US Army Corps of Engineers®
New York District

NEW YORK AND NEW JERSEY HARBOR AND TRIBUTARIES COASTAL STORM RISK MANAGEMENT STUDY

DRAFT INTEGRATED FEASIBILITY REPORT & TIER 1 ENVIRONMENTAL IMPACT STATEMENT

APPENDIX A3: TIER 1 ESSENTIAL FISH HABITAT ASSESSMENT

September 2022

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List of Acronyms

ABS	Aquatic Biological Survey
BMPs	best management practices
CSRM	coastal storm risk management
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
FMC	Fishery Management Council
FMP	fishery management plan
Ft	feet
GNRA	Gateway National Recreation Area
HATS	Harbor and Tributaries Study
HRNERR	Hudson River National Estuarine Research Reserve
HUC	hydrologic unit code
m	meters
MAFMC	Mid-Atlantic Fishery Management Council
MFS	Migratory Fish Survey
MLLW	mean lower low water
mm TL	millimeters total length
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NEFMC	New England Fishery Management Council
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NY/NJ Harbor (Harbor)	New York/New Jersey Harbor
NYCDCP	New York City Department of City Planning
NYD	New York District
NYNJHATS	New York/New Jersey Harbor and Tributaries Study
NYSDEC	New York State Department of Environmental Conservation
ppt	parts per thousand
SAV	submerged aquatic vegetation
SFA	Sustainable Fisheries Act
SNWA	Special Natural Waterfront Area
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

1 Introduction

1.1 Authority and Purpose

The purpose of this Tier 1 assessment is to evaluate the potential effects to Essential Fish Habitat (EFH) from the New York and New Jersey Harbor and Tributaries Coastal Storm Risk Management Study (NYNJHAT Study). The NYNJHAT Study is in response to the January 2015, USACE North Atlantic Coast Comprehensive Study (NACCS) which identified high-risk areas on the Atlantic Coast warranting further investigation of flood and coastal storm risk management solutions. In February 2019, a NYNJHAT Feasibility Study Interim Report (Interim Report) was completed to document existing information and assumptions about the future conditions, and to identify knowledge gaps that warranted further investigation because of their potential to affect plan selection. The Interim Report states the impacts from Hurricane Sandy highlighted the national need for a comprehensive and collaborative evaluation to reduce risk to vulnerable populations within the North Atlantic region.

In response to the destruction laid forth by Hurricane Sandy in 2012, the U.S. Congress passed and the President signed into law the Disaster Relief Appropriations Act of 2013 (Public Law 113-2). The legislation appropriated over $50 billion to address damages caused by the hurricane, and to reduce future flood risk in ways that will support the long-term resilience of vulnerable coastal communities. Almost half of this appropriated funding supports the ongoing recovery and resilience of communities within the Study Area. In NYC alone, $17 billion has been committed to provide funding for projects and programs administered by the federal, state, and local governments (NYC Recovery, 2019). Developing a project that will reduce the frequency and severity of coastal storm damage supports one of the primary missions of USACE.

The North Atlantic Division was authorized by P.L. 113-2 to commence the NACCS to investigate coastal storm risk management (CSRM) strategies for areas impacted by the storm. Under the direction of Public Law 113-2, Chapter 4, USACE completed a Focus Area Analysis (FAA) for the NYNJHAT Study as part of the NACCS. The January 2015 NACCS final report identifies nine high-risk focus areas of the North Atlantic Coast that warrant additional analyses by USACE to address coastal flood risk. One of these areas is the NY-NJ Harbor and Tributaries area.

EFH is defined under section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (Public Law 94-265), as amended by the Sustainable Fisheries Act (SFA) of 1996 (Public Law 104-267), as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." EFH designations emphasize the importance of habitat protection to healthy fisheries and serve to protect and conserve the habitats of marine and estuarine finfish, mollusks, and crustaceans. Under the EFH definition, necessary habitat is that which is required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem. The SFA requires that EFH be identified for those species actively managed under Federal fishery management plans (FMPs). This includes species managed by the eight regional Fishery Management Councils (FMCs) established under the MSFCMA, as well as those managed by National Marine Fisheries Service (NMFS) under FMPs developed by the Secretary of Commerce.

The purpose of this EFH Assessment is to evaluate the potential impacts associated with the Tentatively Selected Plan (TSP) as identified by the NYNJHAT study) on EFH and in support of the Tier 1 Environmental Impact Statement (EIS) prepared for the NYNJHAT study. This draft document focuses on the structural measures of the TSP. Project structural measures include combinations of levees, storm surge barriers (SSBs), seawalls, elevated promenades, elevating structures and non-structural measures including preservation. It is important to note, that the TSP may have associated impacts and benefits from nonstructural and natural and nature-based features (NNBFs). At this time, nonstructural and NNBFs are still being evaluated and locations are being determined. Potential impacts and benefits from nonstructural and NNBFs will be included in the Final Integrated Feasibility Report (FR)/Tier 1 EIS.

1.1.1 Tier 1 Impact Analysis

The National Environmental Policy Act (NEPA) of 1969, as amended, requires Federal agencies, including USACE, to consider the potential environmental impacts of their proposed actions and any reasonable alternatives before undertaking a major Federal action, as defined by 40 CFR 1508.18.

To evaluate potential environmental impacts, USACE has prepared an Integrated Feasibility Report/Tier 1 EIS. The EIS will be conducted in two stages or tiers. As defined in 40 CFR 1508.28, Tiering, is a means of making the NEPA environmental review process more efficient by allowing parties to "eliminate repetitive discussions of the same issues and to focus on the actual issues suitable for decision at each level of environmental review" (40 CFR 1502.20).

The Tier 1 EIS involves technical analysis completed on a broad scale and is therefore an effective method for identifying existing and future conditions and understanding the comprehensive effects of the project. It provides the groundwork for future project-level environmental and technical studies and modeling and agency consultation.

1.1.2 Modeling of Impacts for Final Integrated Feasibility Report/Tier 1 Analysis

USACE Engineer Research and Development Center (ERDC) has developed the New York Bight Ecological Model (NYBEM) of the NYNJHAT Study Area. The model is presented in this Draft Integrated FR/Tier 1 EIS for Agency and public review of the model development and the preliminary modeling results of the NYNJHAT Study Alternatives. Feedback received on the NYBEM will inform the final version of the model and the results of its application to the NYNJHAT Study Area will be presented in the Final Integrated FR/Tier 1 EIS.

The NYBEM focuses on tidally influenced ecosystems within the project boundary to quantify and evaluate potential Project impacts on aquatic resources. The USACE ERDC is also developing an Adaptive Hydraulics Model (AdH Model) to evaluate potential physical changes to flow, tidal range, and water elevations in both storm and non-storm conditions, as well as sediment budget. Currently, the Draft AdH Model has been incorporated into the Draft Integrated FR/Tier 1 EIS; however, the Final Integrated FR/Tier 1 EIS will utilize the information gained from the NYBEM and AdH modeling efforts, as well as project design, to determine potential impacts from the SSB (open and closed), including, but not limited to, the following physical and biological resources:

- Bathymetry
- Sediment and Soil Quality and Type
- Tides
- Currents and Circulation
- Salinity
- Dissolved Oxygen
- Turbidity
- Sea Level Change/Climate Change
- Flooding
- Wetlands and water resources

Based on additional analysis completed for Tier 2, a supplemental EFH assessments may be completed for the proposed action that will include MSFCMA and SFA consultations and applications to NMFS.

1.2 Project Background

Storms have historically severely impacted the NY/NJ Harbor region, including Hurricane Sandy most recently, causing loss of life and extensive economic damages. In response, the USACE NYD is investigating measures to manage future flood risk in ways that support the long-term resilience and sustainability of the coastal ecosystem and surrounding communities, and reduce the economic costs and risks associated with flood and storm events for the NYNJHAT Study Area (USACE 2019). The alternative concepts proposed would help the region manage flood risk that is expected to be exacerbated by relative sea level rise.

In 2012, Hurricane Sandy caused considerable loss of life, extensive damage to property, and massive disruption to the North Atlantic Coast. The effects of this storm were particularly severe because of its tremendous size and the timing of its landfall during high tide. Twenty-six states were impacted by Hurricane Sandy, and disaster declarations were issued in 13 states. New York (NY) and New Jersey (NJ) were the most severely impacted states, with the greatest damage and most fatalities in the NY Metropolitan Area. For example, a storm surge of 12.65 feet above normal high tide was reported at Kings Point on the western end of Long Island Sound and 9.4 feet at the

Battery on the southern tip of Manhattan. Flood depths due to the storm tide were as much as nine feet in Manhattan, Staten Island, and other low-lying areas within the NY Metropolitan Area. The storm exposed vulnerabilities associated with inadequate coastal storm risk management (CSRM) measures and lack of defense to critical transportation and energy infrastructure.

The January 2015, USACE North Atlantic Coast Comprehensive Study (NACCS) identified high-risk areas on the Atlantic Coast for warranting further investigation of flood risk management solutions. In February 2019, a NYNJHAT Feasibility Study Interim Report was completed to document existing information and assumptions about the future conditions, and to identify knowledge gaps that warranted further investigation because of their potential to affect plan selection. The Interim Report states the impacts from Hurricane Sandy highlighted the national need for a comprehensive and collaborative evaluation to reduce risk to vulnerable populations within the North Atlantic region. To address the impacts and concerns associated with devastating storms, the USACE has proposed measures to manage coastal storm risk in the NY/NJ Harbor and its tributaries.

In response, the USACE is investigating measures to manage future flood and coastal storm risk in ways that support the long-term resilience and sustainability of the coastal ecosystem and surrounding communities, and reduce the economic costs and risks associated with flood and storm events for the NYNJHAT Study Area (USACE 2019). The alternative concepts proposed would help the region manage flood risk that is expected to be exacerbated by relative sea level rise.

1.3 Coordination And Consultation

Coordination with stakeholders has been a critical component of the NYNJHAT study. Since early 2017, the USACE New York District has held many workshops and meetings with Cooperating Agencies and other stakeholders to share information on the study scope and purpose and formulation of alternatives, and to exchange ideas and information on natural and marine resources within the Study Area.

USACE announced the preparation of an Integrated Feasibility Report/Tiered EIS for the NYNJHAT feasibility in the February 13, 2018, Federal Register pursuant to the requirements of Section 102(2)(C) of NEPA. The NEPA scoping period initially spanned 45 days from July 6 – August 20, 2018 but was extended to 120 days due to numerous requests from the public. USACE held a total of nine public scoping meetings during the public scoping period. On November 5, 2018, the USFWS provided a scoping comment letter highlighting key considerations within the NYNJHAT Study Area pertaining to the watersheds, threatened and endangered species, marine mammals and sea turtles, migratory birds, fish and EFH, shellfish, and wetlands (refer to Appendix A). On November 26, 2018, NOAA provided a scoping letter with additional considerations for the NYNJHAT Study regarding estuarine and marine fishes, diadromous fishes, SAV, wetlands, shellfish, and key considerations for EFH under section 305(b)(2) of the MSFCMA.

In 2019, four NYBEM workshops were held on January 3, March 11, June 6, and November 14 to help inform the NYBEM model set up to be used as a tool for assessing some direct and indirect effects of agency actions on regional ecosystems including the NYNJHAT study, among others.

In February 2020, the NYNJHAT study paused until October 2021 due to a lack of Federal funding. Following study resumption, the USACE NYD held several Cooperating Agency meetings to facilitate open communication, share study progress, status updates, and data as it became available, including an engineering presentation on the study alternatives, a presentation on the Tentatively Selected Plan (TSP), and a presentation on the NYBEM development progress. These meetings took place on February 17, June 9, August 3, and August 11.

2 Study Area

This Study Area encompasses the NY Metropolitan Area, including the most populous and densely populated city in the United States, and the six largest cities in NJ. The shorelines of some of the NYNJHAT Study Area is characterized by low elevation areas, developed with residential and commercial infrastructure, and is subject to tidal flooding during storms. The NYNJHAT Study Area covers more than 2,150 square miles and comprises parts of 25 counties in NJ and NY, including Bergen, Passaic, Morris, Essex, Hudson, Union, Somerset, Middlesex, and Monmouth Counties in NJ; and Rensselaer, Albany, Columbia, Greene, Dutchess, Ulster, Putnam, Orange, Westchester, Rockland, Bronx, New York, Queens, Kings, Richmond, and Nassau Counties in NY.

The NYNJHAT Study Area for the Tier 1 EIS includes NY and NJ Harbor and tidally affected tributaries encompassing all of New York City (NYC), the Hudson River (HR) to Troy, NY; the lower Passaic, Hackensack, Rahway, and Raritan Rivers; and the Upper and Lower Bays of NY Harbor, Newark, Jamaica, Raritan and Sandy Hook Bays; the Kill Van Kull, Arthur Kill and East River tidal straits; and western Long Island Sound.

The Study Area and description of existing environment have been separated into nine regions based on the hydrologic unit codes (HUCs) from the Watershed Boundary Dataset of the U.S. Geological Survey (USGS). Figure 2-1 provides an overview of the HATS Planning Regions. The Planning Regions are described in Section 4.1.

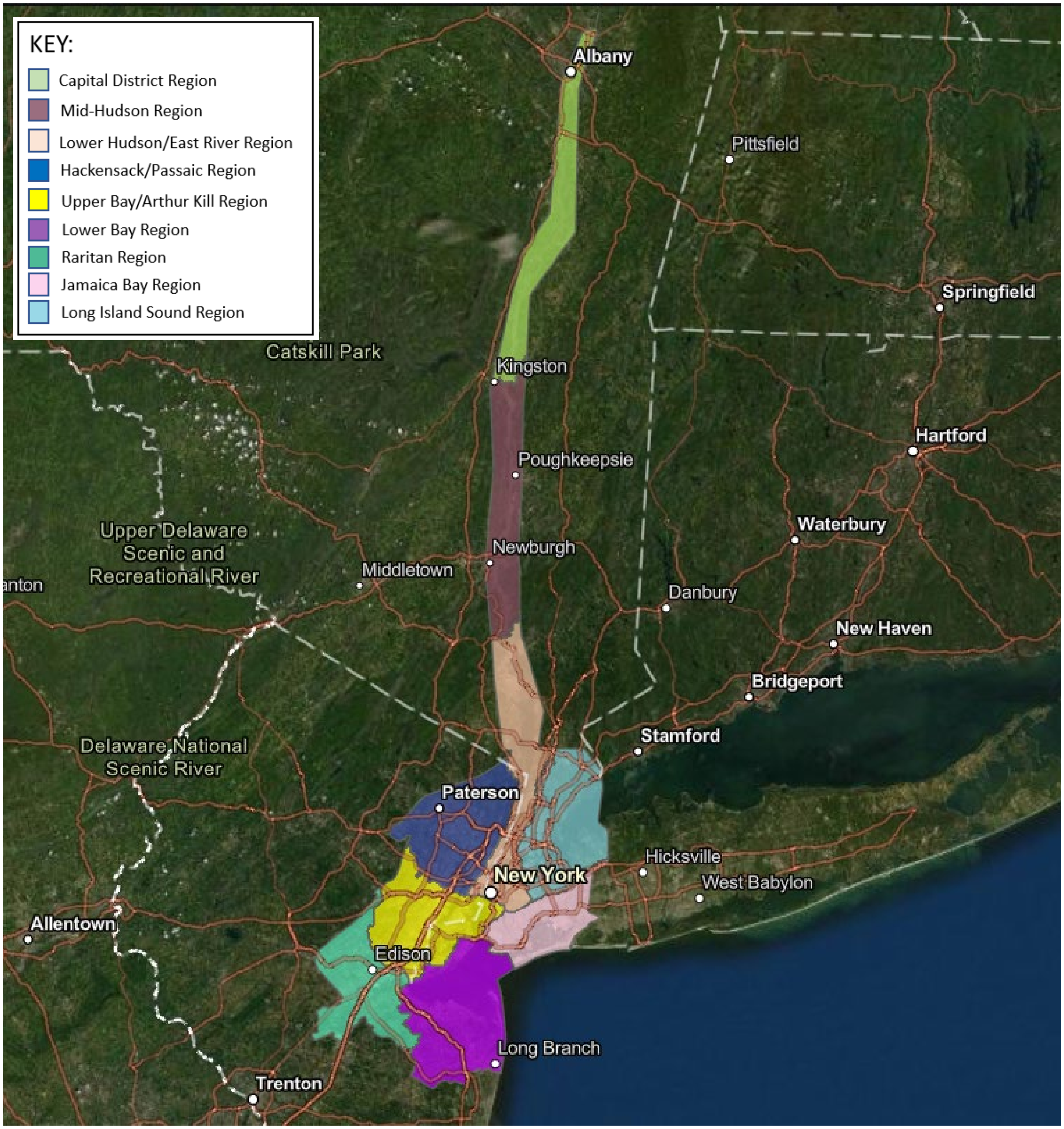

Figure 2-1. Overview of USACE New York-New Jersey Harbor and Tributaries Study Area Showing Planning Regions

3 Proposed Action

The Tier 1 EIS describes all alternatives evaluated for this NEPA study. This appendix evaluates only the structural project measures incorporated into the TSP.

3.1 Tentatively Selected Plan

The TSP is Alternative 3B – Multi-basin SSBs With Shore-Based Measures. The TSP includes a combination of coastal storm risk management (CSRM) measures that function as a system to manage the risk of coastal storm damage in the New York Metropolitan Area, including a combination of shore-based and in-water measures. These measures are located within the Hackensack/Passaic, Upper Bay/Arthur Kill, Lower Hudson/East River, Long Island Sound and Jamaica Bay Planning Regions. The TSP measures include storm surge barriers (SSBs), Shore-Based Measures (SBMs), complementary Induced Flooding-Mitigation Features (IFFs) and Risk Reduction Features (RRFs) as well as nonstructural measures and natural and nature-based features described in more detail as follows:

The TSP includes SSBs and complementary SBMs at Jamaica Bay, Arthur Kill, Kill Van Kull, Gowanus Canal, Newtown Creek, Flushing Creek, Sheepshead Bay, Gerritsen Creek, Hackensack River, Head of Bay, Old Howard Beach East, and Old Howard Beach West. The SBMs would provide land-based CSRM and include floodwalls, levees, elevated promenades, buried seawalls/dunes, revetments, berms, bulkheads, pedestrian/vehicular gates, and road raisings. Ringwalls and SBMs will also be considered under the TSP, to be further refined for the Final Integrated FR/Tier 1 EIS.

RRFs would provide CSRM in areas behind SSBs that may experience high frequency flooding when the barriers are not operated.

IFFs would provide CSRM in areas in front of SSBs that may experience induced flooding due to operation of the SSBs.

Nonstructural measures to be included in the TSP may include structure elevations and floodproofing. Currently, conceptual nonstructural measure locations are located throughout the Study area; however, nonstructural measures and locations will be further refined for the Final Integrated FR/Tier 1 EIS.

Natural and nature-based features (NNBF) to be included in the TSP consist primarily of natural features such as wetlands and living shorelines that may provide both CSRM and ecological enhancement. Specific NNBF types and locations will be further refined for the Final Integrated FR/Tier 1 EIS. At this time, it is anticipated they will be located in areas that experience high frequency coastal flooding.

While the TSP will improve coastal flood risks in the project area, it will not totally eliminate flood risks; therefore, residual risk for flooding still remains a threat to life and property. It is essential that flood risk be proactively communicated to residents in accessible and thoughtful ways.

This assessment only includes structural measures of the TSP. Structural measures included in the TSP are show in Table 1 by Planning Region, and on Figures 2-2 and 2-3.

Figure 3-1. NYNJHAT Study Tentatively Selected Plan

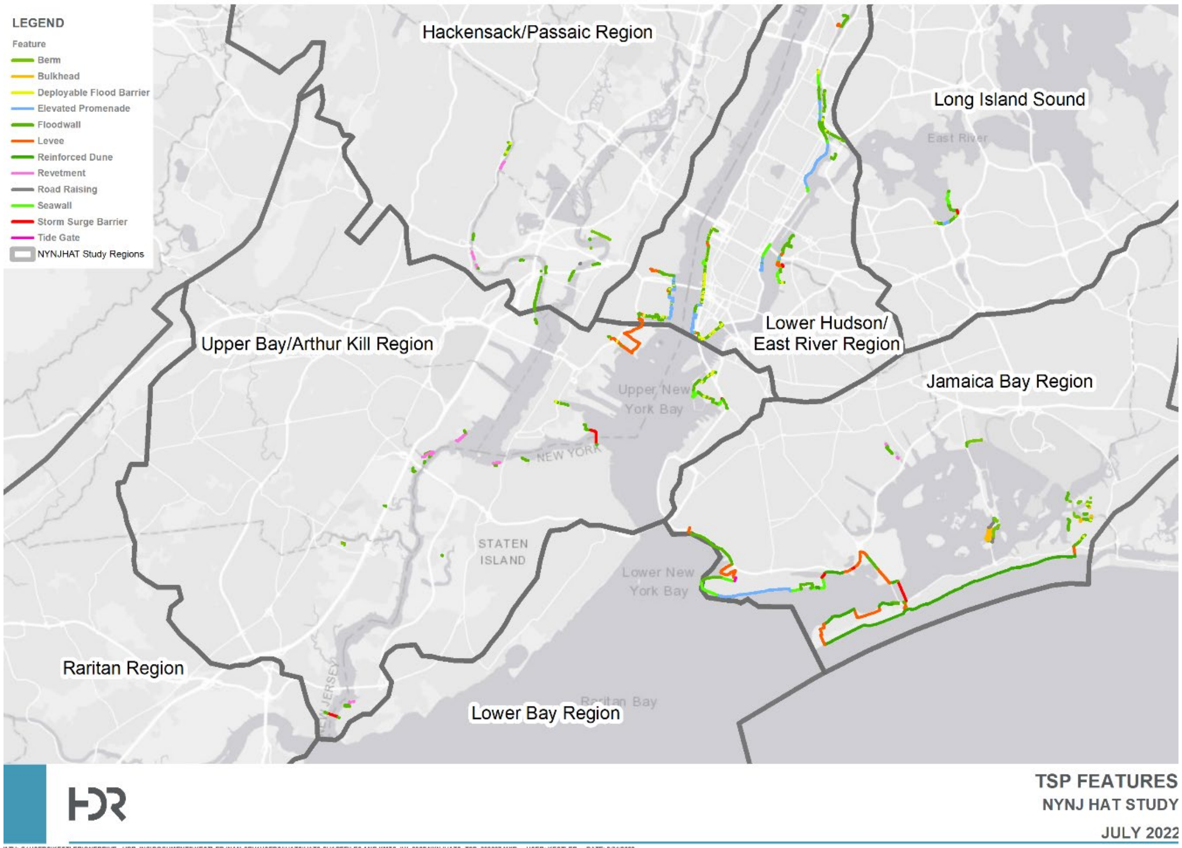

Figure 3-2. Overview of NYNJHAT Study Measures Included in the TSP

Table 3.1: Structural measures included in the TSP, by Planning Region.

Planning Region	Storm Surge Barriers	Tide Gates	Floodwalls	Levees	Elevated Promenades	Buried Seawalls/Sand Dunes	Seawalls	Revetments	Berms	Bulkheads	Pedestrian/Vehicular Gates	Road Raising
Capital District												
Mid-Hudson												
Lower Hudson/East River	●		●	●	●		●				●	
Upper Bay/Arthur Kill	●	●	●	●			●	●	●		●	
Lower Bay												
Hackensack/Passaic			●					●	●		●	●
Raritan Region												
Long Island Sound	●		●		●		●					
Jamaica Bay	●	●	●	●	●	●	●	●	●	●	●	●

● = Included in the Planning Region

3.2 Potential Impacts from TSP

Based on NOAA coordination, potential impacts from the proposed action could include the following:

- Underwater noise;
- Physical disturbance and re-suspended sediments/re-deposition of suspended sediments (short-term direct and indirect impacts including potential burial and/or release of contaminants);
- Vessel traffic and/or barge grounding;
- Entrainment of early life stages (eggs and larvae) as a form of short-term direct impact due primarily due to hydraulic dredging and capture of eggs and possibly larvae in the dredge, and impingement of larger fish in construction equipment;
- Prevention of fish passage or spawning;
- Benthic community disturbance; and
- Impacts to prey species
- Habitat Alterations (i.e., Loss of EFH function or conversion of habitat) due to increased sedimentation and/or changes in water depths, tidal flow, substrate types, and/or in-water fill or structures that reduce or eliminate the suitability of habitat for EFH-managed species.

3.2.1 Direct Impacts

Direct impacts are defined as those impacts that cause an immediate change to EFH and can cause mortality. Potential direct impacts associated with the TSP to EFH-designated species within the Study Area include changes to and/or removal of EFH habitat; localized changes in water column depth, bathymetry, hydrodynamics, and sedimentation rates; temporary and localized impacts from water disturbances, noise, and vibrations; and short-term changes to turbidity from re-suspension of sediments that is typically associated with in-water construction. TSP measures include combinations of levees, SSBs, seawalls, elevated promenades, and elevating structures that occur both onshore and in-water.

3.2.2 Indirect Impacts

Indirect impacts are defined as those impacts that do not immediately affect the well-being of a particular species but cause a secondary effect due to a change in the environment or ecosystem. These impacts could lead to mortality and include activities that cause the loss of forage species. The primary indirect impact associated with implementation of the TSP to EFH species is the disturbance of benthic and epibenthic forage communities. Several of the EFH species that may occur in the Study Area are demersal, or benthic feeders (i.e., red hake and winter flounder), that may experience a change in feeding efficiency for some time during and immediately following construction activities.

3.2.3 Cumulative Impacts

Cumulative impacts are those impacts to EFH resulting from all activities associated with a given project or from a combination of activities associated with several projects in a given area. Cumulative impacts can result from effects that are minor, but when combined, cause significant impacts to habitat or a given species over time.

Short-term cumulative impacts are related to in-water and shore-based measures associated with the NYNJHAT study and other ongoing projects within the Harbor area. Short-term cumulative impacts to EFH occur from the combined disturbances of each project. Long-term cumulative impacts include changes to hydrodynamics, sedimentation, habitat conversion, and changes in water column depth that are associated with operations and maintenance of the ongoing projects withing the Study Area.

4 Existing Conditions

The NYNJHAT Study Area and description of existing environment have been separated into nine Planning Regions based on the hydrologic unit codes (HUCs) from the Watershed Boundary Dataset of the U.S. Geological Survey (USGS).

4.1.1 Upper Bay/ Arthur Kill Region

The Upper Bay/Arthur Kill Region is based on the 10-digit HUCs for the Arthur Kill-Upper Bay watershed and the Rahway River watershed, from the Watershed Boundary Dataset (USGS 2018). This region lies between the mouth of the HR and the Lower Raritan River and includes portions of Richmond and Kings counties in NY, as well as Governors Island, NY County. This Region also includes portions of Hudson, Essex, Union, and Middlesex counties in NJ. The Upper Bay is comprised predominantly of deep water (67 percent is >25 ft [7 m] deep).

The Arthur Kill is a tidal strait that connects to Upper Bay via the Kill Van Kull (another tidal strait) and mixes waters with Newark Bay. The Arthur Kill also connects Newark Bay with Raritan Bay. Important tributaries to the Arthur Kill include the Rahway and Elizabeth Rivers, Old Place Creek, Woodbridge Creek, and Fresh Kills Creek (USACE 2004a). The Arthur Kill and Kill Van Kull have deepwater navigation channels that allow transport of cargo into and out of the Ports of NY and NJ. The area is highly industrialized, however, approximately 55 percent of the shoreline is natural mudflats and marshes (NOAA 2022).

The Arthur Kill Complex is a significant habitat of the NY Bight Watershed (NOAA 2022). The Gowanus Canal is a prominent site within the Upper Bay Planning Region. The canal is a 100-foot-wide, 1.8-mile-long canal in a highly developed section of Brooklyn, NY that has become one of the most contaminated water bodies in the country. Contaminants found in high levels include polycyclic aromatic hydrocarbons, polychlorinated biphenyls, mercury, lead, and copper. In 2010, this site was added to the EPA Superfund List. A plan has been put in place to dredge the contaminated soil and then cap the area (EPA 2018).

4.1.2 Lower Bay Region

The Lower Bay Region is based on the 10-digit HUCs for the Raritan Bay-Lower Bay watershed and the Navesink River-Shrewsbury River watershed, and well as the 8-digit HUC for the Mullica-Toms subbasin, from the Watershed Boundary Dataset (USGS 2018). This includes a portion of Richmond County in NY, and portions of Middlesex and Monmouth counties in NJ.

The major waterbodies in this Region are home to diverse marine and estuarine wildlife communities (USACE 2019). Sandy Hook and some parts of Staten Island comprise a portion of the Gateway National Recreation Area, which features estuarine and freshwater wetland habitat (USFWS 2018).

4.1.3 Jamaica Bay Region

The JB Region is based on the 8-digit HUCs for the Southern Long Island subbasin from the Watershed Boundary Dataset (USGS 2018). This includes a portion of Kings, Nassau, and Queens Counties in NY.

JB is a saline to brackish, nutrient-rich estuary covering almost 40 square miles. The bay has a mean depth of 13 feet, a tidal range averaging five feet, and a residence time of about 33 days (USFWS 1997). The bay opens into Lower Bay and the Atlantic Ocean via the Rockaway Inlet. Rockaway Inlet is a high current area that is 0.63 miles wide at its narrowest point, with an average depth of 23 feet (USFWS 1997).

JB is part of the Gateway National Recreation Area and is a designated National Wildlife Refuge. The Region offers a range of habitats such as deep-water channels, tidal creeks, salt marshes, and tidal flats. Areas of existing salt marsh in the region provide reproductive habitat for invertebrates such as mussels and crabs. Each spring, horseshoe crabs congregate on the mudflats of this region to breed.

4.1.4 Hackensack/Passaic Region

The Hackensack/Passaic River Region is based on the 8-digit HUCs for the Hackensack-Passaic subbasin from the Watershed Boundary Dataset (USGS 2018). This includes portions of Bergen, Passaic, Essex, and Hudson counties in NJ, as well as a small part of Rockland County in NY.

This watershed is connected to Upper Bay and Lower Bay via Kill Van Kull and Arthur Kill, respectively. An important and ecologically valuable habitat in this region is the NJ Hackensack Meadowlands which includes the largest remaining brackish wetland complex in the NYNJHAT Study Area, measuring approximately 8,400 acres (USACE 2004b). Although degraded, the Meadowlands and surrounding areas in this Region are ecologically significant and continue to provide ecosystem functions, including flood storage and fish/wildlife habitat, and offer a variety of potential restoration opportunities (USFWS 1997).

4.1.5 Raritan Region

The Raritan River Region is based on the 8-digit HUCs for the Raritan subbasin in the Watershed Boundary Dataset (USGS 2018). This includes portions of Middlesex, Monmouth, Somerset, and Union counties in NJ, and is the westernmost region in the NYNJHAT Study Area.

This region contains the lower six miles of the Raritan River before its confluence with Raritan Bay (USACE 2004a). The shoreline of the Lower Raritan River is flanked with residential or industrial development. Land use is predominantly industrial development with bulk-headed shorelines and piers at the river’s mouth, and changes to a mix of industrial, commercial, and residential development farther upstream (USACE 2004a; USACE 1999).

This tidally influenced river features diverse floral and faunal assemblages (RPA 2003; USACE 2004a). A large wetland complex of 1,000 acres, located in Edison Township, provides habitat for waterfowl, wading birds, mammals, and fish (USACE 2004a). Saltwater intrusion occurs throughout the length of the Lower Raritan River, with sensitive estuarine resources such as tidal wetlands, submerged aquatic vegetation, and intertidal mud flats occurring in shallow, nearshore areas (USACE 1999).

4.1.6 Long Island Sound Region

The Long Island Sound Region (Figure 2-1) is based on the 8-digit HUCs for the Bronx, Saugatuck, Long Island Sound, and Northern Long Island subbasins from the Watershed Boundary Dataset (USGS 2018). This region contains sections of Bronx County and Queens County, as well as portions of Westchester and Nassau Counties.

The Long Island Sound is connected to the Upper Bay via the East River, a tidal strait. Tributaries of the Sound in this region include the Bronx River, Flushing Creek, Westchester Creek, Hutchinson River, Mamaroneck River, and Byram River. There are major estuarine wetlands in Little Neck Bay, sections of the coastline in Sands Point on Long Island, Hen Island and Milton Harbor, Mamaroneck River and its tributaries, and Pelham Bay Park (USFWS 2018). The 437-acre Thomas Pell Wildlife Refuge is also within Pelham Bay Park on the Bronx River.

4.1.7 Lower Hudson/East River Region

The Lower HR/East River Region is based on the 8-digit HUCs for the Lower Hudson subbasin in the Watershed Boundary Dataset (USGS 2018). This region extends from the Upper Bay to the Bear Mountain Bridge (also known as the Purple Heart Veterans Memorial Bridge), and includes all of NY County, as well as portions of Kings, Queens, Bronx, Rockland, and Westchester Counties in NY and portions of Bergen and Hudson Counties in NJ.

Strong semi-diurnal tides make the HR one of the few major tidal rivers of the North Atlantic coast (USFWS 1997). The water level of the HR rises and falls, accompanied by changes in flow direction, based on the ocean’s tide from the Upper Bay to Troy, NY. Salt water from the ocean remains in the mix between the Governor Mario M. Cuomo Bridge (formerly known as the Tappan Zee Bridge) and Poughkeepsie, depending on the time of year and drought conditions (NYSDEC 2014). There are estuarine wetland systems on the northern tip of Manhattan at Sherman Creek, Muscota Marsh, and Inwood Hill Park (USFWS 2018). Along the HR there are additional major wetland systems at Croton Bay and River, Stony Point Bay and State Park, Cedar Pond Brook, Furnace Brook, Dickey Brook, and the Piermont Marsh and Iona Island components of the HR National Estuarine Research Reserve (HRNERR) (NYSDEC 2009; USFWS 2018).

4.1.8 Mid-Hudson Region

The Mid-Hudson Region is based on the 8-digit HUCs for the Hudson-Wappinger subbasin and the Rondout subbasin in the Watershed Boundary Dataset (USGS 2018). This region includes portions of Orange, Putnam, Ulster, and Dutchess counties in NY.

There are major wetland systems at Constitution Marsh, Moodna Creek, Fishkill Creek, and Sleightsburgh Park at the mouth of Rondout Creek (USFWS 2018).

4.1.9 Capital District Region

The Capital District is the northernmost portion of the NYNJHAT Study Area and is based on the 8-digit HUCs for the Middle Hudson, Mohawk, and Hudson-Hoosic subbasins in the Watershed Boundary Dataset (USGS 2018). This region includes portions of Ulster, Dutchess, Greene, Columbia, Albany, and Rensselaer Counties in NY. This region is also home to the Wappinger Creek superfund site (EPA 2018).

The northernmost portion of this Region contains the Troy Lock and Dam and is dredged to a maintenance depth of approximately 14 feet deep. The Federal Dam at Troy is the limit of the HR's tidal influence (approximately 1.5 meters or 4.92 feet).

4.2 EFH-Designated Species

The NMFS, New England Fishery Management Council (NEFMC), MAFMC, and South Atlantic Management Council have defined EFH for key species in the Northeastern United States coastal waters. The NOAA EFH mapper was reviewed to determine the presence of EFH within the Study Area (NOAA 2021). Table 4-1 provides a list of EFH-designated species and life stages in the Study Area.

Table 4-1. EFH-Designated Species in the Study Area

Common Name	Scientific Name	EFH Habitat within Project Area				Habitat Association
		Egg	Larvae	Juvenile	Adult	
New England Finfish Species						
Atlantic Cod	*Gadus morhua*	S	S	N/A	S	Egg/Larvae: Pelagic Adult: Demersal/Structure Oriented
Atlantic Herring	*Clupea harengus*	N/A	M, S	M, S	M, S	Pelagic
Monkfish	*Lophius americanus*	X	X	N/A	X	Egg/Larvae: Pelagic Adult: Demersal
Ocean Pout	*Macrozoarces amercanus*	S	N/A	N/A	S	Demersal
Pollock	*Pollachius pollachius*	N/A	N/A	S	S	Pelagic
Red Hake	*Urophycis chuss*	M, S	M, S	M, S	M, S	Egg/Larvae: Pelagic Juvenile/Adult: Demersal
Silver Hake	*Merluccius bilnearis*	X	X	N/A	X	Demersal/Pelagic

Common Name	Scientific Name	EFH Habitat within Project Area				Habitat Association
		Egg	Larvae	Juvenile	Adult	
Windowpane Flounder	*Scophthalmus aquosus*	M, S	M, S	M, S	M, S	Egg: Pelagic Larvae/Juvenile/Adult: Demersal
Winter Flounder	*Pseudopleuronectes americanus*	M, S	M, S	M, S	M, S	Demersal
Witch Flounder	*Glyptocephalus cynoglossus*	N/A	X	N/A	N/A	Pelagic
Yellowtail Flounder	*Limanda ferruginea*	S	S	S	S	Egg/Larvae: Pelagic Juvenile/Adult: Demersal
Mid-Atlantic Finfish Species						
Atlantic Butterfish	*Peprilus triacanthus*	S	M, S	M, S	M, S	Demersal/Pelagic
Atlantic Mackerel	*Scomber scombrus*	S	S	S	S	Pelagic
Black Sea Bass	*Centropristis striata*	N/A	N/A	M, S	M, S	Demersal/Structure Oriented
Bluefish	*Pomatomus saltatrix*	X	X	M, S	M, S	Pelagic
Scup	*Stenotomus chrysops*	S	S	S	S	Demersal
Summer Flounder	*Paralichthys dentatus*	N/A	M, S	M, S	M, S	Demersal
Spanish Mackerel	*Scomberomorus maculates*	N/A	N/A	N/A	X	Pelagic
Invertebrate Species						
Atlantic Sea Scallop	*Placopecten magellanicus*	S	S	S	S	Egg/Juvenile/Adult: Demersal/Somewhat Structure Oriented Larvae: Demersal/Pelagic
Longfin Inshore Squid	*Loligo pealeii*	S	N/A	S	M, S	Egg: Demersal/Somewhat Structure Oriented Juvenile/Adult: Pelagic
Ocean Quahog	*Artica islandica*	N/A	N/A	N/A	X	Demersal
Highly Migratory Species						
Bluefin Tuna	*Thunnus thynnus*	N/A	N/A	X	N/A	Pelagic
Skipjack Tuna	*Katsuwonus pelamis*	N/A	N/A	N/A	X	Pelagic
Skate Species						
Clearnose Skate	*Raja eglanteria*	N/A	N/A	X	X	Demersal
Little Skate	*Leucoraja erinacea*			X	X	Demersal
Winter Skate	*Leucoraja ocellata*			X	X	Demersal
Shark Species						
Common Thresher Shark	*Alopias vulpinus*	X		X	X	Pelagic
Dusky Shark	*Carcharhinus obscurus*	S		S	N/A	Pelagic
Sand Tiger Shark	*Carcharias taurus*	M, S		M, S	N/A	Pelagic
Sandbar Shark	*Carcharhinus plumbeus*	M, S		M, S	M, S	Demersal
Smoothhound Shark Complex (Atlantic Stock)	*Mustelus spp.*	X		X	X	Demersal

Common Name	Scientific Name	EFH Habitat within Project Area				Habitat Association
		Egg	Larvae	Juvenile	Adult	
Spiny Dogfish	*Squalus acanthias*	N/A		S (sub-adult female)	S	Pelagic/Epibenthic
White Shark	*Carcharodon carcharias*	X		X	X	Pelagic
Blue Shark	*Prionace glauca*	X		X	X	Pelagic

S = includes the seawater salinity zone (salinity ≥ 25 parts per thousand [ppt])
M = Includes mixing water / brackish salinity zone (0.5 ppt < salinity < 25.0 ppt)
F = Includes tidal freshwater salinity zone (0.0 ppt < salinity < 0.5 ppt)
X = Designated EFH but no salinity zone specified
N/A = not applicable

4.3 EFH Species Distribution and Abundance

This section provides a description of the historical occurrence and abundance of those species designated EFH in the Study Area (Table 4-1). The habitat requirements of these EFH-designated species in the Study Area are summarized in Attachment 1.

The Harbor and NY Bight have been extensively studied over the last three decades, including numerous studies sponsored by the USACE in support of various projects, such as the Harbor Deepening Project and use of sand borrow areas. The seasonal timing and spatial distribution of each EFH-designated species within the NY/NJ Harbor is characterized herein based on data from several major biological monitoring studies including the ABS between 2002 and 2012 (USACE 2010a, 2012a, 2015b) and the Migratory Finfish Survey (MFS) during 2006 and between 2011 and 2013 (USACE 2012b, 2015a). The USACE and others also conducted several monitoring studies in nearshore habitat that included bottom trawl surveys to characterize finfish communities in or near borrow areas. These studies included East Rockaway offshore, western Long Island (USACE 2008a), as well as others just outside the NYNJHAT Study Area (Burlas et al. 2001; EEA 2002; Wilbur et al. 2003; Byrnes et al. 2004; USACE 2004a, 2008b, 2010b; Able et al. 2010). Bottom trawl sampling was also conducted monthly in the Hudson-Raritan Estuary from 1992 to 1997 to provide data on the distributions and abundances of 26 fish and macroinvertebrate species (Wilk et al. 1998).

4.3.1 New England Finfish Species

4.3.1.1 Atlantic Cod (*Gadus morhua*)

Atlantic cod is a benthopelagic, commercially important groundfish ranging from the coasts of Greenland to north of Cape Hatteras, North Carolina, in North America. The Study Area is designated EFH for egg, larvae, and adult life stages (Table 4-1).Atlantic cod are not expected to be abundant in the Study Area, although cod eggs have been found to be widely distributed in the Harbor (USACE 2015b). However, during ABS sampling between 2002 and 2012, cod larvae were only found in the Harbor in 2004 and 2005. Juvenile and adult Atlantic cod have been caught in winter trawls in the Harbor. They were also collected in small numbers during the MFS in the Upper Bay in 2006 and 2013 (USACE 2015a).

4.3.1.2 Atlantic Herring (*Clupea harengus*)

Atlantic herring is a schooling, pelagic, commercially important coastal species that ranges from northern Labrador to North Carolina in the western Atlantic and - depending on feeding, spawning, and wintering - migrates extensively north-south (Collette & Klein-MacPhee 2002). Atlantic herring have been documented in coastal waters of NY. The Study Area is designated EFH for the larvae, juvenile, and adult life stages (Table 4-1).

Atlantic herring larvae were present, but only rarely from February to June during ABS epibenthic ichthyoplankton sampling (USACE 2010a, 2012a, 2015). Juveniles were captured in bottom trawls during ABS sampling. In the winter, juveniles were not collected at most stations and when present, were collected at low abundances throughout the Harbor. Peak juvenile abundances occurred in April and May, with the highest spring collections at non-channel stations in Newark Bay and in Upper Bay near Port Jersey. Juveniles were not collected from June to September in the Harbor in either the bottom or mid-water trawls of the MFS and were present in low abundances in October and November. This seasonal pattern of occurrence in the Harbor is consistent with distributions observed in the mid-1990s during the Hudson-Raritan Estuary Trawl Survey (Wilk et al. 1998), in which juveniles were most common in winter and spring, sometimes present at the mouth of the estuary in the summer and were rare in the fall. Adults were most abundant in the winter in ABS bottom trawl sampling and were concentrated on the eastern side of the Harbor, with only two adults collected in Arthur Kill, none in Newark Bay, and few on the western side of the Lower and Upper Bays (USACE 2010a, 2012a, 2015). Juvenile and adult Atlantic herring were most abundant in the Harbor between 2008 and 2009 during ABS trawls.

A total of 6,008 Atlantic herring were collected during the MFS. Yearly totals ranged from a low of 116 in 2011 to a high of 3,853 in 2012 and totaled 618 in 2006 and 1,421 in 2013. Atlantic herring were most common during the spring of 2012 in Newark Bay and Arthur Kill/Kill Van Kull. Atlantic herring were typically absent from collections during the summer and fall in all Harbor regions. Juvenile Atlantic herring typically occurred with alewife, blueback herring, and bay anchovy during the spring in Upper Bay, Newark Bay, and Arthur Kill/Kill Van Kull aggregations, though a few Atlantic herring occurred with these species in the Lower Bay (USACE 2015a).

Atlantic herring larvae were not collected in ichthyoplankton samples from either the surf zone or nearshore habitats in northern NJ (Burlas et al. 2001; Able et al. 2010). Juveniles were present, but rare, in surf zone sampling in northern NJ from August to October. In nearshore habitat, where sampling was conducted on or near borrow areas, juvenile abundances were highest in the late summer and December. Adult Atlantic herring were not collected in the surf zone and were abundant in nearshore trawl surveys only in December. The occurrence of Atlantic herring in nearshore habitat is consistent with their preference for higher salinities.

4.3.1.3 Monkfish (Lophius americanus)

Monkfish can be found from Newfoundland to North Carolina, in the Gulf of Mexico, and along the coast of Brazil (Collette & Klein-MacPhee 2002). The Study Area is designated EFH for egg, larvae, and adult life stages (Table 4-1).

Monkfish eggs and larvae were collected in small numbers during the ABS studies within the Harbor (USACE 2015b). Monkfish were not collected in the surf zone habitat in northern NJ (USACE 2013). Monkfish were uncommon in all sampling on the south shore of Long Island and were sporadically collected in April, June, July, November, and December.

4.3.1.4 Ocean Pout (Macrozoarces americanus)

The ocean pout is a bottom-dwelling, cool-temperate species that utilizes both open and rough habitats, feeding on benthic organisms (Steimle et al. 1999d). The distribution of ocean pout is from the Atlantic continental shelf of North America between Labrador and the southern Grand Banks and to Virginia. Ocean pout also occur south of Cape Hatteras in deeper, cooler waters. The Study Area contains designated EFH for egg and adult life stages (Table 4-1).

Ocean pout were not collected during the ABS or MFS in the Harbor (USACE 2015a, 2015b) nor in the surf zone habitat in northern NJ (USACE 2013). Ocean pout were collected from February to April and in December on the south shore of Long Island in very low abundances.

4.3.1.5 Pollock (Pollachius pollachius)

Pollock is a bony fish found in the northwest Atlantic, most commonly on the Scotian Shelf, Georges Bank, in the Great South Channel, and in the Gulf of Maine (Cargnelli et al. 1999a). The Study Area is designated EFH for juvenile and adult life stages (Table 4-1).

Limited spawning activity has been documented in the mid-Atlantic Bight. YOY pollock may be present during winter in oceanic waters of the mid-Atlantic Bight and in both inshore and offshore waters during early summer (Able & Fahay 2010 as cited in USACE 2013). One juvenile pollock (< 70 mm) was collected in a mid-water trawl during May 2011 in Newark Bay during the MFS studies (USACE 2015a). Pollock were collected in the Harbor during six of the ABS monitoring years in very small numbers (27 total) (USACE 2015b).

Pollock were not collected in the surf zone habitat in northern NJ. Pollock were uncommon in monitoring studies on the south shore of Long Island but were collected sporadically in the spring and summer and in December (USACE 2013).

4.3.1.6 Red Hake (Urophycis chuss)

Red hake can be found from southern Nova Scotia to North Carolina, and historically, the heaviest concentrations of red hake were documented from the southwestern area of Georges Bank to the shelf valley of the Hudson Canyon (Bigelow & Schroeder 1953a; Grosslein & Azarovitz 1982). The Study Area contains designated EFH for all life stages (Table 4-1).

Red hake larvae were not collected in any epibenthic ichthyoplankton sampling conducted over 10 years from January through June 2002–2011 (USACE 2015b). Juvenile red hake were abundant in bottom trawls from January through April and were present in the Harbor at lower abundances in May and June. Juveniles were most abundant in channels in the Upper Bay and Newark Bay areas in both the winter and spring. The strong preference for channels was also observed in the bottom trawl surveys conducted in the Lower Bay in the mid-1990s (Wilk et al. 1998). Adult red hake were present in the Harbor but were rare in abundance.

Red hake larvae were present, but rare, in surf zone plankton tows in July and juvenile and adults were not collected in the surf zone of northern NJ (USACE 2013). Red hake larvae were also sampled at very low abundances in nearshore habitat in the late summer (Able et al. 2010). The rare occurrences of eggs and larvae in the surf zone and nearshore habitat reflect that they are more commonly collected in habitats with lower salinities (e.g., < 25 ppt). Juvenile red hake were highly abundant from November through April in the nearshore habitat west of Shinnecock Inlet and were present at lower abundance throughout the summer and early fall. The high abundance of juvenile red hake in nearshore habitat is consistent with the high salinity (31-33 ppt) preference for this life stage. Adult red hake were collected in only one study conducted near Shinnecock Inlet and this collection occurred in April.

4.3.1.7 Silver Hake (Merluccius bilinearis)

Silver hake (a.k.a. whiting) are found from the Gulf of St. Lawrence to Cape Hatteras (Lock and Packer 2004). The areas of highest abundance in the US are the Gulf of Maine, Georges Bank, and the mid-Atlantic Bight off Long Island (Lock & Packer 2004). The Study Area contains designated EFH for egg, larvae, and adult life stages (Table 4-1).

Silver hake is not common in the Harbor, although juveniles and adults were collected in small to moderate numbers during ABS bottom trawls between 2002 and 2010 (USACE 2015b). Silver hake eggs were uncommon and collected in only Lower Bay and Upper Bay. Silver hake eggs are pelagic, therefore, may not be reliably sampled by the epibenthic sled. Silver hake larvae were not collected during ABS sampling, in part because sampling stopped in June when eggs were first collected.

Silver hake were not collected off the coasts of NY and NJ during the borrow area surveys (USACE 2013).

4.3.1.8 Windowpane Flounder (*Scophthalmus aquosus*)

The range of windowpane flounder is from the Gulf of Saint Lawrence to Florida (Gutherz 1967). The Study Area contains designated EFH for windowpane flounder for all life stages (Table 4-1).

Windowpane flounder eggs were collected in the Harbor in high abundances in May and June and were distributed widely throughout channel and non-channel stations in the Lower and Upper Bays (USACE 2015b). Eggs were not commonly collected in the Arthur Kill and Newark Bay areas. Windowpane flounder larvae were abundant in May and June in the Harbor and exhibited a distribution in the Lower and Upper Bays that was similar to that of eggs, with rare collections in the Arthur Kill and Newark Bay areas. Juvenile windowpane flounder were more widely distributed throughout the Harbor and were more common at channel stations in the Arthur Kill, Newark Bay, and Upper Bay areas of the Harbor in both the winter and spring. Adult windowpane flounder were common in the spring and most abundant in the Upper Bay area. Bottom trawl sampling in the Lower Bay in the mid-1990s revealed the highest collections of windowpane flounder in channel areas (Wilk et al. 1998).

Windowpane flounder larvae were highly abundant in the surf zone of northern NJ in May and June. Juvenile windowpane flounder were present, but rare, in the surf zone in August and September and were not present in October, while adults were present, but rare, in September in the surf zone. Juvenile and adult windowpane flounder were collected throughout the year in nearshore habitat. High abundances were observed in May and from July through December (USACE 2013).

4.3.1.9 Winter Flounder (Pseudopleuronectes americanus)

The range for winter flounder is from the coastal waters in the Strait of Belle Isle, Newfoundland, south to Georgia (Collette & Klein-MacPhee 2002). These economically important flatfish are also found in inshore areas from Massachusetts and occur regularly in NY waters (Stone et al. 1994), as well as south to Absecon Inlet (NEFMC 2017). The Study Area contains designated EFH for all winter flounder life stages (Table 4-1).

Winter flounder eggs were common in the Harbor in January, becoming abundant in February and March and decreasing in abundance in April. Winter flounder eggs were most common at non-channel stations in the Lower and Upper Bay areas in the winter and in the Lower Bay in the spring. Eggs were rarely collected in the Arthur Kill and Newark Bay areas. Winter flounder larval abundances peaked in April and were concentrated primarily in the Lower Bay at both channel and non-channel stations, with lower densities in the Upper Bay and very low occurrences in the Arthur Kill and Newark Bay areas. Juvenile winter flounder were abundant from January through June and were also collected throughout the fall. Juveniles were collected in the Arthur Kill, Newark Bay, and Upper Bay areas, primarily at channel stations in both the winter and spring. Winter flounder adults were concentrated in the channels of the Upper and Lower Bays both in the winter and spring. There were very few adults collected in the Arthur Kill and Newark Bay areas.

Collections of adult winter flounder in aggregations during April, the critical post-spawning feeding period, occurred only in the Upper and Lower Bays in areas close to clam, mussel and ampeliscid amphipod beds (USACE 2012a). Spatial distributions of juveniles and adults in the Lower Bay during ABS sampling were similar to that observed in the mid-1990s, with highest abundances at channel locations (Wilk et al. 1998).

Winter flounder larvae were collected in surf zone habitat in northern NJ in May and were not collected in June or July. Juveniles were present, but rare, in the surf zone in August and were not collected in September or October. Adult winter flounder were not collected in the surf zone habitat. Juvenile and adult winter flounder were collected in all months in nearshore habitat, with highest abundances occurring in April, May, and December (USACE 2013).

4.3.1.10 Witch Flounder (Glyptocephalus cynoglossus)

Witch flounder is a medium-sized, right-eyed, small-mouthed flounder found on both sides of the Atlantic (NEFMC 1985). Witch flounder is common in the Gulf of Maine and Georges Bank and is found south to Cape Hatteras (NEFMC 1985). The Study Area contains designated EFH for witch flounder for the larval life stage (Table 4-1).

Witch flounder were not collected during the ABS or MFS, nor were they collected in the nearshore or surf zone habitats (USACE 2013, 2015a, 2015b). Therefore, witch flounder, including larval life stages are not expected to occur in the Study Area.

4.3.1.11 Yellowtail Flounder (*Limanda ferruginea*)

Yellowtail flounder have a range along the Atlantic coast of North America from Newfoundland to Chesapeake Bay, with the majority located on the western half of Georges Bank, the western Gulf of Maine, east of Cape Cod, and southern New England (Collette & Klein-MacPhee 2002). The Study Area contains designated EFH for yellowtail flounder for all life stages (Table 4-1).

Only one yellowtail flounder was collected during the ABS (USACE 2015b) and none were collected during the MFS (USACE 2015a). Yellowtail flounder were not collected in surf zone or nearshore habitats during the biological surveys referenced in Section 4.1 in support of borrow area surveying (USACE 2013).

4.3.2 Mid-Atlantic Finfish Species

4.3.2.1 Atlantic Butterfish (*Peprilus triacanthus*)

Atlantic butterfish is a demersal/pelagic species ranging from the Gulf of St. Lawrence south to Florida but is most abundant from the Gulf of Maine to Cape Hatteras (Bigelow & Schroeder 1953a; Overholtz 2006). Butterfish are found in the Mid-Atlantic shelf in the summer and autumn but migrate to the edge of the continental shelf where they aggregate in response to seasonal cooling of water temperatures (Grosslein & Azarovitz 1982). The Study Area contains designated EFH for all life stages (Table 4-1).

Juvenile and adult butterfish were rarely collected during the winter ABS sampling, becoming more common in the spring and abundant in the late summer and fall. Butterfish were collected in both bottom and mid-water trawls and were more abundant near the bottom in non-channel areas (USACE 2007b). Butterfish were collected most frequently in the Lower Bay, followed by Newark Bay, with very low collections in Upper Bay and Arthur Kill (USACE 2007b). Size data indicate YOY and yearlings comprise the peak summer and early fall catches. Bottom trawl surveys conducted in the mid-1990s also did not catch butterfish in the Lower Bay in the winter but reported peak abundances during the summer (Wilk et al. 1998).

Juvenile butterfish were present, but rare, in surf zone sampling from August to October on the northern NJ shoreline. In nearshore habitat on the south shore of Long Island, juvenile butterfish were highly abundant from May to November, represented 80–90 percent of the fish collected in some summer months, and were among the numerically dominant finfish captured each year (2004–2008) (USACE 2008b).

4.3.2.2 Atlantic Mackerel (*Scomber scombrus*)

Atlantic mackerel is a pelagic, schooling species that can be found from the Gulf of St. Lawrence to Cape Lookout, North Carolina (MAFMC 2011; Studholme et al. 1999). The Study Area contains designated EFH for Atlantic mackerel for all life stages (Table 4-1).

Atlantic mackerel eggs were collected primarily in Lower Bay and Upper Bay in both channel and non-channel locations. Larval densities were highest in Lower Bay, intermediate in Upper Bay, and uncommon in Arthur Kill/Newark Bay. Atlantic mackerel larvae comprised 0.1% of all the larvae collected during the ABS. Their larvae were found in low densities in all Harbor regions at channel and non-channel stations. However, they were not found at all stations. They were found at three channel stations in the Arthur Kill/Newark Bay region; at five channel and three non-channel stations in the Upper Bay; and at three channel and three non-channel stations in the Lower Bay. Both yolk-sac and post yolk-sac larvae, two stages of larvae, were found primarily in May and June (USACE 2015b).

Juvenile Atlantic mackerel were present, but rare, in the surf zone of northern NJ in August and were not collected in September or October. Juveniles were sporadically collected in low abundances in nearshore sampling on the south shore of Long Island. Adult Atlantic mackerel were not collected in the surf zone but were collected at low abundances in nearshore sampling in March, April, and December (USACE 2013).

4.3.2.3 Black Sea Bass (Centropristis striata)

Black sea bass is a demersal, warm temperate species that can be found in the western Atlantic, ranging from southern Nova Scotia and the Bay of Fundy to southern Florida (Drohan et al. 2007).

Black sea bass are found in an array of complex, structured habitats, including reefs, shipwrecks, and lobster pots along the continental shelf (Steimle et al. 1999c). YOY are typically found in estuarine habitats with structural complexity (Drohan et al. 2007). The Study Area contains designated EFH for the juvenile and adult life stages (Table 4-1).

Juvenile black sea bass were collected at very low densities in the Harbor throughout the year, becoming more common in the fall (USACE 2015b). Adults were rarely collected within the Harbor regardless of season. This seasonal pattern of occurrence in the harbor is consistent with that observed in the mid-1990s during the Hudson-Raritan Estuary Trawl Survey in which only juveniles were collected and were most abundant in the fall (Wilk et al. 1998).

Seabass abundances during the MFS were highest in 2006 bottom trawl sampling in which 42 fish were collected from all Harbor areas from August to November and represented both juveniles and adults. Midwater sampling yielded two black sea bass: a juvenile in October 2011 and an adult in November 2013 (USACE 2015a).

Post yolk-sac larvae were collected in one Lower Bay non-channel sample in 2008. No eggs or yolk-sac larvae were collected, suggesting black sea bass spawning within the Harbor is limited, if it occurs at all, and advection of larvae into the Harbor does not commonly occur during the spring (USACE 2015b).

Juvenile and adult black sea bass were not collected in the surf zone of northern NJ (USACE 2013). Juveniles were collected in nearshore habitat from April through November, with highest abundances in April, July, August, and November. Adult black sea bass were collected from April through September in nearshore habitat. Juveniles and adults were common in fish trap sampling in September at the entrance to Ambrose channel in Lower Bay where gravel to boulder size rocks cause an obstruction to navigation. Adults are typically associated with structurally complex habitats such as rocky reefs, cobble and rock fields, and mussel beds with summer habitat on the nearshore continental shelf (Drohan et al. 2007). This habitat preference is consistent with the higher abundance of black sea bass found in similar habitats during sampling at the Ambrose channel obstruction.

4.3.2.4 Bluefish (Pomatomus saltatrix)

Bluefish are a coastal migratory pelagic species that can be found in inshore and offshore temperate and warm temperate waters of the continental shelf, ranging from Nova Scotia to Florida, as well as in the Gulf of Mexico from Florida to Texas (Bigelow & Schroeder 1953a; Briggs 1960). In mid-to-late May, bluefish, traveling in large schools of like-size fish, migrate into Mid-Atlantic waters, returning to deeper offshore waters of southeastern Florida in November (Grosslein & Azarovitz 1982; Stone et al. 1994). The Study Area contains designated EFH for all life stages (Table 4-1).

Juvenile bluefish were not collected within the Harbor during the winter but were present, but rare, in the spring (USACE 2015b). Likewise, juvenile bluefish were not collected in the Harbor in the mid-1990s during the Hudson-Raritan Estuary Trawl Survey (Wilk et al. 1998). Juveniles were collected in slightly higher abundances in bottom than midwater trawl sampling in 2006 (USACE 2007c), with peak abundances in the late summer and early fall. The majority of fish collected were young-of-year (YOY), which were more common at non-channel than channel stations and present in higher abundances in Newark Bay and Lower Bay than in Arthur Kill and Upper Bay. Adults were collected, but rare, in the spring during ABS surveys and were also present, but rare, in the Hudson-Raritan Estuary Trawl Survey (Wilk et al. 1998). Bluefish eggs and larvae were not collected during the ABS efforts (USACE 2015b).

During the MFS surveys, bluefish were collected in all Harbor areas from May to October. Larger bluefish (>100 millimeters total length [mm TL]) were collected in the spring in 2011 and may have either overwintered in the estuary during a particularly cold winter or reentered the estuary early in the spring. Spring-spawned juveniles were especially abundant during the later months of the spring 2013 sampling season, whereas juvenile recruits from the summer-spawned cohort were evident in 2006 and 2013. Growth of bluefish within the estuary is evident by fall, with many juveniles reaching sizes over 100 mm TL. Most YOY bluefish have moved from estuaries in the mid-Atlantic Bight at sizes less than 240 mm TL by the fall (Able & Fahay 1998; Able et al. 2003). Bluefish were primarily collected during the summer from Newark Bay in 2006, 2011, and 2013; from the Arthur Kill/Kill Van Kull in 2011 and 2013; from the Lower Bay in 2012 and 2013; and from the Upper Bay in 2013 (USACE 2015a).

Juvenile bluefish were highly abundant in surf zone habitat in northern NJ from August through October (USACE 2013). Size frequency distributions suggest these juveniles result from both spring and summer spawned cohorts (Wilber et al. 2003a). Bluefish were significantly more abundant at reference areas than at sites near active beach nourishment operations, suggesting an avoidance response to the disturbance (Wilber et al. 2003). Adult bluefish were not collected in the surf zone (USACE 2013). Juveniles were collected from August to November in nearshore habitat and were most abundant from August to October. Adults were collected in very low abundances in nearshore habitat in June and September.

4.3.2.5 Scup (Stenotomus chrysops)

Scup is a demersal species that can be found from the Gulf of Maine to North Carolina, with a winter distribution that ranges from approximately NJ to Cape Hatteras in waters 36-146m deep and a summer distribution that ranges from southern New England to Mid-Atlantic coasts (Bigelow & Schroeder 1953a; Collette & Klein-MacPhee 2002; Grosslein & Azarovitz 1982). The Study Area contains designated EFH for all life stages (Table 4-1).

Scup eggs and larvae were not collected within the Harbor in the epibenthic ichthyoplankton sampling conducted over ten years from January through June (USACE 2015b). Juveniles were more abundant in bottom than mid-water trawl samples and were abundant from May through August, with highest occurrences in the Lower and Upper Bay areas. Abundances were highest at non-channel stations in the Upper Bay and at a single channel station in the Lower Bay. The seasonal and spatial occurrences of scup in the Lower Bay in the mid-1990s were similar to that observed in the ABS study with fish collected at both channel and non-channel stations (Wilk et al. 1998). Only one juvenile scup was collected during the MFS (USACE 2015a).

Scup were not collected in the surf zone habitat of northern NJ. Juvenile and adult scup were highly abundant in nearshore habitat on or near borrow areas during the summer and early fall. In nearshore habitat, scup were present but rarely between November through January and not collected in February and March (USACE 2013).

4.3.2.6 Summer Flounder (Paralichthys dentatus)

Summer flounder is a demersal, left-eyed flatfish that is distributed from Georges Bank to South Carolina and Florida, and is concentrated in the Mid-Atlantic Bight from Cape Cod to Cape Hatteras (Bigelow & Schroeder 1953a; Collette & Klein-MacPhee 2002). The Study Area contains designated EFH for the larval, juvenile, and adult life stages (Table 5-1).

The HAPC for summer flounder is defined by the MAFMC as "all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH is HAPC. If native species of SAV are eliminated then exotic species should be protected because of functional value, however, all efforts should be made to restore native species" (MAFMC 1998). Summer flounder HAPC exists in the entirety of the Study Area.

Summer flounder larvae were present, but rare, from January through May in the Harbor and were not collected in June in any year of sampling (USACE 2015b). Juveniles were collected in the Harbor in all months of sampling, with the exception of September, while adults were not collected in the Harbor in September and November. Adult densities (number of individuals per unit area) were highest in the late spring and were concentrated in the Arthur Kill/Newark Bay and Upper Bay areas at both channel and non-channel stations. In sampling conducted in the mid-1990s (Wilk et al. 1998), summer flounder were most abundant in the Raritan Bay portion of the Hudson-Raritan Estuary at both channel and non-channels stations.

Summer flounder larvae were not collected in the surf zone of northern NJ; however, juveniles and adults were present, but rare, in August and September beach seine samples. Juveniles were not commonly collected in nearshore bottom trawl surveys. Adult summer flounder were collected in all monitoring studies that used bottom trawls and were present from April through January and abundant from April through November. The high abundances from late spring to early fall is consistent with their known distribution in shallow coastal and estuarine water during warmer months (USACE 2013).

4.3.2.7 Spanish Mackerel (Scomberomorus maculates)

Spanish Mackerel exhibit fast growth and reproduce by age two. Wild populations are currently above target levels. They are sustainably managed and responsibly harvested under U.S. regulations and therefore considered a smart food choice. There are two distinct populations of Spanish Mackerel: one in the Gulf of Mexico and the other in the Atlantic. The Atlantic populations of Spanish mackerel spend the winter off the Florida coast and move northward staring in April; reaching NY in June. Spanish mackerel feed on a variety of prey including herring, menhaden, sardines, mullet, needlefish, and anchovy and sometimes inverts such as shrimp, crabs, and squid. Dolphins and sharks prey on mackerel making them an important food source (NOAA 2020).

Two juvenile Spanish mackerel were collected during the Migratory Finfish Suvery (MFS) conducted by the USACE in August 2006 along the Arthur Kill sector, east of Staten Island, NY (USACE 2015). Spanish Mackerel are a pelagic/mid water species and not generally present in the Harbor. (USACE 2015).

4.3.3 Highly Migratory Species

4.3.3.1 Bluefin Tuna (*Thunnus thynnus*)

Bluefin tuna is a pelagic species that feeds opportunistically upon a variety of fish and benthic invertebrates (NMFS 2017). The Study Area contains designated EFH for the juvenile life stage within the Lower Bay Region. Juvenile bluefin tuna are found in the Mid-Atlantic Bight and the Gulf of Maine (southern Maine and Cape Lookout), from the shore to the continental shelf (except within the Long Island Sound, Delaware Bay, Chesapeake Bay, and Pamlico Sound) (NMFS 2017). Preferred water temperatures within EFH in the Mid-Atlantic Bight range from 4 to 26 °C, usually in water less than 20 m deep, but can be found 40-100 m deep during the winter) (NMFS 2017).

This highly migratory pelagic species is not expected to be common in the Study Area and its presence would likely be transitory.

4.3.3.2 Skipjack Tuna (Katsuwonus pelamis)

Skipjack tuna are found circumglobally in tropical and warm-temperate waters (NMFS 2017). The optimum water temperature for the species is 27°C and they are known to dive to 260m (Collette & Nauen 1983). Skipjack tuna travel in schools and feed opportunistically on fish, cephalopods, and crustaceans (Dragovich 1969, 1970; Dragovich & Potthoff 1972; Collette & Nauen 1983; ICCAT 1997). Aggregations of skipjack tuna are associated with convergences and hydrographic discontinuities (Collette & Nauen 1983). The Study Area contains designated EFH for the adult life stage (Table 4-1).

Skipjack tuna were not collected at any time during the ABS or MFS sampling efforts (USACE 2015a, 2015b). Skipjack tuna were also not collected in surf zone or nearshore habitats during the additional biological surveys referenced in Section 4.1 (USACE 2013). This highly migratory pelagic species is not expected to be common in the Study Area and its presence would likely be transitory.

4.3.4 Skate Species

4.3.4.1 Clearnose Skate (*Raja eglanteria*)

Clearnose skate occurs from the Nova Scotian Shelf to northeastern Florida as well as in the northern Gulf of Mexico, although it is rarer in the northern portion of its range (Packer et al. 2003c). Clearnose skate is distinguished from other skate species with is acute snout, three rows of equal-sized thorns dorsally and laterally, and dark spots and bars on its dorsal surface (McEachran 2002). Clearnose skates feed on polychaetes, amphipods, several shrimp species, crabs, squid, and small fish (Bigelow & Schroeder 1953b; Bowman et al. 2000). The main predators of clearnose skate are sharks including the sand tiger shark (McEachran 2002). North of Cape Hatteras, the clearnose skate moves inshore and northward along the continental shelf in spring and summer, then offshore and southward in fall and winter (Bigelow & Schroeder 1953b; McEachran 1973; McEachran & Musick 1975). The Study Area contains EFH for juvenile and adult life stages (Table 4-1).

Clearnose skate juveniles were present, but rare, throughout the winter and spring in the Harbor (USACE 2013). Clearnose skate were collected during the ABS bottom trawl sampling primarily from channel stations in the Lower Bay and Upper Bay. Adult clearnose skate were collected in low numbers only in the winter. In the mid-1990s, clearnose skate were also rare in the winter and spring, with higher abundances in the summer (Wilk et al. 1998). Clearnose skate were also collected in nearshore habitat in the Rockaway borrow area (USACE 2015b).

4.3.4.2 Little Skate (Leucoraja erinacea)

The little skate is a demersal fish species that occurs from Nova Scotia to Cape Hatteras (Packer et al. 2003a). Little skate are most abundant and found year-round in the northern section of the Mid-Atlantic Bight and Georges Bank (Packer et al. 2003a). The little skate prefers sandy or pebbly bottom but can also be found on mud and ledges (Collette & Klein-MacPhee 2002) where temperature ranges from 1 to 21°C. The Study Area contains EFH for juvenile and adult life stages (Table 4-1).

Little skate juveniles were collected in the Harbor in the winter and early spring but were rare. Adults were present throughout the winter and spring with highest abundances observed in January and April. In the mid-1990s, little skate were common from the fall through the spring in both channel and non-channel areas of the Lower Bay (Wilk et al. 1998). However, little skate were collected in high abundances in nearshore habitats outside the Harbor, including the Rockaway borrow area (Burlas et al. 2001; Able et al. 2010; USACE 2013; USACE 2015b).

4.3.4.3 Winter Skate (Leucoraja ocellata)

Winter skate occurs from the south coast of Newfoundland and the southern Gulf of St. Lawrence to Cape Hatteras (Packer et al. 2003b). Like little skate, winter skate are highly abundant on Georges Bank and in the northern section of the Mid-Atlantic Bight. The Study Area contains EFH for the juvenile and adult life stages (Table 4-1).

Winter skate were present in low abundances from January through May with adults collected only in March and April. Winter skate were most abundant in winter in the mid-1990s (Wilk et al. 1998). Winter skate were not collected in the surf zone habitat in northern NJ (USACE 2013). Winter skate were present in all months during the three years of sampling borrow areas on the south shore of Long Island, with high abundances in the spring and fall west of Shinnecock Inlet (northeast of the Study Area) (USACE 2008b, 2013). Winter skate were rare in June and common in September in the Rockaway borrow area (USACE 2013).

4.3.5 Shark Species

4.3.5.1 Common Thresher Shark (*Alopias vulpinus*)

The common thresher shark is found in coastal and offshore waters, exhibiting some north-south migrations along the U.S. east coast, especially offshore and in cold inshore waters during the summer (Castro 2011; Gervelis & Natanson 2013). Thresher sharks feed on pelagic invertebrates and small fish (Preti et al. 2004). Mating occurs in the late fall and females, once sexually mature between three to seven years of age, give birth to live young annually in the spring (Goldman 2009; Gervelis & Natanson 2013). The Study Area contains designated EFH for neonate, juvenile, and adult life stages (Table 4-1).

Common thresher shark were not collected during the biological surveys referenced in this Section.

4.3.5.2 Dusky Shark (Carcharhinus obscurus)

The dusky shark can be found in throughout the Atlantic, Pacific, and Indian Oceans in warm and temperate continental waters (NMFS 2017). Tagging studies suggest that dusky sharks spend most of their time in waters 20 to 125m depth and 23 to 30°C (Hoffmayer et al. 2014). The Study Area contains designated EFH for neonate, juvenile, and adult life stages (Table 4-1).

Dusky shark were not collected during the biological surveys referenced in this Section.

4.3.5.3 Sand Tiger Shark (*Carcharias taurus*)

The sand tiger shark is found globally in coastal tropical and warm temperate waters, often in very shallow areas less than 4m (Castro 1983). In the northwest Atlantic, juveniles and adult males are found from Cape Cod to Cape Hatteras, while females are typically more common to Cape Hatteras and to Florida (Gilmore 1993). Sand tiger sharks are generalist feeders (Gelsleichter et al. 1999). Sand tiger sharks in North America typically give birth in March and April to two young (Lucifora et al. 2002). The Study Area contains designated EFH for neonate, juvenile, and adult life stages (Table 4-1).

Sand tiger shark were not collected during the biological surveys referenced in this Section.

4.3.5.4 Sandbar Shark (Carcharhinus plumbeus)

The sandbar shark is commonly found in coastal habitats and subtropical and warm waters (NMFS 2017). The sandbar shark is ovoviviparous, meaning fertilization and embryonic development occurs within the mother, before a pup is born (Musik and Sminkey 1995). The North Atlantic population ranges from Cape Cod to the western Gulf of Mexico. This bottom-dwelling species is common in 20 to 55m of water and is only found occasionally at depths of 200m. The Study Area contains designated EFH for all life stages (Table 4-1).

Sandbar shark were not collected during the biological surveys referenced in this Section.

4.3.5.5 Smoothhound Shark Complex (Atlantic Stock, Mustelus canis)

The smoothhound shark complex consists of three species: smooth dogfish (*Mustelus canis*); Florida smoothhound (*Mustelus norrisi*); Gulf smoothhound (*Mustelus sinusmexicanus*). These species are difficult to differentiate in the field and all occur in the Gulf of Mexico, while the smooth dogfish is the only species of the three found in the Atlantic Ocean (NMFS 2017). Smooth dogfish is commonly found in coastal waters of the Atlantic from Massachusetts to northern Argentina. Smooth dogfish are a demersal species that inhabit inshore waters up to 200m (Compagno 1984). They feed primarily on invertebrates, especially large crabs (Gelsleichter et al. 1999; Scharf et al. 2000). The three species of smoothhound shark give birth to live young (Compagno 1984; Heemstra 1997). The Study Area contains designated EFH for all life stages (Table 4-1).

Smooth dogfish were collected in the Harbor during three of the ABS study years, with a total of 16 collected (USACE 2015b). In the Harbor, larger individuals were collected during spring sampling as compared to winter sampling. They were also present in the Rockaway borrow area.

4.3.5.6 Spiny Dogfish (Squalus acanthias)

The spiny dogfish is widely distributed throughout the world, with populations existing on the continental shelf of the northern and southern temperate zones which includes the North Atlantic from Greenland to northeastern Florida, with concentrations from Nova Scotia to Cape Hatteras (Compagno 1984). Females of the species produce eggs each spawning season which are fertilized internally. Females give birth to live young (NOAA 2022a). The Study Area contains designated EFH for juvenile and adult life stages (Table 4-1).

Spiny dogfish were collected in the Harbor during three of the ABS survey years, with a total of 29 collected (USACE 2015b). Both monthly and interannual variation in spiny dogfish abundances were relatively high in the Harbor with monthly collections only in January and June and peak annual collections in 2007 and 2010. Spiny dogfish were found primarily in Lower Bay channel and non-channel stations during winter and spring. Spiny dogfish were not present in nearshore or surf zone habitats of northern NJ or in the vicinity of the Rockaway borrow area but were collected in nearshore habitats outside of Shinnecock Bay.

4.3.5.7 White Shark (Carcharodon carcharias)

The white shark occurs in coastal and offshore waters and is most common in cold and warm temperate seas (Compagno 1984). The white shark ranges from Newfoundland to the Gulf of Mexico in the western North Atlantic (Casey & Pratt 1985). White sharks have a high occurrence in the Mid-Atlantic Bight and are observed seasonally in this area from April to December (Casey & Pratt 1985; Curtis et al. 2014). The optimum temperature range for white sharks is estimated to be 14 to 23°C (Curtis et al. 2014). Small and intermediate sized white sharks are abundant on the continental shelf of the Mid-Atlantic Bight (Casey & Pratt 1985; Skomal 2007). White sharks feed on fish and marine mammals, especially pinnipeds (Klimley 1985; McCosker 1985). Females give birth to live young that are approximately 4-feet in length (NOAA 2022b). The Study Area contains designated EFH for all life stages (Table 4-1).

White shark were not collected during the biological surveys referenced in this Section.

4.3.5.8 Blue Shark (*Prionace glauca*)

Blue sharks are a pelagic species occurring in temperate and tropical oceans. Blue sharks rarely come near shore but have been spotted within inshore areas around oceanic islands and where the continental shelf narrows (Compagno et al. 2005). They prefer cooler water temperatures (12-20°C) (Stevens 2009). Blue sharks are the most heavily fished shark in the world (Compagno et al. 2005). Though the species is rarely targeted commercially, they are common bycatch from longline and driftnet fish practices and often fished for recreationally (Stevens 2009). Blue sharks typically feed at night but will feed throughout the day when an opportunity is presented. They have a diet that includes small bony fish, such as herring and sardine, invertebrates, such as squid, cuttlefish, and octopi and are known to aggregate to feed on schools of prey (Compagno et al. 2005). Blue Sharks are viviparous and give birth to litters of 30-80 pups in summer or spring (Stevens 2009).

Blue sharks were not collected during the biological surveys referenced in this Section.

4.3.6 Invertebrate Species

4.3.6.1 Atlantic Sea Scallop (Placopecten magellanicus)

The Atlantic sea scallop is a commercially important bivalve species ranging from the Gulf of St. Lawrence to Cape Hatteras (Hart and Chute 2004). Atlantic sea scallops are most common at water depths 20 to 80m in the mid-Atlantic at water temperatures less than 20°C. Scallops may be found in temporary or permanent aggregations known as beds. The Study Area contains designated EFH for all life stages (Table 4-1).

Atlantic sea scallops are most abundant in deeper waters approximately 20 to 80m depth (Hart & Chute 2004; Stokesbury et al. 2014) and are therefore not expected to be common in the Study Area, although suitable habitat or substrate may be present.

4.3.6.2 Longfin Inshore Squid (*Loligo pealeii*)

The longfin inshore squid is a pelagic, schooling species that can be found from Newfoundland to the Gulf of Venezuela and is considered a commercially important species from Georges Bank to Cape Hatteras (Cargnelli et al. 1999b). Longfin inshore squid are known to migrate seasonally, moving south and offshore in the late fall and wintering on the continental shelf edge; as temperatures increase seasonally, this species moves inshore and north (Cargnelli et al. 1999b). The Study Area contains designated EFH for egg, juvenile, and adult life stages (Table 4-1).

Longfin squid were not collected in the surf zone habitat in northern NJ (USACE 2013). However, longfin squid were highly abundant in the summer Rockaway borrow area sampling, comprising as much as 7 percent of the total catch in some years. High summer abundances were also observed in bottom trawl sampling in the lower bay area of the Harbor in the mid-1990s (Wilk et al. 1998).

4.3.6.3 Ocean Quahog (*Arctica islandica*)

The ocean quahog is a commercially important bivalve mollusk distributed along the continental shelf that can be found from Newfoundland to Cape Hatteras, with peak offshore densities occurring south of Nantucket to the Delmarva Peninsula (Cargnelli et al. 1999c). The ocean quahog is managed by the Mid-Atlantic Fishery Management Council under the Atlantic surfclam and ocean quahog fishery management plan. The Study Area contains designated EFH for the adult life stage (Table 4-1).

Ocean quahog were collected incidentally in several trawl surveys, as part of a survey for a different species, on the south shore of Long Island but in low abundances (USACE 2013). Their abundances were high in grab samples collected in June near the Rockaway borrow area. However, ocean quahog are not expected to be common within the Harbor.

5 EFH Species Assessment

The following sections describe the potential adverse effects on EFH due to the implementation (construction, operation and maintenance) of the TSP. . Additional model analysis may be completed and included in the Tier 1 Final EIS (and the Final EFH Assessment), as the project becomes more defined. At such time NMFS has determined that USACE has provided sufficient information upon which to issue Conservation Recommendations, USACE will request to initiate formal consultation under MSA.

USACE NYD is committed to implementing best management practices (BMP) designed to avoid and minimize significant adverse impacts to EFH, including the inclusion of seasonal work restrictions, as well as including the beneficial use of dredge material to pursue habitat creation and enhancement opportunities. . .

Compensatory mitigation will be undertaken to replace regulated littoral habitat directly impacted by removal down to the -6'MLLW elevation per the mandate of the CWA and CZMA statutes (see EIS for details). The release on May 7 2021 of NOAAs Draft Mitigation Policy for Trust Resources contains some overall guidance pertaining to mitigation for significant impacts to EFH, with more detailed implementing guidance expected to be provided after the closure of the review period and finalization of the Policy. Mitigation for significant and permanent impacts will be addressed via the appropriate sequential application of mitigation measures of avoidance and minimization being proactively applied, initially. A functional assessment determining the ecological value of habitat to the system will be prepared, per USACE regulations, and in compliance with appropriate statutes, and a compensatory mitigation plan, after the full benefits of the proposed project are evaluated and applied, will be developed at such time sufficient project details and any updated implementing policy, including NOAAs, are available for such determination.

Construction and operation and maintenance operations will implement Best Management Practices, as required by the affected state under their CWA and CZMA jurisdictions as necessary and appropriate.

5.1 Impacts Assessment

The direct, indirect, and cumulative impacts of construction and operations and maintenance associated with the TSP to EFH is discussed in this section. The Regions expected to receive the greatest impact under the TSP are JB and the Upper Bay/Arthur Kill Regions. These Regions are expected to be impacted the most because of in-water construction of the storm-surge barrier and tide gates, and those measures that may adversely affect EFH, such as the elevated promenade, buried seawall/dune, and floodwalls. Impacts associated with each measure vary by species and according to the extent of the measure in each Region.

The potential direct impacts to EFH associated with the proposed measures under the TSP is limited primarily to demersal fish species. Migratory finfish could experience short-term, temporary impacts including alteration of migration pathways during construction associated with noise, vibration, and physical disturbance. Migratory species will actively avoid most in-water work areas and move to appropriate nearby habitat. This avoidance behavior would occur only in those areas where construction and operations and maintenance is underway.

5.1.1 Upper Bay/Arthur Kill and Lower Hudson/East River Regions

The Upper Bay/Arthur Kill and Lower Hudson/East River Regions have identified EFH for many similar species, therefore, the two Regions are discussed together.

5.1.1.1 Construction Impacts

Direct

EFH-designated species that are expected to be impacted the most by construction of the TSP within the Upper Bay/Arthur Kill and Lower Hudson/East River Regions are Atlantic butterfish, winter flounder, summer flounder, windowpane flounder, clearnose skate, winter skate, little skate, and red hake. These are primarily demersal species found in bottom-water and benthic habitat that will be temporarily altered and disturbed during construction of the SSBs and tide gates in the Upper Bay/Arthur Kill Region. Impacts to bottom habitat include physical disturbance of benthic substrate and suspended sediment plumes or turbidity. Project-related changes are not expected to significantly change the natural variability in water quality parameters during construction and, therefore, would not have long-term impacts. Construction of shore-based measures including the elevated promenade, floodwalls, and seawalls may result in temporary impacts to the benthic environment, such as disturbances to benthic habitat and sediment plumes, depending on proximity to the water. Species that are found in the Study Area tend to be highly adaptable or are itinerant species that move through the area on a seasonal basis. BMPs will be used to reduce impacts to EFH habitat. Most species are expected to avoid most active in-water work zones and move to appropriate nearby habitat, then return to the area after construction is completed.

EFH for Atlantic butterfish larvae, a pelagic species, has been identified in both the Upper Bay/Arthur Kill and Lower Hudson/East River Regions. Construction impacts to Atlantic butterfish larvae are expected to be limited to in-water construction of the SSB and tide gates. Impacts to larvae would primarily be associated with turbidity plumes that may temporarily reduce dissolved oxygen. Fish larvae will not be able to actively avoid construction zones.

Similar impacts are expected to red hake, which has EFH designated for all life stages (egg, larvae, juvenile, and adult) in the two Regions. Red hake eggs and larvae are pelagic, but juveniles and adults are demersal. Eggs and larvae are uncommon in the Study Area and spawning takes place offshore. Red hake juveniles and adults are expected to be impacted by bottom-habitat disturbances and benthic habitat conversion to hard-bottom during structure installation. Impacts are expected to be temporary because individuals will move to other nearby habitat.

Winter flounder and summer flounder EFH for larvae, juvenile, and adult life stages, and windowpane flounder egg, larvae, juvenile, and adult life stages, is also present in the two Planning Regions. These three species of flounder are demersal and expected to be impacted from construction of the SSBs and tide gates during substrate disturbances and potential sediment plumes to are generated from installation activities. Direct permanent impacts from foundation installation and structure installation are expected when estuarine habitat benthic habitat is replaced with hard-bottom habitat. Impacts to these species are expected to be temporary, and fish are anticipated to return to the area after construction is completed.

Three species of skate (clearnose skate, winter skate, and little skate) have juvenile and adult EFH identified in the Upper Bay/Arthur Kill and Lower Hudson/East River Regions. Skate species were rare or uncommon during the winter in bottom trawl sampling in the Harbor (USACE 2013), but present in higher numbers during the spring and fall, and sometimes summer (Burlas et al. 2001; Able et al. 2010; USACE 2013; USACE 2015b). During their peak abundances, these species were most common outside the Harbor in the Rockaway Borrow Area and south shore of Long Island. The three species of skate are not expected to be impacted by construction during the winter months due to their low abundances during the winter. Impacts to skate species depend upon seasonal abundances, and impacts are expected to be similar as those for flounder. Impacts will be primarily associated with construction of the SSB and tide gate measures that would cause physical disturbance to bottom-habitat utilized by each species.

While most mobile juvenile and adult fish species will be able to actively avoid construction areas, mortality or injury to slow or immobile fish species, invertebrates, and demersal eggs could occur, but impacts would be localized and likely limited to individuals. The longfin inshore squid is an invertebrate EFH-designated species with egg, juvenile, and adult life stages identified within the Upper Bay/Arthur Kill Region. This species could be impacted by vessel strikes or entrainment during construction of the SSBs. However, impacts are expected to be localized and affect only a small portion of available EFH for the species.

Bluefish is a migratory EFH-designated species found within the Upper Bay/Arthur Kill and Lower Hudson/East River Regions. EFH for bluefish juveniles and adults has been identified in the two Regions. Migratory finfish could experience short-term, temporary impacts during construction of in-water structures including alteration of migration pathways during construction associated with noise, vibration, and physical habitat disturbance. Temporary in-water noise level impacts would occur during foundation installation, cofferdam construction, dredging, dewatering, and excavation and fill activities. Migratory species will actively avoid most in-water work areas and move to appropriate nearby habitat. This avoidance behavior would occur only in those areas where construction is underway.

Indirect

EFH-designated species that are expected to be indirectly impacted the most by construction of the TSP within the Upper Bay/Arthur Kill and Lower Hudson/East River Regions are demersal species such as Atlantic butterfish, winter flounder, summer flounder, windowpane flounder, clearnose skate, winter skate, little skate, and red hake. These species are found in bottom-water and benthic habitat that will be temporarily altered and disturbed during construction of the SSBs and tide gates in the Upper Bay/Arthur Kill Region. Indirect impacts from construction activities would include bottom habitat disturbance and the potential loss of forage organisms in the immediate vicinity of the placement of new structures or bottom disturbance.

Indirect impacts to fish species may occur from the effects of construction activities on benthic communities, including forage species displacement, temporary loss of forage species habitat and/or temporary loss of forage species individuals. Based on previous studies, the re-establishment of benthic communities varies between six months to a year after the project's completion depending on substrate type (USACE 2007c, Wilber and Clarke 2007). Thus, no long-term indirect impacts are expected on benthic communities due to construction and the overall area that would be impacted is a small percentage of the habitat that is available. Fish species will be able to forage in adjacent areas.

Temporary in-water impacts from sediment transport during construction include physical seabed disturbances, such as foundation installation, dredging, dewatering, and excavation and fill activities. With the exception of levees, which have no impact because they are set back from the shoreline, the installation of hardened structure along the shoreline may result in increased wave energy, erosion, and sediment transport. These impacts are not anticipated to surpass the impacts produced by a major storm/flood event under the No Action Alternative.

EFH for Atlantic butterfish larvae, a pelagic species, has been identified in both the Upper Bay/Arthur Kill and Lower Hudson/East River Regions. Indirect impacts to Atlantic butterfish larvae are expected to be limited to in-water construction of the SSB and tide gates. Impacts to larvae would primarily be associated with turbidity plumes that may temporarily reduce dissolved oxygen and limit the number of prey organisms available to larvae.

Similar impacts are expected to red hake, which has EFH designated for all life stages (egg, larvae, juvenile, and adult) in the two Regions. Red hake eggs and larvae are pelagic, but juveniles and adults are demersal. Eggs and larvae are uncommon in the Study Area and spawning tends to occur offshore. Red hake juveniles and adults are expected to be impacted by bottom-habitat disturbances which displace prey and forage species habitat. Impacts are expected to be temporary because individuals will forage in nearby habitat.

Winter flounder and summer flounder EFH for larvae, juvenile, and adult life stages, and windowpane flounder egg, larvae, juvenile, and adult life stages, is also present in the two Planning Regions. These three species of flounder are demersal and expected to be impacted from construction of the SSBs and tide gates which may displace prey and impact forage species' habitat, similar to the indirect impacts described above for other species. Impacts to all life stages are expected to be temporary. Mobile life stages are expected to return to the area after construction is completed.

Three species of skate (clearnose skate, winter skate, and little skate) have juvenile and adult EFH identified in the Upper Bay/Arthur Kill and Lower Hudson/East River Regions. Skate species were rare or uncommon during the winter (USACE 2013), and indirect impacts depend upon seasonal abundances. Indirect impact factors to skate are expected to be the same as flounder, described above.

The longfin inshore squid is an invertebrate EFH-designated species with egg, juvenile, and adult life stages identified within the Upper Bay/Arthur Kill Region. Indirect impacts are expected to be localized and occur primarily from construction of the SSBs, which are in-water measures. Similar to other species, indirect impacts are associated with reduced food availability.

Bluefish is a migratory EFH-designated species found within the Upper Bay/Arthur Kill and Lower Hudson/East River Regions. Migratory finfish are not expected to experience significant indirect impacts during construction of in-water structures because they will actively move to appropriate nearby foraging habitat. This avoidance behavior would occur only in those areas where construction is underway.

Cumulative

The NY/NJ Harbor is densely populated and heavily industrialized and the potential for a variety of ongoing and future activities to cumulatively affect EFH-managed species does exist. Other permitted and pending projects located within the Study Area have been authorized by permits issued under the USACE's Permits Program for the Clean Water Act Section 404 and Section 10 of the Rivers and Harbors Act of 1899. Some of these applicants have already completed some dredging; others have not begun or scheduled the work. Some examples of dredging projects in the NY/NJ Harbor include the Harbor Deepening Project, East Rockaway Inlet maintenance, and maintenance of several other USACE navigation channel maintenance projects in the Harbor (USACE 2022). Other than the Port Authority and USACE projects, the permitted and pending work typically represents maintenance around pier areas and includes dredging, pier rehabilitation, and pier maintenance, rehabilitation of wave breaks, bridge abutment rehabilitation, and wharf reinforcements. Numerous sand and aggregate borrow areas also lie off the coasts of NJ and NY. These areas are dredged periodically and used for beach nourishment and coastal storm risk reduction. Some examples of other coastal storm risk management projects include the Passaic River Tidal Protection Area, the Sea Bright to Manasquan Project, and the East Rockaway Inlet to Rockaway Inlet.

In addition to dredging, beach nourishment, and navigation projects, several other in-water and restoration projects exist in the region. For example, the HR Estuary Program includes the development of a habitat restoration plan and provides funding and planning assistance for restoration projects (USACE 2020a). Restoration efforts include the improvement of water quality and wetlands, as well as bird, shellfish, and other sensitive species habitat in the Port District of NY and NJ (USACE 2020a). Additional restoration projects in the region include the NY Rising Community Reconstruction Program, implemented in 2013 with over 3,000 projects across the state addressing critical infrastructure, drainage improvements, and shoreline protection (USACE 2020b). Environmental mitigation and restoration related to the Tappan Zee Bridge replacement project on the HR include wetland restoration and management, oyster restoration, and stormwater treatment construction projects (USACE 2020b). In addition, the NYCDEP is undertaking large infrastructure improvement projects at several of its wastewater treatment facilities including at Wards Island in Manhattan and Coney Island in southern Brooklyn. The cumulative impact of these projects in improving overall water quality in the Harbor should represent a net benefit but would need to be evaluated in more detail and for specific waterbodies in coordination with the appropriate federal, state, and local agencies.

Short-term cumulative impacts are related to Project activities and in-water construction associated with other permitted projects that are ongoing concurrently within the Harbor area. These short-term cumulative impacts to EFH would be a combination of disturbances associated with each project. Impacts to EFH would be the combined effect on EFH related to temporary effects on water quality, such as increased turbidity, and temporary loss of benthic communities in the various study areas. Impacts related to construction would be minimized as practicable using BMPs, such as soil erosion controls and construction windows.

5.1.1.2 Operations and Maintenance Impacts

<u>Direct</u>

EFH-designated species that are expected to be impacted by operation and maintenance of the TSP within the Upper Bay/Arthur Kill Region are Atlantic butterfish, black sea bass, winter flounder, summer flounder, clearnose skate, winter skate, little skate, and red hake. These are primarily demersal species found in bottom-water and benthic habitat that will be temporarily disturbed during operation and maintenance of the SSBs and tide gates in the Upper Bay/Arthur Kill Region. These species are expected to avoid the SSB when it is closed and move to appropriate nearby habitat, then return when the barrier is opened. Barrier closure is only expected during a 100-year storm or flood event. Fish are expected to avoid active in-water work zones while maintenance is taking place. Similarly, during maintenance of specific shore-based measures that are located along the shoreline (elevated promenade and berms), impacts depend upon the extent of the measure. BMPs will be used to reduce impacts to EFH habitat. Most species are expected to avoid most active in-water work zones and move to appropriate nearby habitat, then return to the area after construction is completed.

The longfin inshore squid is an invertebrate EFH-designated species with egg, juvenile, and adult life stages identified within the Upper Bay/Arthur Kill Region. This species could be impacted by vessel strikes or entrainment during construction of the SSBs. However, impacts are expected to be localized.

EFH for Atlantic butterfish larvae, a pelagic life stage, has been identified in the Upper/Bay Arthur Kill and Lower Hudson/East River Regions. Impacts to Atlantic butterfish larvae are expected to be limited to in-water maintenance of the SSB and tide gates. Impacts to larvae would primarily be associated with turbidity plumes that may temporarily reduce dissolved oxygen during maintenance activities. Fish larvae will not be able to actively avoid construction zones, however, maintenance activities occur “as-needed” and will not be ongoing.

Similar impacts are expected to red hake, which has EFH designated for all life stages (egg, larvae, juvenile, and adult) in the two Regions. Red hake eggs and larvae are pelagic and spawning occurs offshore, outside the Study Area. Red hake juveniles and adults are demersal and expected to be impacted by bottom-habitat disturbances caused by operations and maintenance, which would be uncommon occurrences. Individuals are expected to avoid barriers when they are deployed.

Winter flounder and summer flounder EFH for larvae, juvenile, and adult life stages, and windowpane flounder egg, larvae, juvenile, and adult life stages, is present in the two Planning Regions. These demersal species are expected to be impacted by in-water maintenance of the SSBs and tide gates, when/if substrate disturbances and potential sediment plumes are generated. Impacts may also occur during maintenance of certain shore-based measures that are located along the shoreline, such as the elevated promenade, which may cause noise or runoff that disrupts aquatic habitat. Impacts are expected to be temporary, and fish are expected to return to the area after maintenance is completed.

Three species of skate (clearnose skate, winter skate, and little skate) have juvenile and adult EFH identified in the Upper Bay/Arthur Kill and Lower Hudson/East River Regions. As discussed for construction in Section 6.1.1.1.1, the three species of skate are not expected to be impacted by maintenance during the winter months due to their low abundances during the winter. Impacts to skate species during operations and maintenance depend upon seasonal abundances, and impacts will be similar to those for flounder.

Bluefish is a migratory EFH-designated species found within the Upper Bay/Arthur Kill and Lower Hudson/East River Regions. EFH for bluefish juveniles and adults has been identified in the two Regions. Migratory finfish could experience short-term impacts during operations and maintenance of in-water structures, including alteration of migration pathways caused by noise, vibration, and physical habitat disturbances. Migratory species will actively avoid most in-water work areas and move to appropriate nearby habitat, and this avoidance behavior is only expected when maintenance activities are underway or the barriers are deployed: as described above, both are uncommon occurrences. Therefore, impacts to bluefish from operation and maintenance of the TSP are not expected to be significant.

Indirect

EFH-designated species that are expected to be indirectly impacted the most by operation and maintenance of the TSP within the Upper Bay/Arthur Kill Region are demersal species such as demersal species such as Atlantic butterfish, winter flounder, summer flounder, windowpane flounder, clearnose skate, winter skate, little skate, and red hake. These species are found in bottom-water benthic habitat that will be temporarily disturbed during operation and maintenance of the SSBs and tide gates in the Upper Bay/Arthur Kill Region. Indirect impacts during barrier closure include temporary disturbance of forage species' habitat and displacement of benthic prey.

Extreme storm and high tide events would trigger the gate closures, causing shifts in water quality and flow rates. During these closures, tidal fluxes in water would cease for a period of time, potentially reducing water quality and dissolved oxygen (DO), while increasing the number of harmful nutrients in the water. The changes in water quality, DO, and nutrients could have compound and/or cumulative interactions, causing increased stress levels to fish populations, which may lead to increased susceptibility to disease or even a mortality event (Tietze 2016; Bachman and Rand 2008). Importantly, the barrier closure is only expected to occur during a 100-year storm or flood, so indirect impacts would be limited to these uncommon events.

Initial AdH modeling conducted by USACE for the TSP found only slight changes to tidal flow (Emerin and McAlpin 2020). Additionally, once the measures are constructed, they will protect areas prone to erosion and minimize the loss of EFH due to future storm surges. A net benefit to EFH is anticipated from the TSP.

EFH for Atlantic butterfish larvae, a pelagic species, has been identified in both the Upper Bay/Arthur Kill and Lower Hudson/East River Regions. Indirect impacts to Atlantic butterfish larvae are expected to be limited to in-water operations and maintenance of the SSB and tide gates. Impacts to larvae would primarily be associated with turbidity plumes that may temporarily reduce dissolved oxygen and limit the number of prey items available to larvae.

EFH designated habitat for red hake, for all life stages, occurs in the two Regions. Red hake eggs and larvae are pelagic, but juveniles and adults are demersal. Eggs and larvae are uncommon in the Study Area. Red hake juveniles and adults are expected to be impacted by bottom-habitat disturbances during operations and maintenance of the SSBs, which would displace prey and disrupt forage species habitat. Impacts are expected to be temporary and individuals will seek other nearby foraging habitat.

Winter flounder and summer flounder EFH for larvae, juvenile, and adult life stages, and windowpane flounder egg, larvae, juvenile, and adult life stages, is also present in the two Planning Regions. These three species of flounder are demersal and expected to be impacted from operations and maintenance of the SSBs and tide gates, which may displace prey and impact forage species' habitat, as described above for other demersal species. Impacts to all life stages of EFH-designate flounder species that occur in the two Regions is expected to be temporary. Mobile life stages are expected to return to the area after construction is completed.

Three species of skate (clearnose skate, winter skate, and little skate) have juvenile and adult EFH identified in the Upper Bay/Arthur Kill and Lower Hudson/East River Regions. Skate species were rare or uncommon during the winter (USACE 2013), and indirect impacts to skate species are expected, depending upon seasonal abundances. Indirect impact factors are anticipated to be the same as for flounder, as described above.

The longfin inshore squid is an invertebrate EFH-designated species with egg, juvenile, and adult life stages identified within the Upper Bay/Arthur Kill Region. Indirect impacts are expected to be localized, occurring during operations and maintenance of the SSBs. Indirect impacts include reduced food availability.

Bluefish is a migratory EFH-designated species found within the Upper Bay/Arthur Kill and Lower Hudson/East River Regions. Migratory finfish are not expected to experience significant indirect impacts during construction of in-water structures because they will actively move to appropriate nearby foraging habitat. This avoidance behavior would occur only in those areas where construction is underway. Modeling of the potential impacts to migratory patterns as a result of SSBs and other structures may occur as the project becomes more defined and would be included in subsequent NEPA assessments for specific alternatives.

Cumulative

Human activities in the Study Area causing pollution are reasonably certain to continue in the future, as are impacts of pollution on fish and EFH. However, the magnitude of these impacts cannot be projected. Sources of contamination in the Study Area includes atmospheric loading of pollutants, stormwater runoff from coastal development, groundwater discharges, and industrial and residential development.

Long-term cumulative impacts from other construction projects in the Study Area would be limited to localized changes in water column depth, bathymetric contours, hydrodynamics, and sedimentation rates, such as those potential impacts associated with the operation and maintenance of the existing or proposed deepened channels, any deepening or operations and maintenance proposed by private entities, and the berth deepening being proposed by the Port Authority of NY and NJ, as well as sand borrow and beach nourishment activities and other restoration projects ongoing or planned for the region. However, cumulative restoration activities related to habitat improvement or coastal storm risk management are expected to generate cumulative benefits to the Study Area by reducing water quality impacts from potential flooding and improve quality of habitats and wetlands.

Chemical contamination may have effects on the reproduction and survival of EFH-designated species. The extent of these effects is dependent upon the type of contaminant and the chemical concentration in ESA-listed species habitat. Excessive turbidity due to coastal development and/or construction sites could have similar impacts on EFH as those described for turbidity in this Tier 1 Assessment.

5.1.2 Jamaica Bay Region

5.1.2.1 Construction Impacts

Direct

EFH-designated species that are expected to be impacted the most by construction of the TSP within the JB Region are winter flounder, summer flounder, windowpane flounder, yellowtail flounder, clearnose skate, little skate, winter skate, monkfish, Atlantic butterfish, black sea bass, scup, red hake. These are primarily demersal species that rely upon benthic habitat which will be temporarily altered and disrupted during construction of the SSB and tide gate. Impacts to bottom habitat include habitat conversion, suspended sediment plumes, and turbidity that may reduce dissolved oxygen. BMPs will be used to reduce impacts to EFH habitat. These species are expected to avoid most active in-water work zones and move to appropriate nearby habitat, then return after conditions improve following the construction. Construction of the elevated promenade, dunes, seawalls, and berms will take place along the shoreline in the JB region; however, fish are expected to avoid the construction zone and return when completed.

EFH for Atlantic butterfish larvae, juvenile, and adult life stages has been identified in the JB Region. Atlantic butterfish is a pelagic species and construction impacts are expected to be limited to in-water construction of the SSB and tide gates. Impacts to larvae would primarily be associated with turbidity plumes that may temporarily reduce dissolved oxygen. Fish larvae will not be able to actively avoid construction zones and impacts depend upon the extent of construction activities. Most juveniles and adults can avoid active construction zones.

Similar impacts are expected to red hake, which has EFH designated for all life stages (egg, larvae, juvenile, and adult) in the Region. Red hake eggs and larvae are pelagic, however juveniles and adults are demersal. Eggs and larvae are uncommon in the Study Area and spawning tends to occur offshore. Red hake juveniles and adults are expected to be impacted by bottom-habitat disturbances and benthic habitat conversion to hard-bottom during structure installation. Impacts are expected to be temporary.

Winter flounder, summer flounder, and windowpane flounder have EFH for larvae, juvenile, and adult, life stages in JB, and yellowtail flounder juvenile EFH is also present in the Region. These four species of flounder are demersal and expected to be impacted from construction of the SSBs and tide gates, when bottom habitat becomes disturbed and sediment plumes occur. Direct permanent impacts from foundation installation and structure installation are expected when estuarine habitat benthic habitat is replaced with hard-bottom habitat. Impacts to these species are expected to be temporary, and fish are expected to return to the area after construction is completed.

Three species of skate (clearnose skate, winter skate, and little skate) have juvenile and adult EFH identified in the JB Region. Skate species were rare or uncommon during the winter in bottom trawl sampling in the Harbor (USACE 2013), but present in higher numbers during the spring and fall, and sometimes summer (Burlas et al. 2001; Able et al. 2010; USACE 2013; USACE 2015b). During their peak abundances, these species were most common outside the Harbor in the Rockaway Borrow Area and south shore of Long Island. Impacts to skate species depend upon their abundances throughout the year, and impacts are expected to be similar as those for flounder.

Monkfish is a commercially important species that could be impacted by construction within JB. EFH for monkfish eggs and larvae occurs in JB which could potentially be impacted by construction of the SSB and tide gate. However, impacts to eggs and larvae are expected to be localized and in-water construction activities account for only a small portion of the planned measures in the JB Region. Similarly, EFH for silver hake eggs and larvae occurs within JB, and impacts are expected to be localized.

EFH is designated for black sea bass (adult) and scup (all life stages) in the JB Region. Each species is demersal, and black sea bass is a structure-oriented species. Similar impacts from in-water construction are expected as described for other demersal species. These species are expected to return to the area when construction is completed.

The ocean quahog and longfin inshore squid are two commercially important invertebrate species that could be impacted by construction of the SSB and tide gate in the JB Region. Longfin inshore squid EFH for eggs is present within the Region and would be impacted directly by bottom-habitat conversion, as would the ocean quahog due to slow movement. These impacts are expected to be localized, however, only effecting a small portion of available EFH in JB.

Bluefish and Atlantic herring are migratory species that could experience short-term, temporary impacts during construction of in-water structures, such as alteration of migration pathways associated with noise, vibration, and physical disturbance. EFH has been identified for adult and juvenile life stages of bluefish, and larvae, juvenile, and adult life stages of Atlantic herring. Juveniles and adults of these species are expected to avoid in-water construction, including any noise generated by the shore-based construction measures. This avoidance behavior would occur only in those areas where construction is underway. Atlantic mackerel is a pelagic species with juvenile and adult EFH within the JB Planning Region, however, the species is not expected to be common.

Sand tiger shark, sandbar shark, and smoothhound shark complex (Atlantic stock) are EFH-designated species within the JB Planning Region, however, these species primarily occur offshore along the Mid-Atlantic Bight and are not expected to be present in JB. Any individuals in the area are expected to avoid the construction zones.

Indirect

EFH-designated species that are expected to be indirectly impacted the most by construction of the TSP within the JB Region are winter flounder, summer flounder, windowpane flounder, yellowtail flounder, clearnose skate, little skate, winter skate, monkfish, Atlantic butterfish, black sea bass, scup, and red hake. As described above, these are demersal species that rely heavily upon benthic habitat which will be temporarily altered and disrupted during construction of the SSB and tide gate. Indirect impacts would include bottom habitat disturbances and the potential loss of forage organisms in the immediate vicinity of the placement of new structures or bottom disturbance. Impacts to fish species may occur due to forage species displacement, temporary loss of forage species habitat and/or temporary loss of forage species individuals, as described in Section 5.1.

EFH for Atlantic butterfish larvae, juvenile, and adult life stages has been identified in the JB Region. Atlantic butterfish is a pelagic species and indirect impacts are expected to be limited to in-water construction of the SSB and tide gates. Impacts to larvae would primarily be associated with turbidity plumes that may displace prey such as zooplankton. Indirect impacts to fish larvae are expected to occur since larvae cannot actively avoid construction zones in search of prey. Juveniles and adults are anticipated to seek other nearby foraging habitat.

Similar impacts are expected to red hake, which has EFH designated for all life stages (egg, larvae, juvenile, and adult) in the Region. Red hake eggs and larvae are pelagic and uncommon in the Study Area. Red hake juveniles and adults are demersal and expected to be impacted by bottom-habitat disturbances and displacement of forage species, but individuals are expected to seek other nearby foraging habitat.

Winter flounder, summer flounder, and windowpane flounder have EFH for larvae, juvenile, and adult, life stages in JB, and yellowtail flounder juvenile EFH is also present in the Region. These four species of flounder are demersal and expected to be indirectly impacted by construction of the SSBs and tide gates, as described above for other species. Indirect impacts include forage species displacement and disturbance of prey species/ habitat, which would occur during foundation installation and structure installation. Impacts to these species are expected to be temporary, and fish are expected to return to the area after construction is completed.

Three species of skate (clearnose skate, winter skate, and little skate) have juvenile and adult EFH identified in the JB Region. Skate species were rare or uncommon during the winter in bottom trawl sampling in the Harbor (USACE 2013). Impacts to skate species will depend upon seasonal abundances. Indirect impacts to skate are expected to be the same as those discussed for flounder.

Monkfish is a commercially important species that could be indirectly impacted by construction within JB. EFH for monkfish eggs and larvae occurs in JB, which could potentially be indirectly impacted by construction of the SSB and tide gate. Impacts to eggs and larvae are expected to be localized, as described for other demersal species in this Section. Similarly, EFH for silver hake eggs and larvae occurs within JB and indirect impacts are expected.

EFH is designated for black sea bass (adult) and scup (all life stages) in the JB Region. Each species is demersal, and black sea bass is a structure-oriented species. Similar indirect impacts from in-water construction are expected as described for other demersal species. These species are expected to return to the area when construction is completed.

The ocean quahog and longfin inshore squid are two commercially important invertebrate species that could be indirectly impacted by water quality changes during construction of the SSB and tide gate in the JB Region. Longfin inshore squid EFH for eggs is present within the Region and would be impacted by bottom-habitat conversion. These impacts are expected to affect only a small portion of available EFH in JB.

Bluefish and Atlantic herring are migratory species that are not expected to experience significant indirect impacts from construction. These species are expected to avoid construction and seek nearby foraging habitat, as necessary. Atlantic mackerel is a pelagic species with juvenile and adult EFH within the JB Planning Region, however, the species is not expected to be common.

Sand tiger shark, sandbar shark, and smoothhound shark complex (Atlantic stock) are EFH-designated species within the JB Planning Region, however, these species primarily occur off-shore along the Mid-Atlantic Bight and are not expected to be present in JB. Any individuals in the area are expected to avoid the construction zones.

One potential benefit of the construction of in-water measures is the attraction of structure-oriented invertebrates. The foundation and structure installations can produce the artificial “reef effect,” attracting numerous species of algae, shellfish, and other invertebrates.

Cumulative

The NY/NJ Harbor is densely populated and heavily industrialized, so the potential for a variety of ongoing and future activities to cumulatively affect EFH-managed species does exist. Other permitted and pending projects located within the Study Area have been authorized by permits issued under the USACE’s Permits Program for the Clean Water Act Section 404 and Section 10 of the Rivers and Harbors Act of 1899. Some of these applicants have already completed some dredging; others have not begun or scheduled the work. One example is the JB Federal Navigation Channel maintenance (USACE 2022). Numerous sand and aggregate borrow areas also lie off the coasts of NJ and NY. These areas are dredged periodically and used for beach nourishment and coastal storm risk reduction. Examples of other coastal storm risk management projects include the East Rockaway Inlet to Rockaway Inlet and JB project. The cumulative impact of these projects in improving overall water quality in the Harbor should represent a net benefit but may be further evaluated in more detail and for specific waterbodies as the project measures become more defined.

Short-term cumulative impacts are related to Project activities and in-water construction associated with other permitted projects that are ongoing concurrently within the Harbor area. These short-term cumulative impacts to EFH would be a combination of disturbances associated with each project. Impacts to EFH would be the combined effect on EFH related to temporary effects on water quality, such as increased turbidity, and temporary loss of benthic communities in the various study areas. Impacts related to construction would be minimized as practicable using BMPs, such as soil erosion controls and construction windows.

5.1.2.2 Operations and Maintenance Impacts

Direct

EFH-designated species that are expected to be impacted the most by operation and maintenance of the in-water measures associated with the TSP within the JB Region are winter flounder, summer flounder, windowpane flounder, yellowtail flounder, clearnose skate, little skate, winter skate, monkfish, Atlantic butterfish, black sea bass, scup, red hake, as described in Section 6.1.2.1. The elevated promenade, seawalls, and dunes are located along the shoreline in the JB region and fish are expected to avoid these locations while maintenance is taking place. No impacts are expected from operation and maintenance of the other shore-based measures.

EFH for Atlantic butterfish larvae, juvenile, and adult life stages has been identified in both the Upper Bay/Arthur Kill and Lower Hudson/East River Regions. Atlantic butterfish is a pelagic species and impacts are expected to be limited to in-water maintenance of the SSB and tide gates. Impacts to larvae would primarily be associated with turbidity plumes generated during operations and maintenance which could temporarily reduce dissolved oxygen. Fish larvae will not be able to actively avoid plumes. Juveniles and adults are expected to avoid active in-water work zones.

Similar impacts are expected to red hake, which has EFH designated for all life stages (egg, larvae, juvenile, and adult) in the Region. Red hake eggs and larvae are pelagic and expected to occur outside the Study Area, however, juveniles and adults are demersal and occur within the Study Area. Red hake juveniles and adults are expected to be impacted by bottom-habitat disturbances during operations of these measures, but individuals are expected to avoid active work zones.

Winter flounder, summer flounder, and windowpane flounder have EFH for larvae, juvenile, and adult, life stages, in JB, and yellowtail flounder juvenile EFH is also present in the Region. These four species of flounder are demersal and expected to be impacted from operations and maintenance of the SSBs and tide gates, when/if bottom habitat becomes disturbed and sediment plumes occur. Direct impacts may also occur during maintenance of the elevated promenade and seawalls. Impacts to these species are expected to be temporary, since operations of the in-water measures is only expected to occur during 100-year storm events and maintenance will be conducted on an “as-needed” basis.

Three species of skate (clearnose skate, winter skate, and little skate) have juvenile and adult EFH identified in the JB Region. As previously discussed, skate species were rare or uncommon during the winter (USACE 2013), and impacts are expected to be limited to seasonal fluctuations in abundance. Impacts to skate are expected to be similar to those described for flounder.

Monkfish is a commercially important species that could be impacted by operations and maintenance of the TSP within JB. EFH for monkfish eggs and larvae occurs in JB and those life stages may be impacted by operations and maintenance of the SSBs during bottom habitat disturbances and re-suspension of sediments. Impacts to eggs and larvae are expected to be localized in the JB Region. Similarly, EFH for silver hake eggs and larvae occurs within JB, but impacts are expected to be localized.

EFH is designated for black sea bass (adult) and scup (all life stages) in the JB Region. Each species is demersal, and black sea bass is a structure-oriented species. Similar impacts from in-water operations and maintenance are expected as described for other demersal species. These species are expected to return to the area when construction is completed.

The ocean quahog and longfin inshore squid are two commercially important invertebrate species that could be impacted by operations and maintenance of the SSB and tide gate in the JB Region. EFH is designated for longfin inshore squid eggs within the Region and would be impacted directly by bottom-habitat disturbances, as would the ocean quahog due to the species’ slow movements. These impacts are expected to be localized, however, only affecting a small portion of available EFH in JB.

Bluefish and Atlantic herring are migratory species that could experience short-term impacts during operations and maintenance of the SSBs and tide gates. EFH has been identified for adult and juvenile life stages of bluefish, and larvae, juvenile, and adult life stages of Atlantic herring. Impacts may include minor alteration of migration pathways associated with noise and physical disturbances. Impacts to each species are not expected to be significant due to the infrequency of maintenance activities and because each species is anticipated to avoid in-water activities. Atlantic mackerel is a pelagic species with juvenile and adult EFH within the JB Planning Region, however, the species is not expected to be common in the Study Area.

Sand tiger shark, sandbar shark, and smoothhound shark complex (Atlantic stock) are EFH-designated species within the JB Planning Region, however, these species primarily occur off-shore along the Mid-Atlantic Bight and are not expected to be present in JB. Any individuals in the area are expected to avoid active work zones, including closed SSBs, and no impacts are expected to any shark species.

The introduction of new hard-bottom habitat may have the beneficial effect of localized increase in habitat and species diversity. For example, species such as black sea bass often associate with hard-bottom or structured habitats. The total area of habitat conversion from soft to hard-bottom habitat, as well as total benthic impact area, may be calculated during future analyses.

Indirect

EFH-designated species that are expected to be indirectly impacted by operation and maintenance of the TSP within the JB Region are winter flounder, summer flounder, windowpane flounder, yellowtail flounder, clearnose skate, little skate, winter skate, monkfish, Atlantic butterfish, black sea bass, scup, red hake. These are demersal species that rely heavily upon benthic habitat which will be temporarily disrupted during operation and maintenance of the SSB and tide gate. Indirect impacts during barrier closure include temporary changes to water quality and the potential loss of forage organisms in the immediate vicinity of the barrier closure and maintenance activities. Indirect impacts to these fish species may occur due to forage species displacement, temporary loss of forage species habitat and/or temporary loss of forage species individuals. These indirect impacts are described for each species above in Section 6.1.2.1.2.

Initial AdH modeling conducted by USACE for the TSP found only slight changes to tidal flow (Emerin and McAlpin 2020). Additionally, once the measures are constructed, they will protect areas prone to erosion and minimize the loss of EFH habitat due to future storm surges. A net benefit to EFH is anticipated from the TSP.

Cumulative

Human activities in the Study Area causing pollution are reasonably certain to continue in the future, as are the impacts of pollution on fish and EFH. However, the magnitude of these impacts cannot be projected. Sources of contamination in the Study Area includes atmospheric loading of pollutants, stormwater runoff from coastal development, groundwater discharges, and industrial and residential development.

Long-term cumulative impacts from other construction projects in the Study Area would be limited to localized changes in water column depth, bathymetric contours, hydrodynamics, and sedimentation rates, such as those potential impacts associated with the operation and maintenance of the existing or proposed deepened channels, any deepening or operations and maintenance proposed by private entities, and the berth deepening being proposed by the Port Authority of NY and NJ, as well as sand borrow and beach nourishment activities and other restoration projects ongoing or planned for the region. However, cumulative restoration activities related to habitat improvement or coastal storm risk management are expected to generate cumulative benefits to the Study Area by reducing water quality impacts from potential flooding and improve quality of habitats and wetlands.

Chemical contamination may have effects on the reproduction and survival of EFH-designated species. The extent of these effects is dependent upon the type of contaminant and the chemical concentration in ESA-listed species habitat. Excessive turbidity due to coastal development and/or construction sites could have similar impacts on EFH as those described for turbidity on this project.

5.1.3 Hackensack/Passaic Region

5.1.3.1 Construction Impacts

Direct

EFH-designated species that are expected to be impacted by construction of the TSP within the Hackensack/Passaic Region are winter flounder, summer flounder, windowpane flounder, clearnose skate, winter skate, little skate, Atlantic butterfish, and red hake. These demersal species rely upon benthic habitat and are expected to experience minor impacts during construction of the shore-based measures planned in the Region. No in-water measures are planned. Construction of shore-based measures such as the floodwalls and berms may result in temporary impacts to the aquatic environment, depending on proximity to the water. Species are expected to avoid noise generated by construction of the shore-based measures such as floodwalls, berms and bulkheads.

Winter flounder and windowpane flounder (all life stages), and summer flounder (larvae, juvenile, and adult) have designated EFH in the Hackensack/Passaic Region. These three species of flounder are demersal and expected to be experience impacts during construction of the floodwalls along the shoreline. Impacts to these species are expected to occur primarily from sediment plumes caused by runoff and temporary disturbances of benthic habitat along the shoreline.

Three species of skate (clearnose skate, winter skate, and little skate) have juvenile and adult EFH identified in the Hackensack/Passaic Region. Skate species were rare or uncommon during the winter in bottom trawl sampling in the Harbor (USACE 2013), but present in higher numbers during the spring and fall, and sometimes summer (Burlas et al. 2001; Able et al. 2010; USACE 2013; USACE 2015b). During their peak abundances, these species were most common outside the Harbor in the Rockaway Borrow Area and south shore of Long Island. Impacts to skate species depend upon seasonal abundance, and impacts are expected to be similar as those for flounder.

EFH for Atlantic butterfish larvae has been identified in Hackensack/Passaic Region. Atlantic butterfish larvae are pelagic and not anticipated to be impacted by shore-based construction.

Impacts to red hake EFH (egg, larvae, juvenile, and adult) are expected in the Region. Red hake eggs and larvae are pelagic and uncommon in the Study Area. Red hake juveniles and adults are demersal and expected to be impacted by bottom-habitat disturbances during structure installation along the shoreline.

Longfin inshore squid EFH for eggs is present within the Region. Impacts to eggs would occur from bottom-habitat conversion during the construction of shore-based measures. These impacts are expected to be localized.

Bluefish and Atlantic herring are migratory species that are expected to avoid noise and vibration generated by construction. This avoidance behavior would occur only in those areas where construction is underway. Both species are expected to experience impacts from the shore-based construction within the Region.

<u>Indirect</u>

EFH-designated species that are expected to be indirectly impacted by construction of the TSP within the Hackensack/Passaic Region are winter flounder, summer flounder, windowpane flounder, clearnose skate, winter skate, little skate, Atlantic butterfish, and red hake. These are demersal species that rely upon benthic foraging habitat and are expected to experience indirect impacts from construction of the shore-based measures in the Region under the TSP, such the floodwalls and berms. No in-water measures are planned in the Region that would indirectly impact these species.

Winter flounder and windowpane flounder (all life stages), and summer flounder (larvae, juvenile, and adult) have designated EFH in the Hackensack/Passaic Region. These three species of flounder are demersal and expected to be experience indirect impacts during construction of the floodwalls along the shoreline. Indirect impacts to these species are expected to occur primarily from sediment plumes and temporary disturbances of benthic habitat that displaces prey along the shoreline.

Three species of skate (clearnose skate, winter skate, and little skate) have juvenile and adult EFH identified in the Hackensack/Passaic Region. Indirect impacts to skate species are expected in this Region, depending on seasonal abundances; impacts are expected to be similar to those discussed for flounder.

EFH for Atlantic butterfish larvae has been identified in Hackensack/Passaic Region. Atlantic butterfish larvae are pelagic and not anticipated to be indirectly impacted by shore-based construction.

Impacts to red hake EFH (egg, larvae, juvenile, and adult) are expected in the Region. Red hake eggs and larvae are uncommon and not expected to occur in the Study Area. Red hake juveniles and adults are demersal and may experience minor indirect impacts if prey species become displaced by noise, water quality changes, or habitat disturbance near shore-based construction areas, however, individuals are anticipated to seek other nearby foraging habit.

Longfin inshore squid EFH for eggs is present within the Region, however, no impacts are anticipated from the shore-based construction measures.

Bluefish and Atlantic herring are migratory species that are not anticipated to be indirectly impacted by shore-based construction within the Hackensack/Passaic Region under the TSP. Migratory species are expected to actively avoid construction and pursue other appropriate habitat.

Cumulative

Short-term cumulative impacts are related to Project activities and in-water construction associated with other permitted projects that are ongoing concurrently within the Harbor area. These short-term cumulative impacts to EFH would be a combination of disturbances associated with each project. Impacts to EFH would be the combined effect on EFH related to temporary effects on water quality, such as increased turbidity, and temporary loss of benthic communities in the various study areas. Impacts related to construction would be minimized as practicable using BMPs, such as soil erosion controls and construction windows. Some examples of dredging projects in the NY/NJ Harbor include the Harbor Deepening Project, East Rockaway Inlet maintenance, JB Federal Navigation Channel maintenance, and maintenance of several other USACE navigation channel maintenance projects in the Harbor (USACE 2022). Other than the Port Authority and USACE projects, the permitted and pending work typically represents maintenance around pier areas and includes dredging, pier rehabilitation, and pier maintenance, rehabilitation of wave breaks, bridge abutment rehabilitation, and wharf reinforcements. One example of another coastal storm risk management project in the Region includes the Passaic River Tidal Protection Area. The cumulative impact of these projects in improving overall water quality in the Harbor should represent a net benefit but would be further evaluated in more detail and for specific waterbodies as the project measures become more defined.

5.1.3.2 Operations and Maintenance Impacts

Direct

EFH-designated species that are expected to be impacted by operations and maintenance of the TSP within the Hackensack/Passaic Region are winter flounder, summer flounder, windowpane flounder, clearnose skate, winter skate, little skate, Atlantic butterfish, and red hake. These demersal species rely upon benthic habitat and are expected to experience impacts during operations and maintenance of the shore-based measures planned in the Region. No in-water measures are planned. Maintenance of the floodwalls and berms may result in temporary impacts to the aquatic environment, depending on proximity to the water. Species are expected to avoid noise generated by during maintenance activities, as well as disturbances such as re-suspended sediment or minor plumes caused by runoff.

Winter flounder and windowpane flounder (all life stages), and summer flounder (larvae, juvenile, and adult) have designated EFH in the Hackensack/Passaic Region. Impacts to eggs and larvae during maintenance of the floodwalls and berms along the shoreline are expected, while impacts to juveniles and adults are not anticipated to be significant. Minor impacts from bottom-habitat disturbances and sediment plumes are expected, including noise generated by maintenance activities.

Three species of skate (clearnose skate, winter skate, and little skate) have juvenile and adult EFH identified in the Hackensack/Passaic Region. Skate species were rare or uncommon during the winter (USACE 2013), and impacts are expected to be driven by seasonal abundances of the species. No impacts are expected to skate species during operations and maintenance of the TSP.

EFH for Atlantic butterfish larvae has been identified in Hackensack/Passaic Region. No impacts are expected to Atlantic butterfish larvae, which are pelagic and not anticipated to be significantly impacted by operations and maintenance of the shore-based measures.

Red hake EFH (egg, larvae, juvenile, and adult) is designated in the Region. Eggs and larvae are not expected to be common in the Study Area. Red hake juveniles and adults are not expected to be impacted by shoreline maintenance activities since individuals will avoid active work zones.

EFH for Longfin inshore squid eggs is designated within the Hackensack/Passaic, however, no impacts are anticipated from the infrequent maintenance activities associated with the shore-based measure in the Region.

Bluefish and Atlantic herring are migratory species that are expected to avoid noise and vibration generated by maintenance of the shore-based measures. No impacts are expected to either species in the Region.

Indirect

EFH-designated species that are expected to be indirectly impacted by operations and maintenance of the TSP within the Hackensack/Passaic Region are winter flounder, summer flounder, windowpane flounder, clearnose skate, winter skate, little skate, Atlantic butterfish, and red hake. These are demersal species that rely upon benthic foraging habitat and are expected to experience indirect impacts from operations and maintenance of the shore-based measures in the Region under the TSP, such the floodwalls and berms. No in-water measures are planned in the Region that would indirectly impact these species. Indirect impacts are expected due to forage species displacement and the disruption of forage species' habitat that occurs along the shoreline where floodwalls and berms are located. Indirect impacts to all EFH-designated species within the Hackensack/Passaic Region are similar to those described above, in Section 5.1.3.1.2.

Initial AdH modeling conducted by USACE for the TSP found only slight changes to tidal flow (Emerin and McAlpin 2020). Additionally, once the measures are constructed, they will protect areas prone to erosion and minimize the loss of EFH due to future storm surges. A net benefit to EFH is anticipated from the TSP.

Cumulative

Human activities in the Study Area causing pollution are reasonably certain to continue in the future, as are impacts of pollution on fish and EFH. However, the magnitude of these impacts cannot be projected. Sources of contamination in the Study Area includes atmospheric loading of pollutants, stormwater runoff from coastal development, groundwater discharges, and industrial and residential development.

Chemical contamination may have effects on the reproduction and survival of EFH-designated species. The extent of these effects is dependent upon the type of contaminant and the chemical concentration in ESA-listed species habitat. Excessive turbidity due to coastal development and/or construction sites could have similar impacts on EFH as those described for turbidity on this project.

Long-term cumulative impacts from other construction projects in the Study Area would be limited to localized changes in water column depth, bathymetric contours, hydrodynamics, and sedimentation rates, such as those potential impacts associated with the operation and maintenance of the existing or proposed deepened channels, any deepening or operations and maintenance proposed by private entities, and the berth deepening being proposed by the Port Authority of NY and NJ, as well as sand borrow and beach nourishment activities and other restoration projects ongoing or planned for the region. However, cumulative restoration activities related to habitat improvement or coastal storm risk management are expected to generate cumulative benefits to the Study Area by reducing water quality impacts from potential flooding and improve quality of habitats and wetlands.

5.1.4 Long Island Sound Region

5.1.4.1 Construction Impacts

Direct

EFH-designated species within the Long Island Sound Region include Atlantic mackerel, red hake, windowpane flounder, little skate, winter skate, and Atlantic butterfish. Summer flounder, winter flounder, scup, and black sea bass are recreationally important species that are found within the Region, while pollock and longfin inshore squid are some commercially important fish found there. Many of these species are demersal and would be impacted by the construction of the SSB. However, this in-water measure occurs in a small area within the Planning Region, so impacts will be localized. Individuals are expected to avoid noise and vibrations caused by construction and return to the area when construction has concluded. Impacts are also expected from the construction of the elevated promenade, seawalls, and floodwalls in the Region, which are shore-based measures.

EFH for Atlantic butterfish (all life stages) has been identified in the Region. Atlantic butterfish is a pelagic species and construction impacts are expected to be limited to in-water construction of the SSB and tide gates. Impacts to larvae would primarily be associated with turbidity plumes that may temporarily reduce dissolved oxygen. Fish larvae will not be able to actively avoid construction zones. Juveniles and adults are expected to avoid active construction zones.

Similar impacts are expected to red hake, which has EFH designated for all life stages (egg, larvae, juvenile, and adult) in the Region. Red hake eggs and larvae are pelagic and expected to occur offshore, however, juveniles and adults are demersal and found within the Study Area. Red hake juveniles and adults are expected to be impacted by bottom-habitat disturbances and benthic habitat conversion to hard-bottom during structure installation. Impacts are expected to be temporary.

Winter flounder and windowpane flounder (all life stages), and summer flounder (juveniles and adults) have designated EFH in the Long Island Sound Region. These three species of flounder are demersal and expected to be impacted from construction of the SSBs and tide gates, when bottom habitat becomes disturbed and sediment plumes occur. Direct permanent impacts from foundation installation and structure installation are expected when benthic habitat is replaced with hard-bottom habitat. Impacts to these species are expected to be localized and temporary, and fish are expected to return to the area after construction is completed.

Two species of skate (winter skate, and little skate) have juvenile and adult EFH identified in the Region. Skate species were rare or uncommon during the winter in bottom trawl sampling in the Harbor (USACE 2013), but present in higher numbers during the spring and fall, and sometimes summer (Burlas et al. 2001; Able et al. 2010; USACE 2013; USACE 2015b). During their peak abundances, these species were most common outside the Harbor in the Rockaway Borrow Area and south shore of Long Island. Impacts to skate species are expected, depending on their abundances throughout the year. Impacts are expected to be similar as those for flounder.

EFH is designated for black sea bass (juvenile) and scup (all life stages) in the Long Island Sound Region. Each species is demersal, and black sea bass is a structure-oriented species. Similar impacts from in-water construction are expected as described for other demersal species. These species are expected to return to the area when construction is completed.

The longfin inshore squid (Eggs, juvenile, and adult) has EFH designated habitat in the Region. Longfin inshore squid EFH for eggs would be impacted by bottom-habitat disturbances from the SSBs, however impacts would be minor and localized. Juvenile and adults of the species would experience minor impacts from the in-water construction measures; impacts are expected to be localized.

The Region is a significant route for migratory fish. Bluefish and Atlantic herring, juveniles and adults, present in the Region and expected to avoid noise and vibration generated by construction. This avoidance behavior would occur only in those areas where construction is underway.

Pollock were uncommon in monitoring studies on the south shore of Long Island but were collected sporadically in the spring and summer and in December (USACE 2013). Although EFH is designated for Pollock juvenile and adult life stages in the Long Island Sound Region, pollock is not expected to common.

Indirect

Indirect impacts to EFH are expected to occur from construction of measures associated with the TSP within the Long Island Sound Region. Construction is only planned within a small area of the Region and impacts are expected to be localized. Indirect impacts are expected from construction of the SSB in Flushing Creek, which is an in-water measure. Impacts are also expected to occur from the construction of the elevated promenade and from the other shore-based measures that are located along the shoreline. The SSB and shore-based measures are located within a small area within the Region, so impacts will be localized.

EFH-designated species within the Long Island Sound include Atlantic mackerel, red hake, windowpane flounder, little skate, winter skate, and Atlantic butterfish. Summer flounder, winter flounder, scup, and black sea bass are recreationally important species that are found within the Region, while pollock and longfin inshore squid are some commercially important fish found there. Many of these species are demersal and could be indirectly impacted by disruption of benthic foraging habitat during the construction of the SSB in Flushing Creek and along the shoreline during construction of the elevated promenade. Individuals are expected to avoid construction areas in search of other nearby foraging habitat and return to the area when construction has completed. Indirect impacts would include bottom habitat disturbances and the potential loss of forage organisms in the immediate vicinity of the placement of new structures or bottom disturbance. Impacts to fish species may occur due to forage species displacement and temporary loss of forage species habitat and/or temporary loss of forage species individuals.

EFH for Atlantic butterfish (all life stages) has been identified in the Region. Atlantic butterfish is a pelagic species and construction impacts are expected to be limited to in-water construction of the SSB and tide gates, and shore-based construction of the elevated promenade along the shoreline. Indirect impacts to larvae would primarily be associated with turbidity plumes that may temporarily displace prey items, such as zooplankton. Fish larvae will not be able to actively avoid construction zones. Impacts to juveniles and adults are not expected to be significant since individuals can avoid active construction zones and seek nearby foraging habitat.

Similar impacts are expected to red hake, which has EFH designated for all life stages (egg, larvae, juvenile, and adult) in the Region; however, red hake eggs and larvae are pelagic and spawning tends to take place offshore. Red hake juveniles and adults are demersal and expected to avoid construction areas and seek nearby foraging habit.

Winter flounder and windowpane flounder (all life stages), and summer flounder (juveniles and adults) have designated EFH in the Long Island Sound Region. These three species of flounder are demersal and expected to be indirectly impacted from construction of the SSBs and tide gates, when forage species' habitat becomes disturbed and prey are displaced. Impacts to these species are expected to be localized and temporary, and fish are anticipated to find other appropriate habitat during construction, then return to the area after construction is completed.

Two species of skate (winter skate, and little skate) have juvenile and adult EFH identified in the Region. Skate species were rare or uncommon during the winter in bottom trawl sampling in the Harbor (USACE 2013), but present in higher numbers during the spring and fall, and sometimes summer (Burlas et al. 2001; Able et al. 2010; USACE 2013; USACE 2015b). During their peak abundances, these species were most common outside the Harbor in the Rockaway Borrow Area and south shore of Long Island. Impacts to skate species are expected to depend upon their abundances throughout the year. Impacts are expected to be similar as those for flounder.

EFH is designated for black sea bass (juvenile) and scup (all life stages) in the Long Island Sound Region. Each species is demersal, and black sea bass is a structure-oriented species. Similar indirect impacts from in-water construction are expected as described for other demersal species above. These species are expected to return to the area when construction is completed.

The longfin inshore squid (Eggs, juvenile, and adult) has EFH designated habitat in the Region. Juvenile and adults of the species would experience minor impacts from the in-water construction measures; impacts are expected to be localized; squid will return to the area when construction is complete.

The Region is a significant route for migratory fish. Bluefish and Atlantic herring, juveniles and adults, present in the Region and expected to avoid noise and vibration generated by construction. These species are expected to actively seek other nearby foraging habitat and return when construction is complete.

Pollock were uncommon in monitoring studies on the south shore of Long Island but were collected sporadically in the spring and summer and in December (USACE 2013). Although EFH is designated for Pollock juvenile and adult life stages in the Long Island Sound/Port Washington Region, pollock is not expected to be common.

Cumulative

Short-term cumulative impacts are related to Project activities and in-water construction associated with other permitted projects that are ongoing within the Harbor area. These short-term cumulative impacts to EFH would be a combination of disturbances associated with each project. Impacts to EFH would be the combined effect on EFH related to temporary effects on water quality, such as increased turbidity, and temporary loss of benthic communities in the various construction projects. Impacts related to construction would be minimized as practicable using BMPs, such as soil erosion controls and construction windows. The cumulative impact of these projects in improving overall water quality in the Harbor should represent a net benefit but may be evaluated in more detail and for specific waterbodies as the project measures become more defined.

Human activities in the Study Area causing pollution are reasonably certain to continue in the future, as are impacts of pollution on fish and EFH. However, the magnitude of these impacts cannot be projected. Sources of contamination in the Study Area includes atmospheric loading of pollutants, stormwater runoff from coastal development, groundwater discharges, and industrial and residential development.

Chemical contamination may have effects on the reproduction and survival of EFH-designated species. The extent of these effects is dependent upon the type of contaminant and the chemical concentration in ESA-listed species habitat. Excessive turbidity due to coastal development and/or construction sites could have similar impacts on EFH as those described for turbidity on this project.

5.1.4.2 Operations and Maintenance

Direct

Impacts to EFH are expected to occur from operation and maintenance of measures associated with the TSP within the Long Island Sound/Port Washington Region. Measures are only planned within a small area of the Region and impacts are expected to be localized. Impacts are expected to occur from operation and maintenance of the SSBs because most species are expected to avoid closed barriers and in-water work zones. Impacts are expected to occur from operation and maintenance of the elevated promenade and seawalls.

As describe in Section 6.1.4.1.1, EFH-designated species that would be impacted within the Long Island Sound Region include Atlantic mackerel, red hake, windowpane flounder, little skate, winter skate, and Atlantic butterfish. Summer flounder, winter flounder, scup, and black sea bass are recreationally important species that are found within the Region, while pollock and longfin inshore squid are some commercially important fish found there.

EFH for Atlantic butterfish (all life stages) has been identified in the Region. Atlantic butterfish is a pelagic species and operations and maintenance impacts are expected to be limited to in-water maintenance of the SSBs, or closure of the barriers; both activities are expected to be uncommon. Impacts to larvae would primarily be associated with turbidity plumes that may temporarily reduce dissolved oxygen. Fish larvae will not be able to actively avoid disturbances. Impacts to juveniles and adults are not expected since individuals can avoid in-water activities. Similarly, impacts are expected during shoreline maintenance of the elevated promenade and seawalls.

Red Hake has EFH designated for all life stages (egg, larvae, juvenile, and adult) in the Long Island Sound Region. Red hake eggs and larvae are uncommon in the Region. Red hake juveniles and adults are demersal and expected to avoid active work zones.

Winter flounder and windowpane flounder (all life stages), and summer flounder (juveniles and adults) have designated EFH in the Long Island Sound Region. These three species of flounder are demersal and expected to be impacted by operations and maintenance of the SSBs, when bottom habitat becomes disturbed and sediment plumes occur. Impacts to these species are expected to be localized and temporary, and fish are expected to return to the area after construction is completed.

Two species of skate (winter skate, and little skate) have juvenile and adult EFH identified in the Region. Impacts to skate species depend upon their abundances throughout the year. Impacts are similar those described for flounder.

EFH is designated for black sea bass (juvenile) and scup (all life stages) in the Long Island Sound Region. Each species is demersal, and black sea bass is a structure-oriented species. Similar impacts from in-water operations and maintenance, as described for other demersal species, are expected for black sea bass.

The longfin inshore squid (Eggs, juvenile, and adult) has EFH designated habitat in the Region. Longfin inshore squid EFH for eggs would be impacted by bottom-habitat disturbances from the SSBs, however, impacts would belocalized. Juvenile and adults of the species would experience minor impacts from the in-water maintenance.

Bluefish and Atlantic herring, juveniles and adults, are present in the Region. These migratory species are expected to avoid noise and vibration generated by construction. No impacts are expected.

Although EFH is designated for Pollock juvenile and adult life stages in the Long Island Sound Region, pollock is not expected to be common.

Indirect

Indirect impacts to EFH are expected to occur from operations and maintenance of measures associated with the TSP within the Long Island Sound Region. Measures are only planned within a small area of the Region and impacts are expected to be localized. Indirect impacts are expected from operations and maintenance of the SSB in Flushing Creek, which is an in-water measure. Impacts are also expected to occur from the operations and maintenance of the elevated promenade and from the other shore-based measures planned, depending on the species and life stage. The SSB and shore-based measures are located within a small area within the Region, so impacts will be localized.

Initial AdH modeling conducted by USACE for the TSP found only slight changes to tidal flow in the Study Area (Emerin and McAlpin 2020). Additionally, once the measures are constructed, they will protect areas prone to erosion and minimize the loss of EFH due to future storm surges. A net benefit to EFH is anticipated from the TSP.

EFH-designated species within the Long Island Sound include Atlantic mackerel, red hake, windowpane flounder, little skate, winter skate, and Atlantic butterfish. Summer flounder, winter flounder, scup, and black sea bass are recreationally important species that are found within the Region, while pollock and longfin inshore squid are some commercially important fish found there. Many of these species are demersal and could be indirectly impacted by disruption of benthic habitat during the operations and maintenance of the SSB in Flushing Creek and the elevated promenade which is located along the shoreline. Individuals are expected to avoid active work zones during maintenance in search of other nearby foraging habitat and return to the area when operations and maintenance has completed. Indirect impacts would include bottom habitat disturbances and the potential loss of forage organisms in the immediate vicinity of the placement of new structures or bottom disturbance. Impacts to fish species may occur due to forage species displacement and temporary loss of forage species habitat and/or temporary loss of forage species individuals.

EFH for Atlantic butterfish (all life stages) has been identified in the Region. Atlantic butterfish is a pelagic species and operations and maintenance indirect impacts are expected to be limited to in-water operations and maintenance of the SSB and tide gates, and shore-based operations and maintenance of the elevated promenade along the shoreline. Indirect impact producing factors for all life stages are similar to those described for Atlantic butterfish in Section 5.1.4.1.2.

Indirect impacts for red hake, which has EFH designated for all life stages (egg, larvae, juvenile, and adult), however, red hake eggs and larvae are pelagic and uncommon. Indirect impact producing factors for juvenile and adults life stages are similar to those described for Atlantic butterfish in Section 6.1.4.1.2.

Winter flounder and windowpane flounder (all life stages), and summer flounder (juveniles and adults) have designated EFH in the Long Island Sound Region. These three species of flounder are demersal and expected to be indirectly impacted from operations and maintenance of the SSBs and tide gates, when forage species' habitat becomes disturbed and prey are displaced. Impacts to these species are expected to be localized and temporary, and fish are anticipated to find other appropriate habitat during operations and maintenance, then return to the area after operations and maintenance is completed.

Two species of skate (winter skate, and little skate) have juvenile and adult EFH identified in the Region. Skate species were rare or uncommon during the winter in bottom trawl sampling in the Harbor (USACE 2013), but present in higher numbers during the spring and fall, and sometimes summer (Burlas et al. 2001; Able et al. 2010; USACE 2013; USACE 2015b). During their peak abundances, these species were most common outside the Harbor in the Rockaway Borrow Area and south shore of Long Island. Impacts to skate species depend upon their abundances throughout the year. Indirect impacts are expected to be similar as those for flounder.

EFH is designated for black sea bass (juvenile) and scup (all life stages) in the Long Island Sound Region. Each species is demersal, and black sea bass is a structure-oriented species. Similar indirect impacts from in-water operations and maintenance are expected as described for other demersal species above.

The longfin inshore squid (Eggs, juvenile, and adult) has EFH designated habitat in the Region. Juvenile and adults of the species would experience minor impacts from the in-water operations and maintenance measures; impacts are expected to be localized.

The Region is a significant route for migratory fish. Bluefish and Atlantic herring, juveniles and adults, present in the Region and expected to avoid noise and vibration generated by operations and maintenance. These species are expected to actively seek other nearby foraging habitat and return when operations and maintenance is complete. No impacts are expected.

Pollock were uncommon in monitoring studies on the south shore of Long Island but were collected sporadically in the spring and summer and in December (USACE 2013). Although EFH is designated for Pollock juvenile and adult life stages in the Long Island Sound Region, pollock is not expected to be common.

Cumulative

Chemical contamination may have effects on the reproduction and survival of EFH-designated species. The extent of these effects is dependent upon the type of contaminant and the chemical concentration in ESA-listed species habitat. Excessive turbidity due to coastal development and/or construction sites could have similar impacts on EFH as those described for turbidity on this project.

Long-term cumulative impacts would be limited to localized changes in water column depth, bathymetric contours, hydrodynamics, and sedimentation rates, such as those potential impacts associated with the operation and maintenance of the existing or proposed deepened channels, any deepening or operations and maintenance proposed by private entities, and the berth deepening being proposed by the Port Authority of NY and NJ, as well as sand borrow and beach nourishment activities and other restoration projects ongoing or planned for the region. However, cumulative restoration activities related to habitat improvement or coastal storm risk management are expected to generate cumulative benefits to the Study Area by reducing water quality impacts from potential flooding and improve quality of habitats and wetlands.

5.2 Effects of Climate Change

There are numerous impacts associated with climate change; the effect on EFH-designates species within the Study Area is difficult to predict. Sea-level rise will continue to impact coastal habitats such as marshes, inlets and barrier islands which provide habitat for the early life stages of fishes, as well as important foraging habitat for juvenile and adult fish. According to the NYS 2100 Commission Report (2013), sea level rise in NYC and Long Island is projected to be as much as six feet within the next 90 years (USACE 2013). Rising global temperatures can also have impacts on fish egg and larvae survival. These impacts are unpredictable and will vary in severity over the temporal scale.

1. NOAA requests the effects of climate change are evaluated during an EFH assessment to determine if climate change will exacerbate any effects from the proposed action. Consideration for NOAAs five climate change questions is provided below. Could species or habitats be adversely affected by the proposed action due to projected changes in the climate?

   No. The proposed action is expected to combat the effects of climate change (increased storm intensities and frequency) and protect species and habitats from extreme weather events. The action will have a net benefit to species and habitats in the Study Area.

2. Is the expected life span of the action greater than 10 years?

   Construction of the proposed action is expected to take place over roughly 10 years; details will be defined as planning continues to take place. However, the action is expected to provide beneficial effects that will last for decades or more.

3. Is climate change currently affecting vulnerable species or habitats, and would the effects of a proposed action be amplified by climate change?

   Climate change is currently affecting vulnerable species and habitats in the Study Area and the proposed action would protect against and reduce those harmful effects.

4. Do the results of the assessment indicate the effects of the action on habitats and species will be amplified by climate change?

   No. As described above, the action will have a net benefit to habitats and species in the Study Area.

5. Can adaptive management strategies (AMS) be integrated into the action to avoid or minimize adverse effects of the proposed action as a result of climate change?

   The proposed action will not have adverse effects on climate change.

5.3 Summary of Effects

A total of 34 finfish, invertebrate, skate, and shark species have designated EFH in the NYNJHATS Study Area. Of these species, 24 species may occur in the Study Area as documented in major long-term sampling efforts. Table 5-1 summarizes the potential effects by stressor that the TSP may have on EFH.

Table 5-1. Summary of Effects on EFH in the NYNJHAT Study Area

Common name	Scientific name	Life Stage Occurring in Study Area	Potential Stressor Caused by Activity							
			Underwater Noise	Water Quality/Turbidity/ Release	Vessel Traffic	Impingement/ Entrainment	Fish Passage	Benthic Disturbance	Impacts to Prey Species	Habitat Alterations
New England Finish Species										
Atlantic cod	*Gadus morhua*	Eggs, larvae (rare), Adults offshore.	**No impacts** expected; Adults generally occur offshore and outside the Study Area; larvae uncommon; eggs pelagic.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Atlantic herring	*Clupea harengus*	Larvae (uncommon), Juvenile and Adult.	**No impacts** anticipated; species is expected to actively avoid noise.	**Direct Impacts:** All life stages pelagic; impacts limited to water column turbidity during in-water construction and maintenance activities. **Indirect Impacts:** Forage organism displacement during construction; zooplankton widely available throughout habitat; no significant impacts. **Cumulative Impacts:** None; species is expected to actively avoid other construction projects.	**Direct Impacts:** Minor; species is expected to avoid vessel traffic. **No direct or cumulative impacts** expected.	**Direct impacts:** potential entrainment from boat intakes; impacts are not anticipated to be significant. **Indirect impacts:** None anticipated. **Cumulative Impacts:** None; species is expected to actively avoid other construction projects.	**Direct impacts:** not expected to be significant. Barrier closure during 100-year storm event, for 24 hour duration. Species presence in Study Area during Spring and Winter. Highly active species will seek alternate routes. **No indirect or cumulative impacts** expected.	**No impacts** expected; species is pelagic.	**Direct Impacts:** Minor impacts to zooplankton during sediment suspension. Other preferred habitat is widely available in the Study Area. Atlantic herring not anticipated to be adversely affected. **No indirect or cumulative impacts** expected.	**Direct Impacts:** All life stages pelagic; construction impacts limited to suspended sediments primarily during in-water activities. **Indirect Impacts:** Potential for forage organism displacement during installation of in-water structures; zooplankton widely available throughout habitat; no significant impacts. Operations impacts are expected to benefit EFH by protecting from storm surge damage. **Cumulative Impacts:** None. A net benefit to EFH is expected.
Monkfish	*Lophius americanus*	Eggs and larvae (uncommon), Adults (rare).	**No impacts** anticipated from noise.	**Direct Impacts**: Monkfish is not common in the Harbor. Localized impacts from sediment suspension may impact eggs and larvae; other habitat is available throughout the Study Area. Potential sediment plumes during maintenance of in-water measures will not be significant compared to construction. **Indirect Impacts:** Forage organism displacement from sediment plumes; minor localized impacts to larvae expected. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.	**Direct impacts:** eggs and larvae remain pelagic for some time. Significant impacts from vessel traffic are not expected. **Indirect impacts:** None anticipated. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; significant impacts unlikely.	**Direct impacts:** potential entrainment from boat intakes; impacts are not anticipated to be significant. **Indirect impacts:** None anticipated. **Cumulative impacts:** potential impacts from entrainment by boat intakes from other construction projects; impacts are not anticipated to be significant.	**Direct impacts:** potential for restricted movement during barrier closure; only anticipated during 100-year storm/flood events; impacts minor. **Indirect impacts:** None anticipated. **Cumulative impacts:** none anticipated.	**Direct impacts:** potential impacts from sediment plumes; eggs and larvae are pelagic and construction is expected to take place in a small portion of open habitat. **Indirect impacts:** potential forage organism displacement for larvae; impacts are expected to be localized and minor. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	**Direct impacts:** prey organism displacement during construction of in-water measures. Larvae are not anticipated to be adversely affected. **Indirect impacts:** foraging habitat disturbance leads to prey species displacement; larvae are not expected to be adversely affected; construction will be localized and impact a small portion of available habitat. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	**Direct Impacts:** Monkfish is not common in the Harbor. Localized construction impacts from suspended sediment and installation of hard-bottom structures. **Indirect Impacts:** Potential for forage organism displacement during installation of in-water structures; zooplankton widely available in other habitat. Operations impacts are expected to benefit EFH by protecting from storm surge damage. Artificial reef effect from new structure installation may increase forage habitat availability. **Cumulative Impacts:** None. A net benefit to EFH is expected.

Common name	Scientific name	Life Stage Occurring in Study Area	Potential Stressor Caused by Activity							
			Underwater Noise	Water Quality/Turbidity/ Release	Vessel Traffic	Impingement/ Entrainment	Fish Passage	Benthic Disturbance	Impacts to Prey Species	Habitat Alterations
Ocean pout	*Macrozoarces amercanus*	Eggs (rare)	**No impacts** anticipated; species is not likely to occur in Study Area.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Pollock	*Pollachius pollachius*	Juvenile and Adult (both uncommon)	Species primarily occurs offshore; **no impacts** anticipated.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Red hake	*Urophycis chuss*	Eggs and larvae (uncommon); Juvenile and Adults.	**Direct impacts:** Juveniles and adult expected to avoid areas of noise and seek other nearby habitat. **Indirect impacts:** none expected. **Cumulative impacts:** potential noise from other construction projects; juveniles and adult expected to avoid areas of noise. **No impacts** to eggs and larvae; both life stages occur offshore.	**Direct impacts:** sediment suspension during in-water construction will impact demersal juvenile and adult life stages. Winter and spring abundances expected; species is anticipated to seek other habitat nearby. **Indirect impacts:** forage species displacement from sediment plumes; Red hake expected to seek other nearby foraging habitat. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity. **No impacts** to eggs and larvae; both life stages occur offshore.	**No impacts** expected; eggs and larvae are pelagic and spawning occurs offshore; juveniles and adults are demersal.	**No impacts** expected; eggs and larvae are pelagic and spawning occurs offshore; juveniles and adults are demersal.	**Direct impacts:** potential for restricted movement of juveniles and adults during barrier closure; only anticipated during 100-year storm/flood events; impacts not significant. **Indirect impacts:** None anticipated. **Cumulative impacts:** none anticipated.	**Direct impacts:** impacts to benthic foraging habitat during construction of SSB and tide gates; red hake is anticipated to seek other foraging habitat, then return when construction is completed. **Indirect impacts:** benthic prey species displacement. Red hake is expected to seek other habitat nearby. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above. **No impacts** to eggs and larvae; both life stages occur offshore.	**Direct impacts:** impacts to benthic foraging habitat during construction of SSB and tide gates; red hake is anticipated to seek other foraging habitat, then return when construction is completed. **Indirect impacts:** benthic prey species displacement. Red hake is expected to seek other habitat nearby. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above. **No impacts** to eggs and larvae; both life stages occur offshore.	**Direct impacts:** construction impacts include sediment suspension and bottom-habitat disturbance during installation of SSB and tide gates. Red hake juveniles and adults are demersal, but mobile, and expected to seek other nearby habitat. **Indirect impacts:** primarily associated with prey species displacement due to conversion of foraging habitat to hard-bottom substrate. Other habitat will be available. Operations and maintenance impacts include the potential benefit to benthic habitat through the artificial reef effect. EFH is expected to be benefited by protection from storm surge damage. **Cumulative impacts:** None. A net benefit to EFH is expected.
Silver hake	*Merluccius bilnearis*	Eggs, larvae, and adults (uncommon)	**Direct impacts:** Juveniles and adult expected to avoid areas of noise and seek other nearby habitat. No impacts to larvae. **Indirect impacts:** none expected. **Cumulative impacts:** potential noise from other construction projects; juveniles and adult expected to avoid areas of noise.	**Direct impacts:** sediment suspension during in-water construction will impact bottom and mid-water habitat. Juveniles and adults anticipated to seek other habitat nearby. Larvae are uncommon. **Indirect impacts:** forage species displacement from sediment plumes; silver hake is expected to seek other nearby habitat. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.	**Direct Impacts:** Minor; species is expected to avoid vessel traffic. Demersal juveniles and adults will not be impacted. **Indirect impacts:** None anticipated. **Cumulative impacts:** vessel traffic is expected throughout the Study Area under normal conditions; cumulative impacts are not anticipated.	**Direct impacts:** potential entrainment from boat intakes to eggs and larvae. All life stages are uncommon and impacts are not anticipated to be significant. **Indirect impacts:** None anticipated. **Cumulative Impacts:** Similar impacts as described for direct.	**Direct impacts:** not expected to be significant. Barrier closure during 100-year storm event, for 24 hour duration. Species presence in Study Area during Spring and Winter. Highly active species will seek alternate routes. **No indirect or cumulative impacts** expected.	**Direct impacts:** impacts to benthic foraging habitat during construction of SSB and tide gates. Silver hake is anticipated to seek other foraging habitat, then return when construction is completed. **Indirect impacts:** benthic prey species displacement. Silver hake will seek other nearby habitat. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above. **No impacts** to pelagic eggs; uncommon.	**Direct impacts:** impacts to benthic foraging habitat during construction of SSB and tide gates; silver hake is anticipated to seek other foraging habitat, then return when construction is completed. **Indirect impacts:** benthic prey species displacement. Silver hake is expected to seek other habitat nearby. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	**Direct impacts:** construction impacts include sediment suspension and bottom-habitat disturbance during installation of SSB and tide gates. Silver hake are uncommon in the Study Area and impacts will be localized. **Indirect impacts:** primarily associated with prey species displacement due to conversion of foraging habitat to hard-bottom substrate. Other habitat will be available. EFH is expected to be benefited by protection from storm surge damage. **Cumulative impacts:** None. A net benefit to EFH is expected.
Windowpane flounder	*Scophthalmus aquosus*	All life stages.	**Direct impacts:** Juveniles and adult expected to avoid	**Direct impacts:** sediment suspension during in-water	**No impacts** expected; species is demersal.	**Direct impacts:** potential entrainment from boat intakes to	**Direct impacts:** not expected to be significant. Barrier closure during	**Direct impacts:** impacts to benthic habitat during construction of SSB and tide	**Direct impacts:** impacts to benthic foraging habitat during construction of SSB and tide gates; Windowpane	**Direct Impacts:** Localized construction impacts from suspended

Common name	Scientific name	Life Stage Occurring in Study Area	Potential Stressor Caused by Activity							
			Underwater Noise	Water Quality/Turbidity/ Release	Vessel Traffic	Impingement/ Entrainment	Fish Passage	Benthic Disturbance	Impacts to Prey Species	Habitat Alterations
			areas of noise and seek other nearby habitat. Impacts to larvae are minor. **Indirect impacts:** none expected. **Cumulative impacts:** potential noise from other construction projects; juveniles and adult expected to avoid areas of noise.	construction will impact bottom water habitat. Juveniles and adults anticipated to seek other habitat nearby. Impacts to larvae are expected to be localized. **Indirect impacts:** forage species displacement from sediment plumes; flounder are expected to seek other nearby habitat and return when construction is completed. **Cumulative impacts:** Other construction projects are anticipated in the study area; BMPs employed to reduce turbidity.		eggs and larvae. All life stages are uncommon and impacts are not anticipated to be significant. **Indirect impacts:** None anticipated. **Cumulative Impacts:** Similar impacts as described for direct.	100-year storm event, for 24 hour duration. **No indirect or cumulative impacts** expected.	gates. Windowpane flounder are demersal and impacts to benthic habitat will displace the species. Individuals are anticipated to seek other foraging habitat, then return when construction is completed. Impacts are expected to be localized. Mortality would be limited to individuals and unlikely. **Indirect impacts:** benthic prey species displacement. Flounder expected to seek other nearby habitat. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	flounder is anticipated to seek other foraging habitat, then return when construction is completed. **Indirect impacts:** benthic prey species displacement. Flounder are expected to find prey in other locations away from construction. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	sediment and installation of hard-bottom structures. **Indirect Impacts:** Potential for forage organism displacement during installation of in-water structures; other habitat will be available. Operations impacts are expected to benefit EFH by protecting from storm surge damage. Artificial reef effect from new structure installation may increase forage habitat availability. **Cumulative Impacts:** None. A net benefit to EFH is expected.
Winter flounder	*Pseudopleuronectes americanus*	All life stages.	**Direct impacts:** Juveniles and adult expected to avoid areas of noise and seek other nearby habitat. Impacts to larvae are minor. **Indirect impacts:** none expected. **Cumulative impacts:** potential noise from other construction projects; juveniles and adult expected to avoid areas of noise.	**Direct impacts:** sediment suspension during in-water construction will impact bottom water habitat. Juveniles and adults anticipated to seek other habitat nearby. Impacts to larvae are expected to be localized. **Indirect impacts:** forage species displacement from sediment plumes; flounder are expected to seek other nearby habitat and return when construction is completed. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.	**No impacts** expected; species is demersal.	**Direct impacts:** potential entrainment from boat intakes to eggs and larvae. All life stages are uncommon. **Indirect impacts:** None anticipated. **Cumulative Impacts:** Similar impacts as described for direct.	**Direct impacts:** not expected to be significant. Barrier closure during 100-year storm event, for 24 hour duration. **No indirect or cumulative impacts** expected.	**Direct impacts:** impacts to benthic habitat during construction of SSB and tide gates. Winter flounder are demersal and impacts to benthic habitat will displace the species. Individuals are anticipated to seek other foraging habitat, then return when construction is completed. Impacts are expected to be localized. Mortality would be limited to individuals and unlikely. **Indirect impacts:** benthic prey species displacement. Flounder expected to seek other nearby habitat. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	**Direct impacts:** impacts to benthic foraging habitat during construction of SSB and tide gates; Winter flounder is anticipated to seek other foraging habitat, then return when construction is completed. **Indirect impacts:** benthic prey species displacement. Flounder are expected to find prey in other locations away from construction. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	**Direct Impacts:** Localized construction impacts from suspended sediment and installation of hard-bottom structures. **Indirect Impacts:** Potential for forage organism displacement during installation of in-water structures; other habitat will be available. Operations impacts are expected to benefit EFH by protecting from storm surge damage. Artificial reef effect from new structure installation may increase forage habitat availability. **Cumulative Impacts:** None. A net benefit to EFH is expected.
Witch flounder	*Glyptocephalus cynoglossus*	Larvae.	**No impacts** expected; primarily occur offshore.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Yellowtail flounder	*Limanda ferruginea*	All life stages.	**Direct impacts:** Juveniles and adult expected to avoid areas of noise and seek other nearby habitat. **Indirect impacts:** none expected.	**Direct impacts:** sediment suspension during in-water construction will impact bottom water habitat. Juveniles and adults anticipated to seek other habitat nearby. Impacts	**No impacts** expected; species is demersal.	**Direct impacts:** potential entrainment from boat intakes to eggs and larvae. All life stages are uncommon and impacts are not anticipated to be significant.	**Direct impacts:** not expected to be significant. Barrier closure during 100-year storm event, for 24 hour duration. **No indirect or cumulative impacts** expected.	**Direct impacts:** impacts to benthic habitat during construction of SSB and tide gates. Yellowtail flounder are demersal and impacts to benthic habitat will displace the species. Individuals are anticipated to seek other foraging habitat, then return when construction is	**Direct impacts:** impacts to benthic foraging habitat during construction of SSB and tide gates; Yellowtail flounder is anticipated to seek other foraging habitat, then return when construction is completed. **Indirect impacts:** benthic prey species displacement. Flounder are	**Direct Impacts:** Localized construction impacts from suspended sediment and installation of hard-bottom structures. **Indirect Impacts:** Potential for forage organism displacement during installation of in-water structures; other habitat will be available.

Common name	Scientific name	Life Stage Occurring in Study Area	Potential Stressor Caused by Activity							
			Underwater Noise	Water Quality/Turbidity/ Release	Vessel Traffic	Impingement/ Entrainment	Fish Passage	Benthic Disturbance	Impacts to Prey Species	Habitat Alterations
			Cumulative impacts: potential noise from other construction projects; juveniles and adult expected to avoid areas of noise.	to larvae are expected to be localized. **Indirect impacts:** forage species displacement from sediment plumes; flounder are expected to seek other nearby habitat and return when construction is completed. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.		**Indirect impacts:** None anticipated. **Cumulative Impacts:** Similar impacts as described for direct.		completed. Impacts are expected to be localized. Mortality would be limited to individuals and unlikely. **Indirect impacts:** benthic prey species displacement. Flounder expected to seek other nearby habitat. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	expected to find prey in other locations away from construction. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	Operations impacts are expected to benefit EFH by protecting from storm surge damage. Artificial reef effect from new structure installation may increase forage habitat availability. **Cumulative Impacts:** None. A net benefit to EFH is expected.
Mid-Atlantic Finfish Species										
Atlantic butterfish	*Peprilus triacanthus*	All life stages uncommon.	**Direct Impacts**: Species is expected to avoid areas of noise caused by in-water construction activities and return when construction is complete. Maintenance noise is expected to be minor compared to construction. **Indirect impacts:** prey species displacement may occur; Atlantic butterfish are expected to seek other nearby foraging opportunities away from construction noise. **Cumulative impacts**: Impacts from other construction projects in the Study Area may occur; BMPs will be employed to reduce cumulative effects.	**Direct Impacts**: Localized impacts from sediment suspension during construction of SSBs and tide gates; other nearby unaffected habitat will be available. Potential sediment plumes during maintenance of in-water measures will not be significant compared to construction. **Indirect Impacts:** Forage species displacement; nearby foraging habitat will be available. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.	**Direct impacts:** vessel strikes unlikely; species prefers mid-depth and bottom water. **Indirect impacts:** None anticipated. **Cumulative impacts:** vessel traffic is expected throughout the Study Area under normal conditions; cumulative impacts will be minor.	**Direct impacts:** possible impingement during barrier closure; closures only expected during 100-year storm/flood events, for 24 hours; impacts minor. Potential entrainment from boat intakes to eggs and larvae. All life stages are uncommon and impacts are not anticipated to be significant. **Indirect:** none. **Cumulative:** none.	**Direct impacts:** species anticipated to swim around in-water construction activities. Barrier closures only occur during 100-year storm events, for 24 hours; not likely to impact passage. **Indirect:** none. **Cumulative impacts:** none anticipated.	**Direct impacts:** direct disturbance to habitat preferred by species during construction of the SSBs and tide gates. Expected to seek other nearby available habitat. **Indirect impacts:** prey species displacement. Atlantic butterfish is expected to seek other nearby habitat. **Cumulative impacts:** depend upon other construction projects in the vicinity that disturb bottom habitat. Species is expected to seek other available habitat.	**Direct impacts:** prey species displacement during construction of in-water measures. Atlantic butterfish will seek other nearby foraging habitat. **Indirect impacts:** foraging habitat disturbance leads to prey species displacement; butterfish will seek other appropriate habitat. **Cumulative impacts:** depend upon other construction projects in the vicinity that disturb bottom habitat. Species is expected to seek other available habitat.	**Direct impacts:** construction impacts include sediment suspension and bottom-habitat disturbance during installation of SSB and tide gates. Impacts will be localized. **Indirect impacts:** primarily associated with prey species displacement due to installation of in-water structures. Other habitat will be available. EFH is expected to be benefited by protection from storm surge damage. **Cumulative impacts:** None. A net benefit to EFH is expected.
Atlantic mackerel	*Scomber scombrus*	All life stages	**Direct Impacts**: Species is expected to avoid areas of noise caused by in-water construction activities and return when construction is complete. Maintenance noise is expected to be	**Direct Impacts**: Localized impacts to pelagic eggs and larvae are expected; sediment suspension during construction of SSBs and tide gates can decrease DO. Atlantic mackerel juveniles and adults are pelagic; mainly occur in	**Direct impacts:** species is pelagic; potential for vessel strikes, but Atlantic mackerel is expected to avoid active construction zones. **Indirect impacts:** None anticipated.	**Direct impacts:** possible impingement during barrier closure; closures only expected during 100-year storm/flood events, for 24 hours; impacts not expected to be significant. Potential entrainment from boat	**Direct impacts:** species anticipated to swim around in-water construction activities. Barrier closures only occur during 100-year storm events, for 24 hours; not likely to impact passage. **Indirect:** none.	**No impacts** anticipated. All life stages are pelagic.	**Direct impacts:** potential displacement of prey species during construction of in-water measures. Atlantic mackerel will seek other nearby foraging habitat. **Indirect impacts:** foraging habitat disturbance such as water column plumes may lead to prey species displacement. Other habitat will be available.	**Direct Impacts:** Species is pelagic; construction impacts limited to suspended sediments primarily during in-water activities. **Indirect Impacts:** Potential for prey displacement during installation of in-water structures; other habitat is widely available; no significant impacts. Operations impacts are

Common name	Scientific name	Life Stage Occurring in Study Area	Potential Stressor Caused by Activity							
			Underwater Noise	Water Quality/Turbidity/ Release	Vessel Traffic	Impingement/ Entrainment	Fish Passage	Benthic Disturbance	Impacts to Prey Species	Habitat Alterations
			minor compared to construction. **Indirect impacts:** prey species displacement may occur; Atlantic mackerel are expected to seek prey in other locations. **Cumulative impacts**: Impacts from other construction projects in the Study Area may occur; BMPs will be employed to reduce cumulative effects.	Lower Bay and Upper Bay, impacts expected to be Low. Expected to find other suitable nearby habitat. Maintenance of in-water measures will not be significant compared to construction. **Indirect Impacts:** Potential for forage species displacement; nearby foraging habitat will be available. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.	**Cumulative impacts:** vessel traffic is expected throughout the Study Area under normal conditions; cumulative impacts will be minor.	intakes to eggs and larvae. Larvae and eggs occur mainly in May and June, so impacts are seasonal dependent. **Indirect:** none. **Cumulative:** none.	**Cumulative impacts:** none anticipated.		**Cumulative impacts:** depend upon other construction projects in the vicinity. Species expected to seek other available habitat.	expected to benefit EFH by protecting from storm surge damage. **Cumulative Impacts:** None. A net benefit to EFH is expected.
Black sea bass	*Centropristis striata*	Juvenile and Adult.	**Direct Impacts**: Species is expected to avoid areas of noise caused by in-water construction activities and return when construction is complete. Maintenance noise is expected to be minor compared to construction. **Indirect impacts:** prey displacement may occur; black sea bass are expected to seek prey in other locations. **Cumulative impacts**: Impacts from other construction projects in the Study Area may occur; BMPs will be employed to reduce cumulative effects.	**Direct Impacts**: Localized impacts from sediment suspension during construction of SSBs and tide gates; other nearby unaffected habitat will be available. Potential sediment plumes during operations and maintenance of in-water measures will not be significant compared to construction. **Indirect Impacts:** Forage species displacement; nearby foraging habitat will be available. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.	**No impacts** anticipated. Species is demersal.	**Direct impacts:** possible impingement during barrier closure; closures only expected during 100-year storm/flood events, for 24 hours; impacts not expected to be significant. **Indirect:** none. **Cumulative:** none.	**Direct impacts:** species anticipated to swim away from in-water construction activities. Barrier closures only occur during 100-year storm events, for 24 hours; not likely to impact passage. **Indirect:** none. **Cumulative impacts:** none anticipated.	**Direct impacts:** direct disturbance to habitat preferred by the species during construction of in-water measures. Black sea bass is mobile and expected to seek other nearby habitat that is available. **Indirect impacts:** prey species displacement. Black sea bass is expected to seek other nearby habitat. **Cumulative impacts:** depend upon other construction projects in the vicinity that disturb bottom habitat. Species is expected to seek other available habitat.	**Direct impacts:** displacement of prey organisms preferred by black sea bass during construction of the SSBs and tide gates and shore-based measures located along the shoreline. Black sea bass is expected to seek other nearby foraging habitat. **Indirect impacts:** foraging habitat disturbance; physical seabed disturbance during construction of in-water measures will lead to prey species displacement. Other habitat will be available in the Study Area. **Cumulative impacts:** depend upon other construction projects in the vicinity. Species expected to seek other available habitat.	**Direct Impacts:** Localized construction impacts from suspended sediment and installation of hard-bottom structures. **Indirect Impacts:** Potential for forage organism displacement during installation of in-water structures; other habitat will be available. Operations impacts are expected to benefit EFH by protecting from storm surge damage. Black sea bass is structure oriented and installation of SSBs may benefit species through artificial reef effect. Increased foraging opportunities are possible over the long-term. **Cumulative Impacts:** None. A net benefit to EFH is expected.
Bluefish	*Pomatomus saltatrix*	Juvenile and Adult.	**Direct Impacts**: Species is expected to avoid areas of noise caused by in-water construction activities and return when construction is complete. Maintenance noise is expected to occur less frequently than when construction is underway.	**Direct Impacts**: Localized impacts when sediment suspension occurs during construction of SSBs and tide gates. Juveniles and adults are pelagic and highly mobile; therefore, expected to find other suitable nearby habitat. Maintenance of in-water measures will not be	**Direct impacts:** Vessel strikes are possible, but unlikely. Species is highly mobile and expected to avoid in-water construction activities. **Indirect:** none. **Cumulative:** none.	**No impacts** anticipated. Blue is a highly active pelagic species and expected to avoid construction zones.	**Direct impacts:** barrier closures only expected during 100-year storm/flood events, for 24 hours; impacts not expected to be significant. Bluefish will find other suitable habitat until barriers are open. **Indirect:** none. **Cumulative:** none.	**No impacts** are anticipated. Species is pelagic.	**Direct impacts:** displacement of prey organisms from in-water construction noise or activity is possible, however bluefish is expected to find other foraging areas. **Indirect impacts:** possible disturbance to habitat used by prey species; water column sediment plumes; noise. Bluefish will find other foraging areas. **Cumulative impacts:** depend upon other construction projects in the	**Direct Impacts:** Species is pelagic and highly active; construction impacts limited to suspended sediments primarily during in-water activities. **Indirect Impacts:** Potential for prey displacement during installation of in-water structures; other habitat is widely available; no significant impacts. Operations impacts are expected to benefit EFH by protecting from storm surge damage.

Common name	Scientific name	Life Stage Occurring in Study Area	Potential Stressor Caused by Activity							
			Underwater Noise	Water Quality/Turbidity/ Release	Vessel Traffic	Impingement/ Entrainment	Fish Passage	Benthic Disturbance	Impacts to Prey Species	Habitat Alterations
			Indirect impacts: prey displacement may occur; bluefish is highly mobile and will seek forage species elsewhere. **Cumulative impacts**: Impacts from other construction projects in the Study Area may occur; BMPs will be employed to reduce cumulative effects.	significant compared to construction. **Indirect Impacts:** Potential for forage species displacement; nearby foraging habitat will be available. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.					vicinity. Species expected to seek other available habitat.	**Cumulative Impacts:** A net benefit to EFH is expected from the TSP.
Scup	*Stenotomus chrysops*	All life stages	**Direct Impacts**: Species is expected to avoid areas of noise caused by in-water construction activities and return when construction is complete. Maintenance noise will not occur as frequently as ongoing construction. **Indirect impacts:** prey displacement may occur; scup is expected to seek prey in other locations. **Cumulative impacts**: Impacts from other construction projects in the Study Area may occur; BMPs will be employed to reduce cumulative effects.	**Direct Impacts**: Localized impacts from sediment suspension during construction of SSBs and tide gates; other nearby unaffected habitat will be available. Eggs and larval stages will be unable to avoid plumes. Potential sediment plumes during operations and maintenance of in-water measures will not be significant compared to construction. **Indirect Impacts:** Forage species displacement; nearby foraging habitat will be available. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.	**Direct impacts:** Vessel strikes are possible, but unlikely; scup are demersal. **Indirect:** none. **Cumulative:** none**.**	**Direct impacts:** possible impingement during barrier closure; closures only expected during 100-year storm/flood events, for 24 hours; impacts not expected to be significant. Possible entrainment of eggs and larvae near construction zones; impacts will be localized. **Indirect:** none. **Cumulative:** none**.**	**Direct impacts:** barrier closures only expected during 100-year storm/flood events, for 24 hours; impacts not expected to be significant. Scup will find other suitable habitat until barriers are open. **Indirect:** none. **Cumulative:** none**.**	**Direct impacts:** direct disturbance to habitat preferred by scup (demersal species) during construction of in-water measures. Species is expected to find other nearby habitat despite impacts to EFH. **Indirect impacts:** prey species displacement. Scup is expected to seek other nearby habitat to find prey. **Cumulative impacts:** depend upon other construction projects in the vicinity that disturb bottom habitat. Species is expected to seek other available habitat.	**Direct impacts:** displacement of prey organisms during construction of the SSBs and tide gates and shore-based measures located along the shoreline. Scup is expected to find other suitable habitat. **Indirect impacts:** foraging habitat disturbance; physical seabed disturbance during construction of in-water measures will lead to prey species displacement. Impacts will be localized. **Cumulative impacts:** depend upon other construction projects in the vicinity. Species expected to seek other available habitat.	**Direct impacts:** construction impacts include sediment suspension during installation of SSBs. Impacts will be localized. **Indirect impacts:** primarily associated with prey species displacement due to installation of in-water structures. Other habitat will be available. EFH is expected to be benefited by protection from storm surge damage. **Cumulative impacts:** None. A net benefit to EFH is expected.
Spanish mackerel	*Scomberomorus maculates*	Adult	**No impacts** anticipated; species is not likely to occur in the Study Area.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Summer flounder	*Paralichthys dentatus*	All life stages.	**Direct impacts:** Juveniles and adult expected to avoid areas of noise and seek other nearby habitat. **Indirect impacts:** none expected. **Cumulative impacts:** potential noise from other construction	**Direct impacts:** sediment suspension during in-water construction will impact bottom water habitat. Juveniles and adults anticipated to seek other habitat nearby. Impacts to larvae are expected to be localized. **Indirect impacts:** forage species displacement from sediment plumes;	**No impacts** expected; species is demersal.	**Direct impacts:** Potential impingement during barrier operations; barrier closures only occur during 100-year storm event, for 24 hour duration. **Indirect impacts:** None anticipated. **Cumulative Impacts:** Similar impacts as described for direct.	**Direct impacts:** not expected to be significant. Barrier closure during 100-year storm event, for 24 hour duration. **No indirect or cumulative impacts** expected.	**Direct impacts:** impacts to benthic habitat during construction of SSB and tide gates. Summer flounder are demersal and impacts to benthic habitat will displace the species. Individuals are anticipated to seek other foraging habitat, then return when construction is completed. Impacts are expected to be localized. Mortality would be limited to individuals and unlikely.	**Direct impacts:** impacts to benthic foraging habitat during construction of SSB and tide gates; Summer flounder is anticipated to seek other foraging habitat, then return when construction is completed. **Indirect impacts:** benthic prey species displacement. Flounder are expected to find prey in other locations away from construction. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom	**Direct Impacts:** Localized construction impacts from suspended sediment and installation of hard-bottom structures. **Indirect Impacts:** Potential for forage organism displacement during installation of in-water structures; other habitat will be available. Operations impacts are expected to benefit EFH by protecting from storm surge damage. Artificial reef effect

Common name	Scientific name	Life Stage Occurring in Study Area	Potential Stressor Caused by Activity							
			Underwater Noise	Water Quality/Turbidity/ Release	Vessel Traffic	Impingement/ Entrainment	Fish Passage	Benthic Disturbance	Impacts to Prey Species	Habitat Alterations
			projects; juveniles and adult expected to avoid areas of noise.	flounder are expected to seek other nearby habitat and return when construction is completed. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.				**Indirect impacts:** benthic prey species displacement. Summer flounder is opportunistic and expected to seek other nearby habitat. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	habitat. Impacts are similar to those described above.	from new structure installation may increase forage habitat availability. **Cumulative Impacts:** None. A net benefit to EFH is expected.
Highly Migratory Species										
Bluefin tuna	*Thunnus thynnus*	Juvenile (rare)	Species occurs offshore; **no impacts** expected	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Skipjack tuna	*Katsuwonus pelamis*	Adult (rare)	Species occurs offshore; **no impacts** expected	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Skate Species										
Clearnose skate	*Raja eglanteria*	Juvenile and Adult (uncommon)	**Direct impacts:** Juveniles and adult expected to avoid areas of noise and seek other nearby habitat. **Indirect impacts:** none expected. **Cumulative impacts:** potential noise from other construction projects; juveniles and adult expected to avoid areas of noise.	**Direct impacts:** sediment suspension during in-water construction will impact bottom water habitat. Juveniles and adults anticipated to seek other habitat nearby. Clearnose skate is uncommon and impacts dependent upon seasonal abundances. **Indirect impacts:** forage species displacement from sediment plumes created by in-water construction and maintenance activities. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.	**No impacts** expected; species is demersal.	**Direct impacts:** Potential impingement during barrier operations; barrier closures only occur during 100-year storm event, for 24 hour duration. Impacts are not anticipated to be widespread. **Indirect impacts:** None anticipated. **Cumulative Impacts:** Similar impacts as described for direct.	**Direct impacts:** not expected to be significant. Barrier closure during 100-year storm event, for 24 hour duration. **No indirect or cumulative impacts** expected.	**Direct impacts:** impacts to benthic habitat during construction of SSB and tide gates. Skate species are demersal and impacts to benthic habitat will displace individuals within active construction zones. Individuals are anticipated to seek other foraging habitat, then return when construction is completed. Impacts are expected to be localized. Mortality would be limited to individuals and unlikely; clearnose skate are uncommon. Maintenance impacts are similar if benthic disturbances occur. **Indirect impacts:** benthic prey species displacement. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	**Direct impacts:** impacts to benthic foraging habitat during construction of SSB and tide gates; clearnose skate is anticipated to seek other areas to forage. Maintenance associated with in-water measures is also anticipated to displace prey. **Indirect impacts:** benthic prey species habitat disturbance; leads to prey species displacement. Skate expected to find other locations with prey. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	**Direct Impacts:** Clearnose skate are not expected to be common in the Study Area. Localized construction impacts from suspended sediment and installation of hard-bottom structures. **Indirect Impacts:** Potential for forage organism displacement during installation of in-water structures; other foraging habitat will be available. Operations impacts are expected to benefit EFH by protecting from storm surge damage. **Cumulative Impacts:** None. A net benefit to EFH is expected.
Little skate	*Leucoraja erinacea*	Juvenile and Adult (uncommon)	**Direct impacts:** Juveniles and adult expected to avoid areas of noise and seek other nearby habitat. **Indirect impacts:** none expected. **Cumulative impacts:** potential noise from other construction	**Direct impacts:** sediment suspension during in-water construction will impact bottom water habitat. Juveniles and adults anticipated to seek other habitat nearby. Impacts to little skate are related to plumes caused by bottom-habitat disturbance.	**No impacts** expected; species is demersal.	**Direct impacts:** Potential impingement during barrier operations; barrier closures only occur during 100-year storm event, for 24 hour duration. Impacts are not anticipated to be widespread. **Indirect impacts:** None anticipated.	**Direct impacts:** not expected to be significant. Barrier closure during 100-year storm event, for 24 hour duration. **No indirect or cumulative impacts** expected.	**Direct impacts:** impacts to benthic habitat during construction of SSB and tide gates. Skate species are demersal and impacts to benthic habitat will displace individuals within active construction zones. Individuals are anticipated to seek other foraging habitat, then return when construction is completed. Impacts are expected to be localized. Mortality would be limited to individuals and unlikely; little skate is	**Direct impacts:** impacts to benthic prey are associated with benthic habitat disturbance during construction of SSB and tide gates; prey species mortality may occur, but is expected to be localized. Maintenance associated with in-water measures is also anticipated to displace prey. **Indirect impacts:** benthic prey species habitat disturbance; leads to prey species displacement. Skate are expected to find other locations with prey.	**Direct Impacts:** Little skate are not expected to be common in the Study Area. Localized construction impacts from suspended sediment and installation of hard-bottom structures. **Indirect Impacts:** Potential for forage organism displacement during installation of in-water structures; other foraging habitat will be available.

Common name	Scientific name	Life Stage Occurring in Study Area	Potential Stressor Caused by Activity							
			Underwater Noise	Water Quality/Turbidity/ Release	Vessel Traffic	Impingement/ Entrainment	Fish Passage	Benthic Disturbance	Impacts to Prey Species	Habitat Alterations
			projects; juveniles and adult expected to avoid areas of noise.	**Indirect impacts:** forage species displacement from sediment plumes created by in-water construction and maintenance activities. Skate species are expected to find other suitable habitat nearby. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.		**Cumulative Impacts:** Similar impacts as described for direct.		uncommon. Maintenance impacts are similar if benthic disturbances occur. **Indirect impacts:** benthic prey species displacement. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	**Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	Operations impacts are expected to benefit EFH by protecting from storm surge damage. **Cumulative Impacts:** None. A net benefit to EFH is expected.
Winter skate	*Leucoraja ocellata*	Juvenile and Adult	**Direct impacts:** Juveniles and adult expected to avoid areas of noise and seek other nearby habitat. **Indirect impacts:** none expected. **Cumulative impacts:** potential noise from other construction projects; juveniles and adult expected to avoid areas of noise.	**Direct impacts:** sediment suspension associated with bottom-habitat disturbance during in-water construction. Juveniles and adults anticipated to seek other habitat nearby. **Indirect impacts:** forage species displacement from sediment plumes created by in-water construction and maintenance activities. Skate species are expected to find other suitable habitat nearby. **Cumulative impacts:** Other construction projects are anticipated in the Study Area; BMPs employed to reduce turbidity.	**No impacts** expected; species is demersal.	**Direct impacts:** Potential impingement during barrier operations; barrier closures only occur during 100-year storm event, for 24 hour duration. Impacts are not anticipated to be widespread. **Indirect impacts:** None anticipated. **Cumulative Impacts:** Similar impacts as described for direct.	**Direct impacts:** not expected to be significant. Barrier closure during 100-year storm event, for 24 hour duration. **No indirect or cumulative impacts** expected.	**Direct impacts:** impacts to benthic habitat during construction of SSB and tide gates. Skate species are demersal and impacts to benthic habitat will displace individuals; impacts localized. Individuals are anticipated to seek other foraging habitat, then return when construction is completed. Mortality would be limited to individuals and unlikely. Maintenance impacts are similar if benthic disturbances occur. **Indirect impacts:** benthic prey species displacement during construction and maintenance activities. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	**Direct impacts:** impacts to benthic prey are associated with benthic habitat disturbance during construction of SSB and tide gates; prey species mortality may occur, but is expected to be limited. Maintenance associated with in-water measures is also anticipated to displace prey. **Indirect impacts:** benthic prey species habitat disturbance; leads to prey species displacement. Skate are expected to find other locations with prey. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	**Direct Impacts:** Localized construction impacts from suspended sediment and installation of hard-bottom structures. **Indirect Impacts:** Potential for forage organism displacement during installation of in-water structures; other foraging habitat will be available. Operations impacts are expected to benefit EFH by protecting from storm surge damage. **Cumulative Impacts:** None. A net benefit to EFH is expected.
Shark Species										
Blue shark	*Prionace glauca*	Neonate, Juvenile, and Adult (all rare)	Species occurs offshore; **no impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Common thresher shark	*Alopias vulpinus*	Neonate, Juvenile, and Adult (all rare)	Species occurs offshore; **no impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Dusky shark	*Carcharhinus obscurus*	Neonate, Juvenile, and Adult (all rare)	Species occurs offshore; **no impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Sand tiger shark	*Carcharias taurus*	Neonate, Juvenile, and Adult (all rare)	Species occurs offshore; **no impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Sandbar shark	*Carcharhinus plumbeus*	Neonate, Juvenile, and	Species occurs offshore; **no impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.

Common name	Scientific name	Life Stage Occurring in Study Area	Potential Stressor Caused by Activity							
			Underwater Noise	Water Quality/Turbidity/ Release	Vessel Traffic	Impingement/ Entrainment	Fish Passage	Benthic Disturbance	Impacts to Prey Species	Habitat Alterations
		Adult (all rare)								
Smoothbound shark complex (Atlantic stock)	*Mustelus spp.*	Neonate, Juvenile, and Adult (all rare)	Species occurs offshore; **no impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Spiny dogfish	*Squalus acanthias*	Neonate, Juvenile, and Adult (all rare)	Species occurs offshore; **no impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
White shark	*Carcharodon carcharias*	Neonate, Juvenile, and Adult (all rare)	Species occurs offshore; **no impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.
Invertebrate Species										
Longfin inshore squid	*Loligo pealeii*	Egg, juvenile, and adult.	Species is expected to avoid noise. **No impacts** are expected.	**Direct impacts:** species is slow moving and not readily able to avoid sediment plumes generated during in-water construction. Species is demersal so impacts would be associated with bottom-habitat disturbance. In-water maintenance activities also expected to generate turbidity, but will not occur as frequently as ongoing construction. **Indirect impacts:** potential for prey organism displacement from plumes generated during construction and maintenance activities.	**Direct impacts:** slow moving species not expected to avoid vessels, however species is demersal and not likely to be impacted. **Indirect and cumulative impacts:** none expected.	**Direct impacts:** Potential entrainment during construction; impacts are expected to be localized. **Indirect impacts:** None anticipated. **Cumulative Impacts:** Similar impacts as described for direct.	**Direct impacts:** not expected to be significant. Barrier closure during 100-year storm event, for 24 hour duration. **No indirect or cumulative impacts** expected.	**Direct impacts:** impacts to benthic habitat during construction of SSB and tide gates. Longfin inshore squid are demersal and impacts to benthic habitat will displace individuals; impacts localized. Mortality is possible because the species is slow-moving, however squid are only expected to occupy the Lower Bay and Rockaway areas. Maintenance impacts are similar if benthic disturbances occur. **Indirect impacts:** benthic prey displacement during construction and maintenance activities. **Cumulative impacts:** dependent upon other construction projects in the vicinity that disturb bottom habitat. Impacts are similar to those described above.	**Direct impacts:** impacts to prey would be associated with benthic disturbance that occurs during in-water construction and maintenance activities. Barrier operation could disturb benthic habitat, however this would be infrequent. **Indirect impacts:** prey habitat disturbance will displace prey organisms. Related to in-water activities. **Cumulative Impacts:** Similar impacts as described for direct.	**Direct impacts:** species is slow moving and demersal; benthic habitat replacement during installation of hard-bottom/in-water structures will disturb the species. Impacts will be localized. Suspended sediment may impact foraging; however, species is expected to exploit other available habitat. **Indirect impacts:** primarily associated with bottom-habitat conversion to hard-structure and subsequent removal of foraging habitat. Other habitat is widely available in the Study Area. Operations impacts are expected to benefit EFH by protecting from storm surge damage. Longfin inshore squid is somewhat structure oriented and installation of new in-water structures may benefit the species through the artificial reef effect. **Cumulative impacts:** None. A net benefit to EFH is expected.
Ocean quahog	*Artica islandica*	Adult.	**No impacts** expected.	**Direct impacts:** species is slow moving and will not avoid sediment plumes generated during in-water construction. Species is demersal so impacts would be associated with bottom-habitat disturbance. In-water maintenance activities expected to generate turbidity, but will not occur as frequently as ongoing construction. **Indirect impacts:** plumes/turbidity may displace phytoplankton.	**Direct impacts:** slow moving species not expected to avoid vessels, however species is demersal and no impacts are expected. **Indirect and cumulative impacts:** none expected.	**Direct impacts:** None anticipated. **Indirect impacts:** None anticipated. **Cumulative Impacts:** None.	**Direct impacts:** None. **No indirect or cumulative impacts** expected.	**Direct impacts:** impacts to benthic habitat during construction of SSB and tide gates will disturb, bury, or cause mortality to some individuals. Species is not widespread throughout the Study Area, so impacts are limited to locations in JB, Lower Bay, and Long Island Sound. However, the species is not common which reduces the likelihood of impacts. Maintenance impacts are similar if benthic disturbances occur. **Indirect impacts:** benthic prey displacement during construction and maintenance activities. **Cumulative impacts:** dependent upon other construction projects	**Direct impacts:** impacts to forage organisms would be associated with benthic disturbance that occurs during in-water construction and maintenance activities. Barrier operation could disturb benthic habitat, however this would be infrequent. **Indirect impacts:** habitat disturbance may displace forage organisms. Displacement would be relative to in-water construction; the ocean quahog is not common in the Study Area. **Cumulative Impacts:** Similar impacts as described for direct.	**Direct impacts:** species is very slow moving; benthic habitat replacement during installation of hard-bottom/in-water structures will disturb the species, or cause mortality. Impacts will be localized. Suspended sediment may impact foraging. However, species is not expected to be widely distributed or abundant in the Study Area. **Indirect impacts:** primarily associated with bottom-habitat conversion to hard-structure and subsequent removal of prey organism habitat. Other habitat is widely available in the Lower Bay area. Operations impacts are expected to benefit EFH by protecting from storm surge damage.

Common name	Scientific name	Life Stage Occurring in Study Area	Potential Stressor Caused by Activity							
			Underwater Noise	Water Quality/Turbidity/Release	Vessel Traffic	Impingement/Entrainment	Fish Passage	Benthic Disturbance	Impacts to Prey Species	Habitat Alterations
				Cumulative Impacts: Similar impacts as described for direct.				in the vicinity that disturb bottom habitat. Impacts are similar to those described above.		**Cumulative impacts:** None. A net benefit to EFH is expected.
Atlantic sea scallop	*Placopecten magellanicus*	All life stages (rare)	Species occurs in deep water and offshore; not expected to occur in Study Area. **No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.	**No impacts** expected.

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Attachment 1 – Summary Habitat Parameters for EFH-Designated Species in the Study Area

Species	Life Stage	Geographic Area	Temp (°C)	Salinity (‰)	Depth (m)	Seasonal Occurrence	Habitat Description	Comments
Atlantic cod	Eggs	GOME, GB, eastern portion of continental shelf off southern NE and following estuaries: Englishman/ Machias Bay to Blue Hill Bay; Sheepscot R., Casco Bay, Saco Bay, Great Bay, Mass Bay, Boston Harbor, Cape Cod Bay, Buzzards Bay	<12	32 - 33 (10 - 35)	<110	Begins in fall, peaks in winter and spring	Surface Waters	
	Larvae	GOME, GB, eastern portion of continental shelf off southern NE and following estuaries: Passamaquoddy Bay to Penobscot Bay; Sheepscot R., Casco Bay, Saco Bay, Great Bay, Mass Bay, Boston Harbor, Cape Cod Bay, Buzzards Bay	<10	32 - 33	30-70	Spring	Pelagic waters	
	Juveniles	GOME, GB, eastern portion of continental shelf off southern NE and following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay, Boston Harbor, Cape Cod Bay, Buzzards Bay	<20	30 - 35	25 - 75		Bottom habitats with a substrate of cobble or gravel	HAPC - An area approximately 300sq. nautical miles along the northern edge of GB and the Hague line containing gravel cobble substrate.
	Adults	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay, Boston Harbor, Cape Cod Bay, Buzzards Bay	<10	(29 - 34)	10-150		Bottom habitats with a substrate of rocks, pebbles, or gravel	(Major prey: fish crustaceans, decapods, amphipods)
	Spawning Adults	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and following estuaries: Englishman/ Machias Bay to Blue Hill Bay; Sheepscot R., Mass Bay, Boston Harbor, Cape Cod Bay, MA	<10	(10 - 35)	10-150	Spawn during fall, winter, and early spring	Bottom habitats with a substrate of smooth sand, rocks, pebbles, or gravel	
Atlantic herring	Eggs	GOME, GB and following estuaries: Englishman/ Machias Bay, Casco Bay, and Cape Cod Bay	<15	32 - 33	20 - 80	July through November	Bottom habitats with a substrate of gravel, sand, cobble, shell fragments & aquatic macrophytes. .	Eggs adhere to bottom forming extensive beds. Eggs most often found in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots (Egg beds can range from 4500 to 10,000 Km2 on GB. Eggs susceptible to suffocation from high densities and siltation)
	Larvae	GOME, GB, Southern NE and following estuaries: Passamaquoddy Bay to Cape Cod Bay, Narragansett Bay, & Hudson R./ Raritan Bay	<16	32	50 - 90	Between August and April, peaks from Sept. - Nov.	Pelagic waters	
	Juveniles	GOME, GB, Southern NE and Middle Atlantic south to Cape Hatteras and following estuaries: Passamaquoddy Bay to Cape Cod Bay; Buzzards Bay to Long Island Sound; Gardiners Bay to Delaware Bay	<10	26 - 32	15-135		Pelagic waters and bottom habitats	
	Adults	GOME, GB, southern NE and middle Atlantic south to Cape Hatteras and following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Cape Cod Bay; Buzzards Bay to Long Island Sound; Gardiners Bay to Delaware Bay; & Chesapeake Bay	<10	>28	20-130		Pelagic waters and bottom habitats	(Major prey: zooplankton)
	Spawning Adults	GOME, GB, southern NE and middle Atlantic south to Delaware Bay and Englishman/ Machias Bay Estuary	<15	32 - 33	20 - 80	July through November	Bottom habitats with a substrate of gravel, sand, cobble, and shell fragments, also on aquatic macrophytes	Herring eggs are spawned in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots
Monkfish	Eggs	GOME, GB, southern NE, middle Atlantic south to Cape Hatteras, North Carolina	<18		15- 1000	March to September	Surface waters	(Eggs contained in long mucus veils that float near or at the surface)
	Larvae	GOME, GB, southern NE, middle Atlantic south to Cape Hatteras, North Carolina	15		25-1000	March to September	Pelagic waters	
	Juveniles	Outer continental shelf in the middle Atlantic, mid-shelf off southern NE, all areas of GOME	<13	29.9-36.7	25-200		Bottom habitats with substrates of a sand-shell mix, algae covered rocks, hard sand, pebbly gravel, or mud	
	Adults	Outer continental shelf in the middle Atlantic, mid-shelf off southern NE, outer perimeter of GB, all areas of GOME	<15	29.9-36.7	25-200		Bottom habitats with substrates of a sand-shell mix, algae covered rocks, hard sand, pebbly gravel, or mud	(Major prey: fish, shrimp, squid, crustaceans, mollusks)
	Spawning Adults	Outer continental shelf in the middle Atlantic, mid-shelf off southern NE, outer perimeter of GB, all areas of GOME	<13	29.9-36.7	25-200	February to August	Bottom habitats with substrates of a sand-shell mix, algae covered rocks, hard sand, pebbly gravel, or mud	
Ocean pout	Eggs	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay and Cape Cod Bay	<10	32-34	<50	Late fall and winter	Bottom habitats, typically hard bottom sheltered nests, holes, or crevices where they are guarded by parents	(Eggs are laid in gelatinous masses and take 2-3 months to develop
	Larvae	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay and Cape Cod Bay	<10	>25	<50	Late fall to spring	Bottom habitats close to hard bottom nesting areas	

Species	Life Stage	Geographic Area	Temp (°C)	Salinity (‰)	Depth (m)	Seasonal Occurrence	Habitat Description	Comments
	Juveniles	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay, Boston Harbor and Cape Cod Bay	<14	>25	<80		Bottom habitats, often smooth bottom near rocks or algae	
	Adults	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay, Boston Harbor and Cape Cod Bay	<15	32 - 34	<110		Bottom habitats. (Dig depressions in soft sediments which are then used by other species)	(Major prey: mollusks, crustaceans, echinoderms, sand dollars)
	Spawning Adults	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay, and Cape Cod Bay	<10	32 - 34	<50	Late summer to early winter, peaks in Sept. and October	Bottom habitats with a hard bottom substrate, including artificial reefs and shipwrecks	(Internal fertilization)
Pollock	Eggs	GOME, GB and the following estuaries: Great Bay to Boston Harbor	<17	32 - 32.8	30-270	October to June, peaks in November to February	Pelagic waters	
	Larvae	GOME, GB and the following estuaries: Passamaquoddy Bay, Sheepscot R., Great Bay to Cape Cod Bay	<17		10-250	September to July, peaks from Dec. to February	Pelagic waters	(Migrate inshore as they grow)
	Juveniles	GOME, GB and the following estuaries: Passamaquoddy Bay to Saco Bay; Great Bay to Waquoit Bay; Long Island Sound, Great South Bay	<18	29 - 32	0 - 250		Bottom habitats with aquatic vegetation or a substrate of sand, mud, or rocks	(Intertidal zone may be important nursery area. Juveniles present in shallow intertidal zone at all tide stages throughout summer. Subtidal marsh creeks such as Little Egg Harbor, NJ are also seasonally important as nursery)
	Adults	GOME, GB, southern NE, and middle Atlantic south to New Jersey and the following estuaries: Passamaquoddy Bay, Damariscotta R., Mass Bay, Cape Cod Bay, Long Island Sound	<14	31 - 34	15-365		Hard bottom habitats including artificial reefs	(Major prey: crustaceans, fish, mollusks)
	Spawning Adults	GOME, southern NE, and middle Atlantic south to New Jersey includes Mass Bay	<8	32 - 32.8	15-365	September to April, peaks December to February	Bottom habitats with a substrate of hard, stony, or rocky bottom includes artificial reefs	
Red hake	Eggs	GOME, GB, continental shelf off southern NE, and middle Atlantic south to Cape Hatteras	<10	< 25		May to November, peaks in June and July	Surface waters of inner continental shelf	
	Larvae	GOME, GB, continental shelf off southern NE, and middle Atlantic south to Cape Hatteras and following estuaries: Sheepscot R., Mass Bay to Cape Cod Bay; Buzzards Bay, Narragansett Bay & Hudson R./ Raritan Bay	<19	>0.5	<200	May to December, peaks in Sept. and October	Surface waters	(Newly settled larvae need shelter, including live sea scallops, also use floating or mid-water objects for shelter)
	Juveniles	GOME, GB, continental shelf off southern NE, and middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Saco Bay; Great Bay, Mass Bay to Cape Cod Bay; Buzzards Bay to Conn. R.; Hudson R./ Raritan Bay, & Chesapeake Bay	<16	31 - 33	<100		Bottom habitats with substrate of shell fragments, including areas with an abundance of live scallops	
	Adults	GOME, GB, continental shelf off southern NE, and middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Saco Bay; Great Bay, Mass Bay to Cape Cod Bay; Buzzards Bay to Conn. R.; Hudson R./ Raritan, Delaware Bay, & Chesapeake Bay	<12	33 - 34	10-130		Bottom habitats in depressions with a substrate of sand and mud	(Major prey: fish and crustaceans)
	Spawning Adults	GOME, southern edge of GB, continental shelf off southern NE, and middle Atlantic south to Cape Hatteras and following estuaries: Sheepscott R., Mass Bay, Cape Cod Bay, Buzzards Bay, & Narragansett Bay	<10	>25	<100	May to November, peaks in June and July	Bottom habitats in depressions with a substrate of sand and mud	
Silver hake	Eggs	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Merrimack R. to Cape Cod Bay	<20		50-150	All year, peaks June to October	Surface waters	
	Larvae	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Mass Bay to Cape Cod Bay	<20		50-130	All year, peaks July to September	Surface waters	
	Juveniles	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Casco Bay, Mass Bay to Cape Cod Bay	<21	>20	20-270		Bottom habitats of all substrate types	
	Adults	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Casco Bay, Mass Bay to Cape Cod Bay	<22		30-325		Bottom habitats of all substrate types	
	Spawning Adults	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Mass Bay and Cape Cod Bay	<13		30-325		Bottom habitats of all substrate types	
Window-pane flounder	Eggs	GOME, GB, southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Delaware Inland Bays	<20		<70	February to November, peaks May and October in middle Atlantic July - August on GB	Surface waters	

Species	Life Stage	Geographic Area	Temp (°C)	Salinity (‰)	Depth (m)	Seasonal Occurrence	Habitat Description	Comments
	Larvae	GOME, GB, southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Delaware Inland Bays	<20		<70	February to November, peaks May and October in middle Atlantic July - August on GB	Pelagic waters	
	Juveniles	GOME, GB, southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Chesapeake Bay	<25	5.5 - 36	1 - 100		Bottom habitats with substrate of mud or fine-grained sand	
	Adults	GOME, GB, southern NE, middle Atlantic south to Virginia - NC border and the following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Chesapeake Bay	<26.8	5.5 - 36	1 - 75		Bottom habitats with substrate of mud or fine-grained sand	(Major prey: polychaetes, small crustaceans, mysids, small fish)
	Spawning Adults	GOME, GB, southern NE, middle Atlantic south to Virginia -NC border and the following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Delaware Inland Bays	<21	5.5 - 36	1 - 75	February - December, peak in May in middle Atlantic	Bottom habitats with substrate of mud or fine-grained sand	
Winter flounder	Eggs	GB, inshore areas of GOME, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Delaware Inland Bays	<10	10 - 30	<5	February to June, peak in April on GB	Bottom habitats with a substrate of sand, muddy sand, mud, and gravel	* On GB, eggs are typically found in water temp < 8EC, and < 90m deep.
	Larvae	GB, inshore areas of GOME, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Delaware Inland Bays	<15	4 - 30	<6	March to July, peaks in April and May on GB	Pelagic and bottom waters	* On GB, larvae are typically found in water temp < 8EC, and < 90m deep.
	Juveniles (age 1+)	GB, inshore areas of GOME, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Chincoteague Bay	<25	10 - 30	1 - 50		Bottom habitats with a substrate of mud or fine-grained sand	* Young-of-year exist where water temp <28, depths 0.1 - 10m, salinities 5 - 33 (major prey: amphipods, copepods, polychaetes, bivalve siphons)
	Adults	GB, inshore areas of GOME, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Chincoteague Bay	<25	15 - 33	1 - 100		Bottom habitats including estuaries with substrate of mud, sand, gravel	(Major prey: amphipods, polychaetes, bivalve siphons, crustaceans)
	Spawning Adults	GB, inshore areas of GOME, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Delaware Inland Bays	<15	5.5 - 36	<6*	February to June	Bottom habitats including estuaries with substrate of mud, sand, gravel	*Except on GB where they spawn as deep as 80m
Witch flounder	Eggs	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras	<13	High	Deep	March to October	Surface waters	
	Larvae	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras	<13	High	Deep	March to November, peaks in May - July	Surface waters to 250m	
	Juveniles	GOME, outer continental shelf from GB south to Cape Hatteras	<13	34 - 36	50-450 to 1500m		Bottom habitats with fine-grained substrate	(The upper slope is nursery area; major prey: crustaceans, polychaetes, mollusks)
	Adults	GOME, outer continental shelf from GB south to Chesapeake Bay	<13	32 - 36	25-300		Bottom habitats with fine-grained substrate	(Major prey: polychaetes, echinoderms, crustaceans, mollusks, squid)
	Spawning Adults	GOME, outer continental shelf from GB south to Chesapeake Bay	<15	32 - 36	25-360	March to November, peaks in May- August	Bottom habitats with fine-grained substrate	
Yellowtail flounder	Eggs	GB, Mass Bay, Cape Cod Bay, southern NE continental shelf south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Great Bay to Cape Cod Bay	<15	32.4 33.5	30 - 90	Mid-March to July, peaks in April to June in southern NE	Surface waters	
	Larvae	GB, Mass Bay, Cape Cod Bay, southern NE continental shelf, middle Atlantic south to Chesapeake Bay and the following estuaries: Passamaquoddy Bay to Cape Cod Bay	<17	32.4 33.5	10 - 90	March to April in New York bight; May to July in south NE and southeastern GB	Surface waters	(Largely an oceanic nursery)
	Juveniles	GB, GOME, southern NE continental shelf south to Delaware Bay and the following estuaries: Sheepscot R., Casco Bay, Mass Bay to Cape Cod Bay	<15	32.4 - 33.5	20 - 50		Bottom habitats with substrate of sand or sand and mud	
	Adults	GB, GOME, southern NE continental shelf south to Delaware Bay and the following estuaries: Sheepscot R., Casco Bay, Mass Bay to Cape Cod Bay	<15	32.4 -33.5	20 - 50		Bottom habitats with substrate of sand or sand and mud	(Major prey: annelids, arthropods, mollusks)
	Spawning Adults	GB, GOME, southern NE continental shelf south to Delaware Bay and the following estuaries: Mass Bay to Cape Cod Bay	<17	32.4 33.5	10-125		Bottom habitats with substrate of sand or sand and mud	
Atlantic Butterfish	Eggs	Over Continental shelf from GOME through Cape Hatteras, NC, also in estuaries from Mass Bay to Long Island Sound; Gardiners Bay, Great South Bay, and Chesapeake Bay	11 - 17	(25 - 33)	0-1829	(Spring and summer)	Pelagic waters	

Species	Life Stage	Geographic Area	Temp (°C)	Salinity (‰)	Depth (m)	Seasonal Occurrence	Habitat Description	Comments
	Larvae	Over Continental shelf from GOME through Cape Hatteras, NC, also in estuaries from Boston Harbor, Waquoit Bay to Long Island Sound; Gardiners Bay to Hudson R./ Raritan Bay; Delaware Bay and Chesapeake Bay	9 - 19	(6.4 - 37)	10-1829	(Summer and fall)	Pelagic waters	
	Juveniles	Over Continental shelf from GOME through Cape Hatteras, NC also in estuaries from Mass Bay, Cape Cod Bay to Delaware Inland Bays; Chesapeake Bay, York R. and James R.	3 - 28	(3 - 37)	10-365 (most <120)	(Winter - shelf spring to fall - estuaries)	Pelagic waters (larger individuals found over sandy and muddy substrates)	(Pelagic schooling - smaller individuals associated with floating objects including jellyfish)
	Adults	Over Continental shelf from GOME through Cape Hatteras, NC, also in estuaries from Mass Bay, Cape Cod Bay to Hudson R./ Raritan Bay; Delaware Bay and Inland Bays; York R. and James R.	3 - 28	(4 - 26)	10-365 (most <120)	(Winter - shelf summer to fall - estuaries)	Pelagic waters (schools form over sandy, sandy-silt and muddy substrates)	(Common in inshore areas and surf zone; prey: planktonic, thaliacians, squid, copepods)
Atlantic mackerel	Eggs	Continental Shelf from Maine through Cape Hatteras, NC also includes estuaries from Great Bay to Cape Cod Bay; Buzzards Bay to Long Island Sound; Gardiners Bay and Great South Bay	5-23	(18 - >30)	0 - 15		Pelagic waters	(Peak spawning in salinities >30ppt)
	Larvae	Continental Shelf from GOME through Cape Hatteras, NC also includes estuaries from Great Bay to Cape Cod Bay; Narragansett Bay to Long Island Sound; Gardiners Bay and Great South Bay	6-22	(>30)	10-130		Pelagic waters	
	Juveniles	Continental Shelf from GOME through Cape Hatteras, NC also includes estuaries from Passamaquoddy Bay; Penobscot Bay to Saco Bay; Great Bay; Mass Bay to Cape Cod Bay; Narragansett Bay, Long Island Bay; Gardiners Bay to Hudson R./ Raritan Bay	4 - 22	(>25)	0 - 320		Pelagic waters	
	Adults	Continental Shelf from GOME through Cape Hatteras, NC also includes estuaries from Passamaquoddy Bay to Saco Bay; Mass Bay to Long Island Bay; Gardiners Bay to Hudson R./ Raritan Bay	4 - 16	(>25)	0 - 380		Pelagic waters	(Opportunistic feeding: can filter feed or select individual prey. Major prey: crustaceans, pelagic mollusks, polychaetes, squid, fish)
Spanish Mackerel	Eggs	GOM: all estuaries; Atlantic: sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf Stream shoreward, including Sargassum.				Spawn April-September	Estuaries, south Atlantic and mid-Atlantic bights	
	Larvae	GOM: all estuaries; Atlantic: sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf Stream shoreward, including Sargassum.					Estuaries, south Atlantic and mid-Atlantic bights	
	Juveniles	GOM: all estuaries; Atlantic: sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf Stream shoreward, including Sargassum.					Estuaries, south Atlantic and mid-Atlantic bights	
	Adults	GOM: all estuaries; Atlantic: sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf Stream shoreward, including Sargassum.		<20	0-183	Winter in Florida, move Northward to NC in early Spring, NY for Summer	Estuaries, south Atlantic and mid-Atlantic bights	Migrate as seasons and temperatures change. Two distict populations-one in Atlantic and one in Gulf of Mexico
Black sea bass	Eggs	Continental Shelf and estuaries from southern NE to North Carolina, also includes Buzzards Bay			0 - 200	May to October	Water column of coastal Mid-Atlantic Bight and Buzzards Bay	
	Larvae	Pelagic waters over Continental Shelf from GOME to Cape Hatteras, NC, also includes Buzzards Bay	(1126)	(30 - 35)	(<100)	(May - Nov, peak Jun - Jul)	Habitats for transforming (to juveniles) larvae are near coastal areas and into marine parts of estuaries between Virginia and NY. When larvae become demersal, found on structured inshore habitat such as sponge beds.	
	Juveniles	Demersal waters over Continental Shelf from GOME to Cape Hatteras, NC, also includes estuaries from Buzzards Bay to Long Island Sound; Gardiners Bay, Barnegat Bay to Chesapeake Bay; Tangier/ Pocomoke Sound and James River	>6	>18	(1 - 38)	Found in coastal areas (Apr -Dec, peak Jun - Nov) between VA and MA, but winter offshore from NJ and south; Estuaries in summer and spring	Rough bottom, shellfish and eelgrass beds, manufactured structures in sandy-shelly areas, offshore clam beds and shell patches may be used during wintering	(YOY use salt marsh edges and channels; high habitat fidelity)
	Adults	Demersal waters over Continental Shelf from GOME to Cape Hatteras, NC, also includes estuaries: Buzzards Bay, Narragansett Bay, Gardiners Bay, Great South Bay, Barnegat Bay to Chesapeake Bay; Tangier/ Pocomoke Sound and James River	>6	(>20)	(20- 50)	Wintering adults (Nov. to April) offshore, south of NY to NC Inshore, estuaries from May to October	Structured habitats (natural & manufactured) sand and shell substrates preferred	(Spawn in coastal bays but not estuaries; change sex to males with growth; prey: benthic and near bottom inverts, small fish, squid)

Species	Life Stage	Geographic Area	Temp (°C)	Salinity (‰)	Depth (m)	Seasonal Occurrence	Habitat Description	Comments
Bluefish	Eggs	North of Cape Hatteras, found over Continental Shelf from Montauk Point, NY south to Cape Hatteras, South of Cape Hatteras, found over Continental Shelf through Key West, Florida	>18	>31ppt	Mid-shelf depths	April to August	Pelagic waters	*No EFH designation inshore
	Larvae	North of Cape Hatteras, found over Continental Shelf from Montauk Point, NY south to Cape Hatteras, South of Cape Hatteras, found over Continental Shelf through Key West, Florida, the slope sea, and Gulf Stream between latitudes 29N and 40N; includes the following estuaries: Narragansett Bay	>18	>30ppt	>15	April to September	Pelagic waters	No EFH designation inshore for larvae
	Juveniles	North of Cape Hatteras, found over Continental Shelf from Nantucket Island, MA south to Cape Hatteras, South of Cape Hatteras, found over Continental Shelf through Key West, Florida, the slope sea, and Gulf Stream between latitudes 29N and 40N also includes estuaries between Penobscot Bay to Great Bay; Mass Bay to James R.; Albemarie Sound to St. Johns River, FL	(1924)	(23 - 36) freshwater zone in Albemarie Sound		North Atlantic estuaries from June to October Mid-Atlantic estuaries from May to October South Atlantic estuaries from March to December	Pelagic waters	(Use estuaries as nursery areas; can intrude into areas with salinities as low as 3 ppt)
	Adults	North of Cape Hatteras, found over Continental Shelf from Cape Cod Bay, MA south to Cape Hatteras, South of Cape Hatteras, found over Continental Shelf through Key West, Florida also includes estuaries between Penobscot Bay to Great Bay; Mass Bay to James R.; Albemarie Sound to Pamilco/ Pungo R., Bougue Sound, Cape Fear R., St. Helena Sound, Broad R., St. Johns R., & Indian R.	(14-16)	>25ppt		North Atlantic estuaries from June to October Mid-Atlantic estuaries from April to October South Atlantic estuaries from May to January	Pelagic waters	Highly migratory (major prey: fish)
Scup	Eggs	Southern NE to coastal Virginia includes the following estuaries: Waquoit Bay to Long Island Sound; Gardiners Bay, Hudson R./ Raritan Bay	13 - 23	>15	(<30)	May - August	Pelagic waters in estuaries	
	Larvae	Southern NE to coastal Virginia includes the following estuaries: Waquoit Bay to Long Island Sound; Gardiners Bay, Hudson R./ Raritan Bay	13 - 23	>15	(<20)	May - September	Pelagic waters in estuaries	
	Juveniles	The Continental Shelf from GOME to Cape Hatteras, NC includes the following estuaries: Mass Bay, Cape Cod Bay to Long Island Sound; Gardiners Bay to Delaware Inland Bays; & Chesapeake Bay	>7	>15	(0 - 38)	Spring and summer in estuaries and bays	Demersal waters north of Cape Hatteras and Inshore on various sands, mud, mussel, and eelgrass bed type substrates	
	Adults	The Continental Shelf from GOME to Cape Hatteras, NC includes the following estuaries: Cape Cod Bay to Long Island Sound; Gardiners Bay to Hudson R./ Raritan Bay; Delaware Bay & Inland Bays; & Chesapeake Bay	>7	>15	(2 -185)	Wintering adults (November April) are usually offshore, south of NY to NC	Demersal waters north of Cape Hatteras and Inshore estuaries (various substrate types)	(Spawn < 30m during inshore migration - May - Aug; prey: small benthic inverts)
Summer flounder	Eggs	Over Continental Shelf from GOME to Cape Hatteras, NC; South of Cape Hatteras to Florida			30-70 fall; 110 winter; 9-30 spring	October to May	Pelagic waters, heaviest concentrations within 9miles of shore off NJ and NY	
	Larvae	Over Continental Shelf from GOME to Cape Hatteras, NC; South of Cape Hatteras to Florida; also includes estuaries from Waquoit Bay to Narragansett Bay; Hudson River/ Raritan Bay; Barnegat Bay, Chesapeake Bay, Rappahannock R., York R., James R., Albemarie Sound, Pamlico Sound, Neuse R. to Indian R.	(9 - 12)	(23-33) Fresh in Hudson R. Raritan Bay area	10-70	mid-Atlantic Bight from Sept. to Feb.; Southern part from Nov. to May at depths 9-30m	Pelagic waters, larvae most abundant 19 83km from shore; Southern areas 12 - 52 miles from shore	(High use of tidal creeks and creek mouths)
	Juveniles	Over Continental Shelf from GOME to Cape Hatteras, NC; South of Cape Hatteras to Florida; also includes estuaries from Waquoit Bay to James R.; Albemarle Sound to Indian R.	>11	10 -30 Fresh in Narrag. Bay, Albem/ Pamlico Sound, & St. Johns R.	(0.5-5) in estuary		Demersal waters, muddy substrate but prefer mostly sand; found in the lower estuaries in flats, channels, salt marsh creeks, and eelgrass beds	HAPC - All native species of macroalgae, seagrasses and freshwater and tidal macrophytes in any size bed as well as loose aggregations, within adult and juvenile EFH. (Major prey: mysid shrimp)
	Adults	Over Continental Shelf from GOME to Cape Hatteras, NC; South of Cape Hatteras to Florida; also includes estuaries from Buzzards Bay, Narragansett Bay, Conn. R. to James R.; Albemarle Sound to Broad R.; St. Johns R., & Indian R.		Fresh in Albemarie Sound, Pamlico Sound, & St. Johns R	(0 - 25)	Inhabit shallow coastal and estuarine waters during warmer months and move offshore on outer Continental Shelf at depths of 150m in colder months	Demersal waters and estuaries	HAPC - All native species of macroalgae, seagrasses and freshwater and tidal macrophytes in any size bed as well as loose aggregations, within adult and juvenile EFH. (Major prey: fish, shrimp, squid, polychaetes)
Atlantic sea scallop	Eggs	GOME, GB, southern NE, and middle Atlantic south to Virginia- North Carolina border and following estuaries: Passamaquoddy Bay to Sheepscot R.; Casco Bay, Mass Bay, and Cape Cod Bay	<17			May through October Peaks in May and June in middle Atlantic area, and in Sept. and Oct. on GB and GOME	Bottom habitats	Eggs remain on sea floor until they develop into the first free-swimming larval stage.
	Larvae	GOME, GB, southern NE, and middle Atlantic south to Virginia- North Carolina border and following estuaries: Passamaquoddy Bay to Sheepscot R.; Casco Bay, Mass Bay, and Cape Cod Bay	<18	16.9 - 30			Pelagic waters and bottom habitats with a substrate of gravelly sand, shell fragments, pebbles, or on various red algae, hydroids, amphipod tubes and bryozoans	
	Juveniles	GOME, GB, southern NE, and middle Atlantic south to Virginia- North Carolina border and following estuaries: Passamaquoddy Bay to Sheepscot R.; Casco Bay, Great Bay, Mass Bay, and Cape Cod Bay	<15		18-110		Bottom habitats with a substrate of cobble, shells, and silt	(Prey: filter feeders on phytoplankton; preferred substrates are associated with low concentrations of inorganics for optimal feeding)

Species	Life Stage	Geographic Area	Temp (°C)	Salinity (‰)	Depth (m)	Seasonal Occurrence	Habitat Description	Comments
	Adults	GOME, GB, southern NE, and middle Atlantic south to Virginia- North Carolina border and following estuaries: Passamaquoddy Bay to Sheepscot R.; Casco Bay, Great Bay, Mass Bay, and Cape Cod Bay	<21	>16.5	18-110		Bottom habitats with a substrate of cobble, shells, coarse/gravelly sand, and sand	
	Spawning Adults	GOME, GB, southern NE, and middle Atlantic south to Virginia- North Carolina border and following estuaries: Passamaquoddy Bay to Sheepscot R.; Casco Bay, Mass Bay, and Cape Cod Bay	<16	>16.5	18-110	May through October, peaks in May and June in middle Atlantic area, and in Sept. and Oct. on GB and in GOME	Bottom habitats with a substrate of cobble, shells, coarse/gravelly sand, and sand	
Longfin inshore squid	Eggs	Newfoundland south to Cape Hatteras, on continental shelf and upper slope	10-23 (>8)	30-32	<50		commonly found on sandy/mud bottom; usually attached to rocks/boulders, pilings, or algae such as *Fucus*, *Ulva lactuca*, *Laminaria* and *Porphyra* sp.	
	Larvae	Newfoundland south to Cape Hatteras, on continental shelf and upper slope	10-26	31.5-34		coastal, surface waters in spring, summer, and fall	Hatchlings found in surface waters day and night, move deeper in water column as they grow larger.	
	Juveniles	Newfoundland south to Cape Hatteras, on continental shelf and upper slope.		31.5-34	50-100			
	Adults	Newfoundland south to Cape Hatteras, on continental shelf and upper slope.	8-21		<400	Most abundant inshore March – October; spawn April-November	Mud or sandy mud	
Ocean quahog	Eggs	Eastern edge of GB and GOME throughout the Atlantic EEZ	14-18		<40			
	Larvae	Eastern edge of GB and GOME throughout the Atlantic EEZ	14-18		<40			Medium to fine grain sand, sandy mud, silty sand
	Juveniles	Eastern edge of GB and GOME throughout the Atlantic EEZ	<18	(>25)	8-245		Throughout substrate to a depth of 3ft within Federal waters, occurs progressively further offshore between Cape Cod and Cape Hatteras	(Medium to fine grained sands, sandy mud, silty sand)
	Adults	Eastern edge of GB and GOME throughout the Atlantic EEZ	<18	(>25)	8 -245	(spawn May-Dec with several peaks)	Throughout substrate to a depth of 3ft within Federal waters, occurs progressively further offshore between Cape Cod and Cape Hatteras	(Medium to fine grained sands, sandy mud, silty sand; earliest age of maturity 7 yrs, avg 13 yrs; suspension feeders on phytoplankton)
Bluefin tuna	Juveniles	The continental shelf from the outer extent of the U.S. EEZ on Georges Bank to Cape Lookout.	4-26		<20		Coastal and pelagic habitats of the Mid-Atlantic Bight.	
Skipjack tuna	Eggs	Offshore waters in the Gulf of Mexico to the EEZ and portions of the Florida Straits	20-31					
	Larvae	Offshore waters in the Gulf of Mexico to the EEZ and portions of the Florida Straits	20-31					
	Juveniles	Pelagic habitats seaward of the continental shelf break between the seaward extent of the U.S. EEZ boundary on Georges Bank (off Massachusetts); coastal and offshore habitats between Massachusetts and South Carolina; localized in areas off Georgia and South Carolina; and from the Blake Plateau through the Florida Straits. Offshore waters in the central Gulf of Mexico from Texas through the Florida Panhandle.	20-31		>20			
	Adults	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; the Blake Plateau and in the Florida Straits through the Florida Keys; central Gulf of Mexico, offshore in pelagic habitats seaward of the southeastern edge of the West Florida Shelf to Texas	20-31				Subtropical waters spawn spring to early fall	
Clearnose skate	Juveniles	Coastal and inner continental shelf waters from New Jersey to the St. Johns River in Florida (including Hudson River/Raritan Bay, Barnegat Bay, New Jersey Inland Bays, Delaware Bay, Delaware Inland Bays, Maryland Inland Bays, Chincoteague Bay, and Chesapeake Bay)	9-30		<30		Sub-tidal benthic habitats (mud, sand, gravel, and rock bottoms)	Typically prefer higher salinity zones
	Adults	Coastal and inner continental shelf waters from New Jersey to Cape Hatteras (including Hudson River/Raritan Bay, Barnegat Bay, New Jersey Inland Bays, Delaware Bay, Delaware Inland Bays, Maryland Inland Bays, Chincoteague Bay, and Chesapeake Bay)	9-30		<40		Sub-tidal benthic habitats (mud, sand, gravel, and rock bottoms)	Typically prefer higher salinity zones

Species								
Little skate	Juveniles	Coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank (including estuaries and embayments from Maine to Maryland)	1-21	>15	<80		Intertidal and sub-tidal (sand, gravel, mud)	
	Adults	Coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank (including estuaries and embayments from Maine to Maryland)	1-21	>15	<100		Intertidal and sub-tidal (sand, gravel, mud)	
Winter skate	Juveniles	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 (including estuaries and embayments from Maine to Maryland)	-1.2-19	28-35	<90		Sub-tidal benthic habitats (sand, gravel, mud)	Typically prefer higher salinity zones
	Adults	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 (including estuaries and embayments from Maine to Maryland)	-1.2-19	30-36	<80		Sub-tidal benthic habitats (sand, gravel, mud)	Typically prefer higher salinity zones
Common thresher shark	Neonate	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	18.2-20.9		4.6-13.7			
	Juvenile	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	18.2-20.9		4.6-13.7			
	Adult	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	18.2-20.9		4.6-13.7			
Dusky shark	Neonate	Offshore areas of southern New England to Cape Lookout, North Carolina	18.1-22.2	25-35	4.3-15.5		Coastal nursery waters, but rarely enter estuaries	Seaward extent of EFH for this life stage in the Atlantic is 60m in depth
	Juvenile	Continental shelf break from Cape Cod to Georgia, southern Georges Bank from Nantucket Shoals, and the Great South Channel to the eastern boundary of the U.S. EEZ, offshore Gulf of Mexico			< 200			
	Adult	Continental shelf break from Cape Cod to Georgia, southern Georges Bank from Nantucket Shoals, and the Great South Channel to the eastern boundary of the U.S. EEZ, offshore Gulf of Mexico			< 200			
Sand tiger shark	Neonate	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	19-25	23-30	2.8-7		Sand and mud areas	Mid-Atlantic Bight estuaries used as nursery areas: Chesapeake, Delaware, Sandy Hook, and Narragansett Bays as well as coastal sounds
	Juvenile	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	19-27	30-31	8.2-13.7		Rocky and mud substrate or areas that contain benthic structure	
	Adult	In the Atlantic along the mid-east coast of Florida (Cape Canaveral) through Delaware Bay	17-23		<200	In North America, gives birth in March and April to two young		
Sandbar shark	Neonate	Coastal areas from Long Island, NY to Cape Lookout, North Carolina, and from Charleston, South Carolina to Amelia Island, Florida (including Delaware Bay, Chesapeake Bay, Great Bay, and the waters off Cape Hatteras)	15-30	15-35	0.8-23		Sand, mud, shell, and rocky sediments	
	Juvenile	Coastal portions of the Atlantic Ocean between southern New England (Nantucket Sound, Massachusetts) and Georgia (including Delaware Bay, Chesapeake Bay, Great Bay, and the waters off Cape Hatteras)	15-30	15-35	0.8-23		Sand, mud, shell, and rocky sediments	
	Adult	Coastal areas from southern New England to the Florida Keys, ranging from inland waters of Delaware Bay and the mouth of Chesapeake Bay to the continental shelf break			<200	Peak mating April to July, average 8 pups		
Smooth-hound shark complex	Neonate	Atlantic Ocean from Massachusetts to northern Argentina	6-27		<200		Mid-Atlantic Bight estuaries are important nursery areas	
	Juvenile	Atlantic Ocean from Massachusetts to northern Argentina	6-27		<200			
	Adult	Atlantic Ocean from Massachusetts to northern Argentina	6-27		<200	Give birth June-July		Primarily feed on large crustaceans and small bony fish

Species			Temp		Depth			
Spiny dogfish	Juveniles	GOME through Cape Hatteras, NC across the Continental Shelf; Continental Shelf waters South of Cape Hatteras, NC through Florida; also includes estuaries from Passamaquaddy Bay to Saco Bay; Mass Bay & Cape Cod Bay	3 - 28		10-390		Continental Shelf waters and estuaries	
	Adults	GOME through Cape Hatteras, NC across the Continental Shelf; Continental Shelf waters South of Cape Hatteras, NC through Florida; also includes estuaries from Passamaquaddy Bay to Saco Bay; Mass Bay & Cape Cod Bay	3 - 28	(30 - 32)	10-450		Continental Shelf waters and estuaries	(Major prey: crabs, eels, small fish)
	Spawning Adults	GOME through Cape Hatteras, NC across the Continental Shelf; Continental Shelf waters South of Cape Hatteras, NC through Florida; also includes estuaries from Passamaquaddy Bay to Saco Bay; Mass Bay & Cape Cod Bay			41-400		Outer continental shelf, pelagic or demersal	
White shark	Neonate	Inshore waters out to 105 km from Cape Cod, Massachusetts, to an area offshore of Ocean City, New Jersey			<100			
	Juvenile	Inshore waters to habitats 105 km from shore, from Cape Ann, Massachusetts, including parts of the GOME, to Long Island, NY, and from Jacksonville to Cape Canaveral, Florida	9-28		<100		Continental Shelf waters between coastal Massachusetts and the Mid-Atlantic Bight are important nursery waters	
	Adult	Inshore waters to habitats 105 km from shore, from Cape Ann, Massachusetts, including parts of the GOME, to Long Island, NY, and from Jacksonville to Cape Canaveral, Florida	9-28		<100			
Blue Shark	Neonate	In the Atlantic in areas offshore of Cape Cod through New Jersey, seaward of the 30m bathymetric line (and excluding inshore waters such as Long Island Sound). EFH follows the continental shelf south of GB to the outer extent of the U.S. EEZ in the GOME						
	Juvenile	Localized areas in the Atlantic Ocean in the GOME, from GB to North Carolina, South Carolina, Georgia, and off Florida.						
	Adult	Localized areas in the Atlantic Ocean in the GOME, from GB to North Carolina, South Carolina, Georgia, and off Florida	7-16		≥ 350			

All information presented is part of the Regional Fishery Management Council's EFH designations except for that contained within ( ) which is provided as important additional ecological information. Definitions: GOME - Gulf of Maine; GB - George's Bank; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year