFH.

3.2.3.4 Wetlands

Elements of the NNBF work that is being considered would occur in or in the vicinity of wetlands. Wetlands restoration and conservation efforts as well as potential living shoreline and/or reef that are developed by additional analyses within EFH for the NNBF features would ultimately be beneficial to EFH.

3.2.3.5 SAV

The NNBF plan will have no effects to SAV, as no SAV is present in the vicinity of the project area.

3.3 Effects by Species: Mid-Atlantic Species

The following section provides an analysis of the direct, secondary, and cumulative impacts of the TSP, CI & NS Plan, and NNBF plan on federally managed species, and prey species consumed by managed species that occur in the project vicinity.

3.3.1 Atlantic Butterfish

Juvenile Atlantic butterfish are the only life stage of this species mapped in the study area. Juvenile butterfish are pelagic and occur in water depths between 10 and 365 meters, and therefore are unlikely to be present in the project areas due to insufficient water depths. EFH is not designated in the study area for Atlantic butterfish eggs, larvae, or adults. Due to the distance of any proposed work from sufficient water depths for this juvenile butterfish, it is anticipated that this project will have no adverse effects to EFH for this species.

3.3.2 Atlantic Mackerel

EFH is designated in the study area for all life species of Atlantic mackerel. No effects to EFH are expected for this species as a result of the TSP or NNBF features due to the absence of suitable habitat. Based on salinity, it is unlikely that larvae would be in the CI Plan project areas. Salinity in the back bays system is typically less than 30% except in the vicinity of the ocean inlets. Therefore, if the CI & NS Plan is implemented, adult and juveniles may experience adverse effects through water quality impacts such as a temporary and localized increase in turbidity and decreased dissolved oxygen content in the water column during construction of project features. Adult and juvenile Atlantic mackerel are transient and would be expected to relocate from the project area during construction. Any impacts would subside upon project completion. The Freeport component would have the greatest potential to affect EFH for this species and would result in a loss of 2.64 acres of shallow subtidal habitat. Wantagh would have no effects (EFH 10 x 10 square 3). Except for the minimal impacts of the Far Rockaway and a small portion of the Long Beach components, impacts are limited to EFH 10 x 10 square 2. No significant direct effects are anticipated. Impact level is expected to be low.

3.3.3 Atlantic Surfclam (*Spisula solidissima*)

Parts of the project area (including 10x10 Squares 2 and 3) are designated as EFH for Atlantic surfclam juveniles and adults. Juvenile and adult Atlantic surfclam are benthic, and are primarily located within Atlantic Ocean continental shelf waters in fine to medium sands in turbulent waters just beyond the breakers in depths of 8 to 66 m. These life stages are primarily found in salinities greater than 28%, and are susceptible to low dissolved oxygen. It is not likely that EFH exists in the project areas for either of these life stages of this species due to the insufficient water depths, therefore no effects to their EFH are anticipated.

3.3.4 Black Sea Bass (*Centropristis striata*)

EFH is designated in the study area for juveniles and adults (juveniles and adults in EFH 10x10 squares 1 and 2, adults only in EFH 10x10 square 3). No effects to EFH are expected for this species as a result of the TSP or NNBF features due to the absence of suitable habitat, however adverse effects may be possible if the CI & NS Plan is implemented. Black sea bass are transient and would be expected to relocate from the project area during construction. Therefore, direct impacts to individuals from construction are not anticipated. However, construction of the CI & NS Plans at some locations may impact areas containing man-made structures (primarily the Freeport CI Plan) and areas of sand and shell bottom if they are implemented. Any impacted areas of this type would be replaced with structured habitat that black sea bass could likely utilize. No significant direct effects are anticipated. Impact level is expected to be low and limited to EFH 10 x 10 square 2.

3.3.5 Bluefish (*Pomatomus saltatrix*)

EFH is designated for bluefish adult and juveniles throughout the action area. Adult and juvenile bluefish are pelagic. Juveniles would likely be in the project area from May through October; adults from April through October. Juvenile and adult bluefish eat a wide array of invertebrates and fishes. No effects to EFH are expected for this species as a result of the TSP or NNBF features due to the absence of suitable habitat. However, if the CI & NS Plan is implemented, both life stages and their prey may be adversely impacted temporarily through water quality impacts such as a temporary and localized increase in turbidity and decreased dissolved oxygen content in the water column during construction. These impacts would subside upon project completion. However, bluefish and their prey are mobile species, and would likely leave the project area during construction to avoid these impacts. The Freeport component would have the greatest potential to affect EFH for this species and would result in a loss of 2.64 acres of shallow subtidal habitat. Wantagh would have no effects (EFH 10 x 10 square 3). Except for the minimal impacts of the Far Rockaway and a small portion of the Long Beach components, impacts are limited to EFH 10 x 10 square 2. No significant direct effects are anticipated. Impact level is expected to be low. Undertaking construction in the fall or winter would minimize any interactions with or impacts to bluefish.

3.3.6 Long finned Inshore Squid (*Loligo pealei*)

EFH is designated for eggs and juveniles across the entire study area. It is possible that pre-recruits may use the inshore waters near locations where work would occur for the CI & NS Plan, and therefore could be impacted temporarily due to turbidity during construction. It is also possible that the CI & NS Plan may have adverse effects to eggs due to the possible presence of rocks and small boulders on sandy/muddy bottom. Any subtidal hardened structure associated with the CI measures, if implemented, could provide replacement structured habitat that eggs could utilize. Overall, impacts would be low depending on the extent to which rocks and small boulders on sandy/muddy habitat are present in the affected area, and the extent to which new structures could provide hardened habitat for eggs. The Freeport component would have the greatest potential to affect EFH for this species and would result in a loss of 2.64 acres of shallow subtidal habitat. Wantagh would have no effects (EFH 10 x 10 square 3). Except for the minimal impacts of the Far Rockaway and a small portion of the Long Beach components, impacts are limited to EFH 10 x 10 square 2. No significant direct effects are anticipated. Impact level is expected to be low. Undertaking construction in the fall or winter would minimize any interactions with or impacts to long finned inshore squid.

3.3.7 Spiny Dogfish (*Squalus acanthias*)

EFH 10x10 Square 1 is designated as EFH for spiny dogfish sub-adults and adults. The only CI Plan component in Square 1 is the Far Rockaway with a projected loss of 0.03 acres and an indirect impact to 0.02 acres of shallow subtidal habitat. Spiny dogfish are demersal by day, but may vertically migrate at night to feed. Spiny dogfish prefer muddy/silty and sandy bottoms in polyhaline baymouths and contenintal slope waters in depths of 1– 500 m. Summer and fall bring seasonal migrants into outer estuaries where the water is cooler and more saline. Direct impacts from construction are not expected as it would be unlikely that sub-adults and adults would be in the vicinity of the Far Rockaway CI Plan. Additionally, spiny dogfish are mobile and would likely to move from the project area due to disruptions during construction. Impacts are expected to be low to none.

3.3.8 Scup (*Stenotomus chrysops*)

EFH is designated for juvenile and adult scup throughout the study area. Juvenile and adult scup are both demersal utilizing a variety of habitats including sandy bottom or structured habitats. Scup would be expected to be present in the project area in spring through fall; some adults may winter offshore.

While no adverse effects would occur to scup EFH as a result of implementation of the TSP or NNBF features, potential implementation of the CI measures may result in loss of habitat used by scup. The Freeport component would have the greatest potential to affect EFH for this species and would result in a loss of 2.64 acres of shallow subtidal habitat. Wantagh would have no effects (EFH 10 x 10 square 3). Except for the minimal impacts of the Far Rockaway (0.05 ac) and a small portion of the Long Beach components, impacts are limited to EFH 10 x 10 square 2. Given that scup are bottom feeders, there could be permanent and temporary impacts to scup and their prey from disturbance of bottom habitats;

smothering from construction; and water quality impacts in CI measure locations where work in subtidal habitats may occur (a total of 2.97 acres). Prey availability could be reduced during and following construction activities. Impacts associated with impaired water quality include a temporary, but localized increase in turbidity and decreased dissolved oxygen content in the water column during construction. Overall, impacts would be anticipated to be low to moderate since scup are demersal and benthic feeders, but able to move from the area and similar habitat is abundant in the region. Further, undertaking the project in the winter would minimize any interactions with or impacts to scup.

3.3.9 Summer Flounder (*Paralicthys dentatus*)

EFH is designated for summer flounder larvae, juveniles, and adults throughout the entire study area. HAPC is also designated in EFH 10x10 Square 1. Summer flounder larvae are pelagic and most likely to be in the project area between October to May when they use coastal and estuarine habitats as nursery grounds. Larvae prey upon zooplankton and small crustaceans. Summer flounder juvenile and adults are demersal, associated with mud and sandy substrates in shallow coastal and estuarine waters (juvenile < 5 m; adult < 25 m) in warmer months. Adults move offshore to depths greater than 150 m in colder months. EFH for summer flounder juveniles and adults is likely present in all CI plan work areas containing subtidal or intertidal soft bottomed habitat. The Freeport component would have the greatest potential to affect EFH for this species and would result in a loss of 2.64 acres of shallow subtidal habitat. Wantagh would have no effects (EFH 10 x 10 square 3). Except for the minimal impacts of the Far Rockaway component (0.05 acres) and a small portion of the Long Beach component impacts are limited to EFH 10 x 10 square 2. HAPC for summer flounder includes all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH. No HAPC for summer flounder is present in or near the proposed work areas for the TSP, CI plan, or NNBF plan.

Summer flounder larvae would be impacted by construction activities occurring between October and May. They are mobile and would likely avoid construction areas. Impacts to larvae could include loss of individuals during construction (direct impact), and increased turbidity and reduced water quality (indirect impacts) that would affect habitat condition and feeding.

Juveniles and adults are demersal and inhabit the project area during warmer months. There could be impacts to juveniles and adults as loss of individuals from construction activities (direct impact), loss of habitat, and reduced availability of benthic food prey. Direct impacts are expected to be moderate as juvenile and adults are mobile and would likely move from the project area due to disruptions from construction. However, an array of habitats utilized by summer flounder would likely be lost due to construction the CI measures, if implemented. In total, implementation of the CI plan would permanently impact 2.97 acres of subtidal habitat (soft bottom substrate) and 0.46 acre of shoal, bar, and mudflat, primarily within EFH 10 x 10 square 2.

The impact to summer flounder is projected to be low to moderate due to the impact to multiple habitat types, but also bearing in mind the low quality of habitat that may be impacted (primarily soft bottom habitat immediately adjacent to bulkheaded areas, most of which are industrial). No HAPC would be affected by the CI plan due to the lack of HAPC in or near the proposed work areas. Conducting construction in fall and winter months would reduce the likelihood of interactions with juvenile and adult summer flounder, but not larvae. Impacts to summer flounder larvae could still be likely during winter months as they would remain in the study area, but would be anticipated to be low since they are pelagic.

3.4 Effects by Species: NEW ENGLAND SPECIES

3.4.1 Atlantic Sea Herring

EFH is designated for juvenile and adult Atlantic sea herring throughout the entire study area. Atlantic sea herring juveniles and adults typically avoid warmer waters (juvenile < 22°C; adult < 10 ° C) and low salinities. Atlantic sea herring are most likely to be in the project area during fall and winter. However, waters within the study area could provide suitable water temperatures for juveniles throughout the year. Juveniles and adults are pelagic. Adults are typically found near the surface, but spawning occurs on the bottom at depths of 5 – 90 m in late summer/fall. The TSP would not affect EFH for Atlantic sea herring. The Freeport CI measures would have the greatest potential to affect EFH for this species and would result in a loss of 2.64 acres of shallow subtidal habitat. The Wantagh CI measures would have no effects (EFH 10 x 10 square 3). Except for the minimal impacts of the Far Rockaway CI measures (0.05 acres) and a small portion of the Long Beach CI measure, impacts are limited to EFH 10 x 10 square 2 (2.94 ac). Both life stages and their prey may be adversely impacted (indirect impact) temporarily through water quality impacts such as a temporary and localized increase in turbidity and decreased dissolved oxygen content in the water column during construction. These impacts would subside upon project completion. Atlantic sea herring and their prey are mobile species and would likely leave the project area during construction to avoid these impacts. Effects are anticipated to be low due to use of pelagic habitats and mobility. No significant direct effects are anticipated.

3.4.2 Atlantic Cod

EFH is designated for Atlantic cod eggs and larvae in EFH 10 x10 Squares 2 and 3. EFH is designated for Atlantic cod adults in EFH 10 x10 Square 1. The TSP would be constructed entirely in uplands and the NNBF features being considered would be in intertidal and wetland areas, and therefore would have no adverse effects to EFH for Atlantic cod. Except for the minimal impacts of the Far Rockaway CI Plan component (0.05 acres) and a small portion of the Long Beach CI measure components, any impacts would be limited to EFH 10 x 10 square 2. Adult cod, having EFH limited to square 1 would likely not be impacted. Given that cod eggs and larvae are pelagic and prefer offshore and coastal water and the limited spatial extent of the EFH designations in the proposed work areas, any effect to Atlantic cod and their EFH would be expected to be minimal also. Eggs and larvae could be adversely impacted (indirect impact) temporarily through water quality impacts such as a temporary and localized increase in turbidity and decreased dissolved oxygen content in the water column during construction. These impacts would subside upon project completion. Impacts are anticipated to be low to Atlantic cod EFH.

3.4.3 Ocean Pout

EFH is designated in EFH 10 x10 Squares 2 and 3 for ocean pout eggs and adults. The TSP would be constructed entirely in uplands and the NNBF features being considered would be in intertidal and wetland areas, and therefore would have no adverse effects to EFH for ocean pout. As no CI measures that affect EFH are located in square 3, potential impacts only exist in square 2. Ocean pout eggs are demersal and may utilize high salinity zones of bays and estuaries. Ocean pout spawn on hard bottom habitats, such as rock crevices and sometimes also within man-made artifacts. Adults are demersal and prefer benthic habitats deeper than 20 m but may use high salinity zones of bays and estuaries in mud and sandy bottoms with structure. Areas of rock crevices and mud and sandy bottoms with structure are likely present in the study area. Additionally, benthic invertebrates, which are prey for this species, are likely present in areas being considered for the CI measures in square 2. Direct adverse effects to adult individuals are not expected, as adult ocean pout prefer deeper waters and would be expected to be able to move from the area during construction. However, direct adverse effects to eggs may be possible due to potential impacts to rocky crevices which may serve as spawning areas where eggs are deposited. The distribution of this habitat is not known and is currently of marginal quality given its proximity to developed land uses. However, subtidal areas that would be impacted as a result of the CI plan total 2.94 acres. Furthermore, eggs and adults could be adversely impacted (indirect impact) temporarily through water quality impacts such as a temporary and localized increase in turbidity and decreased dissolved oxygen content in the water column during construction. These impacts would subside upon completion of construction. Impacts are projected to be low to moderate for eggs and adults, depending on the presence of subtidal areas that may meet the habitat parameters for this species.

3.4.4 Pollock

EFH is mapped for juvenile pollock in all three EFH 10 x 10 Squares. EFH is mapped for pollock eggs in EFH 10 x10 squares 2 and 3 only. Pollock eggs are found in pelagic waters from October to June, and peaks in November to February. No work is proposed in or near locations that have sufficient depth or salinity to meet the habitat description, therefore, the TSP, NNBF plan, and CI plan have no potential to affect pollock eggs or their EFH.

Juvenile pollock are found in association with bottom habitats with aquatic vegetation or a substrate of sand, mud or rocks. Typical conditions are water temperatures less than 18°C, water depths between 0 and 250 meters, and salinities between 29% and 32%. The intertidal zone may be important nursery area for juvenile pollock. Juveniles may be present in the shallow intertidal zone at all tide stages throughout summer. Subtidal marsh creeks are also seasonally important as nursery. Within the study area, salinities may limit the presence of juvenile pollock. If the CI plan is implemented, habitat used by juvenile pollock may be permanently impacted due to construction in areas that may contain substrate of sand, mud, and/or are located in the intertidal zones. The distribution of this habitat is not known, however, subtidal areas that would be permanently impacted as a result of the CI plan total 2.94 acres in square 2, and areas of intertidal bars, shoals, and mudflat that would be permanently impacted as a result of the CI plan total 0.45 acre. It is possible that the NNBF plan may have temporary adverse effects to subtidal marsh creeks due to turbidity caused by restoration work in adjacent wetlands, however the effect of turbidity would be minimal and temporary, and ultimately beneficial to the species through improvements to marsh habitat. Although considered to be of marginal quality, implementation and closure of the sluice gates at Island Park under flood conditions would temporarily limit access and potentially trap pollock in subtidal marsh creeks. If the CI plan is implemented, temporary adverse effects (indirect effects) could stem from water quality impacts associated with a localized increase in turbidity and decreased dissolved oxygen content in the water column during construction. However, these impacts would subside upon completion of construction. Impacts are projected to be low to moderate for juvenile pollock, depending on salinity and the presence of suitable areas that may meet the habitat parameters for this species.

3.4.5 White Hake

EFH is designated for juvenile white hake in EFH 10 x10 Squares 2 and 3. Juvenile white hake are found in pelagic waters from May to September, and demersal waters thereafter. During their demersal stage, they are found in bottom habitat with seagrass beds or substrate of mud or fine-grained sand. Further parameters for juvenile white hake habitat include temperatures below 19°C and water depths between 5 and 225 meters. No work is proposed in or near locations that have sufficient depth to meet this habitat description, therefore, the TSP, NNBF plan, and CI plan have no potential to affect juvenile white hake or their EFH.

3.4.6 Windowpane Flounder

EFH is designated for windowpane flounder eggs, larvae, juveniles, and adults throughout the entire study area. Windowpane flounder eggs and larvae are pelagic. Eggs are likely in the study area between February to July and September to November. Larvae are likely found between May to July and October and November. As larvae age, they start to utilize benthic habitats. Windowpane flounder juvenile and adults are demersal, associated with mud and sandy substrates in intertidal and sub-tidal benthic habitats in shallow coastal and estuarine waters.

The TSP would be constructed entirely in uplands and the NNBF features being considered would be in intertidal and wetland areas, and therefore would have no adverse effects to EFH for windowpane flounder.

Windowpane flounder eggs and larvae would be directly and indirectly impacted by construction activities associated with the CI plan occurring between February and November. The Freeport CI measures would have the greatest potential to directly affect EFH for this species and would result in a loss of 2.64 acres of shallow subtidal habitat and 0.04 acres of intertidal marsh habitat. The Wantagh CI measures would have no effects (EFH 10 x 10 square 3). Except for the minimal impacts of the Far Rockaway CI measures (0.1 acres across habitats) and a small portion of the Long Beach CI Plan component, impacts are limited to EFH 10 x 10 square 2 (2.94 ac of shallow subtidal habitat; 0.45 acres of shoals, bars, and mudflats; and 0.11 acres of intertidal marsh). EFH for these life stages would be temporarily adversely affected by turbidity during construction. Larvae are mobile and would likely avoid construction areas, however impacts could include loss of individuals during construction. Undertaking construction in winter months would avoid adverse effects to eggs and larvae.

Juveniles and adults are demersal and therefore, at higher risk from project impacts from the CI plan. If the CI plan is implemented, potential shallow habitat for juvenile and adult windowpane flounder would be permanently converted to infrastructure. The precise distribution of mud and sand habitat is not known, however, subtidal areas that would be permanently impacted as a result of the CI plan total 3.6 acres. If the CI plan is implemented, an additional 3.94 acres would be temporarily impacted. Temporary adverse effects (indirect effects) could stem from water quality impacts associated with a localized increase in turbidity and decreased dissolved oxygen content in the water column during construction. However, these impacts would subside upon completion of construction.

Impacts are projected to be moderate for juvenile and adult windowpane flounder, depending on the presence of suitable areas that may meet the habitat parameters for this species. Conducting construction in fall and winter months would reduce the likelihood of interactions with eggs and larvae, but not juvenile and adults.

3.4.7 Winter flounder

EFH is designated for eggs, larvae, juvenile, and adult winter flounder throughout the study area.

All life stages of winter flounder are associated with benthic habitats. At first, larvae use pelagic habitats, but become benthic with growth. Prey include benthic invertebrates, phytoplankton, and fish.

The TSP would be constructed entirely in uplands and the NNBF features being considered would be in intertidal and wetland areas, and therefore would have no adverse effects to EFH for winter flounder.

Potential impacts to winter flounder associated with the CI measures include loss of individuals from construction activities (direct impact), loss of habitat (indirect), water quality impacts during construction such as a temporary and localized increase in turbidity and decreased dissolved oxygen content in the water column (indirect), and reduced availability of benthic food prey (indirect). These impacts would be focused in EFH square 2 with minimal to no impacts in squares 1 or 3.

Winter flounder eggs are sensitive to sedimentation and could be particularly affected by turbidity increases associated with construction of the CI plan. However, winter flounder and their prey are mobile and would likely leave the project area during construction to avoid these impacts.

If the CI plan is implemented, habitat used by all life stages of winter flounder may be permanently impacted due to construction in areas that are shallow and have substrates of mud and sand. The precise distribution of this habitat is not known, however, subtidal areas that would be permanently impacted as a result of the CI plan total 2.97 acres; areas of intertidal bars, shoals, and mudflat that would be permanently impacted as a result of the CI plan total 0.46 acre; and areas of intertidal marsh total 0.11 acres. If the CI plan is implemented, temporary adverse effects (indirect effects) could stem from water quality impacts associated with a localized increase in turbidity and decreased dissolved oxygen content in the water column during construction. However, these impacts would subside upon completion of construction.

Impacts are projected to be moderate for all life stages of winter flounder if the CI plan is implemented due to likely loss of habitat. Prior coordination with NMFS has concluded an environmental conservation recommendation to not conduct construction activities from January 1 through May 31, unless a cofferdam is already in place. If applicable, this recommendation would apply to activities in potential winter flounder habitat. If that recommendation were adhered to for construction, the likelihood of direct impacts to winter flounder individuals is reduced, though the potential for adverse effects to winter flounder habitat would still exist due to habitat loss.

3.4.8 Yellowtail Flounder

EFH for adult yellowtail flounder is designated in EFH 10 x 10 Square 1. Adults yellowtail flounder and their prey utilize benthic habitats. However, adults are limited to deeper waters greater than 20 m and therefore do not have EFH located in or near any of the areas where work is being considered. Therefore, the TSP, NNBF plan, and CI plan have no potential to affect yellowtail flounder or their EFH.

3.4.9 Red Hake

EFH is designated in the entire study area for red hake adults. Red hake adults utilize benthic habitats in the Gulf of Maine and the outer continental shelf and slope in depths of 50 – 750 meters and as shallow as 20 meters in a number of inshore estuaries and embayments as far south as Chesapeake Bay. Shell beds, soft sediments (mud and sand), and artificial reefs provide essential habitats for adult red hake. They are usually found in depressions in softer sediments or in shell beds and not on open sandy bottom. However, adults are limited to deeper waters greater than 20 m and are therefore do not have EFH located in or near any of the areas where work is being considered. The TSP, NNBF plan, and CI plan have no potential to affect red hake or their EFH.

3.4.10 Monkfish

EFH is designated for monkfish eggs and larvae monkfish throughout the study area, while EFH is designated for monkfish adults in EFH 10 x10 Square 1 only. Eggs and larvae utilize pelagic areas in inshore areas, while monkfish larvae occur from the surf zone to depths of 1,000 to 1,500 meters on the continental slope. Neither of these habitat types are being considered for work, and therefore no effects to EFH for monkfish eggs or larvae will occur from implementation of any of the measures that area being considered. Adult monkfish are found in bottom habitats with substrates of a sandshell mix, algae covered rocks, hard sand, pebbly gravel, or mud. They live in waters of less than 15°C, 29.9 – 36.7% salinity, and depths of 25 – 200 meters. No areas of 25 meters or greater water depth are being considered for work, and therefore no effects to EFH for adult monkfish will occur from implementation of any of the measures being considered.

3.4.11 Little Skate

EFH is designated for juvenile and adult little skate throughout the study area. Juvenile and adult little skate are found in intertidal and subtidal benthic habitats, utilizing gravel, sand, and mud bottom. Little skate prey upon benthic macrofauna.

The TSP would be constructed entirely in uplands and the NNBF features being considered would be in intertidal and wetland areas, and therefore would have no adverse effects to EFH for winter flounder.

Due to the presence of suitable intertidal and subtidal benthic habitats of sand and mud bottom in the areas where work is proposed for the CI plan, there could be impacts to little skate as loss of individuals from construction activities (direct impact); loss of habitat (indirect); water quality impacts during construction such as a temporary and localized increase in turbidity, decreased dissolved oxygen content in the water column (indirect), and reduced availability of benthic food prey (indirect). The Freeport CI Plan component would have the greatest potential to directly affect EFH for this species and would result in a loss of 2.64 acres of shallow subtidal habitat and 0.04 acres of intertidal marsh habitat. The Wantagh CI Plan would have no effects (EFH 10 x 10 square 3). Except for the minimal impacts of the Far Rockaway CI Plan component (0.1 acres across habitats) and a small portion of the Long Beach CI Plan component, impacts are limited to EFH 10 x 10 square 2 (2.94 ac of shallow subtidal habitat; 0.45 acres of shoals, bars, and mudflats; and 0.11 acres of intertidal marsh). Subtidal areas that would be permanently impacted as a result of the CI plan total 2.97 acres, and areas of intertidal bars, shoals, and mudflat that would be permanently impacted as a result of the CI plan total 0.46 acre. Juveniles and adults are mobile and would likely move from the project area due to disruptions from construction. However, habitats utilized by little skate would likely be lost due to construction of the CI plan. Impacts would be expected to moderate due to permanent impacts to habitat used by juvenile and adult little skate.

3.4.12 Winter skate

EFH is designated for juvenile and adult winter skate throughout the study area. Juvenile and adult winter skate are found in sub-tidal benthic habitats in the project area, utilizing gravel, sand, and mud bottom. Winter skate prey upon benthic macrofauna. Impacts would be similar to those outlined for little skate, excluding intertidal habitats.

3.5 Effects by Species: HIGHLY MIGRATORY SPECIES

3.5.1 Bluefin Tuna

EFH is designated throughout the study area for juvenile bluefin tuna. Bluefin tuna are a pelagic species that feeds opportunistically on an array of fish and benthic invertebrates. Juvenile bluefin utilize all inshore and pelagic surface waters warmer than 12°C. If implemented, it is possible that the CI plan may have temporary adverse effects to juvenile bluefin tuna due to turbidity during project construction, however these impacts will be minimal and temporary. Impacts are projected to be low to bluefin tuna due to their mobility, pelagic habitat use, and the limited extent of EFH in the study area.

3.5.2 Skipjack Tuna (*Katsuwonus pelamis*) (NMFS, 2017)

EFH is designated for adult skipjack tuna throughout the entire study area. Skipjack tuna are an epipelagic and oceanic species. The optimum temperature for the species is 27 ºC, with a range from 20 to 31° C (ICCAT, 1995). If implemented, it is possible that the CI plan may have temporary adverse effects to adult skipjack tuna due to turbidity during project construction, however these impacts will be minimal and temporary. Impacts are projected to be low to skipjack tuna due to their mobility, pelagic habitat use, and their seasonal use of EFH in the study area.

3.6 Effects by Species: SHARKS

3.6.1 Sand tiger shark (*Carcharias taurus*)

Sand tiger shark is listed as a Species of Concern by NOAA. EFH is designated for neonates and juveniles in EFH 10x10 Square 1. Sand tiger sharks utilize shallow coastal waters and bottom habitats where temperatures range from 19 – 25 °C (66.2 – 77 °F) (June through October) and salinities range from 23 – 30 ppt at depths of 2.8 – 7.0 m in sand and mud. No habitat meeting this description is present at the potential CI plan work location in EFH Square 10x10 1 (Far Rockaway), as the depths at this site are too shallow. No impacts to sand tiger shark or its EFH are expected.

3.6.2 Common Thresher Shark (*Alopias vulpinus)*

EFH is designated for all life stages (neonates/YOY, juveniles, and adults) for common thresher shark throughout the study area. At this time, insufficient data is available to differentiate EFH between the juvenile and adult size classes; therefore, EFH is the same for those life stages. Common thresher shark is a pelagic species that preys on invertebrates such as squid and pelagic crabs as well as small fishes such as anchovy, sardines, hakes, and small mackerels (Preti et al. 2004). Thresher sharks are found in both coastal and oceanic waters, but according to Strasburg (1958), it is more abundant near land, with some seasonal abundance and north-south migrations along the U.S. East Coast (Castro, 2011), particularly in the offshore and cold inshore waters during the summer months (Gervelis and Natanson 2013).

Though information gaps exist regarding the specific habitat needs of the thresher shark, it is possible that turbidity generated during the potential construction of the CI plan could impact all life stages of common thresher shark due to temporary and localized increase in turbidity, decreased dissolved oxygen content in the water column (indirect), and reduced availability of benthic food prey (indirect). However, impacts are projected to be low to common thresher shark due to their mobility and use of pelagic habitats.

3.6.3 Dusky Shark (*Charcharinus obscurus*)

Dusky shark is listed as a Species of Concern by NOAA and has EFH designated for neonates throughout the study area. Dusky shark neonates often inhabit nursery areas in coastal waters. EFH is associated with habitat conditions including temperatures from 18.1 – 22.2 °C, salinities of 25 – 35 ppt and depths at 4.3 – 15.5 m. Seaward extent of EFH for this life stage in the Atlantic is 60 m in depth. No habitat meeting this description is present at any of the potential work locations, as the depths at these sites are too shallow. No impacts to dusky shark or its EFH are expected.

3.6.4 Sandbar shark (*Charcharinus plumbeus*)

EFH is designated for juvenile sandbar shark throughout the study area, and adult sandbar shark in EFH 10 x10 Squares 2 and 3 only. Studies indicate that juvenile sandbar sharks are generally found in water temperatures ranging from 15 – 30 °C (59 – 86 °F) (June through October), salinities at least from 15 – 35 ppt, and water depth ranging from 0.8 – 23 m in sand, mud, shell and rocky habitats from Massachusetts to North Carolina (Grubbs and Musick 2007, Grubbs et al. 2007; McCandless et al. 2002, 2007; Merson and Pratt 2007). Pregnant sandbar shark females are typically in the area between late spring and early summer, give birth and depart shortly after while neonates (young-of-year) and juveniles (ages one and over) occupy the nursery grounds until migration to warmer waters in the fall (Rechisky and Wetherbee 2003 and Springer 1960). Neonates return to their natal grounds as juveniles and remain there for the summer.

It is likely that water depths in the majority of the potential work areas are too shallow to serve as EFH for sandbar shark, however some subtidal areas of a sufficient depth are present. Although the precise distribution of this habitat is not known, subtidal areas that would be permanently impacted as a result of the CI plan total 2.94 acres. If the CI plan is implemented, permanent displacement of soft bottom habitat that may be used by juvenile and adult sandbar shark would occur, and temporary adverse effects (indirect effects) could stem from water quality impacts associated with a localized increase in turbidity and decreased dissolved oxygen content in the water column during construction. However, these impacts would subside upon completion of construction. While a time of year restriction would not avoid permanent impacts to habitat, temporary turbidity impacts could be largely avoided by conducting activities in the winter. Overall, the projected impacts to sandbar shark are projected to be low if the CI plan is implemented.

3.6.5 Smoothhound Shark

EFH is designated in EFH 10 x10 Square 1 for all life stages (neonates/YOY, juveniles, and adults). At this time, available information is insufficient for the identification of EFH for specific life stages, therefore all life stages are combined in the EFH designation. Smoothhound shark EFH identified in the Atlantic is exclusively for smooth dogfish, and is identified as shallow, coastal waters.

Though information gaps exist regarding the specific habitat needs of the smoothhound shark, it is possible that turbidity generated during the potential construction of the CI plan could impact all life stages of smoothhound shark due to temporary and localized increase in turbidity, decreased dissolved oxygen content in the water column (indirect), and reduced availability of benthic food prey (indirect). However, the proposed CI measures within square 1 (Far Rockaway) are extremely limited in extent (0.03 acres of shallow subtidal habitat). Although, the creek would likely be too shallow, implementation and closure of the sluice gate at Far Rockaway under flood conditions would temporarily limit access and potentially trap shoothhound shark in the small subtidal marsh creek. Impacts are projected to be low to negligible to smoothhound shark due to the project extent, mobility, and use of pelagic habitats.

3.6.6 White Shark

EFH is designated throughout the study area for white shark neonates/YOY, juveniles, and adults. EFH for neonates/YOY includes inshore waters out to 105 km from Cape Cod, Massachusetts, to an area offshore of Ocean City, New Jersey. EFH for juveniles and adults includes inshore waters to habitats 105 km from shore, in water temperatures ranging from 9 to 28 °C, but more commonly found in water temperatures from 14 – 23 °C from Cape Ann, Massachusetts, including parts of the Gulf of Maine, to Long Island, New York, and from Jacksonville to Cape Canaveral, Florida.

It is possible that white shark neonates, juveniles and adults may utilize waters in and around the proposed work areas associated with the CI plan. It is possible that turbidity generated during the potential construction of the CI plan could impact all life stages of white shark due to temporary and localized increase in turbidity and decreased dissolved oxygen content in the water column (indirect). However, impacts are projected to be low to white shark due to their mobility and use of pelagic habitats.

3.7 Summary of Findings

3.7.1 TSP

Within the project area, there is a diversity of species with EFH designations. These species utilize a broad array of habitats and include pelagic and benthic species as well as those that inhabit multiple types of habitats. The TSP would be constructed entirely in uplands and the NNBF features being considered would be in intertidal and wetland areas, and therefore would have no adverse effects to EFH.

3.7.2 CI & NS Plan

Construction of the complementary critical infrastructure components would result in minor, temporary, and permanent effects on EFH. Within the project area EFH is designated for a broad variety of species. Impacts from construction would result in minor disturbance and loss of tidal, intertidal, and wetland habitats. Those species utilizing intertidal and shallow subtidal benthic habitats (flounders, ocean pout, scup, pollock, and skates) have the most potential to be affected by the proposed CI Plan. However, those impacts would be expected to be low to moderate due to their mobility, the extent of construction, and the current quality of the habitat.

More specifically, a total 2.97 acres of unvegetated subtidal shallow areas would be permanently impacted, with an additional 2.94 acres of temporary impacts as well due to cofferdams, excavation, etc. These impacts would occur in tidal creeks and would be adjacent to existing bulkheads and hardened shoreline. This habitat is marginal, and the impact would constitute a small impact relative to the similar available habitat in the study area.

A total of 0.46 acres of unvegetated intertidal areas including bars, shoals, and mudflats would be permanently impacted, with an additional 0.75 acre of temporary impacts. Most of these impacts would occur at the Long Beach floodwall in open estuarine waters in an industrialized area and are adjacent to shoreline that is heavily riprapped. This habitat is marginal and the impact would constitute a small impact relative to the similar available habitat in the study area.

Permanent impacts to intertidal vegetated wetlands could impact prey species for some species. These impacts include 0.17 acre of permanent impacts to intertidal marsh (0.25 acre of temporary impact during construction), and 0.01 acre of temporary impacts to forested wetland during construction. These impacts would occur in tidal creeks and would be adjacent to existing bulkheads and hardened shoreline. This habitat is marginal, and the impact would constitute a small impact relative to the similar available habitat in the study area.

The impacts would primarily occur in EFH 10 x 10 square 2. The Freeport CI Plan component would have the greatest potential to directly affect EFH for this species and would result in a loss of 2.64 acres of shallow subtidal habitat and 0.04 acres of intertidal marsh habitat. There would be no effects in EFH 10 x 10 square 3 (Wantagh CI Plan). Except for the minimal impacts in EFH 10 x 10 square 1 associated with the Far Rockaway CI Plan component (0.1 acres across habitats) and a small portion of the Long Beach CI Plan component, impacts are limited to EFH 10 x 10 square 2 (2.94 ac of shallow subtidal habitat; 0.45 acres of shoals, bars, and mudflats; and 0.11 acres of intertidal marsh).

While construction would be conducted from shore or within a cofferdam, some minor localized increases in turbidity would occur, but these are expected to dissipate within a tidal cycle. While increases in turbidity have the potential to interfere with foraging, and potentially smother certain species temporarily, impacts occur in marginal habitat and would be extremely localized. Impacts would be minimized through use of cofferdams, onshore construction and erosion and sediment control BMPs. Further, undertaking the project in the winter would minimize interactions with or impacts to some species.

3.7.3 NNBF

It is possible that any wetland restoration work that may occur as a part of the complementary NNBF measures may generate temporary turbidity in open estuarine waters and adjacent tidal streams. These impacts would also be minimized through use of sediment control BMPs. Overall, NNBF measures are expected to result in beneficial effects on EFH. However, future refinement of the TSP and subsequent surveys (such as wetlands and SAV) is needed before a final EFH assessment can be completed.

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