APPENDIX A

NEW YORK STATE MAPPED FRESHWATER WETLANDS IN THE STUDY AREA

Table A-1. New York State Freshwater Wetlands Mapped for the Barrier Islands[1]

ID	Classification	Acreage
Q-18	2	3.7
Q-15	2	6.7
Q-14	2	6.4
Q-9	1	1.0
HP-5	1	42.0
HP-4	1	170.0
S-12	2	11.4
S-5	2	17.3
S-11	2	12.7
BE-17	2	25.3
BE-22	2	5.8
BE-21	2	5.2
BE-20	2	0.8
BE-19	2	35.8
BE-18	2	5.0
BE-16	2	43.3
	Total	**392.4**

[1] Includes all New York State Freshwater Wetland areas mapped within the marine beach, dunes and swales, terrestrial uplands, and bayside beach habitat types.

Source: New York State Freshwater Wetland GIS Coverage; New York State Department of Environmental Conservation, New York State Regulatory Freshwater Wetlands For Suffolk County , 1999

Snapshot Example of New York State Mapped Freshwater Wetlands on Fire Island Barrier Island

Table A-2. New York State Freshwater Wetlands Mapped for the Mainland Upland

ID	Classification	Acreage[1]	Mainland Upland Habitat Acreage[2]
B-11	2	14.8	11.7
B-12	1	32.9	26.9
B-2	1	1065.3	372.9
B-21	2	15.0	12.2
B-3	1	131.7	19.8
B-4	1	59.1	19.9
B-5	1	157.3	97.6
B-6	1	11.2	9.1
B-7	1	44.8	37.6
B-8	1	36.2	28.2
B-9	2	112.6	98.8
BE-10	1	10.2	7.1
BE-11	1	59.4	49.9
BE-12	1	65.4	58.9
BE-13	1	130.4	171.7
BE-14	2	16.5	14.3
BE-15	1	206.4	183.0
BE-23	2	8.8	7.2
BE-24	2	3.0	2.3
BE-25	2	11.9	9.9
BE-26	2	25.0	17.6
BE-27	1	23.5	17.9
BE-28	2	3.3	2.3
BE-30	2	6.5	5.2
BE-31	1	12.7	9.6
BE-32	2	1.7	1.1
BE-33	2	2.1	1.2
BE-5	1	126.5	11.1
BE-8	1	46.3	40.0
BE-9	1	64.7	51.2
BW-1	1	515.9	2.0
BW-10	1	3.3	2.2
BW-11	2	21.1	14.4
BW-15	2	4.0	2.5
BW-18	1	6.3	4.8
BW-19	2	0.8	0.5
BW-2	1	172.1	1.6
BW-20	2	37.6	30.0
BW-21	2	6.8	5.5

ID	Classification	Acreage[1]	Mainland Upland Habitat Acreage[2]
BW-5	1	41.3	0.4
BW-6	2	16.7	0.0
BW-7	1	160.1	117.5
BW-9	2	13.0	6.5
C-3	1	745.2	1.9
C-8	2	82.9	14.2
E-1	1	17.0	9.5
E-10	1	12.5	9.5
E-11	1	26.6	22.3
E-12	1	39.3	1.8
E-13	1	11.8	9.8
E-14	1	11.8	8.5
E-15	1	12.8	8.6
E-18	2	9.2	7.6
E-19	1	15.1	10.9
E-2	1	78.4	2.9
E-3	1	38.0	5.0
E-5	1	22.2	8.5
E-6	1	24.3	20.0
E-7	1	31.4	25.4
E-8	1	11.1	8.4
E-9	1	3.1	2.1
EH-11	1	10.7	8.8
EH-12	1	13.6	10.8
EH-19	1	7.9	6.6
EH-20	2	2.7	2.1
EH-21	2	4.6	3.6
EH-22	2	10.2	8.7
EH-23	3	2.3	1.5
EH-24	1	3.5	2.1
EH-25	1	2.6	1.8
EH-29	1	2.9	1.8
EH-3	1	150.4	132.8
EH-30	1	2.0	1.5
EH-31	1	3.6	2.4
EH-32	1	2.8	1.7
EH-34	2	3.8	3.0
EH-4	1	54.3	48.6
EH-5	2	8.6	6.8
GE-4	1	8.3	6.1
GE-41	2	1.1	0.7
GE-5	1	22.3	10.1
GE-6	1	3.4	2.3

ID	Classification	Acreage[1]	Mainland Upland Habitat Acreage[2]
HP-1	1	4.4	3.1
HP-2	1	9.2	6.8
HP-3	1	19.7	14.9
M-1	2	28.8	23.2
M-10	1	13.7	9.0
M-11	1	30.8	23.4
M-12	1	15.5	10.2
M-13	1	16.6	8.9
M-14	1	9.7	7.3
M-15	1	5.6	3.7
M-16	1	14.2	10.9
M-17	2	3.7	2.8
M-18	1	2.1	1.4
M-19	1	10.0	6.7
M-2	2	7.7	4.2
M-20	1	97.4	65.5
M-33	2	13.0	9.5
M-37	1	2.6	1.9
M-4	2	34.9	24.7
M-45	2	0.7	0.3
M-46	2	1.8	0.8
M-47	2	1.0	0.5
M-48	2	6.6	4.5
M-49	2	10.9	6.8
M-50	2	2.1	1.4
M-51	2	1.5	0.3
M-52	2	1.6	1.0
M-53	2	1.2	0.6
M-54	2	49.0	31.9
M-59	2	4.6	3.3
M-61	2	1.3	0.8
M-7	1	71.2	14.2
M-8	1	62.3	20.1
M-9	1	116.3	101.1
MP-13	1	102.1	1.8
MP-14	1	129.1	80.0
MP-15	1	21.8	16.8
MP-16	1	42.6	34.6
MP-17	1	61.0	45.8
MP-19	3	26.0	21.2
MP-20	1	112.3	105.8
MP-28	1	5.1	3.5
MP-29	1	11.1	6.9

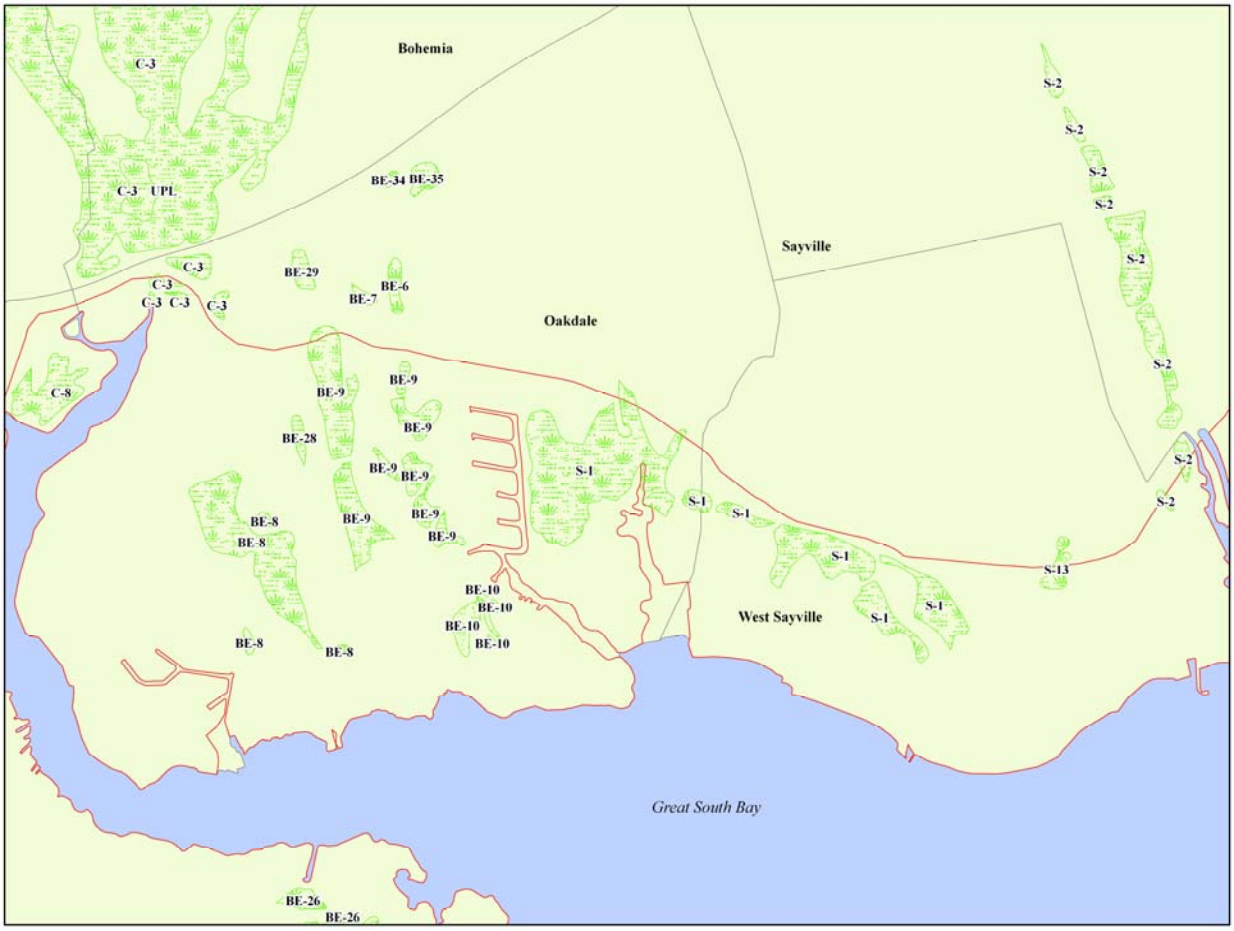
ID	Classification	Acreage[1]	Mainland Upland Habitat Acreage[2]
MP-30	1	81.9	50.7
MP-31	1	25.9	18.7
MP-35	3	0.7	0.4
MP-38	1	1.3	0.7
MP-39	1	20.7	16.7
MP-43	2	4.1	2.9
MP-44	2	4.8	3.7
MP-45	2	1.4	1.0
MP-6	1	26.7	20.2
MP-7	1	47.9	42.7
MP-8	1	62.1	45.4
NA-3	1	15.3	2.8
NA-4	3	4.6	3.0
NA-5	1	7.2	4.9
NA-6	3	120.6	95.5
NA-7	1	8.2	5.7
NA-8	3	17.7	5.5
P-2	1	232.7	6.1
P-5	1	71.3	10.7
P-6	1	20.5	10.1
P-9	1	15.6	11.8
Q-10	2	21.0	1.2
Q-11	2	2.8	2.0
Q-2	1	27.3	21.5
Q-20	2	6.2	3.1
Q-3	1	5.7	3.5
Q-4	1	1.9	1.3
Q-5	1	14.6	3.7
Q-6	1	12.1	3.8
Q-7	1	5.5	3.6
Q-8	1	15.3	2.1
S-1	1	132.7	113.6
S-10	2	0.9	0.5
S-13	2	5.3	2.3
S-14	2	3.1	2.0
S-15	2	6.5	4.7
S-16	2	1.0	0.6
S-2	1	47.8	1.4
S-3	1	46.0	3.7
S-4	1	119.4	32.6
S-6	1	7.7	5.5
S-7	1	3.7	2.8
S-8	2	3.1	2.3

ID	Classification	Acreage[1]	Mainland Upland Habitat Acreage[2]
S-9	1	12.9	9.5
SA-10	1	15.8	13.1
SA-11	1	12.5	10.4
SA-12	1	14.0	11.9
SA-13	1	20.8	17.6
SA-14	1	32.4	23.0
SA-15	1	11.9	10.0
SA-38	1	35.9	3.0
SA-40	1	8.7	6.1
SA-41	2	12.1	9.1
SA-42	1	6.3	4.4
SA-44	1	4.6	3.4
SA-45	1	5.2	4.1
SA-46	3	7.7	5.7
SA-48	2	0.9	0.6
SA-51	2	0.9	0.6
SA-61	2	4.9	3.8
SA-63	2	4.0	2.7
SA-64	2	1.4	0.9
SA-7	1	94.0	83.5
SA-8	1	134.3	122.8
SA-89	2	11.1	8.2
SA-93	2	2.2	1.6
SH-6	3	68.4	62.3
SI-1	1	21.0	17.5
SI-2	1	18.7	15.6
SI-3	1	19.7	15.7
SI-4	1	22.6	16.8
SI-5	2	2.8	2.1
SI-6	2	4.2	3.2
	Total	**8094.0**	**3832.9**

[1] Total acreage of the polygon for the identified wetland.
[2] Acreage of the portion of the wetland that occurs within the mainland upland habitat designation

Source: New York State Freshwater Wetland GIS Coverage; New York State Department of Environmental Conservation, New York State Regulatory Freshwater Wetlands For Suffolk County , 1999

Snapshot Example of New York State Mapped Freshwater Wetlands on Mainland



APPENDIX B

ENDANGERED SPECIES ACT COMPLIANCE DOCUMENTS

USFWS BIOLOGICAL ASSESSMENTS
&
NOAA COORDINATION

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B.1 INTRODUCTION

B.1.1 PURPOSE AND OBJECTIVES OF THE BIOLOGICAL ASSESSMENT

This BA has been prepared in accordance with requirements identified in the Endangered Species Act (ESA) of 1973, to identify and discuss potential impacts to Federally listed threatened and endangered (T&E) species caused by the U.S. Army Corps of Engineers (USACE), New York District activities associated with implementation of alternatives for shore protection and coastal storm risk management for the south shore of Long Island, New York, from Fire Island to Montauk Point (Figure B-1). T&E species include those species Federally listed and protected by the U.S. Department of the Interior, Fish and Wildlife Service (USFWS) under the ESA.

In accordance with Section 7(a)(2) of the ESA, as amended, Federal agencies are required to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of any habitat of such species determined to be critical unless an exemption has been granted. Additionally, a Biological Assessment (BA) must be prepared if listed species or critical habitat may be present in an area to be impacted by a "major construction activity." A major construction activity is defined at 50 CFR §402.02 as a construction project (or an undertaking having similar effects) which is a major Federal action significantly affecting the quality of the human environment as referred to in the National Environmental Policy Act (NEPA) (42 U.S.C. 4332(2)(C)).

B.1.1.1 OBJECTIVE FOR THIS BA

This BA will facilitate the preparation of the Environmental Impact Statement (EIS) that will identify and evaluate potential environmental impacts associated with the proposed Project and will maintain compliance with Section 7(a)(2) of the ESA. The BA is designed to provide the USFWS with the required information for their assessment of the effects of the proposed Project on Federally listed endangered and threatened species.

Specific objectives of this BA are to:

1. Ensure Project actions do not contribute to the loss of viability of T&E species;

2. Comply with the requirements of the ESA, as amended, that Project actions not jeopardize or adversely modify critical habitat for Federally listed T&E species;

3. Analyze the effects of implementation of Project actions on Federally listed T&E species;

4. Recommend impact avoidance, minimization, and measures to offset impacts to Federally listed T&E species; and,

5. Provide biological input to ensure District compliance with the NEPA and the ESA.

Figure B-1. EIS Study Area

B.2 PROJECT AREA DESCRIPTION

As shown on Figure B-1, the EIS Study Area extends from Fire Island Inlet east to Montauk Point along the Atlantic Coast of Suffolk County, Long Island, New York. The majority of Fire Island lies within the legislative boundaries of the Fire Island National Seashore (FIIS). The Study Area includes the barrier island chain from Fire Island Inlet to Southampton inclusive of the Atlantic Ocean shorelines, and adjacent back-bay areas along Great South, Moriches, and Shinnecock Bays. The Study Area continues to the east including the Atlantic Ocean shoreline along the mainland of Long Island extending from Southampton to Montauk Point. This area includes the entire Atlantic Coast of Suffolk County covering a shoreline length of approximately 83 miles. The Study Area also includes over 200 additional miles of shoreline within the estuary system. The Study Area includes areas on the mainland that are vulnerable to flooding, which generally extend as far landward as Montauk Highway, for an approximate area of 126 square miles.

This Study Area represents a complex mosaic of ocean fronting shorelines, barrier islands, tidal inlets, estuaries, and back bay mainland area (see Section B.4 for a general discussion of the ecosystems and habitats). The Study Area functions as an interconnected system driven by large scale processes with respect to hydrodynamic and sediment exchange, supporting diverse biological and natural resources. Within the Study Area, ocean shoreline sand generally moves east to west alongshore, in response to waves, and currents during normal conditions and during storms. This alongshore movement of sand maintains the prevailing shoreline conditions. In addition to alongshore movement, sediment is also exchanged in the cross-shore direction, through erosion and accretion of the beach and dune, exchange of sand through tidal inlets, and during large storm events through the episodic transport of sand over the island through overwash or breaching.

Over the years, the Study Area has become increasingly developed with extensive development on portions of the barrier island and in the mainland floodplain. As development has increased over the past 75 years, activities have been undertaken, to provide for and protect infrastructure in the area, and to improve navigation in the area. These past activities have included inlet stabilization, construction of jetties and groins, seawalls, and revetments, beachfill, beach scraping, breach closures, channel dredging in the inlets and bays, bayside bulkheading, and ditching of wetlands for mosquito control.

These activities have been undertaken to address localized problems, and often have been implemented without consideration of regional effects. Collectively, these activities have dramatically altered the existing natural coastal processes. As a result, the area is not functioning as a natural, sustainable system. This leaves over 15,000 structures at risk to major damages from coastal storms such as hurricanes and nor'easters. This risk will continue to grow with continued development, continued erosion, and sea level rise.

The Study Area also includes portions of the Towns of Babylon, Islip, Brookhaven, Southampton and Easthampton, as well as 12 incorporated Villages, the entirety of FIIS, the Poospatuck Indian Reservation, and the Shinnecock Indian Reservation. The Study Area contains over 46,000 buildings, including 42,600 homes and more than 3,000 businesses. There

are 60 schools, 2 hospitals, and 21 firehouses and police stations in the Study Area. Of the buildings within the Study Area, more than 9,000 fall within the modeled 100-yr floodplain (storm with a 1 percent probability of occurring in any given year, based upon current modeling). It is estimated that over 150,000 people reside in the coastal 100-year floodplain of the South Shore of Suffolk County, which represents 10 percent of the population of Suffolk County (USCB 2010). The Study Area is also a popular summer recreation area. In addition to the residential population, there is a large seasonal influx of tourists who recreate in this area, and businesses which support the year round and seasonal population of the area.

Commercial, residential, public and other infrastructure in the Study Area are subject to economic losses (or damages) during severe storms. The principal problems are associated with extreme tides and waves that can cause extensive flooding and erosion both within barrier island and mainland communities. Breaching and/or inundation of the barrier islands also can lead to increased flood damages, especially along the mainland communities bordering Shinnecock, Moriches and Great South Bays.

B.3 PLANNING OBJECTIVES AND RECOMMENDED ALTERNATIVE

The New York District (District) is conducting a comprehensive analysis of the environmental impacts of alternatives for shore protection and risk management for the south shore of Long Island, New York, from Fire Island to Montauk Point. In support of the preparation of the Fire Island to Montauk Point Environmental Impact Statement (FIMP EIS), the District, in cooperation with Federal, state and local agencies, conducted a study to evaluate several risk management plans for the Study Area (USACE 2009). That Study focused on identifying a long-term solution to reduce the risk of coastal storm damages in the Study Area in a manner which considers the risks to human life and property, while maintaining, enhancing, and restoring ecosystem integrity and coastal biodiversity.

Following Hurricane Sandy on October 29-30, 2012, the New York District has continued to work collaboratively to refine the proposed action that was identified in the Reformulation Study to address the agency missions and respond to lessons learned during Hurricane Sandy. Participating agencies have coordinated their response to storm impacts and the breaches that occurred, to implement the stabilization efforts, and to advance the overall Reformulation Study. Through that process, the New York District and the cooperating agencies have collectively recognized that adjustments to the proposed action identified in the 2009 Study were necessary. The District has prepared a General Reevaluation Report (USACE 2016) to document the post-Sandy proposed action for the EIS.

B.3.1 ALTERNATIVES

FIMP EIS evaluates the reasonable alternatives that would help define a long-term solution to the risk imposed by coastal storms and their associated damage to human life and property, while maintaining, enhancing, and restoring the ecosystem integrity of coastal biodiversity. The EIS for the Project evaluated four alternatives, the No Action Alternative (FWOP), the Tentatively Selected Plan (TSP), Alternative 1 (Plan 2B), and Alternative 2 (Plan 3A). The TSP is the recommended alternative.

B.3.1.1 NO ACTION ALTERNATIVE (FWOP)

Under the No Action Alternative (or future without project condition [FWOP]) is by definition, the projection of the most likely future condition if no Federal actions are to be taken as a result of this EIS. Without the project, natural processes as well as anthropogenic factors would continue to have an impact on the existing condition. The FWOP serves as the base condition for all the analyses, including the engineering design, and economic evaluation and comparison of alternatives, as well as environmental, social and cultural impact assessments. The FWOP is a forecast based on what has occurred and what is likely to occur in the Study Area during the project's life (i.e., 50 years) in the absence of implementation of any of the reasonable alternatives considered in this EIS. The FWOP represents the most likely future scenario based on reasoned, documentable forecasting using historic data, current practices, and trends.

B.3.1.2 PREFERRED ALTERNATIVE (TENTATIVELY SELECTED PLAN)

The TSP has been identified as the plan that reasonably balances the policies of the USACE and the Department of the Interior, as well as meets the needs from and engineering and economic point of view to restore and enhance the coastal zone of the Study Area. The vulnerable breach locations are shown in Figure B-2. The components of the TSP, which provide a comprehensive plan as shown in Figure B-3, are further described below.

Inlets: Fire Island, Moriches, Shinnecock

At Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet, the TSP would authorize the continuation of current management along with ebb shoal dredging, outside the navigational channel, with downdrift placement. The deposition basin is a dredged area designed to capture sediment so that shoaling in navigable regions (e.g., the channel) would be minimized. Placement of a +13 foot dune and berm would occur in identified placement areas, as needed.

Mainland Non-Structural

The mainland non-structural plan consists of non-structural building retrofits, flood proofing, relocation, acquisition of approximately 4,400 structures (consisting of approximately 44 in Shinnecock Bay, 857 in Moriches Bay, and 3,110 in Great South Bay), and road raising in four locations. The non-structural plan involves a 100-year level of protection for all structures inside the 10-year floodplain. Building retrofit measures are proposed, and could include limited relocation or buyouts based upon structure type and condition. The proposed TSP provides protection to each building identified as having a ground elevation below the baseline condition 10-year flood elevation. For each building identified for protection, the design flood elevation is the baseline condition 100-year flood elevation plus two foot of freeboard.

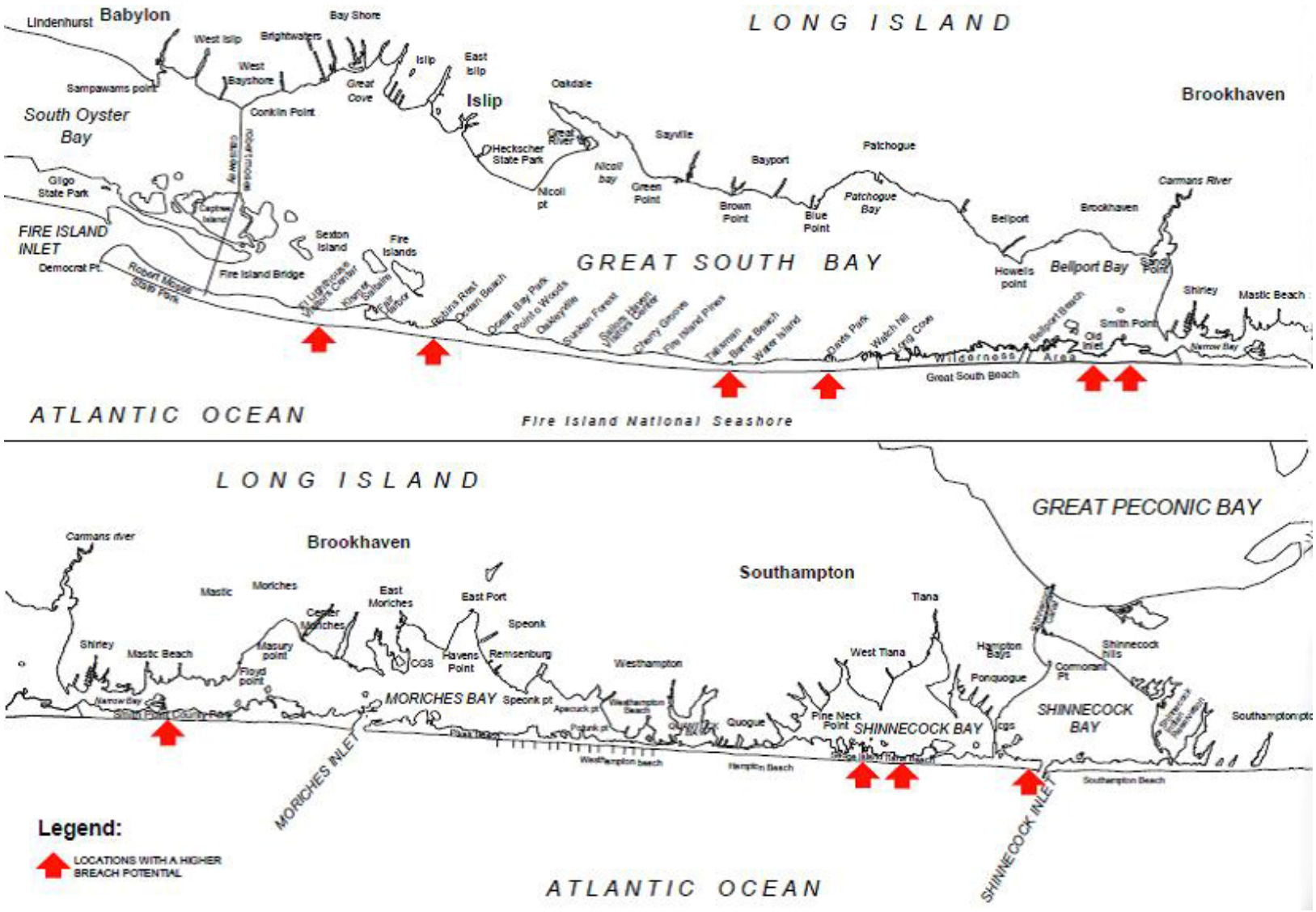

Figure B-2. Vulnerable Breach Locations in the Study Area

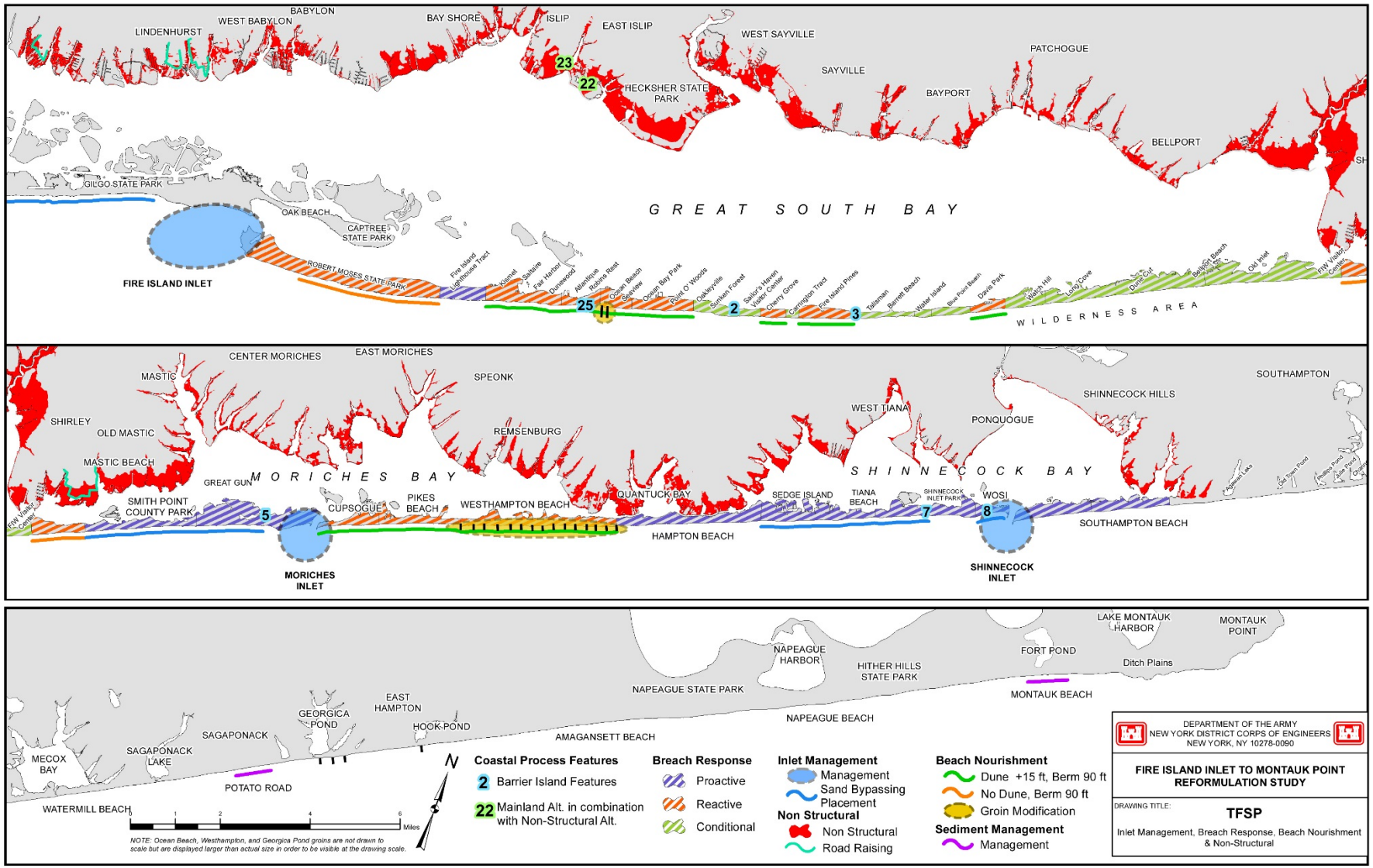

Figure B-3. Overview of the TSP

Included in the non-structural plan is road raising, as a means to achieve risk management for a greater number of buildings at a reduced cost compared to individual-building nonstructural protection plans for a given area. In addition to reducing damage to structures, road raising would reduce outside physical costs such as the flooding of cars, and non-physical costs such as clean up and evacuation. Raised roads would also offer enhancements to local evacuation plans and public safety by reducing the risk of inundation of local roads within the protected area, and providing safer evacuation routes out of the area. Road raising may also be more acceptable to residents in some communities since it reduces the need for alterations to individual buildings that may disrupt the owners' lives. Four locations have been identified for road raising, totaling 5.9 miles in length. This road would enhance protection to 1,054 houses (see Table B-1). Also included would be the long-term relocation of facilities in Smith Point County Park to minimize renourishment requirements.

Table B-1. Road Raisings

Site	Town	Community	Approximate Length of Raised Road (feet)	Structures Protected
4a	Babylon	Amityville	6,600	97
8c	Babylon	Lindenhurst	5,300	240
8d 8e	Babylon	Lindenhurst	9,000	362
52a	Brookhaven	Mastic Beach	10,500	355

Source: USACE 2016.

Site 4a Description. The area protected is a residential area along the waterfront of the Village of Amityville, west of Robert Moses Causeway. Houses are generally medium quality, in good condition. The canals in Bayside Park extend all the way to the roadways. The average roadway elevation above the existing roadway would be approximately 2 feet, with a range of elevation from 0.5 to 4 feet.

Site 8c Description. The area protected is a peninsular residential area on the waterfront of the Village of Lindenhurst, west of Robert Moses Causeway. Houses are generally medium quality, in good condition. Houses along the canals south of the proposed line of protection are custom, multi-level structures. Shore Road runs along a canal, which has been bulkheaded to allow boat moorings. The area between the Shore Road and the canal is relatively narrow, roughly the width of a sidewalk. This will require a sheetpile wall due to the limited access. Average roadway elevation above the existing roadway would be approximately 2 feet, with a range of elevation from 1.0 to 4.0 feet.

Site 8d 8e Description. The area protected is a peninsular residential area on the waterfront of the Village of Lindenhurst, west of Robert Moses Causeway. Houses are generally medium quality, in good condition. A few houses along the waterfront, east of Venetian Blvd are in average to fair condition, most likely the result of frequent flooding. The Harding Avenue Elementary School in located on the peninsula, as is Green Park, a recreational facility consisting of lighted ball fields and restrooms.

Average roadway elevation above the existing roadway would be approximately 2 feet, with a range of elevation from 2.0 to 4.5 feet. Elevation of the roadway to 7 feet NGVD would provide

approximately a 50-year level of protection. East Shore Road runs along the Neguntatogue Creek. The creek sides have been bulkheaded for boat moorings. The roadway is relatively wide, with a dirt/grass shoulder between the creek and the roadway. A few houses have been constructed along the creek on the west side of the roadway; however, these are generally elevated on fill. A 1,600-foot levee is included around the Harding Avenue Elementary School. Extension of the line of protection around the school would provide protection to the school, while reducing the structural plan costs, as the levee would costs significantly less than raising the roadway to a comparable level.

Site 52a Description. The area protected is a large, low-lying peninsular residential area on the waterfront of the Mastic Beach, between Johns Neck Creek and Pattersquash Creek. Houses in this area are generally medium quality, in average to fair condition. The western side of the peninsula is wooded; the eastern side has much fewer trees. The southeast portion of the peninsula is overgrown with Phragmites. Average roadway elevation above the existing roadway would be approximately 2.0 feet, with a range of elevation from 1.0 to 4.0 feet. Riviera Road on the east side of the peninsula runs along a Pattersquash Creek. There is a relatively wide, grassy area between the roadway and the creek. There are no houses on the creek side of the roadway.

Barrier Islands

A variety of measures are proposed for the barrier islands, as described below.

Beach Work (Beach and Dune Fill, Berms, and/or Sand Bypassing). The TSP would include a nearly continuous beach and dune fill area along the developed shorefront areas that front Great South Bay and Moriches Bay. The MREI baseline is proposed as the layout of TSP beachfill plan. This beach fill alignment closely follows the “natural” dune alignment and includes a realignment of the dune farther seaward in areas where multiple structures would need to be relocated or acquired in a more landward alignment. These areas include most of the developed communities in Fire Island with the exception of Cherry Grove and Water Island. Beachfill, berms, and sand bypassing are proposed as follows:

Fire Island at Developed Locations:

- +15 foot dune with berm, with post-Sandy optimized alignment;

Fire Island at Undeveloped Locations:

- @ Lighthouse (+13 foot dune and berm);
- @ Smith Point County Park East - sand bypassing;
- @ Smith Point County Park West – short-term beachfill in western, developed section;
  Westhampton:
- Beachfill (+l5 foot dune with berm) fronting Moriches Bay.

Not all design subreaches are appropriate for beach fill. In areas where there is either an insignificant risk of breaching, no oceanfront structures, or relatively few structures, and/or lack of public access, beach fill was not considered. Subreaches where beach fill was not considered include Sailors Haven, Wilderness Area- West, Great Gun, Hampton Beach; and most of the shoreline between Shinnecock Inlet and Montauk Beach. The total initial fill for the TSP would be approximately 6.44 million cubic yards. A 30-year commitment of Federal and non-Federal

renourishment is proposed, which recognizes the potential for variable beach conditions between renourishment cycles. After 30 years, the Federal and non-Federal commitment would transition to a BRP for the remainder of the 50 years.

Breach Response Plan (BRP). The BRP recommends the Conditional BRP (consisting of a +9.5 foot berm only) in undeveloped areas of Fire Island. For areas along Shinnecock Bay, a Proactive and Reactive BRP (consisting of a +13 foot berm, with dune) is proposed. This plan includes restoring the template to the design condition when the shoreline is degraded to an effective width of 50 feet. This plan is created for areas where a breach is imminent.

Groin Modification Plan. Groin modification within the TSP would result in the tapering of the existing Westhampton groins and modifying existing Ocean Beach groins. The shortening of groins 1 through 13 in Westhampton, where 15 groins currently exist. Groins 1-8 would be shortened to 380 feet. Groins 9-13 would be shortened to 386 feet, 392 feet, 398 feet, 402 feet, and 410 feet, respectively. The shortening of 13 groins varying between 70-100 feet could release up to 2 million cubic yards of sand to be transported to the west reestablishing longshore coastal processes. Therefore, this proactive plan could reduce the renourishment requirements for the shoreline downdrift of the groins.

Sediment Management Plans (including Inlet Modification Plan). Two high damaged areas, Downtown Montauk and Potato Road, were identified for a sediment management plan over a conventional beach nourishment project due to the lack of economic viability. This sediment management alternative will maintain the current protection and prevent conditions from getting worse by adding fill at each location approximately every four years for 30 years. The material would be placed as advance fill on the seaward side of the berm which would serve as feeder beaches for locations farther to the west. The TSP recommended plan for inlet management includes the continuation of the authorized project at each inlet with increased sediment bypassing from the ebb shoal to offset the downdrift deficit. A long-term, monitoring and adaptive management plan, which is describe below, would allow for future changes or improvements to inlet management, over time.

The TSP includes a variety of project-based features that would contribute to protecting areas from flooding, erosion, and other storm damage, while concurrently maintaining, preserving, or enhancing the natural resources. Specifically, USACE identified conceptual habitat coastal process feature opportunities for 6 sites. Appendix K of this EIS identifies these sites and includes detailed descriptions and photographs (when available), based on the site conditions observed/documented during field visits. The objective in evaluating conceptual designs with the Habitat Evaluation Procedure (HEP) was to assess a broad spectrum of conceptual ideas that could be carried out at locations across the barrier island, to evaluate extremes of alternatives (e.g., full feature versus reduced area), and to present a range of possible options.

The project-based features for coastal processes include the following:

- Enhance upper beach/dune width/slope/height
- Close some access roads and trails
- Remove sand fence

- Enhance salt marsh by restoring hydrologic connection
- Remove parking lot, re-grade to natural contours
- Enhance the existing salt marsh through the use of herbicides to control *Phragmites*
- Ditch plugging and pool creation
- Convert disturbed areas to salt marsh
- Reconfigure existing tidal channels
- Remove bulkhead, re-grade shoreline, and restore marsh through plantings
- Enhance submerged aquatic vegetation (SAV) beds
- Create sand spits in the bay

Integration of Adaptive Management

The adaptive management plan would formalize mechanisms for reviewing and revising the life cycle management of elements of the project. Currently proposed adaptive management measures include:

- Period of renourishment for 30 years, subject to adaptive management considerations and local land use regulations; to be adjusted to BRP, following 30 years.
- Provisions to continually adjust components of the Project to improve effectiveness;
- Applies to all plan features, developed to address climate change concerns (e.g., sea level rise).

B.3.1.3 ALTERNATIVE 1

Alternative 1 would involve similar actions as the TSP; the major differences between Alternative 1 and the TSP would involve: (1) the amount of beachfill that would occur in the Barrier Islands (Fire Island at developed locations) and Westhampton (fronting Moriches Bay), and (2) changes in the adaptive management approach (there would be no set renourishments; instead, renourishment would only occur when cross-section falls below the design level of 25-years). Based on these differences to the TSP, Alternative 1 is defined as follows.

Beach and Dune Fill Component

Alternative 1 include changes in alignment of +13 feet NGVD dune, plus a 90 foot berm with a +9.5 feet NGVD in developed areas and minor Federal tracts. Alternative 1 includes a +13 feet NGVD dune, plus a 90 foot berm along the Lighthouse tract to also be constructed. Under Alternative 1, no set renourishments would occur. Instead, renourishment would only occur when cross-section falls below the design level of 25-years.

Sediment Management Plans (including Inlet Modification Plan). Same as TSP.

Groin Modification Plan. Same as TSP.

Breach Response Plan. Same as TSP.

Coastal Process Features. Same as TSP.

Non-Structural Plan. Same as TSP.

Adaptive Management

Similar to TSP, but there would be no set renourishments; instead, renourishment would only occur when cross-section falls below the design level of 25-years. Other aspects of adaptive management would be the same as the TSP.

B.3.1.4 ALTERNATIVE 2

Alternative 2 would involve similar actions as the TSP; the major differences between Alternative 2 and the TSP would involve: (1) differences in non-structural plans; (2) adaptive management would not be integrated; and (3) land use regulations and management would not be integrated. Based on these differences to the TSP, Alternative 2 is defined as follows.

Beach and Dune Fill Component

Alternative 2 would be the same as the TSP except: (1) at the Fire Island undeveloped locations there would be a +13 feet NGVD dune with berm, and (2) no renourishments.

Sediment Management Plans (including Inlet Modification Plan). No ongoing sediment management.

Groin Modification Plan. Same as TSP.

Breach Response Plan (BRP). Same as TSP.

Coastal Process Features. Same as TSP.

Non-Structural Plan

The non-structural plan considers the net excess benefits to a combined building retrofit plan and a road-raising plan focusing on the mainland backbay shores, which includes 3,200 structures. This plan involves a 100-year level of protection for all structures inside the 6-year floodplain. Building retrofit measures are proposed, but no relocation or buyouts would occur. Included in the non-structural plan is road raising, as discussed for the TSP. There would be no relocation of facilities in Smith Point County Park. Instead, there would be a +13 feet NGVD dune with berm.

B.4 DESCRIPTION OF HABITATS, THREATS AND SPECIES

B.4.1 ECOSYSTEM AND HABITAT DESIGNATIONS

The Study Area is a complex array of marine, estuarine, coastal, and terrestrial ecosystems. To facilitate a thorough description of conditions, the Study Area has been partitioned into a series of defined ecosystems and habitats. The ecosystems and habitats defined and studied in the previous Conceptual Model and Habitat Evaluation Procedures (HEP) have been combined as presented in this section, and as defined in Table B-2.

Table B-2. FIMP Ecosystem and Habitat Designations

Ecosystem/Habitat	Definition
Atlantic Shores and Inlets Ecosystem	
Marine Nearshore	MLW to depth of 30 feet; includes pelagic and benthic zones
Marine Intertidal	Extends from mean low water (MLW) to mean high water (MHW) with a sandy and/or rocky substrate
Marine Beach	Extends from MHW on the ocean side to the boundary of the primary dunes and swales habitat within the barrier island ecosystem; sandy substrate
Inlets	Areas of water interchange between bay and ocean zones (e.g., Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet)
Barrier Island Ecosystem	
Dunes and Swales	Extends from the seaward toe of the primary dune through the most landward primary swale system; includes freshwater ponds, wetlands, and sparsely-vegetated shrub or forested communities found within this zone
Terrestrial Upland	Extends from the landward boundary of the primary dunes and swales habitat on the ocean side to MHW of the bay intertidal habitat; includes all upland as well as any freshwater wetland habitats within this zone; bayside beach and maritime forested habitats are included in this habitat
Maritime Forest	Forested communities found within the terrestrial upland habitat. These areas are defined by salt tolerant vegetation, high salinity and salt spray adapted soils and vegetation assemblages such as trees, shrubs, and herbaceous species (e.g., Sunken Forest)
Bayside Beach	Unvegetated sandy areas between MHW and the bayside limit of upland vegetation; included in the terrestrial upland habitat. This habitat is also present in association with the mainland upland habitat where mainland shoreline is adjacent to backbay areas.
Backbay Ecosystem	
Bay Intertidal	Extends from MHW to MLW on the bay side of the barrier island. Habitats such as sand shoals, mud flats, and salt marsh are included in bay intertidal habitat

Ecosystem/Habitat	Definition
Sand Shoal and Mud Flat	Unvegetated areas within the bay intertidal habitat exposed at low tide. Sand shoals and mud flats differ on the basis of sediment texture and grain size, providing separate but potentially overlapping infaunal and epifaunal habitats.
Salt Marsh	Bayside vegetation communities found within the bay intertidal habitat that are dominated and defined by salt-tolerant species, predominantly salt marsh cordgrass (*Spartina alterniflora*) and salt meadow cordgrass (*Spartina patens*). Occurs from the landward limit of the high marsh vegetation, sometimes also MHW or slightly landward, to the seaward limit of the intertidal marsh vegetation
Bay Subtidal	Bayside aquatic areas below MLW, including channels and deeper areas of the bay that are always inundated.
Submerged Aquatic Vegetation (SAV)	Bayside submerged aquatic vegetation (SAV) communities found within the bay subtidal habitat
Mainland Upland Ecosystem	
Mainland Upland	Area generally extends from the landward limit of the bay intertidal MHW line to the landward limit of the Study Area (i.e., +16 feet NGVD), which generally correlates with Montauk Highway (Route 27). This habitat also includes mainland wetlands and coastal ponds (e.g., Mecox Bay). Along the Atlantic shorefront, mainland upland begins at the landward toe of the primary dune. Along the mainland shoreline adjacent to backbay areas, this habitat also includes bayside beach.

Source: Tetra Tech 2008.

B.4.1.1 ATLANTIC SHORES AND INLETS ECOSYSTEM

The Atlantic shores and inlets ecosystem includes all oceanic habitats from 30 feet deep to the seaward toe of the primary dune, and includes the Fire Island, Moriches, and Shinnecock inlets. Habitats within the Atlantic shores and inlets ecosystem include the marine nearshore, marine intertidal, marine beach, and inlets.

B.4.1.2 MARINE NEARSHORE AND MARINE INTERTIDAL

The marine nearshore is define as the oceanic area from the mean low water (MLW) level to a depth of 30 feet and includes pelagic and benthic zones. The marine intertidal habitat is defined as the oceanic area from MLW to mean high water (MHW) typically having a sandy and/or rocky substrate. There are an estimated 1,192 acres of marine nearshore and marine intertidal habitat within the Study Area (USACE 2005d).

B.4.1.3 MARINE BEACH

Within the barrier island ecosystem the marine beach habitat extends from the MHW line, or upper bound of the marine intertidal habitat, to the seaward toe of the primary dune. The marine beach habitat consists of sand and is typically unvegetated or only sparsely vegetated, and not subject to regular inundation. Of the 330 acres of the barrier island cover type mapped by the

USACE in 2001–2002, 22percent was represented by the marine beach habitat (USACE 2003a). There is an estimated 1,638 acres of marine beach habitat within the Study Area (USACE 2005d).

Although the dry sandy substrate of the marine beach habitat excludes establishment of typical marine benthic invertebrates, other less water dependent invertebrates have adapted to spending at least a portion of their life cycle on the beach, particularly within the wrack line. Densities of all forms of beach invertebrates generally are relatively lower in comparison to other surrounding habitats, with the wrack line providing the primary source of food and cover for a myriad of invertebrates and saprophagous, scavenger, and predatory insects, and a variety of oligochaetes and nematodes typically found in this habitat type. No representative invertebrate species have been identified in the FIMP Conceptual Model for the marine beach habitat, however, a review of a invertebrate study conducted within the marine beach, and dunes and swales habitat of the Study Area identified amphipod beach fleas (*Talorchestia longicornis*, *T. megalopthalma* and *Orchestia grillus*) as the dominant invertebrate type collected (USACE 2005c). Other common invertebrate types collected within these zones include flies belonging to the families Dolichopodidae and Ephydridae, beetles belonging to the families Carabidae, Staphylinidae, and Histeridae, the ant *Lasius neoniger*, and mites (class Arachnida).

B.4.1.4 INLETS

The inlets ecosystem includes the area below MHW within the three barrier island inlets: Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet. These inlets are aligned generally perpendicular to the barrier island and mainland shorelines. The inlets are typically rocky at their perimeter edges at the MHW line.

B.4.1.5 BARRIER ISLAND ECOSYSTEM

The barrier island ecosystem includes all habitats of the barrier islands from the landward limit of the marine beach habitat to MHW of the bay intertidal habitat. Habitats within the barrier island ecosystem include dunes and swales, and terrestrial upland (which encompasses maritime forest and bayside beach).

B.4.1.6 DUNES AND SWALES

The dunes and swales habitat is located between the landward edge of the marine beach and terrestrial upland habitat of the barrier island ecosystem. The dunes and swales habitat typically has a sand substrate and is not regularly inundated by tides. Freshwater ponds, wetlands, and sparsely-vegetated shrubby or forested communities are included in this habitat designation. Of the 330 barrier island acres cover type mapped by the USACE in 2001–2002, 21 percent was represented by dunes and swales habitat (USACE 2003a). A comprehensive vegetation mapping study for the FIIS found that approximately 33 percent of the 4,075 vegetated acres analyzed was represented by dune habitat associations (e.g., Northern Beach Grass Dune, Northern Dune Shrubland) (Conservation Management Institute [CMI] 2002). Approximately 1,142 acres of the barrier islands is characterized as dunes and swales habitat (USACE 2005d).

B.4.1.7 BAYSIDE BEACH

The bayside beach extends from MHW on the bay side landward to the upland habitat and is included in the terrestrial upland habitat. Bayside beach habitat is also present in association with the mainland upland habitat where mainland shoreline is adjacent to backbay areas. It is generally characterized as narrow beach areas devoid of vegetation and comprising mostly sand. Within the Study Area, much of the bayside beach has been eliminated due to bulkhead construction, immediate upland development, and/or severe erosion (USACE 2009).

B.4.1.8 BAY INTERTIDAL (INCLUDING SALT MARSH, SAND SHOAL, SAND AND MUD FLATS)

The bay intertidal habitat extends from MHW to MLW on the bay side of the barrier island and includes salt marsh, sand shoal, and mud flat habitat areas. The substrate is periodically exposed and flooded by semidiurnal tides (two high tides and two low tides per tidal cycle), resulting in alternating periods of inundation and dryness and fluctuating salinity, making this a naturally stressed habitat suitable only for biota that are adapted to these conditions. Sand shoals and mud flats are generally distinguishable from each other on the basis of sediment texture and grain size, providing separate but potentially overlapping infaunal and epifaunal habitats.

Bay intertidal habitat is influenced by hydrology and sediment transport, and includes natural and hardened shoreline areas, such as those associated with bulkheads and riprap revetments. There are an estimated 3,700 acres of bay intertidal habitat within the Study Area (USACE 2005d).

B.4.1.9 BAY SUBTIDAL (INCLUDING SAV)

The bay subtidal habitat extends from the MLW boundary of the bay intertidal habitat and includes the channels and deeper areas of the bay that are always inundated. There are an estimated 80,000 acres of bay subtidal habitat within the Study Area (USACE 2005d). Most subtidal areas are unvegetated. However, some vegetated subtidal areas exist in the form of SAV habitat, where the dominant submerged plant species is eelgrass (*Zostera marina*). SAV habitat areas are included in the bay subtidal habitat definition because SAV generally occurs below MLW. Mean depths of the bays in the Study Area range from 3 to 10 feet MLW. There are an estimated 3,326 acres of SAV habitat within the Study Area (USACE 2005d).

B.4.1.10 MAINLAND UPLAND ECOSYSTEM

The mainland ecosystem extends from the landward limit of the backbay intertidal MHW line to the landward limit of the Study Area. In the eastern portion of the Study Area, where the barrier island and backbay habitats do not occur, mainland ecosystem begins at the landward toe of the primary dune. This habitat also includes mainland wetlands and coastal ponds (e.g., Mecox Bay). Along the mainland shoreline adjacent to backbay areas, this habitat also includes bayside beach.

The mainland ecosystem contains various upland and wetland habitats occurring in a mosaic with largely residential and commercially developed lands. Natural vegetation on the mainland primarily consists of various pine-oak forests on upland slopes and ridgetops and forested

swamps and emergent marsh along stream channels, pond margins, and in low lying depressional areas. Also included in the mainland ecosystem are areas of residential and commercial development. Disturbed and densely developed areas generally increase in presence and extent from east to west on Long Island. Historically, much of the shoreline of the mainland has been subject to extensive clearing and filling to support the development of homes and commercial facilities. Along with this development, ornamental plants and exotic faunal species have been introduced, which compete with native flora and faunal species.

B.4.2 LISTED SPECIES AND HABITATS

The following sections provide a description of the invertebrate, bird and species/communities that are expected to be associated with the ecosystems and habitats described in Section B.4.1

B.4.2.1 LISTED SPECIES

The Federally and state-listed Piping Plover, seabeach amaranth, and roseate tern, as well as the state-listed common tern and least tern, and the state species of special concern black skimmer, all nest or carry out a major portion of their life cycle activities (i.e., breeding, resting, foraging) within essentially the same habitat (Table 4). This habitat encompasses areas located between the high tide line and the area of dune formation and consists of sand or sand/cobble beaches along ocean shores, bays and inlets and occasionally in blowout areas located behind dunes (Bent 1929, NatureServe 2002, NJDEP 1997, USFWS 2004a).

Table B-3. Protection Status of Species that Utilize Habitats Similar to those in the Project Area.

Common Name	Federal Status	State Status
Common Tern	Not Listed	Threatened
Least Tern	Threatened	Threatened
Piping Plover	Endangered	Endangered
Roseate Tern	Endangered	Endangered
Seabeach Amaranth	Endangered	Imperiled

List of Species

The USFWS, through its consultation with the District regarding implementation of the Project has identified four T&E species as being present on or near the Project Area (see Table 4.). Based on habitat and life history assessments, recommendations from the USFWS and a site assessment conducted by the USACE, the District has determined that the following Federally-listed species (with their respective recent population numbers below them) are likely to occur in the FIMP Project Area and warrant a Biological Assessment (These numbers represent the oceanside populations):

- Piping Plover (*Charadrius melodus*),

- Seabeach Amaranth (*Amaranthus pumilus*)

2015: Piping plovers: 89 nesting pairs,

Seabeach amaranth: 45 individuals

2014: Piping plovers: 81 nesting pairs

Seabeach amaranth: 54 individuals

2013: Piping plovers: 85 nesting pairs

Seabeach amaranth: 83 individuals

2012: Piping plovers: 92 nesting pairs

Seabeach amaranth: 54 individuals

2011: Piping plovers: 81 nesting pairs, 13 fledglings

Seabeach amaranth: 130 individuals

https://irma.nps.gov/App/Portal/Home

The state-listed common tern (*Sterna hirundo*) and the least tern (*Sterna antillarum*) and roseate tern (*Sterna dougallii*), which utilize beach habitat similar to that of the Piping Plover and Sea Beach Amaranth, have been identified as species that may occur in the Project Area. Additionally, the state species of special concern, black skimmer (*Rynchops niger*), also is known to nest on coastal beaches and frequently nests in or near tern nesting areas. None of these species have yet been identified by the USFWS as species requiring further ESA consultation or Biological Assessment. However, measures taken to avoid and protect plover and seabeach amaranth habitats would benefit and protect these species as well.

Life Stages of Listed Species

Piping Plover

On January 10, 1986, the Piping Plover was listed as threatened and endangered under provisions of the ESA. Protection of the species under the ESA reflects its precarious status range-wide. Three distinct populations were identified by the Service during the listing process: Atlantic Coast (threatened), Great Lakes (endangered), and Northern Great Plains (threatened). The Atlantic Coast population, which is the focus of this biological opinion, breeds on coastal beaches from Newfoundland to North Carolina (and occasionally in South Carolina) and winters along the Atlantic Coast from North Carolina southward, along the Gulf Coast, and in the Caribbean. No critical habitat, as defined by the ESA, has been designated for the Atlantic Coast population (U.S. Fish and Wildlife Service 1996a). The "Piping Plover *(Charadrius melodus*) Atlantic Coast Population Revised Recovery Plan" (hereafter referred to as the "Piping Plover Recovery Plan") found in U.S. Fish and Wildlife Service (1996a) delineates four recovery units, or geographic sub-populations, within the Atlantic Coast population: Atlantic Canada, New England (including Massachusetts, Maine, New Hampshire, Rhode Island, and Connecticut),

New York-New Jersey (NY-NJ), and Southern (including Delaware, Maryland, Virginia, and North Carolina).

Life History. The piping plover is a small robin-sized shorebird 17–18 cm (7.25 in) in length, a wingspan of 47 cm (19 in), and an average weight of 55 g (1.9 oz) (Sibley 2000). Piping plover breed and nest on coastal beaches from Newfoundland and southeastern Quebec to North Carolina and winter primarily on the Atlantic coast from North Carolina to Florida. Along the Atlantic coast, plover nest mainly on gently sloping foredunes above the high tide line, in blow-out areas behind primary dunes of sandy coastal beaches, and on suitable dredge spoil deposits (USFWS 1988, Cashin Associates 1993, NPS 1994). Nests are usually found in sandy areas with little or no vegetation. Vegetation, when present, consists of beach grass, sea rocket, and/or seaside goldenrod.

Plover begin northward migration to breeding grounds from southern U.S. wintering areas in March, and arrive on nesting grounds from March – May; males arrive prior to females. Fall migration to southern wintering grounds begins in mid- to late summer. Juvenile plover may remain on breeding grounds later but are generally gone by mid- to late August (Cuthbert and Wiens 1982). Atlantic coast breeders migrate primarily to Atlantic coast sites located farther south of breeding areas (i.e., Virginia to Florida, Bahamas) (Haig and Oring 1988, Haig and Plissner 1993).

The breeding season begins when adult plover reach the breeding grounds in early April or in mid-May in northern parts of the range. The adult males arrive earliest, select beach habitats, and defend established territories against other males (Hull 1981). When adult females arrive at the breeding grounds several weeks later, the males conduct elaborate courtship rituals including aerial displays of circles and figure eights, whistling song, posturing with spread tail and wings, and rapid drumming of feet (Bent 1929, Hull 1981).

Plover typically return to the same general nesting area in consecutive years (but few return to natal sites). Plover are known to shift breeding location by up to several hundred kilometers between consecutive years. However, Wilcox (1959) has shown that only 20 percent settle at a nest site farther than 1,000 ft from the previous year's locality. Adult females tend to choose new nest sites within the same geographic area with over 50 percent choosing a new nest site over 1,000 ft from the previous year. Previous reproductive success apparently does not increase the probability of returning to specific breeding sites (NatureServe 2002).

Nest sites are simple depressions or scrapes in the sand (Bent 1929, Wilcox 1959). The average nest is about 6 to 8 cm in diameter, and is often lined with pebbles, shells, or driftwood to enhance the camouflage effect. Males make the scrapes and may construct additional (unused) nests in their territories, which may be used to deceive predators or may simply reflect over-zealousness (Wilcox 1959, Hull 1981). Occupied nests are generally 50 to 100 meters apart (Wilcox 1959, Cairns 1977, Cuthbert and Wiens 1982).

Egg-laying commences soon after mating (Hull 1981, Cuthbert and Wiens 1982). Eggs are laid every second day. The average clutch size is four eggs (Wilcox 1959) and three-egg clutches occur most commonly in replacement clutches. The average number of young fledged per

nesting pair usually is two or fewer. The young hatch about 27 to 31 days after egg laying. Incubation is shared by both adults (Wilcox 1959, Hull 1981).
Young plover leave the nest about two hours after hatching and immediately are capable of running and swimming. The young usually remain within about 200 meters of the nest, although they do not return after hatching (Wilcox 1959, Johnsgard 1979, Hull 1981). When disturbed or threatened, the young either freeze or combine short runs with freezing and blend very effectively into their surroundings (Wilcox 1959, Hull 1981). Adults will feign injury to draw intruders away from the nest or young (Bent 1929, Wilcox 1959). Adults also defend the nest territory against other adult piping plovers, gulls, and songbirds (Wilcox 1959, Matteson 1980). First (unsustained) flight has been observed at around 18 days, with chicks molting into first juvenile plumage by day 22.

Nest success depends heavily upon camouflage (Hull 1981). Hatching success ranges widely as follows: 91 percent for undisturbed beaches on Long Island (Wilcox 1959), 76 percent for undisturbed beaches in Nova Scotia (Cairns 1977), 44 percent on relatively undisturbed beaches at Lake of the Woods (Cuthbert and Wiens 1982), and 30 percent maximum at disturbed Michigan beaches (Lambert and Ratcliff 1979).

Plover diet consists of worms, fly larvae, beetles, crustaceans, mollusks, and other invertebrates (Bent 1929). In New Jersey, intertidal polychaetes were the main prey of plovers (Staine and Burger 1994). Plover forage along ocean beaches, on intertidal flats and tidal pool edges. Studies by Cuthbert and Weins (1982) indicate that open shoreline areas are preferred and vegetated beaches are avoided. Plover obtain their food from the surface of the substrate, or occasionally will probe into the sand or mud.

In Massachusetts, plover preferred mudflat, intertidal and wrack habitats for foraging (Hoopes et al. 1992a). On Assateague Island, bay beaches and island interiors were much more favorable as brood-rearing habitats than were ocean beaches (Patterson et al. 1992).

Habitat Use before Breeding.A growing body of evidence reinforces information presented in the 1996 revised recovery plan regarding the importance of wide, flat, sparsely-vegetated barrier beach habitats for recovery of Atlantic Coast piping plovers. Such habitats include abundant moist sediments associated with blowouts, washover areas, spits, unstabilized and recently closed inlets, ephemeral pools, and sparsely vegetated dunes.

Many Piping Plovers arrive in breeding areas well before the time of most active courtship. During this period, Piping Plovers use bay intertidal zones preferentially (Loegering 1992, Cohen, Houghton, and Keane, unpublished data). This use is tide dependent. During pre-breeding surveys conducted at low tide on Assateague Island, Loegering (1992) observed 9 times as many plovers on bay tidal flats as he did in the ocean intertidal zone. At high tide, however, when the bay intertidal flats were submerged, the number of Piping Plovers on the bay side of barrier islands was similar to the number on the ocean side. On South Monomoy Island, Massachusetts, foraging in sound and tidal pool intertidal zones was not spread uniformly across falling and rising tides. Rather use was most concentrated on the lowest stage of the tide (Keane, unpublished data). This may be because benthic organisms are more abundant in the lower part of the intertidal zone where their habitat is covered by water much of the day (Bertness 1999).

Habitat use during breeding. Nest Site Selection – Piping Plovers often select nest sites near moist substrate habitats. Patterson (1991) noted that most plover nesting on Assateague Island, Maryland and Virginia, occurred on beaches adjacent to one of the several types of moist substrate habitats available there. Elias et al. (2000) reported the pattern of nesting on three New York barrier islands. All 1-km beach segments that were adjacent to either beach pools or bay intertidal zone were used for nesting, whereas fewer than half of the beach segments without these habitats were used by nesting Piping Plovers. Beach segments adjacent to these habitats supported 48 percent of nesting pairs in that study, despite comprising only 1 percent of the habitat.

Piping Plovers colonized the Village of West Hampton Dunes, New York, after the island breached and large tidal flats were deposited. Similarly, the plover population on Assateague Island National Seashore increased dramatically after storms overwashed the island, increasing access to bay intertidal habitats (Kumer, unpublished data). On South Monomoy Island, more than 75 percent of plovers nested <400 m from large sound intertidal flats or a large intertidal pool (Keane, unpublished data).

Cohen et al. (2008) reported that mean vegetative cover around piping plover nests on a recently re-nourished Long Island beach was 7.5 percent, and all plovers nested in <47 percent cover. Although almost 60 percent of nests were on bare ground, nests occurred in sparse vegetation more often than expected based on availability of this habitat type. Plovers also appeared to favor nest sites with coarse substrate over pure sand. At the same study area, piping plover chicks foraged more than expected and exhibited high peck rates in wrack, where arthropod abundance indices were also high (Cohen et al. 2009). Following storm-and human-related increases in nesting and foraging habitat, the population at West Hampton Dunes, New York, grew from five pairs in 1993 to 39 pairs in 2000, and then declined to 18 pairs by 2004 concurrent with habitat losses to human development and vegetation growth (Cohen et al. 2009). Distribution of nests was heavily concentrated on the bayside of the barrier island in the early years following inlet formation and closure, but bayside nests decreased precipitously starting in 2001 and disappeared by 2004 as the study area was redeveloped and the bayside revegetated. The chick foraging rate was highest in bayside intertidal flats and in ocean and bayside fresh wrack. Chicks used the bayside more than expected based on percentage of available habitat, and survived better on the bayside before village construction and the initiation of predator trapping, but not after. In most years, density of nesting pairs adjacent to bayside overwash was 1.5 to two times that at an adjacent reference site, where beach nourishment increased nesting habitat but not foraging habitat. Cohen et al. (2009) concluded that local population growth can be very rapid where storms create both nesting and foraging habitat in close juxtaposition. An increase in local nesting habitat via artificial beach nourishment, however, is not necessarily followed by an increase in the local population if nearby intertidal flats are absent. Cohen et al. (2009) also note similarity between their results and observations by Wilcox (1959) of rapid colonization of habitats created on Westhampton barrier beaches by storms in the 1930s and their subsequent decline following revegetation and redevelopment (see the 1996 recovery plan).

Brood Habitat Selection. In New York, when broods had access to beach pools, they spent more than 70 percent of their time in pool habitat. Compositional analysis, a technique for

ranking habitats (Aebischer et al. 1993), showed that pool habitat ranked first in these areas (Elias et al. 2000). In the same study, broods with access to bay tidal flats spent 57 percent of their time in those habitats, which ranked first among habitats for that set of broods.
Habitat Use by Adults During Breeding

Preliminary information from color marked birds in West Hampton Dunes, New York (Cohen, et al. 2008), indicates that breeding adult plovers travel substantial distances to forage on tidal flats in Moriches Bay during incubation and brood rearing. Travel distances approaching 1 km have been recorded.

Habitat Use after Breeding. Habitat use immediately following breeding has received little formal study. However, we have observed fledgling Piping Plovers using the intertidal flats at West Hampton Dunes, New York, at the end of the breeding season. When chicks are first capable of flying, they only weigh about 70 percent of adult weight (Cohen, et al. 2008). Foraging on the intertidal flats, which are rich in polychaetes, mollusks and arthropods (Loegering 1992, Loegering and Fraser 1995, Bertness 1999, Elias et al. 2000) may allow fledglings to put on fat required for successful migration to wintering areas.

Winter. On the Alabama coast, Piping Plovers used mudflats or sandflats 93 percent of the time observed (Johnson and Baldassare 1988). As before breeding, this use is tide-dependent. Johnson and Baldassarre (1988) reported a negative correlation between tide height and foraging activity. Nicholls and Baldassare (1990) Surveyed 1422 km of shoreline from Virginia to Key West, and 1283 km from Everglades National Park to Brownsville, Texas. Using discriminant analysis, they found that percent of habitat classified as mudflat, sand flat and tide pool helped distinguish used from unused habitats on the Atlantic coast, and percent mudflat helped discriminate used from unused areas on the gulf coast. They noted “Piping Plovers were observed foraging most frequently on sandflats and sandy mudflats.” Likewise, Zonick (2000) found that during the winter on the Texas Gulf Coast barrier islands, plover densities were greater in bay side feeding areas than on Gulf side areas. Drake et al. (2001) used radio telemetry and estimated use of algal flats, lower sandflats and mudflats to comprise 74 percent, 89 percent and 78 percent of habitat use in fall, winter and spring, respectively.

Population Dynamics. Recovery criteria established in the Piping Plover Recovery Plan set population and productivity goals for each recovery unit, as well as for the entire population. The population goals for the Atlantic Canada, New England, NY-NJ, and Southern Recovery Units are 400, 625, 575, and 400 pairs, respectively. The productivity goal for each of the recovery units is to achieve a five-year average productivity of 1.5 chicks fledged per pair. Attainment of these goals for each recovery unit is an integral part of the recovery strategy that seeks to reduce the probability of extinction for the entire population by:

- contributing to the population total;
- reducing vulnerability to environmental variation, including effects of hurricanes, oil spills, or disease;
- increasing the likelihood of genetic interchange among recovery units; and
- promoting re-colonization of any sites that experience declines or local extirpations due to low productivity or temporary habitat succession.

The Piping Plover Recovery Plan identifies a recovery objective to ensure the long-term viability of the Atlantic Coast plover population in the wild, thereby allowing for the de-listing of this species, along with five criteria for meeting the objective, which are listed below:

- The population goal of 2,000 breeding pairs, distributed among four recovery units, and maintained at that level for five years;
- The adequacy of a 2,000-pair population of Piping Plovers has been verified to maintain heterozygosity and allelic diversity over the long-term;
- A five-year average productivity of 1.5 chicks fledged per pair has been achieved in each of the recovery units;
- Long-term agreements have been instituted to assure protection and management sufficient to maintain the population targets and average productivity in each recovery unit; and
- Long-term maintenance of wintering habitat, sufficient in quantity, quality, and distribution has been ensured to maintain survival rates for a 2,000-pair population.

The Piping Plover Recovery Plan further states, "A premise of this plan is that the overall security of the Atlantic Coast Piping Plover population is profoundly dependent upon attainment and maintenance of the minimum population levels for the four recovery units. Any appreciable reduction in the likelihood of survival of a recovery unit will also reduce the probability of persistence of the entire population." Under Section 7 (a)(2) of the ESA, Federal agencies shall consult with the Service or NMFS to ensure that any activities that they fund, authorize, or carry out do not jeopardize the continued existence of a Federally-listed species. Recovery of the Atlantic Coast Piping Plover population is occurring in the context of an extremely intensive protection effort, since pressures on Atlantic Coast beach habitat from development and human disturbance is continually increasing. Loss and degradation of habitat due to development and shoreline stabilization have been major contributors to the species' decline. Disturbance by humans and pets often reduces the functional suitability of habitat and causes direct and indirect mortality of eggs and chicks. Predation has also been identified as a major factor limiting Piping Plover reproductive success at many Atlantic Coast sites and substantial evidence shows that human activities are affecting types, numbers, and activity patterns of predators, thereby exacerbating natural predation (U.S. Fish and Wildlife Service 1996a).

Range-wide Status and Distribution of the Atlantic Coast and NY-NJ Recovery Unit Populations. The Atlantic Coast population breeds on sandy beaches along the east coast of North America, from Newfoundland to South Carolina. The 2010 Atlantic Coast piping plover population estimate was 1,782 pairs, more than double the 1986 estimate of 790 pairs. Discounting apparent increases in New York, New Jersey, and North Carolina between 1986 and 1989, which likely were due in part to increased census effort (USFWS1996), the population posted a net increase of 86 percent between 1989 and 2010. The largest net population increase between 1989 and 2010 has occurred in New England (266 percent), followed by New York-New Jersey (56 percent). In the Southern recovery unit, net growth between 1989 and 2010 was 54 percent, but almost all of this increase occurred in two years, 2003-2005. Most recently, the total Atlantic Coast population estimate attained 1,890 pairs in 2007 before declining 6 percent to 1,782 pairs in 2010. Decreases during this period occurred in all recovery units except New

England, where the population grew 7 percent between 2007 and 2010. Abundance in both the Eastern Canada and New York-New Jersey recovery units declined 15 percent, while the Southern recovery unit population experienced an 8 percent net decrease. The 64 percent decline in the Maine population between 2002 and 2008, from 66 pairs to 24 pairs, followed only a few years of decreased productivity and provides another example of the continuing risk of rapid and precipitous reversals in population growth. Thus, optimism about progress towards recovery should be tempered by observed geographic and temporal variability in population growth (USFWS 2012).

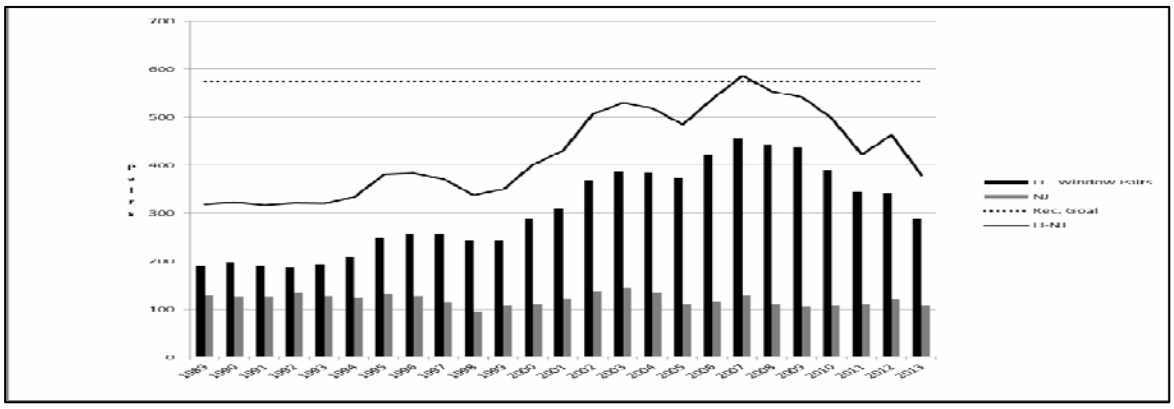

Figure B-4. Graph showing Long Island and New Jersey piping plover populations in relation to the New York- New Jersey Recovery Unit recovery goal

Piping Plover Habitat Utilization History along the Long Island Coast. Overwash habitats, bayside flats, unstabilized and recently closed inlets, ephemeral pools (areas on the beach where sea and/or rain water pool during storm overwashes and rains), and moist, sparsely vegetated barrier flats are especially important to Piping Plover productivity and carrying capacity in the New England, NY-NJ, and Southern Recovery Units (*e.g.*, Wilcox 1959; Strauss 1990; Massachusetts Division of Fisheries and Wildlife 1996; Jones 1997; Houghton *et al*. 2000; Cohen *et al.* 2003). In New York, Wilcox (1959) described the effects on Piping Plovers from storms in 1931 and 1938 that breached the Long Island barrier islands, forming Moriches and Shinnecock Inlets and leveling dunes across the south shore. Only three to four pairs of Piping Plovers nested on 17 mi. (27.4 km.) of barrier beach along Moriches and Shinnecock Bays in 1929. Following the natural opening of Moriches Inlet in 1931, plover abundance increased to 20 pairs in 2 mi. (3.2 km.) of beach habitat by 1938. In 1938, a hurricane opened Shinnecock Inlet and also eroded dunes along both Shinnecock and Moriches Bays. In 1941, plover abundance along the same 17 mi. (27.4 km.) of beach peaked at 64 pairs. Abundance then gradually decreased, a decline that Wilcox (1959) attributed to loss of habitat due to beach nourishment to rebuild dunes, the planting of beach grass, and the construction of roads and summer homes. Elias *et al.* (2000), in a study of nest site selection on 55.8 mi. (90 km.) of beach, stretching from Jones Beach Island to Westhampton Barrier Island, New York, found that Piping Plover use of ephemeral pools and bay tidal flats was greater than expected based on habitat availability. Arthropod abundances (a prey base for Piping Plovers), plover foraging rates, and brood survival were highest in these habitats. Ephemeral pools and tidal flats produced 51 of 81 surviving broods (63 percent), although they accounted for only 12 percent of the habitat surveyed. The

authors observed that these "superior habitats" were rare in their study area and that this may be due, in part, to beach development and management practices, including attempts to stabilize beaches by means of jetty construction, breach filling, and beach renourishment. They concluded that the retention of adequate high quality habitats is important to raising Piping Plover productivity rates to levels that will allow the species' recovery. Fire Island has a history of sporadic overwashes and formation and closures of inlets (Leatherman and Allen 1985) which have renewed habitats important to Piping Plovers (Elias-Gerken 1994). Compared to the baseline for the last several hundred years, the frequency of overwashes and breaches on Fire Island has decreased since the 1938 hurricane, apparently due to anthropogenic barrier island stabilization (Elias-Gerken 1994). However, overwash habitat formed in Old Inlet in the early to mid-1990s and early 2000s. Fire Island would probably be covered with more overwashes, more open vegetation, and perhaps more inlets if humans had not begun to counter natural geologic processes and storm-related changes to barrier island morphology following the 1938 hurricane (Leatherman and Allen 1985). On Fire Island, where ephemeral pools, bayside overwash fans, and sandspits were absent and where broods had access only to oceanic foraging habitats, Elias-Gerken (1994) found that the majority of Piping Plovers tended to cluster near the barrier island tips at Moriches Inlet (Smith Point County Park and Cupsogue County Park) and Democrat Point (Robert Moses State Park).

Predation of Piping Plovers. Predators of piping plover eggs and chicks within the New York-New Jersey Recovery Unit include, but are not limited to, red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), herring gull (*Larus argentatus*), great black-backed gull (*Larus marinus*), and crow (*Corvus brachyrhyncos*), as well as feral and domestic cats. Beach stabilization may be exacerbating natural predation on Piping Plover adults, eggs, and chicks by promoting human use which introduces pets and other natural predators of the Piping Plover (U.S. Fish and Wildlife Service 1996a). For example, unleashed domestic dogs destroyed at least two nests within the Corps' Westhampton Interim Project Area, a nourished beach, in 2003 (Cohen, Virginia Tech, pers. comm., 2003); Raithel (1984) reported that the availability of trash at beach homes led to an increase in local populations of raccoons. Wilcox (1959) observed 92 percent hatching success of nests between 1939 and 1958 in Long Island, New York (a period of less beach development and stabilization), with loss of only two percent of nests to crows. Elias-Gerken (1994) observed crows perching and nesting in Japanese black pines (*Pinus thunbergii*) that were planted to stabilize the beaches and provide wind breaks on Jones Island, New York, and hypothesized that this vegetation and other perches, such as electric light poles, exacerbated depredation by crows on Piping Plovers, as the author reported the loss of 21 percent of nests in her study area to crows in 1992 and 1993. Gulls and crows are also major predators at other vital Long Island nesting areas (Kiesel, pers. comm., 2000; Davis, *unpublished report*, 2002). Avian predators such as crows and blackbirds (Icteridae sp.) were a significant source of predation during the 2003 breeding season at the Corps' Westhampton Interim Project Area, Westhampton, New York (Cohen, Virginia Tech, pers. comm., 2003). A variety of techniques are employed to reduce nest predation. Predator exclosures have reduced predation on Piping Plover eggs and increased hatching success at many nesting sites on the Atlantic Coast (Rimmer and Deblinger 1990; Melvin *et al.* 1992; Canale, New Jersey Department of Environmental Protection, *in litt*., 1997). The use of predator exclosures has been associated with increased mortality due to entanglements of adult birds in the exclosure netting, attraction of predators, and vandalism. Vandalism of exclosures (and symbolic fencing) may influence a land managers' decision to

deploy exclosures (Davis, *unpublished report*, 2002). Exclosures may also be an attractant to predators. In 1995, foxes keyed in on exclosures causing high rates of Piping Plover nest abandonment and low productivity in 1995 (Houghton *et al.* 1997).

B.4.2.2 LIFE HISTORY RED KNOT

The red knot (*Calidris canutus*) was added to the list of Federal candidate species in 2006.
A proposed rule to list the rufa subspecies (*C. c. rufa*), the subject of this Opinion, as threatened under the Endangered Species Act (ESA) was published on September 30, 2013, and a final decision is expected in the fall of 2014. Red knots are federally protected under the Migratory Bird Treaty Act, and are New Jersey State-listed as endangered. The red knot is currently listed as endangered or threatened in New York State.

Red knots were heavily hunted for both market and sport during the 19th and early 20th centuries in the Northeast and the mid-Atlantic. Red knot population declines were noted by several authors of the day, whose writings recorded a period of intensive hunting followed by the introduction of regulations and at least partial population recovery.

Calidris canutus is classified in the Class Aves, Order Charadriiformes, Family Scolopacidae, Subfamily Scolopacinae. Six subspecies are recognized, each with distinctive morphological traits (i.e., body size and plumage characteristics), migration routes, and annual cycles. Each subspecies is believed to occupy a distinct breeding area in various parts of the Arctic but some subspecies overlap in certain wintering and migration areas (FWS BO 2014).

Calidris canutus canutus, C. c. piersma, and *C. c. rogersi* do not occur in North America. The subspecies *C.c. islandica* breeds in the northeastern Canadian High Arctic and Greenland, migrates through Iceland and Norway, and winters in western Europe (Committee on the Status of Endangered Wildlife in Canada. *C. c. rufa* breeds in the central Canadian Arctic (just south of the *C. c. islandica* breeding grounds) and winters along the Atlantic coast and the Gulf of Mexico coast (Gulf coast) of North America, in the Caribbean, and along the north and southeast coasts of South America including the island of Tierra del Fuego at the southern tip of Argentina and Chile (FWS BO 2014).
The rufa red knot is a medium-sized shorebird about 9 to 11 inches (in) (23 to 28 centimeters (cm)) in length. The red knot migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast United States (Southeast), the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed (FWS BO 2014).

The red knot is a large, bulky sandpiper with a short, straight, black bill. During the breeding season, the legs are dark brown to black, and the breast and belly are a characteristic russet color that ranges from salmon-red to brick-red. Males are generally brighter shades of red, with a more distinct line through the eye. When not breeding, both sexes look alike – plain gray above and dirty white below with faint, dark streaking. As with most shorebirds, the long-winged, strong-flying knots fly in groups, sometimes with other species. Red knots feed on

invertebrates, especially small clams, mussels, and snails, but also crustaceans, marine worms, and horseshoe crab eggs. On the breeding grounds, knots mainly eat insects (FWS BO 2014).

Small numbers of red knots may occur in New Jersey year-round, while large numbers of birds rely on New Jersey's coastal stopover habitats during the spring (mid-May through early June) and fall (late-July through November) migration periods. Smaller numbers of knots may spend all or part of the winter in New Jersey. Red knots also rely on New York's coastal stopover habitats during the spring and fall migration periods. As stated above, several stopover habitats in New York are being proposed for critical habitat designations (FWS BO 2014).

The primary wintering areas for the rufa red knot include the southern tip of South America, northern Brazil, the Caribbean, and the southeastern and Gulf coasts of the U.S. The rufa red knot breeds in the tundra of the central Canadian Arctic. Some of these robin-sized shorebirds fly more than 9,300 miles from south to north every spring and reverse the trip every autumn, making the rufa red knot one of the longest-distance migrating animals. Migrating red knots can complete non-stop flights of 1,500 miles or more, converging on critical stopover areas to rest and refuel along the way. Large flocks of red knots arrive at stopover areas along the Delaware Bay and New York/New Jersey's Atlantic coast each spring, with many of the birds having flown directly from northern Brazil. The spring migration is timed to coincide with the spawning season for the horseshoe crab (*Limulus polyphemus*). Horseshoe crab eggs provide a rich, easily digestible food source for migrating birds. Mussel beds on New Jersey's southern Atlantic coast and intertidal/wrack line areas on New York's coast are also important forage habitats for migrating knots. Birds arrive at stopover areas with depleted energy reserves and must quickly rebuild their body fat to complete their migration to Arctic breeding areas. During their brief 10- to 14-day spring stay in the mid-Atlantic, red knots can nearly double their body weight.

Major spring stopover areas along the Atlantic coast include Río Gallegos, Península Valdés, and San Antonio Oeste (Patagonia, Argentina); Lagoa do Peixe (eastern Brazil, State of Rio Grande do Sul); Maranhão (northern Brazil); the Virginia barrier islands (United States); and Delaware Bay (Delaware, New Jersey and New York, United States) (Cohen *et al*.. 2009, p. 939; Niles *et al*.. 2008, p. 19; González 2005, p. 14). However, large and small groups of red knots, sometimes numbering in the thousands, may occur in suitable habitats all along the Atlantic and Gulf coasts from Argentina to Massachusetts (Niles *et al*.. 2008, p. 29). In Massachusetts, red knots use sandy beaches and tidal mudflats during fall migration. In New York and the Atlantic coast of New Jersey, knots use sandy beaches during spring and fall migration (Niles *et al*.. 2008, p. 30).

From geolocators, examples of spring migratory tracks are available for three red knots that wintered in South America. One flew about 4,000 mi (6,400 km) over water from northeast Brazil in 6 days. Another flew about 5,000 mi (8,000 km) from the southern Atlantic coast of Brazil (near Uruguay) over land and water (the eastern Caribbean) in 6 days. Both touched down in North Carolina, and then used Delaware Bay as the final stopover before departing for the arctic breeding grounds (Niles *et al*.. 2010a, p. 126). A third red knot, which had wintered in Tierra del Fuego, followed an overland route through the interior of South America,

departing near the Venezuela-Colombia border. This bird then flew over the Caribbean to Florida, and finally to Delaware Bay (Niles 2011a).

In Delaware Bay, red knots preferentially feed in microhabitats where horseshoe crab eggs are concentrated, such as at horseshoe crab nests (Fraser *et al*.. 2010, p. 99), at shoreline discontinuities (e.g., creek mouths) (Botton *et al*.. 1994, p. 614), and in the wrack line (Nordstrom *et al*.. 2006a, p. 438; Karpanty *et al*.. 2011, pp. 990, 992). (The wrack line is the beach zone just above the high tide line where seaweed and other organic debris are deposited by the tides.) Wrack may also be a significant foraging microhabitat outside Delaware Bay, for example where mussel spat (i.e., juvenile stages) are attached to deposits of tide-cast material. Wrack material also concentrates certain invertebrates such as amphipods, insects, and marine worms (Kluft and Ginsberg 2009, p. vi), which are secondary prey species for red knots (see Migration and Wintering Food, below).

For many shorebirds, the supra-tidal (above the high tide) sandy habitats of inlets provide important areas for roosting, especially at higher tides when intertidal habitats are inundated (Harrington 2008, pp. 4–5). Along the Atlantic coast, dynamic and ephemeral features are important red knot habitats, including sand spits, islets, shoals, and sandbars, often associated with inlets (Harrington 2008, p. 2). From South Carolina to Florida, red knots are found in significantly higher numbers at inlets than at other coastal sites (Harrington 2008, pp. 4–5).

The District is not aware of comprehensive monitoring of red knots on Long Island, New York. Some data is available from individual birders or associated with horseshoe crab monitoring. At Plum Beach in Brooklyn, NY, recorded red knot abundances during horseshoe crab surveys in 2009 and 2010 decreased from 31 (peak of 28 on May 29) in 2009 to 2 (on May 31) in 2010 (New York City Audubon 2010). Individual birders have documented red knot presence at Overlook County Park (May 2013 – 5 red knots) and Cupsogue County Park (June 2007 – 150 red knots) (Ebird website- http://ebird.org/ebird/subnational2/US-NY-103/hotspots).

Threats to Red Knot

Much of the U.S. coast within the range of the red knot is already extensively developed. Direct loss of shorebird habitats occurred over the past century as substantial commercial and residential developments were constructed in and adjacent to ocean and estuarine beaches along the Atlantic and Gulf coasts. In addition, red knot habitat was also lost indirectly, as sediment supplies were reduced and stabilization structures were constructed to protect developed areas.

Sea level rise and human activities within coastal watersheds can lead to long-term reductions in sediment supply to the coast. Damming of rivers, bulkheading highlands, and armoring coastal bluffs have reduced erosion in natural source areas and, consequently, the sediment loads reaching coastal areas. Although it is difficult to quantify, the cumulative reduction in sediment supply from human activities may contribute to the long-term shoreline erosion rate. Along coastlines subject to sediment deficits, the amount of sediment supplied to the coast is less than that lost to storms and coastal sinks (inlet channels, bays, and upland deposits), leading to long-term shoreline recession.

Red knots require open habitats that allow them to see potential predators and that are away from tall perches used by avian predators. Invasive species, particularly woody species, degrade or eliminate the suitability of red knot roosting and foraging habitats by forming dense stands of vegetation. Although not a primary cause of habitat loss, invasive species can be a regionally important contributor to the overall loss and degradation of the red knot's nonbreeding habitat.

Commercial harvest of horseshoe crabs has been implicated as a causal factor in the decline of the rufa red knot by decreasing the availability of horseshoe crab eggs in the Delaware Bay stopover (Niles *et al*.. 2008, pp. 1-2). Notwithstanding the importance of the horseshoe crab and Delaware Bay, other lines of evidence suggest that the rufa red knot also faces threats to its food resources throughout its range.

About 40 percent of the U.S. coastline within the range of the red knot is already developed, and much of this developed area is stabilized by a combination of existing hard structures and ongoing beach nourishment programs. In those portions of the range for which data are available (New Jersey and North Carolina to Texas), about 40 percent of inlets, a preferred red knot habitat, are hard-stabilized, dredged, or both. Hard stabilization structures and dredging degrade and often eliminate existing red knot habitats, and in many cases prevent the formation of new shorebird habitats. Beach nourishment may temporarily maintain suboptimal shorebird habitats where they would otherwise be lost as a result of hard structures, but beach nourishment also has adverse effects to red knots and their habitats. Demographic and economic pressures remain strong to continue existing programs of shoreline stabilization and to develop additional areas, with an estimated 20 to 33 percent of the coast still available for development. However, we expect existing beach nourishment programs will likely face eventual constraints of budget and sediment availability as sea level rises. In those times and places that artificial beach maintenance is abandoned, the remaining alternatives would likely be limited to either a retreat from the coast or increased use of hard structures to protect development. The quantity of red knot habitat would be markedly decreased by a proliferation of hard structures. Red knot habitat would be significantly increased by retreat, but only where hard stabilization structures do not exist or where they get dismantled. The cumulative loss of habitat across the nonbreeding range could affect the ability of red knots to complete their annual cycles, possibly affecting fitness and survival, and is thereby likely to negatively influence the long-term survival of the rufa red knot.

In wintering and migration areas, the most common predators of red knots are peregrine falcons (*Falco peregrinus*), harriers (*Circus* spp.), accipiters (Family Accipitridae), merlins (*F. columbarius*), shorteared owls (*Asio flammeus*), and greater black-backed gulls (*Larus marinus*) (Niles *et al.* 2008, p. 28). In addition to greater black-backed gulls, other large gulls (e.g., herring gulls (*Larus argentatus*)) are anecdotally known to prey on shorebirds. Predation by a great horned owl (*Bubo virginianus*) has been documented in Florida Nearly all documented predation of wintering red knots in Florida has been by avian, not terrestrial, predators (2014 FWS BO). However, in migration areas like Delaware Bay, terrestrial predators such as red foxes (*Vulpes vulpes*) and feral cats (*Felis catus*) may be a threat to red knots by causing disturbance, but direct mortality from these p redators may be low (Niles *et al.* 2008, p. 101).

Red knots' selection of high-tide roosting areas on the coast appears to be strongly influenced by raptor predation, something well demonstrated in other shorebirds (Niles *et al*.. 2008, p. 28). Red knots require roosting habitats away from vegetation and structures that could harbor predators (Niles *et al*.. 2008, p. 63). Red knots' usage of foraging habitat can also be affected by the presence of predators, possibly affecting the birds' ability to prepare for their final flights to the arctic breeding grounds (Watts 2009) (e.g., if the knots are pushed out of those areas with the highest prey density or quality). In 2010, horseshoe crab egg densities were very high in Mispillion Harbor, Delaware, but red knot use was low because peregrine falcons were regularly hunting shorebirds in that area (Niles 2010a). Growing numbers of peregrine falcons on the Delaware Bay and New Jersey's Atlantic coasts are decreasing the suitability of a number of important shorebird areas (Niles 2010a). Analyzing survey data from the Virginia stopover area, Watts (2009) found the density of red knots far (greater than 3.7 mi (6 km)) from peregrine nests was nearly eight times higher than close (0 to 1.9 mi (0 to 3 km)) to peregrine nests. In addition, red knot density in Virginia was significantly higher close to peregrine nests during those years when peregrine territories were not active compared to years when they were (Watts 2009).

The quantity and quality of red knot prey may also be affected by the placement of sediment for beach nourishment or disposal of dredged material. Invertebrates may be crushed or buried during project construction. Although some benthic species can burrow through a thin layer of additional sediment, thicker layers (over 35 in (90 cm)) smother the benthic fauna. By means of this vertical burrowing, recolonization from adjacent areas, or both, the benthic faunal communities typically recover. Recovery can take as little as 2 weeks or as long as 2 years, but usually averages 2 to 7 months (Burlas et al 2001; Peterson and Manning 2001, p. 1). Although many studies have concluded that invertebrate communities recovered following sand placement, uncertainty remains about the effects of sand placement on invertebrate communities and how these impacts may affect red knots.

B.4.2.3 ATLANTIC SHORES PIPING PLOVER AND RED KNOT PREY SPECIES

Atlantic Shore Invertebrates Communities

The benthic community of the marine nearshore environment includes a variety of benthic invertebrates, several of which are commercially and recreationally important. Within the marine nearshore habitat of the Study Area, there is a high degree of spatial and seasonal uniformity in both species composition and abundance (USACE 2004a). Benthic invertebrate communities in the marine nearshore habitat are generally similar in distribution and composition to that of the marine offshore habitat and consist of a variety of taxa common to generally clean, well-oxygenated, coarse, sandy, subtidal marine habitats. Indicator benthic invertebrate species that characterize the marine nearshore environment of the Study Area include polychaetes, amphipods, sea stars, and *Yoldia* species of bivalves (USACE 2006a). Epibenthic invertebrates include numerous shrimp species, and indicator pelagic species include jellyfish and zooplankton. Commercial and recreationally indicator species include several species of clams including surf clam and ocean quahog, horseshoe crab, American lobster, and long-finned and short-finned squid (USACE 2006a).

A review of USACE studies conducted within the marine nearshore habitat of the Study Area in 2000 and 2001 (USACE 2004a), identified the dominant invertebrates collected as segmented worms (phylum Annelida), snails, clams and squid species (phylum Mollusca), crabs, American lobster, various shrimp species (phylum Arthropoda), and sea urchins and sea stars (phylum Echinodermata).

Commercially important benthic species such as surf clams, and long- and short-finned squid are harvested within the marine nearshore habitat of the Study Area. The greatest concentrations of surf clams are associated with depths less than 65 feet (USFWS 1997b), however this species is not commercially significant throughout the Study Area due to its recent decline in population.

NOAA defines the marine intertidal zone as the area that is periodically flooded with tidal waters (NOAA 2008a), which would include those areas inundated and exposed approximately twice per month during the spring and neap tidal cycles associated with the new and full phases of the moon. Because of the alternate inundation and drying of this zone, the species richness of the benthic community of the marine intertidal region tends to be lower in comparison to that of other marine habitats discussed. Representative benthic invertebrate species identified in the FIMP Conceptual Model for marine intertidal habitats of the Study Area include the polychaete species *Scolelepsis*, amphipods, isopods (phylum Isopoda), *Donax* species of bivalves, and mole crab (*Emerita* sp. [USACE 2006a]). Attached and sessile forms of benthic invertebrates identified as indicator species within the marine habitat include barnacles (*Balanus* spp.), limpets (phylum Mollusca, class Gastropoda), mussel species (phylum Mollusca, class Bivalvia), chitons (phylum Mollusca, class Polyplacophora), hermit crabs, and numerous snail species (phylum Mollusca, class Gastropoda). Barnacles, blue mussel, common eastern chitons (*Chaetopleura apiculata*), hermit crabs, and snails (e.g., *Littorina littorea*) are especially adapted to live within the rocky intertidal zone located in the eastern portion of the Study Area [USFWS 2007d]). Benthic invertebrate surveys conducted within the marine intertidal zone of the Study Area revealed that the abundance and diversity of the benthic infauna increases from west to east, with the highest biomass attributed to polychaete worms (USFWS 2007d). One exception to the biomass results were associated with the rocky intertidal areas associated with the Montauk Headlands, which were dominated by mollusks, especially periwinkle (*Littorina littorea*).

Although the dry sandy substrate of the marine beach habitat excludes establishment of typical marine benthic invertebrates, other less water dependent invertebrates have adapted to spending at least a portion of their life cycle on the beach, particularly within the wrack line. Densities of all forms of beach invertebrates generally are relatively lower in comparison to other surrounding habitats, with the wrack line providing the primary source of food and cover for a myriad of invertebrates and saprophagous, scavenger, and predatory insects, and a variety of oligochaetes and nematodes typically found in this habitat type. No representative invertebrate species have been identified in the FIMP Conceptual Model for the marine beach habitat, however, a review of a invertebrate study conducted within the marine beach, and dunes and swales habitat of the Study Area identified amphipod beach fleas (*Talorchestia longicornis*, *T. megalopthalma* and *Orchestia grillus*) as the dominant invertebrate type collected (USACE 2005c). Other common invertebrate types collected within these zones include flies belonging to the families Dolichopodidae and Ephydridae, beetles belonging to the families Carabidae, Staphylinidae, and Histeridae, the ant *Lasius neoniger*, and mites (class Arachnida).

Due to similarities in tidal inundation and salinity levels, the benthic community of the inlets is similar to that of the marine nearshore environment, and represents important feeding areas for crabs and American lobster within the Study Area. Indicator benthic invertebrate species identified by the FIMP Conceptual Model prepared for the Study Area include polychaetes, horseshoe crabs, amphipods, sea stars, *Yoldia* spp., eastern mudsnail (*Nassarius obsoleta*), Say mud crab (*Dyspanopeus sayi*), hermit crabs of the Paguridae family, green crab (*Carcinus maenas*), and other species of crab as well as isopods and zooplankton. Epibenthic indicator invertebrates include numerous shrimp species and barnacles. Pelagic invertebrates such as jellyfish, and commercially and recreationally important species including the ocean quahog, American lobster, squid species, blue crab, blue mussel, Atlantic ribbed mussel (*Geukensia demissa*), surf clam, and softshell clam (*Mya arenaria*) have also been identified as indicator species for the inlet habitat of the Study Area.

Barrier Island Invertebrates

As with the marine beach habitat, the dryness of the dune and swale habitat excludes establishment of aquatic benthic invertebrates. It is likely that insects similar to those collected from the marine beach habitat described in Section 4.2.2 are also present on the adjacent dune and swale habitats. Although invertebrate densities are generally low within this habitat type, a variety of beetles, ants, and flying insects are present within this community. Historically, northeastern beach tiger beetles (*Cincindela dorsalis dorsalis*) were known to inhabit dune areas, but are believed to have been extirpated from Long Island (USFWS 1997b). Extirpation of this species has been largely attributed to destruction and disturbance of natural beach habitats as a result of shoreline development, beach stabilization structures, and the high rate of recreation use of the beaches. Further contributing to the extirpation of this species from the Long Island area is the high mortality rate of northeastern beach tiger beetle larvae that has been linked to those areas with a high rate of human activity.

Invertebrates of the terrestrial upland habitats of the barrier island habitat include a variety of insects and spiders, including beetles (order Coleoptera), wolf spiders (family Lycosidae) and jumping spider (family Salticidae). Ants (family Formicidae) and burrowing spiders (family Theraphosidae) are common as they are able to construct deep underground tunnels to escape hot summer temperatures. USACE (2006a) identified amphipods and isopods as the indicator benthic invertebrate species likely to inhabit the wrack zone and upland habitats of the bayside beach.

B.4.2.4 SEABEACH AMARANTH DESCRIPTION

Listing

On April 7, 1993, seabeach amaranth was added to the List of Endangered and Threatened Wildlife and Plants as a threatened species. The listing was based upon the elimination of seabeach amaranth from two-thirds of its historic range, and continuing threats to the 55 populations that remained at the time (U.S. Fish and Wildlife Service 1993). No critical habitat, as defined under the ESA, has been designated for this species.

Life History

Seabeach amaranth (family *Amaranthaceae*) is an annual plant native to the barrier island beaches of the Atlantic Coast from Massachusetts to South Carolina. The original range of this species extended from Cape Cod, Massachusetts, to central South Carolina, a stretch of coast approximately 994 mi. (1,600 km.). The range of seabeach amaranth is characterized by islands developed by highwave energy, low tidal energy, frequent overwash, and frequent breaching by hurricanes with resulting formation of new inlets (Weakley and Bucher 1992). Within its range, the species' primary habitat consists of overwash flats at accreting ends of barrier islands, and lower foredunes and upper strands of non-eroding beaches. Seabeach amaranth is never found on beaches where the foredune is scarped by undermining water at high storm tides (Weakley and Bucher 1992).

Occasionally, small, temporary, and casual populations are established in secondary habitats such as blowouts in foredunes, and sand or shell dredge spoil or beach nourishment material (Weakley and Bucher 1992). Upon germination, the plant initially forms a small, unbranched sprig. Soon after, it begins to branch profusely into a low-growing mat.

Seabeach amaranth's fleshy stems are prostrate at the base, erect or somewhat reclining at the tips, and pink, red, or reddish in color. The leaves of seabeach amaranth are small, rounded, and fleshy, spinach-green in color, with a characteristic notch at the rounded tip. Leaves are approximately 1.3 to 2.5 cm. in diameter and clustered towards the tip of the stem (Weakley and Bucher 1992). Plants often grow to 30 cm. in diameter, consisting of 5 to 20 branches, but occasionally reach 90 cm. in diameter, with 100 or more branches. Flowers and fruits are inconspicuous, borne in clusters along the stems. Seeds are 2.5 mm. in diameter, dark reddish-brown, and glossy, borne in low-density, fleshy, iridescent utricles (bladder-like seed capsules or fruits), 4 to 6 mm. long (Weakley and Bucher 1992). The seed does not completely fill the utricle, leaving an air-filled space (U.S. Fish and Wildlife Service 1996b). Many utricles remain attached to the parent plant and are never dispersed, leading to *in situ* planting. This phenomenon has also been observed in sea rocket (*Cakile edentula*) and may be an adaptation to dynamic beach conditions. If conditions remain favorable at the site of the parent plant, then seed source for retention of that site is guaranteed. When habitat conditions become unsuitable, other seeds have been dispersed to colonize new sites (Weakley and Bucher 1992). Individual plants live only one season with only a single opportunity to produce seed. The species overwinters entirely as seeds.

Germination of seedlings begins in April and continues at least through July. In the northern part of the range, germination occurs slightly later, typically late June through early August. Reproductive maturity is determined by size rather than age and flowering begins as soon as plants have reached sufficient size. Even very small plants can flower under certain conditions. Flowering sometimes begins as early as June in the Carolinas but more typically commences in July and continues until the death of the plant. Seed production begins in July or August and reaches a peak in most years in September. Seed production likewise continues until the plant dies. Senescence and death occur in late fall or early winter (U.S. Fish and Wildlife Service 1996b). While seabeach amaranth seems capable of essentially indeterminate growth (Weakley and Bucher 1992), predation and weather events, including rainfall, hurricanes, and temperature

extremes, have significant effects on the length of the species' reproductive season. As a result of one or more of these influences, the flowering and fruiting period can be terminated as early as June or July (U.S. Fish and Wildlife Service 1993).

Seabeach amaranth does not occur on well-vegetated beaches, particularly where perennials have become strongly established (Weakley and Bucher 1992). Pauley *et al*. (1999) documented a negative correlation between seabeach amaranth and several dominant foredune species. A particularly strong negative association has been reported between seabeach amaranth and beach grasses (*Ammophila* sp.) (U.S. Fish and Wildlife Service 1996b). A positive correlation has been observed between seabeach amaranth and sea rocket, an annual plant (Hancock 1995). Historic records of seabeach amaranth are known from nine states. Largely due to human activities such as trampling during recreation and beach stabilization, the species was eliminated from seven of these states in the 1980s, remaining only in the North and South Carolinas. Seabeach amaranth is still considered extirpated from Massachusetts and Rhode Island. Since 1990, the species has reoccupied five states from which it had previously been extirpated. The current known range of naturally occurring seabeach amaranth is Water Mill Beach on Long Island, New York, to Debidue Beach, South Carolina (Young 2003; Hamilton 2000a).

The plant is eliminated from existing habitats by competition and erosion and colonizes newly-formed habitats by dispersal and (probably) long-lived seed banks. A poor competitor, seabeach amaranth is eliminated from sites where perennials have become established, probably because of root competition for scarce water and nutrient supplies (Weakley and Bucher 1992). The same physical forces (*e.g*., storms and extreme high tides) that create the plant's very specific and ephemeral coastal habitat also destroy it. Existing habitats are eroded away but new habitats are created by island overwash and breaching. Therefore, seabeach amaranth requires extensive areas of barrier island beaches and inlets, functioning in a relatively natural and dynamic manner. Such conditions allow the plant to move around in the landscape, occupying suitable habitats as they are formed (U.S. Fish and Wildlife Service 1996b). Seeds are dispersed by a variety of mechanisms involving transport via wind and water. Seeds retained in utricles are easily blown about, deposited in depressions, the lee behind plants, or in the surf. Naked seeds are also commonly encountered in the field and are also dispersed by wind, but to a much lesser degree than seeds retained in utricles. Naked seeds tend to remain in the lee of the parent plant or get moved to nearby depressions (Weakley and Bucher 1992). Observations from South Carolina indicate that seabeach amaranth seeds are also dispersed by birds through ingestion and eventually deposited with their droppings (Hamilton 2000b).

Population Dynamics

Density of seabeach amaranth is extremely variable within and between populations. The species generally occurs in a sparse to very sparse distribution pattern, even in the most suitable habitats. A typical density is 100 plants per linear km. of beach, though occasionally on accreting beaches, dense populations of 1,000 plants per linear km. of beach can be found. Island-end sand flats generally have higher densities than oceanfront beaches (Weakley and Bucher 1992). Seabeach amaranth has been found to have a strongly clumped distribution (Hancock 1995). On Long Island, New York, however, dense assemblages and high abundances have been recorded on central barrier island locations (Young 2002). Within its primary habitats, seabeach amaranth

concentrations can be found in the wrackline (Mangels 1991; Weakley and Bucher 1992; Hancock 1995; MacAvoy 2000). In 2001, a study by Pauley *et al.* (1999) suggested that organic litter may be an advantageous microhabitat for seabeach amaranth when it contains higher levels of organic material and moisture than bare sand.

Range-wide Status and Distribution

Because of the species vulnerability to threats and the fact that it has already been eliminated from two-thirds of its range, the species was Federally-listed as threatened by the Service in 1993. Weakley and Bucher (1992) completed range-wide surveys of seabeach amaranth at known historical sites in 1987 and 1988. In 1987, 39 populations contained a total of 11,740 plants. In 1988, 45 populations contained a total of 43,651 plants, representing a one-year increase of 372 percent. A survey in 1990 revealed 43 populations with a total of 11,075 plants in the Carolinas plus an additional 13 populations with 357 plants which reappeared on Long Island, New York (Clements and Mangels 1990). Even with the addition of the New York populations, the 1990 survey documented a range-wide reduction of 74 percent from the 1988 census. Due to the limited number of surveys, consecutive data over the last three years (2000-2002) was only available for the states of Delaware, New Jersey, and New York. In New York State, the New York State Natural Heritage Program (NYSNHP) has collected data over those years. The 2000 population of seabeach amaranth had an uneven geographic distribution, with almost 99 percent of the plants located on Long Island, New York. A single site on Long Beach Island, New York, comprised 75 percent of the total plants range-wide. Of the 39 extant sites documented in 2000, eleven had 100 or more plants (seven in New York, two in New Jersey, and two in North Carolina), and four had 1,000 or more plants (all in New York). Seventeen sites had fewer than ten plants (three in New York, one in Maryland, eleven in North Carolina, and two in South Carolina) (Young 2003; MacAvoy 2000; National Park Service 2001a and 2001b; Jolls and Sellers 2000; U.S. Army Corps of Engineers 2001b; Hamilton 2000a). Historically, seabeach amaranth occurred in nine states from Massachusetts to South Carolina.

The populations which have been extirpated are believed to have succumbed as a result of hard shoreline stabilization structures, erosion, tidal inundation, and possibly as a result of herbivory by webworms (U.S. Fish and Wildlife Service 1994). The continued existence of the plant is threatened by these activities (Elias-Gerken 1994; Van Schoik and Antenen 1993) as well as the adverse alteration of essential habitat primarily as a result of “soft” shoreline stabilization (beach nourishment, artificial dune creation, and beach grass plantings), but also from beach grooming and other causes (Murdock 1993). Populations of seabeach amaranth at any given site are extremely variable (Weakley and Bucher 1992) and can fluctuate by several orders of magnitude from year to year. The primary reasons for the natural variability of seabeach amaranth are the dynamic nature of its habitat and the significant effects of stochastic factors such as weather and storms on mortality and reproductive rates. Although wide fluctuations in species populations tend to increase the risk of extinction, variable population sizes are a natural condition for seabeach amaranth and the species is well adapted to its ecological niche.

Recreational and Off Road Vehicle (ORV) Impacts to Seabeach Amaranth

Intensive recreational use and ORV traffic on beaches can threaten seabeach amaranth populations, both through direct damage and mortality of plants and by impacting their habitats. Light pedestrian traffic, even during the growing season, usually has little effect on seabeach amaranth (U.S. Fish and Wildlife Service 1993). Problems generally arise only on narrow beaches or beaches which receive heavy recreational use. In such areas, seabeach amaranth populations are sometimes eliminated or reduced by repeated trampling. Off-road vehicle use on the beach during the growing season can have detrimental effects on the species, as the fleshy stems of this plant are brittle and easily broken. Plants generally do not survive even a single pass by a truck tire (Weakley and Bucher 1992). In some cases, winter ORV traffic may actually provide some benefits for the species by setting back succession of perennial grasses and shrubs with which seabeach amaranth cannot successfully compete. But, extremely heavy ORV use, even in winter, may have some negative impacts, including pulverization of seeds (Weakley and Bucher 1992).

Herbivory

Predation by webworms (caterpillars of small moths) is a major source of mortality and lowered fecundity in the Carolinas, often defoliating plants by early fall (U.S. Fish and Wildlife Service 1993). Defoliation at this season appears to result in premature senescence and mortality, reducing seed production, the most basic and critical parameter in the life cycle of an annual plant. Webworm predation may decrease seed production by more than 50 percent (Weakley and Bucher 1992). In New York, herbivory by saltmarsh caterpillars (*Estigmene acraea*) has been observed (U.S. Fish and Wildlife Service 1996b). Webworm herbivory of seabeach amaranth has not been documented in Delaware or Maryland. Overall, webworm herbivory is probably a contributing, rather than a leading factor, in the decline of seabeach amaranth. In combination with extensive habitat alteration, severe herbivory could threaten the existence of the species (Weakley and Bucher 1992).

New Threats

New threats (mammalian and avian herbivores and disease) to seabeach amaranth have been documented since the species was listed in 1993. These factors are lesser threats than habitat modification, but may increase the risk of extinction by compounding the effects of other, more severe threats. Several additional herbivores of seabeach amaranth have been observed including white-tailed deer (*Odocoileus virginianus*), rabbits (*Sylvilagus floridanus*), and migratory songbirds (Van Schoik and Antenen 1993).

The first known disease of seabeach amaranth was documented in South Carolina in 2000. During the 2000 growing season, an oomycete (*Albugo* sp.) was observed on seabeach amaranth in several South Carolina sites (Strand and Hamilton 2000). This pathogen is a white rust or water mold. Effects on infected individuals were significant, resulting in death of the plants two to four weeks after lesions were first observed. Anecdotal observations suggest that isolated plants tended to avoid infection (Strand and Hamilton 2000).

Direct Impacts to Affected Species

The definition of "Take" of beach species (i.e. piping plover and amaranth) from construction and other beach activities includes harm or harassment to individuals from construction or other project related activities such as disturbance to animals and their habitat. For the plant species, this includes amaranth mortality and burial of its seed bank due to fill placement.

Seabeach amaranth, red knot and piping plover could be directly impacted under this alternative, as sand would be placed on sections of beach involving manipulation of the beach area by construction equipment. However, historical and current distribution of these species has not been in the community areas where part of the project is proposed. There are six recorded locations of seabeach amaranth on Fire Island. Historically the largest concentrations of the plant have been recorded at Democrat Point and Smith Point. Most of the piping plover and nest occurrences have been recorded outside of the Wilderness area, however birds and nests have been located in or around communities in front but mainly flanking the communities' boarders to the east or west. In the areas of active plover nesting the project would be constructed outside of the April 1 – September 1 window or a 100 meter buffer put in place to protect the species.

Therefore, direct impacts on listed species are not anticipated for two reasons. First, listed species are not expected to occur in the community areas since existing beach profiles and human disturbance conditions are for the most part unsuitable. Second, the projects activities will restrict activity to the time of year when species are not present to avoid and minimize direct impacts. Plovers are expected to leave the area by August, and amaranth, although presence is unlikely, is expected to have peaked in seed production by September.
A requirement of beach nourishment is to conduct surveys for both species (per USFWS conservation measures protocol) prior to and during such activities so that species status is accurately determined. If active breeding plovers are present, then no sand placement will be conducted. If amaranth is present, then protective fencing (per USFWS conservation measure protocol) will be used as a protective buffer and monitored until natural annual mortality occurs. In the unlikely event of amaranth presence and construction activities unable to avoid plants physically or time of year, plants could be transplanted to similar nearby project site habitat and protected through fencing and educational signs and monitored. Burial of seed bank with sand placement on the beach is also a potential adverse impact. An additional measure to minimize and compensate for any amaranth direct take, seeds would be collected and germinated and replanted in the project site and protected through natural senescence (per USFWS protocol, USFWS 2002).

Potential Indirect Impacts to the Affected Species

Potential indirect impacts are anticipated to plovers, red knot and amaranth and their habitat. Beach nourishment could have both beneficial and adverse effects on these beach-dependent species. If the result of the sand placement produces a higher, wider beach and more available, suitable habitat for both amaranth and plovers, there can be potential positive habitat impacts. This could reduce flooding and potential loss of individuals and progeny (young and seed bank) and provide additional habitat for more colonization.

On the other hand, creating additional habitat in heavily disturbed community areas could result in sub-optimal or nonfunctional habitat, which could also result in a population sink. Wider, higher beaches could attract and result in higher recreational use and an increase in predation with additional habitat available for predators. Numerous studies have documented the direct and indirect adverse effects of human disturbance on piping plovers (Burger 1987, Melvin et. al. 1992, Howard et. al. 1993, Elias-Gerken and Fraser 1994, and Strauss 1990).

Since the ocean beaches already receive high public use and have protected areas for rare flora and fauna, no shift or change in existing use is expected. This is also the case with human induced predator impacts, as both beach conditions and predator populations fluctuate and cycle. Further, construction activities would temporarily impact beach invertebrates and prey base of plovers as well as the potential habitat and seed bank of amaranth. Intertidal zone prey base would be affected, as project activities would place material below the high tide line. These impacts will be short term and minimal due to time of year placement and the amount of intertidal are along LI. Placement of sand on the dune could also bury amaranth seeds and affect the integrity of the plant community.

The construction of the beach and dune building could preclude natural overwash processes and early successional habitat formation in the short term within the footprint of the project, but also noting that majority of the coastline will not be effected by this project. Nourishment would also bury or remove established beach vegetation and temporarily retard vegetative growth. It would provide a gently sloping beach and wider intertidal areas for increased plover breeding and foraging and invertebrate amaranth colonization. The project could also bury or temporarily remove the wrack line, an important source of prey for plovers.

Nourishment of the beach towards more stabilized conditions can preclude natural habitat formation, including overwash and back-bay foraging sites. The habitat resulting from the activities will be temporarily changed, as well as available prey base (potential removal of wrack/beach invertebrates). These conditions may be positive or negative, as more beach will be available as breeding habitat, but natural habitat formation of overwash areas could be precluded. These manipulated conditions are expected to be temporary and localized and quickly recover and recolonize with prey. Effects of this project are recognized to not last through the dynamic winters the shoreline will returned to its natural configuration within few years. The project will allow for overwash in all the other areas outside the project area along Fire Island.
The District has identified the following potential indirect adverse effects to listed species resulting from implementation of the project:

- Disturbance to prey base and temporarily reduced prey availability (destruction of beach invertebrates and wrack line);
- Reduction of potential for formation and maintenance of overwash or bayside breeding and foraging habitat;
- Disturbance through enhancing beaches to attract increased recreational activities on oceanside beaches;
- Increased potential predator populations/activity that could utilize habitat created by the project;
- Changes in existing habitats on FIIS (could be positive or negative);

The District coordinated with the Department of Interior (NPS and USFWS), NYSDEC and Suffolk County and developed a consensus-based modifications to the proposed beach fill component of the TSP that would provide increased protection and improved productivity for listed species, including the piping plover. In addition, the District will conduct pre-construction field surveys for active piping plover nesting areas. Beach fill would not be placed within 1000 m of active populations of piping plover or other state or Federally-listed shorebirds/seabirds during the breeding season.

The proposed activities would cause short-term impacts to amaranth by potentially covering the seeds or plants. However, as noted above, amaranth is limited to inhabit the Project area. In addition, similar to the recommendations provided by NYSDEC and USFWS for the piping plover, the District will implement several measures in an effort to minimize potential adverse impacts to existing seabeach amaranth populations (USACE 1998, USFWS 1999). These impact minimization measures include the following: pre and post-construction surveys of the Project area to determine the presence/absence of seabeach amaranth; education of residents, landowners, beach visitors, and beach managers; and the use of physical deterrents to deter human use of potential seabeach amaranth habitat. Because seabeach amaranth has not been identified as occurring in the majority of the Project area and because measures will be taken to minimize access to areas that are shown to have amaranth, No Effect determination was made on populations of seabeach amaranth related to the implementation of these actions.

Construction of the Project is likely to increase overall habitat suitability for seabeach amaranth along the affected beachfront. Although the planned beach berm is designed for an elevation of 9.5 ft NGVD, which is slightly higher than seabeach amaranth's preferred elevation, as the beach berm slopes toward the ocean, there will be a zone that falls within the plants preferred elevation range. Expanding the beach and particularly the zone most suitable for amaranth would likely provide habitat for seabeach amaranth.
A summary of Project activities and their effects on populations of seabeach amaranth are presented in Table 5.

Table B-4. Summary of Project Effects on Populations of Red Knot Piping Plover

Activities	Potentially Beneficial	Not Likely to Adversely Affect	Likely to Adversely Affect	No Effect
No-Action	X			
Project				
Staging Area Construction and Use		X		
Beach Fill/Dune Construction		X		
Cumulative				
Beach Fill/Dune as Coordinated with DOI	X	X		

Table B-5. Summary of Project Effects on Populations of Seabeach Amaranth

Activities	Potentially Beneficial	Not Likely to Adversely Affect	Likely to Adversely Affect	No Effect
No-Action	X			
Project				
Staging Area Construction and Use		X		
Beach fill/Dune Creation	X	X		
Cumulative				
Beach fill/Dune Creation	X	X		

B.4.2.5 BACK BAY ECOSYSTEM

Back bay Invertebrates

The bay intertidal habitat of the Study Area extends from MHW to MLW on the bay side of the barrier island, and includes sand shoals, sand flats, mud flats, and salt marsh habitats. Benthic invertebrates of the bay intertidal habitat must be adapted to life in regularly changing conditions of alternating submersion in salt water and then exposure to air. Benthic invertebrates of the bay intertidal habitat can be attached to hard structures or live on top of sediment (epifauna), or live in association with sediments (infauna). Epifauna typically feed on particulate matter associated with the attached biota. Examples of attached forms of epifauna include barnacles, mussels and limpets, and free-living forms include amphipods and other crustaceans such as crabs, and sea stars. Benthic invertebrates of the bay subtidal habitat are those adapted to fine-grained sediments typical of this habitat.

Invertebrate indicator species identified in the FIMP Conceptual model for the bay intertidal habitat include horseshoe crab, barnacles, eastern mudsnail, Say mud crab, hermit crab, green crab and other crab species, amphipods, isopods, sea stars and zooplankton (USACE 2006a).

Commercially and recreationally important invertebrates of the bay intertidal habitat include blue mussel, Atlantic ribbed mussel, blue crab, and softshell clam. Great South Bay and Moriches Bay are important spawning grounds for blue crab (USFWS 1991). Blue crab also spawns in the shallow salt marsh areas located along the fringes of the Study Area estuaries.

Two invertebrate surveys have been conducted by USACE in both marine intertidal and bay intertidal areas of the Study Area. In general, a higher density of invertebrates within the bay intertidal habitat was found in comparison to samples collected from similar marine intertidal habitats (USACE 1999d and 2005c). Sediment cores collected within the bay intertidal habitat were dominated by oligochaete worms and nematode representatives, with blue mussel dominating one of the wrack line samples in the 1998 study (USACE 1999d). Pitfall fall traps

set out within the bay intertidal habitats generally had a higher catch per unit effort in comparison to pitfall traps located within similar marine intertidal habitats.

Sand shoal and sand/mud flat habitats support many of the species described for the bay intertidal habitat, and include horseshoe crab, fiddler crabs (*Uca pugilator* and *U. pugnax*), and the commercially and recreationally important blue mussel, Atlantic ribbed mussel, and softshell clam (USACE 2006a).

Invertebrate indicator species of the salt marsh habitat of the Study Area include horseshoe crab, barnacles, eastern mudsnail, Say mud crab, blue crab, hermit crab, other crab species, amphipods, and isopods (USACE 2006a). Indicator invertebrates of the salt marsh habitat that are considered commercially and recreationally important are the blue mussel and Atlantic ribbed mussel.

Several invertebrate species have been identified in the FIMP Conceptual Model as indicator species for the bay subtidal habitat of the Study Area. These include the crab species Say mud crab, green crab, and other crab species, comb jelly (phylum Ctenophora), sea star, polychaetes, jellyfish, shrimp species, and zooplankton (USACE 2006a). Indicator invertebrates of the bay subtidal habitat that are considered commercially and recreationally important include hard clam (*Mercenaria mercenaria*), blue crab, and scallop. Great South Bay and Moriches Bay are important spawning grounds for hard clam (USFWS 1991).

Beds of submerged aquatic vegetation (SAV) are one of the most important features of the bay subtidal habitat, because they provide nursery areas for finfish and a niche for colonization of epiphytic algae and invertebrates. Epiphytic algae attach to other algae, plants, and rocks, and can outcompete certain SAV species such as eelgrass for light (Bradley et al. 2002). They also provide unique habitat for a diverse assemblage of invertebrates, including habitat for the commercially and recreationally important blue mussel, Atlantic ribbed mussel and blue crab (USACE 2004c), all of which have been identified in the FIMP Conceptual Model as indicator species for the SAV habitat of the Study Area (USACE 2006a). Other indicator invertebrate species identified for SAV habitats of the Study Area include horseshoe crab, barnacles, eastern mudsnail, Say mud crab, hermit crab, green crab, other crab species, amphipods, isopods, softshell clam, hard clam, sea star, comb jelly, scallop, polychaetes, jellyfish, and shrimp species.

Beach seine surveys were conducted by USACE in 2004 and 2005 in Great South Bay, Moriches Bay, and Shinnecock Bay, as part of a SAV investigation in the Study Area. The 2004 survey collected a total of 50 invertebrate species, and overall the dominant invertebrate species collected were marsh grass shrimp (*Palaemonetes vulgaris*), green crab, Atlantic mud crab (*Panopeus herbstii*), comb jelly, eastern mudsnail, golden star tunicate (*Botryllus schlosseri)* and red beard sponge (*Microciona prolifera* [USACE 2004c]). Blue crab also was collected, but this species represented only 5 percent of the total catch. Other crab species collected included lady crab, rock crab, and spider crab, with each species making up 2 percent of the total catch. Similar results were obtained for the same study conducted in 2005 with blue mussel and green crab dominating the catch, and other crab species such as Atlantic mud crab and spider crab commonly collected (USACE 2006d). In addition to the SAV indicator invertebrates described in this section, Appendix C, Table C-6 provides a species list of additional invertebrates

collected in the beach seine surveys in 2004 and 2005 as part of the SAV investigation (USACE 2006d). Scientific names that include an asterisk in Table C-6 are indictor invertebrate species for the SAV habitat of the Study Area.

Back bay Birds

Based on USACE surveys conducted in 2002 and 2003, relative to the amount of habitat surveyed throughout the FIMP Study Area, sand shoal and mudflats of the bayside intertidal areas had the highest species richness and abundance of all community types surveyed, with an average of 37.6 individuals observed per acre (USACE 2003a). Wading birds, shorebirds, and gulls utilized the narrow bayside intertidal areas, which were on average approximately 10 feet in width. The primary use of the sand shoal and mudflat areas by birds is for foraging activities, but significant numbers of birds also loaf on these areas when exposed during low tides.

Thirty-five (35) species were documented on the sand shoals and mudflats (USACE 2003b). The species most often observed include black-bellied plover (*Pluvialis squatarola*), common tern, dunlin (*Calidris alpina*), herring gull (*Larus argentatus*), and sanderling (*Calidris alba),* which were using these areas primarily for foraging activities (USACE 2003b). Individuals from these species made up more than 50 percent of the birds observed in this habitat during a one-year period. Other species observed in this habitat include cormorants, American oystercatcher (*Haematopus palliates*), black duck, great egret (*Casmerodius albus*), greater yellowlegs (*Tringa melanoleuca*), spotted sandpiper, least sandpiper (*Calidris minutilla*), ruddy turnstone (*Arenaria interpres*), willet (*Catoptrophorus semipalmatus*), great blue heron (*Ardea herodias*), and great black-backed (*Larus marinus*), herring, and ring-billed (*Larus delawarensis*) gulls.

Forty-one (41) bird species were documented within the bay intertidal salt marsh habitat of the backbay ecosystem, including those marshes dominated by the invasive species common reed (USACE 2003b). Of these, 17 species were documented only in salt marshes with less than 50 percent cover of common reed. Based on habitat availability, salt marsh had one of the lowest numbers of individuals per acre recorded for the study relative to other habitats, with 13.4 individuals per acre. Common reed and common-reed/shrub dominated communities had 25 individuals per acre (USACE 2003b). Osprey, sharp-tail sparrow (*Ammodramus caudacutus*) seaside sparrow (*Ammodramus maritimus*), American oystercatcher, piping plover, and least tern as well as seabirds, egrets, herons, rails, other shorebirds, and migratory and resident passerine species are the FIMP Conceptual Model indicator species/groups for the salt marsh (including sand shoals and sand and mud flats) habitat type (USACE 2006a).

The large, open, relatively shallow waters of the bay subtidal habitat provide resting and staging areas for a variety of bays subtidal FIMP indicator species of waterfowl, cormorants, gulls, and loons, as well as common and least terns. The productive bay waters are known for high concentrations of wintering waterfowl, such as the American black duck and brant (*Branta bernicla)* (USFWS 1991). The black skimmer (*Rhynchops niger*) is another FIMP indicator species for this habitat type and is a common breeder in the Study Area and is often found utilizing bay subtidal areas for foraging. In addition, FIMP indicator species that characterize SAV habitat include recreationally and commercially important duck species (USFWS 1991), as well as wading birds (e.g., herons), shorebirds, and seabirds.

B.4.2.6 MAINLAND UPLAND ECOSYSTEM

The mainland upland habitat generally extends from the landward limit of the bay intertidal MHW line to the landward limit of the Study Area (i.e., +16 feet NGVD), which generally correlates with Montauk Highway (Route 27). This habitat also includes mainland wetlands and coastal ponds. Along the Atlantic shorefront, mainland upland habitat begins at the landward toe of the primary dune, and along the mainland shoreline adjacent to backbay areas, this habitat also includes bayside beach. Although the FIMP Conceptual Model indicator species described for the coastal pond and freshwater wetland habitat were included in the barrier island upland ecosystem in the conceptual model for modeling purposes (USACE 2006a), these species are discussed in the mainland upland habitat, because it is within this habitat that a majority of the coastal ponds and freshwater wetlands are located.

B.4.3 SIGNIFICANT HABITATS AND SPECIES

B.4.3.1 HABITATS OF CONCERN

Essential Fish Habitat

The NMFS is responsible for enforcing the Magnuson-Stevens Fishery Conservation and Management Act (MFCMA [PL 95-265]), as amended through 2007 by the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act [PL 109-479]), which is intended to promote sustainable fisheries through ecosystem approach management and conservation. To implement the MSA, the NMFS and the eight regional Fishery Management Councils have identified and described Essential Fish Habitat (EFH) for each managed fish species. EFH can consist of both the water column (pelagic) and the underlying surface (seafloor) of a particular area. Areas designated as EFH contain habitat essential to the long-term survival and health of our nation's fisheries and include waters and substrate that are required for breeding, spawning and foraging.

Significant Habitats

The USFWS has identified Shinnecock Bay, Moriches Bay, Great South Bay, Montauk Peninsula, and South Fork Long Island Beaches as Significant Habitats and Complexes of the New York Bight Watershed (the large gulf area of the Atlantic Ocean extending generally from New Jersey to Long Island) (USFWS 1997b). These areas have been recognized as regionally significant habitats that support numerous populations of finfish and invertebrate species. In addition, all of the back bay waters, including bay intertidal and bay subtidal habitats within the Study Area have been designated as Significant Coastal Fish and Wildlife Habitats by the New York State Department of State (NYSDOS 2004).

The rocky intertidal zone of Montauk Point has been designated as a rare community by NYSDEC Natural Heritage Program (USFWS 1997b). The rocky intertidal zone is considered a generally rare habitat and has been assigned a rarity rank of S1, indicating that the habitat is very vulnerable in the state. The Montauk Point habitat is one of two large, high quality sites in New York State, which currently only has approximately 40 rocky intertidal habitats sites in New

York. To ensure the protection of the rocky intertidal habitat associated with Montauk Point, USFWS has suggested that NOAA designate this area as a National Marine Sanctuary (USFWS 1997b).

The maritime freshwater interdunal swale community occupies certain low-lying and wet areas between the dunes in the barrier island ecosystem, dunes and swales habitat. This community generally supports a variety of plants designated as rare or unique by the NYNHP, and has been designated as a Significant Habitat by NYSDEC. The state listed rare species associated with the unusual maritime/coastal wetland conditions found in these swales include round-leaf boneset (*Eupatorium rotundifolium var. ovatum*) and state listed rare pine-barren sandwort (*Minuartia caroliniana*). The Federally threatened and state endangered seabeach amaranth is also known to occupy dune areas (USFWS 2007d).

SAV is considered unique habitat within the subtidal region, and establishment of SAV is dependent on suitable water quality, substrate, depth, and water currents. SAV is one of the most important features of the backbay ecosystem as it provides nursery areas for finfish and a niche for colonization of epiphytic algae and invertebrates.

Other Potentially Significant Areas

Although not part of the FIMP Study Area, Captree Island, Captree State Park, Oak Island, Oak Beach, Gilgo State Park, are located north of Fire Island Inlet and may fall within the area of potential affects from proposed Project activities. On Captree Island, several pairs of state threatened northern harrier are known to nest in the dense common reed and poison ivy stands, and seaside (*Ammodramus maritimus*) and sharptailed (*A. caudacutus*) sparrows and clapper rail nest on the marshes (USFWS 1991). The mosaic of tidal pools, marshes and sand/mud flats provides a rich summer feeding area for wading birds, including the snowy egret, great egret, tricolored heron (*E. tricolor*), little blue heron (*E. caerulea*), glossy ibis (*Plegadis falcinellus*), and American oystercatcher, and a migration stopover for shorebirds such as the whimbrel (*Numenius phaeopus*), yellowlegs (*Tringa* spp.), and black-bellied plover (*Pluvialis squatarola*). Migrating raptors, including peregrine falcon and merlin use the Captree Islands as foraging habitat. The Captree Islands have supported breeding least tern, marsh-nesting common tern, and a large mixed heronry (USFWS 1991). The entire area is an important foraging area for these species as well with the short-eared owl and northern harrier being a common winter residents.

The Oak Beach marsh is extremely productive, and is distinctive as one of the few remaining unditched salt marshes in the northeastern U.S. (USFWS 1991). Northern harriers may reach their highest New York State (and possibly northeastern U.S.) breeding densities here (USFWS 1991). There is also evidence that seaside and sharptailed sparrow densities are higher at Oak Beach than on adjacent ditched marshes. This is the only known location on Long Island where black rail (*Laterallus jamaicensis*) are regularly heard or observed (USFWS 1991). The marsh also supports nesting habitat for the American black and mallard ducks, Canada goose, and clapper rail, and is important as a spawning and/or nursery ground for weakfish, blue crab and forage fish species. The extensive tidal sand and mud flats are known for supporting high concentrations of shorebirds during migration especially sanderling (*Calidris alba*), sandpipers,

dowitchers (*Limnodromus* spp.) and plover, while the shallow tidal pools are used as a feeding area by resident and migratory waterfowl and wading birds.

The second largest common tern nesting colony (over 4000 pairs in 1990) in the world is found behind the primary dunes at Cedar Beach. Ninety pairs of the Federally listed endangered roseate tern (the fourth largest colony in the northeastern U.S.) also nested at this site in 1990 (USFWS 1991). The colony also supports three pairs of the Federally threatened piping plover (*Charadrius melodus*) and about 200 pairs of state special concern black skimmer. A pair of northern harrier nests adjacent to the nearby salt marsh, and both harriers and short-eared owls use these marshes and dunes as foraging areas during winter. Cedar Beach is an area used by large numbers of nesting northern diamondback terrapins, which also feed and winter in the tidal areas north of the tern colony. A population of seabeach amaranth (*Amaranthus pumilis*), a candidate for listing under the ESA, occurs at Cedar Beach (USFWS 1991).

Gilgo Beach was one of the most productive least tern nesting colonies on Long Island. This area also supports breeding piping plover, seaside sparrow and northern harrier, as well as high concentrations of nesting northern diamondback terrapin (USFWS 1991).

B.4.3.2 SPECIES OF CONCERN

A list of the Federally listed species that are known or believed to occur in the Study Area was obtained by conducting a search by county on the USFWS website and evaluation of species/habitat associations. Table B-6 provides the listed species that may occur within the Study Area, and their Federal and/or state status. Table B-7 lists each species and presents a summary of the habitats that they may utilize within the Study Area.

Table B-6. Federally Listed Species That May Be Potentially Affected by the Project

Common Name	Scientific Name	Federal Status	New York State Status
	Plants		
Sandplain gerardia	*Agalinis acuta*	Endangered	Endangered
Seabeach amaranth	*Amaranthus pumilus*	Threatened	Threatened [S2]
	Birds		
Least tern	*Sterna antillarum*	Endangered	Threatened
Piping plover	*Charadrius melodus*	Threatened	Endangered
Red knot	*Calidris canutus*	Threatened	Candidate Species
Roseate tern	*Sterna dougallii*	Endangered	Endangered

Sources: NYSDEC 2015, USFWS 2015, USACE 2014a

Table B-7. Primary Habitat Associations in Study Area for Federal- and/or State-Listed and Candidate Species Potentially Affected by Project

Common Name	Common Associated Habitat
Plants	
Sandplain Gerardia	Mainland Upland, Terrestrial Upland, Dunes and Swales
Seabeach Amaranth	Marine Beach
Birds	
Least Tern	Marine Nearshore, Marine Intertidal, Marine Beach, Terrestrial Uplands, Bayside Beach, Bay Intertidal
Roseate tern	Marine nearshore, Marine Intertidal, Marine Beach
Piping Plover	Marine Beach, Terrestrial Upland, Bayside Beach, Bay Intertidal
Red Knot	Marine Intertidal, Rocky Shores, Marine Beach, Bayside Beach, Bay Intertidal

Sources: NYSDEC 1993, USACE 1999b, USACE 2003b, NatureServe 2006, NYSDEC 2015, USFWS 2015, USACE 2014a

Plants

Sandplain Gerardia. This plant is a small, pink-blossomed annual related to snapdragons, that grows in native grassland sites along coastal Cape Cod, Massachusetts, Long Island, New York, and in Rhode Island and Maryland (Thomas 2004). This species requires prairie grassland habitat dominated by native bunchgrasses, especially little bluestem (Jordan 2007). It is believed that a hemi-parasitic relationship exists between sandplain gerardia and little bluestem, in which the sandplain gerardia obtains nutrients and moisture from the bluestem roots. Significant remnant populations remain only at Sayville, the Hempstead Plains, and Montauk.

Seabeach Amaranth. This is an annual plant, typically found on actively accreting beaches (USACE 1999b). The species requires sparsely vegetated upper beach habitat that is not flooded during the growing season. In New York State, it tends to be found away from well-developed and stable dune systems and has an affinity for inlets, storm washouts, and other rapidly eroding or accreting shorelines, sometimes precariously close to the surf. Seabeach amaranth is usually found growing in nearly pure, unvegetated sand. In the Study Area, this species is visible between May and November. Seabeach amaranth seeds are dispersed by wind and water and are present on the beach year-round.

Least Tern. This species is a small, colonial nesting sea bird whose diet commonly consists of fish. McCormick (1975) identifies the least tern as a non-pelagic bird species that has breeding habitats within the Study Area. Least terns generally arrive in the Study Area in April–May (Cashin1994) and nest in open shoreline sites such as beaches, sandbars, and dredged material disposal areas with sparse vegetation, but typically on bare sand areas, sometimes containing shell fragments. Nesting activity continues through July and this species generally departs the Study Area by early September. It is common to see groups of fledged chicks on the beach in August, preparing for the early September migration. Breeding sites within the Study Area include Fire Island Democrat Point, Fire Island Pines, Watch Hill and Long Cove, Fire Island Wilderness, and Smith Point (NYSDEC 1997). During the USACE avian surveys in the Study Area, least terns were observed within beach and primary dune habitats and as flyovers. In May and June of 2002 a mixed colony of nearly 100 common and least tern was documented on the

beach/primary dune area just east of Shinnecock Inlet; the colony was again documented at this location during 2003 spring surveys (USACE 2003a).

Piping Plover. Piping plovers are small, territorial shore birds that have been observed the Study Area and are known to breed on sandy beaches within Fire Island. Piping plovers frequent intertidal portions of ocean beaches, washover areas, mudflats, sand shoals, wrack lines, and shorelines of coastal ponds, lagoons, or salt marshes to feed predominantly on invertebrates. Wintering plovers on the Atlantic Coast are generally found at accreting ends of barrier islands, along sandy peninsulas, and near coastal inlets. They prefer dry, sandy, open beaches well above the high tide line as breeding sites, although openings in grassy dunes as small as 200 to 300 feet wide may also be used (Wilcox 1959). Mating generally begins in late March and continues through early June. Most nesting activity ceases by mid-August to September, when the birds begin to fly south for the winter.

Suitable nesting habitat within the Study Area includes: 1) a shallow depression in the sand between the high tide line and the foredune area; 2) sandflats at the end of sandpits; 3) blowout areas behind primary dunes; 4) sparsely vegetated dunes; and, 5) washover areas cut into or between dunes (USACE 1999b). Piping plovers may also nest on dredged material areas if sand, pebble, and shell fragments are present.

Piping plovers nest within the Study Area at several locations, including Democrat Point, Robert Moses, Smith Point, Cupsogue, Shinnecock East Hampton. Piping plover nests have been seen along the southern shore of Long Island in grassy areas at the edges of dunes, and sometimes behind dunes in blowout areas. Westhampton Beach is an important nesting beach for piping plover (USFWS 1997b) in the Study Area. During avian surveys conducted by USACE in 2002 and 2003, individuals and pairs of piping plovers were recorded in the beach/primary dune areas and as flyovers in several locations. According to USFWS, Hurricane Sandy created approximately 200 acres of new potential overwash habitat located within the Project Area. Below are the recent figures of piping plovers within the Project Area:

- 2015: Piping plovers: 154 window pairs, 255 fledglings
- 2014: Piping plovers: 155 window pairs, 204 fledglings
- 2013: Piping plovers: 153 window pairs, 134 fledglings
- 2012: Piping plovers: 193 window pairs, 152 fledglings
- 2011: Piping plovers: 187 window pairs, 192 fledglings (NYSDEC 2016).

Red Knot. This species has the appearance of a large bulky sandpiper, and is approximately 10 inches in length. Red knots winter along both the Atlantic and Pacific coasts from Massachusetts and California south to South America. This species breeds on the tundra in the Arctic regions of Canada and migrates long distances for the winter. Red knots that migrate to South America can make a round trip of close to 20,000 miles. During migration and in the winter they are typically found in very large flocks in primarily intertidal marine habitats, on tidal flats, rocky shores, and beaches, especially near coastal inlets, estuaries, and bays. On its tundra breeding ground, the red knot eats the seeds of sedges, horsetails and grass shoots, and also may eat invertebrates such as beetles and cutworm larvae. In its winter range, red knots eat horseshoe

crabs and their eggs, marine worms, grasshoppers, and other invertebrates. This species was documented in the Study Area during 2003 bird surveys (USACE 2003a).

Roseate Tern. Roseate terns are medium sized terns that typically select nest sites located in sandy areas with about 80 percent vegetative cover, on small islands or at the ends of barrier beaches. Terns nest on coastal islands in colonies, concealing their nest under grass, rocks, driftwood, or other flotsam. Roseate terns can arrive in the Study Area as early as late April, and typically depart by October, or November at the latest (USFWS 1989). These terns forage for small schooling fish in areas including open ocean waters within approximately 1¼ mile offshore. Roseate terns are commonly found in breeding colonies with common terns and less frequently with Forster's and arctic terns. Roseates have been reported as utilizing the barrier island to the west of Fire Island Inlet and islands within the backbay portions of the Study Area. A single roseate term was documented during two separate survey events during the 2002–2003 USACE avian surveys (USACE 2003a).

B.5 NO-ACTION ALTERNATIVE (FWOP)

Potential habitats for threatened and endangered species and species of special concern occur within many habitat types in the Study Area, for species of invertebrates, finfish, birds, mammals, reptiles and amphibians. As an important area of coastal refuge for numerous wildlife species of concern, the Study Area will continue to provide critical habitat for threatened and endangered species under the FWOP scenario, as Federal and state protection measures for these species would remain in place. Direct loss of habitat over time poses the greatest potential impact to rare species, and if their habitats are affected in this way, population declines would be expected.

Rare, threatened and endangered species that are currently afforded legal protection would continue to be protected under the FWOP scenario. The FWOP scenario would require the continued compliance with the Endangered Species Act (ESA) of 1973 for local projects, which regulates and prevents the unauthorized "take" of listed species on pubic as well as private lands. Any Federal actions that are proposed within the Study Area will require agency consultations pursuant to Section 7 of the ESA. Non-Federal actions must be coordinated with the USFWS under Section 10 of the ESA regarding any protected or rare species that could potentially be impacted by the action. New York State also provides protection for state listed species under the New York Endangered Species Act. However, the Federal and state review of development projects, and legal protections afforded to threatened/endangered species, typically extend only to development projects for which Federal or state permits are required or public funds are committed. Therefore, certain types of development projects (such as some residential and commercial/industrial development projects) may be constructed without regulatory review and protection of threatened/endangered species.

B.6 PREFERRED ALTERNATIVE (TSP)

The Study Area will continue to provide critical habitat for threatened and endangered species under the TSP, as Federal and state protection measures for these species would remain in place.

Rare, threatened and endangered species that are currently afforded legal protection would continue to be protected.

The following potential indirect adverse effects to species of concern resulting from implementation of the TSP include:

- Disturbance to prey base and temporarily reduced prey availability (destruction of beach invertebrates and wrack line);
- Reduction of potential for formation and maintenance of overwash or bayside piping plover breeding and foraging habitat;
- Disturbance to piping plovers through enhancing beaches to attract increased recreational activities on oceanside beaches;
- Increased potential predator populations/activity that could utilize habitat created by the project; and
- Changes in existing plover and amaranth habitats on FIIS (could be positive or negative).

B.6.1 PLANTS

Sandplain Gerardia

Sandplain gerarida thrives in disturbed prairie grassland habitat that is sandy and open (Jordan 2007). Management of this species requires prescribed fires which may be essential for germination (Thomas 2013), and shrub cutting and mowing which rid the habitat of competitor species that would crowd out sandplain gerarida (Jordan 2007). The TSP could reduce the likelihood of coastal erosion and inundation of the upland ecosystem where this species occurs. If the building retrofit plan and a road-raising plan occur on sandplain gerarida habitat it may actually be beneficial to the species since it requires a disturbed habitat. These benefits would likely be outweighed if these plans reduce the amount of habitat available for this species. Since direct sand placement in grasslands is not part of the TSP no impacts from it are expected.

Seabeach Amaranth

The TSP could reduce the likelihood of breach formation (and subsequent development of potential habitat), and involves the movement of construction vehicles and placement of fill material within a zone of potential growth for the species and may experience negative impacts from the TSP.

Direct sand placement onto these plant species will result in mortality, with no chance of seed production, which may have a significant impact on the local population. Trampling by workers or construction equipment could also directly destroy the plants. Beach slope is another factor for the species habitat selection and use. The TSP will also indirectly impact these species by limiting new potential habitat areas.

Construction of the TSP is likely to increase overall habitat suitability for seabeach amaranth along the affected beachfront. Although the planned beach berm is designed for an elevation of 9.5 foot NGVD, which is slightly higher than seabeach amaranth's preferred elevation, as the

beach berm slopes toward the ocean, there will be a zone that falls within the plants preferred elevation range. Expanding the beach and particularly the zone most suitable for amaranth would likely provide habitat for seabeach amaranth.

B.6.2 BIRDS

Least and Roseate Tern

While roseate terns prefer breeding on moderately vegetated sandy deposits in isolated island colonies, least and common terns utilize similar nesting habitat as piping plovers. The placement of sand on the barrier beach has the potential to benefit both the least and common terns which show a distinct preference for nesting on open shorelines, barrier beach dunes, and dredge spoils (USACE 1999). Roseate terns usually nest in association with common terns in areas of slightly denser vegetative cover. It is anticipated that the TSP will protect the barrier and back-bay areas from extensive erosion, and would enhance protection of the back-barrier islands. Roseate terns may also benefit from a reduction in breach or washover events, which would allow beachgrass and other herbaceous vegetation to fill in. Conversely, the decrease in potential breaches may result in a reduction of specialized feeding habitat provided by tidal rips, sandbars, and bay inlets that roseate terns require.

Piping Plover

This species is known to nest within the Study Area at several locations. Stabilizing the eroding beaches under the TSP may have a positive effect on maintaining or increasing suitable shoreline nesting or feeding habitat in the long term (USACE 1999). If a breach is closed or an overwash area is formed the winter prior to the shorebird breeding season (April 1st - July 1st), piping plovers (in addition to other shorebirds) will immediately use the newly altered area for foraging. Gently sloping overwash fans that extend into the backbay marshes provide prime foraging habitat. Due to routine dynamic changes in washover or breach areas, the vegetation typically remains sparse. This provides optimal nesting habitat. The insects associated with the sparse vegetation (i.e., common ants and flies) also provide a food source for the foraging shorebirds. However, shorebirds that utilize washover areas for nesting may also be subject to increased predation, and to nest failure due to subsequent washovers at the same location. In direct contrast to the benefits derived from overwash deposits, a barrier island breach and continued beach erosion could have negative impacts on piping plovers. A breach occurring during the nesting season could result in the direct loss of eggs, and mortality of chicks and/or adults. Flood tidal deltas resulting from a breach may provide additional foraging areas for piping plovers. However, this benefit must be weighed against the loss of beachfront nesting habitat. Continued erosion of the beach and fore-dune can create erosion scarps, thereby degrading existing or other potential plover habitat.

Potential short term impacts to piping plover habitat could result from proposed filling activities, placement may temporarily decrease the habitat quality of the piping plover’s food source resulting in a decrease in the value of the foraging habitat until the beach is stabilized and its faunal community restored. Beach slope is also a critical factor for piping plover habitat

selection and use. In order to maintain existing habitat conditions, the slope of the placement material will be consistent with adjacent existing beaches that contain successful brooding areas.

Conducting the beach fill operations outside of the piping plover nesting season is the easiest way to avoid adverse impacts. To minimize impacts to the species and habitat efforts would be made to artificially create and maintain high quality piping plover habitats, minimize direct disturbance to piping plover breeding on stabilized beaches, and reduce project induced effects of increased recreational disturbance.

Red Knot

This species is abundant on beach and dune communities of the similar barrier island during certain parts of the year (USACE 2003a). During migration and in the winter they are typically found in very large flocks in primarily intertidal marine habitats, on tidal flats, rocky shores, and beaches, especially near coastal inlets, estuaries, and bays. This species was documented in the Study Area during 2003 bird surveys (USACE 2003a). Stabilizing the eroding beaches under the TSP may have a positive effect on maintaining or increasing suitable shoreline feeding habitat in the long term (USACE 1999). Potential short term impacts to red knot habitat could result from proposed filling activities, placement may temporarily decrease the habitat quality of the red knot's food source resulting in a decrease in the value of the foraging habitat until the beach is stabilized and its faunal community restored. To minimize impacts to the species and habitat, efforts would be made to artificially create and maintain high quality red knot habitats and reduce project induced effects of increased recreational disturbance.

B.7 CUMULATIVE IMPACTS

A cumulative impact assessment requires consideration of impacts beyond the site-specific direct and indirect impacts and consideration of effects that expand beyond the geographical extent of the proposed project. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." The New York District based the cumulative impact analysis on the TSP and alternatives, other actions associated with the Study Area, and other activities in the surrounding region with the potential to contribute to cumulative environmental impacts.

The barrier beach environment exists in a continually changing state of "dynamic equilibrium" that depends on the size of the waves, changes in sea level relative to the land, the shape of the beach, and the beach sand supply. When any one of these factors changes, the others adjust accordingly. The TSP would partially break the cycle of storm damage in the Study Area that has built up over the years under the cumulative effect of natural processes acting on an environment altered by human' intervention. The additive damages to homes, businesses, the area's recreational resources, and its economy would be reduced. The use of natural and non-renewable resources in the salvage, repair, and reconstruction in the aftermath of storm damage would also be reduced. The discussion below addresses the potential for the TSP to result in cumulative effects on natural resources in the Study Area. It focuses on impacts related to dredging, sand placement, and non-structural actions (relocation, buyouts, and road raisings).

B.7.1 DREDGING IMPACTS

The portion of borrow areas actively dredged for all the Federal projects located along the south shore represent a very small percentage of the total available habitat. These areas also are spatially distributed so that dredging impacts are not concentrated in any one portion of the Study Area. In addition, the borrow areas are sloped in a manner to prevent anoxic conditions. Finally, the substrate in the borrow areas is similar in composition to pre- and post-construction conditions, allowing for the recolonization of these areas, which should occur within 12 to 18 months following dredging operations. Thus, the cumulative effect of dredging on the ecology of the Study Area would not be significant. Cumulative impacts of dredging on artificial structure/reef communities will not be significant, since surveys will locate the majority of artificial reefs or shipwrecks, which will be avoided to allow, for efficient dredging operations.

B.7.2 SAND PLACEMENT IMPACTS

Sand placement activities have the potential to directly affect the shoreline communities. These communities are located in dynamic, high energy areas where substrates are continuously shifting, eroding and accreting along the south shore of Long Island. Beach and surf zone, organisms are well adapted to their rigorous environments. Although a temporary loss of shallow nearshore/intertidal habitat would occur, a new sandy bottom will begin to recolonize shortly after construction ceases. Varying nourishment schedules and other project variables (contractor availability, funding, local conditions, etc.) may cause staggering of construction activities so that extensive stretches of the, shoreline are not nourished at the same time. In addition, only a short stretch (typically 500-1,000 feet) of beach is nourished at one time. This practice allows motile species to avoid area where beach fill placement will occur.

Federally listed threatened and endangered species exist in these shoreline communities and include the Federally threatened piping plover; Federally endangered roseate tern and the Federally threatened seabeach amaranth. The New York District has been coordinating and consults with USFWS in accordance with the ESA when projects in the Study Area have the potential of impacting affecting Federally listed species. Section 7 (of the ESA) consultation usually requires that construction occur outside of the breeding/growing season of these species and/or monitoring of these species during construction with the implementation of buffer areas to' minimize project-specific and cumulative impacts to these species.

B.7.3 NON STRUCTURAL

The mainland non-structural plan consists of non-structural building retrofits, flood proofing, relocation, acquisition of approximately 4,400 structures (consisting of approximately 44 in Shinnecock Bay, 857 in Moriches Bay, and 3,110 in Great South Bay), and road raising in four locations. Building retrofit measures are proposed, and could include limited relocation or buyouts based upon structure type and condition. The proposed TSP provides protection to each building identified as having a ground elevation below the baseline condition 10-year flood elevation. For each building identified for protection, the design flood elevation is the baseline condition 100-year flood elevation plus two foot of freeboard. Varying construction schedules and other project variables (contractor availability, funding, local conditions, etc.) will cause

staggering of construction activities so that extensive stretches of the project area are not being disturbed at the same time. It is not anticipated that any of the home will have any endangered species on the individual property. As part of the continuing coordination with the agencies and local government the District will ensure that no endangered species will be impacts by the construction of this project. It is the Districts intent to do a supplemental NEPA documentation per town or village as the non-structural moves forward. Cumulative impacts of the non-structural portion of this project will not be significant.

B.8 UNAVOIDABLE ADVERSE EFFECTS AND CONSIDERATIONS THAT OFFSET ADVERSE EFFECTS

Some non-motile prey species that inhabit the intertidal and beach areas will unavoidably be lost during the beachfill operations. Those species that are not able to escape the construction area are expected to recolonize after project completion. This would be limited to the immediate areas of the projects footprint.

The FWOP as a baseline would not generate significant impacts and would not require mitigation. The TSP and Alternatives 1 and 2 would have the potential to result in similar impacts on natural resources. Best Management Practices (BMP's) have been developed as described below.

The action alternatives would include efforts to minimize impacts on barrier island vegetation and the sandy habitat of the piping plovers and red knot and the seabeach amaranth, which has been listed as a threatened plant species. For general habitat protection, existing vehicle routes on the barrier island will be used whenever possible, to reduce impacts on barrier island habitat. Impacts of vehicular traffic may cause disaggregation of drift lines, as well as destruction of annual and perennial plant seedlings. By limiting vehicular traffic to the previously established access routes, impacts to these habitats may be avoided or substantially minimized. Implementation of the action alternatives could potentially affect piping plover, red knot habitat and existing seabeach amaranth. The following minimization measures are therefore being proposed:

- During construction, a survey/monitoring effort will be undertaken to ensure adequate protection of these endangered species. Monitoring will be flexible. All findings will be reported to the USFWS for potential consultation to modify any procedures to reflect actual observed impacts and associated responses.

- Excavated sediments shall be placed directly into the disposal site. No side canting (double handling) or temporary storage of dredge material outside of the placement site is authorized.

- The storage of equipment and materials shall be confined to within the construction site and/or upland areas greater than 75 feet from the intertidal zone.

- The USFWS shall be notified of the start and completion date, of the proposed project.

- Symbolic fencing will be installed (under supervision of New York District biologists or designated representatives) on active piping plover nests within 1000 meters of the construction area.

- The contractor and employees shall be adequately informed of Endangered Species Act concerns, and contractor specifications written accordingly. These shall be highlighted prior to construction actions, when possible.

- A biologist will be on site during laying of the pipeline to ensure it is aligned in a practicable manner conducive to minimal adverse impact to plovers and amaranths, as determined by the New York District after consultation with the local, state, and Federal agencies involved with project review. During sand placement operations, the New York District will conduct on site monitoring to ensure that the activity is not impacting nesting and brooding behavior, and will fence habitats of concern for specific nests or plants.

- All fill shall consist of "clean" sand material, to maintain suitable piping plover and seabeach amaranth habitat.

B.8.1 PIPING PLOVER AND RED KNOT

- Dredging will take place continuously (if practicable) from the time the pipe is laid until placement activities are completed. If practicable, the New York District will limit the operation by restricting dredging during the more sensitive, early nesting period in areas of active piping plover usage (April-August). The noise from sand moving through the pipeline to the placement area would be negligible as a cause of disturbance, since the birds are themselves adapted to louder natural surf sounds. All other sources of loud noise (i.e., earth moving equipment) will be muffled to minimize disturbances.

- The hydraulic pipeline will be placed in the offshore and nearshore zones as much as possible to allow the piping plover chick’s access to the shoreline to feed. Pipeline burial or elevation on the beach will be undertaken, wherever practicable and feasible.

- A biologist or designated representative will be present during pipeline construction to ensure the approved alignment is adhered to. If a nest is present prior to pipeline construction, activities will be delayed to allow the plover chicks to fledge.

- Should a pair attempt to nest in close proximity to the pipe, actions would be taken to shield the nest from construction activity in its immediate vicinity until the chicks are fledged. Work would be redirected away from the nest via enclosure erection and fencing, which would also keep any chicks away from the placement area being filled.

B.8.2 SEABEACH AMARANTH

- Biologist/botanist or designated representative will survey the area immediately prior to any construction activity within the piping plover, red knot and seabeach amaranth

growing season (April 1 to November 1). Approximately twice a week the construction area will be surveyed. Records shall include species locations, numbers of individuals, and size of plants. If there is any seabeach amaranth present, seabeach amaranth locations will be recorded. If construction personnel or vehicles are at the site or might transit the site, symbolic fencing will be placed in a 10 foot-diameter ring.

- All construction activities shall avoid all delineated locations of seabeach amaranth where feasible. The New York District will undertake all practicable measures to avoid an incidental take. In the unlikely event that the species appears at the placement area, and there is a very good possibility that the surrounding placed sand will encroach upon and smother the plant, the New York District proposes to transplant the individual plant to a similar habitat near or within the project area to lessen the impact of placement. Transportation will include removal of a sufficiently large enough and intact volume of sand to include the full extent of the roots. This action, when necessary, will occur as soon as possible after the plant is identified, and every attempt will be made to include the entire (undamaged) root system.

- It is understood that this action, when feasible, will be undertaken for individual plants whose destruction could not be avoided. Seed collection or transplants will be attempted as a means of mitigating potential loss; this should not be construed as a long term commitment or research endeavor on the part of the New York District by replanting beyond the current year.

- Placement areas shall be finished to a natural grade with compatible material.

Given the measures summarized above, and the local implementation of existing USFWS protection measures, impacts to either piping plovers, red knot or seabeach amaranth associated with the proposed projects will be minimized. The precautions taken will allow dredging or upland source placement of fill and continuous operation, thereby providing the most cost-effective and expeditious operation, while minimizing long-term endangered species impacts.

B.9 PROJECT MODIFICATIONS AND CONSERVATION MEASURES

To minimize adverse impacts on listed species, the New York District will continue to coordinate with the Department of the Interior USFWS and NYSDEC to develop modifications to the TSP that would provide increased protection and improved productivity. The New York District will also follow recommendations provided by the NYSDEC and USFWS that would minimize potential adverse indirect impacts on species that may use coastal habitats in the Study Area.

Conservation Measures

The District will also follow recommendations provided by the NYSDEC and USFWS previously (USACE 1998, USFWS 1999) and are described below. These measures are expected to minimize potential adverse indirect impacts on numerous other species that may use coastal habitats (listed above) in the Project area, including several state-listed shorebird species.

However, due to the critical nature of the FIMP reach, construction activities not will occur during the piping plover breeding and nesting season (unless in the communities). To minimize impacts, the District will conduct surveys during the spring/summer, and prior to construction activities, to identify nesting plover in the Project area and to document all known locations of plover, red knot and seabeach amaranth. In addition, the USACE will document any other Federal or state-listed wildlife species observed in the Project area during survey and will initiate consultation with appropriate state and Federal agencies.

The Proposed Plan includes a number of conservation measures that will be implemented until the project is completed. The intended purpose of these conservation measures is to avoid or minimize adverse effects of this project to Federally-listed species.

1. Project Design Features

- Planting endemic vegetation at low densities (18 in. on center) on the dune/upper beach interface, reducing the density of beachgrass plantings on the south face of the dune (Risotto 2008), and developing a variable density planting scheme on the south side of the dune slopes.
- Contacting the Service upon initiation and completion of construction activities. Pre-construction meetings with all project staff will be held to provide all information on resource protection and terms of the project permit. Providing all project personnel, construction staff, etc. with information regarding the conditions of the project (including all conservation measures).
- Time-of-Year Restrictions, which will provide for no activities between April 1 and September 1 to protect piping plovers and May 1 to November 1 to protect seabeach amaranth (except in the communities). The Proposed Plan allows that, if breeding piping plovers are not observed in a proposed project area, or are not within 1000 meters of the project area by July 1, then project activities may commence, following consultation with the agencies.
- Provisions for the project to only undertake low impact construction activities, such as beach surveying or the installation of sand fencing, during the piping plover breeding season, utilizing a 300-ft protective buffer zone.

2. Surveying, Monitoring, and Management

- Surveying and monitoring of the action area for threatened and endangered species during the spring and summer nesting seasons. The monitoring will be completed in coordination with the land manager(s) and the Service. Monitoring will include identification of suitable habitats, nesting areas, symbolic fencing, and signage.
- Surveying and Monitoring will be undertaken by a qualified, designated biologist(s). Qualified biologists shall also work on the threatened and endangered species management activities (*e.g.*, coordinating with local communities and

agencies, as well as organizing the pre-season planning) in community beach nourishment project areas. The qualified biologist will also recommend and implement changes in the location and configuration of symbolic fencing and warning signs and gauge the effectiveness of management actions. Biologists will be educated about the biology of listed species and required to attend a piping plover management course organized by the Service, the NYSDEC, and The Nature Conservancy (TNC), prior to undertaking surveying, monitoring or management actions.

- Protection of breeding piping plovers and red knot on all suitable habitats in the action area from human disturbance (*e.g.*, Off-road vehicles, hereafter ORVs, and recreational activities) and predation will be undertaken following the conditions outlined below. These conditions are also intended to offset impacts of habitat degradation and to assist in the recovery of the species.

- Suitable habitats within the project area(s) shall be protected through the placement of symbolic fencing and warning signs.

- Symbolic fencing is intended to avoid or minimize accidental crushing of nests and repeated flushing of incubating adults, as well as provide an area where chicks can rest and seek shelter when people are on the beach. Therefore, prior to the piping plover breeding or seabeach amaranth growing seasons, the applicant will coordinate with the land manager(s) and the Service biologists to design a "symbolic fencing plan." Coordination on the placement of symbolic fencing will incorporate field population and habitat data for the project area and visual assessment of all oceanside and bayside habitats each year.

- Habitats will be deemed suitable if piping plovers, red knot and/or seabeach amaranth were observed at the site in previous years or the beach width, slope, cover material (shell fragments), etc., and are deemed adequate by the Service.

- Consistent with current FWS management measures, breeding and growing areas shall be protected with symbolic fencing using steel or CarsoniteTM fiberglass posts placed approximately 33 ft apart and connected with string or twine. Fluorescent flagging material will be tied to the string every 1.6 ft to increase visibility, and piping plover or seabeach amaranth habitat warning signs shall be placed on every second or third post. Posts stretch from the toe of the dune seaward to about 40 ft south of the toe of dune line. As sand accretes through the season, posts and fences may need to be moved seaward to maintain symbolic fencing at this distance.

- All pedestrian and ORV access into, or through, the active breeding or growing areas shall be prohibited. Walkways may be permitted after an assessment by a qualified biologist and with the permission of the Service. Only persons engaged in monitoring, management, or research activities shall enter the protected areas. These areas shall remain symbolically fenced for piping plovers until at least July

1, and as long thereafter as viable eggs or unfledged chicks are present. If no breeding piping plovers or their chicks are observed in the symbolically fenced areas, the fencing may be removed or reduced in scale provided that the seabeach amaranth is not present or the site is not suitable for seabeach amaranth. Symbolic fencing erected to protect seabeach amaranth shall be in place until the plant dies, or until November 1, whichever comes first.

- An area within each designated community will be allowed to be kept outside of the symbolically fenced area and open to the public for swimming and for visitor use. This area will be the normal area protected by lifeguards, where provided, but in no case will exceed more than two locations per community and will not exceed 1000 ft in width. The final locations for these designated swimming and visitor areas will be identified in the symbolic fence plan submitted by the permittee and approved by the Service.

- Beach access sites (*i.e.*, existing pedestrian dune crossings) will be evaluated each spring to determine if such access sites will be closed to pedestrian use (April 1 to July 1, if no birds are present; and from April 1 until the birds fledge, if there are plovers present). Such closures will be identified in the symbolic fence plan. Pedestrian dune crossings will allow direct community access to designated swim beaches and shall allow access to the beach in response to breeding activities.

- Population survey information shall include the total number of breeding pairs; the total number of piping plovers, paired and unpaired, within the action area; and detailed mapping of breeding (courtship, territorial, scrapes, egg-laying, incubating, and brood-rearing) and foraging use habitats in the action area. Productivity information shall include the total number of nests, the total number of fledged chicks per pair, and quantification of take, if observed, including eggs, chicks, and adults that occurred, including reasons for take and actions that were taken to avoid take.

- Surveys will be recorded and summarized, and plover locations will be recorded on maps, indicating areas surveyed and habitat types. Information collected will include the following:

    - date;
    - time begin/end;
    - weather conditions;
    - tidal stage;
    - area of coverage;
    - ownership of site;
    - number of adults observed;
    - number of pairs observed;
    - habitat type;
    - nearest known plover occurrence;
    - banded plovers; and

- predator trail indices

- Surveys would be conducted three times weekly with observations evenly distributed over a minimum time period (to be determined). Survey time periods shall be conducted during daylight hours from 30 minutes after sunrise to 30 minutes before sunset and should include a wide range of tidal conditions and habitat types. Areas should be surveyed slowly and thoroughly and should not be conducted during poor weather (*e.g.*, heavy winds greater than 25 miles-per-hour (mph), heavy rains, and severe cold), since birds may seek protected areas during these times.

- *Predator Management:* The applicant is required to submit to the Service, a predator plan(mammalian) for pre-season and in-season predator monitoring program for all project areas. The predator monitoring plan will include measures needed to protect piping plovers, nests, and chicks.

3. ORV Management

Sections of intertidal beaches where unfledged piping plover chicks are present shall be temporarily closed to all ORVs. Areas where ORVs are prohibited shall include all dune, beach, and intertidal habitat within the chicks' foraging range, to be determined by either of the following methods:

The vehicle-free area should extend 1000 meters on each side of a line drawn through the nest site and perpendicular to the long axis of the beach. The resulting 7,560-ft wide area of protected habitat for plover chicks should extend from the oceanside, low-water line to the farthest extent of dune habitat.

OR

If nests and chicks are monitored at least daily, vehicle-free areas may be reduced to not less than 656 ft on each side of the brood location. The size and location of the protected area should be adjusted in response to the observed mobility of the brood, and in some cases, highly mobile broods may require protected areas up to 3,280 ft, even where they are intensively monitored. Protected areas should extend from the oceanside, low-water line to the farthest extent of dune habitat.

Restrictions on the use of ORVs in areas where unfledged plover chicks are present should begin on, or before, the date that hatching begins and continue until the chicks have fledged. For purposes of ORV management, plover chicks are considered fledged at 35 days of age, or when observed in sustained flight for at least 50 ft, whichever occurs first. When piping plover nests are found before the last egg is laid, restrictions on ORVs should begin on the 26th day after the last egg is laid. This assumes an average incubation period of 27 days and provides one day margin of error. When piping plover nests are found after the last egg has been laid, making it impossible to predict the hatch date, ORV restrictions shall begin on a date determined by one of the following scenarios:

With intensive monitoring: If the nest is monitored at least twice per day, at dawn and dusk (before 0600 hours [hrs] and after 1900 hrs) by a qualified biologist, ORV use may continue until hatching begins. Nests shall be monitored at dawn and dusk to minimize the time that hatching may go undetected if it occurs after dark. Nests shall be monitored from a distance with spotting scope or binoculars to minimize disturbance to incubating plovers.

OR

Without intensive monitoring: Restrictions should begin on May 15 (the earliest probable hatch date). If the nest is discovered after May 15, then restrictions should start immediately. If hatching occurs earlier than expected, or chicks are discovered from an unreported nest, restrictions on ORVs should begin immediately. If ruts are present that are deep enough to restrict the movements of plover chicks, then restrictions on ORVs should begin at least five days prior to the anticipated hatching date of the plover nests. If a plover nest is found with a complete clutch, precluding estimation of hatching date, and deep ruts have been created that could reasonably be expected to impede chick movements, then restrictions on ORVs should begin immediately. A corridor that is 25-ft wide shall be permitted along the water's edge, above the MHW line, and will be kept free of symbolic fencing along the entire project area as an ORV and emergency response corridor.

4. Documentation of Commitments

The Proposed Plan requires that applicants to the NPS for beach nourishment projects provide written documentation of their commitment(s) to carry out protection and conservation measures for listed species in their project areas.

5. Access

The Service and their authorized representatives will be allowed unrestricted access to all project sites within the action area for the purposes of conducting research, monitoring, enforcement, looking for evidence of rare, threatened, or endangered wildlife or plants, preserving or protecting habitat, and erecting symbolic fencing or exclosure fencing for the purpose of protecting wildlife or plants. Access will be permitted from the landward toe of the dune to the water's edge.

6. Fireworks

Fireworks shall be prohibited on beaches within 0.75 mi of where piping plovers nest from April 1 to September 1, or the last date of fledging. Guidelines for avoiding adverse effects from fireworks events can be found at:

https://www.fws.gov/newengland/pdfs/Fireworks_guidelines.pdf

Overview of BMP for Listed Species

Piping Plover

1) The USACE will conduct surveys during the spring/summer, and prior to construction activities, to identify
2) nesting plover in the Project Area and to document all known locations of plover. In addition, the USACE will document any other Federal or state-listed wildlife species observed in the Project Area during survey and will initiate consultation with appropriate state and Federal agencies.
3) Symbolic fence and signs will be placed around all plover nests and brood rearing areas located in the construction area to deter use of the area and to protect sites from incidental disturbance from construction activities.
4) The USACE will conduct construction activities near known plover nesting areas from September 2 through April 1 to avoid the key shorebird nesting period (outside of the communities).
5) Construction activities will avoid all delineated locations of the species during the breeding season and will undertake all practicable measures to avoid incidental taking of the species.
6) The USACE will consult with the USFWS to identify acceptable alternatives should any plover nest sites be identified within the direct construction footprint.
7) The USACE will monitor the Project Area before, during and after construction.
8) The USACE will educate residents, landowners, beach visitors and beach managers on piping plover.
9) The USACE will encourage local agencies to place time restrictions on beach use by vehicles to avoid key nesting and fledging periods.
10) The USACE will conduct follow-up surveys of plover habitat within the Project Area. Surveys will be conducted for three consecutive nesting seasons post-construction and a summary report regarding habitat use and nesting will be provided annually to the USFWS.

Seabeach Amaranth

1) The USACE will conduct surveys during July/August to determine the presence/absence of seabeach amaranth within the Project Area and to document all known locations of amaranth. In addition, the USACE will document any other Federal or state-listed plant species observed in the Project Area during the survey and will initiate consultation with appropriate state and Federal agencies.
2) Symbolic fence and signs will be placed around all seabeach amaranth plants located in the construction area to deter use of the area and to protect plants.
3) The USACE will restrict construction activities in areas of known populations during the growing season (allow limited activities only, from June through November).
4) Construction activities will avoid all delineated locations of the plant and will undertake all practicable measures to avoid incidental taking of the plant.
5) The USACE will consult with the USFWS to identify acceptable alternatives should any seabeach amaranth plants are identified within the direct construction footprint.

6) The USACE will educate residents, landowners, beach visitors, and beach managers on seabeach amaranth.
7) The USACE will conduct follow-up surveys of amaranth habitat within the Project Area. Surveys will be conducted for three consecutive growing seasons post-construction and a summary report will be provided annually to the USFWS.

Red Knot

1) The USACE will conduct surveys during the spring/summer, and prior to construction activities, to identify red knots in the Project Area and to document all known locations. In addition, the USACE will document any other Federal or state-listed wildlife species observed in the Project Area during survey and will initiate consultation with appropriate state and Federal agencies.
2) Symbolic fence and signs will be placed around all red knot nests and brood rearing areas located in the construction area to deter use of the area and to protect sites from incidental disturbance from construction activities.
3) The USACE will conduct construction activities near known red knot nesting areas from September 2 through April 1 to avoid the key shorebird nesting period.
4) Construction activities will avoid all delineated locations of the species during the breeding season and will undertake all practicable measures to avoid incidental taking of the species.
5) The USACE will reinitiate consultation with the USFWS to identify acceptable alternatives should any plover nest sites be identified within the direct construction footprint.
6) The USACE will monitor the Project Area before, during and after construction.
7) The USACE will educate residents, landowners, beach visitors and beach managers on red knot.
8) The USACE will encourage local agencies to place time restrictions on beach use by vehicles to avoid key nesting and fledging periods.
9) The USACE will conduct follow-up surveys of red knot habitat within the Project Area. Surveys will be conducted for three consecutive nesting seasons post-construction and a summary report regarding habitat use and nesting will be provided annually to the USFWS.

B.10 CONCLUSIONS

When trying to promote conservation goals using iconic species such as Piping Plover, Sea Beach Amaranth, or Red Knot, it is important to keep in mind that there are conflicting uses among stakeholders with competing legitimate goals. When a consensus is meet on the management goals among these stalk holders you will accomplish a more productive public policy to progress the species.

It is essential when formulating this management plan to work within the limitations of our location, rather than create a plan based on management plans for other areas with different characteristics (e.g. Westhampton Dunes). To accomplish this the FWS needs to look at management practices aimed at urban ecosystems, which differ greatly from managing forever

wild or rural locations. There are many reports on urban ecosystems that successfully support native wildlife, as well as the active management efforts that accomplish this (DiCicco, 2014, Feinburg et al. 2014, Fisher 2011, Flores et al. 1998,). Central Park is an example of an early a planned construction intended as a naturalistic pastoral design (Brown 2013). Urbanization produces a variety of unprecedented and intense manipulations to an ecosystem. These include changes in disturbance regimes, biota, landscape structure, physiological stresses (e.g. air pollution), as well as include cultural, economic and political factors (McDonnell and Pickett 1990).

Assateague Island, Maryland is another location that should not be compared to this project. A relevant difference between the locations is that Assateague was in a natural state prior to the protective dune construction with a variety of habitats that included foraging and nesting areas inland from the barrier dune (Loegering et al. 1995) and most nests had been located behind and further away from the ocean than the constructed dune (Schupp et al 2013), therefore the creation of notches through the constructed dune that mimicked previously existing paths was logical and successful (Schupp et al. 2013). The Project area, however, has been heavily developed years ago, and majority of the Piping Plover activity for the past decades has been in front of existing dune system in these developed areas. No plover activity is known to have occurred in the much wider, unsuitable developed areaa behind these dunes, so providing access to unsuitable areas would not achieve the success of this listed species.

It is the USACE's determination that implementing the proposed action in accordance with the standards and guidelines recommended by USFWS and NYSDEC, will not jeopardize the continued existence or contribute to the loss of viability of either of the Federally-listed endangered or threatened species listed identified by the USFWS. In addition, the proposed action would not significantly contribute to cumulative impacts associated with piping plover, red knot and seabeach amaranth. Therefore, the USACE requests USFWS concurrence for a May Affect, but Not Likely to Adversely Affect determination for the piping plover, red knot and seabeach amaranth.

Each of the alternatives will affect the project shoreline as well as the species that inhabit them. The No Action Alternative appears to have the most unpredictable short and long-term impacts on natural resources due to the changeable nature of coastal dynamics and inlet/overwash formation. It could create additional overwash and back bay habitat with inlet formation, which may be advantageous to higher plover abundance and productivity. But the ephemeral nature of shoreline dynamics makes it difficult to predict the longevity and morphology of such newly created habitat as seen at Old Inlet. Additionally, though the creation of a new inlet could provide additional beaches suitable for plovers and other beach-dependent species, it is unclear whether the total shoreline within the project would gain or lose suitable habitat due to the changes in sand transport caused by the new inlet. Serious consideration should be given to the existing nesting beach habitat which may be affected by altered sand transport conditions along the coast as a result of a breach. A breach clearly would have significant adverse impacts on both cultural and human resources, due to the potential loss of numerous structures.

The implementation of this long-term proposed beach project is intended to reintroduce sediment that is passing through the system (that would be lost to the inlet) and reestablish it back to the

erosive areas in the least intrusive way. It is one of the numerous NY/NJ shoreline coastal storm risk management projects, therefore contributing to the overall loss of natural coastal habitat. However, this project is in response to the adjacent pre-existing man induced changes which threaten the area, and attempts to reestablish the most natural shoreline processes possible through this sand recycling method. Continual replenishment of the beach by recycling smaller quantities of sand on a regular basis through a sand slurry pipeline operation would more closely mimic natural shoreline dynamics while increasing and stabilizing the beach habitat necessary to sustain the area's rare flora and fauna. The potential natural resource loss associated with this alternative is the prevention of overwash and back bay habitat formation which may at some point benefit or limit piping plover nesting populations.

As previously discussed, this proposed action would result in impacts to benthic communities (potential burial and habitat disturbances) and water quality (turbidity and dissolved oxygen) during active construction activities. However, these effects would be short-term, as the benthic communities will naturally begin to re-establish shortly after construction is completed, forming a similar community within a period of 6 months to 2 years (USFWS 1991, Burlas et al 2001, Peterson and Manning 2001). These impacts may result in a short-term reduction of forage material for piping plover in the immediate Project Area. However, plover will utilize nearby undisturbed areas for feeding. In addition, because sediments in the Project Area are sandy, any increased turbidity effects would generally be limited to the period of in-water construction, as this type of substrate tends to settle out of suspension quickly.

The Project would potentially result in direct and/or indirect disturbances to seabeach amaranth, red knot and piping plover and other nesting shorebirds/seabirds, including the Federally and state-listed least tern, roseate tern, and the state-listed common tern, if any are present in the Project vicinity during the time of construction. However, these impacts can largely be avoided if the period of construction is limited to periods outside of the piping plover nesting season which occurs from April 1 through September 1, and outside of the growing season for seabeach amaranth which extends from June through November in the designated historic (past three years) nesting areas. Therefore, the USACE has incorporated these construction window recommendations, as well as other recommendations from the USFWS, into the Project construction plans. In addition, the USACE will conduct a pre-construction survey for the piping plover and seabeach amaranth and will avoid disturbing these species if any are found within the construction area. As a result, significant adverse impacts to these species are not expected. The USACE is in the process of completing coordination and consultation processes with the USFWS pursuant to the Fish and Wildlife Coordination Act and the ESA.

Because a site-specific survey will be conducted prior to implementation of the Project and NYSDEC and USFWS, standards and guidelines would be followed regarding the protection of species and potential habitat, implementation of the proposed action May Affect but, Not Likely Adversely Affect the piping plover, red knot or seabeach amaranth. Implementation of the proposed action would not contribute to the loss of viability of the piping plover, red knot or seabeach amaranth and thus, no additional measures to offset impacts to these species are necessary. When compared to the No Action alternative, implementation of the proposed action

would benefit piping plover, red knot and seabeach amaranth, as well as other shorebird/seabird species, through habitat improvement and an increase in the availability of suitable habitat.

B.11 REFERENCES

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ATTACHMENT 1

COPIES OF AGENCY CORRESPONDENCE REGARDING THREATENED AND ENDANGERED SPECIES

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

Environmental Analysis Branch

Ms. Kim Damon-Randall
Assistant Regional Administrator for Protected Resources
United States Department of Commerce
National Oceanic and Atmospheric Administration (NOAA)
National Marine Fisheries Service (NMFS)
Northeast Region
55 Great Republic Drive
Gloucester, MA 01930-2276

SUBJECT: Atlantic Coast of Long Island, Fire Island to Montauk Point (FIMP) Coastal Storm Risk Management Project

Dear Ms. Damon-Randall:

In compliance with our agencies' commitment to streamline Endangered Species Act (ESA) coordination, the U.S. Army Corps of Engineers, New York District (USACE-NYD) is submitting a request for informal Section 7 consultation on the above referenced project.

The New York District determined that the proposed action may affect, but is not likely adversely affect ESA listed species under your jurisdiction that may occur in the project area. Please see the Attachment for our Determination of Effects statement for the FIMP project.

It is requested that your office concur with the USACE-NYD determination. We thank you for your coordination and cooperation on this action. Additional information about the project is located at: www.nan.usace.army.mil/FIMP. If there are any questions or you require clarification on any of our submittals please do not hesitate to contact Jenine Gallo, Regional Technical Specialist at 917-790-8617, Catherine Alcoba, Section Chief at 917-790-8216 or Peter Weppler, Branch Chief at 917-790-8634.

Encl.

Sincerely,

Peter Weppler
Chief, Environmental Analysis Branch

Attachment

Fire Island to Montauk Point

1. *Project Description*

The Fire Island Inlet to Montauk Point, NY, Combined Beach Erosion Control and Hurricane Protection Project (FIMP) was authorized by the River and Harbor Act of 14 July 1960. The authorization provides for beach erosion control and hurricane protection along five reaches of the Atlantic Coast of New York from Fire Island Inlet to Montauk Point, a distance of about 83 miles, by widening the beaches along the developed areas to a minimum width of 100 feet, with an elevation of 14 feet above mean sea level, and by raising dunes to an elevation of 20 feet above mean sea level, from Fire Island Inlet to Hither Hills State Park, at Montauk and opposite Lake Montauk Harbor.

The Fire Island Inlet to Montauk Point, New York Combined Beach Erosion Control and Hurricane Protection Project (FIMP) was authorized by the River and Harbor Act of 1960. The project is being reformulated to identify a long-term solution to manage the risk of coastal storm damages along the densely populated and economically valuable south shore of Long Island, New York in a manner which balances the risks to human life and property, while maintaining, enhancing, and restoring ecosystem integrity and coastal biodiversity, and achieving multiple agency objectives.

There is a long history of damaging storms along the south shore of Long Island, as well as many efforts to mitigate the damages, including construction of several features of the authorized FIMP project that are described later in this chapter. The study area also includes critical coastal habitat and environmentally sensitive areas, such as the Fire Island National Seashore and the Smith Point County Park.

The project need has been demonstrated by repeated storms and breaches in the study area and the most recent impacts of Hurricane Sandy. A coordinated effort is necessary to reduce uncoordinated efforts to reduce vulnerability by various agencies and municipalities.

The Study Area extends from Fire Island Inlet east to Montauk Point along the Atlantic Coast of Suffolk County, Long Island, New York, a distance of about 83 miles (Figure 1.). It includes the barrier island chains from Fire Island Inlet to Shinnecock Inlet, and also the back-bay and lands adjacent too Great South, Moriches, and Shinnecock Bays, which comprise over 200 miles of shoreline that comprises the back bay and estuary system. The study area includes about 126 square miles on the mainland that are vulnerable to flooding.

Within the study area, ocean shoreline sand generally moves east to west alongshore, in response to waves, and currents during normal conditions and during storms. This alongshore movement of sand maintains the prevailing shoreline conditions. In addition to alongshore movement, sediment is also exchanged in the cross-shore direction, through erosion and accretion of the beach and dune, exchange of sand through tidal inlets, and during large storm events through the episodic transport of sand over the island through overwash or breaching.

There has been extensive development on both the barrier islands and the mainland floodplains and significant modifications to the natural systems and coastal processes. These include constructing jetties and providing navigation channels through Fire Island, Moriches, and Shinnecock Inlets and within the bays; constructing of groins, seawalls, revetment, bulkheads and other structures along the ocean and

bays, placing fill and sand along the beaches; and ditching of wetlands for mosquito control.

The Study Area includes portions of the Towns of Babylon, Islip, Brookhaven, Southampton and Easthampton and 12 incorporated Villages. The Fire Island National Seashore (FIIS), the Poospatuck Indian Reservation and the Shinnecock Indian Reservation are all within the study area. The study area contains over 46,000 buildings, including 42,600 homes and more than 3,000 businesses. There are 60 schools, 2 hospitals, and 21 firehouses and police stations in the study area. Of the buildings within the study area, more than 9,000 fall within the modeled 100-yr floodplain (storm with a 1% probability of occurring in any given year, based upon current modeling).

Approximately 150,000 people reside within the coastal 100-year floodplain of the South Shore of Suffolk County (2010 U.S. Census). The study area is also includes a popular summer recreation area with a large seasonal influx of beachgoers and visitors, as well as businesses which support the year round and seasonal population of the area.

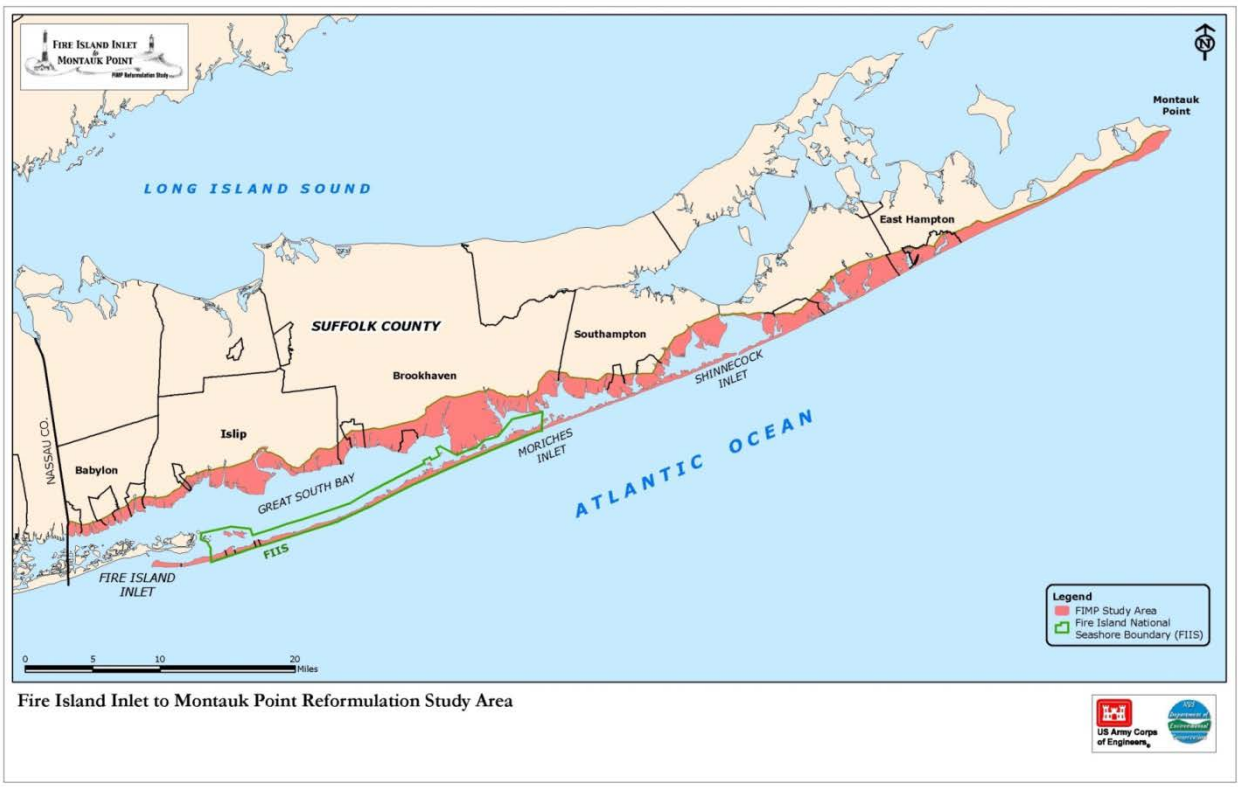

Figure 1. FIMP project area.

2. *Tentatively Selected Plan (TSP)*

The TSP for the FIMP project area is comprised of the following physical components:

<u>Inlets: Fire Island, Moriches, Shinnecock</u>

- Additional dredging of the ebb shoal, outside navigation channel, with downdrift placement;
- Placement of a +13 ft dune and berm, as needed in identified placement areas;

<u>Mainland Non-Structural</u>

- 10-year floodplain non-structural building retrofits, floodproofing, relocation, and acquisition
- Road raising in 4 locations
    - Amityville 6,600 ft
    - Lindenhurst 5,300 ft
    - Lindenhurst 9,000 ft
    - Mastic Beach 10,500 ft

<u>Barrier Islands</u>

<u>Fire Island @ Developed Locations</u>

- Beachfill (+15 ft dune with berm) with post-Sandy optimized alignment

Fire Island @ Undeveloped Locations

- Conditional Breach Response (+9.5 ft berm only)
- @ Lighthouse (+13 ft dune and berm)
- @ Smith Point County Park East - sand bypassing
- @ Smith Point County Park West - short term beachfill in western, developed section

Westhampton Barrier Island:

- Beachfill (+l5 ft dune with berm) fronting Moriches Bay
- Proactive and Reactive Breach Response (+13 ft dune, with berm), fronting Shinnecock Bay

Downtown Montauk and Potato Road

- Feeder beach created by placing sediment on a four year cycle over 50-year span.
- Potato Road feeder beach is contingent upon the implementation of a local pond opening management plan for Georgica Pond

Groin Modification

- Taper existing Westhampton Groins and existing Ocean Beach Groins
- Shortening of groins 1 through 13
- Taper existing Ocean Beach Groins

Natural/Nature-Based Features (Nnbf)

- A variety of NNBFs will be addressed and specifically identified in the EIS, including:
    - Enhance upper beach/dune width/slope/height
    - Close some access roads and trails
    - Remove sand fence
    - Raise boardwalks above dunes
    - Enhance salt marsh by restoring hydrologic connection

- Remove parking lot, re-grade to natural contours
- Enhance the existing salt marsh through the use of herbicides to control *Phragmites*
- Ditch plugging and pool creation
- Convert disturbed areas to salt marsh
- Reconfigure existing tidal channels
- Remove bulkhead, re-grade shoreline, and restore marsh through plantings

3. *Environmental Conditions*

Oceanfront beach and deepwater ocean habitats constitute the majority of the Project area. The beach community includes upper, intertidal, and nearshore subtidal areas.

The intertidal zone extends from the low tide line to the high tide line and is submerged and exposed according to daily tidal cycles. Species diversity in this zone is relatively low due to limited ability of species to withstand the daily submersion and exposure. Micro and macro-invertebrates known to inhabit this zone include crabs, shrimp, bivalves, and worms.

The affected near shore subtidal zone extends from the low water line down to 25 feet below mean low water (-25' MLW) and is nearly continuously submerged. The area contains a rich diversity of aquatic micro and macro-invertebrates including crabs, shrimp, bivalves, worms, and finfish. In addition, numerous man-made groins extend from the intertidal zone into the subtidal zone from 200 to 600 feet (USACE 1998).

The offshore subtidal zone is located approximately 1.5 miles south of the FIMP project area is between 25 feet MLW and to about 60 feet MLW. The area contains a diversity of benthic organisms and phytoplankton and diverse assemblages of shellfish, gastropods, amphipods, isopods and crustaceans (USACE 2004b). The area also provides a migratory pathway and spawning, feeding and nursery area for many common mid-Atlantic fish species (USACE 2004b).

Habitat and Species that Occur in the Project Area

Both the nearshore and offshore waters of the Project area support seasonally abundant populations of many recreational and commercial finfish (USFWS 1989, 1995, USACE 1998). Primary fish species include black sea bass (*Centropristis striata*), summer flounder (*Paralichthys dentatus*), winter flounder (*Pseudopleuronectes americanus*), weakfish (*Cynosion regalis*), bluefish (*Pomatomus saltatrix*), scup (*Stenotomus chrysops*), striped bass (*Morone saxatillis*), and Atlantic mackerel (*Scomber scombrus*). In addition, other common species in near shore waters include tautog (*Tautoga onitis*), northern puffer (*Sphoeroides maculates*), windowpane (*Scophthalmus aquosus*) and American eel (*Anguilla rostrata*).

A number of migrant anadromous and catadromous species are found throughout the Project area. Common migrant species include the Atlantic sturgeon (*Acipenser oxyhinchus*), blueback herring (*Alosa aestivalis*), alewife (*alosa pseudoharengus*), American shad (*Alosa sapidissima*), Atlantic silverside (*Menidia menidia*), striped bass, and American eel (Woodhead 1992).

The primary shellfish with important commercial or recreational value in the near shore portion of the Project area are the American oyster (*Crassostrea virginica*), hardshell clam [Quahog] (*Mercenaria mercenaria*), softshell clam (*Mya arenaria*), bay scallop (*Argopencten irradiens*), American lobster (*Homarus americanus*), and blue crab (*Callinectes sapidus*) (MacKenzie 1990). Surf clam

(*Spisula solidissima*), razor clam (*Ensis directus*) and tellin (*Tellina agillis*) occur in the vicinity of the offshore borrow area. Surveys conducted by the USACE in 2003 indicate that the borrow area itself contains very small, to no, localized populations of surf clam (USACE 2004b).

Beginning in 1966, there have been at least 17 major sediment-benthic macrofauna sampling efforts in the region. As reported in these studies, the sediment composition of the Project area consists of a silty sand, medium coarse grain sand, and hard substrate community (USACE 1998, 2004b). The benthic community of the near shore portion of the Project area is dominated by polychaetous annelids, followed by malacostracans, bivalves, and gastropods (Reid et al. 1991,Ray and Clarke 1995, Ray 1996, Way 1998, USACE 2004b). The silty-sand substrates are dominated by bivalves such as the blue mussel (*Mytilis edulis*), and polychaetes such as red-lined worms (*Nephtys incisa*) (Steimle and Stone 1973).

Medium coarse sand substrates are dominated by bivalves (e.g., dwarf tellin [*Tellina agilis]*), echinoidea (e.g., sand dollar [*Echinarachnius parma]*, amphipods (e.g., *Protohaustraius deichmaae* and *Unicola irrorata)*, and polychaetes (*e.g.*, burrowing scale worm [*Sthenelais limicola*], lumbrinerid thread worms [*Lumbrineris fragilis*], and mud worm [*Spiophanes bombyx*]) (Steimle and Stone 1973). Hard substrates such as groins are dominated by blue mussel (Steimle and Stone 1973).

ESA Listed Species Present in the Project Area; General Information

Whales

The federally endangered North Atlantic right, humpback, and fin whales, are seasonally present in the waters off New York; however, these ESA listed species of whales are not known to occur in the shallow, near shore (i.e., within 1 miles from shore) waters of eastern Long Island, and thus, are not expected to occur in the project area. Based on this information, ESA listed species of humpback, fin, and North Atlantic right whales will not be considered further in our assessment.

Sea Turtles

Four species of federally listed threatened or endangered sea turtles under NMFS jurisdiction may be found seasonally (late spring thru early fall) in the coastal waters of New York and New Jersey: the threatened Northwest Atlantic Ocean distinct population segment (DPS) of loggerhead, and the endangered Kemp's ridley, green and leatherback sea turtles. In general, listed sea turtles are seasonally distributed in coastal U.S. Atlantic waters, migrating to and from habitats extending from Florida to New England, with overwintering concentrations in southern waters. As water temperatures rise in the spring, these turtles begin to migrate northward. As temperatures decline rapidly in the fall, turtles in northern waters begin their southward migration. Sea turtles are expected to be in the waters of Long Island in warmer months (NMFS 2013)

Atlantic Sturgeon

There are five DPSs of Atlantic sturgeon listed as threatened or endangered. Atlantic sturgeon originating from the New York Bight, Chesapeake Bay, South Atlantic and Carolina DPSs are listed as endangered, while the Gulf of Maine DPS are listed as threatened (77 FR 5880; 77 FR 5914; February 6, 2012). The marine range of all five DPSs extends along the Atlantic coast from Canada to Cape Canaveral, Florida.

Atlantic sturgeon are known to occur in the coastal and oceanic waters of the Atlantic Ocean, primarily

using these bodies of water throughout the year as a migratory pathway to and from overwintering, and/or foraging grounds throughout their range. As young remain in their natal river/estuary until approximately age 2, and at lengths of 30-36 inches before emigrating to open ocean as subadults (ASSRT 2007), only subadult and adult Atlantic sturgeon will be found in this system. Since Atlantic sturgeon may be present within the coastal waters of the project area, there is the potential that they will be exposed to the direct and indirect effects of dredging operations. Specifically, an aggregation of sturgeon is documented as utilizing an area near Breezy Point, nearly fifty (50) miles west of the nearest project site.

4. *Potential Adverse Effects*

Indirect

Negligible increases in near shore turbidity and suspended solids may result during placement of the beach fill from disturbance of subsurface sediments. But, because the fill material is 100% coarse grain sand, these minor and temporary increases in turbidity will not cause any adverse effects (Naqvi and Pullen 1982).

Direct

The proposed action under analyses for this determination is that of utilizing a cutterhead dredge to dredge three inlets at Fire Island, Moriches and Shinnecock and procuring sand utilizing a hopper dredge from the three borrow areas, and pumping sand utilizing a pipeline from the hopper dredge to the beach. The protected species that is considered for analysis in this determination is the Atlantic sturgeon since sea turtles do not generally occur in the project area during the fall-winter months when dredge operations will occur.

The inlets dredging accounts for approximately 3.4MCY dredged material removal, and the sand mining operations at the borrow areas will collect approximately 3MCY required for the beach repair and nourishment portion. These dredge operations will be divided up into five (5) contracts. The seasonal restriction to protect piping plover, annually, from 1 April to 1 September in all five contract areas, will suspend all inlet dredging and borrow area sand mining fill placement activities at borrow areas and at the placement sites. The six months per year that hopper operations will be permitted to occur, coupled with the fact that the borrow areas are significantly distant, at a minimum over 50 miles from the Breezy Point sturgeon aggregate, justifies our contention that it is unlikely that there would be interaction between hopper dredge operations at the ecologically barren borrow area sites and sturgeon during the brief duration of the hopper dredge operations. Please see Appendix A (Borrow Area [Figure/Plate B-3] and Beach Fill data)

The pipeline operations that deliver the sand from the dredge to the beach pose no risk to protected species since the pipeline connecting the dredge to the shore either is floated upon the surface of the water or is laid on the bottom, presenting no possibility of intake of an individual or adverse interaction with an individual.

5. *Conclusion*

USACE has determined that adverse effects to sea turtles and Atlantic sturgeon resulting from the proposed Federal action at FIMP will be discountable and insignificant since these species occurrence, or utilization of habitat, in the project area for the timeframe proposed for construction is either rare or non-

existent.

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
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MAR 29 2016

Peter Weppler
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Dear Mr. Weppler,

We have completed our consultation under section 7 of the Endangered Species Act (ESA) in response to your letter received February 2, 2016, regarding a Coastal Storm Risk Management Project off the Atlantic Coast of Long Island from Fire Island to Montauk Point (FIMP), New York. We concur with your determination that the proposed project may affect, but is not likely to adversely affect, any species listed by us as threatened or endangered under the ESA of 1973, as amended. Our supporting analysis is provided below.

Proposed Project
The U. S. Army Corps of Engineers (ACOE) is proposing to provide shoreline protection for five reaches of the south shore of Long Island between Fire Island Inlet and Montauk Point, a distance of approximately 83 miles. It includes the barrier island chains from Fire Island Inlet to Shinnecock Inlet, and also the back-bay and lands adjacent to Great South Bay, Moriches Bay, and Shinnecock Bay, which comprise over 200 miles of shoreline. The beaches will be widened to a minimum width of 100 feet, with an elevation of 14 feet above mean sea level. The project will start in April, 2016, and will be finished in January, 2025. No in-water work will occur from April 1 to September 1 of any year.

The study area also includes approximately 126 square miles on the mainland that are vulnerable to flooding. The land based components of the proposed project will have no effect on ESA-listed species and will not be considered as part of this consultation.

The project will involve use of one hopper dredge and one cutterhead dredge. A cutterhead dredge will be use to dredge three inlets for a total of 3,402,000 cubic yards (cy) of material. Approximately 2,341,000 cy of material will be removed from Fire Island Inlet, 512,000 cy from Moriches Inlet, and 549,000 cy from Shinnecock Inlet. The dredged material will be delivered

via a pipeline connected to the dredge to surrounding areas of the Inlets and used for inlet management and beach nourishment.

The proposed project will also extract sand using a hopper dredge from six different borrow areas located less than 1.5 miles south of Long Island. The sand will be used for inlet management and beach nourishment. Approximately 3,038,000 cy will be removed from the borrow areas and delivered to the placement sites via a pipeline connected to the dredge. Depths in the borrow areas are approximately 25 - 60 feet. Additionally, stone groins will be repaired using land based equipment.

Common to all hopper dredging activities are:

- All dredges will be equipped with turtle/sturgeon deflectors that have been properly installed in front of the draghead and will be used at all times.
- Starting immediately upon project commencement, all project vessels will have an on deck observer to monitor for Atlantic sturgeon, sea turtles, and whales. Monitoring requirements include checking for turtles or sturgeon (whole or parts) impinged on the draghead, in the hopper, and swimming/present at or near the surface. If the observer on board observes a whale in the vicinity of the vessel during transit throughout the project area, maximum vessel speeds will be limited to 10 knots. If a right whale is observed, the vessel will maintain a 500 yard buffer from the whale. For all other whale species, a 100 yard buffer will be maintained.
- The draghead will remain on the bottom at all times during a pumping action except when: the dredge is not in pumping operation, or, the pumps are completely shut off; the dredge is being re-oriented to the next dredge line during dredging activities; or the vessel's safety is at risk.
- Upon completion of the dredge track line, the drag tender will throttle back on the RPMs of the suction pump engine to idle speed prior to raising the draghead off the bottom so that no flow of material is coming through the pipe into the hopper. Prior to raising the draghead, no suction will remain in the draghead or the dragarm in order to prevent impingement of listed species during the dragarm lifting phase. Prior to actual lifting of the dragarm from the bottom, the draghead will be held firmly on the bottom for 10 to 15 seconds (with no suction) then lifted rapidly to midwater to further reduce the potential for an interaction with an ESA-listed species. The dredge will then be re-oriented quickly to the next dredge line and the draghead will be firmly repositioned on the bottom before bringing the suction pump up to pumping speed.

Description of the Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR§402.02). For this project, the action area includes the offshore borrow areas, the vessel transit route within the borrow areas, the area of the pipeline from the dredge to the beach nourishment sites, and the underwater areas where the effects of dredging and fill placement (i.e., increases in suspended sediment) will be experienced. In the vicinity of hopper dredging operations, a near-bottom turbidity plume of resuspended bottom material may extend 2,300 to 2,400 feet down current from the dredge (USACE 1983). In the immediate vicinity of the dredge, a well-defined upper plume is generated

by the overflow process. Approximately 1,000 feet behind the dredge, the two plumes merge into a single plume (USACE 1983). By a distance of 4,000 feet from the dredge, plume concentrations are expected to return to background levels (USACE 1983). For cutterhead dredging, the maximum distance of increased suspended sediment is likely to be a distance of 1,000 feet from the dredge (ACOE 1983). We anticipate elevated total suspended sediment (TSS) concentrations associated with the active beach nourishment site to be limited to a narrow area of the swash zone (defined as the area of the nearshore that is intermittently covered and uncovered by waves) up to 1,640 feet down current from the discharge pipe (Burlas *et al.* 2001).

Based on this information, the action area consists of the project footprint of the areas that will be dredged, the vessel transit route within the borrow areas, the area of where the pipeline will be, areas within 4,000 feet down current of the dredging operation, as well as the area within 1,640 feet down current from the site where sediments will be deposited. These areas are expected to encompass all of the direct and indirect effects of the operations. The sediments in the areas to be dredged consist of mostly sand and gravel (90% sand). Benthic resources at the borrow area is limited, but does include a diversity of species including those types considered primary prey species for sturgeon and sea turtles (crustaceans and mollusks). There are no sea grasses and only very sparse SAV at the borrow areas.

NMFS Listed Species in the Project Area

Whales

Federally endangered North Atlantic right, humpback, and fin whales, are seasonally present in the waters off New York. These species use the nearshore, coastal waters of the Atlantic Ocean as they migrate to and from calving and foraging grounds. Humpback and fin whales primarily occur in the waters of New York during the spring, summer and fall months, while the North Atlantic right whale primarily occurs in these waters from November 1 through April 30, although transient right whales can be present outside of this time frame. Although humpback, right, fin whales are not expected to occur in the portions of the action area located in the shallow nearshore waters of New York where sand will be placed, ESA listed species of whales may occur in the vicinity of the borrow areas (i.e., the Atlantic Ocean).

Sea Turtles

Four species of federally threatened or endangered sea turtles under our jurisdiction are found seasonally in the coastal waters of New York: federally threatened Northwest Atlantic Ocean distinct population segment (DPS) of loggerhead (*Caretta caretta*), and the federally endangered Kemp's ridley (*Lepidochelys kempi*), green (*Chelonia mydas*) and leatherback (*Dermochelys coriacea*) sea turtles. In general, listed sea turtles are seasonally distributed in coastal U.S. Atlantic waters, migrating to and from habitats extending from Florida to New England, with overwintering concentrations in southern waters. As water temperatures rise in the spring, these turtles begin to migrate northward. As temperatures decline rapidly in the fall, turtles in northern waters begin their southward migration. Sea turtles are expected to be in the waters of New York in warmer months, typically the months of May through November, with the highest concentration of sea turtles present from June through October (Morreale 1999; Morreale 2003; Morreale and Standora 2005; Shoop and Kenney 1992).

Several studies have examined the seasonal distribution of sea turtles in New York waters. In most years, sea turtles begin to arrive in New York waters in June (Morreale and Standora, 1993; Morreale and Burke, 1997). Tracking studies on juvenile Kemp's ridleys demonstrate that all tagged turtles had traveled south from New York coastal waters by the first week in November (Standora *et al.* 1992). In 2002 and 2003, Morreale conducted a study of loggerhead, Kemp's ridley and green sea turtles captured in pound nets fishing in the Peconic Bay area. Sea turtles were not encountered after the last week in October (Morreale 2003). Tracking studies summarized in Morreale and Standora (2005) indicate that loggerhead and Kemp's ridley sea turtles begin leaving New York waters in October and generally by the first week of November, turtles head southward past the Virginia border. Similar migratory patterns are expected for green and leatherback sea turtles (Shoop and Kenney 1992; Morreale 1999). Based on this information, sea turtles may occur in the action area between May through November.

Atlantic Sturgeon

There are five DPSs of Atlantic sturgeon listed as threatened or endangered. Atlantic sturgeon originating from the New York Bight, Chesapeake Bay, South Atlantic and Carolina DPSs are listed as endangered, while the Gulf of Maine DPS is listed as threatened. The marine range of all five DPSs extends along the Atlantic coast from Canada to Cape Canaveral, Florida.

At around three years of age, subadults exceeding 2.3 feet in total length begin to migrate to marine waters (Bain et al. 2000). After emigration from the natal river/estuary, subadults and adult Atlantic sturgeon travel within the marine environment, typically in waters less than 164 feet in depth, using coastal bays, sounds, and ocean waters (ASSRT 2007). In rivers and estuaries, Atlantic sturgeon typically use the deepest waters available; however, Atlantic sturgeon also occur over shallow (8.2 feet), tidally influenced flats and mud, sand, and mixed cobble substrates (Savoy and Pacileo 2003). Occurrence in these shallow waters is thought to be tied to the presence of benthic resources for foraging.

Based on the above information, adult and subadult Atlantic sturgeon from any of five DPSs could occur in the project area; however, as Atlantic sturgeon spawn in freshwater portions of large rivers and early life stages are not tolerant of salinity, no eggs, larvae or juvenile Atlantic sturgeon occur in the action area.

Effects of the Action

The primary concerns for loggerhead, Kemp's ridley, and green sea turtles is entrainment and loss of forage, while the primary concern for leatherbacks is vessel collision as the dredge transits the borrow area. Due to their large size, whales are not vulnerable to entrainment in dredges; as such, effects of impingement or entrainment on whales will not be considered in this consultation. The primary concern for listed species of whales is the potential for vessel collisions as the dredge transits the borrow area. The primary concerns for Atlantic sturgeon is entrainment, loss of forage, and vessel collision as the dredge transits the borrow area. The potential effects of a temporary increase in turbidity and sedimentation as a result of dredging and beach nourishment on listed species are also discussed below.

The pipeline connecting the dredge to the shore will float on the surface of the water or will be laid on the bottom, presenting no possibility of intake of an ESA-listed species or adverse interaction with an ESA-listed species, and will not present a barrier to ESA-listed species. These

effects will not be discussed further in this consultation.

Below, we discuss the effects of both hopper and cutterhead dredging on ESA-listed species and exposure to: (1) entrainment and impingement of Atlantic sturgeon and sea turtles; (2) alteration of listed species prey items and foraging behavior due to dredging; (3) suspended sediment associated with dredging operations. The potential for interactions (i.e., vessel strikes) between project vessels and individual Atlantic sturgeon, whales or sea turtles is discussed separately.

Hopper Dredging: Impingement / Entrainment

Sea Turtles

Loggerhead, Kemp's ridley, and green sea turtles are known to be vulnerable to entrainment and/or impingement in hopper dredges.[1] Factors that are believed to contribute to the likelihood of sea turtle entrainment include: 1) dredge duration (e.g., greater number of interactions associated with longer duration dredging); 2) Hydraulic pump operation (i.e., interactions rates increase with hydraulic pumps operating during the placement/removal of draghead); 3) the location, habitat, and geography of the project site (e.g., open estuarine environment versus confined channel areas); and, 4) the species' use of, and behavior within, the affected location (e.g., foraging, brumating, breeding, resting, transiting).

As the draghead of a hopper dredge operates on the bottom, interactions with sea turtles primarily occur when a sea turtle is foraging or resting on the bottom; these interactions occur more frequently in areas where sea turtle forage is abundant, and thus, sea turtle densities are high. Habitat conditions in the borrow areas are not consistent with the areas where brumation has been documented; therefore, we do not anticipate that brumating sea turtles are present in the project area. Sea turtles are not known to concentrate in, or use the waters of the borrow areas affected by dredging operations as an essential foraging or resting ground; instead it is believed that they use these waters to transit to other waterways of New York. Although sea turtle forage exists within the United States coastal waters of the Atlantic Ocean (e.g., crabs, mollusks, submerged aquatic vegetation (SAV)), there is no optimal foraging habitat within the portion of the action area affected by the sand mining operations. The borrow areas have been used previously as a dredge site. As a result, the benthos in the borrow areas are absent of a diverse and abundant benthic invertebrate community and has very sparse SAV. As such, the borrow areas are unsuitable for sea turtle foraging. Based on the best available information, sea turtle species are not expected to be foraging or resting in these portions of the project area and thus, are not expected to be on the benthos where the draghead of the hopper dredge will be operating. Instead, within the project area, these species of sea turtles are expected to be found in the water column, migrating to and from foraging, breeding, or resting grounds found in nearshore coastal bays and estuaries located outside of the borrow areas (e.g., Long Island bays and estuaries). As sea turtles are not expected to occur within the vicinity of the draghead, the likelihood of an interaction between a sea turtle and the dredge head is extremely unlikely.

In addition to the habitat characteristics of the project area, the location and geography of a project may also affect the likelihood of entrainment. The risk of entrainment is believed to be

[1] Due to the large size of leatherback sea turtles, leatherback sea turtles are not vulnerable to entrainment in hopper dredges. To date, this species has never been documented entrained in any dredge operation along the U.S. Atlantic Coast (USACE Sea Turtle Warehouse, 2013).

highest in areas where the movements of animals are restricted (e.g., rivers, narrow confined channels) and therefore, where the animal has limited opportunity to move away from the dredge. If these restricted areas also occur within sites in which species are known to concentrate, the likelihood of an interaction further increases. These characteristics; however, are not present within the project area. The borrow areas are situated within the nearshore waters of the Atlantic Ocean, an area we consider an open environment; that is, an unconfined body of water in which the shorelines of the surrounding land masses do not encroach on the body of water to an extent that narrow waterways are created. The distance from the borrow areas to the shoreline is approximately 1.5 mile or less to the north. As dredging operations will occur in an open environment, sea turtle movements will be unrestricted, with ample space surrounding the dredging area for sea turtles to move and avoid the dredge or dredge site and continue normal behaviors in other waterways of New York. Further, because sea turtles are only expected to transit the project area, and not congregate, the density of sea turtles in any portion of the project area is expected to be low. Based on this information, combined with the fact that sea turtles are not expected to occur on the benthos to forage or rest, the potential for an interaction with a dredge is further reduced.

Based on the information above, and the following factors, we conclude that the risk factors that increase the likelihood for sea turtle entrainment are not present. First, hydraulic pumps will be only turned on once the draghead is on the bottom; thereby, directing and maintaining the suction velocity to the benthos of the borrow areas, and thus, within an area where sea turtles are not expected to occur. Second, prior to the actual lifting of the dragarm from the bottom, the draghead will be held firmly on the bottom for 10 to 15 seconds (with no suction) then lifted rapidly to midwater. Third, a turtle deflector draghead will be properly installed in front of the draghead and used at all times. Based on this information, it is extremely unlikely that there will be any impingement or entrainment of sea turtles. Effects of hopper dredging on sea turtles are discountable.

Atlantic Sturgeon

Atlantic sturgeon are known to be vulnerable to entrainment and/or impingement in hopper dredges. Factors that are believed to contribute to the likelihood of Atlantic sturgeon entrainment include: 1) dredge duration (e.g., greater number of interactions associated with longer duration dredging); 2) hydraulic pump operation (i.e., interactions rates increase with hydraulic pumps operating during the placement/removal of draghead); 3) the location, habitat, and geography of the project site (e.g., open estuarine environment versus confined channel areas); and, 4) the species' use of, and behavior within, the affected location (e.g., foraging, overwintering, spawning, resting).

Information suggests that Atlantic sturgeon in the marine environment do not move along the bottom, but instead move further up in the water column during their migratory movements along the coast line. However, Atlantic sturgeon forage on the benthos and as the draghead of a hopper dredge operates on the bottom, an interaction is possible with a foraging Atlantic sturgeon within the area being dredged. Atlantic sturgeon feed on benthic invertebrates (e.g., amphipods, gastropods, annelids, decapods) and occasionally on small fish. Foraging also often occurs at, or near, areas with SAV or shellfish resources. As forage may be present in the project area, opportunistic foraging may occur at the site. If an Atlantic sturgeon is foraging

opportunistically within this portion of the project area, there could be a risk of interacting with the dredge. However, because the dredge moves very slowly, and there is ample space for movements (see below), it is likely that subadult or adult Atlantic sturgeon can easily avoid the dredge. This assumption is supported by recent monitoring work, completed in the James River (Virginia) and the Delaware River (New Jersey) (Cameron 2010; ERC 2011), as well as work undertaken on a related species, the white sturgeon, in the Columbia River (Parsley and Popoff 2004). During these studies, the movements of tagged Atlantic, white, and/or shortnose sturgeon were tracked near the dredge (mechanical and hydraulic). No interactions between sturgeon and the dredge occurred. Some tagged sturgeon moved through the area where the dredge was operating multiple times during the study, while others remained within the vicinity of the dredging operation with no incidence. The risk is further increased at overwintering areas because evidence suggests that sturgeon may be less responsive to stimuli while overwintering, which may make it less likely that sturgeon would avoid a dredge during this time period. However, overwintering grounds are not known to exist in the borrow areas and therefore, no overwintering sturgeon were likely to occur in the portion of the project area where dredging operations will occur. As a result, these increased risk factors are not present.

In addition to the habitat characteristics of the project area, the location and geography of a project may also affect the likelihood of entrainment. The risk of entrainment is believed to be highest in areas/environments where the movements of animals are restricted (e.g., rivers, narrow confined channels, small semi-enclosed harbors) and therefore, where the animal has limited opportunity to move away from the dredge. If these restricted areas also occur within sites in which a species is known to concentrate, the likelihood of an interaction further increases. These characteristics; however, are not present within the project area. The borrow areas are situated within the Atlantic Ocean, an area we consider an open ocean environment; that is, an unconfined, body of water in which the shorelines of the surrounding land masses do not encroach on the body of water to an extent that narrow waterways are created. The distance from the borrow areas to the nearest shoreline is approximately 1.5 miles or less to the north. As dredging operations will occur in an open environment, Atlantic sturgeon movements will be unrestricted, with ample space surrounding the project area for sturgeon to move and avoid the dredge, or dredge site and continue normal behaviors in other waterways of New York. Further, because Atlantic sturgeon are expected to be using the borrow areas only as they move to other areas, the density of Atlantic sturgeon in any portion of the project area is expected to be low and thus, if an Atlantic sturgeon occurs in the area to be dredged, there is ample space and ability for the sturgeon to avoid the dredge. Based on this information, combined with the fact that Atlantic sturgeon are not expected to occur at the bottom of the borrow areas, the potential for an interaction with a dredge is further reduced.

Based on the information above, and the following factors, we conclude that the risk factors that increase the likelihood for Atlantic sturgeon entrainment are not present. First, hydraulic pumps will only be turned on once the draghead is on the bottom, thereby, directing and maintaining the suction velocity to the benthos of the borrow areas, and thus, within an area where ESA listed species are not expected to occur. Second, prior to the actual lifting of the dragarm from the bottom, the draghead will be held firmly on the bottom for 10 to 15 seconds (with no suction) then lifted rapidly to midwater. Based on this information, it is extremely unlikely that any

impingement or entrainment of Atlantic sturgeon will occur. Effects of dredging on Atlantic sturgeon are discountable.

Cutterhead Dredging: Impingement / Entrainment

Sea Turtles

Sea turtles are not known to be vulnerable to entrainment in cutterhead dredges, presumably because they are able to avoid the relatively small intake area and low intake velocity. Thus, if a sea turtle were to be present at the dredge site, it would be extremely unlikely to be injured or killed as a result of dredging operations carried out by a hydraulic cutterhead dredge. Based on this information, effects to sea turtles from the hydraulic cutterhead dredge are discountable.

Atlantic Sturgeon

Impingement or entrainment in hydraulic cutterhead dredges may kill or injure sturgeon.
In order for sturgeon to be impinged or entrained in the cutterhead dredge, sturgeon would have to be on the bottom. Sturgeon do occur on the bottom, especially while foraging; however, studies indicate that small, juvenile sturgeon (less than 0.6 foot fork length) need to be within 4.9 feet to 6.6 feet of the cutterhead for there to be any potential entrainment (Boysen and Hoover 2009). Sturgeon in the action area are considerably bigger (subadults and adults), and as they are stronger swimmers, are even less vulnerable to being overcome by the suction of the dredge and to becoming entrained. Because the dredge moves slowly and sturgeon are highly mobile, strong swimmers, it is likely that sturgeon would easily be able to avoid the dredge. This assumption is supported by recent monitoring work completed in the James River (Virginia) and the Delaware River (New Jersey) (Reine *et al.* 2014; ERC 2012). During these two studies, while the movements of tagged sturgeon were traced near a dredge, there were no interactions between tagged sturgeon and the dredge. Furthermore, tagged sturgeon moved through the dredge area during the study multiple times while the dredge was operating.

While entrainment of smaller sturgeon in cutterhead dredges has been observed (as evidenced by the presence of a few individual shortnose sturgeon at the Money Island Disposal Site in the Delaware River in 1996 and 1998), these instances are rare and have been limited to dredging events that occur near sturgeon overwintering areas where sturgeon are known to form dense aggregations. However, although sturgeon may be present in the action area year round, the action area is not a known overwintering area for Atlantic sturgeon. The risk of entrainment is also higher for small fish, including early life stages and small juveniles. Because these life stages are not present in the action area and the smallest sturgeon present would be at least 2.3 feet (the size at which we expect them to begin migrations from their natal river), the risk of entrainment is minimal in the action area. Increased risk factors (i.e., small fish, overwintering area) are not present in the action area, overall. Therefore, it is extremely unlikely that any sturgeon would be impinged or entrained in a cutterhead dredge operating within the project site; effects to sturgeon from the proposed hydraulic dredging operations are discountable.

Dredging, Beach Nourishment, Inlet Management, and Fill Placement Effects on Foraging and Migration

Whales

ESA listed species of whales may be present within the borrow areas where dredging will occur. Because whales forage upon pelagic prey items (e.g., krill, copepods), dredging and its impacts

on the benthic environment will not have any direct effects on whale prey/foraging items. Additionally, the proposed project will have an observer on board and dredging operations will be stopped if a whale is in the vicinity of the project. Therefore, as dredging operations will not be undertaken within the vicinity of ESA listed species of whales, migratory behaviors of ESA listed whales will also not be affected. ESA listed species of whales will not occur in the shallow, nearshore area where fill placement for the repair of the groins will occur and will not experience any effects from fill placement activities. As such, the remainder of this section will discuss the effects of dredging and the alteration of sea turtle and Atlantic sturgeon foraging habitat.

Atlantic Sturgeon and Sea Turtles

Dredging can cause effects on Atlantic sturgeon and sea turtles by reducing prey species through the alteration of the existing biotic assemblages and habitat. As forage for both species may be present in the project area (e.g., polychaetes, bivalves, and gastropods), opportunistic foraging may occur at the site and thus, dredging and the placement of fill (e.g., beach nourishment, groin repair) may cause effects to sturgeon and sea turtles by reducing prey species through the alteration of existing biotic assemblages and habitat. This reduction, however, will be temporary (i.e., recolonization will begin within two months, with complete recolonization in a year; Burlas *et al.* 2001; Guerra-Garcia and Garcia-Gomez 2006). Due to the limited benthic foraging in the borrow area, some nearshore areas may be more desirable to certain turtles or sturgeon due to prey availability. The pipeline may also lay on the ocean floor causing a temporary reduction in available prey. There is no information to indicate that the dredged areas, sand placement sites, or pipeline placement sites have more abundant sturgeon and turtle prey or better foraging habitat than other surrounding areas. The assumption can be made that sturgeon and sea turtles are not likely to be more attracted to the waters of the action area than to other foraging areas in the waters of NY and will be able to find sufficient prey in these alternate areas.

While dredging, sand placement activities, and the placement of the pipeline may temporarily disrupt normal feeding behaviors for sturgeon and sea turtles by causing them to move to alternate areas, these activities are not likely to remove critical amounts of prey resources. Based on this and the best available information, we believe the impacts of dredging, fill operations, and placement of the pipeline on Atlantic sturgeon and sea turtle foraging are insignificant.

During dredging operations, ESA-listed species will avoid the immediate area when dredging, pipeline placement, and fill placement takes place. The proposed action will not alter the habitat in any way that prevents sturgeon or sea turtles from transiting the action area to other near-by areas suitable for foraging. Additionally, as the sand will be placed along the shoreline, placement of fill will not impede the transiting or passage of sea turtles or Atlantic sturgeon through the area. Based on this and the best available information, we believe the impacts of dredging, sand placement, and pipleine operations on Atlantic sturgeon and sea turtle migration are insignificant.

Water Quality Effects: Dredging, Beach Nourishment, Inlet Management, and Groin Construction

Beach Nourishment and Inlet Management

Beach nourishment and inlet management operations require the placement of large quantities of

sand below the mean high water mark of a shoreline. The placement of dredged material along beaches or shorelines cause an increase in localized turbidity in the nearshore environment. Nearshore turbidity impacts from fill placement are directly related to the quantity of fines (silt and clay) in the nourishment material. As the material from the borrow areas consists of beach quality sand of similar grain size and composition as indigenous beach sands, we expect short suspension time and containment of sediment during and after placement activities. As such, turbidity impacts would be short-term (*i.e.*, turbidity impacts will dissipate completely within several hours of the cessation of operations (Greene 2002)) and will be spatially limited to the vicinity of the dredge outfall pipe, the pump out buoy/mooring station, and dredge anchor points.

The Atlantic States Marine Fisheries Commission (Greene 2002) review of the biological and physical impacts of beach nourishment cites several studies that report that the turbidity plume and elevated total suspended solids (TSS) levels drop off rapidly seaward of the sand placement operations. Wilber *et al.* (2006) evaluated the effects of a beach nourishment project along the coast of northern New Jersey and reported that maximum bottom surf zone and nearshore TSS concentrations related to nourishment activities were 64.0 mg/L and 34.0 mg/L, which were only slightly higher than background maximum bottom TSS concentrations in the surf and nearshore zones on unnourished portions of the beach (i.e., less than 20.0 mg/L). Additionally, Wilber *et al.* (2006) reported that elevated TSS concentrations associated with the active beach nourishment site were limited to within 1,312 feet of the discharge pipe in the swash zone (defined as the area of the nearshore that is intermittently covered and uncovered by waves), while other studies found that the turbidity plume and elevated TSS levels are expected to be limited to a narrow area of the swash zone up to 1,640 feet down current from the discharge pipe (Schubel *et al.* 1978; Burlas *et al.* 2001). Based on this and the best available information, turbidity levels created by beach nourishment and inlet management operations along the shoreline are expected to be between 34.0 to 64.0 mg/l; limited to an area approximately 1,640 feet down current from the area of sand placement; and, are expected to be short term, only lasting several hours.

Stone Fill Placement

The placement of stone fill for the groin repair will be done at depths of up to 20 feet from land based equipment and will disturb shoreline sediments and may cause a temporary increase in suspended sediment in the nearshore area. However, suspended sediment is expected to settle out of the water column within a few hours and any increase in turbidity will be short term. Turbidity levels associated with any sediment plume are expected to be only slightly elevated above background levels. The equipment used will place the stone at slow speeds which will allow any ESA-listed species to avoid being directly struck by the placement of fill. Additionally, this activity will take place in a shallow area and any species in the vicinity is expected to move away from the construction activities prior to the placement of any fill. Based on this information, effects of stone placement to ESA-listed species are extremely unlikely, and therefore, discountable.

Dredging

Dredging operations cause sediment to be suspended in the water column. This results in a sediment plume in the water, typically radiating from the dredge site and decreasing in concentration as sediment falls out of the water column as distance increases from the dredge site. The nature, degree, and extent of sediment suspension around a dredging operation are controlled by many factors including: the particle size distribution, solids concentration, and

composition of the dredged material; the dredge type and size, discharge/cutter configuration, discharge rate, and solids concentration of the slurry; operational procedures used; and the characteristics of the hydraulic regime in the vicinity of the operation, including water composition, temperature and hydrodynamic forces (i.e., waves, currents, etc.) causing vertical and horizontal mixing (ACOE 1983).

Cutterhead Dredging
Based on a conservative total suspended solids (TSS) background concentration of 5 mg/L, modeling results of cutterhead dredging indicated that elevated TSS concentrations (i.e., above background levels) would be present throughout the bottom six feet of the water column for a distance of approximately 1,000 feet (USACE 1983). Based on these analyses, elevated suspended sediment levels are expected to be present only within a 1,000 foot radius of the location of the cutterhead dredge. Turbidity levels associated with cutterhead dredge sediment plumes typically range from 11.5 to 282 mg/L with the highest levels detected adjacent to the cutterhead dredge and concentrations decreasing with greater distance from the dredge (Nightingale and Simenstad 2001).

Hopper Dredging
Resuspension of fine-grained dredged material during hopper dredging operations is caused by the dragheads as they are pulled through the sediment, turbulence generated by the vessel and its prop wash, and overflow of turbid water during hopper filling operations. During the filling operation, dredged material slurry is often pumped into the hoppers after they have been filled with slurry in order to maximize the amount of solid material in the hopper. The lower density turbid water at the surface of the filled hoppers overflows and is usually discharged through ports located near the waterline of the dredge. In the vicinity of hopper dredge operations, a near-bottom turbidity plume of resuspended bottom material may extend 2,300 to 2,400 feet down current from the dredge (USACE 1983). In the immediate vicinity of the dredge, a well-defined upper plume is generated by the overflow process. Approximately 1,000 feet behind the dredge, the two plumes merge into a single plume (USACE 1983). Suspended solid concentrations may be as high as several tens of parts per thousand (ppt; grams per liter) near the discharge port and as high as a few parts per thousand near the draghead. In a study done by Anchor Environmental (2003), nearfield concentrations ranged from 80.0-475.0 mg/l. Turbidity levels in the near-surface plume appear to decrease exponentially with increasing distance from the dredge due to settling and dispersion, quickly reaching concentrations less than 1 ppt. By a distance of 4,000 feet from the dredge, plume concentrations are expected to return to background levels (USACE 1983). Studies also indicate that in almost all cases, the vast majority of resuspended sediments resettle close to the dredge within one hour, and only a small fraction takes longer to resettle (Anchor Environmental 2003).

Effects on Whales, Atlantic Sturgeon, and Sea Turtles
No information is available on the effects of TSS on juvenile and adult sea turtles. Studies of the effects of turbid waters on fish suggest that concentrations of suspended solids can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton 1993).

TSS is most likely to affect sea turtles, subadult and adult Atlantic sturgeon, or whales if a plume causes a barrier to normal behaviors or if sediment settles on the bottom affecting sea turtle or sturgeon prey. As whales, sturgeon, and sea turtles are highly mobile, they are likely to be able to

avoid any sediment plume and any effect on their movements is likely to be insignificant. Additionally, the TSS levels expected from dredging (11.5 to 475.0 mg/L) or beach nourishment/inlet management (34.0 to 64.0 mg/l) are below those shown to have an adverse effect on fish (580.0 mg/L for the most sensitive species, with 1,000.0 mg/L more typical; see summary of scientific literature in Burton 1993). While the increase in suspended sediments may cause whales, Atlantic sturgeon, and sea turtles to alter their normal movements, any change in behavior is not able to be measured or detected, as it will only involve minor movements that alter their course out of the sediment plume which will not disrupt any essential life behaviors. Based on this information, we believe the effects of suspended sediment on whales, Atlantic sturgeon, and sea turtles resulting from increased turbidity from dredging and beach nourishment operations are insignificant.

Effects of Vessel Interactions

Whales, sea turtles, and sturgeon may be injured or killed as a result of being struck by boat hulls or propellers. The factors relevant to determining the risk to these species from vessel strikes vary, but may be related to the size and speed of the vessels, navigational clearance (i.e., depth of water and draft of the vessel) in the area where the vessel is operating, and the behavior of individuals in the area (e.g., foraging, migrating, overwintering, etc.). We have considered the likelihood that an increase in vessel traffic associated with the project increases the risk of interactions between listed species and vessels in the project areas, compared to baseline conditions. The use of one hopper dredge and one cutterhead dredge will cause a small, localized, temporary increase in vessel traffic. Given the large volume of traffic in the project area, the increase in traffic associated with the projects is extremely small. Based on this information, we believe the effects of vessel traffic on whales, sea turtles, and sturgeon from dredging operations are insignificant.

Conclusion

Based on the analysis that any effects to ESA-listed species will be insignificant or discountable, we concur with your determination that the proposed project is not likely to adversely affect any listed species under our jurisdiction. Therefore, no further consultation pursuant to section 7 of the ESA is required. Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or (c) If a new species is listed or critical habitat designated that may be affected by the identified action. No take is anticipated or exempted. If there is any incidental take of a listed species, reinitiation would be required. Should you have any questions regarding these comments, please contact Daniel Marrone at Daniel.Marrone@noaa.gov or by phone (978-282-8465).

Technical Assistance for Proposed Species

On March 23, 2015, we published a proposed rule to list three distinct population segments (DPS) of green sea turtles as endangered and eight distinct population segments of green sea turtles as threatened, including the North Atlantic DPS (80 FR 15272). This rule, when finalized, would replace the existing listing for green sea turtles. Once a species is proposed for listing, the

conference provisions of the ESA may apply (see ESA section 7(a)(4) and 50 CFR § 402.10). Conference is defined as "a process which involves informal discussions between a Federal agency and the Service… regarding the impact of an action on proposed species or proposed critical habitat and recommendations to minimize or avoid the adverse effects" (50 CFR § 402.02). Federal agencies are required to confer with NMFS on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat (50 CFR § 402.10).

Currently, green sea turtles are listed as threatened, except for the Florida and Pacific coast of Mexico breeding populations, which are listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green sea turtles are currently considered endangered wherever they occur in U.S. waters. In the analysis above, we have considered effects to the current global listing of green sea turtles. Green sea turtles in the action area are from the North Atlantic DPS. As explained above, all effects to green sea turtles will be insignificant and discountable, and the proposed action will not result in the injury or mortality of any green sea turtles; as this determination was based on the potential effects to individuals, the proposed change in status for these sea turtles (i.e., from endangered to threatened) would not change these determinations. As all effects of the proposed action are insignificant and discountable, and the proposed action will not result in the injury or mortality of any green sea turtles, the action is not likely to appreciably reduce the survival and recovery of any DPS of green sea turtle, including the North Atlantic DPS. Therefore, it is not reasonable to anticipate that this action would be likely to jeopardize the continued existence of any DPS of green sea turtles. As such, we have determined that no conference is necessary for green sea turtles.

Essential Fish Habitat Comments

NMFS Habitat Conservation Division (HCD) is responsible for overseeing programs related to Essential Fish Habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act and other NOAA trust resources under the Fish and Wildlife Coordination Act. HCD will provide comments separately on this project. If you wish to discuss this further, please contact Karen Greene at (732) 872-3023 or Karen.Greene@Noaa.gov.

Sincerely,

for Kimberly B. Damon-Randall
Assistant Regional Administrator
for Protected Resources

EC: Marrone, GAR/PRD
Greene, GAR/HCD
Gallo, ACOE

File Code: Section 7\ Non-Fisheries\ACOE\Informal\ 2016\New York\Fire Island to Montauk Point (FIMP)PCTS: NER-2016-13119

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BORROW SOURCE INVESTIGATIONS

APPENDIX L

BORROW SOURCE INVESTIGATIONS

1. **Project Location** The US Army Engineer District, New York (CENAN) is currently conducting a reformulation study of the shore protection and storm damage reduction project for the south shore of Long Island, New York. The project area is located entirely in Suffolk County, Long Island, along the Atlantic and the bay shores of the towns of Babylon, Islip, Brookhaven, Southampton, and East Hampton. The overall study area, is approximately 83 miles long and includes three large estuarial bays: Great South Bay (connected to the ocean by Fire Island Inlet), Moriches Bay (connected to the ocean by Moriches Inlet), and Shinnecock Bay (connected to the ocean by Shinnecock Inlet). The westernmost portion of the overall study area, the Nassau/Suffolk County border at Great South Bay, is located about 47 miles east of The Battery, NY. The area is primarily low-lying and as such, subject to flooding by storm surge from the Atlantic Ocean, surge propagation through tidal inlets, wave setup and run-up, and barrier island over wash and breaching.

2. **Objective.** The objective of the borrow area investigation was to identify and delineate sources of sand borrow material for use as design fill and nourishment material for FIMP beach erosion control project. The geology of the study area sets the framework of the sedimentary development of the shoreline and the offshore. Beach fill sediments were sought which had adequate data available, sufficient quantity, compatible sediment characteristics, would cause minimal adverse wave attenuation, would cause minimal geomorphological effects, contained minimal overburden of fines, contained minimal quantity of fines and minimal adverse environmental effects. Methodology from EM 1110-2-1100 (Coastal Engineering Manual) was used to determine sediment characteristic suitability. Beach sand models were created using samples along the shoreline between Fire Island and Montauk Point. Borrow sources investigated included upland (quarry), maintenance dredging of navigation channels, flood and ebb shoal mining at inlets, and offshore (dredging) sites. Sand Bypassing was evaluated in the Engineering Appendix, but is not expected to provide more than a small percentage of the fill needs. So the other sources were assumed to be required for all the fill, and if it turns out that sand bypassing is a cost effective way of diminishing the fill needs, then it will be become part of the usage plans. Usage plans were developed for the suitable sources.

3. **Study Area Geology** (*derived from Schwab, W.C., Thieler, E.R., Denny, J.F., Danforth, W.W. 2000. Seafloor Sediment Distribution Off Southern Long Island, New York: U.S. Geological Survey Open-File Report 00-243, performed as a part of this study)***.** Long Island marks the southern boundary of the late Pleistocene glacial advance in the eastern part of North America (Stone and Borns, 1986). Two end moraines are superimposed along the western part of northern Long Island. The moraines bifurcate in eastern Long Island, where each moraine forms the core of the two peninsulas north and south of Great Peconic Bay (Fig. 1). The topography of Long Island is a reflection of this glacial history and exhibits greater relief on the northern side, where the two moraines are superimposed, and a gentler southward dipping gradient on the outwash plains that make up much of the southern side of the island. The coast from Southampton to Montauk Point is a headland region where the Ronkonkoma moraine and associated outwash sediment are eroded directly by wave action (Williams, 1976). The south shore

of Long Island west of Southampton consists of reworked glaciofluvial outwash and includes shallow back-barrier bays, marshes, and low-relief, sandy (fine- to medium-grained sand) barrier islands.

4. Leatherman (1989) identified 26 historical inlet sites along the Fire Island barrier-island system east of Watch Hill (Fig. 1). Inlet breaches account for most of the littoral sand transport into the back-barrier bays, and relict flood-tidal deltas are common throughout Moriches and Shinnecock Bays (Leatherman, 1985). The great number of relict flood-tidal deltas east of Watch Hill and outcrops of tidal-marsh sediments on the upper shoreface provide evidence of landward migration of this portion of the barrier-island system (Leatherman and Allen, 1985). In contrast, most of Fire Island west of Watch Hill has experienced in-place submergence over the past ~1000 yr (Sanders and Kumar, 1975; Leatherman, 1985; Leatherman and Allen, 1985). From the early 1800's until 1931, the Fire Island barrier-island system from Shinnecock Bay west to Fire Island Inlet, formed a single spit. A strong storm in 1931 opened Moriches Inlet and the "great hurricane" of 1938 opened Shinnecock Inlet and 11 other smaller inlets between Shinnecock and Moriches Inlets (Howard, 1939). All of these inlets subsequently closed naturally except Shinnecock and Moriches Inlets, which were stabilized by jetties in 1954. The east side of Fire Island Inlet was stabilized with a jetty in 1940.

5. Recent USGS Geologic Investigations. Data coverage for the Fire Island to Montauk Point study area extends from 10 miles west of Fire Island Inlet to approximately 10 miles west of Montauk Point, and from 8-m isobath to about 10 km offshore. Sea floor mapping was accomplished by using side scan sonar, high-resolution seismic-reflection profiles, surficial sediment samples, and visual observations. Data products include:

    a. The bathymetric coverage was generated from track line bathymetric data collected and was tidally corrected using NOAA's Sandy Hook control tide station: 8531680. Side scan sonar cross-shore line spacing was 300 m (1000 ft.), and alongshore spacing was approximately 2 km (200 statute miles).

    b. Side scan sonar imagery with contrast augmentation was used to portray backscatter. Backscatter is related to sediment texture where high backscatter indicates coarse-grained sediment or rock outcropping and low backscatter indicates fine sands, silt, or clays.

    c. Fifty-two surficial samples were collected and analyzed in the 1996 tour, 131 in spring of 1997, and 134 in fall of 1997. Reported parameters include sample tour identification; sample number; location in geographic coordinates; percentages of sand, silt and clay; sediment description; and mean sediment diameter, median sediment diameter, standard deviation, skewness, and kurtosis (all in phi units).

    d. Seismic-reflection data, taken in conjunction with the side scan sonar images and surficial sediment samples allowed interpretive mapping estimating Cretaceous rock outcropping, subsurface Pleistocene and Early Holocene sediment filled channels and thicknesses, and mapping of modern reworked deposits and thicknesses.

6. Recent USGS Geologic Results (*derived from Schwab, W.C., Thieler, E.R., Denny, J.F., Danforth, W.W. 2000. Seafloor Sediment Distribution Off Southern Long Island, New York: U.S. Geological Survey Open-File Report 00-243, performed as a part of this study. The most recent results of this study can be found in the originating document)*.

The USGS analysis identified a large outcrop of Cretaceous rock approximately 6km offshore of Watch Hill. To the west of this outcrop a field of shoreface-connected sand ridges that thin in the westward direction was identified. It was hypothesized that these features may reflect onshore sediment transport west of Watch Hill from erosion of the Cretaceous strata traveling via sand waves. Quantification and confirmation have yet to be studied. It was further hypothesized that removal of material from these ridges may interrupt the onshore migration of material from the ridges to the shore face. USACE acknowledges that the potential for this onshore movement is a plausible process. The U.S.G.S. investigators concluded that the coastlines in the study area are influenced by the geological framework. Figure 2 shows estimated thicknesses of Holocene deposits.

7. **Screening Criteria.** Screening criteria included: adequate data available, sufficient quantity, compatible sediment characteristics, would cause minimal adverse wave attenuation, would cause minimal geomorphological effects, contained minimal overburden of fines, contained minimal quantity of fines, minimal adverse environmental effects, and minimal effect on cultural resources. Data meant sediment characteristics at a minimum. Sufficient quantity meant a minimum of 150,000 cy from an upland source within 2 to 4 months, and 250,000 cy from an offshore source. The EM 1110-2-1100 optimal level of sediment compatibility is an overfill factor (defined below) between 1.00 and 1.05. This is not always possible due to limitations in available borrow sites. New York District has had success in long-term placement of sediments with overfill factors between 1.00 and 1.30. This range was adopted for this study. Minimal adverse wave attenuation meant negligible wave changes at the shoreline demonstrated in modeling study. An ERDC rule of thumb of avoiding offshore borrow areas with existing grades shallower than -37 ft. NGVD was utilized. Minimal geomorphological effects meant minimal long term effect on current sediment transport in sensitive offshore areas such as the areas west of Watch Hill on Fire Island. Minimal overburden of fines was defined as less than one foot. Minimal quantity of fines was defined as less than 10%. Minimal adverse environmental effects meant negligible long term impact to flora or fauna as demonstrated by surveying. Minimal effect on cultural resources meant negligible effect upon known cultural resources.

8. **Grain Size Characteristics**. Grain size characteristics are a critical design parameter. Most often, sand with grain size characteristics similar to those of the native beach is sought as beach fill. This is done to maximize compatibility with the existing beach system. Indirectly, selecting compatible material also maximizes the accuracy of predictions of future project performance, which is based on past observations of the native beach response. Occasionally, fills are designed using material with different properties because of limitations on sand availability and the cost to transport it to the project site. Sometimes the choice of a nourishment material with different characteristics is made to satisfy a particular design objective, such as use of a coarser-grained fill material to improve resistance to erosion (EM 1110-2-1100, Chapter 4).

9. Grain size characteristics are quantified based on sieve analyses of samples which are collected throughout the project domain. Those samples acquired on the profile between the berm crest (or mean high water line) and a water depth corresponding to the [position of the typical storm bar should be used to characterize native beach sand for the purpose of assessing the compatibility of sand from potential borrow sources. Compatibility of borrow and native beach material is primarily based on grain size characteristics, and to a lesser extent on color (EM 1110-2-1100, Part V, Chapter 4).

10. Sediment Suitability. The grain size distribution of the borrow material will affect the cross-shore shape of the nourished beach profile, the rater at which material is eroded from the project, and how the beach will respond to storms. Typically borrow material will not exactly match the native beach (except perhaps in some bypassing projects). An analysis is required to assess the compatibility of the borrow material with the native beach, from a functional perspective. A comparative analysis of sand suitability is also required to economically evaluate alternative borrow areas for a given project (EM 1110-2-1100, Part V, Chapter 4). Core composites were developed using averages weighted based on thickness of sediment layers.

11. Early research into compatibility of borrow area material by Krumbein (1957), Krumbein and James 91965), James (1974, 1975), and Dean (1974) addressed this issue by various comparative analysis techniques that utilize the sand size distributions of the natural beach in the fill area and the borrow material in the candidate borrow sites. These approaches develop a factor, or parameter, indicating how much fill is required in light of the different sediment characteristics between borrow and native beach materials. They assume that borrow material placed on the beach will undergo sorting as a result of the coastal processes; and given enough time, will approach the native grain size distribution. The portion of borrow material that does not match the native sediment gain size distribution is assumed to be lost to the offshore. James (1975) developed this concept into a method to calculate an overfill factor, Ra, and a renourishment factor, Rj. Conceptually, the overfill factor is the volume of borrow material required to produce a stable unit of usable fill material with the same grain size characteristics as the native beach sand. The renourishment factor addresses the higher alongshore transportability of the finer grain sizes in the borrow sands and provides an estimate of renourishment needs. Use of the renourishment factor is no longer recommended in beach fill design calculations (EM 1110-2-1100, Part V, Chapter 4).

12. Equations. Mechanical sieve analysis results indicate that the existing beach material consists of coarse to fine sand, however, the coarse material predominates. Simplified methodology of mean grain diameter and standard deviation was utilized due to the large amount of samples analyzed. It is acknowledged that there are more robust methods (e.g., Method of Moments), however the differences in results would not be great enough to change the inclusion or exclusion of a potential source. The simplified mean grain diameter, $M_{\phi i}$, is defined by the following formula:

$$M_{\phi} = \frac{\phi_{84} + \phi_{16}}{2}$$

$\phi =$ grain diameter defined in “phi” units

where phi_{84} is the phi transformation of the percentile at which 84 percent of the particles on the grain size distribution curve have larger diameters, and 16 percent have diameters finer than the diameter of the 84th percentile. Whereas, phi_{16} and phi_{50} are the phi value of the 16th and 50th percentile, similarly determined. The mean diameter is used to categorize the beach material into its appropriate component. The standard deviation, $Sigma_{phi}$, is a measure of the natural sorting of the sample. It is simplistically defined by:

$$\sigma_{\phi} = \frac{\phi_{84} - \phi_{16}}{2}$$

= Standard Deviation in phi units

13. **Beach Model Development.** Beach sediment samples were collected in 1995 along 59 selected profile lines in the entire project shoreline, as shown in Figure 3, with nine samples collected per profile line at the following elevations: Back-Berm; Fore-Berm; Mean High Water (MHW); 0 ft. NGVD; Mean Low Water (MLW); -6.0 ft. NGVD, -12.0 ft NGVD; -18 ft. NGVD; and -30.0 ft. NGVD. Eleven beach models were selected to represent the 83 miles of shoreline. Models were selected based on geographic/geomorphic profile location, and are delineated in Figure 3, and described in Table 1. Divisions within one geomorphic region were selected based on constructability factors (e.g., pumping distance), correlation with economic models, grouping based on sediment characteristic similarities, and fill need. Details on how the sediment characteristics were determined follows.

14. All beach sediment samples were used in the development of the beach models with the exception of: samples from elevations -18 and -30 ft. NGVD, anomalous samples, and gravel range samples. These omissions are described below:

    a. Offshore Samples. Offshore samples collected at –18 and –30 ft. NGVD were omitted from the composites. As recommended in EM 1110-2-1100, the most active portion of the profile, located between the natural crest of the berm and the depth corresponding to the typical storm bar. The storm bar is typically located landward of the -18 ft. NGVD contour. Thus, the -18 and -30 ft. NGVD samples were not included in the composites.

    b. Anomalous “Scatter” Samples. Sample mean grain diameter (for all samples) was plotted against sample standard deviation. Beach sediments plotted in this manner typically result in a very dense grouping, with few outliers. The few outlier samples (located significantly away from the central “cluster”) were omitted from beach model composites. Outliers may be comprised of a random shell or cobble, or a limited pocket of silts or clay making its way into the sample cup.

    c. Gravel Samples. Samples that contained more than 16% retained on the ASTM Mesh #10 sieve (i.e., 16% or more of the sample is coarser than 2mm) were omitted from the composites as well. The risk of including gravel samples in the models arose from the potential of having a beach model in the non-sand range (according to the Wentworth Sediment Classification Scale), or from having a bimodal beach model for which our current methods of compatibility analysis are not equipped to model.

15. **Borrow Source Screening.** The potential borrow sources included: upland (quarry), navigation channel maintenance dredging, shoal mining, and offshore. Table 2 shows a comprehensive matrix of all sources investigated. Table 3 shows the list of potential quarries. The following vibracore data sets were used: 1975 FIMP (USACE, 1979); 1976 ICONS (Williams, 1976); 1979 FIMP (OSSI, 1983); 1995 FIMP (MNE and OSI, 1995); 1997 FIMP (collected for this study); and 1998 FIMP (collected for this study) The compatibility is discussed further by beach model. Table 4 shows the result of the screening. Figure 4 shows a comprehensive map with all the potential sources shown.

Table 1

Summary of Native Beach Models						
Model	**1995 PL**	**1996 PL**	**Location**	**Mean Grain Size (phi units)**	**Standard Deviation (phi units)**	**Mean Grain Size (mm)**
GSB-D1	P001-P007	F1-F12	Robert Moses State Park to Fire Island Lighthouse	1.34	0.58	0.39
GSB-D2	P007B-P012A	F13-F35	Kismet to Cherry Grove	1.33	0.64	0.40
GSB-D3	P013-P019	F36-F58	Cherry Grove to Watch Hill	1.26	0.58	0.42
GSB-D4	P022-P024	F64-F68	Fire Island Wilderness Area	1.25	0.68	0.42
MB-D1	P027-P029	F72-F79	Smith Point County Park	1.25	0.64	0.42
MB-D2	P031-P037	F81-W17	Moriches Inlet to Westhampton Groinfield	1.15	0.62	0.45
SB-D1	P039-P045	W20-W35	East of Westhampton Groins to Tiana Beach	1.33	0.62	0.40
SB-D2	P045C-P048	W38-P3	Vicinity of Shinnecock Inlet	1.14	0.61	0.45
SB-D3	P050-P052	P7-P11	Southampton Beach	1.26	0.57	0.42
P-D1	P056-P063	P20-P41	Agawam Lake to Amagansett	1.15	0.63	0.45
M-D1	P065-P077	M5-M32	Amagansett to Montauk Point	1.05	0.67	0.48

Table 2

Comprehensive Matrix of Evaluated Sources										
		Screening Selections								
Location	Source	Insufficient Data	Insufficient Quantity	Incompatible Sediment Characteristics	Potential Adverse Wave Attenuation	Potential Adverse Geomorph-ological Effects	Overburden of Fines	Excessive Fines	Potential Environ-mental Impacts	Potential Cultural Impacts
Upland	Quarries (12)	3 Quarries	7 Quarries							
Maintenance Dredging	Moriches Inlet (max. 50,000 cy/yr)									Yes
	Shinnecock Inlet (max 60,000 cy/yr)									Yes
	Long Island Intracoastal Waterway			Incompatible						
Shoal Mining	Fire Island Inlet Ebb Shoal			Incompatible						
	Moriches Inlet Ebb Shoal			Incompatible						
	Shinnecock Inlet Ebb Shoal			3 Incompatible Cores	4 Core Locations					
	Fire Island Inlet Flood Shoal	Insufficient Data								
	Moriches Inlet Flood Shoal	Insufficient Data								
	Shinnecock Inlet Flood Shoal			Incompatible						
Offshore	1976 FIMP Reach 2 Cores (46)		2 Cores	20 Cores	12 Cores		1 Core			
	1976 ICONS Cores (56)			42 Cores	10 Cores	1 Core				
	1979 FIMP Cores (60)		4 Cores	36 Cores	2 Cores	3 Cores	1 Core			
	1995 FIMP Reach 1 Cores (15)		2 Cores	8 Cores		1 Core	3 Cores		1 Core	
	1996 FIMP Reach 2 Cores (15)			10 Cores	3 Cores					
	1997 FIMP Cores (10)			5 Cores	1 Core	1 Core				
	1998 FIMP Cores (39)			15 Cores	3 Cores	3 Cores		4 Cores		

Table 3

.

Potential Upland Sources				
Potential Upland Sources	**Location**	**Contact**	**Quantity***	**Grain Size Da**
American Sand & Gravel	Dix Hills, NY	(631) 242-9485	Insufficient	
Bistrian	East Hampton, NY	(631) 324-1123	Insufficient	
Empire Sand & Stone	Westbury, NY	(516) 997-2246	Insufficient	
European Express Sand and Stone	Kings Park, NY	(631) 544-9370	Insufficient	
Guillo	Southampton, NY	(631) 283-7251	Insufficient	
Hubbard Sand & Gravel	Bay Shore, NY	(631) 665-1005	Insufficient	
Stone, Sand, Soil & Rock	Lindenhurst, NY	(631) 956-7645	Insufficient	
Horan Sand & Gravel	Syosset, NY	(516) 364-2972	Sufficient	5 samples (200
Ranco Sand & Stone	Manorville, NY	(631) 874-3939	Sufficient	5 samples (200
East Coast Mines & Materials	Quogue, NY	(631) 645-7005	Sufficient	TBD
Sagaponack	Bridgehampton, NY	(631) 537-2252	Sufficient	TBD
Wainscott	Bridgehampton, NY	(631) 537-4583	Sufficient	TBD
Note: * Specification was 150,000 cy within 2 to 4 months.				

16. Borrow Screening for Beach Model GSB-D1-Fire Island Robert Moses State Park to Fire Island Lighthouse.

    a. Quarries. Out of the six quarries within the range of Model GSB-D1, only Horan Sand and Gravel in Syosset could supply 150,000 cy within 2 to 4 months and provided grain size distributions. The distributions at the time of the sampling (2002) were compatible with the beach model (overfill factor 1.11). Trucked in fill has no wave, geomorphological, and when specified in a detailed enough manner, negligible fines. Environmental and cultural effects (detailed elsewhere in the report) are minimal. The round trip distance from the quarry to the site is over 40 miles, and would require over 10,000 trucks to travel over a minimum of two bridges each way, and would require extra cost to restore roads and bridge surfaces from premature wear.
    b. Maintenance Dredging. This area occasionally receives small amounts of fill from Fire Island Maintenance Dredging. This would be assumed to continue into the future. Historical dredging observations have described Long Island Intracoastal Waterway material as unsuitable for ocean beach placement and won't be considered any further as a source in this study, i.e., less than 90% sand.
    c. Shoal Mining. Fire Island Inlet flood shoal has no data available, but is likely to contain material unsuitable for ocean beach fill. The ebb shoal has coring data, but the characteristics of the sediment were unsuitable.
    d. Offshore. No offshore cores were found to be suitable for this fill area.

17. Borrow Screening for Beach Model GSB-D2- Fire Island Kismet to Point O'Woods.

    a. Quarries. Horan Sand and Gravel in Syosset was suitable with a similar overfill factor 1.11 as for the previous model. See above for screening details.

b. Maintenance Dredging. The maintenance dredging material from Fire Island Inlet meets greater erosion needs further downdrift, so maintenance dredging as fill placement is not considered for this reach.
c. Shoal Mining. Fire Island Inlet flood shoal has no data available, but is likely to contain material unsuitable for ocean beach fill. The ebb shoal has coring data, but the characteristics of the sediment are unsuitable.
d. Offshore. Five offshore cores were found to be suitable for this fill area; ICONS-71, FIMP 79-2-9, 1995 FIMP Core 2, FIMP 97-2 and 97-6. There was adequate data to determine the overfill factors (1.02, 1.02, 1.02, 1.06, and 1.02, respectively). None of the cores is shallower than -37 ft. NGVD so no wave attenuation effects are expected. Four of the cores are located on sand ridges hypothesized to provide transport between offshore and onshore depths in recent studies. It is assumed that with the shortage of borrow sources in the area, borrow sources on the sand ridges may be utilized in such a way, with much adaptive management, and in deeper areas first, to make any impact to on-offshore transport negligible.

18. Borrow Screening for Beach Model GSB-D3- Fire Island Cherry Grove to Davis Park.

a. Quarries. No quarries were within convenient distance from fill area.
b. Maintenance Dredging. Inlets are located outside of convenient fill range.
c. Shoal Mining. Inlets are located outside of convenient fill range.
d. Offshore. Seven offshore cores were found to be suitable for this fill area; ICONS-67, FIMP 79-2-1 and 2-12, FIMP 97-5 and VC98-3, 4, 5 and 6. There was adequate data to determine the overfill factors (1.19, 1.08, 1.02, 1.08, 1.23, 1.28 and 1.25, respectively). None of the cores is shallower than -37 ft. NGVD so no wave attenuation effects are expected. Six of the cores are located on sand ridges hypothesized to provide transport between offshore and onshore depths in recent studies. It is assumed that with the shortage of borrow sources in the area, borrow sources on the sand ridges may be utilized in such a way, with much adaptive management, and in deeper areas first, to make any impact to on-offshore transport negligible.

19. Borrow Screening for Beach Model GSB-D4- Fire Island Wilderness Area.

a. Quarries. No quarries were within convenient distance from fill area.
b. Maintenance Dredging. Inlets are located outside of convenient fill range.
c. Shoal Mining. Inlets are located outside of convenient fill range.
d. Offshore. Four offshore cores were found to be suitable for this fill area; FIMP 79-3-7 and 3-9, and VC98-7 and 8. There was adequate data to determine the overfill factors (1.10, 1.06, 1.04 and 1.21, respectively). None of the cores is shallower than -37 ft. NGVD so no wave attenuation effects are expected. Three of the cores are located on relict headland area hypothesized to provide transport between offshore and onshore depths in recent studies. It is assumed that with the shortage of borrow sources in the area, borrow sources on the sand ridges may be utilized in such a way, with much adaptive management, and in deeper areas first, to make any impact to on-offshore transport negligible.

20. Borrow Screening for Beach Model MB-D1- Fire Island Smith Point County Park.

a. Quarries. Out of the quarries within the range of Model MB-D1, only Ranco Sand and Stone in Manorville could supply 150,000 cy within 2 to 4 months and

supplied grain size distributions. The distributions at the time of the sampling (2002) were compatible with the beach model (overfill factor 1.21). Trucked in fill has no wave, geomorphological, and when specified in a detailed enough manner, negligible fines. Environmental and cultural effects (detailed elsewhere in the report) are minimal. The round trip distance from the quarry to the site is over 40 miles, and would require over 10,000 trucks to travel over a minimum of two bridges each way, and would require extra cost to restore roads and bridge surfaces from premature wear.

b. Maintenance Dredging. Moriches Inlet Maintenance Dredging material is occasionally placed in this reach, and this practice is expected to continue.
c. Shoal Mining. Moriches Inlet flood shoal has no data available, but is likely to contain material unsuitable for ocean beach fill. The ebb shoal has coring data, but the characteristics of the sediment were unsuitable.
d. Offshore. No offshore cores were found to be suitable.

21. Borrow Screening for Beach Model MB-D2- Westhampton West of Groins.

a. Quarries. Out of the quarries within the range of Model MB-D2, none met the quantity available threshold. Samples therefore, were not collected.
b. Maintenance Dredging. Moriches Inlet Maintenance Dredging material is usually placed in this beach area at a rate of 50,000 cy/year at 5 years intervals, and this practice is likely to continue.
c. Shoal Mining. Moriches Inlet flood shoal has no data available, but is likely to contain material unsuitable for ocean beach fill. The ebb shoal has coring data, but the characteristics of the sediment were unsuitable.
d. Offshore. One offshore core were found to be suitable for this fill area; 1976 FIMP Cores CB-40. There was adequate data to determine adequate quantity, and overfill factor (1.22). The core is not shallower than -37 ft. NGVD so no wave attenuation effects are expected. No sensitive geomorphological areas were identified in the vicinity of this core.

22. Borrow Screening for Beach Model SB-D1- Westhampton Groins and East of Groins.

a. Quarries. Out of the quarries within the range of Model SB-D1, none met the quantity available threshold. Samples therefore, were not collected.
b. Maintenance Dredging. Shinnecock Inlet Maintenance Dredging material is occasionally placed in this beach area, and this practice is likely to continue.
c. Shoal Mining. Shinnecock Inlet flood shoal has data available, but contains material unsuitable for ocean beach fill. The ebb shoal is located closer to the updrift beachfill placement area, and is discussed there.
d. Offshore. Thirteen offshore cores were found to be suitable for this fill area; 1976 FIMP Cores CB-11, 12, 13, 14, 15, 22, 23 and 24, 1979 Core 5-1, 1998 FIMP Cores VC98-21, 22, 23, and 24. There was adequate data to determine adequate quantity, and overfill factors (1.17, 1.02, 1.02, 1.17, 1.27, 1.16, 1.20, 1.23, 1.26, 1.09, 1.17, 1.12, and 1.18, respectively). The cores are not located in areas shallower than -37 ft. NGVD so no wave attenuation effects are expected. No sensitive geomorphological areas were identified in the vicinity of these cores. Environmental and cultural analyses shall be performed to determine impacts prior to use, in the cases where it has not been done already.

23. Borrow Screening for Beach Model SB-D2- West of Shinnecock Inlet.

a. Quarries. Out of the quarries within the range of Model SB-D2, four met the quantity available threshold. Only one of the four provided sediment characterization data; Ranco Sand and Stone in Manorville. The overfill factor for Ranco was 1.21 for this fill area. Trucked in fill has no wave, geomorphological, and when specified in a detailed enough manner, negligible fines. Environmental and cultural effects (detailed elsewhere in the report) are minimal. The round trip distance from the quarry to the site is over 40 miles, and would require over 10,000 trucks to travel over a minimum of two bridges each way, and would require extra cost to restore roads and bridge surfaces from premature wear. Samples from the remaining three quarries may be collected in the future.
b. Maintenance Dredging. Shinnecock Inlet Maintenance Dredging material is commonly placed in this beach area, and this practice is likely to continue, at a rate of 60,000 cy/year placed at 5-year intervals.
c. Shoal Mining. Shinnecock Inlet flood shoal has data available, but contains material unsuitable for ocean beach fill. The ebb shoal has coring data, adequate volume, and one core was found to be suitable with an overfill ratio of 1.19; 1997 FIMP Core Alt-1. The grade of the shoal at the location of the core is shallower than -37 ft. NGVD, due to its nature of being located on the shoal, hence hydrodynamic and sediment transport modeling is recommended prior to dredging to evaluate potential wave attenuation and geomorphological effects. The core does not contain excessive fines or overburden. Environmental and cultural analyses shall be performed to determine negligible effects prior to use.
d. Offshore. No offshore cores were found to be suitable for this fill area.

24. Borrow Screening for Beach Model SB-D3- Southampton.

a. Quarries. Out of the quarries within the range of Model SB-D3, three met the quantity available threshold but none provided sediment characterization data. Trucked in fill has no wave, geomorphological, and when specified in a detailed enough manner, negligible fines. Environmental and cultural effects (detailed elsewhere in the report) are minimal. The round trip distance from the quarry to the site is over 40 miles, and would require over 10,000 trucks to travel over a minimum of two bridges each way, and would require extra cost to restore roads and bridge surfaces from premature wear. Samples from the three quarries may be collected in the future.
b. Maintenance Dredging. Shinnecock Inlet Maintenance Dredging material is rarely placed in this beach area, and this practice is likely to continue.
c. Shoal Mining. Shinnecock Inlet flood shoal has data available, but contains material unsuitable for ocean beach fill. The ebb shoal has coring data, but the down drift reach (SB-D2) was closer to the coring data, and was considered for placement there.
d. Offshore. Three offshore cores were found to be suitable for this fill area; 1979 FIMP Cores 79-6-17, 1996 FIMP Cores SHIN-12 and 15. There was adequate data to determine adequate quantity, and overfill factors (1.06, 1.24 and 1.26). The cores are not located on grades shallower than -37 ft. NGVD so no wave attenuation effects are expected. No sensitive geomorphological areas were identified in the vicinity of these cores. Environmental and cultural analyses shall be performed to determine negligible effects prior to use.

25. Borrow Screening for Beach Model P-D1- Ponds.

a. Quarries. Out of the quarries within the range of Model P-D1, four met the quantity available threshold but none provided sediment characterization data. Trucked in fill has no wave, geomorphological, and when specified in a detailed enough manner, negligible fines. Environmental and cultural effects (detailed elsewhere in the report) are minimal. The round trip distance from the quarry to the site is over 40 miles, and would require over 10,000 trucks to travel over a minimum of two bridges each way, and would require extra cost to restore roads and bridge surfaces from premature wear. Samples from the three quarries may be collected in the future.
b. Maintenance Dredging. Inlets are not in proximity of fill area.
c. Shoal Mining. Inlets are not in proximity of fill area.
d. Offshore. Eleven offshore cores were found to be suitable for this fill area; 1976 ICONS Core 34, 1979 FIMP Cores 79-6-2, 6-5, 6-8, 6-13, 7-3, 7-7, and 7-9, 1998 FIMP VC98-30, 32, and 33. There was adequate data to determine adequate quantity, and overfill factors (1.06, 1.10, 1.25, 1.16, 1.22, 1.19, 1.23, 1.09, 1.17, 1.16 and 1.10, respectively). The cores are not located on grades shallower than -37 ft. NGVD so no wave attenuation effects are expected. No sensitive geomorphological areas were identified in the vicinity of these cores. Environmental and cultural analyses determined negligible adverse impacts in the areas surrounding cores 1979 FIMP 6-13 and 1998 Core VC98-32. Environmental and cultural analyses shall be performed to determine negligible effects prior to use for the other potential areas.

26. Borrow Screening for Beach Model M-D1- Montauk.

a. Quarries. Out of the quarries within the range of Model M-D1, one met the quantity available threshold but didn't provide sediment characterization data. Trucked in fill has no wave, geomorphological, and when specified in a detailed enough manner, negligible fines. Environmental and cultural effects (detailed elsewhere in the report) are minimal. The round trip distance from the quarry to the site is over 40 miles, and would require over 10,000 trucks to travel over a minimum of two bridges each way, and would require extra cost to restore roads and bridge surfaces from premature wear. Samples from the quarry may be collected in the future.
b. Maintenance Dredging. Inlets are not in proximity of fill area.
c. Shoal Mining. Inlets are not in proximity of fill area.
d. Offshore. Six offshore cores were found to be suitable for this fill area; 1976 ICONS Core 29, 1979 FIMP Cores 79-8-1, 8-8 and 8-9, 1998 FIMP VC98-34 and 35. There was adequate data to determine adequate quantity, and overfill factors (1.06, 1.09, 1.16, 1.29 and 1.13, respectively). The cores are not located on grades shallower than -37 ft. NGVD so no wave attenuation effects are expected. No sensitive geomorphological areas were identified in the vicinity of these cores. Environmental and cultural analyses determined negligible adverse impacts in the areas surrounding cores 1979 FIMP 8-9 and 1998 Core VC98-34. Environmental and cultural analyses shall be performed to determine negligible effects prior to use for the other potential areas.

Table 4

Results of Screening Analysis				
Beach Model	Suitable Quarries	Maintenance Dredging	Suitable Shoal Mining Source	Suitable Offshore Sources
GSB-D1	Horan	Fire Island Inlet occasional		
GSB-D2	Horan			5 cores
GSB-D3				7 cores
GSB-D4				4 cores
MB-D1	Ranco	Moriches Inlet regular		
MB-D2		Moriches Inlet occasional		1 core
SB-D1		Shinnecock Inlet occasional		15 cores
SB-D2	Ranco	Shinnecock Inlet regular	1 core	
SB-D3				3 cores
P-D1				11 cores
M-D1				6 cores

27. **Borrow Source Recommendations.** Modern reworked deposits formed from erosion of eastern Long Island were targeted as having the highest likelihood of compatibility with beach sediment based on textural characteristics, based on preliminary vibracore data correlation (see Figure 2). While hundreds of miles of seismic data was collected, ease of use was not found. Therefore, Holocene thickness maps (derived by the USGS from the seismic and other data) were utilized for the delineation. Where suitable cores were located in groupings of two or more, a borrow area delineation was drawn to contain the group. Where suitable cores were isolated, it was assumed that the core has a horizontal influence of 2000' by 2000' and a vertical influence equal to the extent of the suitable material in the core. During the pre-construction phase, seismic interpretive profiles can be examined to refine the delineation, and more cores collected for verification purposes. The recommended borrow sources for each beach model area is described below. Borrow Areas are shown on Figures 5, 6, and 7. Borrow source recommendations are summarized in Table 5. Estimated volumes available in each beach model are detailed in Table 6.

27. Recommended Borrow Sources for Beach Model GSB-D1-Fire Island Robert Moses State Park to Fire Island Lighthouse.

    a. Initial Fill. Offshore. While no offshore cores were found to be suitable for this fill area in the immediate vicinity, cores suitable for Beach Model GSB-D2 were found to be suitable for this reach as well (the models were virtually identical). So an area was drawn around Cores ICONS-71, FIMP 79-2-9, 1995 FIMP Core 2 and FIMP 97-2, following the Holocene boundaries called Borrow Area 2C. This area covers 522 acres with an average depth of 12.7 feet. This area is recommended for initial fill. Environmental surveying was completed on this area.
    b. Future Renourishments. Navigation Channel Maintenance Dredging, Quarry or Offshore. Fire Island Inlet Maintenance dredging will be used in this reach for all

future operations. In addition, quarry may be utilized. Further, additional cores may be collected in Borrow Area 2C to confirm its suitability and if material is still shown to be compatible, Borrow Area 2C may be utilized. And environmental surveying may be performed on Borrow Area 1A (2000' by 2000' by 10.5 feet depth, surrounding core 1997 FIMP 97-6), and if negligible impacts are found, Borrow Area 1A may be specified.

28. Borrow Sources for Beach Model GSB-D2- Fire Island Kismet to Point O'Woods.

    a. Initial Fill. Offshore. Borrow Area 2C.
    b. Future Renourishments. Offshore. Borrow Area 2C.

29. Borrow Sources for Beach Model GSB-D3- Fire Island Cherry Grove to Davis Park.

    a. Initial Fill. Offshore. Borrow Area 2C was found to be suitable for this fill area as well and is recommended for initial fill (very similar models).
    b. Future Renourishments. Offshore. Additional vibracoring is recommended and if areas are shown to be still compatible, then the suitable borrow areas delineated surrounding core couple 1979 FIMP 79-2-12 and 1998 FIMP encompassing 500 acres at an average depth of 5 feet, called Borrow Area 2B, and two borrow areas of 165 and 200 acres with average depths of 15 and 10.1 feet, respectively, called 2A and 2D are recommended for future renourishments. Environmental and cultural surveys have already been completed on these areas. And/or environmental and cultural surveys may be completed on three additional areas, each 2000' by 2000', by 9.5, 4.3, and 17.2 feet depths, respectively, called 2F, 2G, and 2H, and if no adverse impacts are found, these areas may be utilized.

30. Borrow Sources for Beach Model GSB-D4- Fire Island Wilderness Area. No fill is recommended for this area.

31. Borrow Sources for Beach Model MB-D1- Fire Island Smith Point County Park.

    a. Initial Fill. Offshore. Although no offshore cores were found to be suitable for this reach in the immediate vicinity, cores from model areas MB-D2 and SB-D1 were found to be suitable (very similar models). A borrow area was delineated surrounding cores 1975 CB-12 and 13, 1979 FIMP Core 5-1, 1998 FIMP Cores VC98-21, 22, 23 and 24 covering 610 acres with an average depth of 13 feet, called Borrow Area 5B. Environmental and cultural surveys have been performed in this area, and it is thus recommended for use.
    b. Future Renourishments. Offshore or Quarry. Borrow Area 5B is recommended, or quarry, or environmental and cultural surveys may be performed on a 2000' by 2000' area with an average depth of 20 feet called Borrow Area 4C surrounding core 1975 FIMP Core CB-40 may have environmental and cultural surveys performed and if no adverse impact is found, then Borrow Area 4C can be utilized.

32. Borrow Sources for Beach Model MB-D2- Westhampton West of Groins.

    a. Initial Fill. No initial fill is recommended.

b. Future Renourishments. Maintenance Dredging and/or Offshore. Moriches Inlet Maintenance Dredging material is occasionally placed in this beach area, and this practice is likely to continue at a rate of 50,000 cy/year. Additional material may be obtained from Borrow Area 5B.

33. Borrow Sources for Beach Model SB-D1- Westhampton Groins and East of Groins.

    a. Initial Fill. Initial fill from an existing stockpile will be placed.
    b. Proactive Breach Contingency Plan Fill. Fill will be placed as needed as part of a Proactive BCP. Should fill be needed, Navigation Channel Maintenance Dredging material from Shinnecock Inlet may be utilized, or Offshore Borrow Area 5B may be used (similar models and similar suitability).

34. Borrow Sources for Beach Model SB-D2- West of Shinnecock Inlet.

    a. Initial Fill. Initial fill is not recommended for this reach.
    b. Proactive Breach Contingency Plan Fill. Fill will be placed as needed as part of a Proactive BCP. Should fill be needed, Navigation Channel Maintenance Dredging material from Shinnecock Inlet may be utilized, or Quarry or modeling studies and environmental and cultural surveys performed, and if no adverse impact is found, then a 2000' by 2000' by 17.8 feet depth, called Ebb Shoal Borrow Area 6B may be used.

35. Borrow Sources for Beach Model SB-D3- Southampton. No fill is recommended for this reach.

36. Borrow Sources for Beach Model P-D1- Ponds.

    a. Initial Fill. Offshore. An area 4000' by 2500' with an average depth of 8 feet, called Borrow Area 7B is recommended for use for initial fill. All environmental and cultural survey work has been performed on this area.
    b. Future Renourishments. Offshore. Borrow 7A is recommended. Or any of three 2000' by 2000' by 15, 12, or 11 feet depth, surrounding cores 1998 FIMP VC98-30, 1979 FIMP Core 7-9 and 7-7, respectively, called Borrow Areas 6I, 7B, and 7C may have environmental and cultural surveys performed, and if no adverse impacts are determined, then these areas may be utilized.

37. Borrow Sources for Beach Model M-D1- Montauk.

    a. Initial Fill. Offshore. Environmental and cultural survey shall be undertaken on an area 2000' by 2000' with a average depth of 13.3 feet, called Borrow Area 8D, surrounding core 1998 FIMP VC98-35, if found to have no adverse impact will be utilized.
    b. Future Renourishments. Offshore. Borrow Area 8D. Or vibracoring, environmental and cultural survey shall be undertaken on an area 4000' by 1500' with a average depth of 8 feet, called Borrow Area 8C, surrounding core 1979 FIMP VC 8-1 and 8-8, if found to have no adverse impact will be utilized. Or, environmental and cultural survey shall be undertaken on an area 2000' by 2000' with a average depth of 11 feet, called Borrow Area 8B, surrounding core 1976 ICONS-29, if found to have no adverse impact will be utilized. Or, vibracoring, survey shall be undertaken on an area 10000' by 3000' with an average depth of

15 feet, called Borrow Area 8A, surrounding cores 1979 FIMP VC 8-1 and 8-8, if found to have suitability confirmed, will be utilized.

Table 5

Results of Borrow Delineation		
Beach Model	Initial Fill	Future Renourishments
GSB-D1	Borrow Area 2C	Fire Island Inlet Dredging and/or Quarry and/or Borrow Areas 2C or 1A*
GSB-D2	Borrow Area 2C	Borrow Area 2C**
GSB-D3	Borrow Area 2C	Borrow Area 2B**, 2A**, and 2D** and/or Borrow Areas 2F*, 2G*, and 2H
GSB-D4		
MB-D1	Borrow Area 5B	Borrow Area 5B and/or Borrow Area 4C*
MB-D2		Moriches Inlet Dredging and/or Borrow Area 5B
SB-D1	Existing Stockpile	Shinnecock Inlet dredging and/or Borrow Area 5B
SB-D2		Shinnecock Inlet dredging and/or Quarry and/or Borrow Area 6B* ***
SB-D3		
P-D1	Borrow Area 7B	Borrow Area 7A and/or Borrow Areas 6I*, 7B*, and 7C*
M-D1	Borrow Area 8D*	Borrow Area 8D, 8C*, 8B* or 8A**
Notes: * indicates environmental and cultural survey needed		
** indicates more vibracoring needed		
*** indicates hydrodynamic and sediment transport modeling recommended		

Available Borrow Volumes

Table 6

Beach Model	Vicinity	Borrow Area ID	Suitable Cores	Average Dredging Cut Depth in ft	Area in acres	Assumed % Unusable	Average Ra	Environmental Analysis Status	Available Volume in cy	Subtotal Available Volume in cy
GSB-D1		no suitable borrow areas							0	
GSB-D1										0
GSB-D2	F15	1A	97-6	10.5	90	25%	1.02	Not Done	1,140,000	
GSB-D2	F32	2C	ICONS 71, 79-2-9, FII 2, 97-2	12.7	522	25%	1.03	Complete	8,010,000	
GSB-D2										9,150,000
GSB-D3	F38	2B	79-2-12, 98-3	5	500	25%	1.05	Complete	3,020,000	
GSB-D3	F43	2F	79-2-1	9.5	90	25%	1.04	Not Done	1,030,000	
GSB-D3	F46	2G	97-5	4.3	90	25%	1.04	Not Done	470,000	
GSB-D3	F49	2A	VC98-6	15	165	25%	1.25	Complete	2,990,000	
GSB-D3	F47	2D	VC98-5	10.1	200	25%	1.28	Complete	2,440,000	
GSB-D3	F54	2H	ICONS 67	17.2	90	25%	1.19	Not Done	1,870,000	
GSB-D3										11,820,000
GSB-D4	F61	3A	79-3-7, 79-3-9, VC98-7	7	609	25%	1.06	Complete	5,150,000	
GSB-D4	F67	3B	VC98-8	4.6	90	25%	1.21	Not Done	500,000	
GSB-D4										5,650,000
MB-D1		no suitable borrow areas							0	
MB-D1										0
MB-D2	W5	4A	CB-37, VC98-12	13	74	25%	1.26	Complete	1,160,000	
MB-D2	W5	4B	CB-43	20	140	25%	1.10	Complete	3,380,000	
MB-D2	W13	4C	CB-40	20	90	25%	1.22	Not Done	2,180,000	
MB-D2										6,720,000
SB-D1	W18	5A	VC98-18, VC98-20	14.5	132	25%	1.16	Complete	2,310,000	
SB-D1	W20	5B exp	CB-14, CB-15, CB-22, CB-23, CB-24	18	300	25%	1.21	Not Done	6,530,000	
SB-D1	W23	5B	CB-12, CB-13, 79-5-1, VC98-21, VC98-22, VC98-23, VC9	13	610	25%	1.20	Complete	9,580,000	
SB-D1	W28	5C	CB-11	15	43	25%	1.17	Not Done	780,000	
SB-D1										19,200,000
SB-D2	W44	6B	97-Alt1	17.8	23	25%	1.19	Not Done	490,000	
SB-D2										490,000
SB-D3	P10	6C	79-6-17, SHIN 12	9.9	110	25%	1.18	Not Done	1,320,000	
SB-D3	P12	6D	SHIN 15	10.2	90	25%	1.28	Not Done	1,110,000	
SB-D3										2,430,000
P-D1	P14	6A	79-6-13	15	74	25%	1.22	Completed	1,340,000	
P-D1	P16	6E	ICONS 34	10	90	25%	1.05	Not Done	1,090,000	
P-D1	P18	6F	79-6-8	9	90	25%	1.16	Not Done	980,000	
P-D1	P23	6G	79-6-5	10	90	25%	1.25	Not Done	1,090,000	
P-D1	P25	6H	79-6-2	10	90	25%	1.10	Not Done	1,090,000	
P-D1	P29	6I	VC98-30	15	90	25%	1.17	Not Done	1,630,000	
P-D1	P39	7A	VC98-32	8	90	25%	1.16	Completed	870,000	
P-D1	M1	7B	79-7-9	12	90	25%	1.09	Not Done	1,310,000	
P-D1	M2	7C	79-7-7	11	90	25%	1.23	Not Done	1,200,000	
P-D1	M6	7D	79-7-3	5	90	25%	1.19	Not Done	540,000	
P-D1	M8	7E	VC98-33	15	90	25%	1.10	Not Done	1,630,000	
P-D1										12,770,000
M-D1	M11	8A	79-8-9, VC98-34	15	184	25%	1.23	Completed	3,340,000	
M-D1	M15	8B	ICONS 29	11	90	25%	1.06	Not Done	1,200,000	
M-D1	M19	8C	79-8-1	8	90	25%	1.09	Not Done	870,000	
M-D1	M27	8D	VC98-35	13.3	90	25%	1.13	Not Done	1,450,000	
M-D1										6,860,000
Total Borrow Volume Available										**75,090,000**

35. **Wave Attenuation Avoidances.** In order to evaluate wave attenuation effects from potential borrow dredging, wave shoreline change modeling was performed utilizing wave conditions developed on the existing conditions bathymetry, and a post-dredge hypothetical bathymetry where the full dredged quantity is assumed to be excavated all at once in order to evaluate wave attenuation effects. Bathymetric data for the numerical domain was acquired from the NOAA bathymetric database. Areas not covered by the NOAA database were defined using beach profile surveys collected in 1995 for this study. The post excavation bathymetry was estimated assuming a cutterhead dredge operation, which results in a fixed cutting depth, and 1V:37.5H final adjusted side slopes, over a 1.85 square mile area. RCPWAVE is the wave model utilized as input to the

GENESIS shoreline change model to determine the shoreline changes. The results of the GENESIS modeling without project (without dredging and without fill placement) and with project (with dredging and with fill placement) future net longshore transport rates show decreased or stable net transport rate within 3 miles down drift of Cherry Grove. This indicates that the dredged borrow depressions do not adversely impact the down drift shoreline. As an added safety factor, borrow areas did not extend landward of -37 ft. NGVD which is seaward of the "depth of closure" for the majority of storm events.

36. Cultural Resource Avoidance. Buffer zones surrounding significant cultural resources have not been delineated and concordant volume reductions in the borrow areas have not been incorporated. These will be accomplished prior to construction.

37. Geomorphologic Impact Avoidance. Towards gaining an understanding of the geomorphologic processes that we shall minimize impacts to, a literature review of onshore sediment movement on Western Fire Island was performed. A summary of the hypothesis of onshore sediment transport from sand ridges offshore of Fire Island appears below.

    - In 1961 (a and b) Taney proposed onshore sand transport as the source to balance the sediment transport deficit from Moriches Inlet to Fire Island Inlet.
    - In 1972, Duane et al identified sand ridges offshore of Fire Island.
    - In 1975, Kumar and Sanders proposed that west of Watch Hill the island was drowning in place.
    - In 1976, Williams in "Geomorphology of Long Island" identified cretaceous strata on subbottom profiles.
    - In 1977, Williams and Meisberger in "Sand Sources for the Transgressive Barrier Coast of Long Island" propose material migrating onshore from the Continental Shelf.
    - In 1983, Kana suggested relic Fire Island Inlet shoals as the onshore source, though presently exhausted.
    - In 1985, Leatherman proposed that inlet breaching provided the majority of sediment into the bays east of Watch Hill.
    - In 1985, Leatherman and Allen connected frequent inlet breaching east of Watch Hill with landward island migration.
    - In 1989, Leatherman identified historical inlet sites along the barrier island system east of Watch Hill.
    - In 1999, Rosati et al acknowledged the possibility of onshore transport, although no transport to 160,000 cubic meters/year of onshore transport is still within the level of uncertainty of the data making up the balanced sediment budget. In other words, if no transport exists, the budget is balanced, and if 160,000 m3/year of onshore transport occurs, the budget is still balanced to the accuracy of the supporting data.
    - Also in 1999, Schwab et al in "Geological Mapping of the Nearshore Area Offshore Fire Island" propose that the geologic framework influences the shoreline, and describe the side scan sonar, subbottom profiling, and surface sampling performed between 1997 and 1998 for the purpose of mapping the geologic framework. Approximately 6 km offshore of Watch Hill, a large outcrop of Cretaceous strata was proposed, and outside of Watch Hill, the outcrop is proposed to be buried by

Quaternary sediments. And the field of sand waves oriented 30 to 40 degrees with respect to the shoreline were revealed in the data.

- Also in 1999, Foster et al proposed that the thickness of the sand ridges varies from 5 m immediately west of the outcrop, thinning to the west, to less than 1 m offshore of Fire Island Inlet.
- In 2000, Schwab et al in "Seafloor Sediment Distribution off Southern Long Island, New York" concluded that the ridges west of Watch Hill provide sediment to the shoreline west of Watch Hill, contributing to the island stability in that region (as opposed to the drowning-in-place shoreline east of Watch Hill).
- In 2008, Lentz, Hapke and Schwab in "Review of Sediment Budget Estimates at Fire Island National Seashore, New York" propose that removal of sediment from nearshore regions have the potential to alter wave refraction and diffraction patterns, and result in changes in the wave energy reaching the beach.
- In 2008, a two-day technical workshop on offshore sand resources south of Long Island was held at Stony Brook University's School of Marine and Atmospheric Sciences. The workshop was intended to review what is known, or unknown about the volume of offshore sand reserves, the potential for onshore transport, and the character of offshore sand ridges. Workshop attendees included researchers from federal agencies, academia and the private sector as well as federal, state local agency representatives involved in coastal resource management. Bokuniewicz and Tanski summarize the workshop in, "White Paper: Long Island Offshore Sediment Resources". (provided as a sub-appendix). Some of the workshop recommendations include the following:
    - Collection of high-resolution bathymetry of the proposed borrow pits and surrounding areas before and after dredging
    - Collection of periodic bathymetry and sidescan sonar from the 0 m to the 10 m contours
    - Collection of wave, water level, and current data via bottom-mounted instrumentation

    A conclusion of the workshop included the following: adverse impacts on the shoreline can be minimized by project design (such as borrow area size, orientation, and distance offshore).
- In 2013, Schwab et al. in "Geologic Evidence for Onshore Sediment Transport from the Intercontinental Shelf, Fire Island, NY" compare high-resolution mapping (sidescan sonar, seismic profiling and bathymetry) collected in 2011 with that collected in 1996-1997. The conclusion of "outcropping" was changed to "erosion outwash lobe", as the data reveals it is buried by 15 m of Quaternary sediments. The 1996-1997 data was not able to resolve layers less than 50 cm thick. The 2011 data revealed that southeast of the outwash lobe are linear Pleistocene gravely-lag ridges less than 50 cm in height. These ridges extend from the 5m contour offshore 20 km to greater than the 35 m contour, and they vary in height from 6 m at the Watch Hill end to 1m at the Fire Island Inlet end. Net westward transport of fine to medium sand was suggested (as evidenced by low backscatter of the sonar), leaving medium to coarse material in the troughs and on the east-facing flanks (as evidenced by high backscatter). It was proposed that the southwest flanks of the

larger attached ridges have eroded, leaving high scarps, and that these scarps may be migrating landward. Older borrow sites were seen to have filled in, and in some cases the sand ridge systems reformed.

- And more recently, Schwab et al., in "Modification of the Quaternary stratigraphic framework of the inner-continental shelf by Holocene marine transgression: An example offshore of Fire Island, New York", assert more firmly that the morphology of the inner-continental shelf region is the result of ongoing erosion of the Pleistocene glaciofluvial sediments. The outwash lobe is concluded to define a past Fire Island headland, east of which has eroded for the past 8,000 years providing material west of the lobe, in a sand wave formation. And finally that the comparison of the seafloor mapping between 1996-1997 and 2011 indicate that the nearshore sediment zone has received sediment at the expense of deflation of the sand waves.

38. In summary, more data is needed to quantify these processes, and then modeling is needed to more fully understand them. In order to have sufficient fill for Fire Island, it is impossible with the data currently existing to avoid use of the borrow areas on the ridges. However, steps shall be taken to select the lowest impact areas first, and use the lowest impact portions of that borrow area, collecting data before and after use, and repeatedly. This data can be used for quantification analyses and for modeling prior to the future renourishment cycles. The resulting recommended borrow source for western Fire Island is offshore Borrow Area 2C (the deepest borrow area on the sand ridges), and to dredge the deepest portion of the area for the initial operation. Use of Borrow Areas 1A, 2A, 2B, 2D, 2F, 2G, 3A, and 3B will be deferred until future renourishment operations, at which time, a better understanding of the sediment transport processes will have been gained through pre and post dredging monitoring of Borrow Area 2C.

28. **Borrow Area Monitoring.** Borrow areas 2B, 2C, and 2D have been proposed in the region with the largest sediment thicknesses contained in shore face connected sand ridges. USACE is looking at historic infilling between shore face attached sand ridges. The findings of the historic infilling study will be used for adaptive borrow area management to minimize impacts to the shoreline. Adaptive borrow area management practices include, but are not limited to: dredging in shallow lifts, managing the order that the ridge borrow areas are accessed during the project life, allowing further time in between operations of the borrow areas allow for infilling, minimizing the surface area impacted individual borrow areas. USACE welcomes further collaboration on future research from the community of coastal sedimentation scientists.

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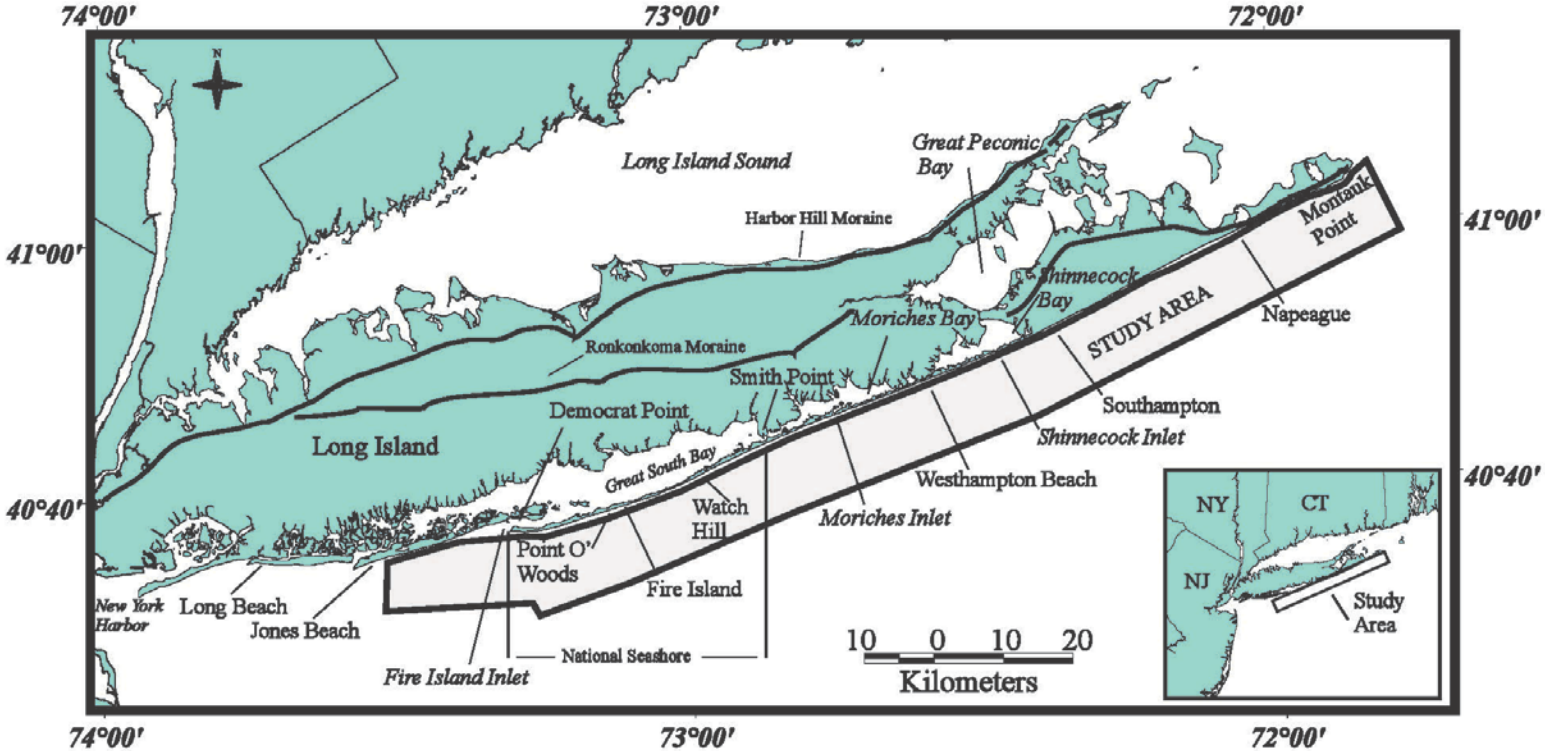


Figure1. Location figure showing the study area and location of late Pleistocene terminal moraines on Long Island, NY.

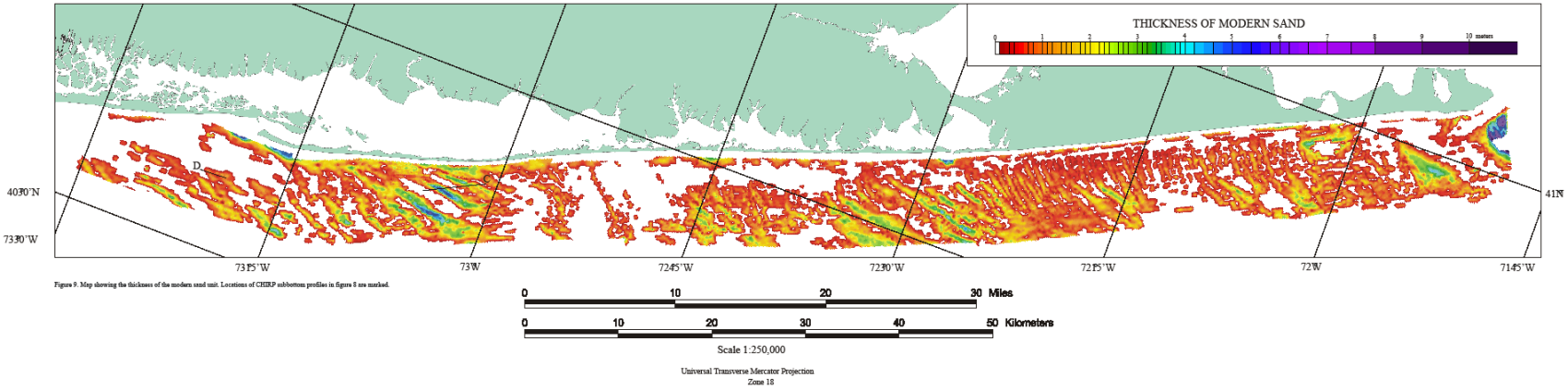
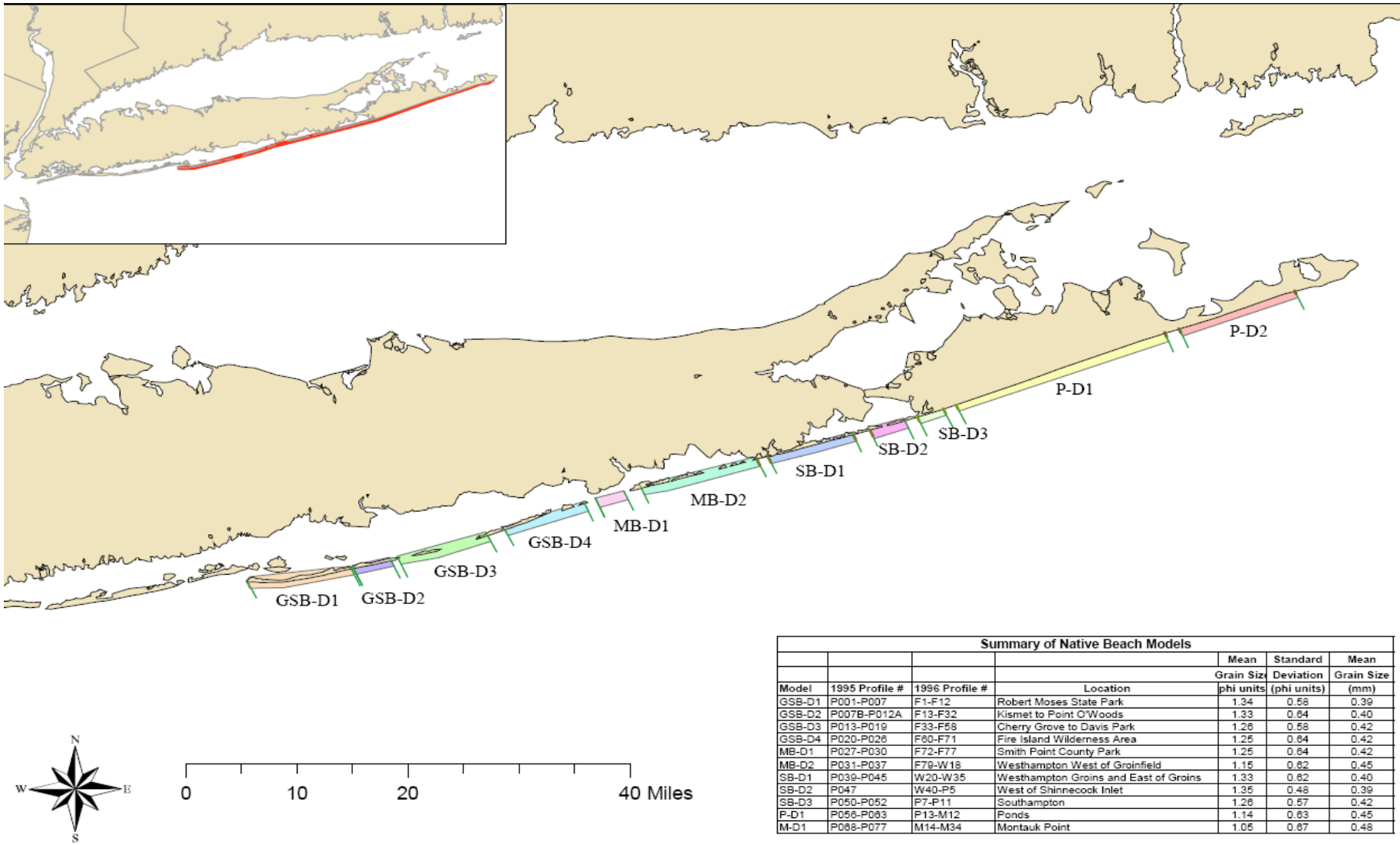


Figure 1

Map of Modern Sediment Thicknesses



Summary of Native Beach Models						
				Mean Grain Size	Standard Deviation	Mean Grain Size
Model	1995 Profile #	1996 Profile #	Location	phi units	(phi units)	(mm)
GSB-D1	P001-P007	F1-F12	Robert Moses State Park	1.34	0.58	0.39
GSB-D2	P007B-P012A	F13-F32	Kismet to Point O'Woods	1.33	0.64	0.40
GSB-D3	P013-P019	F33-F58	Cherry Grove to Davis Park	1.26	0.58	0.42
GSB-D4	P020-P026	F60-F71	Fire Island Wilderness Area	1.25	0.64	0.42
MB-D1	P027-P030	F72-F77	Smith Point County Park	1.25	0.64	0.42
MB-D2	P031-P037	F79-W18	Westhampton West of Groinfield	1.15	0.62	0.45
SB-D1	P039-P045	W20-W35	Westhampton Groins and East of Groins	1.33	0.62	0.40
SB-D2	P047	W40-P5	West of Shinnecock Inlet	1.35	0.48	0.39
SB-D3	P050-P052	P7-P11	Southampton	1.26	0.57	0.42
P-D1	P056-P063	P13-M12	Ponds	1.14	0.63	0.45
M-D1	P068-P077	M14-M34	Montauk Point	1.05	0.67	0.48

Figure 2

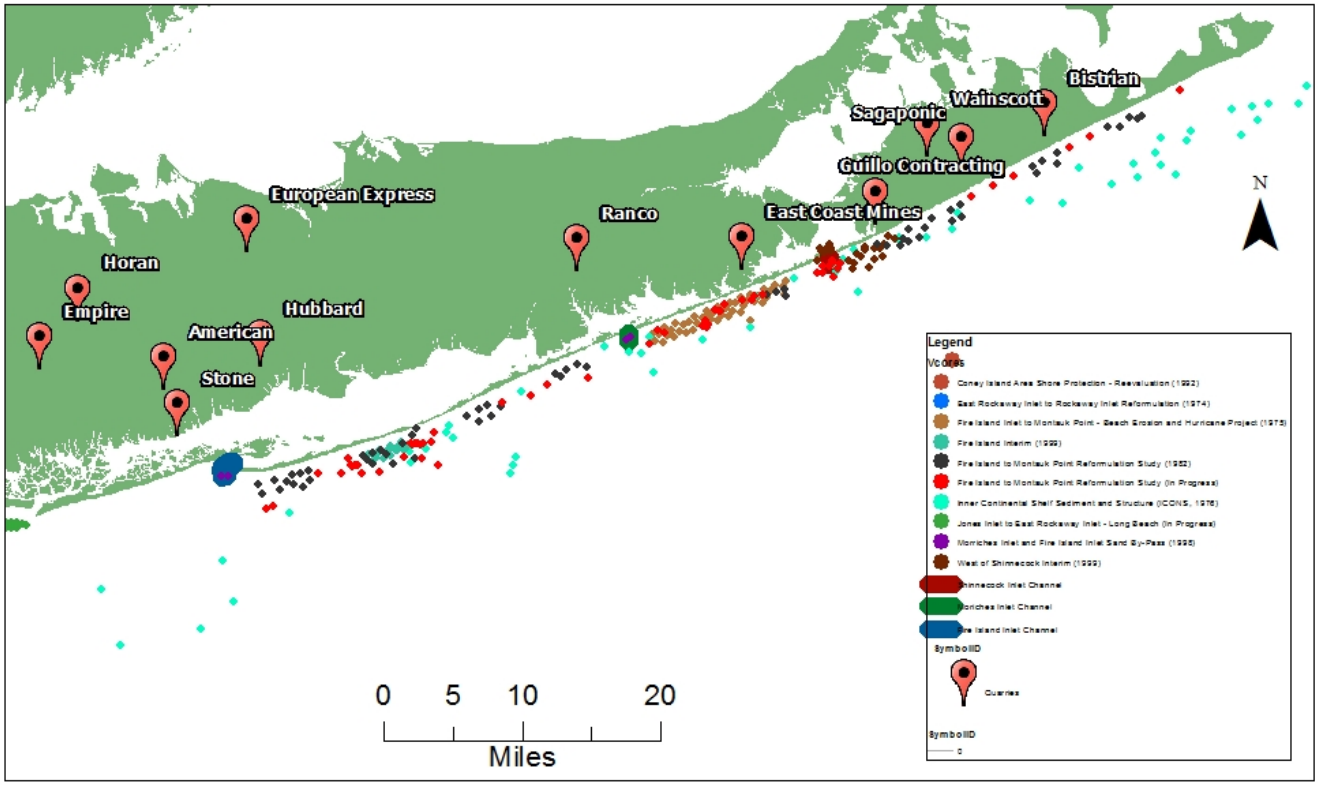

Bistrian
Wainscott
Sagaponic
Guillo Contracting
East Coast Mines
Ranco
European Express
Horan
Empire
Hubbard
American
Stone
N
Legend
0 5 10 20
Miles

Figure 3

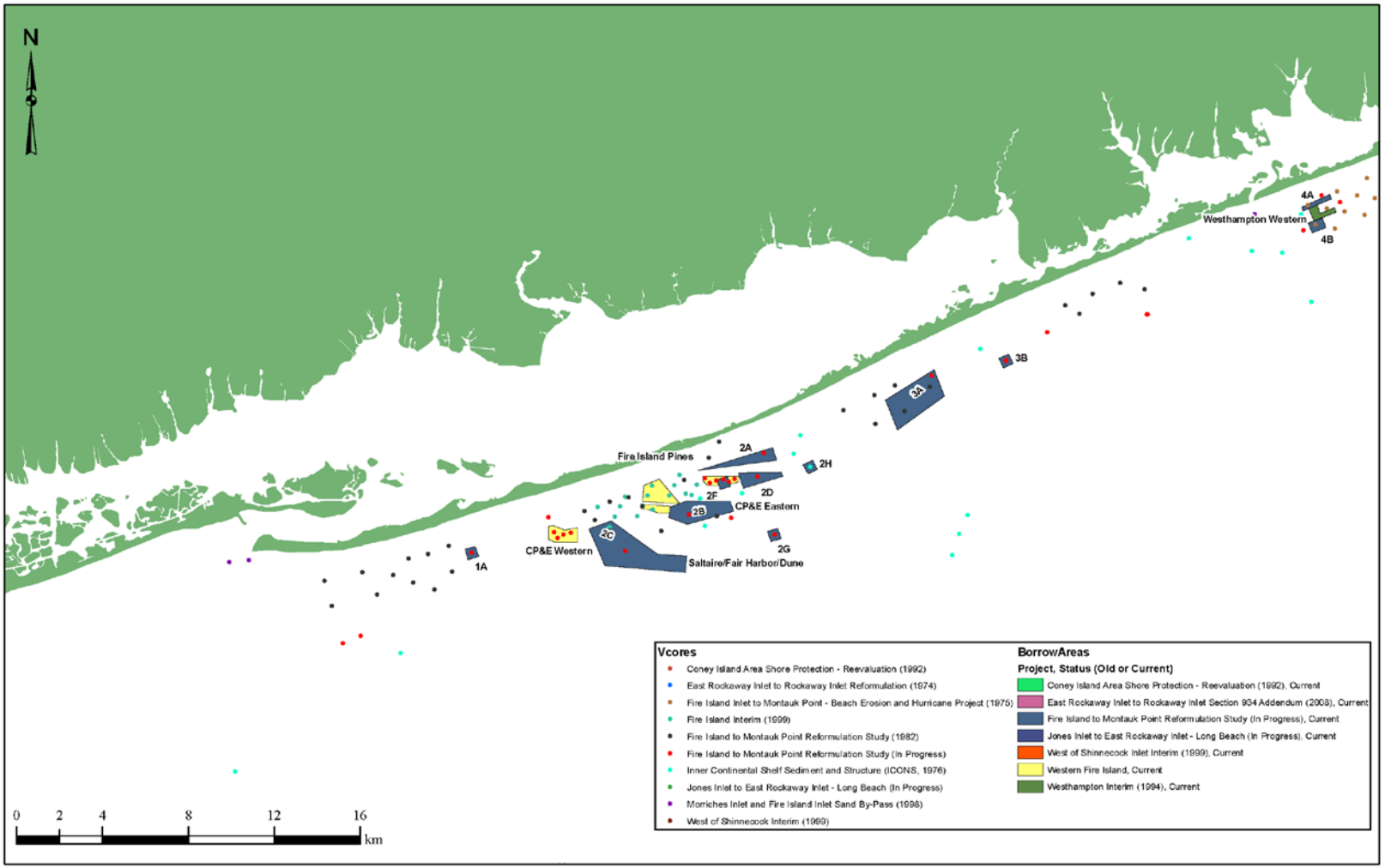


Figure 4 Active Borrow Sites for Fire Island

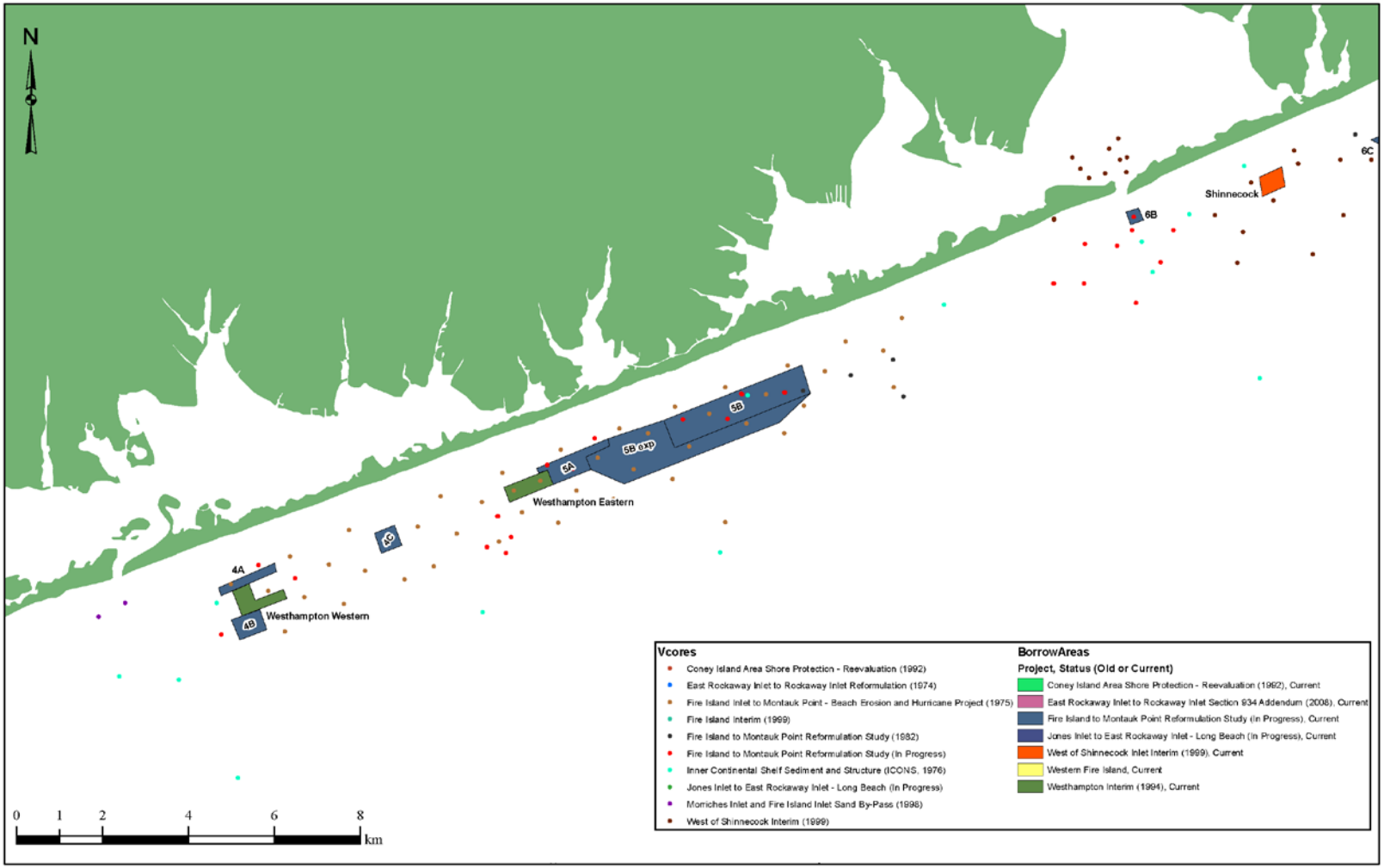


Figure 5: Active Borrow Sites for Westhampton

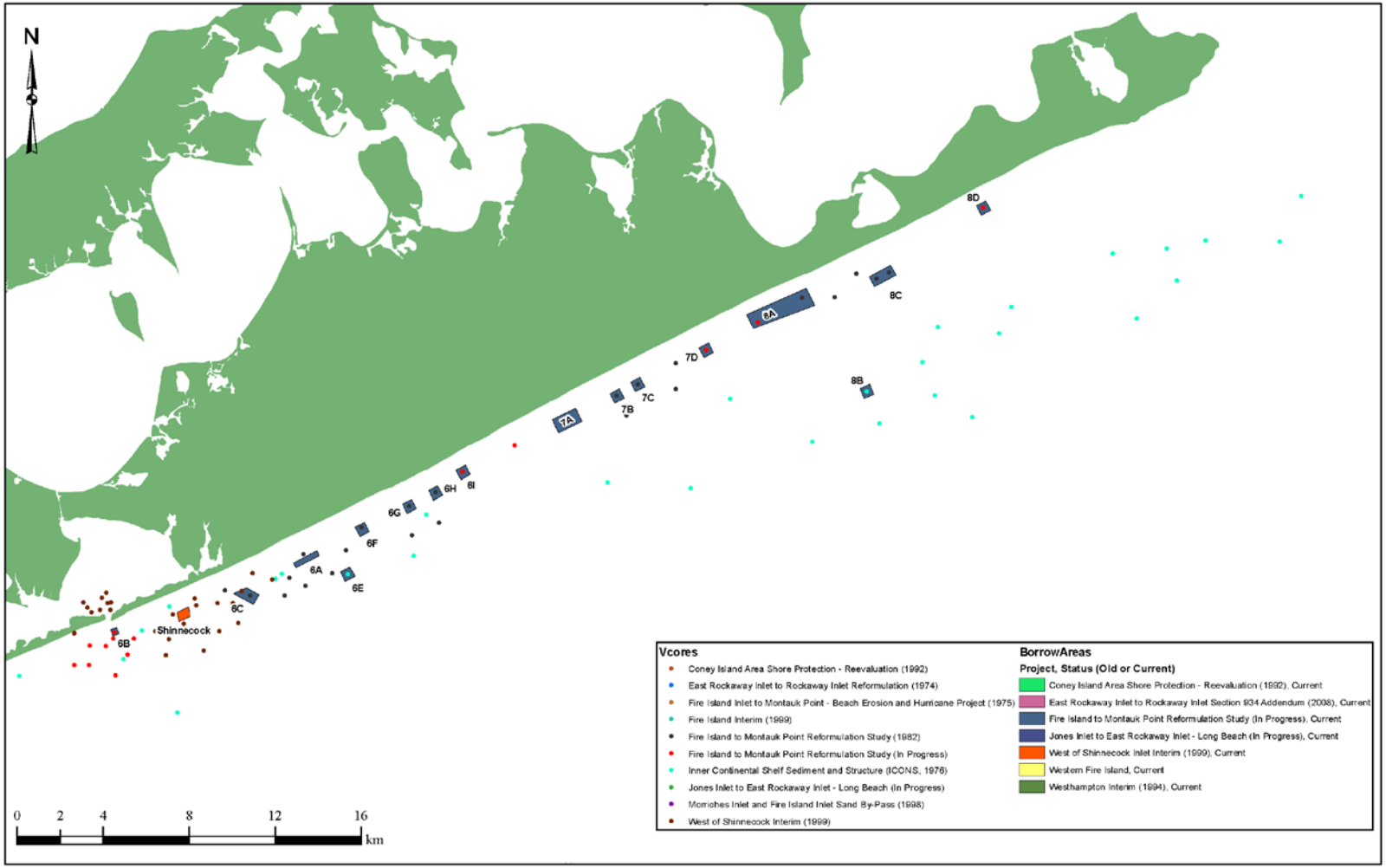


Figure 6: Active Borrow Sites for Montauk

APPENDIX C

LISTS OF WILDLIFE SPECIES KNOWN OR LIKELY TO OCCUR IN STUDY AREA

Table C-1. Invertebrates Species Collected in Marine Offshore Habitats During Trawl Surveys

Scientific Name	Common Name
*Aurelia aurita**	Moon jelly
*Arctica islandica**	Ocean quahog
Asteroidea spp.*	Sea star species
*Callinectes sapidus**	Blue crab
*Cancer borealis**	Jonah crab
*Cancer irroratus**	Rock crab
Caprella spp.*	Skeleton shrimp species
*Crangon septemspinosa**	Sand shrimp
*Cyanea capillata**	Lion's mane
*Echinarachinius parma**	Sand dollar
Ensis directus	Razor clam
Hippolyte spp.*	Grass shrimp species
*Homarus americanus**	Northern lobster
*Ilex illecebrosus**	Short-finned squid
Ilyassoma obsoleta	Eastern mud snail
Isopoda	Isopods
*Libinia emarginata**	Spider crab
*Limulus polyphemus**	Horseshoe crab
Littorina obtusata	Smooth periwinkle
*Loligo pealeii**	Long-finned squid
Lunatia heros	Northern Moon Snail
*Mnemiopsis leidyi**	Comb jelly
Mytilus edulis	Blue mussel
*Ovalipes ocellatus**	Lady crab
Pagurus spp.*	Hermit Crab species
*Paleomonetes vulgaris**	Shore shrimp
*Pandalus borealis**	Boreal red shrimp
*Panopeus herbstii**	Mud crab
Polydora spp.	Mud worm species
Porifera spp.	Yellow sponge species
*Sepioteuthis sepioidea**	Caribbean reef squid
*Spisula solidissima**	Surf clam
*Squilla empusa**	Mantis shrimp

* FIMP Conceptual Model indicator invertebrate species for marine offshore habitat
Source: USACE 2008a

Table C-2. Historic Domestic Commercial, Recreational, and Foreign Finfish Species for Landings in the North and Middle Atlantic Regions, Including the New York Bight

Scientific Name	Common Name
Acipenser oxyrhynchrus oxyrhynchrus	Atlantic sturgeon
*Alosa aestivalis**	Blueback herring
Alosa mediocris	Hickory shad
*Alosa pseudoharengus**	Alewife
*Alosa sapidissima**	American shad
Aluterus schoepfii	Orange filefish
*Ammodytes americanus**	American sandlace
Anchoa hepsetus	Striped anchovy
Anchoa mitchilli	Bay anchovy
Anguilla rostrata	American eel
Apeltes quadracus	Fourspine stickleback
Balistes capriscus	Gray triggerfish
Brevoortia tyrannus	Atlantic menhaden
Carangidae sp.	Scad species
Centropristis striata	Black sea bass
Citharichthys arctifrons	Gulf stream flounder
*Clupea harengus harengus**	Atlantic herring
Clupeidae sp.*	Herring species
Conger oceanicus	Conger eel
Cottidae sp.	Sculpin
Cynoscion regalis	Common weakfish
Dasyatis centroura	Roughtail stingray
*Decapterus punctatus**	Round scad
Enchelyopus cimbrius	Fourbeard rockling
Epinephelus niveatus	Snowy grouper
Etropus microstomus	Smallmouth flounder
Etrumeus teres	Round herring
Fistularia petimba	Red cornetfish
Fistularia tabacaria	Bluespotted cornetfish
Gadidae sp.*	Hake species
Gadus morhua	Atlantic cod
Gasterosteus aculeatus aculeatus	Threespine stickleback
Gobiidae sp.	Gobiidae species
Hemitripeterus americanus	Sea raven
Heteropriacanthus cruentatus	Glasseye snapper
Hippocampus erectus	Lined seahores
Hippoglossina oblonga	American fourspot flounder
Icelus bicornis	Twohorn sculpin
Leiostomus xanthurus	Spot croaker
Lepidopus caudatus	Ribbonfish

Scientific Name	Common Name
*Leucoraja erinacea**	Little skate
*Leucoraja ocellata**	Winter skate
Limanda ferruginea	Yellowtail flounder
Liparis inquilinus	Inquiline snailfish
Liparis sp.	Seasnail species
*Lophius americanus**	Goosefish
Lopholatilus chamaeleonticeps	Golden tilefish
Melanogrammus aeglefinus	Haddock
Menidia menidia	Atlantic silverside
Menticirrhus saxatilis	Northern kingfish
*Merluccius bilinearis**	Silver hake
Micropogonias undulatus	Atlantic croaker
Morone americana	White perch
*Morone saxatilis**	Striped bass
Mullus auratus	Red goatfish
Mustelus canis	Smooth dogfish
Myoxocephalus aenaeus	Grubby sculpin
Ophidion marginatum	Striped cusk-eel
Opsanus tau	Oyster toadfish
Ostracion cubicus	Yellow boxfish
*Paralichthys dentatus**	Summer flounder
*Peprilus triacanthus**	Atlantic butterfish
Petromyzon marinus	Sea lamprey
Pholis gunnellus	Rock gunnel
Pollachius virens	Pollock
*Pomatomus saltatrix**	Bluefish
Prionotus carolinus	Northern searobin
Prionotus evolans	Striped searobin
Pristigenys alta	Short bigeye
*Pseudopleuronectes americanus**	Winter flounder
*Raja eglanteria**	Clearnose skate
Sarda sarda	Atlantic bonito
*Scomber scombrus**	Atlantic mackerel
*Scophthalmus aquosus**	Windowpane
Selar crymenophythalmus	Bigeye scad
Selene setapinnis	Atlantic moonfish
Selene vomer	Lookdown
Serranida sp.	Grouper
Sphoeroides maculatus	Northern puffer
Sphyraena borealis	Northern sennet
Squalus acanthias	Spiny dogfish
*Stenotomus chrysops**	Scup
Stephanolepis setifer	Pygmy filefish
Symphurus plagiusa	Blackcheek tonguefish

Scientific Name	Common Name
Syngnathus fuscus	Northern pipefish
Synodus foetens	Inshore lizardfish
*Tautoga onitis**	Tautog
Tautogolabrus adspersus	Cunner
Thunnus thynnus	Atlantic bluefin tuna
Torpedo nobiliana	Atlantic torpedo
*Tracharus lathami**	Rough scad
Trachipteridae sp.	Ribbonfish species
Triglopsis quadricornis	Fourhorn sculpin
Upeneus parvus	Dwarf goatfish
*Urophycis chuss**	Red hake
*Urophycis regia**	Spotted hake
*Urophycis tenuis**	White hake
Xiphias gladius	Swordfish
Zoarces americanus	Ocean pout

* FIMP Conceptual Model indicator finfish species for marine offshore habitat
Source: NOAA 1977 and USACE 2008a

Table C-3. Avian Use of Marine Beach and Dunes and Swales Habitats

Common Name	Scientific Name	Primary Use
Black-bellied Plover	*Pluvialis squatarola*	Foraging during winter and migration
American Golden Plover[1]	*Pluvialis dominica*	Foraging during migration
Semipalmated Plover	*Charadrius semipalmatus*	Foraging during migration
Piping Plover	*Charadrius melodus*	Foraging, breeding, nesting in summer
Killdeer	*Charadrius vociferus*	Foraging, breeding, nesting in summer
American Oystercatcher	*Haematopus palliatus*	Foraging, breeding, nesting in summer
Greater Yellowlegs	*Tringa melanoleuca*	Foraging during winter and migration
Lesser Yellowlegs	*Tringa flavipes*	Foraging during migration
Solitary Sandpiper	*Tringa solitaria*	Foraging during migration
Spotted Sandpiper	*Actitis macularia*	Foraging in summer
Willet	*Catoptrophorus semipalmatus*	Foraging in summer
Whimbrel	*Nemenius phaeopus*	Foraging during migration
Ruddy Turnstone	*Arenaria interpres*	Foraging during winter and migration
Red Knot	*Calidris canutus*	Foraging during winter and migration
Hudsonian Godwit[1]	*Limosa haemastica*	Foraging during migration
Marbled Godwit[1]	*Limosa fedoa*	Foraging during migration
Sanderling	*Calidris alba*	Foraging during winter and migration
Semipalmated Sandpiper	*Calidris pusilla*	Foraging during migration
Western Sandpiper	*Calidris mauri*	Foraging during migration
Least Sandpiper	*Calidris minutilla*	Foraging during migration
White-rumped Sandpiper[1]	*Calidris fuscicollis*	Foraging during migration
Pectoral Sandpiper[1]	*Calidris melanotos*	Foraging during migration
Purple Sandpiper[1]	*Calidris maritima*	Foraging during winter and migration
Dunlin	*Calidris alpina*	Foraging during winter and migration
Stilt Sandpiper[1]	*Micropalama himantopus*	Foraging during migration
Short-billed Dowitcher [1]	*Limnodromus griseus*	Foraging during migration
Long-billed Dowitcher[1]	*Limnodromus scolopaceus*	Winter foraging (rare occurrence)
Long-billed Curlew	*Nemenius americanus*	Winter foraging (rare occurrence)
Laughing Gull[1]	*Larus atricilla*	Summer foraging
Herring Gull	*Larus argentatus*	Year round foraging
Iceland Gull[1]	*Larus glaucoides*	Winter foraging (rare occurrence)

Common Name	Scientific Name	Primary Use
Lesser Black-backed Gull[1]	*Larus fuscus*	Winter foraging (rare occurrence)
Glaucous Gull[1]	*Larus hyperboreus*	Winter foraging (rare occurrence)
Great Black-backed Gull	*Larus marinus*	Year round foraging
Caspian Tern[1]	*Sterna caspia*	Foraging during migration
Royal Tern[1]	*Sterna maxima*	Foraging, breeding, nesting
Roseate Tern	*Sterna dougallii*	Foraging, breeding, nesting
Common Tern	*Sterna hirundo*	Foraging, breeding, nesting
Forster's Tern	*Sterna forsteri*	Foraging, breeding, nesting
Least Tern	*Sterna albifrons*	Foraging, breeding, nesting
Black Skimmer	*Rynchops niger*	Foraging, breeding, nesting
Black-legged Kittiwake[1]	*Rissa tridactyla*	Winter foraging (rare occurrence)
Ring-billed Gull	*Larus delawarensis*	Foraging during winter and migration
Black-headed Gull[1]	*Larus ridibundus*	Winter foraging (rare occurrence)
Bonaparte's Gull	*Larus philadelphia*	Foraging during winter and migration
Little Gull[1]	*Larus minutus*	Foraging during winter and migration
Horned Lark	*Eremophila alpestris*	Foraging, breeding, nesting

[1] Species is likely to depend on beach/dune communities on Fire Island, but not documented during USACE avian surveys (USACE 2003a).

Table C-4. Primary Habitat Associations of Common Mammal Species In Study Area

Species	Common Name	Marine Beach	Dunes and Swales	Terrestrial/ Mainland Uplands	Bayside Beach	Salt Marsh
Didelphis marsupialis	Opossum		X	X		X
Mus musculus	House mouse	X	X	X	X	X
Microtus pennsylvanicus	Meadow vole		X			**X**
Microtus pinetorum	Woodland vole			X		
Myotis lucifugus	Little brown bat		X	X	X	X
Odocoileus virginianus	White-tailed deer		X	X	X	
Ondatra zibethica	Muskrat		X	X		**X**
Peromyscus leucopus	White-footed mouse	X	X	X	X	X
Procyon lotor	Raccoon		X	X		X
Rattus norvegicus	Norway rat		X	X		
Sciurus carolinensis	Gray squirrel			X		
Sorex cinereus	Masked shrew	X	**X**		X	**X**
Sylvilagus floridanus	Cottontail rabbit		X	X		X
Vulpes fulva	Red fox	X	X	X	X	X

X bold/underlined indicates strong association between species and geomorphological feature.
Sources: Connor 1971, USACE 2004d

Table C-5. Habitat Associations of Herpetile Species of Fire Island

		Barrier Island Communities			
Scientific Name	Common Name	Marine Beach	Dunes and Swales	Terrestrial Upland	Bayside Beach
Bufo woodhousei	Fowlers toad		X	X	X
Chelydra serpentina	Common snapping turtle		X	X	
Chrysemys picta	Red-eared slider		X	X	
Chrysemys picta picta	Eastern painted turtle		X	X	
Clemmys guttata[2]	Spotted turtle[2]			X	
Coluber constrictor	Northern black racer		X	X	
Heterodon platyrhinos[2]	Eastern hog-nosed snake[2]	X	X	X	
Kinosternon subrubrum[1]	Mud turtle[1]			X	
Malaclemys terrapin	Diamondback terrapin	X	X	X	X
Pseudocris crucifer	Spring peeper			X	
Rana catesbeiana	Bullfrog			X	
Rana clamitans melanota	Green frog			X	
Scaphiopus holbrookii[2]	Spadefoot toad[2]		X	X	
Terrapene carolina[2]	Box turtle[2]		X	X	
Thamnophis sirtalis	Garter snake		X	X	

[1]Federal or state-listed threatened or endangered species, or species with special protection status
[2]Federal or state-listed species of Special Concern

Table C-6. Invertebrates Collected By Beach Seine within the Backbay Habitats of the Study Area

Scientific Name	Common Name
*Argopecten irradians**	Bay scallop
*Asterias forbesi**	Sea star
*Aurelia aurita**	Moon jelly
*Callinectes sapidus**	Blue crab
*Cancer irroratus**	Rock crab
*Carcinus maenas**	Green crab
*Crangon septemspinosa**	Sevenspine bay shrimp
Crepidula fornicata	Atlantic slipper snail
*Cyanea capillata**	Lion's mane jellyfish
*Dyspanopeus sayi**	Say mud crab
*Hippolyte pleurocantha**	Hippolyte shrimp
*Ilyassoma obsoleta**	Eastern mud snail
*Libinia emarginata**	Spider crab
*Limulus polyphemus**	Horseshoe crab
Loligo pealeii	Long-finned squid
*Mercenaria mercenaria **	Hardshell clam
Microciona prolifera	Red beard sponge
*Mnemiopsis leidyi**	Comb jelly
*Mytilus edulis**	Blue mussel
Nereis succinea	Clam worm
*Ovalipes ocellatus**	Lady crab
*Pagurus pollicaris**	Hermit crab
*Palaemonetes vulgaris**	Marsh grass shrimp
*Panopeus herbstii**	Mud crab
Polychaete spp.*	Polychaete species
Porifera	Gold sponge species
Porifera	Orange sponge species
Porifera	Other sponge species
Tunicata	Tunicate
*Uca minax**	Fiddler crab

* Indicator invertebrate species for SAV habitat
Source: USACE 2006d

Table C-7. Finfish Collected By Beach Seine Within the Backbay Habitats of the Study Area

Scientific Name	Common Name
Acanthurus chirurgis	Doctorfish
*Alosa aestivalis**	Blueback herring
*Alosa pseudoharengus**	Alewife
Anchoa mitchilli	Bay anchovy
*Anguilla rostrata**	American eel
*Apeltes quadracus**	Fourspine stickleback
Balistidae	Triggerfish species
Brevoortia tyrannus	Atlantic menhaden
Caranx hippos	Crevalle jack
Chaetodon capistratus	Foureye butterflyfish
Chaetodon ocellatus	Spotfin butterflyfish
Chaetodon sedentarius	Reef butterflyfish
Chilomycterus schoepfi	Striped burrfish
Clupeidae spp.*	Herring species
*Cynoscion regalis**	Weakfish
Cyprinodon variegatus	Sheepshead minnow
Enchelyopus cimbrius	Fourbeard rockling
Epinephelus flavolimbatus	Yellowedge grouper
Epinephelus nigritus	Warsaw grouper
Etropus microstomus	Smallmouth flounder
Fistularia tabacaria	Bluespotted cornetfish
*Fundulus heteroclitus**	Mummichog
*Fundulus majalis**	Striped killifish
*Gasterosteus aculeatus aculeatus**	Threespine stickleback
Gobiosoma bosc	Naked goby
Hippocampus erectus	Lined seahorse
Lactophrys quadricornis	Scrawled cowfish
Leiostomus xanthurus	Spot croaker
*Menidia menidia**	Atlantic silverside
Menticirrhus saxatilis	Northern kingfish
Microgadus tomcod	Atlantic tomcod
Micropogonias undulatus	Atlantic croaker
Monacanthus hispidus	Planehead filefish
*Morone saxatilis**	Striped bass
Mugil cephalus	Striped mullet
Mullidae	Goatfish species
Mullus auratus	Red goatfish
Mycteroperca microlepis	Gag
Myoxocephalus aenaeus	Grubby sculpin
Opsanus tau	Oyster toadfish
Ostraciidae	Boxfish/cowfish species

Scientific Name	Common Name
Paralichthys dentatus	Summer flounder
Pholis gunnellus	Rock gunnel
Pollachius virens	Pollock
Prionotus evolans	Striped searobin
Prionotus carolinus	Northern searobin
*Pseudopleuronectes americanus**	Winter flounder
Pterois volitans	Lionfish
Selene vomer	Lookdown
Serranidae	Grouper species
*Sphoeroides maculatus**	Northern puffer
Sphoeroides spengleri	Bandtail puffer
Sphyraena borealis	Northern sennet
Stenotomus chrysops	Scup
Strongylura marina	Atlantic needlefish
*Syngnathus fuscus**	Northern pipefish
*Tautoga onitis**	Blackfish
*Tautogolabrus adspersus**	Cunner
Upeneus parvus	Dwarf goatfish
Urophycis chuss	Red hake
Urophycis regia	Spotted hake

* Indicator finfish species for SAV habitat
Source: USACE 2004c and USACE 2006d

APPENDIX D

ESSENTIAL FISH HABITAT

D.1 INTRODUCTION

D.1.1 Fire Island Inlet to Montauk Point EIS (Project)

This Project evaluates the reasonable alternatives that would help define a long-term solution to the risk imposed by coastal storms and their associated damage to human life and property, while maintaining, enhancing, and restoring the ecosystem integrity of coastal biodiversity. The key components to the proposed action are: Beach Restoration (Beach and Dune Fill), Sediment Management (including Inlet Modification), Groins (including Groin Modification), Breach Response Plan (BRP), Coastal Process Features, Non-Structural Methods, and Adaptive Management. This report presents the Essential Fish Habitat (EFH) assessment for the FIMP Tentative Selected (TSP). The FIMP study area is described in Section D.2.1.

D.1.2 Essential Fish Habitat Assessment Background

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MFCMA), an EFH assessment must be completed which identifies potential impacts to fishery resources and habitat that resulting from activities proposed for the Fire Island Stabilization Project. The MFCMA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104- 267), requires that regional fishery management councils and other federal agencies identify and protect important marine and anadromous fish habitat. Federal agencies that fund, permit, or carry out activities that may adversely impact EFH are required to consult with National Marine Fisheries Service (NMFS) regarding the potential effects of their actions on EFH. According to USDOC (1999a), the contents of an EFH assessment should include:

- A description of the proposed action;
- Analysis of the effects of the proposed action on EFH, the managed fish species, and major prey species;
- The Federal agency's views regarding the effects of the action on EFH; and,
- Proposed mitigation, if applicable.

This EFH assessment includes:

- A description of the proposed activity.
- A description of the existing project area environment.
- A listing of EFH-designated species for the project area.
- Information relating to the habitat suitability and relative abundance of EFH-designated species and life history stages in the project area.
- A summary of the diets of EFH species (i.e., prey species) in the project area.
- A summary of available survey data for benthic prey species in the vicinity of the project area.
- An analysis of the potential impacts of project activities on EFH-designated species and species of special interest in the project area.
- An analysis of the direct, indirect, and synergistic impacts as a result of the activities in the project area.

D.2 PROJECT DESCRIPTION

D.2.1 Project Study Area

D.2.1.1 *Fire Island Inlet to Montauk Point Study Area*

The Study Area extends from Fire Island Inlet east to Montauk Point along the Atlantic Coast of Suffolk County, Long Island, New York (Figure D-1). The majority of Fire Island lies within the legislative boundaries of the Fire Island National Seashore (FIIS). The study area includes the barrier island chain from Fire Island Inlet to Southampton inclusive of the Atlantic Ocean shorelines, and adjacent back-bay areas along Great South, Moriches, and Shinnecock Bays. The study area continues to the east including the Atlantic Ocean shoreline along the mainland of Long Island extending from Southampton to Montauk Point. This area includes the entire Atlantic Coast of Suffolk County covering a shoreline length of approximately 83 miles. The study area also includes over 200 additional miles of shoreline within the estuary system. The study area includes areas on the mainland that are vulnerable to flooding, which generally extend as far landward as Montauk Highway, for an approximate area of 126 square miles.

This Study Area represents a complex mosaic of ocean fronting shorelines, barrier islands, tidal inlets, estuaries, and back bay mainland area. The study area functions as an interconnected system driven by large scale processes with respect to hydrodynamic and sediment exchange, supporting diverse biological and natural resources. Within the study area, ocean shoreline sand generally moves east to west alongshore, in response to waves, and currents during normal conditions and during storms. This alongshore movement of sand maintains the prevailing shoreline conditions. In addition to alongshore movement, sediment is also exchanged in the cross-shore direction, through erosion and accretion of the beach and dune, exchange of sand through tidal inlets, and during large storm events through the episodic transport of sand over the island through overwash or breaching.

Public lands throughout the Barrier Island Segment provide areas where natural resources are protected to the greatest extent possible. The Nation Park Service (NPS) managed FIIS is located along the Atlantic Ocean on the Fire Island barrier island, Great South Bay, and Moriches Bay shoreline. The NPS seeks, as part of its Mission Statement for FIIS, to preserve natural processes and protect ecological resources.

Along the barrier islands storm damages to developed areas are due to wave attack, erosion of the beach and dune, and tidal flooding of infrastructure on the barrier island that occurs when the beach and dune elevations are exceeded due to hurricanes and nor'easters. There is a long history of building destruction during storms. But in addition to storms impacting infrastructure on the barrier island, the barrier island itself is also vulnerable to storms which can erode the beach and dune system and create breaches (new inlets) of the barrier island. When a breach occurs, it impacts both the barrier island and back bay system not only during the storm, but for an extended period after the storm. When a breach opens, it tends to be relatively small, but if not closed quickly, will grow rapidly over time. As these breaches grow they also may migrate (move along the island) and can destroy buildings and other infrastructure on the barrier island. Breaches also impact the hydraulic stability of the existing inlets, which can result in increased sediment deposition in the

inlet channels, and compromised navigability of the inlet. Of greatest impact however, is the hydrodynamic impact on the back bay. When a breach occurs, it increases flooding in the back bay environment due to water levels and storm activity, and this effect continues to increase as the breach grows.

Figure D-1. FIMP Study Area

D.2.2 Proposed Action

The key components to the proposed action are: Beach Restoration (Beach and Dune Fill), Sediment Management (including Inlet Modification), Groins (including Groin Modification), Breach Response Plan (BRP), Coastal Process Features, Non-Structural Methods, and Adaptive Management.

D.2.2.1 *Problem Identification*

The problems along the shorefront include storm damages due to erosion, wave attack, and flooding. Along the barrier island there is also the threat of barrier island overwash and breaching. Along the back bay, there is the threat of tidal flooding during no-breach conditions. Tidal flooding becomes worse when there is a breach of the barrier island, which allows for more storm surge from the ocean. These problems have occurred repeatedly in the past, resulting in damages to the built environment.

The principal problems are associated with extreme tides and waves that can cause extensive flooding and erosion both within barrier island and mainland communities. Breaching and/or inundation of the barrier islands also can lead to increased flood damages, especially along the mainland communities bordering Shinnecock, Moriches and Great South Bays. The following general conclusions can be made:

1. The greatest potential damages in the study area are along the mainland floodplain;
2. Among the mainland floodplain areas, Great South Bay is the most vulnerable to storm damages;
3. Along the mainland floodplain areas, specific measures need to be considered to address localized flooding;
4. The barrier island provides a high degree of protection to the mainland, which can be compromised by a breach. Specific measures need to be considered to address maintaining a stable barrier island;
5. Along the shorefront area, the area of greatest threat to storm damages under current conditions is Fire Island;
6. Along the shorefront, the potential for damages increases dramatically in all areas in the future;
7. It is clear from past degradation that storm damage reduction measures and coastal process features must be evaluated in conjunction to reestablish system functioning;
8. It is clear that reestablishment of longshore transport should be given priority, as feature over all other processes is contingent upon a balanced sediment transport system.

D.2.2.2 *Project Authorization*

The Fire Island Inlet to Montauk Point, New York, Combined Beach Erosion Control and Hurricane Coastal Strom Risk Management Project was originally authorized by the River and Harbor Act of 14 July 1960, and subsequently modified in accordance with Section 103 of the River and Harbor Act of 12 October 1962, Section 31 of the Water Resources Development Act (WRDA) of 1974, and Sections 103, 502, and 934 of the WRDA of 1986 (P.L. 99-662). This report is being prepared in response to Public Law (PL) 113-2 of January 29, 2013, Disaster Relief Appropriations.

D.2.2.3 *Preferred Alternative (Tentatively Selected Plan)*

Recent storm events, such as Hurricane Sandy and Hurricane Irene, have the left the dune and berm system along the south shore of Fire Island vulnerable, increasing the potential for overwash and breaching during future storm events. The proposed action has been developed to reinforce the existing dune and berm system along the island.

The key components to the proposed action are: Beach Restoration (Beach and Dune Fill), Sediment Management (including Inlet Modification), Groins (including Groin Modification), Breach Response Plan (BRP), Coastal Process Features, Non-Structural Methods, and Adaptive Management. A brief discussion of these key components follows.

Inlets: Fire Island, Moriches, Shinnecock

At Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet, the TSP would authorize the continuation of current management along with ebb shoal dredging, outside the navigational channel, with downdrift placement. The deposition basin is a dredged area designed to capture sediment so that shoaling in navigable regions (e.g., the channel) would be minimized. Placement of a +13 foot dune and berm would occur in identified placement areas, as needed.

- Provides for sufficient sand bypassing across the three (3) inlets to ensure the natural longshore transport along the barrier islands.
- Continues the scheduled O&M dredging of the navigation channels at Fire Island, Moriches and Shinnecock Inlets, along with additional dredging of 73,000 to 379,000 cy from the ebb shoals of each inlet, outside of navigation channel, to obtain the required volume of sand needed for the by-passing.
- Bypassed sand is used to construct and maintain a +13 ft. NGVD dune and 90 ft. berm width in identified placement areas

Provides for monitoring to facilitate adaptive management changes in the future.

Mainland Non-Structural

The mainland non-structural plan consists of non-structural building retrofits, flood proofing, relocation, acquisition of approximately 4,400 structures (consisting of approximately 44 in Shinnecock Bay, 857 in Moriches Bay, and 3,110 in Great South Bay), and road raising in four locations totaling 5.91 miles in length, which will reduce flooding to 1,020 houses. The non-structural plan involves a 100-year level of protection for all structures inside the 10-year floodplain. Building retrofit measures are proposed, and could include limited relocation or buyouts based upon structure type and condition. The proposed TSP provides protection to each building identified as having a ground elevation below the baseline condition 10-year flood elevation. For each building identified for protection, the design flood elevation is the baseline condition 100-year flood elevation plus one foot of freeboard.

Barrier Islands

A variety of measures are proposed for the barrier islands, as described below.

Beach Restoration (Beach and Dune Fill, Berms, and/or Sand Bypassing). The TSP would include a nearly continuous beach and dune fill area along the developed shorefront areas that front Great South Bay and Moriches Bay. The minimum real estate impact baseline is proposed as the layout of TSP beachfill plan. This beach fill alignment closely follows the "natural" dune alignment and includes a realignment of the dune farther seaward in areas where multiple structures would need to be relocated or acquired in a more landward alignment. These areas include most of the developed communities in Fire Island with the exception of Cherry Grove and Water Island. Beachfill, berms, and sand bypassing are proposed as follows:

Fire Island at Developed Locations:
- +15 foot dune with berm, with post-Sandy optimized alignment;

Fire Island at Undeveloped Locations:
- @ Lighthouse (+13 foot dune and berm);
- @ Smith Point County Park East - sand bypassing;
- @ Smith Point County Park West – short-term beachfill in western, developed section;

Westhampton:

- Beachfill (+l5 foot dune with berm) fronting Moriches Bay.

Not all design subreaches are appropriate for beach fill. In areas where there is either an insignificant risk of breaching, no oceanfront structures, or relatively few structures, and/or lack of public access, beach fill was not considered. Subreaches where beach fill was not considered include Sailors Haven, Wilderness Area- West, Great Gun, Hampton Beach; and most of the shoreline between Shinnecock Inlet and Montauk Beach. The total initial fill for the TSP would be approximately 6.44 million cubic yards (see Table D-1). A 30-year commitment of Federal and non-Federal renourishment is proposed, which recognizes the potential for variable beach conditions between renourishment cycles. After 30 years, the Federal and non-Federal commitment would transition to a breach response plan for the remainder of the 50 years.

Table D-1. TSP Fill Volumes

Location	Plan	Volume (cubic yards)
Fire Island Inlet	Inlet Management	2,341,000
Moriches and Shinnecock Inlets	Inlet Management	1,061,000
Tiana Beach Area	Proactive BCP	1,326,000
Potato Road and Montauk	Sediment Management	240,000
Westhampton	Beachfill	923,000
Fire Island	Beachfill	549,000
Total		**6,440,000**

Breach Response Plan (BRP). The BRP recommends the Conditional BRP (consisting of a +9.5 foot berm only) in undeveloped areas of Fire Island. For areas along Shinnecock Bay, a Proactive and Reactive BRP (consisting of a +13 foot berm, with dune) is proposed. This plan includes restoring the template to the design condition when the shoreline is degraded to an effective width of 50 feet. This plan is created for areas where a breach is imminent.

- Proactive Breach Response is a plan where action is triggered when the breach and dune are lowered below a 25 year design level of risk reduction, and provides for restoration to the design condition (+13 ft. NGVD dune and 90 ft. berm). This plan is included on Fire Island in vicinity of the FIIS Lighthouse Tract, and in Smith Point County Park (to supplement when needed the sand bypassing), and Smith Point County Park West and also along the barrier island fronting Shinnecock Bay.

- Reactive Breach Response - is a plan where action is triggered when a breach has occurred, e.g. the condition where there is an exchange of ocean and bay water during normal tidal conditions. It will be utilized as needed when a breach occurs.

- Conditional Breach Response – is a plan that applies to the large, federally-owned tracts within Fire Island National Seashore, where the breach response team determines whether a breach should be closed. Conditional Breach closure provides for a 90 ft wide berm at elevation 9.5 ft. NGVD only.

Groin Modification Plan. Groin modification within the TSP would result in the tapering of the existing Westhampton groins and existing Ocean Beach groins, and the shortening of groins 1 through 13 in Westhampton, where 15 groins currently exist. Groins 1-8 would be shortened to 380 feet. Groins 9-13 would be shortened to 386 feet, 392 feet, 398 feet, 402 feet, and 410 feet, respectively. The shortening of 13 groins varying between 70-100 feet could release up to 2 million cubic yards of sand to be transported to the west. Therefore, this proactive plan could reduce the renourishment requirements for the shoreline downdrift of the groins.

Sediment Management Plans (including Inlet Modification Plan). Two high damaged areas, Downtown Montauk and Potato Road, were identified for a sediment management plan over a conventional beach nourishment project due to the lack of economic viability. This sediment management alternative will maintain the current coastal storm risk management and reduce conditions from getting worse by adding fill at each location every four years for 30 years. The material would be placed as advance fill on the seaward side of the berm which would serve as feeder beaches for locations farther to the west. The TSP recommended plan for inlet management includes the continuation of the authorized project at each inlet with increased sediment bypassing from the ebb shoal to offset the downdrift deficit. A long-term, monitoring and adaptive management plan, which is describe below, would allow for future changes or improvements to inlet management, over time.

Coastal Process Features. Collaborative planning supported by the IRG established specific objectives through the development of a Restoration Framework (USACE 2009). In a natural ecosystem, features such as barrier islands and dunes protect coastal lands and property, and reduce danger to human life, stemming from flooding and erosion, while establishing habitats important to coastal species. This framework called for the reestablishment of five coastal processes that are critical to the development and sustainability of the various coastal features (such as beaches, dunes, barrier islands and bluffs), which together form the natural system. The five Coastal Processes identified by the Framework as vital to maintain the natural coastal features are: Longshore Sediment Transport; Cross Island Sediment Transport; Dune Development and Evolution; Estuarine Circulation; and Bayside Shoreline Processes (USACE 2009).

Project Features that contribute to coastal storm risk management through the reestablishment of the coastal processes are included at six locations as follow:

- Sunken Forest – Reestablishes coastal protective features by reestablishing the natural conditions of dune, upper beach and bay shoreline by removing bulkhead adjacent to marina and existing boardwalk, regrading and stabilizing disturbed areas using bioengineering and shoreline.
- Reagan Property – Reestablishes coastal protective features by improving natural conditions of dune, upper beach and shoreline by burying bulkhead, regrading and stabilizing disturbed areas using bioengineering, and creating intertidal areas.

- Great Gunn – Reestablishes salt marsh features by reestablishing hydrologic connections and disturbances.
- Tiana – Reestablishes the bay shoreline natural protective features by reestablishing the dune, salt marsh, and enhancing the SAV beds.
- WOSI – Reestablishes the bay shoreline natural protective features by reestablishing the existing salt marsh.

Corneille Estates – Reestablishes bay shoreline natural storm risk management features including bayside beach habitat.

D.3 EXISTING ENVIRONMENT

The following sections provide a description of the invertebrate, finfish, bird, mammal, amphibian, and reptile species/communities that are in the same area as the proposed action.

D.3.1 Marine Offshore Ecosystem

The borrow areas are within the Marine Offshore Ecosystem. The Marine Offshore Ecosystem includes the Marine Offshore habitat, which consists of the deeper water areas of the Atlantic Ocean within the study area. With the exception of sea turtles and birds, all biota associated with the Marine Offshore habitat are exclusively aquatic. Aquatic biota that utilize the Marine Offshore habitat primarily include fish and benthic invertebrates, as well as marine mammals.

D.3.1.1 *Physical Description*

The Marine Offshore habitat is an oceanic area with water depths ranging from 10 to 30 m. The habitat is relatively homogeneous throughout the entire southern Long Island coastline from Rockaway Inlet, through FIIS and east to Montauk Point. The habitat includes pelagic and benthic zones which support different assemblages of organisms. The pelagic zone refers to the water column and organisms within it, whereas the benthic zone refers to the bottom or substrate and includes sediments and other material present on the ocean floor. The benthic zone substrate is primarily sand within the study area. Through geotechnical analyses, sand suitable for beach nourishment has been identified within the borrow areas.

D.3.1.2 *Marine Invertebrates*

Marine benthic invertebrates are bottom-dwelling species that can be grouped into two categories: infaunal (i.e., benthic invertebrates living within the substrate) and epifaunal (i.e., benthic invertebrates living on the surface of the substrate). Benthic invertebrates are found in the substrate of the borrow areas. Polychaetes (segmented worms with bristles) are an important component of the benthic infaunal community; epifaunal biota include amphipods, crabs, horseshoe crabs (*Limulus polyphemus*), echinoderms (e.g., sea stars, sand dollars), and bivalves (e.g., surf scallops [*Aequipecten sp.*], surf clams [*Spisula solidissima*]). Marine invertebrates provide an important food source for bottom feeding fish and also include species that are

commercially and recreationally important. The benthic invertebrates of the Marine Offshore habitat include a variety of taxa common to generally clean, well-oxygenated, coarse sandy marine habitats.

D.3.1.3 *Finfish*

The Marine Offshore habitat supports a variety of pelagic and benthic finfish, some of which are recreationally or commercially important. The pelagic zone contains few truly resident fish populations; rather it is dominated primarily by a variety of migratory and highly mobile species including red hake (*Urophycis chuss*), scup (*Stenotomus chrysops*), Atlantic butterfish (*Peprilus triacanthus*), bluefish (*Pomatomus saltatrix*), and striped bass (*Morone saxatilis*). Similarly, benthic fish species that occur in the Marine Offshore habitat are largely mobile and migratory; important benthic species include both summer flounder (*Paralichthys dentatus*) and winter flounder (*Pseudopleuronectes americanus*).

D.3.1.4 *Marine Mammals*

The pelagic zone also provides habitat for marine mammals. The harbor seal (*Phoca vitulina*), which is listed as a protected species by New York State is the only marine mammal expected to frequent the Marine Offshore habitat within the study area. Marine mammals such as the right whale (*Eubalaena glacialis*; Federally Endangered) and pygmy-sperm whale (*Kogia breviceps*) may also use this habitat from time to time. Gray seals (*Halichoerus grypus*) may also be found in this habitat

D.3.1.5 *Reptiles*

Several species of sea turtles, including Kemps Ridley turtle (*Lepidochelys kempii*, State and Federally Endangered), green sea turtle (*Chelonia mydas*; State and Federally Endangered), and loggerhead sea turtle (*Caretta caretta*; State and Federally Threatened) may also pass through the Marine Offshore habitat from time to time.

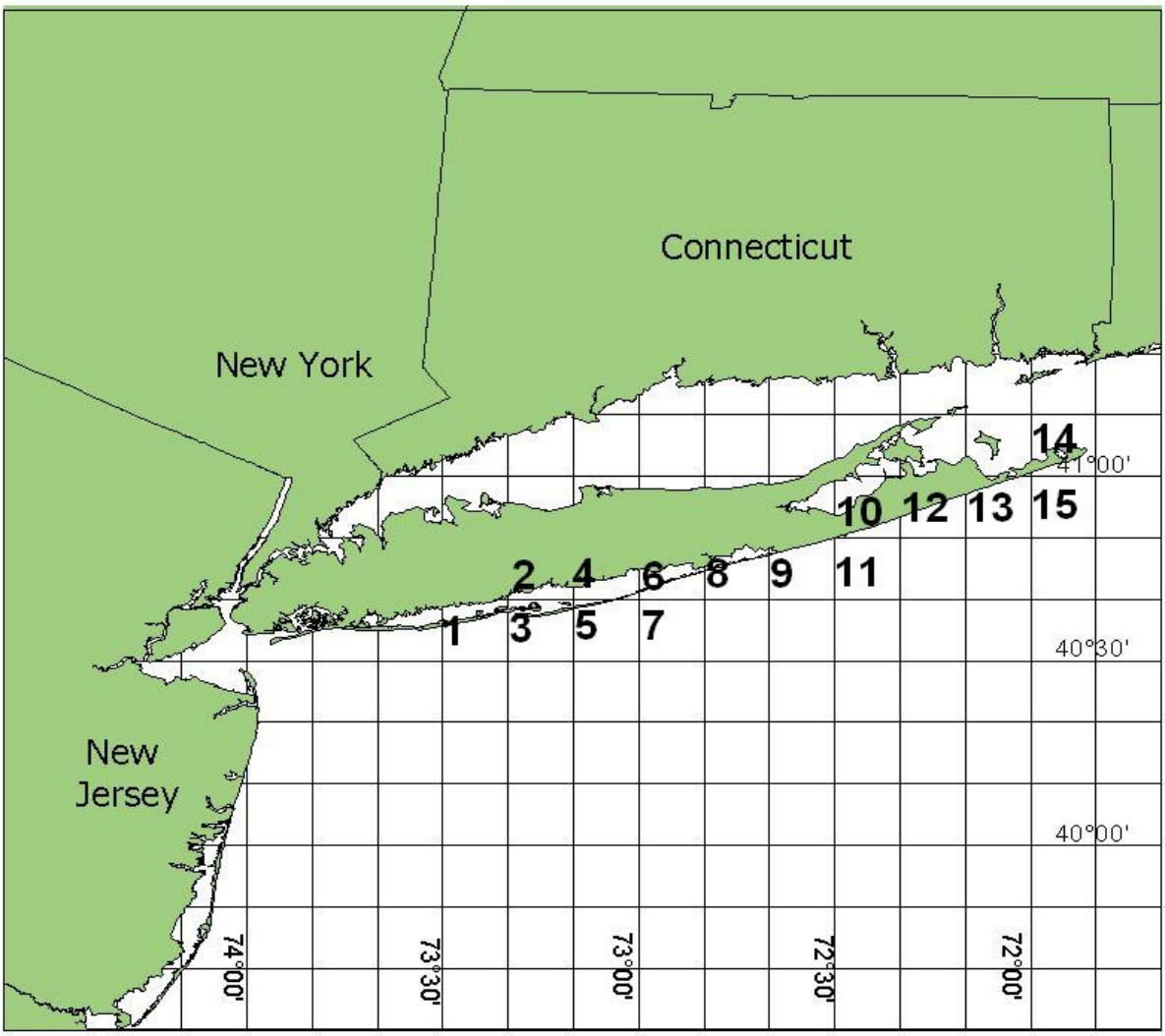
D.4 EFH SPECIES OVERVIEWS

This section describes the habitat requirements of the EFH-designated species, non-EFH designated fish and shellfish species that are important recreationally and commercially, and rare and endangered species that potentially occur within the project area. Specifically, Section D.4.1.1 provides individual species assessment of EFH-designated species.

D.4.1 EFH-Designated Species

EFH-designated species and life history stages in the project area were identified based on the lists in the NOAA Guide to EFH Designations in the Northeastern United States (NOAA 2008a) for the 10- minute by 10-minute areas of latitude and longitude (10’ by 10’ square) where project activity is proposed. The Study Area contains EFH for various life stages for up to 38 species of managed fish and protected invertebrate species. The NMFS has created a grid map overlay for areas that contain EFH within their jurisdiction, and provides species information for each species

afforded EFH (NOAA 2008a). A map showing the fifteen grid squares associated with the Project study area and corresponding latitude and longitude coordinates is provided as Figure D-2. EFH descriptions for the species contained in the project area and life stages found within each grid square are provided in the below text. Species and life stages contained for each of the 15 grid squares within the project is provided as Attachment 1.



Source: NOAA 2008a

Figure D-2. Essential Fish Habitat Grids within the Project Study Area

D.4.1.1 *Bony Fishes*

Atlantic butterfish (*Peprilus triacanthus*)
Grid squares: 1-6, 8, 9, 10 All stages [Egg (E), Larvae (L), Juvenile (J), Adult (A)], 7 (E), 13 (L), 15 (J)

Primary Source: EFH Source Document by Cross et al. (1999)

All life stages are listed for Atlantic butterfish in the 10' by 10' squares. Butterfish are relatively small, fast-growing, short-lived, pelagic fish that form loose schools, often near the surface. Juveniles and adults are common in inshore areas, including the surf zone, as well as in sheltered bays and estuaries in the Mid-Atlantic Bight (MAB) during the summer and fall. Juveniles and adults are eurythermal and euryhaline, and are frequently found over sand, mud, and mixed substrates. Smaller juveniles often aggregate under floating objects and often live in the shelter of large jellyfish. Juvenile and adult butterfish in the MAB are typically found at depths ranging from 3 to 23 meters with water temperatures ranging from 8 to 26°C, salinities ranging from 19 to 32 ppt, and DO ranging from 3 to 10 mg/l. Butterfish eggs are buoyant and the larvae are nektonic.

Project Area: Juvenile and adult butterfish are common inhabitants of the water column in shallow water over sandy substrates in the MAB in the summer and fall and are therefore likely to occupy the project area during those seasons. However, butterfish are pelagic and even juveniles are highly mobile. In addition the dredging activities would be conducted in the late fall, winter and spring when Atlantic butterfish would less likely to be present. Therefore, no more than minimal impact to butterfish EFH is expected to occur as a result of the dredging activities associated with the proposed Project.

Atlantic salmon (*Salmo salar*)
Grid squares: 1-9 (A); 10 (J, A)

Primary Source: Page and Burr (1991)

Juvenile and adult Atlantic salmon are listed in the 10' by 10' grid squares within the project area. This species can be found in the temperate and arctic zones of the Atlantic Ocean in northern hemisphere. In the western Atlantic, they are distributed in coastal drainages from northern Quebec, Canada, to Connecticut, USA. In the eastern Atlantic, they are found in drainages from the Baltic States to Portugal. Accounts of landlocked stocks have been documented in Russia, Finland, Sweden, Norway, and North America. Atlantic salmon typically inhabit cooler waters (< 25°) with strong to moderate flow. Young remain in freshwater for 1 to 6 years, migrate to the ocean, and reside there for 1 to 4 years before returning to the river of their origin to spawn. After spawning, they return to sea. A diurnal species, juveniles feed mainly on aquatic insects, mollusks, crustaceans and fish, and adults at sea feed mainly on squid, shrimp, and fish. Adults approaching the reproductive stage do not feed once they enter the freshwater environment.

Project Area: These life stages of Atlantic salmon prefer colder waters (< 25°) and are generally observed in pelagic areas from Long Island Sound to the Gulf of Maine, which is outside the proposed dredging/nourishment areas. Therefore, little to no impact on Atlantic salmon or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Atlantic sea herring (*Clupea harengus*)
Grid squares: 1-6, 10-13 (J, A); 3 (A), 8 (L, J), 9 (J)

Primary Source: EFH Source Document by Stevenson and Scott (2005) –

Larvae, Juvenile and Adult Atlantic sea herring are listed in the 10' by 10' grid squares within the project area. The Atlantic herring is a small, pelagic, schooling, plankton-feeding species that inhabits both sides of the North Atlantic Ocean. Adult Atlantic sea herring migrate south into southern New England and mid-Atlantic shelf waters in the winter after spawning in the Gulf of Maine, on Georges Bank, and Nantucket Shoals. Juvenile and adult herring are abundant in coastal and mid-shelf waters from southern New England to Cape Hatteras in the winter and spring. In the spring, adults return north, but juveniles do not undertake coastal migrations. Larval herring are limited almost exclusively to Georges Bank and the Gulf of Maine waters. Larvae typically metamorphose the following spring into young-of-year (YOY) juveniles.

Project Area: Atlantic herring are pelagic species. During these life stages, Atlantic herring prefer higher salinities (26–32 ppt) and juveniles and adults (including spawning adults) are typically found at depths (15–130 meters) considerably deeper than the project depth. Therefore, no more than minimal impact on Atlantic sea herring or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Atlantic Mackerel (*Scomber scombrus*)
Grid squares: 1-6, 8, 9, 10 (All stages); 11E

Primary Source: EFH Source Document by Studholme, et. al. (1999)

All life stages of Atlantic mackerel are listed in the 10' by 10' grid squares within the project area. Atlantic mackerel are a fast swimming, pelagic schooling species that are distributed over the western Atlantic ocean in primarily open water. All life stages of this species are pelagic. EFH for this species is mostly pelagic waters over the Continental Shelf with salinities of greater than 25 ppt. However, Atlantic mackerel may be found in estuarine seawater zones. Juveniles may be found at varying levels of abundance in bays and estuarine areas from New Jersey north to Canada, and juveniles and adults are common in saline waters of the Hudson-Raritan estuary in the spring and fall. Atlantic mackerel are intolerant of temperatures below 5-6°C or above 15-16°C and undergo substantial seasonal migrations in response to changes in seawater temperature. In the fall Atlantic mackerel migrate to deeper offshore waters and return to inshore waters in the spring. Atlantic mackerel are opportunistic feeders that either select individual prey organisms or feed by filtering planktonic prey organisms when they are abundant. Juveniles eat mostly small crustaceans such as copepods, amphipods, mysid shrimp, and decapod larvae. They also feed on small pelagic mollusks (Spiratella and Clione) when available. Adults feed on the same food as juveniles but on a wider assortment of organisms and larger prey items. For example, euphausid, pandalid, and crangonid shrimp are common prey; chaetognaths, larvaceans, pelagic polychaetes and larvae of many marine species have been identified in Atlantic mackerel stomachs. Larger prey such as squid and a variety of fishes (silver hake, sand lance, herring, hakes, and sculpins) are not uncommon, especially for large Atlantic mackerel.

Project Area: In the fall Atlantic mackerel migrate to deeper offshore waters and would most likely not be present when in the dredging activities are to be conducted. All life stages of the Atlantic mackerel are pelagic and no more than minimal impact on Atlantic mackerel EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Black sea bass (Centropristis striata)
Grid squares: 1,2,4,8 (A); 3 (L,J); 6,9,13,15 (J,A); 10, 11, 12, 14 (J)

Primary Source: EFH Source Document by Drohan et al. (2007)

Adult black sea bass are usually strongly associated with structured, sheltering habitats such as reefs and ship wrecks on the continental shelf. Their distribution changes seasonally as fish migrate from coastal areas to the outer continental shelf while water temperatures decline in the fall and from the outer shelf to inshore areas as water temperatures rise in the spring. Adult sea bass are very structure oriented, especially during their summer coastal residency. Adults only enter larger estuaries and are most abundant along the outer Atlantic coast. Larger fish tend to be found in deeper water than smaller fish. Adults on the Atlantic coast occupy waters greater than 65 feet MLW in the fall and 260 to 460 feet MLW in the winter and spring. Spawning occurs on the continental shelf, beginning in the spring off Cape Hatteras and progressing into the fall in the MAB and off southern New England. When larvae reach 10 to 16 mm total length (TL), they tend to settle and become demersal on structured inshore habitat such as sponge beds. In the MAB, recently settled juveniles move into coastal estuarine nursery areas between July and September. The estuarine nursery habitat of YOY black sea bass is relatively shallow, hard bottom with some kind of natural or man-made structure including amphipod tubes, eelgrass, sponges, and shellfish beds with salinities above 8 ppt. Black sea bass do not tolerate cold inshore winter conditions. Following an overwintering period presumably spent on the continental shelf, older juveniles return to inshore estuaries in late spring and early summer. They are uncommon in open, unvegetated, sandy intertidal flats or beaches.

Project Area: Due to the absence of three-dimensional structures in the borrow areas adult black sea bass are unlikely to occupy the borrow areas in significant numbers. Black sea bass migrate to deeper waters on the outer continental shelf in the fall and return in the spring and would likely to not be present during the time of the dredging activities. Therefore, no more than minimal impact on black sea bass or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Bluefin tuna (*Thunnus thynnus*)
Grid squares: 3,5,6-9,11-15 (J,A)

Source: Colette and Nauen (1983)

Adult and juvenile bluefin tuna are listed in the 10’ by 10’ grid squares within the project area. Juvenile bluefin tuna are a migratory pelagic species. In the western North Atlantic, bluefin tuna migrate seasonally from spring spawning grounds in the Gulf of Mexico to summer feeding grounds off the northeast U.S. coast. Bluefin tuna often occur over the continental shelf and in embayments, particularly during the summer months when they feed actively on herring, mackerel, and squids. Juveniles and adults are typically found in inshore and pelagic surface waters warmer than 12°C from the Florida to Maine.

Project Area: The dredging activities are proposed during the fall, winter and spring seasons when juvenile and adult bluefin tuna would not be present in the borrow areas. Therefore, little to no

impact on bluefin tuna or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Bluefish (Pomatomus saltatrix)
Grid squares: 1-3,5,6,8,10,12-15(J,A); 4,7(J); 11 (E,J,A); 9 (L,J,A)

Source: EFH Source Document by Shepherd and Packer (2006)
Eggs, juvenile and adult life stages are listed for bluefish are listed in the 10' by 10' grid squares within the project area. Bluefish are a pelagic species that travel in schools of like-sized individuals and undertake seasonal migrations, moving into the MAB during spring and south or farther offshore during fall. Within the MAB they occur in large bays and estuaries as well as across the entire continental shelf. Bluefish spawn offshore in open ocean waters. Juvenile bluefish are found in estuaries, bays, and coastal ocean waters in the MAB and South Atlantic Bight in many habitats. Typically they are found near shorelines, including the surf zone, during the day and in open waters at night. Like adults, they are active swimmers and feed on small forage fishes, which are commonly found in nearshore habitats. They remain inshore in water temperatures up to 30ºC and return to the continental shelf in the fall when water temperatures reach approximately 15ºC. Juvenile bluefish are associated mostly with sand, but are also found over silt and clay bottom substrates. They usually occur at salinities of 23 to 33 ppt, but can tolerate salinities as low as 3 ppt. Adults are generally oceanic but are found near shore as well as offshore. Adults usually prefer warm water (at least 14 to 16ºC) and full salinity. Juveniles and adults are present in the fall and prefer depths greater than 35 feet MLW. Eggs and larvae are present in the MAB during the summer and are more commonly found at depths greater than 100 feet MLW.

Project Area: Juvenile and adult bluefish are pelagic species and are expected to occupy the water column of the project area between the spring, summer and fall. Bluefish eggs and larvae would are not expected to occur in the project area. The dredging activities are proposed during the fall, winter and spring seasons when juvenile and adult bluefish would less likely to be present in the borrow areas. Therefore, no more than minimal impact to bluefish or EFH within the project area is expected to occur as a result of the dredging activities associated with the proposed Project.

Cobia (*Rachycentron canadum*)
Grid squares: 1-15 (All stages)

Primary Sources: Richards (1967), National Audubon Society (1983)

All life stages for cobia are listed in the 10' by 10' grid squares within the project area. Cobia is a southern species that overwinters near the Florida Keys and migrates in the spring and summer to the mid-Atlantic states to spawn. Adults are rarely found as far north as Massachusetts. EFH for this species is the South Atlantic and mid-Atlantic Bights. Cobia prefer coastal waters to the edge of the Continental Shelf and along the edge of the Gulf Stream around sandy shoals, offshore bars, high profile rock bottoms, barrier island ocean-side waters and coastal inlets. EFH for cobia has also been designated within high salinity bays, estuaries and seagrass habitat. Cobia are found in water temperatures that are greater than 20°C.

Project Area: Cobia are pelagic, warm water species and would only be found in the project area during the summer. This species is mobile, not demersal and, therefore, adults and juveniles would not subject to potential entrainment. The project area is the northern temperature limit for this species, therefore an occasional adult cobia may occur in the borrow areas during the summer, but other life history stages of this species are not likely to be found at the project area. The dredging activities are proposed during the fall, winter and spring seasons when the water temperatures are too cold for cobia to be present. Therefore, little to no impact to cobia or EFH is expected as a result of the proposed dredging activities associated with proposed Project.

Haddock (*Melanogrammus aeglefinus*)
Grid squares: 8,11,12,15 (L)

Primary Sources: EFH Source Document by Cargnelli et al. (1999d)

The larvae stage for Haddock are listed in the 10' by 10' grid squares within the project area. Larvae range in size from 2.0-4.99 mm in length. Haddock initially inhabit the upper reaches of the water column, feeding on pelagic prey (zooplankton). Larvae and early stage (pelagic) juveniles are passive foragers on less motile prey such as invertebrate eggs, copepods and phytoplankton. Juveniles undergo a transformation at age 3 to 5 months, after which they are closely associated with the bottom and feed on benthic prey. The egg and larval stages occur in the water column at depths of 10-50 m below the surface. Temperatures of 4-10ºC and high salinities, 34-36 ppt are preferred.

Project Area: Haddock larvae are not very mobile, and pelagic. Larvae density peaks in April and May. They may be present during with the project area; however, most of the larvae are likely to be encountered at greater depths (30-50 m). Therefore, minimal impact is expected to Haddock.

King and Spanish mackerel (*Scomberomorus cavalla and S. maculatus*)
Grid squares: 1-15 (All stages)

Primary Sources: Godcharles and Murphy (1986), Collette and Nauen (1983)

All life stages are listed for the King and Spanish mackerels are listed in the 10' by 10' grid squares within the project area. King and Spanish mackerels are highly migratory, epipelagic, neritic fish that migrate north from Florida as far as the Gulf of Maine in the summer and fall. King mackerel spawn in coastal waters of the Gulf of Mexico and off the South Atlantic coast. Thus, only a few adults of this species would be expected to inhabit MAB coastal waters. In contrast, Spanish mackerel spawn as far north as Sandy Hook and Long Island in late August to late September. King and Spanish mackerel are found in water temperatures that are greater than 20°C.

Project Area: Due to the migratory and epipelagic nature of the Spanish and king mackerels and their regional distribution pattern, it is unlikely that adult Spanish and king mackerels will pass through the project area, and occurrences of early life stages of these species would be rare in the project area. The dredging activities are proposed during the fall, winter and spring seasons when the water temperatures are too cold for king and Spanish mackerel to be present. Therefore, little to no impact to king and Spanish mackerel or EFH is expected as a result of the proposed dredging activities associated with proposed Project.

Monkfish (*Lophius americanus*)
Grid squares: 1-15 (E,L)

Primary Source: EFH Source Document by Steimle et al. (1999a)

The egg and larvae life stages of the monkfish (also known as goosefish) are listed in the 10' by 10' grid squares within the project area. Monkfish are solitary fish that make seasonal onshore–offshore migrations in response to water temperature and can be found over a variety of substrates. Spawning locations are not well known but are thought to be on inshore shoals and in offshore SNE, MAB, and Gulf of Maine shelf waters. Monkfish eggs are contained in long mucus veils that float at or near the surface between March and September and are found in waters ranging from 15 to 1000 m deep. They are rarely collected in surveys but have been reported in open coastal bays and sounds (e.g., Long Island Sound) in low numbers. Monkfish larvae are a common component of the ichthyoplankton community in the MAB and southern New England (SNE) areas. Larvae have been collected in offshore waters in the MAB during March and April and are most often observed in water depths between 25 and 1000 m. Larvae have been found off southern New Jersey, south of Long Island, in the MAB at depths of 30 to 300 feet MLW, and off SNE.

Project Area: Based on their range of habitat utilization, and that these life stages are not typically found in waters of depths < 15 meter. The dredging activities are proposed during the fall, winter and spring seasons when the likelihood of monkfish eggs and larvae occurring in the borrow areas is minimal. Therefore, no more than minimal impact on monkfish or EFH is anticipated as a result of the proposed dredging activities associated with proposed Project.

Ocean pout (*Macrozoarces americanus*)
Grid squares: 1-3,5,7-13,15 (E,L)

Primary Source: EFH Source Document by Steimle et al. (1999d)

Eggs and larvae of Ocean pout are listed in the 10' by 10' grid squares within the project area. Ocean pout is a bottom-dwelling species that occurs in cool waters (< 10ºC) across the continental shelf from Labrador to Cape Hatteras It is non-migratory, but it will move seasonally to remain at preferred temperatures. The eggs are demersal and laid in gelatinous masses in a sheltered place on the bottom, such as rocky crevices, where they are guarded either by one or both parents until hatching. Egg development is about 2-3 months, but incubation time is temperature dependent and is shorter in the warmer MAB. Most of the population spawns in the fall and hatching occurs by mid-winter. The larvae are about 30 mm long at hatching and are relatively advanced in development. Adult ocean pout remain demersal and are not known to form schools or aggregations. In the Middle Atlantic Bight, ocean pout uses rocky habitats during some seasons. Adult ocean pout feed on a variety of benthic invertebrates, including polychaetes, mollusks, crustaceans, and echinoderms. Although ocean pout moves seasonally among habitats within a region, this species is considered nonmigratory.

Project Area: Ocean pout eggs and larvae would be found in the project area. Because the eggs and larvae are demersal, it is likely that they would be impacted by dredging operations.

Pollock (*Pollachius virens*)
Grid squares: 1-6,10 (J)

Primary Source: EFH Source Document by Cargnelli et al. (1999b)

Juvenile pollock are listed in the 10' by 10' grid squares within the project area. EFH for this species includes the waters from the Gulf of Maine south to New Jersey. This demersal species prefers colder (<18°C) pelagic waters and are observed from surface depths to 365 meters. Individuals normally spend their first two years in nearshore coastal waters and then migrate out to deeper waters. Juvenile pollock are found over a variety of bottom habitats with aquatic vegetation or a substrate of sand, mud or rocks. Juveniles feed primarily on crustaceans with nematodes, fish and annelids also making up a portion of their diet.

Project Area: Juvenile pollock will likely occupy the project area when water temperatures are less than 18°C. The dredging activities are proposed during the fall, winter and spring seasons when juvenile pollock are likely to be present. This species is heavily fished commercially and has demonstrated ongoing resilience therefore, no more than minimal impact on pollock or EFH is anticipated to occur within the proposed project area.

Red hake (*Urophycis chuss*)
Grid squares: 1,3,5,8-11,13,15 (E,L,J); 7(E,L); 6(J)

Primary Source: EFH Source Document by Steimle et al. (1999b)

Red hake eggs, larvae and juveniles are listed in the 10' by 10' squares for grid squares within the project area. Red hake occur in continental waters from the Gulf of St. Lawrence to the mid-Atlantic States. Red hake spawn offshore in the MAB in the summer, primarily in southern New England. The distribution of eggs is unknown because they cannot be distinguished from other hakes. However, EFH for eggs is defined as surface temperatures less than 10°C and salinity less than 25 ppt. Hake eggs are buoyant and are common in the upper water column of the MAB from May to November with peaks in June and July. Red hake larvae are a dominant species in the ichthyoplankton in the middle to outer continental shelf of the MAB during the summer at temperatures of 8 to 23°C and depths between 10 and 200 m. After larvae metamorphose into juveniles they are pelagic for about two months before settling to the bottom. Demersal settlement generally occurs between September and December with peaks in October to November. Juveniles are found in bottom environments and are commonly associated with scallops, surf clam shells, and seabed depressions where they seek shelter. Red hake juveniles are typically found in water temperatures below 16° C, depths less than 100 meters and a salinity range from 31 to 33 ppt. Adults prefer depths from 100 to 425 feet and temperatures between 2 to 22°C. Adults are typically associated with sand-mud bottom in holes and depressions. Both juveniles and adults make seasonal migrations in response to changes in water temperatures.

Project Area: Although red hake eggs (including eggs of other hake species) are found in the project area from May to November they are buoyant and would therefore not be present on the bottom where the dredging activities would take place. Red hake larvae are pelagic and would also

not be present on the bottom where the dredging activities would take place. Juvenile red hake would be present in the bottom habitats during the time of year when the dredging activities are proposed and could therefore be impacted by the dredging activities.

Scup (*Stenotomus chrysops*)
Grid squares: 1-9, 11-15(J,A); 10(All stages)

Source: EFH Source Document by Steimle et al. (1999c)
The juvenile and adult life stages for scup are listed in the 10' by 10' grid squares within the project area. Scup spawn along the inner continental shelf from Delaware Bay to SNE between May and August, mainly in bays and sounds in and near SNE. YOY juveniles are commonly found from the intertidal zone to depths of about 30 m in portions of bays and estuaries where salinities are above 15 ppt. Juvenile scup appear to use a variety of coastal intertidal and subtidal sedimentary habitats during their seasonal inshore residency, including sand, mud, mussel beds, and eelgrass beds. Adult scup are common residents in the MAB from spring to fall and are generally found in schools on a variety of habitats, from open sandy bottom to structured habitats such as mussel beds, reefs or rough bottom. Larger adults are found in deeper waters while smaller sized adults are typically found in bays and estuaries. Adults move inshore during early May and June between Long Island and Delaware Bay. As inshore water temperatures decline to < 8 to 9ºC adult and juvenile scup leave inshore waters and move to warmer waters on the outer continental shelf south of the Hudson Canyon off New Jersey and along the coast from south of Long Island to North Carolina in depths ranging from 75- 185 m. Both juvenile and adults are demersal but have also been observed at the water surface.

Project Area: Adult and juvenile scup would be found in the borrow areas during the warmer seasons but migrate offshore to deeper waters when the water temperature falls. The dredging activities are proposed during the fall, winter and spring seasons when juvenile and adult scup are less likely to be present. Therefore, no more than minimal impact on scup or EFH is anticipated as a result of the proposed project.

Skipjack tuna (*Katsuwonus pelamis*)
Grid squares: 1,3-13,15(A)

Source: Colette and Nauen (1983)

Adult skipjack tuna are listed in the 10' by 10' grid squares within the project area. Skipjack tuna are a highly migratory, circumglobal pelagic fish that inhabit tropical and warm-temperate waters and are generally limited by the 15°C isotherm. Skipjack tuna are often found in mixed schools with bluefin tuna of the same size. Like bluefin tuna, skipjack tuna often occur over the continental shelf and in embayments, particularly during the summer months when they feed actively on herring, mackerel, and squid. In the MAB, adults typically occur in pelagic waters where water temperatures range from 20 to 31°C.

Project Area: Skipjack tuna are highly migratory and pelagic, and may be present in the project area during the warmer summer months when the water temperature is above 20°C. The dredging activities are proposed during the fall, winter and spring seasons when adult skipjack tuna are not

likely to be present. Therefore no impact on skipjack tuna or EFH is anticipated as a result of the proposed project.

Summer flounder (*Paralichthys dentatus*)
Grid squares: 1-4,11,14 (J,A); 7,12,13,15 (A); 5,10 (L,J,A); 6,8,9 (All stages)

Primary Source: EFH Source Document by Packer et al. (1999)
Larvae, juvenile and adult summer flounder are listed in the grid squares within the project area. Summer flounder exhibit strong inshore–offshore movements with adult and juveniles normally inhabiting shallow coastal and estuarine waters during the warmer months of the year and moving offshore during the fall and winter. Summer flounder eggs are planktonic and buoyant. Summer flounder eggs were collected in the highest numbers from fall to early winter. Planktonic larvae and post-larvae derived from offshore fall and winter spawning migrate inshore, entering coastal and estuarine nursery areas to complete transformation. Juveniles are distributed inshore and occupy many estuaries during spring, summer, and fall. Some juveniles remain inshore for an entire year before migrating offshore, while others move offshore in the fall and return the following spring. Juvenile summer flounder utilize several different estuarine habitats such as marsh creeks, seagrass beds, mud flats, and open bay areas. As long as other conditions are favorable, substrate preferences and prey availability are the most important factors affecting distribution. Some studies indicate that juveniles prefer mixed or sandy substrates, others show that mud and vegetated habitats are used. Adults are reported to prefer sandy habitats, but can be found in a variety of habitats with both mud and sand substrates. Habitat areas of particular concern (HAPC) for summer flounder include, "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 reestablish native species."

Project Area: Given their association with sandy substrates and the fact that they feed on a variety of bottom-dwelling invertebrates and fish species that occupy the project area, juvenile and adult summer flounder are expected to occupy the project area during the late spring, summer and fall. Early stage juveniles may be present year round. Older juveniles and adults are wary and very capable of high degrees of mobility and would likely avoid the dredge by swimming away. Small juveniles tend to seek protection in structure or by "hiding in plain sight" via cryptic coloration. Juveniles in the path of the dredge might be impacted. Because the project area does not offer SAV or other types of cover large numbers of early stage juveniles are not expected. Therefore, no more than minimal impact on summer flounder or EFH is anticipated as a result of the proposed dredging activities associated with proposed Project.

Whiting (*Merluccius bilinearis*)
Grid squares: 1,3,5-9,11,13-15(E,L,J); 10 (All stages); 12 (E,L)

Primary Source: EFH Source Document by Lock and Packer (2004)

Egg, larval and juvenile life stages for whiting are listed for the 10' by 10' grid squares within the project area. Whiting, or silver hake, spawn on the outer continental shelf where eggs and larvae

are primarily found in surface waters. Primary spawning grounds apparently occur between Cape Cod and Montauk Point, New York, on the southeastern slope of Georges Bank, and in Massachusetts Bay. Significant egg production occurs during May to October, with a peak in August. Whiting eggs are pelagic and hatch in about two days. Juveniles are common during spring and summer in relatively shallow waters in SNE and south of Long Island. Coastal waters off New Jersey, Long Island, and Rhode Island are centers of abundance in the fall. During spring and summer, whiting move into nearshore waters in the Gulf of Maine, to the northern edge of Georges Bank, and northward in the Middle Atlantic Bight. Juvenile and adult whiting migrate to deeper waters of the continental shelf as water temperatures decline in the autumn and return to shallow waters in spring and summer to spawn. The pattern for juveniles is similar to adults in general distribution and movements, except that the centers of juvenile abundance occur in shallower waters. Generally, the following conditions exist where most whiting juveniles are found: water temperatures below 21° C, depths between 20 and 270 meters and salinities greater than 20‰. Juveniles as well as adults utilize bottom habitats of all substrate types.

Project Area: Eggs and larvae are typically dispersed in deeper water, and therefore are not likely to occur in the project area in significant numbers. Based on their range of habitat utilization, juvenile whiting can be expected to occupy the bottom habitats in project area in the spring and summer. The dredging activities are proposed during the fall, winter and spring seasons when juvenile whiting would be less likely to be present in the project area. Therefore, no more than minimal impact on whiting or EFH is anticipated as a result of the dredging activities associated with proposed Project.

Windowpane flounder (*Scophthalmus aquosus*)
Grid squares: 1-12,15 (All stages); 13 (E,J,A); 14 (J,A)

Primary Source: EFH Source Document by Chang et al. (1999)

All life stages for windowpane flounder are listed in the 10’ by 10’ grid squares within the project area. Windowpane flounder are a shallow water mid- and inner-shelf species found primarily between Georges Bank and Cape Hatteras on bottom habitats with a substrate of mud or fine grained sand. Spawning occurs on inner shelf waters, including many coastal bays and sounds, and on Georges Bank. Windowpane flounder eggs and larvae are often observed in the MAB from February to November with peaks in May and October. Windowpane eggs are buoyant and are found in surface waters. Larvae are initially planktonic then settle to the bottom. Juveniles and adults are similarly distributed. They are found in most bays and estuaries south of Cape Cod throughout the year at depths less than 100 meters, bottom temperatures (3 to 12°C in the spring and 9 to 12°C in the fall), and salinities (5.5 to 36 ppt). Juveniles that settle in shallow inshore waters move to deeper offshore waters as they grow. Adults occur primarily on sand substrates off SNE and MAB. Juveniles and adults are common in the MAB throughout the year. YOY and older juveniles are common within 100 feet of shore.

Project Area: Juvenile and adult windowpane are commonly found on shallow, sandy substrates and are expected to occupy the project area throughout the year. Since this species spawns in inner shelf and nearshore waters, eggs and larvae are expected be found in the project area at all time of the year except during the winter. Smaller, YOY juveniles prefer shallow water, and therefore are

less likely to occupy the project area than adults and older juveniles. No more than minimal impact to windowpane or EFH within the project area is expected to occur as a result of the dredging activities associated with the proposed Project.

Winter flounder (*Pseudopleuronectes americanus*)
Grid squares: 1-15 (All stages)

Primary Source: EFH Source Document by Pereira et al. (1999)

All life stages for winter flounder are listed in the 10' by 10' grid squares within the project area. Winter flounder are a small-mouthed, right-eyed flounder that is a valuable commercial and recreational species. They are found in the northwest Atlantic coast from Labrador to Georgia. Winter flounder spawning occurs from late winter through early spring, peaking south of Cape Cod in February and March. The eggs of the winter flounder are typically found at depths of less than five meters in bottom habitats in a broad range of salinity (10–30 ppt), with seasonal abundance from January to May. Eggs are adhesive and demersal and are deposited on a variety of substrates, but sand is the most common; they have been found attached to vegetation and on mud and gravel. The larvae of the winter flounder are typically found at depths of less than six meters in pelagic and bottom waters in a broad range of salinity (10–30 ppt), with seasonal abundance from March to July. Larvae are negatively buoyant and nondispersive; they sink when they stop swimming. Thus, recently settled YOY juveniles are found close to spawning grounds and in high concentrations in depositional areas with low current speeds. YOY juveniles migrate very little in the first summer, move to deeper water in the fall, and remain in deeper cooler water for much of the following year. Habitat utilization by YOY is not consistent across habitat types and is highly variable among systems and from year to year. Several field and lab studies suggest a "preference" for muddy/fine sediment substrates where they are most likely to have been deposited by currents. Adult winter flounder prefer temperatures of 12 to 15° C; DO concentrations greater than 2.9 mg/l, and salinities above 22 ppt, although they have been shown to survive at salinities as low as 15 ppt. Mature adults are found in very shallow waters during the spawning season.

Project Area: The sandy habitat of the borrow areas may provide suitable spawning habitat for this species. In addition, winter flounder would also spawn on the neighboring shoal areas. Due to their range of habitat utilization, juveniles may also be found in the borrow areas throughout the year. Adults are expected to occupy the borrow areas during the fall, winter, and spring, and migrate offshore during the summer. Winter flounder would be expected to be present on the bottom habitats while dredging activities are proposed to take place. Adults and larger juveniles may be able to avoid the hydraulic dredge by swimming away. However, if present, eggs and larvae would most likely be entrained by the hydraulic dredge.

Witch flounder (*Glyptocephalus cynoglossus*)
Grid squares: 11,12,15 (L); 8,9(E)

Primary Source: EFH Source Document by Cargnelli et. al. (1999e)
Eggs and larvae life stages of witch flounder are listed in the 10' by 10' grid squares within the project area. Spawning occurs at or near the bottom, however the buoyant eggs rise into the water column where subsequent egg and larval development occurs. In the MAB spawning occurs from April to August, peaking in May or June and the most important spawning grounds are off Long Island. The main food items in the witch flounder diet are polychaetes and crustaceans, although mollusks and echinoderms are also important. The witch flounder is a deep water fish inhabiting depths down to approximately 1500 m. The egg and larval stages are pelagic, generally over deep water, at temperatures ranging from about 4 to 13oC. When metamorphosis is complete, juveniles settle to the bottom. Juveniles and adults are found at temperatures ranging from about 0 to 15ºC. They are found over mud, clay, silt, or muddy sand substrates at depths ranging from 20 to 1565 m. This close association with soft substrate may be the result of their preference for polychaete prey.

Project Area: Although eggs and larvae life stages of Witch flounder may be found within the project area, eggs are pelagic and larvae are pelagic until eye development occurs and they become demersal. Because of their preference for muddy bottoms, they would not likely be found in the clean sand areas that would be used for dredging. Thus, the witch flounder would not likely be impacted by dredging operations.

Yellowtail flounder (*Limanda ferruginea*)
Grid squares: 5,7,13 (E,A); 12 (E,L); 3 (E); 9,11,15 (All stages); 8 (E,L)

Primary Source: EFH Source Document by Johnson et al. (1999)

All life stages for yellowtail flounder are listed in the grid squares within the project area. The yellowtail flounder is a small- mouthed, thin bodied fish that inhabits waters along the Atlantic coast of North America from the Gulf of St. Lawrence, Labrador, and Newfoundland to the Chesapeake Bay. Yellowtail flounder occupy continental shelf bottom environment on the Atlantic coast between depths typically being from 20 to 50 meters. Adults prefer sand or sand–mud sediments. Spawning takes place from March through August, but occurs during March to May in the MAB. Generally, the following conditions exist where yellowtail eggs are found: sea surface temperatures below 15° C, water depths from 30 to 90 meters and a salinity range from 32.4 to 33.5 ppt. Yellowtail flounder eggs are most often observed during the months from mid-March to July, with peaks in April to June in southern New England. Eggs are buoyant, spherical and are pelagic. Larvae are initially pelagic then become benthic.

Project Area: Based on their range of habitat utilization, all life stages for yellowtail flounder can occur in the project areas. Yellowtail flounder would be expected to be present on the bottom habitats while dredging activities are proposed to take place. Adults and larger juveniles may be able to avoid the hydraulic dredge by swimming away. However, if present, eggs and larvae would most likely be entrained by the hydraulic dredge.

Yellowfin Tuna (*Thunnus albacares*)
Grid squares: 15 (J,A)
Source: USDOC (1999b)

Juvenile and adult yellowfin tuna are listed in the 10' by 10' grid squares within the project area. Atlantic yellowfin tuna are circumglobal in tropical and temperate waters. In the west Atlantic they range from 45° N to 40° S. Yellowfin tuna is an epipelagic, oceanic species, found in water temperatures between 18° and 31° C. It is a schooling species, with juveniles found in schools at the surface, Larger fish are found in deeper water and also extend their ranges into higher latitudes. Atlantic yellowfin tuna are opportunistic feeders. Stomachs have been found to contain a wide variety of fish and invertebrates Yellowfin tuna are believed to feed primarily in surface waters down to a depth of 100 m.

Project area: Yellowfin Tuna are highly migratory and epipelagic, and may be present in the project area. No impact on yellowfin tuna or EFH is anticipated as a result of the proposed project.

D.4.1.2 *Cartilaginous Fishes*

Basking shark (*Cetorhinus maximus*)
Grid squares: 13, 15 (J)
Source: USDOC (1999b)

Late juvenile life stages for the basking shark are listed in the 10' by 10' grid squares within the project area. The basking shark is the second largest fish in the world, and is a filter-feeding plankton eater. It is a migratory species of the subpolar and cold temperate seas throughout the world, spending the summer in high latitudes and moving into warmer water in winter. In spite of its size and local abundance in summer, its habits are very poorly known. Late juvenile basking sharks are found offshore the mid-Atlantic United States south of Nantucket Shoals at 70° W to the north edge of Cape Hatteras, NC at 35.5° N in waters 50 to 200 m deep; associated with boundary conditions created by the western edge of the Gulf Stream.

Project Area: EFH is designated within the project grid for basking shark late juveniles. Basking sharks are a cosmopolitan migratory, slow-moving pelagic species and will most likely be able to avoid the hydraulic dredge. Therefore, little to no impact to basking shark or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Blue shark (*Prionace glauca*)
Grid squares: 3,5,7,9,11,13,14,15 (L,J,A); 1,2,4,10,12(A); 6,8 (L,A)

Source: USDOC (1999b) and Compagno (1984)

Early juvenile, late juvenile and adult life stages for the blue shark are listed in the 10' by 10' grid squares within the project area. Blue shark is an oceanic–epipelagic, fringe–littoral, cosmopolitan species, occurring throughout the tropical, subtropical, and temperate open waters. Atlantic blue sharks are highly migratory with a regular clockwise trans-Atlantic migration route following the warm Gulf Stream waters. The general range of blue shark is from Argentina to Newfoundland in the western Atlantic. The temperature preference of blue shark is between 7 to 18°C.

Project Area: EFH is designated within the project grid for blue shark early juveniles, late juveniles, and adults. Blue sharks are a pelagic, highly mobile species and will most likely be able to avoid the hydraulic dredge. Therefore, little to no impact to blue shark or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Common Thresher Shark (*Alopias vulpinus*)
Grid squares: 3,5,7,9,11,13,15 (L,J,A)

Source: USDOC (1999b)

Early juvenile, late juvenile and adult life stages for the common thresher shark are listed in the 10' by 10' grid squares within the project area. The common thresher shark is cosmopolitan in warm and temperate waters. It is found in both coastal and oceanic waters. It is a large shark that uses its tremendously large tail to hit and stun the small schooling fishes upon which it feeds. Common thresher shark is found Offshore Long Island, NY and southern New England in the northeastern United States, in pelagic waters deeper than 50 m, between 70° W and 73.5° W, south to 40° N.

Project Area: EFH is designated within the project grid for common thresher shark early juveniles, late juveniles, and adults. Common thresher sharks are a pelagic, highly mobile species and will most likely be able to avoid the hydraulic dredge. Additionally, they are typically encountered at greater depths than where dredging will occur. Therefore, little to no impact to common thresher shark or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Dusky Shark (*Carcharhinus obscurus*)
Grid squares: 1,3,5-9, 11,12,14,15 (L,J); 2,4,10,13 (L)

Source: USDOC (1999b) and Compagno (1984)

Early juvenile and late juvenile life stages for the dusky shark are listed in the 10' by 10' grid squares within the project area. The dusky shark is a large, highly migratory species that is common in warm and temperate continental waters throughout the world. Although nursery areas are in coastal waters, dusky sharks do not prefer areas with reduced salinities and tend to avoid estuaries. Dusky sharks are viviparous. Females move inshore to drop their young and then return to deeper water.

Project Area: Although migratory and pelagic, dusky sharks spawn in nearshore waters, and therefore juveniles may occur in the project area. Juvenile dusky sharks are a mobile species and will most likely be able to avoid the hydraulic dredge. No more than minimal impact to dusky shark or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Sand tiger shark (*Carcharias taurus*)
Grid squares: 1-15(L)

Source: Compagno (1984) and USDOC (1999b)

The early juvenile life stage for the sand tiger shark is listed in the 10' by 10' squares for both borrow areas. Sand tiger sharks are commonly found in coastal embayments and nearshore waters from the surf zone to the outer continental shelves from the surface to a minimum of 600 feet. This species exhibits a preference for near-bottom habitats but often occurs in midwater or surface zones. Sand tiger sharks typically feed on bony fishes, small sharks, rays, squids, crabs, and lobsters. EFH for early juveniles (≤125 cm) is shallow coastal waters to 25 meters deep from Barnegat Inlet, NJ south to Cape Canaveral, FL.

Project Area: Early juvenile sand tiger sharks can be present in the near-bottom habitats as well as other parts of the water column in the location of the three borrow areas. Early juvenile sand tiger sharks are a mobile species and will most likely be able to avoid the hydraulic dredge. No more than minimal impact to sand tiger shark or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Sandbar shark (*Carcharinus plumbeus*)
Grid squares: 1-15 (L,J,A)

Source: Compagno (1984) and USDOC (1999b)

Early juvenile, late juvenile and adult life stages for the sandbar shark are listed in the 10' by 10' grid squares within the project area. The sandbar shark is an abundant, coastal–pelagic shark of temperate and tropical waters that occurs inshore and offshore. It is found on continental and insular shelves and is common at bay mouths, in harbors, inside shallow muddy or sandy bays, and at river mouths, but tends to avoid sandy beaches and the surf zone. Sandbar sharks migrate north and south along the Atlantic coast, reaching as far north as Massachusetts in the summer. Sandbar sharks bear live young in shallow Atlantic coastal waters between Great Bay, New Jersey, and Cape Canaveral, Florida. The young inhabit shallow coastal nursery grounds during the summer and move offshore into deeper, warmer water in winter. Late juveniles and adults occupy coastal waters as far north as southern New England and Long Island.

Project Area: Habitat preference and distribution of this species make it possible that adults and juveniles may occur at the project site. Sandbar sharks are a mobile species and will most likely be able to avoid the hydraulic dredge. No more than minimal impact to sandbar shark or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Shortfin mako shark (*Isurus oxyrichus*)
Grid squares: 1,12,14(J); 3,5,7,11,15 (L,J,A); 8,9,13 (L,J)

Sources: Compagno (1984) and USDOC (1999b)

Early juvenile, late juvenile and adult life stages for the shortfin mako shark are listed in the grid squares within the project area. Shortfin mako shark is a common, extremely active, offshore littoral and epipelagic species found in tropical and warm temperate waters that is seldom found in waters below 16°C. In the extreme northern and southern parts of its range, this species migrates with warm water masses in the summer. Very little is known about the life history of this species, but nursery areas are believed to be located in deep tropical waters.

Project Area: Habitat preference and distribution of this species make it possible that adults and juveniles may occur at the project site. Shortfin mako sharks are a mobile species and will most likely be able to avoid the hydraulic dredge. No more than minimal impact to shortfin mako shark or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Spiny dogfish (*Squalus acanthias*)
Grid squares: 14 (J,A); 15(J)

Source: Stehlik 2007

Birth occurs offshore in fall or winter. The pups at birth range from 20-33 cm in total length, with the majority at 26-27 cm. Spiny dogfish feed on squid and fish throughout life. They tend to eat small size classes or young fish, and as they grow they eat larger individuals of the same species. Squid are a major part of the diet in all geographical areas except for the Mid-Atlantic. Worldwide, spiny dogfish favor the temperature range of 7-15°C . Migrations may be over great distances in order to seek out preferred conditions. The mean salinity in locations where they are caught is 33.5 ppt. Large females are abundant on the nearshore shelf and in lower salinities, perhaps to allow maximal growth of their embryos in warmer coastal waters. Juveniles are mainly pelagic and oceanic. Adults are demersal and pelagic, and spawning adults are pelagic or demersal on the outer continental shelf.

Project Area: Juvenile and adult Spiny dogfish may be present if the project area. However, they are mobile and would not likely be impacted by dredging operations.

Tiger shark (*Galeocerdo cuvieri*)
Grid squares: 3,5,6-9,11-13,15 (L,J); 10 (J); 1 (L)

Sources: Compagno (1984) and USDOC (1999b)

Early juvenile and late juvenile life stages for the tiger shark are listed in the 10’ by 10’ grid squares within the project area. Tiger sharks typically inhabit tropical and sub-tropical waters on or adjacent to the continental and insular shelves and makes seasonal migrations into warm temperate waters. This species occupies different marine habitats, but seems to prefer turbid waters. The nurseries for this species appear to be in offshore areas, but have not been described.

Project Area: Habitat preference and distribution of this species make it possible that juvenile tiger shark may occur at the project site. Tiger sharks are a mobile species and will most likely be able to avoid the hydraulic dredge. No more than minimal impact to tiger shark or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

White shark (*Carcharodon carcharias*)
Grid squares: 3,5-13,15(J)

Sources: Compagno (1984) and USDOC (1999b)

The late juvenile life stage for the white shark is listed in the 10' by 10' grid squares within the project area. EFH for these large, apex predators includes pelagic northern New Jersey and Long Island waters of depths between 25 and 100 meters. The white shark is a cosmopolitan, non-schooling species that is primarily a coastal and offshore inhabitant of continental and insular shelves. This species is often found close inshore to the surf line but may also occur off oceanic islands. White sharks typically feed on bony fishes, other sharks, rays, seals, dolphins and porpoises, sea birds, carrion, cephalopods, crabs and whales.

Project Area: Habitat preference and distribution of this species make it possible that late juvenile white shark may occur at the project site. White sharks are a highly mobile species and will most likely be able to avoid the hydraulic dredge. Therefore, no impact to white shark or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

D.4.1.3 *Invertebrate Species*

Atlantic surf clam (*Spisula solidissima*)
Grid squares: 1,3,5,7,13,15 (J,A); 9,11 (A)

Primary Source: EFH Source Document by Cargnelli et al. (1999b)

Juvenile and adult life stages for the Atlantic surf clam are listed in the 10' by 10' grid squares within the project area. Surf clams are the largest bivalve in the mid-Atlantic Bight and are found from the Gulf of Maine to Cape Hatteras, North Carolina. Water currents are responsible the distribution and settlement of juvenile clams. Surf clams generally occur from the beach zone to a depth of about 200 feet, but beyond about 125 feet abundance is low. Surf clams are mostly oceanic and their distribution is limited by salinity. They prefer turbulent waters at the edge of the breaker zone but can be found in some estuarine areas. Juvenile clams prefer medium- to fine-grained sands that contain low levels of organics. Adults prefer medium- to coarse-grained sand and gravel and bury themselves just below the sediment surface. Surf clams are filter feeders and feed on plankton during all life stages. They have two temperature- dependent spawning periods; the first occurs in mid-July and continues through early August, and the second begins in mid-October and lasts through early November, and these periods are believed to be synchronous across an entire bed.

Project Area: Juvenile and adult surf clams occur in the project area. Where present in the borrow areas during dredging most will be lost. The "seeding" mechanisms of the surf clam are at work continuously and will establish populations regularly and will be reestablished after the dredging activities are completed. Therefore, no more than minimal impact to Atlantic surf clam or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

Longfin inshore squid (*Loligo pealeii*)
Grid squares: 6,7,11-13,15 (J,A); 1,3,9,10,14(J)

Primary Source: EFH Source Document by Jacobson (2005)

Pre-recruit and recruit life stages for the longfin squid are listed in the 10' by 10' grid squares within the project area. Pre-recruits and recruits are stock assessment terms used by the Northeast Fisheries Science Center (NEFSC) and correspond roughly to the life history stages juveniles and adults, respectively. Longfin squid pre-recruits are less than or equal to 8 cm and recruits are greater than 8 cm. Longfin inshore squid are a pelagic schooling species that can be found in continental shelf and slope waters from Newfoundland to the Gulf of Venezuela. Juveniles inhabit the upper 10 m of the water column over water 50 to 150 meters deep on continental shelf. Juveniles are typically found in coastal inshore waters in spring/fall while migrating to offshore waters in winter. Juveniles have a temperature preference of 10 to 26°C and salinities of 31.5 to 34.0 ppt. Adult longfin inshore squid inhabit the continental shelf and upper continental shelf slope to depths of 400 m. Adults are typically found over mud or sandy mud bottoms, and have been found at surface temperatures ranging from 9 to 21°C and bottom temperatures ranging from 8 to 16°C.

Project Area: Based on their range of habitat utilization longfin squid may be expected to seasonally occur in the project area. This species is mobile and it is unlikely that it will be subjected to potential entrainment in the dredge or burial during dredging operations. Given the spatial distribution pattern and habits of this species little to no impact on longfin squid or EFH is anticipated to result from the proposed Project.

Shortfin squid (*Illex illecebrosus*)
Grid squares: 15 (J)

Primary Source: EFH Document by Hendrickson and Holmes (2004)

Pre-recruit and recruit life stages for the shortfin squid are listed in the 10' by 10' grid squares within the project area. Generally, pre-recruit and recruit shortfin squid are collected from shore to 200 meters and temperatures between 2°C and 23°C. Like many squid species shortfin squid live for less than one year, has a high natural mortality rate, and exhibits a protracted spawning season whereby overlapping "microcohorts" enter the population throughout the year and exhibit variable growth rates. During spring, squid migrate onto the continental shelf between Newfoundland and Cape Hatteras. During late autumn, squid migrate off the continental shelf, presumably to a winter spawning site.

Project Area: Based on their range of habitat utilization shortfin squid may be expected to seasonally occur within the project area. This species is mobile and it is unlikely that it will be subjected to potential entrainment in the dredge or burial during dredging operations. Given the spatial distribution pattern and habits of this species little to no impact on shortfin squid or EFH is anticipated to result from the proposed Project.

Ocean quahog (*Arctica islandica*)

Grid squares: 3,7,9,11,13,15 (J,A); 5(A)

Primary Source: EFH Source Document by Cargnelli et al. (1999c)

Juvenile and adult life stages for the ocean quahog are listed in the grid squares within the project area. Ocean quahogs are extremely slow-growing and long-lived marine bivalves. Distribution in the western Atlantic ranges in depths from 10 meters to about 250 meters. Ocean quahogs are rarely found where bottom water temperatures exceed 16°C, and occur progressively further offshore between Cape Cod and Cape Hatteras. Adults are usually found in dense beds in medium- to fine-grained sand, sandy– mud, and silty sand. Spawning is protracted, lasting from spring to fall. It has been reported to last from September to November, and sometimes until January, off New Jersey.

Project Area: Juvenile and adult ocean quahogs are likely to occur in the project area. Where present in the borrow areas during dredging most will be lost. The "seeding" mechanisms of the ocean quahog are at work continuously and will establish populations regularly and will be reestablished after the dredging activities are completed. Therefore, no more than minimal impact to ocean quahog or EFH is anticipated as a result of the dredging activities associated with the proposed Project.

D.5 IMPACTS

This section identifies the potential direct and indirect impacts of the proposed sand dredging and placement on the relevant life history stages of EFH-designated species and their habitats. Significant impacts are not anticipated for the majority of species and life history stages. Table D-2 identifies potential direct and indirect impacts for each EFH-designated species. There will be temporary impacts to the habitat and associated prey species for the duration of the construction phase of the Project. However, since the project area is a small portion of this type of habitat in the region, the overall impact on the effected species will be minimal relative to the region.

D.5.1 Habitat Impacts

The proposed dredging activities at the offshore borrow areas are described in Section D.2.2.3. The Marine Offshore ecosystem where the borrow areas are located is described in Section D.3. The proposed dredging activities associated with the project initial construction would be conducted in the offshore borrow sites. In these locations the circulation, flushing rates, and dissolved oxygen levels are relatively high. The beach nourishment or dredge material (comprised primarily of clean, coarse-grained sand and gravel) would be hydraulically dredged and pumped to down drift beaches on the Atlantic coast of the Fire Island barrier island. The borrow area sand consists almost entirely of clean, coarse-grained sand and gravel with a small percentage of fines. Most of the fine material that would be suspended by the activities in the Atlantic Ocean water column would settle out in nearby Atlantic Ocean waters and would not adversely affect the designated habitat areas. Sediment taken from the borrow areas would be extracted to a depth no greater than 20 feet below the existing bottom, in order to minimize impacts on existing coastal processes and avoid anoxic conditions. The existing benthic invertebrate community would be

removed as a result of the dredging. However, once the dredging is complete the ocean bottom would be colonized with invertebrates from the nearby benthic habitats.

D.5.2 Direct Impacts

The following subsections provide a general impact assessment for EFH-designated species (Table D-2). For all species, the impacts during dredging would be temporary and non-significant for the following reasons:

- Turbidity plumes generated at the dredged site are not expected to be significant given that the type of dredge proposed is designed to minimize turbidity. Additionally, the sediment being mined is coarse-grained sand, which contains only trace amounts of fine-grained material. Also, the project site is under the direct influence of the inlet currents which are very powerful throughout most of each tidal cycle. These currents will quickly disperse any turbidity generated by the project operation. There are not expected to be any long lasting impacts to the water quality in or adjacent to the project area. Additionally, bottom sediments are predominantly sand without any significant amount of organic matter, therefore no significant release of nutrients or contaminants or lowering of oxygen concentrations (biological oxygen demand) is expected.

- Entrainment of demersal species may occur, however, hydraulic dredging equipment generally digs below the bottom substrate, gives noticeable warning of their approach (e.g., vibrations, etc.), and covers relatively small widths of the bottom at a time.

- Due to the dominance of sand in the borrow areas, sedimentation and turbidity resulting from the proposed Project are expected to settle quickly out of the water column or be dispersed by currents at the project area, and therefore would have a minimal impact on fish and invertebrate species (gill damage/suffocation or inhibition of sight feeding predators)

- The relatively small change in depth and the small size of the project foot print with a regional area with abundant similar resources result in minimal impacts to EFH-designated species. Direct impacts to EFH habitat is also expected to be minimal, especially since the bottom habitat is a dynamic area known to change by both small and large increments.

Table D-2. Potential Impacts for EFH-Designated Species and Life History Stages in the Project Site

EFH-Designated Species	Life Stage	Potential Impacts
Bony Fish Species		
Atlantic butterfish	E/L	Not likely to occur in the project area. No significant impact
	J/A	Pelagic, zooplankton-feeding species. No significant impact.

EFH-Designated Species	Life Stage	Potential Impacts
Atlantic mackerel	E/L/J/ A	All life stages are pelagic. No significant impact.
Atlantic salmon	J/A	Not likely to occur in the project area. No significant impact
Atlantic sea herring	L/J/A	Pelagic, zooplankton-feeding species. No significant impact.
Black sea bass	J	Loss of benthic infaunal prey organisms would have minimal impact because fish feed primarily on more mobile benthic epifaunal species and small fish.
	L/A	
Bluefin tuna	J/A	Not likely to occur in the project area. No significant impact
Bluefish	E, L	Probably rare in the project area. No significant impact.
	J	Temporary displacement of fish and their prey (forage fish). No significant impact.
	A	Temporary displacement of fish and their prey (forage fish). No significant impact.
Cobia	E/L/J/ A	Transient pelagic species. Not likely to occur in the project area. No significant impact.
Haddock	L	Pelagic, may occur in the project area. No signifcant impact.
King and Spanish mackerel	E/L/J/ A	Transient pelagic species. Not likely to occur in the project area. No significant impact.
Monkfish	E/L	Not likely to occur in the project area. No significant impact.
Ocean pout	E/L	Eggs and larvae are demersal, potential to be impacted by dredging operations.
Pollock	J	Not likely to occur in the project area. No significant impact.
Red hake		Not expected to occur in great densities but may be adversely impacted by dredging/placement activities. No significant impact.
	E	
	L/J	Not likely to occur in the project area. No significant impact.
Scup	E/L	Not likely to occur in the project area. No significant impact.
	J/A	Loss of benthic infaunal prey organisms would have minimal impact because fish also feed on pelagic prey organisms.
Skipjack tuna	A	Probably rare in the project area. No significant impact.
Summer flounder	E/L	Not likely to occur in the project area. No significant impact.

EFH-Designated Species	Life Stage	Potential Impacts
		Loss of benthic infaunal prey organisms would have minimal impact because fish also feed on pelagic prey organisms and larger, more mobile benthic epifauna (e.g., crabs).
	J/A	
Windowpane flounder	E/L	May be adversely impacted by dredging/placement activities.
		Smaller YOY juveniles vulnerable to mortality from dredge. No significant impact from loss of benthic infaunal species because primary prey are more mobile epifaunal species.
	J	
	A	No significant impact from loss of benthic infaunal species because primary prey are more mobile epifaunal species.
Winter flounder	E	Dredge would cause mortality of demersal eggs during January-April spawning season.
		Dredge would cause mortality of recently-hatched larvae near the bottom, but have no significant impact on larvae in surface waters.
	L	
		Loss of benthic infaunal prey organisms would cause larger juveniles to relocate to nearby, unaffected areas; smaller YOY juveniles are less able to relocate and vulnerable to mortality from dredge.
	J	
		Loss of benthic infaunal prey organisms would cause adults to relocate to nearby, unaffected areas to feed; dredging during spawning season would cause females to move to nearby, unaffected areas to spawn, but should have no significant impact on egg production.
	A	
Whiting	E/L/J	
Witch flounder	L	Not likely to occur in the project area. No significant impact.
Yellowtail flounder	E/L	Probably rare in the project area. No significant impact.
Cartilaginous Fish Species		
Blue shark	EJ/LJ/ A	Not likely to occur in the project area. No significant impact.

EFH-Designated Species	Life Stage	Potential Impacts
Common thresher shark	EJ/LJ/ A	Not likely to occur in the project area. No significant impact.
Dusky shark	EJ/LJ	Dredging activities would not affect most prey species.
Sand tiger shark	EJ	Not likely to occur in the project area. No significant impact.
Sandbar shark	EJ	Probably rare in the project area. No significant impact.
	LJ/A	Dredging would not affect most prey species and adults would move out of affected area; no significant impact.
Shortfin mako shark	EJ/LJ/A	Not likely to occur in the project area. No significant impact.
Spiny dogfish	J/A	May occur in the the project area. No significant impact.
Tiger shark	EJ/LJ	Not likely to occur in the project area. No significant impact.
White shark	LJ	Not likely to occur in the project area. No significant impact.
Invertebrate Species		
Atlantic surf clam	J/A	May occur at sand placement site but would suffer minimal impact from sand placement activities.
Longfin inshore squid	J/A	No significant impact from loss of benthic infaunal species because primary prey are fish and mobile epifaunal species.
Shortfin squid	J	No significant impact from loss of benthic infaunal species because primary prey are fish and mobile epifaunal species.
Ocean quahog	J/A	Not likely to occur in the project area. No significant impact.
Key: E = eggs, L = larvae, J = juveniles, A = adults, EJ = early juveniles, LJ = late juveniles		

D.5.3 Indirect Impacts

The most significant impact of sand dredging on EFH in the project area would be the indirect trophic effects caused by the removal of benthic infaunal prey organisms, and some epifaunal prey organisms, for bottom-feeding EFH-designated species. Any benthic organism that lives in the sand (infauna) and the smaller, less motile organisms that live on the bottom (epifauna) and are not capable of avoiding the suction effect of the dredge, would become entrained. Most of these organisms would be invertebrates, but burrowing fish would also be drawn into the dredge.

The negative effects of prey removal would be temporary, lasting only as long as it takes for benthic invertebrates to re-colonize the bottom once the project is complete. Studies conducted on offshore sand borrow areas off the outer New Jersey coast indicate that benthic communities were re-established within 8 to 9 months (USACE 1999a). Re-colonization of the infaunal species will be stimulated by neighboring adult populations that inhabit similar environments adjacent to the project area. However, because the project area is under the direct influence of inlet currents

carrying eggs, larvae and instar forms of many invertebrate species the project area may recover much faster than these other areas. Nevertheless, some parts the project area will remain in a semi-disturbed state throughout the lifespan of the project. This represents a loss of some prey resources to some bottom feeding EFH-designated species. The degree to which sand extraction from the project area impacts benthic prey resources depends a great deal on how large of an area is selected for removal. Because bottom-feeding fish and crustaceans consume epifaunal organisms living on the bottom and infaunal organisms in the top several inches of the sediment, removal of surficial sediments over a large area would have a much greater impact on EFH than removal of the same volume of sand dredging a smaller area to a relatively greater depth. The project area represents a very small percentage of foraging grounds within the bay thus the overall indirect impact of the sand mining to EFH species will be minimal.

The temporary loss of benthic prey resources caused by dredging would not have any serious adverse effects on EFH for any species that feeds primarily on more motile epifaunal organisms (e.g., crabs, mysids, sand shrimp) or fish, since these organisms would re-occupy the dredged area almost immediately after sand was removed. For this reason, most of the EFH species in the project area would probably continue to feed there even after the dredge passed through.

The activities in the project area may have short-term benefits to some EFH-designated. Brinkhuis (1980) conducted a literature assessment on the biological effects of sand and gravel mining in the Lower Bay of New York Harbor and found that during dredging, and immediately after an area has been dredged, fish are attracted to the area to feed on infaunal organisms that are dislodged from the bottom. Due to the composition of the benthic infaunal organisms, bottom feeding fish species would be the primary benefactors as a result of the disturbance and certain opportunistic species such as striped bass would also benefit. Types of species attracted to the Project activity would be limited to highly mobile juveniles and adults, which presumably would be capable of avoiding entrainment.

Species that feed primarily on benthic infaunal organisms are most likely to be affected during the entire life of the Project. However, both benthic and pelagic foragers would likely expand their forage parameters until a sufficient prey patch is located, which in this case would mean re-locating to adjacent unaffected areas of similar habitat. Additionally, mobile foragers could resume feeding in the same location as soon as the dredge activities cease.

D.6 CONCLUSION

This assessment concludes that the overall potential adverse impacts to EFH-designated species and EFH in the project area will be minimal. Most EFH-designated species feed on more motile epifaunal organisms or on small forage fish and would not be seriously affected. For any bottom-feeding EFH species, the impact of dredging on local forage habitat area would be temporary, lasting only until the dredged area is re-colonized by new benthic organisms. There is also available data showing that disturbance to the sediments due to dredging can be short term benefit to many species of various life stages due to redistribution of prey items and detritus. The majority of dredging operations are expected to occur during the time period when most species are not active in the project area. For these reasons, it is concluded that the dredging of the offshore borrow areas and subsequent placement of dredged material on beaches will not cause adverse effects to

EFH-designated species or EFH. The New York District will continue coordination with NOAA to get to a mutual understanding agreement on this policy.

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ATTACHMENT 1

SPECIES AND LIFE STAGES FOR THE 15 GRID SQUARES

Grid 1 (40° 30.0’ N, 73° 20.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): Atlantic Ocean waters within the square affecting the following: south of Amityville, NY, Lindenhurst, NY, Copiague, NY, Seaford, NY, Massapequa, NY, Biltmore Shores, NY, and Nassau Shores, NY, Seaford Creek and Amityville Creek. These waters are also within Great South Bay affecting the following: Jones Beach Island, Toby Beach, and Cedar Island from the western half of Cedar Island Beach to Jones Beach State Park. Also, these waters affect Zachs Bay, eastern Hempstead Bay and southern Oyster Bay, and around the following Islands: South Line, North Line, Goose, and Gilgo.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic Salmon *(Salmo salar)*				x
Pollock (Pollachius virens)			x	
Whiting (Merluccius bilinearis)	x	x	x	
Red Hake (Urophycis chuss)	x	x	x	
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Ocean Pout (Zoarces americanus)	x	x		x
Atlantic Sea Herring *(Clupea harengus)*			x	x
Monkfish (Lophius americanus)	x	x		
Bluefish (Pomatomus saltatrix)			x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a	x	
Short-finned Squid (Illex illecebrosus)	n/a	n/a		
Atlantic Butterfish (Peprilus triacanthus)	x	x	x	x
Atlantic Mackerel *(Scomber scombrus)*	x	x	x	x
Summer Flounder (Paralicthys dentatus)			x	x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a			x
Surf Clam (Spisula solidissima)	n/a	n/a	x	x
Ocean Quahog (Artica islandica)	n/a	n/a		
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Blue Shark (Prionace glauca)				x
Dusky Shark (Charcharinus obscurus)		x	x	
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Shortfin Mako Shark *(Isurus oxyrhyncus)*			x	
Tiger Shark (Galeocerdo cuvieri)		x		
Skipjack Tuna (Katsuwonus pelamis)				x

Source: NOAA 2008

Notes: Boundary coordinates: North: 40° 40.0’ N, East: 73° 20.0’ W, South: 40° 30.0’ N, West: 73° 30.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 2 (40° 40.0’ N, 73° 10.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): Atlantic Ocean waters within the square within Great South Bay, south of East Islip, NY, Islip, NY, Bay Shore, NY, Great Cove, and Babylon, NY, from west of Nicoll Pt. to Bergen Pt.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic Salmon *(Salmo salar)*				x
Pollock (Pollachius virens)			x	
Redfish (Sebastes fasciatus)	n/a			
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Atlantic Sea Herring *(Clupea harengus)*			x	x
Monkfish (Lophius americanus)	x	x		
Bluefish (Pomatomus saltatrix)			x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a		
Short-finned Squid (Illex illecebrosus)	n/a	n/a		
Atlantic Butterfish (Peprilus triacanthus)	x	x	x	x
Atlantic Mackerel *(Scomber scombrus)*	x	x	x	x
Summer Flounder (Paralicthys dentatus)			x	x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a			x
Surf Clam (Spisula solidissima)	n/a	n/a		
Ocean Quahog (Artica islandica)	n/a	n/a		
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Blue Shark (Prionace glauca)				x
Dusky Shark (Charcharinus obscurus)		x		
Sandbar Shark (Charcharinus plumbeus)		x	x	x

Source: NOAA 2008

Notes: Boundary coordinates: North: 40° 50.0’ N, East: 73° 10.0’ W, South: 40° 40.0’ N, West: 73° 20.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 3 (40° 30.0’ N, 73° 10.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): The waters within the square within the Atlantic Ocean and within Great South Bay estuary affecting the following: East and West Fire Island, Saltaire, NY and Democrat Pt. on Fire Island. Captree I., Sexton I., Oak I., Cedar Island Beach, Oak Beach, and the Fire Island Inlet.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic Salmon *(Salmo salar)*				x
Pollock (Pollachius virens)			x	
Whiting (Merluccius bilinearis)	x	x	x	
Red Hake (Urophycis chuss)	x	x	x	
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Yellowtail Flounder (Limanda ferruginea)	x			
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Ocean Pout (Zoarces americanus)	x	x		x
Atlantic Sea Herring *(Clupea harengus)*				x
Monkfish (Lophius americanus)	x	x		
Bluefish (Pomatomus saltatrix)			x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a	x	
Atlantic Butterfish (Peprilus triacanthus)	x	x	x	x
Atlantic Mackerel *(Scomber scombrus)*	x	x	x	x
Summer Flounder (Paralicthys dentatus)			x	x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a	x	x	x
Surf Clam (Spisula solidissima)	n/a	n/a	x	x
Ocean Quahog (Artica islandica)	n/a	n/a	x	x
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Common Thresher Shark *(Alopias vulpinus)*		x	x	x
Blue Shark (Prionace glauca)		x	x	x
White Shark (Charcharadon carcharias)			x	
Tiger Shark (Galeocerdo cuvieri)		x	x	
Dusky Shark (Charcharinus obscurus)		x	x	
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Shortfin Mako Shark *(Isurus oxyrhyncus)*		x	x	x
Bluefin Tuna (Thunnus thynnus)			x	x
Skipjack Tuna (Katsuwonus pelamis)				x

Source: NOAA 2008

Notes: Boundary coordinates: North: 40° 40.0’ N, East: 73° 10.0’ W, South: 40° 30.0’ N, West: 73° 20.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 4 (40° 40.0’ N, 73° 00.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): Atlantic Ocean waters within the square and within Great South Bay, north of Ocean Beach, and south of Sayville, NY and Boheamia, NY, from Patchogue, NY and western Patchogue Bay to just west of Nicoll Pt. on Nicoll Bay, southeast of Great River, NY, and the Connetquot River.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic Salmon *(Salmo salar)*				x
Pollock (Pollachius virens)			x	
Redfish (Sebastes fasciatus)	n/a			
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Atlantic Sea Herring *(Clupea harengus)*			x	x
Bluefish (Pomatomus saltatrix)			x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a		
Short-finned Squid (Illex illecebrosus)	n/a	n/a		
Atlantic Butterfish (Peprilus triacanthus)	x	x	x	x
Atlantic Mackerel *(Scomber scombrus)*	x	x	x	x
Summer Flounder (Paralicthys dentatus)			x	x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a			x
Surf Clam (Spisula solidissima)	n/a	n/a		
Ocean Quahog (Artica islandica)	n/a	n/a		
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Blue Shark (Prionace glauca)				x
Dusky Shark (Charcharinus obscurus)		x		
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Skipjack Tuna (Katsuwonus pelamis)				x

Source: NOAA 2008

Notes: Boundary coordinates: North: 40° 50.0’ N, East: 73° 00.0’ W, South: 40° 40.0’ N, West: 73° 10.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 5 (40° 30.0’ N, 73° 00.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): Atlantic Ocean waters within the square within Great South Bay estuary south and north of Ocean Beach, NY on Fire Island.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic Salmon *(Salmo salar)*				x
Pollock (Pollachius virens)			x	
Whiting (Merluccius bilinearis)	x	x	x	
Red Hake (Urophycis chuss)	x	x	x	
Redfish (Sebastes fasciatus)	n/a			
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Yellowtail Flounder (Limanda ferruginea)	x			x
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Atlantic Sea Herring *(Clupea harengus)*			x	x
Monkfish (Lophius americanus)	x	x		
Bluefish (Pomatomus saltatrix)			x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a		
Atlantic Butterfish (Peprilus triacanthus)	x	x	x	x
Atlantic Mackerel *(Scomber scombrus)*	x	x	x	x
Summer Flounder (Paralicthys dentatus)		x	x	x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a	x		x
Surf Clam (Spisula solidissima)	n/a	n/a	x	x
Ocean Quahog (Artica islandica)	n/a	n/a		x
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Common Thresher Shark *(Alopias vulpinus)*		x	x	x
Blue Shark (Prionace glauca)		x	x	x
White Shark (Charcharadon carcharias)			x	
Tiger Shark (Galeocerdo cuvieri)		x	x	
Dusky Shark (Charcharinus obscurus)		x	x	
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Shortfin Mako Shark *(Isurus oxyrhyncus)*		x	x	x
Bluefin Tuna (Thunnus thynnus)			x	x
Skipjack Tuna (Katsuwonus pelamis)				x

Source: NOAA 2008

Notes: Boundary coordinates: North: 40° 40.0’ N, East: 73° 00.0’ W, South: 40° 30.0’ N, West: 73° 10.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 6 (40° 40.0’ N, 72° 50.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): Atlantic Ocean waters within the square within Great South Bay estuary affecting the following: south of Great South Beach on Fire Island, within western Narrow Bay and Bellport Bay, from Mastic Beach, NY, to the Swan River in East Patchogue, NY. Also affected are eastern Patchogue Bay, and south of Bellport, NY, North Bellport, NY, Brookhaven, NY, Mastic, NY, and East Patchogue, NY.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic Salmon *(Salmo salar)*				x
Pollock (Pollachius virens)			x	
Whiting (Merluccius bilinearis)	x	x	x	
Red Hake (Urophycis chuss)			x	
Redfish (Sebastes fasciatus)	n/a			
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Atlantic Sea Herring *(Clupea harengus)*			x	x
Bluefish (Pomatomus saltatrix)			x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a	x	
Short-finned Squid (Illex illecebrosus)	n/a	n/a		
Atlantic Butterfish (Peprilus triacanthus)	x	x	x	x
Atlantic Mackerel *(Scomber scombrus)*	x	x	x	x
Summer Flounder (Paralicthys dentatus)	x	x	x	x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a		x	x
Surf Clam (Spisula solidissima)	n/a	n/a		
Ocean Quahog (Artica islandica)	n/a	n/a		
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Blue Shark (Prionace glauca)		x		x
White Shark (Charcharadon carcharias)			x	
Dusky Shark (Charcharinus obscurus)		x	x	
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Tiger Shark (Galeocerdo cuvieri)		x	x	
Bluefin Tuna (Thunnus thynnus)			x	x
Skipjack Tuna (Katsuwonus pelamis)				x

Source: NOAA 2008

Notes: Boundary coordinates: North: 40° 50.0’ N, East: 72° 50.0’ W, South: 40° 40.0’ N, West: 73° 00.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 7 (40° 30.0’ N, 72° 50.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): The waters within the square within the Atlantic Ocean one square south of the square affecting Great South Beach on Fire Island, and Mastic Beach, NY, East Patchogue, NY, Bellport, NY, North Bellport, NY, Brookhaven, NY, Mastic, NY, and East Patchogue, NY.

Species	Eggs	Larvae	Juveniles	Adults
Whiting (Merluccius bilinearis)	x	x	x	
Red Hake (Urophycis chuss)	x	x		
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Yellowtail Flounder (Limanda ferruginea)	x			x
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Atlantic Sea Herring *(Clupea harengus)*			x	x
Monkfish (Lophius americanus)	x	x		
Bluefish (Pomatomus saltatrix)			x	
Long-finned Squid *(Loligo pealei)*	n/a	n/a	x	x
Atlantic Butterfish (Peprilus triacanthus)	x			
Summer Flounder (Paralicthys dentatus)				x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a			x
Surf Clam (Spisula solidissima)	n/a	n/a	x	x
Ocean Quahog (Artica islandica)	n/a	n/a	x	x
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Common Thresher Shark *(Alopias vulpinus)*		x	x	x
Blue Shark (Prionace glauca)		x	x	x
White Shark (Charcharadon carcharias)			x	
Tiger Shark (Galeocerdo cuvieri)		x	x	
Dusky Shark (Charcharinus obscurus)		x	x	
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Shortfin Mako Shark *(Isurus oxyrhyncus)*		x	x	x
Bluefin Tuna (Thunnus thynnus)			x	x
Skipjack Tuna (Katsuwonus pelamis)				x

Source: NOAA 2008

Notes: Boundary coordinates: North: 40° 40.0’ N, East: 72° 50.0’ W, South: 40° 30.0’ N, West: 73° 00.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 8 (40° 40.0’ N, 72° 40.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): The waters within the square within the Atlantic Ocean and within Great South Bay estuary affecting the following: south of Tanner Neck, NY, East Moriches, NY, Center Moriches, NY, and within Moriches Bay and Moriches Bay Inlet, south of Eastport, NY, Speonk, NY, and Remsenberg, NY, from Apaucuck Pt. to Mastic Beach, NY, along with waters within eastern Narrow Bay.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic Salmon *(Salmo salar)*				x
Haddock (Melanogrammus aeglefinus)		x		
Whiting (Merluccius bilinearis)	x	x	x	
Red Hake (Urophycis chuss)	x	x	x	
Witch Flounder (Glyptocephalus cynoglossus)	x			
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Yellowtail Flounder (Limanda ferruginea)	x	x		
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Ocean Pout (Zoarces americanus)	x	x		x
Atlantic Sea Herring *(Clupea harengus)*		x	x	
Monkfish (Lophius americanus)	x	x		
Bluefish (Pomatomus saltatrix)			x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a		
Short-finned Squid (Illex illecebrosus)	n/a	n/a		
Atlantic Butterfish (Peprilus triacanthus)	x	x	x	x
Atlantic Mackerel *(Scomber scombrus)*	x	x	x	x
Summer Flounder (Paralicthys dentatus)	x	x	x	x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a			x
Surf Clam (Spisula solidissima)	n/a	n/a		
Ocean Quahog (Artica islandica)	n/a	n/a		
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Blue Shark (Prionace glauca)		x		x
White Shark (Charcharadon carcharias)			x	
Dusky Shark (Charcharinus obscurus)		x	x	
Shortfin Mako Shark *(Isurus oxyrhyncus)*		x	x	
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Tiger Shark (Galeocerdo cuvieri)		x	x	
Bluefin Tuna (Thunnus thynnus)			x	x
Skipjack Tuna (Katsuwonus pelamis)				x

Source: NOAA 2008

Notes: Boundary coordinates: North: 40° 50.0’ N, East: 72° 40.0’ W, South: 40° 40.0’ N, West: 72° 50.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 9 (40° 40.0’ N, 72° 30.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): The waters within the square within the Atlantic Ocean and within the Great South Bay estuary affecting the following: south of Westhampton, NY, Quiogue, NY, Quogue, NY, and Tiana Beach, and within Quantuck Bay and the eastern tip of Moriches Bay.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic Salmon *(Salmo salar)*				x
Whiting (Merluccius bilinearis)	x	x	x	
Red Hake (Urophycis chuss)	x	x	x	
Witch Flounder (Glyptocephalus cynoglossus)	x			
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Yellowtail Flounder (Limanda ferruginea)	x	x	x	x
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Ocean Pout (Zoarces americanus)	x	x		x
Atlantic Sea Herring *(Clupea harengus)*			x	
Monkfish (Lophius americanus)	x	x		
Bluefish (Pomatomus saltatrix)		x	x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a	x	
Short-finned Squid (Illex illecebrosus)	n/a	n/a		
Atlantic Butterfish (Peprilus triacanthus)	x	x	x	x
Atlantic Mackerel *(Scomber scombrus)*	x	x	x	x
Summer Flounder (Paralicthys dentatus)	x	x	x	x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a		x	x
Surf Clam (Spisula solidissima)	n/a	n/a		x
Ocean Quahog (Artica islandica)	n/a	n/a	x	x
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Common Thresher Shark *(Alopias vulpinus)*		x	x	x
Blue Shark (Prionace glauca)		x	x	x
White Shark (Charcharadon carcharias)			x	
Dusky Shark (Charcharinus obscurus)		x	x	
Shortfin Mako Shark *(Isurus oxyrhyncus)*		x	x	
Tiger Shark (Galeocerdo cuvieri)		x	x	
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Bluefin Tuna (Thunnus thynnus)			x	x
Skipjack Tuna (Katsuwonus pelamis)				x

Source: NOAA 2008

Notes: Boundary coordinates: North: 40° 50.0’ N, East: 72° 30.0’ W, South: 40° 40.0’ N, West: 72° 40.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 10 (40° 50.0’ N, 72° 20.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): Atlantic Ocean waters within the square within Gardiners Bay, western Little Peconic Bay and eastern Great Peconic Bay affecting the following: southwest of New Suffolk, NY, Cutchogue, NY, southern Nassau Pt., Robins I., along with and north of North Sea, NY, Sebonac Neck, NY, Southampton , NY, and Shinecock Hills, NY, from Shinecock Canal to south of Jessup Neck. Also, within the Atlantic Ocean south of Southampton, NY, from south of Mecox Bay to just west of the Shinnecock Inlet, within eastern Shinecock Bay. Also, waters within Great South Bay estuary can be found at the very bottom of the square.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic Salmon *(Salmo salar)*			x	x
Pollock (Pollachius virens)			x	
Whiting (Merluccius bilinearis)	x	x	x	x
Red Hake (Urophycis chuss)	x	x	x	
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Ocean Pout (Zoarces americanus)	x	x		x
Atlantic Sea Herring *(Clupea harengus)*			x	x
Monkfish (Lophius americanus)	x	x		
Bluefish (Pomatomus saltatrix)			x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a	x	
Short-finned Squid (Illex illecebrosus)	n/a	n/a		
Atlantic Mackerel *(Scomber scombrus)*	x	x	x	x
Summer Flounder (Paralicthys dentatus)		x	x	x
Scup (Stenotomus chrysops)	x	x	x	x
Black Sea Bass (Centropristus striata)	n/a		x	
Surf Clam (Spisula solidissima)	n/a	n/a		
Ocean Quahog (Artica islandica)	n/a	n/a		
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Blue Shark (Prionace glauca)				x
White Shark (Charcharadon carcharias)			x	
Dusky Shark (Charcharinus obscurus)		x		
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Tiger Shark (Galeocerdo cuvieri)			x	
Skipjack Tuna (Katsuwonus pelamis)				x

Source: NOAA 2008

Notes: Boundary coordinates: North: 41° 00.0’ N, East: 72° 20.0’ W, South: 40° 50.0’ N, West: 72° 30.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 11 (40° 40.0’ N, 72° 20.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): Atlantic Ocean waters within the square one square south of the square affecting the following: western Little Peconic Bay and eastern Great Peconic Bay, southwest of New Suffolk, NY, Cutchogue, NY, North Sea, NY, Sebonac Neck, NY, and within the Atlantic Ocean, waters affecting Southampton , NY, and Shinecock Hills, NY, and Southampton, NY.

Species	Eggs	Larvae	Juveniles	Adults
Haddock (Melanogrammus aeglefinus)		x		
Whiting (Merluccius bilinearis)	x	x	x	
Red Hake (Urophycis chuss)	x	x	x	
Witch Flounder (Glyptocephalus cynoglossus)		x		
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Yellowtail Flounder (Limanda ferruginea)	x	x	x	x
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Ocean Pout (Zoarces americanus)	x	x		x
Atlantic Sea Herring *(Clupea harengus)*			x	x
Monkfish (Lophius americanus)	x	x		
Bluefish (Pomatomus saltatrix)	x		x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a	x	x
Short-finned Squid (Illex illecebrosus)	n/a	n/a		
Atlantic Mackerel *(Scomber scombrus)*	x			
Summer Flounder (Paralicthys dentatus)			x	x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a		x	
Surf Clam (Spisula solidissima)	n/a	n/a		x
Ocean Quahog (Artica islandica)	n/a	n/a	x	x
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Common Thresher Shark *(Alopias vulpinus)*		x	x	x
Blue Shark (Prionace glauca)		x	x	x
White Shark (Charcharadon carcharias)			x	
Tiger Shark (Galeocerdo cuvieri)		x	x	
Dusky Shark (Charcharinus obscurus)		x	x	
Shortfin Mako Shark *(Isurus oxyrhyncus)*		x	x	x
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Bluefin Tuna (Thunnus thynnus)			x	x
Skipjack Tuna (Katsuwonus pelamis)				x

Source: NOAA 2008

Notes: Boundary coordinates: North: 40° 50.0’ N, East: 72° 20.0’ W, South: 40° 40.0’ N, West: 72° 30.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 12 (40° 50.0’ N, 72° 10.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): Waters within the square affecting the following: from south of East Hampton, NY, to half way through Mecox Bay, east of Southampton, NY, including south of Wainscott, NY, and Bridgehampton, NY, within the Atlantic Ocean.

Species	Eggs	Larvae	Juveniles	Adults
Haddock (Melanogrammus aeglefinus)		x		
Whiting (Merluccius bilinearis)	x	x		
Red Hake (Urophycis chuss)	x	x	x	
Redfish (Sebastes fasciatus)	n/a			
Witch Flounder (Glyptocephalus cynoglossus)		x		
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Yellowtail Flounder (Limanda ferruginea)	x	x		
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Ocean Pout (Zoarces americanus)	x	x		x
Atlantic Sea Herring *(Clupea harengus)*			x	x
Monkfish (Lophius americanus)	x	x		
Bluefish (Pomatomus saltatrix)			x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a	x	x
Short-finned Squid (Illex illecebrosus)	n/a	n/a		
Summer Flounder (Paralicthys dentatus)				x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a		x	
Surf Clam (Spisula solidissima)	n/a	n/a		
Ocean Quahog (Artica islandica)	n/a	n/a		
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Blue Shark (Prionace glauca)				x
White Shark (Charcharadon carcharias)			x	
Dusky Shark (Charcharinus obscurus)		x	x	
Shortfin Mako Shark *(Isurus oxyrhyncus)*			x	
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Tiger Shark (Galeocerdo cuvieri)		x	x	
Bluefin Tuna (Thunnus thynnus)			x	x
Skipjack Tuna (Katsuwonus pelamis)				x

Source: NOAA 2008

Notes: Boundary coordinates: North: 41° 00.0’ N, East: 72° 10.0’ W, South: 40° 50.0’ N, West: 72° 20.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 13 (40° 50.0’ N, 72° 00.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): Atlantic Ocean waters within the square within Long Island Sound affecting north of Devon Yacht Club and Amagansett, NY, along with affecting south of Long Island from just southeast of Hither Hills State Park to southeast of East Hampton, NY.

Species	Eggs	Larvae	Juveniles	Adults
Whiting (Merluccius bilinearis)	x	x	x	
Red Hake (Urophycis chuss)	x	x	x	
Redfish (Sebastes fasciatus)	n/a			
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Yellowtail Flounder (Limanda ferruginea)	x			x
Windowpane Flounder (Scopthalmus aquosus)	x		x	x
Ocean Pout (Zoarces americanus)	x	x		x
Atlantic Sea Herring *(Clupea harengus)*			x	x
Monkfish (Lophius americanus)	x	x		
Bluefish (Pomatomus saltatrix)			x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a	x	x
Short-finned Squid (Illex illecebrosus)	n/a	n/a		
Atlantic Butterfish (Peprilus triacanthus)		x		
Summer Flounder (Paralicthys dentatus)				x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a		x	x
Surf Clam (Spisula solidissima)	n/a	n/a	x	x
Ocean Quahog (Artica islandica)	n/a	n/a	x	x
Spiny Dogfish (Squalus acanthias)	n/a	n/a		
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Common Thresher Shark *(Alopias vulpinus)*		x	x	x
Blue Shark (Prionace glauca)		x	x	x
White Shark (Charcharadon carcharias)			x	
Dusky Shark (Charcharinus obscurus)		x		
Shortfin Mako Shark *(Isurus oxyrhyncus)*		x	x	
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Tiger Shark (Galeocerdo cuvieri)		x	x	
Bluefin Tuna (Thunnus thynnus)			x	x
Skipjack Tuna (Katsuwonus pelamis)				x
Basking Shark (Cetorhinus maximus)			x	

Source: NOAA 2008
Notes: Boundary coordinates: North: 41° 00.0’ N, East: 72° 00.0’ W, South: 40° 50.0’ N, West: 72° 10.0’ W.
n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 14 (41° 00.0’ N, 71° 50.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): Atlantic Ocean waters within the square affecting the northeast tip of Long Island from just west of Rocky Point on the north side around Fort Pond Bay, past Lake Montauk, Shagwong Pt., False Pt., Montauk Pt., and Montauk, NY, to just east of Hither Hills State Park.

Species	Eggs	Larvae	Juveniles	Adults
Whiting (Merluccius bilinearis)	x	x	x	
Redfish (Sebastes fasciatus)	n/a			
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Windowpane Flounder (Scopthalmus aquosus)			x	x
Ocean Pout (Zoarces americanus)	x	x		x
Bluefish (Pomatomus saltatrix)			x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a	x	
Short-finned Squid (Illex illecebrosus)	n/a	n/a		
Summer Flounder (Paralicthys dentatus)			x	x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a		x	
Surf Clam (Spisula solidissima)	n/a	n/a		
Ocean Quahog (Artica islandica)	n/a	n/a		
Spiny Dogfish (Squalus acanthias)	n/a	n/a	x	x
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Blue Shark (Prionace glauca)		x	x	x
Dusky Shark (Charcharinus obscurus)		x	x	
Shortfin Mako Shark *(Isurus oxyrhyncus)*			x	
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Bluefin Tuna (Thunnus thynnus)			x	x

Source: NOAA 2008

Notes: Boundary coordinates: North: 41° 10.0’ N, East: 71° 50.0’ W, South: 41° 00.0’ N, West: 72° 00.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

Grid 15 (40° 50.0’ N, 71° 50.0’ W)

Square Description (i.e. habitat, landmarks, coastline markers): The waters within the square within the Atlantic Ocean one square south of the eastern most tip of Long Island, south one square.

Species	Eggs	Larvae	Juveniles	Adults
Haddock (Melanogrammus aeglefinus)		x		
Whiting (Merluccius bilinearis)	x	x	x	
Red Hake (Urophycis chuss)	x	x	x	
Redfish (Sebastes fasciatus)	n/a			
Witch Flounder (Glyptocephalus cynoglossus)		x		
Winter Flounder (Pseudopleuronectes americanus)	x	x	x	x
Yellowtail Flounder (Limanda ferruginea)	x	x	x	x
Windowpane Flounder (Scopthalmus aquosus)	x	x	x	x
Ocean Pout (Zoarces americanus)	x	x		x
Atlantic Sea Herring *(Clupea harengus)*		x	x	x
Monkfish (Lophius americanus)	x	x		
Bluefish (Pomatomus saltatrix)			x	x
Long-finned Squid *(Loligo pealei)*	n/a	n/a	x	x
Short-finned Squid (Illex illecebrosus)	n/a	n/a	x	
Atlantic Butterfish (Peprilus triacanthus)			x	
Summer Flounder (Paralicthys dentatus)				x
Scup (Stenotomus chrysops)	n/a	n/a	x	x
Black Sea Bass (Centropristus striata)	n/a		x	x
Surf Clam (Spisula solidissima)	n/a	n/a	x	x
Ocean Quahog (Artica islandica)	n/a	n/a	x	x
Spiny Dogfish (Squalus acanthias)	n/a	n/a	x	
King Mackerel (Scomberomorus cavalla)	x	x	x	x
Spanish Mackerel (Scomberomorus maculatus)	x	x	x	x
Cobia (Rachycentron canadum)	x	x	x	x
Sand Tiger Shark (Odontaspis taurus)		x		
Blue Shark (Prionace glauca)		x	x	x
White Shark (Charcharadon carcharias)			x	
Dusky Shark (Charcharinus obscurus)		x	x	
Shortfin Mako Shark *(Isurus oxyrhyncus)*		x	x	x
Sandbar Shark (Charcharinus plumbeus)		x	x	x
Tiger Shark (Galeocerdo cuvieri)		x	x	
Bluefin Tuna (Thunnus thynnus)			x	x
Yellowfin Tuna (Thunnus albacares)			x	x
Skipjack Tuna (Katsuwonus pelamis)				x
Common Thresher Shark *(Alopias vulpinus)*		x	x	x
Basking Shark (Cetorhinus maximus)			x	

Source: NOAA 2008

Notes: Boundary coordinates: North: 41° 00.0’ N, East: 71° 50.0’ W, South: 40° 50.0’ N, West: 72° 00.0’ W.

n/a = these species either have no data available on the designated lifestages, or those lifestages are not present in the species' reproductive cycle.

APPENDIX E

PRELIMINARY DRAFT PROGRAMMATIC AGREEMENT

PRELIMINARY DRAFT PROGRAMMATIC AGREEMENT AMONG THE UNITED STATES ARMY CORPS OF ENGINEERS, THE NEW YORK STATE HISTORIC PRESERVATION OFFICE, THE NATIONAL PARK SERVICE, AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING THE FIRE ISLAND to MONTAUK POINT, NEW YORK GENERAL RE-EVALUTION STUDY

WHEREAS, the US Army Corps of Engineers, New York District (District) is proposing to undertake measures to reduce coastal storm damages and minimize impact along the Atlantic Coast from Fire Island to Montauk Point and the backbay and mainland areas along Great South, Shinnecock and Moriches Bays (Project); and

WHEREAS, the Fire Island Inlet to Montauk Point, New York, Combined Beach Erosion Control and Hurricane Protection Project was authorized by the River and Harbor Act of 14 July 1960, and subsequently modified in accordance with Section 103 of the River and Harbor Act of 12 October 1962, Section 31 of the Water Resources Development Act of 1974, Section 156 of the Water Resources Development Act of 1976, and Section 502 of the Water Resources Development Act of 1986 (P.L. 99-662), and the Water Resources Development Acts of 1992 and 1999, to vary cost-sharing and periodic nourishment; and

WHEREAS, the New York State Department of Environmental Conservation is the non-federal sponsor; and

WHEREAS, the Project consists of the continuation of authorized inlet navigation projects, including ebb shoal dredging, and placement of dunes and berms; non-structural measures for residential/non-residential structures consisting of wet/dry floodproofing, relocations, and acquisitions/demolitions; road-raisings, breach response along the barrier islands; beach and dune fill with renourishment every four years for up to thirty years; modifications (tapering or shortening) of existing groins; and the restoration of coastal process features and habitat restoration; and

WHEREAS, the Area(s) of Potential Effect include the offshore borrow sites, the nearshore sand placement and groin modification areas, the mainland locations for non-structural measures, and the location of the coastal process features and habitat restoration sites (Figure 1); and

WHEREAS, the continuation of the current inlet management, including the dredging of the ebb-shoal and its placement on the adjacent shoreline and the modifications (tapering or shortening) of existing groins will not have an adverse effect on historic properties; and

WHEREAS, the Breach Response Plan has a process for coordination with the New York State Office of Parks, Recreation and Historic Preservation, which serves as the New York State Historic Preservation Office (NYSHPO), and other interested parties incorporated into the response plan; and

WHEREAS, the Fire Island Light Station Historic District, the Beach Road Historic District, the Canoe Place Historic District, the Remsenberg Historic District, the East

Quogue Historic District, the Quogue Historic District, William Floyd Estate and a number of other properties have been listed, determined to be eligible or are potentially eligible for the National Register of Historic Places (Appendix A); and

WHEREAS, pursuant to 36 CFR Part 800, the regulations implementing Section 106 of the National Historic Preservation Act (NHPA) (54 U.S.C. § 306108), the District has determined that implementation of the Project will have the potential to cause adverse effects on properties listed in or eligible for listing in the National Register of Historic Places (NRHP) 800.16(m); and

WHEREAS, the District is notifying the Advisory Council on Historic Preservation (ACHP) of the potential for the Undertakings to affect historic properties and that a programmatic agreement will be prepared; and

WHEREAS, the District will consult with the NYSHPO, the Shinnecock Indian Nation, the Unkechaug Indian Nation, the Fire Island National Seashore, National Park Service, and municipal and county historic societies, and other appropriate consulting parties to define efficient and cost effective processes for taking into consideration the effects of the Undertakings upon historic properties; and

WHEREAS, the District will involve the general public through the National Environmental Policy Act (NEPA) process, which affords all persons, organizations, and government agencies the right to review and comment on proposed major federal actions that are evaluated by a NEPA document and participate in public meetings during the review of the feasibility report; and

NOW, THEREFORE, the District, NYSHPO, and ACHP agree that the Undertakings shall be implemented in accordance with the following stipulations in order to take into account the effects of the Undertakings on historic properties.

STIPULATIONS

I. BEACH FILL - NEAR SHORE/TIDAL ZONE

A. The District shall conduct a remote sensing survey(s) of all areas with the beach fill and placement APE that were not previously surveyed, or have not been previously disturbed by the placement of sand, or in which sand will be placed and for which the limit of fill will extend into the near shore area.

B. The District shall evaluate the targets identified by this remote sensing survey(s) as potential resources to determine if they are cultural resources. If determined to be cultural resources, an assessment of the integrity of the sites and their historic significance, in accordance with the eligibility criteria of the National Register of Historic Places, will be conducted. Following that evaluation a determination will be made regarding the effect the Project will have on any items determine to be eligible for the National Register and the need for further investigation.

C. The District will coordinate these investigations of the near shore/tidal zone with the NYSHPO, the FIIS, the Shinnecock Indian Nation, the Unkechaug Indian Nation, and other interested parties and resolve any adverse effects in accordance with Stipulation X below.

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II. BEACH FILL - BORROW AREA INVESTIGATIONS

A. A remote sensing (magnetometer and side scan sonar survey) of any borrow areas not previously surveyed will be conducted to identify any potential cultural resources. In addition, cores for any borrow areas not previously surveyed will be examined to determine the potential for the recovery of buried landsurfaces.

B. If a cultural resource(s) is identified, the District will designate a buffer zone around each potential resource, as determined by the nature of the anomaly/return. Buffer zone(s) shall be clearly delineated on construction plans. No construction activities, including the removal of sand, anchoring, etc., that could potentially impact the wrecks will occur within the designated buffer zones.

C. Should targets and/or anomalies be identified, they will be avoided through the use of buffer zones as identified in Stipulation II.B above.

D. If any targets and/or anomalies cannot be avoided, the District will consult with the NYSHPO and other relevant signatories and other consulting parties to consider alternatives and determine the level of additional investigations (diving, documentation, additional reconnaissance diving, Phase II survey, etc.) are required.

E. The results of any investigations will be coordinated with the NYSHPO and other signatories and consulting parties.

F. If the anomalies/targets are determined to represent a historic property, the District in coordination with the NYSHPO and other relevant signatories and interested parties will determine alternatives including avoidance, data recovery through underwater archaeological investigations, and documentation. The District will resolve adverse effects to historic properties in accordance with Stipulation IV below.

III. NON-STRUCTURAL MEASURES AND ROAD RAISINGS

A. Non-structural measures include building retrofits, flood proofing, relocation, and acquisition/demolition. The District will identify the properties to be acquired/demolished, flood-proofed and/or relocated and determine, in coordination and consultation with the NYSHPO, and other relevant signatories and interested parties, if these properties are eligible for the National Register. As part of these investigations, the District will ensure the New York State structure form is completed. As part of these investigations, the District will also determine if archaeological survey(s) are required. The District will document the results of each properties determination of eligibility.

B. The District will determine if any historic properties will be effected by the proposed road raisings. The District will document the results of any investigations and provide them for review to the NYSHPO, the Shinnecock Indian Nation, the Unkechaug Indian Nation, property owners and any other relevant interested party.

C. If a property is determined to be eligible for the National Register, the District will consult with the NYSHPO, relevant signatories and interested parties to resolve the adverse effects in accordance with Stipulation IV.

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D. Archaeological investigations associated with non-structural measures, if required, should be a part of any treatment plan identified as part of the resolution of adverse effects in accordance with Stipulation IV.

IV. COASTAL PROCESS FEATURES

A. The District will determine, in coordination and consultation with the NYSHPO, the Shinnecock Indian Nation, the Unkechaug Indian Nation, and other relevant signatories and interested parties, what investigations are necessary to determine if the construction of any coastal process features would have an adverse effect on historic properties. The District would carry out investigations, as necessary, to identify historic properties, determine the proposed features effect.

B. The District will document the results of any investigations and provide them for review to the NYSHPO, Shinnecock Indian Nation, the Unkechaug Indian Nation and other relevant signatories and interested parties.

C. If a property is determined to be eligible for the National Register, the District will consult with the NYSHPO, relevant signatories and interested parties to resolve the adverse effects in accordance with Stipulation IV.

V. RESOLUTION OF ADVERSE EFFECTS

A. The District shall continue consultation with the NYSHPO, FIIS, the Shinnecock Indian Nation, the Unkechaug Indian Nation, and other signatories and consulting parties, as appropriate, pursuant to 36 CFR Part 800.6 to avoid, minimize or mitigate adverse effects to historic properties.

B. The District shall notify the NYSHPO and other relevant signatories, property owners and consulting parties and provide documentation regarding the identification and evaluation of the historic properties. The District will work with the NYSHPO, other relevant signatories, property owners, etc. to determine how best to resolve any adverse effects and document the proposed resolution.

C. Once there is agreement on how the adverse effects will be resolved, the District shall prepare treatment plan that will identify the activities to be implemented that will resolve the adverse effects. The treatment plan will be provided for review and comment prior to implementation.

D. Should the District, NYSHPO, and the relevant signatories disagree on how the adverse effects will be resolved, the District shall seek to resolve such objection through consultation in accordance with procedures outlined in Stipulation X.

VI. PUBLIC INVOLVEMENT AND OUTREACH

A. The District shall inform the public of the existence of this PA and the District's plan for meeting the stipulations of the PA. Copies of this agreement and relevant documentation prepared pursuant to the terms of this PA shall be made available for public inspection. Information regarding the specific locations of terrestrial and submerged archaeological sites, including potential wreck areas, will be withheld in accordance with the Freedom of Information Act and National Register Bulletin No. 29, if it appears that this information could jeopardize archaeological sites. Any comments received from the public related to the

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activities identified by this PA shall be taken into account by the District.

B. The District shall develop, in coordination with the NYSHPO, the FIIS, and other interested parties, publically accessible information about the cultural resources and historic properties investigations for the Undertaking in the form of brief publication(s), exhibit(s), or website.

VII. CURATION

A. The District shall ensure that all collections resulting from the identification and evaluation of surveys, data recovery operations, or other investigations pursuant to this PA are maintained in accordance with 36 CFR Part 79 until the collection is turned over to the landowner or other entity. Minimally, the District will ensure that analysis is complete and the final report(s) are produced and accepted by the NYSHPO.

B. The District shall be responsible for consulting with landowners regarding the curation of collections resulting from archaeological surveys, data recovery operations, or other studies and activities pursuant to this agreement. The District shall coordinate the return of collections to non-federal landowners. If landowners wish to donate the collection, the District, in coordination with the NYSHPO, the FIIS, and others to determine an appropriate entity to take control of the collection.

C. The District shall be responsible for the preparation of federally-owned collections and the associated records and non-federal collections donated for curation in accordance with the standards of the curation facility.

VIII. UNANTICIPATED DISCOVERY

A. The following language shall be included in construction plans and specifications:

"When a previously identified cultural resource, including but not limited to archaeological sites, shipwrecks and the remains of ships and/or boats, standing structures, and properties of traditional religious and cultural significance to the Shinnecock Indian Nation are discovered during the execution of the Project, the individual(s) who made the discovery shall immediately secure the vicinity and make a reasonable effort to avoid or minimize harm to the resource, and notify the Project's Contracting Officer's Representative (COR) and the District. All activities shall cease within a minimum of 50 feet from the inadvertent discovery (50-foot radius 'no work' buffer) until authorized by the District and the Project COR.

B. If previously unidentified and unanticipated properties are discovered during Project activities, the District shall cease all work in the vicinity of the discovery until it can be evaluated in accordance with 36 CFR Part 800.13 "Post Review Discoveries". Upon notification of an unanticipated discovery, the District shall implement any additional reasonable measures to avoid or minimize effects to the resource. Any previously unidentified cultural resource will be treated as though it is eligible for the NRHP until such other determination may be made.

C. The District shall immediately notify the NYSHPO, the FIIS and the signatories, and additional interested or consulting parties as appropriate, within 48 hours of the finding and request consultation to resolve potential adverse effects.

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1. If the District, NYSHPO, and the signatories agree that the cultural resource is not eligible for the NRHP, then the suspension of work in the area of the discovery will end.

2. If the District, NYSHPO, and the signatories agree that the cultural resource is eligible for the NRHP, then the suspension of work will continue, and the District, in consultation with the NYSHPO and the signatories, will determine the actions to avoid, minimize, or mitigate adverse effects to the historic property and will ensure that the appropriate actions are carried out.

3. If the District, the NYSHPO and the signatories cannot agree on the appropriate course of action to address an unanticipated discovery or effects situation, then the District shall initiate the dispute resolution process set forth in Stipulation VIII.C below.

IX. DISCOVERY OF HUMAN REMAINS

1. If any human remains and/or grave-associated artifacts are encountered during any of the investigations, including data recovery, the District follow the NYSHPO Human Remains Discovery Protocol (2008; Appendix D) and, as appropriate, develop a treatment plan for human remains that is responsive to the Council's Policy Statement on Human Remains" (September 27, 1988), the Native American Graves Protection and Repatriation Act (PL 101-601) and , US Army Corps of Engineers, Policy Guidance Letter No. 57 (1998) Indian Sovereignty and Government-to-Government Relations with Indian Tribes.

2. The following language shall be included in the construction plans and specifications:

"When human remains, suspected human remains, or indications of a burial are discovered during the execution of a Project, the individual(s) who made the discovery shall immediately notify the local law enforcement, coroner/medical examiner, and the Project COR and the District, and make a reasonable effort to protect the remains from any harm. The human remains shall not be touched, moved or further disturbed. All activities shall cease within a minimum of 50 feet from the area of the find (50-foot radius 'no work' buffer) until authorized by the District."

X. PROFESSIONAL QUALIFICATIONS AND STANDARDS

A. The District shall ensure that qualified professionals meeting the National Park Service professional qualifications for the appropriate discipline [National Park Service Professional Qualification Standards, Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44738-39)] are used to complete all identification and evaluation plans related to this undertaking, to include remote sensing surveys, underwater investigations, historic structure inventory and documentation.

B. All historic structures surveys carried out pursuant to this PA will be undertaken in accordance with the standards and guidelines of the NYSHPO and the Secretary of the Interior's *Standards for the Treatment of Historic Properties* (36 CFR Part 68).

C. All archaeological investigations carried out pursuant to this PA will be undertaken in accordance with the New York State Archaeological Council's Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in New Yorik State

(1994) and Cultural Resources Standards Handbook (2000), the NYSHPO Archaeological Report Format Requirements (2005), and the Secretary of the Interior's *Standards for the Treatment of Historic Properties* (36 CFR Part 68).

X. ADMINISTRATIVE TERMS

A. REPORTING

1. Each year following the execution of this PA until it expires or is terminated, the District shall provide the NYSHPO, FIIS, all signatories, and interested parties a summary report detailing work undertaken pursuant to this PA. This report will include any scheduling changes, problems encountered, project work completed, PA activities completed, and any objections and/or disputes received by the District in its efforts to carry out the terms of this PA.

2. Following authorization and appropriation, the District shall coordinate a meeting or equivalent with the signatories to be held annually on a mutually agreed upon date to evaluate the effectiveness of this PA and discuss activities carried out pursuant to this PA during the preceding year and activities scheduled for the upcoming year.

B. REVIEW PERIODS

1. The District shall ensure that all draft and final reports resulting from action pursuant to this PA will be provided to the NYSHPO, Council, FIIS, the Shinnecock Indian Nation, the Unkechaug Indian Nation, and, upon request, to other interested parties.

2. The NYSHPO, Council, FIIS, the Shinnecock Indian Nation, Unkechaug Indian Nation, and any other interested party shall have 30 calendar days to review and/or object to determinations, evaluations, plans, reports and other documents submitted to them by the District.

3. Any comments and/or objections resulting from a review of any District determination, evaluations, plans, reports and other documents must be provided in writing to the District.

4. If comments, objections, etc., are not received within 30 calendar days, the District will assume concurrence with the subject determination, evaluation, plan, report or other document submitted.

C. DISPUTE RESOLUTION

1. Should any signatory object in writing to the District object in writing to the District at any time to any actions proposed or the manner in which the terms of this PA are implemented, the District and the signatories shall attempt to resolve any disagreement arising from implementation of this PA.

2. If there is a determination that the disagreement cannot be resolved, the District shall forward all documentation relevant to the dispute to the Council and request the Council's recommendations or request the comments of the Council in accordance with 36 CFR

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Part 800.7(c).

3. The Council shall provide the District with its advice on the resolution of the objection within thirty (30) days of receiving adequate documentation. Any Council recommendations or comments provided in response will be considered in accordance with 36 CFR Part 800.7(c), with reference only to the subject of the dispute. The District shall respond to Council recommendations or comments indicating how the District has taken the Council's recommendations or comments into account and complied with the Council's recommendations or comments prior to proceeding with the Undertaking activities that are the subject to dispute. Responsibility to carry out all other actions under this PA that are not the subject of the dispute will remain unchanged.

4. If the Council does not provide its advice regarding the dispute within the thirty (30) calendar day time period, the District may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the District shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories to the PA, and provide them and the Council with a copy of such written response.

D. WITHDRAWAL AND TERMINATION

1. Any signatory may withdraw its participation in this PA by providing thirty (30) days advance written notification to all other signatories. In the event of withdrawal, any signatory to this PA may terminate it by providing 30 calendar days, written notice to the signatories. In the event of withdrawal, this PA will remain in effect for the remaining signatories.

2. This agreement may be terminated in accordance with 36 CFR Part 800, provided that the signatories consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. Any signatory requesting termination of this PA will provide thirty (30) days advance written notification to all other signatories.

3. In the event of termination, the District will comply with 36 CFR 800.4 through 800.6 with regard to individual undertakings covered by this Agreement.

E. DURATION AND SUNSET CLAUSE

1. This PA shall take effect upon execution by the District, the NYSHPO, and the signatories with the date of the final signature.

2. This PA will continue in full force and effect until the construction of the Undertaking is complete and all terms of this PA are met, unless the Undertaking is terminated or authorization is rescinded or a period of five years from execution of the PA has passed, at which time the agreement may be extended as written provided all signatories concur.

F.AMENDMENT

1. This PA may be amended upon agreement in writing by all signatories. Within thirty (30) days of a written request to the District, the District will facilitate consultation between the signatories regarding the proposed amendment.

2. Any amendments will be in writing and will be in effect on the date the amended PA is filed with the Council.

G. ANTI-DEFICIENCY ACT

All requirements set forth in this PA requiring expenditure of funds by the District are expressly subject to the availability of appropriations and the requirements of the Anti-Deficiency Act (31 U.S.C. 1341). No obligation undertaken by the District under the terms of this PA shall require or be interpreted to require a commitment to extend funds not appropriated for a particular purpose. If the District cannot perform any obligation set forth in this PA because of unavailability of funds that obligation must be renegotiated among the District and the signatories as necessary.

Execution and implementation of this PA evidences that the District has satisfied its Section 106 responsibilities for all individual undertakings of the Project, and has afforded the NYSHPO and the Council an opportunity to comment on the undertaking and its effects on historic properties.

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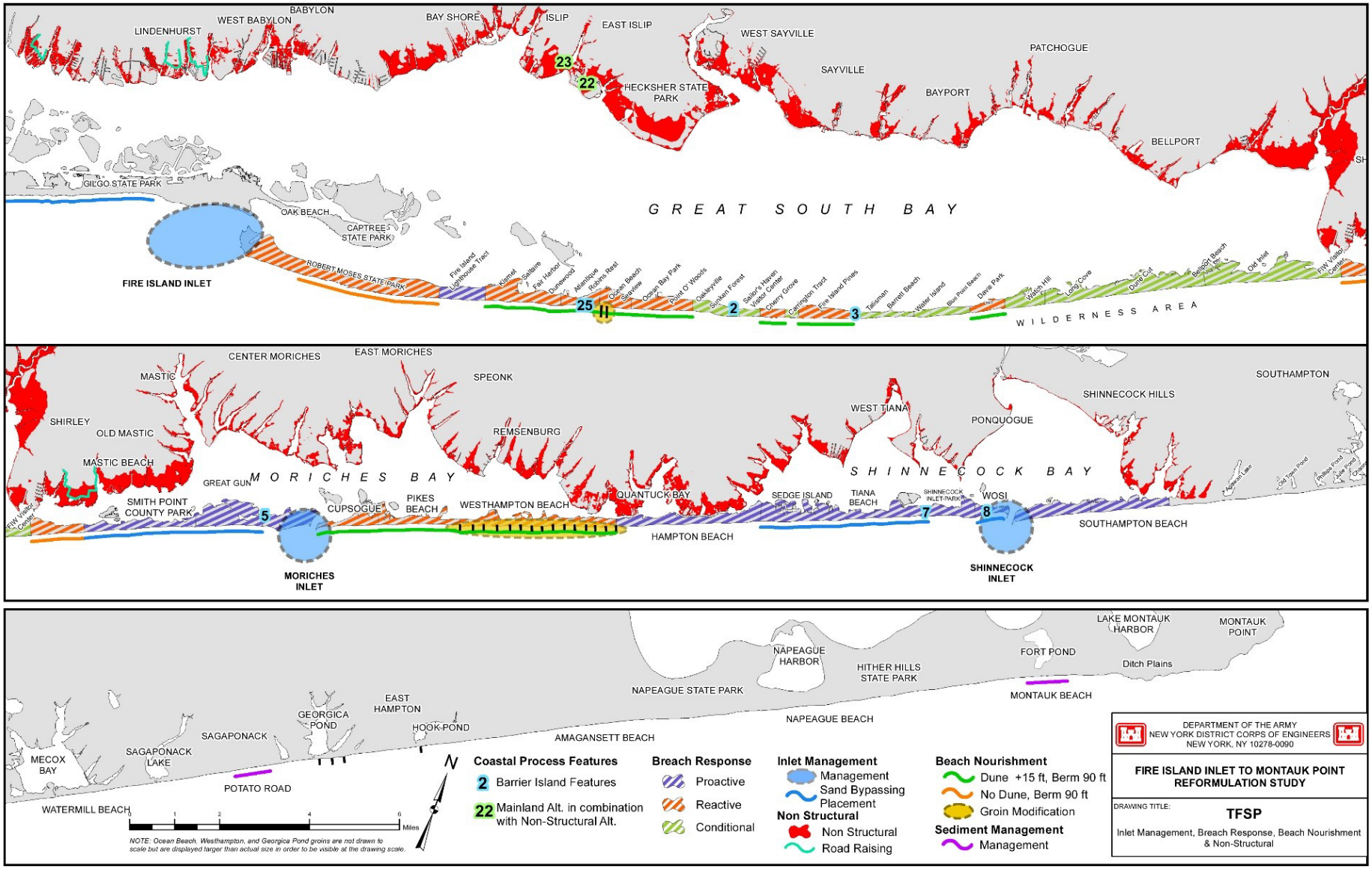

Figure 1: Area of Potential Effect for all elements of the proposed Project.

APPENDIX F

LIST OF DISTRICTS ON THE STUDY AREA MAINLAND AND COMPONENTS DETERMINED TO BE POTENTIALLY ELIGIBLE FOR LISTING ON THE NRHP

VI. INDIVIDUAL PROPERTIES ELIGIBLE FOR LISTING IN THE NATIONAL REGISTER: PRELIMINARY STUDY LIST

The historic resources surveyed within the APE were intended to represent the full spectrum of existing types and styles in aboveground resources, 50 years old or older, associated with the historical contexts of the project area. One thousand four hundred and ninety historic resources were surveyed; of those, 49 were identified as being potentially eligible for the National Register of Historic Places as individual resources.

The majority of the 49 properties were located in the easternmost parts of the APE; 11 are in Quogue and eight in West Hampton Bays. Only one resource of those surveyed was identified as being built prior to 1840; this property is in Babylon. The prevailing primary context of the potentially eligible resources was early suburbanization, for which the period of significance falls between 1890 and 1920. More than half of the individual resources on the potentially eligible list are residential properties.

These properties have been identified through fieldwork and general contextual research as retaining sufficient integrity and demonstrating significance as outlined in both this report and *National Register Bulletin 15: How to Apply the Criteria for National Register Evaluation* (Andrus 2002). These properties may be further evaluated (based upon more intensive research and/or fieldwork) as the FIMP's proposed actions and priority areas are further developed and refined. Other properties not inventoried and/or not included below may also exhibit potential for listing in the National Register. This list is intended as a baseline collection of significant properties. As part of the phased approach to Section 106 compliance, this list is intended to serve as a preliminary decision-aiding tool rather than as a definitive authority. The following list of properties have been determined to be associated with one or more the relevant historical contexts of the APE and are thought to fulfill at least one of the Secretary of Interior's established criteria necessary for listing on the National Register.

												105_671.00
												105_569.00
												106_764.10

												105_1084.00
												105_1085.00
												106_731.00
												109_1110.00
												116_390.00
												117_289.00
												116_179.00
												153_984.00
												153_1009.00

												USACEID
												153_655.00
												USACEID
												USACEID
												153_642.00
												USACEID
												153_648.00
												USACEID
												153_659.00
												USACEID
												186_1119.00
												USACEID
												179_1071.00
												USACEID
												179_1200.00
												USACEID
												185_230.00
												USACEID
												189_300.00
												USACEID
												194_480.00
												USACEID

												194_156.00
												USACEID
												194_362.00
												USACEID
												200_84.00
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												207_176.00
												USACEID
												210_112.00
												USACEID
												210_110.00
												USACEID
												210_106.00
												USACEID
												210_109.00
												USACEID
												207_181.00
												USACEID
												215_21.00
												USACEID
												USACEID
												219_23.00

												USACEID
												213_191.00
												USACEID
												215_112.00
												USACEID
												USACEID
												215_26.00
												USACEID
												218_101.00
												USACEID
												219_80.00
												USACEID
												219_76.00
												USACEID
												219_59.00
												USACEID
												222_178.00
												USACEID
												USACEID
												230_115.00
												USACEID

												230_105.00
												USACEID
												185_747.00

DISTRICTS ELIGIBLE FOR LISTING IN THE NATIONAL REGISTER: PRELIMINARY STUDY LISTS

According to *National Register Bulletin 15: How to Apply the Criteria for National Register Evaluation* (Andrus 2002), a district "results from the interrelationship of its resources, which can convey a visual sense of the overall historic environment or be an arrangement of historically or functionally related properties." In addition, the bulletin notes that a district "may even be considered eligible if all of the components lack individual distinction, provided that the grouping achieves significance as a whole within its historic context."

Within the APE, 10 historic districts were identified. The districts are primarily residential; however, one in Lindenhurst is associated with the maritime and fishing industry. The majority of the residential districts are associated with the primary contexts of early or postwar suburbanization, spanning almost 70 years in history. The district identified in Mastic has a considerable number of vacation or seasonal homes, and the West Hampton district has 13 properties of the 31 associated with the secondary context of resort development. Although resort and vacation community construction historically occurred in the western portion of Suffolk County along the South Shore, today it seems as though more properties associated with seasonal use and resort activities are located further east.

The following study areas feature districts that are likely to be eligible for listing in the National Register of Historic Places. Within the APE, 10 areas stood out as being potentially eligible historic districts. These properties have been identified through fieldwork and general contextual research as retaining sufficient integrity and demonstrating significance as outlined in both this report and *National Register Bulletin 15*. These properties may be further evaluated (based upon more intensive research and/or fieldwork) as the FIMP's proposed actions and priority areas are further developed and refined. Other properties not inventoried and/or not included below may also exhibit potential for listing in the National Register. However, this list is intended as a baseline collection of significant properties. As part of the phased approach to Section 106 compliance, this list is intended to serve as a preliminary decision-aiding tool rather than as a definitive authority; accordingly, some of the properties below may be later determined as non-contributing properties. This list is intended primarily to show the probability for eligible districts, and includes portions of subarea 1C and 1E, as well as subareas 1F, 3D, 4A, 4F, 5B, 6A, 6C, and 7B. The following individual properties are located within the above district areas.

Maritime/Fishing District Area – 1C

											Setting
											1
											Setting
											1
											1
											Setting
											1
											Setting
											1
											Setting
											1

Residential District Area – 1E

											USACEID

Residential District Area – 1F

											USACEID
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											109_1105.00
140_SA1f		sequams lane east		islip	postwar suburban	residential	1945-1960	DSCN0345.jpg		SA1f	105_1081.00
											106_632.00
											106_589.40
											105_531.00
											106_631.00
											105_833.00
											105_823.00
											105_824.00
											105_684.00

											105_534.00
											106_630.00
											106_580.00
											105_768.00
160_SA1f	179	sequams lane cntr		islip	early suburban	residential	1920-1945	DSCN0370.jpg		SA1f	105_1050.00
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											106_657.00
											105_597.00
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											106_589.50
											106_634.00
											106_572.00
											105_1037.00
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											106_652.00
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											106_656.00
											106_589.30
											106_689.00
											106_640.00
											105_317.00
											106_638.00

											106_637.00
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											106_570.00
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Residential District Area – 3D

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Residential District Area – 4A

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											161_49.00
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Residential District Area – 4F

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Residential District Area – 5B

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Residential District Area – 6A

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											210_114.00
											210_115.00
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APPENDIX G

COASTAL ZONE MANAGEMENT AND LOCAL WATERFRONT REVITALIZATION PROGRAMS

APPENDIX G1

VILLAGE OF OCEAN BEACH POLICY STATEMENT

NEW YORK STATE DEAPRTMENT OF STATE
COASTAL ZONE MANAGEMENT PROGRAM

Policy Statement Supplement to Federal Consistency Assessment Form

Project: Fire Island to Montauk Point (FIMP) Reformulation Project

Applicant: U.S. Army Corps of Engineers, New York District

Applicable Policies: In accordance with the Coastal Management Program (CMP) policies of New York State (NYDOS 2006), 26 policies were identified as potentially applicable to the proposed Project. These policies are presented below, followed by an explanation of Project consistency. Policies that are clearly not applicable are not discussed.

Policy 1 Restore, revitalize and redevelop deteriorated and underutilized waterfront areas for commercial, industrial, cultural, recreational and other compatible uses.

Determination – The New York District (District) is proposing measures to provide shore protection and reduce storm damage reduction for the south shore of Long Island, New York, from Fire Island Inlet to Montauk Point. The majority of Fire Island lies within the legislative boundaries of the Fire Island National Seashore (FIIS). The study area includes the barrier island chain from Fire Island Inlet to Southampton inclusive of the Atlantic Ocean shorelines, and adjacent back-bay areas along Great South, Moriches, and Shinnecock Bays. The study area also includes portions of the Towns of Babylon, Islip, Brookhaven, Southampton and Easthampton, as well as 12 incorporated Villages, the entirety of FIIS, the Poospatuck Indian Reservation, and the Shinnecock Indian Reservation. The area/land supports a variety of commercial, industrial, cultural, recreational and other compatible uses. The Project will help to stabilize the south shore of Long Island, protecting it from storm damage, and protecting these uses. The without Project condition would eventually impact commercial, industrial, cultural, recreational and other compatible uses. District has determined that the Tentatively Selected Plan (TSP) would be consistent with, and would advance, this policy.

Policy 2 Facilitate the siting of water dependent uses and facilities on or adjacent to coastal waters.

Determination – The Project area supports a variety of public recreational activities. Numerous water dependent uses, such as marinas, beaches, parks and small business which support the summer tourism industry are located within the Project area. The Project will help to stabilize the south shore of Long Island, protecting it from storm damage, and protecting these uses. The without Project condition would eventually impact public recreational activities. CENAN has determined that the TSP would be consistent with, and would advance, this policy.

Policy 4 Strengthen the economic base by encouraging the development and enhancement of those traditional uses and activities that have provided such areas with their unique maritime identity.

Determination – The TSP would insure that traditional uses of the south shore of Long Island

would be enhanced and preserved. The TSP would stabilize the shoreline and manage the risk from coastal storm damage to the surrounding area, thus encouraging the development and enhancement of those traditional uses and activities that have provided the Project area with its unique maritime identity. Therefore, the District has determined that the TSP would be consistent with this policy.

Policy 5 Encourage the location of development in areas where public services and facilities essential to such development are adequate.

Determination – The TSP would manage the risk of coastal storm damage to existing infrastructure along the south shore of Long Island from hurricane and storm surge flooding. Risk management would provide stability and enhancement to existing and future development Projects. The without Project condition would eventually impact development as contractors would be hesitant to develop in an unstable, unprotected environment. Therefore, CENAN has determined that the TSP would be consistent with this policy.

Policy 7 Significant coastal fish and wildlife habitat will be protected, preserved, and where practicable, restored so as to maintain their viability as habitats.

Determination - All of Great South Bay and many adjoining marshes and natural areas are designated as Significant Coastal Fish and Wildlife Habitat (SCFWH). Policy 7 states that filling of shallows, grading, shoreline alteration and dredging are among generic activities most likely to affect protected habitats. These activities are integral to the proposed Project which consists of dredging sand from offshore borrow areas for placement on the Atlantic shoreline of Fire Island to create enhanced beach area and dunes for coastal storm risk management. No dredging will occur within State-designated SCFWH. No filling or grading will occur within marshes or wetlands; fill placement is limited to the Atlantic shoreline only. Fill placement along the Atlantic shoreline of Fire Island in the Project area will create wider beaches and dunes to minimize breaching and overwashing and consequent damage to habitats and communities on the barrier island and along the south shore of Long Island. There will be no change in existing tidal exchange patterns, only a continuation of the non-storm induced conditions.

A comprehensive assessment of potential Project impacts to threatened and endangered species and habitats was conducted and is presented in Chapter 4 of the Environmental Impact Statement (EIS) prepared for the Project and the Biological Assessment (BA) (see Appendix B). The proposed activities would be undertaken in a manner consistent with this policy.

Policy 8 Protect fish and wildlife resources in the coastal area from the introduction of hazardous wastes and other pollutants which bio-accumulate in the food chain or which cause significant sub-lethal or lethal effect on those resources.

Determination – The material that may be obtained from the offshore borrow areas, consists primarily of clean, coarse-grained sand. The material that would be dredged and used for beach nourishment on the down drift beaches would not contain hazardous wastes or other pollutants that would bio-accumulate in the food chain or cause significant sub-lethal or lethal effects on those resources. Sediment re-suspension is likely to cause temporary increases in turbidity; however, these increases would be limited in duration and spatial extent and are not expected to

significantly affect fish or aquatic wildlife in the Project areas. The proposed activities would not adversely affect fish and wildlife resources and would be undertaken in a manner consistent with this policy.

Policy 12 Activities or development in the coastal area will be undertaken so as to minimize damage to natural resources and property from flooding and erosion by protecting natural protective features including beaches, dunes, barrier islands and bluffs.

Determination – The Long Island south shore barriers, inlets, and associated beaches, dunes, and nearshore areas are natural "defenses" that help preserve coastal lands and property from damage and reduce the danger to resources and property resulting from flooding and erosion. The proposed activities would be conducted in the inlets, mainland (10-year floodplain non-structural building retrofits, floodproofing, relocation, and acquisition, and road raising in 4 locations), and barrier islands. These properties and their associated coastal processes ordinarily provide varying levels of risk management measures to the barrier island upland areas, the south shore bays, and Long Island south shore mainland. The purpose of the Project is to implement measures that will augment and restore the natural protective capabilities of the barrier islands, inlets, and mainland.

The nourishment of beaches and dunes with appropriate material is an allowable activity pursuant to the coastal erosion hazard area regulations contained in 6 NYCRR Part 505 (see also Policy 35), and is a non-structural erosion control measure preferred over structural measures by the State in its tidal wetlands, erosion hazards, and coastal management program statutes and regulations (see Policies 17, 35, and 44). Restoring the natural protective characteristics of the barrier island, inlets, and associated beaches, dunes, and nearshore areas (resulting in the protection of the barrier island itself, the bay-system and the mainland of Long Island) would be consistent with and further promote Policy 12, which is to minimize damage to natural resources and property by protecting the naturally occurring protective characteristics and the associated physical processes.

Policy 13 The construction or reconstruction of erosion protection structures shall be undertaken only if they have a reasonable probability of controlling erosion for at least thirty years as demonstrated in design or construction standards and or assured maintenance or replacement programs.

The proposed Project is a long-term (50-year) plan for storm damage reduction.

Policy 14 Activities and development, including the construction or reconstruction of erosion protection structures, shall be undertaken so that there will be no measurable increase in erosion or flooding at the site of such activities or development, or at other locations.

Determination – The proposed Project consists of both structural measures (groin modifications) and non-structural measures (soft measures such as beach fill and 10-year floodplain non-structural building retrofits, floodproofing, relocation, and acquisition, and road raising in 4 locations) for coastal storm risk management for the south shore of Long Island. No structures that would generate increases in erosion or flooding will be constructed. The Project is consistent with and would advance this policy.

Policy 15 Mining, excavation or dredging in coastal waters shall not significantly interfere with the natural coastal processes which supply beach materials to land adjacent to such waters and shall be undertaken in a manner which will not cause an increase in erosion of such land.

Determination – The proposed action includes the removal of material from offshore borrow sources. The borrow areas are located more than 1 mile offshore, where excavation and dredging has been demonstrated to have a negligible impact on the nearshore coastal processes, and will not cause an increase in coastal erosion. Best management practices will be followed during all dredging activities and the proposed dredging depth in the borrow areas will not reduce the flow of sediments to adjacent areas. Coastal processes along the shoreline sand placement areas will not be interfered with as only natural sands will be placed; no structures or shoreline hardening is proposed. The proposed activities are consistent with this policy.

Policy 16 Public funds shall only be used for erosion protective structures where necessary to protect human life, and new development which requires a location within or adjacent to an erosion hazard area to be able to function, or existing development; and only where the public benefits outweigh the long-term monetary and other costs including the potential for increasing erosion and adverse effects on natural protective features.

Determination – The Project will minimize breaching and overwashing of the barrier islands and is a necessary measure for storm damage reduction on the barrier islands as well as the south shore of Long Island. The Project will enhance and recreate natural protective features of the barrier islands through beach renourishment and berm construction. Benefits to the human and natural environments outweigh the expenditures of public funds. This has been demonstrated through the completion of a comprehensive economic assessment of the Reformulation Plan. The Project is consistent with this policy.

Policy 17 Non-structural measures to minimize damage to natural resources and property from flooding and erosion shall be used whenever possible.

Determination – The proposed use of suitable dredged sand for beach nourishment and dune creation is a non-structural measure. The beach nourishment minimizes damage to natural resources and property from flooding and erosion by strengthening natural protective characteristics and providing the sediments necessary for these characteristics to function (see also Policies 12 and 15). The policy explanation states that consistency with this policy requires the use of such non-structural measures when they are appropriate and available. The Project is consistent with this policy.

Policy 18 To safeguard the vital economic, social and environmental interests of the State and of its citizens, proposed major actions in the coastal area must give full consideration to those interests, and to the safeguards which the State has established to protect valuable coastal resource areas.

Determination – The Project will reduce the frequency and degree of breaches and overwashes of the barrier islands and mainland and thereby afford coastal storm risk management to the

barrier as well as communities on the south shore of Long Island. In addition, several of the inlets (such as Fire Island Inlet and Moriches Inlet) are regionally important navigation inlets that must be stabilized and maintained. The areas adjacent to the inlet support regionally important water-dependent and water-related uses, including commercial fishing and recreational boating facilities, public parklands, and other uses. The physical character of the barriers must be maintained to protect these uses.

The south shore of Long Island also supports a variety of public recreational and commercial activities. The south shore of Staten Island's coastline must be maintained to protect these uses. The without Project condition would eventually impact public recreational and commercial activities. The Project would provide coastal storm risk management to an important public recreational area and adjacent commercial and residential properties with minimal short-term impacts to economic, social, and environmental resources. Therefore, the District has determined that the TSP would be consistent with and advance this policy.

Policy 19 Protect, maintain, and increase the level and types of access to public water related recreation resources and facilities.

Determination – The beach areas in the proposed Project area support a variety of public recreational activities (see also Policies 18 and 20). The TSP would result in positive impacts on recreation as a result of better coastal storm risk management in the Project area. The without Project alternative would result in increased flood risks and increased erosion, thereby decreasing recreational potential in the area.

Buffer areas approximately 1,000 feet in length will be closed during construction activities for safety reasons. Although a reduction in public access to the work site during construction would occur, this impact would be temporary. As beach placement activities are completed within each 1,000-foot compartment, the buffer is shifted accordingly. Public use of the beach area would be restored at that time. The proposed activities would be undertaken in a manner consistent with this policy. Also, over the 50-year Project life the proposed activities would advance the policy to protect, maintain, and increase public access to and use of public water-related recreation resources and facilities.

Policy 20 Access to publicly-owned foreshore and to lands immediately adjacent to the foreshore or the water's edge that are publicly-owned shall be provided and it shall be provided in a manner compatible with adjoining uses.

Determination – Many of the lands and waters adjacent to and at the sites of the proposed activities are publicly-owned and accessible underwater lands and parklands that support a variety of public uses are present in the area (see also Policies 18 and 19). Based on the Policy 19 analysis above, the proposed activities would be undertaken in a manner consistent with and would advance this policy.

Policy 21 Water dependent and water enhanced recreation will be encouraged and facilitated, and will be given priority over non-water-related uses along the coast.

Determination – Many of the lands and waters within the Project area are publicly-owned and

currently support a variety of public water dependent uses such as fishing, boating and beaching. The Project will protect and enhance these uses in the long-term, with only staggered short-term loss of use during construction, as described under Policy 19. The proposed Project is consistent with and will advance this policy.

Policy 22 Development when located adjacent to the shore will provide for water-related recreation whenever such use is compatible with reasonably anticipated demand for such activities, and is compatible with the primary purpose of the development.

Determination – The Project is not "development" per se, but is a coastal storm risk management measure. Water-related recreation is a primary land use in the Project area and will remain as such. The Project will protect and enhance these water-dependent recreational uses in the long-term, with only staggered short-term loss of use during construction, as described under Policy 19. The proposed Project is consistent with and will advance this policy.

Policy 23 Protect, enhance and restore structures, districts, areas or sites that are of significance in the history, architecture, archeology or culture of the State, its communities, or the Nation.

Determination – The Fire Island Light Station (Town of Islip) and the Beach Road Historic District (Village of Southampton) are the only properties within the study area that are listed on the National Register. A number of other structures, each more than 50 years of age, which may possess the requisite characteristics and integrity to be eligible for the National Register are visible from the beach (JMA 2000), including: the Robert Moses State Park Tower; the former Point O' Woods Life Saving Station (presently the Fire Island Hotel and Resort), and houses in various communities in the study area (see Table 3.10-1 of the EIS). The Project will afford additional coastal storm risk management to existing properties on the National Register, as well as the other identified structures. The Project will not affect archaeological site or marine resources, such as shipwrecks. The Project will protect cultural resources and is consistent with this policy.

Policy 24 Prevent impairment of scenic resources of statewide significance.

Determination – Portions of East Hampton have been designated as scenic resources of statewide significance (NYSDOS 2010). Although some of these portions of East Hampton are within the Project area, CENAN is not proposing any actions in these areas that will impact these scenic resources of statewide significance. Consequently, the Project will not impair scenic resources of statewide significance.

Policy 25 Protect, restore, or enhance natural and man-made resources which are not identified as being of statewide significance, but which contribute to the overall scenic quality of the coastal area.

Determination – Implementation of the TSP would require the use of large construction equipment, such as dredge barges and excavators that would visually interrupt the natural landscape during construction activities. These short-term impacts would be similar to visual

impacts that currently occur and would not be significant. Long-term, the TSP would reduce the impacts from storm and flooding events that may cause significant erosion or breaching of beaches, dunes, and shorelines. By reducing these types of impacts, the TSP will contribute positively to the overall scenic quality of the coastal area.

Policy 30 Municipal, industrial, and commercial discharge of pollutants, including but not limited to, toxic and hazardous substances, into coastal waters will conform to State and National water quality standards.

Determination – The Project will not discharge pollutants. The Project is likely to result in sediment re-suspension and associated increases in turbidity during dredging in the borrow areas and during sand placement along the shoreline. These turbidity increases will be temporary and will not result in a violation of this policy.

Policy 35 Dredging and dredge spoil disposal in coastal waters will be undertaken in a manner that meets existing State dredging permit requirements and protects significant fish and wildlife habitats, scenic resources, natural protective features, important agricultural lands and wetlands.

The proposed dredging of clean, relatively coarse-grained accumulated sand from offshore borrow areas will not adversely affect significant coastal fish and wildlife habitats (see Policy 7), natural protective characteristics (see Policies 12, 14, 15, 17, and 18), or wetlands (see Policy 44).

The proposed dredging activities would take place in waters greater than 6 feet deep, and are therefore not required to meet the regulatory standards contained in the State's tidal wetlands land use regulations in 6 NYCRR Part 661. However, the use of the dredged material for beach nourishment in the areas adjacent to the Atlantic Ocean tidal wetland littoral zone would require a tidal wetlands permit (see Policy 44). The sand placement area is within state designated significant fish and wildlife habitats. The State tidal wetlands regulations in 6 NYCRR Part 661 indicate that the use of the dredge material for beach nourishment in an area adjacent to tidal wetlands is a generally compatible use; however, such a use is dependent on several character and resource values and the effects such nourishment and its associated dredged materials might have on intertidal wetlands and adjacent areas. The material to be dredged and used to nourish the beaches is compatible with the material currently on the beaches. The nourishment of beaches and dunes where necessary and appropriate is an activity that may be authorized pursuant to the coastal erosion hazard area regulations in 6 NYCRR Part 505 (see also Policy 12).

The Project will be implemented in such a manner as to avoid adverse impacts to these habitats during construction to the extent practicable. Long-term benefits to significant fish and wildlife habitats are anticipated as the placement of the beach fill would lead to larger and wider beach areas that could be used for breeding and nesting by shorebirds.

There is an overriding need to maintain the physical character of the barrier island and its associated natural protective characteristics, as well as the natural resource values of these characteristics. An EIS has been prepared for the Project which details the potential impacts to

natural and cultural resources. In addition, all required permits, such as a NYSDEC Tidal Wetlands Permit, Section 401 Water Quality Certificate, Clean Water Act Section 404 permit, will be acquired and all permit conditions will be complied with.

Consultation and coordination with State and Federal resource agencies (US Fish &Wildlife Service, NOAA Fisheries, National Park Service and State Natural Resource agencies) will be conducted and species specific seasonal restrictions and mitigation measures will be put in place. The proposed activities will be conducted in a manner consistent with this policy.

Policy 38 The quality and quantity of surface water and groundwater supplies will be conserved and protected, particularly where such waters constitute the primary or sole source of water supply.

Determination – The Project will not affect water supply sources. Temporary increases in turbidity may occur during dredging and sand placement activities; however, these will be limited to construction periods and will be limited in spatial extent and duration. Best management practices will be implemented to minimize impacts. The Project is consistent with this policy.

Policy 41 Land use or development in the coastal area will not cause national or State air quality standards to be violated.

Determination – The Project will result in mobile air emissions sources during construction only. No stationary sources are proposed. A conformity analysis is being conducted for the Project and any required mitigation measures to offset temporary emissions increases will be implemented. A detailed air impact analysis is included with the EIS prepared for the FIMP Reformulation Project. The Project is consistent with this policy.

Policy 43 Land use or development in the coastal area must not cause the generation of significant amounts of the acid rain precursors: nitrates and sulfates.

Determination – Refer to the response to Policy 41; the Project is consistent with this policy.

Policy 44 Preserve and protect tidal and freshwater wetlands and preserve the benefits derived from these areas.

Determination – As demonstrated above in the Policy 35 analysis, the proposed activities would take place areas adjacent to the Atlantic Ocean littoral zone and intertidal wetland areas. The proposed activities are compatible uses according to the tidal wetlands land use regulations in 6 NYCRR Part 661. The proposed activities include one of the preferred non-structural erosion control measures identified in the State erosion hazard area regulations, the Coastal Policies contained in the State's Coastal Management Program document, the State tidal wetlands land use regulations, and Article 42 of the Executive Law and its implementing regulations in 19 NYCRR Part 600. The beach nourishment activities will result in physical changes to the intertidal area that will adversely affect some invertebrates at the site of the beach nourishment activities while the Project is being undertaken (see Policy 35 analysis). However, these adverse effects would not be significant, would be temporary, and would not result in significant adverse

effects nor significantly impair the benefits derived from the tidal wetland areas. The proposed activities would be undertaken in a manner consistent with this policy.

References

JMA 2000	John Milner Associates, Inc. (JMA). 2000. Cultural Resources Baseline Study Fire Island Inlet to Montauk Point. Suffolk County, New York Reformulation Study. Prepared for The Greeley-Polhemus Group and the U.S. Army Corps of Engineers New York District.
NYSDOS 2006	New York State Department of State (NYSDOS). "Coastal Management Program, State Coastal Policies (Including Program changes from 1982-2006)." 2006.
NYSDOS 2010	NYSDOS, Division of Coastal Resources. "East Hampton Scenic Areas of Statewide Significance." January 2010.

APPENDIX G2

VILLAGE OF OCEAN BEACH WATERFRONT ASSESSMENT FORM

VILLAGE OF OCEAN BEACH

LOCAL WATERFRONT REVITALIZATION PROGRAM

POLICY STATEMENT

Project: Fire Island Inlet to Montauk Point (FIMP) Reformulation Project

Applicant: U.S. Army Corps of Engineers, New York District

Project Overview: The Project will provide stabilization along the Fire Island Inlet to Montauk Point of the Fire Island barrier island. Although the project will not afford new public access to the waterfront, existing public access will be maintained and enhanced.

A more detailed description of the Project is provided in the *Fire Island Inlet to Montauk Point Environmental Impact Statement* (EIS), which also includes a comprehensive assessment of potential environmental impacts from the Project.

Applicable Policies: In accordance with the coastal management policies that apply to the Village of Ocean Beach Local Waterfront Revitalization Area (LWRA) that follow the 13 amended policies issued by the New York State Department of State, which have been refined from the original 44 State Coastal Policies (NYSDOS 2006). Upon completion of the Waterfront Assessment Form (WAF) 4 policies were identified as potentially applicable to the proposed Project. These policies are presented below, followed by an explanation of Project consistency.

Policy 5 Protect and restore ecological resources, including significant fish and wildlife habitats, wetlands, and rare ecological communities.

Determination – All of Great South Bay and many adjoining marshes and natural areas are designated as Significant Coastal Fish and Wildlife Habitat (SCFWH). All or portions of additional SCFWHs are within the Project area; however, they are not within the Village of Ocean Beach.

Filling of shallows, grading, shoreline alteration and dredging are among generic activities most likely to affect protected habitats. These activities are integral to the proposed Project which, in the area of the Village of Ocean Beach, consists of dredging sand from offshore borrow areas for placement on the Atlantic shoreline of Fire Island to create enhanced beach area and dunes for coastal storm risk management. No filling or grading will occur within marshes or wetlands; fill placement is limited to the Atlantic shoreline only. Fill placement along the Atlantic shoreline of Fire Island in the area of the Village of Ocean Beach will create wider beaches and dunes to minimize breaching and overwashing and consequent damage to habitats and communities on the barrier island and along the south shore of Long Island. There will be no change in existing tidal exchange patterns, only a continuation of the non-storm induced conditions.

A comprehensive assessment of potential Project impacts to threatened and endangered species and habitats was conducted and is presented in the EIS prepared for the Project. The proposed activities would be undertaken in a manner consistent with this policy.

Policy 7 Minimize loss of life and damage to structures and natural resources from flooding and erosion. Protect the integrity of Fire Island, so as to ensure its continued function as an effective barrier against flooding and erosion for the Long Island mainland.

Determination – The Long Island south shore barriers and their associated beaches, dunes, and nearshore areas are natural "defenses" that help preserve coastal lands and property from damage and reduce the danger to resources and property resulting from flooding and erosion. The proposed activities would be conducted in the nearshore littoral zone and on the south shore barrier island beaches. These properties and their associated coastal processes ordinarily provide varying levels of protection to the barrier island upland areas, the south shore bays, and Long Island south shore mainland. The natural physical functioning and integrity of the beaches, nearshore areas, and dunes immediately down drift are affected, resulting in increased vulnerability to storm damage to natural resources and property from coastal flooding and erosion. The purpose of the Project is to implement measures that will augment and restore the natural protective capabilities of the natural protective characteristics down drift of the inlet.

Sand obtained from the offshore borrow area would be pumped to the beach areas to restore the natural protective features of the barrier island. The nourishment of beaches and dunes with appropriate material is an allowable activity pursuant to the coastal erosion hazard area regulations contained in 6 NYCRR Part 505 and is a non-structural erosion control measure preferred over structural measures by the State in its tidal wetlands, erosion hazards, and coastal management program statutes and regulations. Restoring the natural protective characteristics of the barrier island (resulting in the protection of the barrier island itself, the bay-system and the mainland of Long Island) would be consistent with and further promote Policy 7, which is to minimize damage to natural resources and property by protecting the naturally occurring protective characteristics and the associated physical processes.

Policy 11 Improve public access to and use of public lands and waters.

Determination – The beach areas in the Village of Ocean Beach support a variety of public recreational activities. A temporary reduction in off-season, public access to the work site during the construction season would occur. However, this would be off-set over the longer term by the increased width of the nourished public beach and the continued protection and maintenance of the beach as a public resource that supports a high level of public access and use. Buffer areas approximately 1,000 feet in length will be closed during construction activities for safety reasons. As beach placement activities are completed within each 1,000-foot compartment, the buffer is shifted accordingly.

Public use of the beach area would be restored at that time. Over the Project life (approximately 50 years), the proposed activities would advance the policy to protect, maintain, and increase public access to and use of public water-related recreation resources and facilities. The Project will be consistent with this policy by maintaining and enhancing the beaches within the Village.

Policy 12 Enhance visual quality and protect outstanding scenic resources.

Determination – The Village of Ocean Beach is not designated as a scenic resource of statewide significance (NYSDOS 2010). Consequently, the Project will not impair scenic resources of statewide significance. However, the visual quality of the coastal zone is a major component of the overall character in the Village. The Village contains a variety of natural visual attributes, including the estuarine waters of Great South Bay, a complex land and water interface on the bay side, and a dynamic beach and dune system on the ocean side. The public recognizes that these features make an important contribution to the desirability of the community to live and recreate. The Project will be consistent with this policy by maintaining and enhancing the beach and dune areas of the Village.

References

NYSDOS 2006 New York State Department of State (NYSDOS). "Coastal Management Program, State Coastal Policies (Including Program changes from 1982-2006)." 2006.

NYSDOS 2010 NYSDOS, Division of Coastal Resources. "East Hampton Scenic Areas of Statewide Significance." January 2010.

APPENDIX G3

POLICY STATEMENT FOR THE TOWN OF EAST HAMPTON LOCAL WATERFRONT REVITALIZATION PROGRAM

INC. VILLAGE OF OCEAN BEACH

Waterfront Assessment Form (WAF)

A. INSTRUCTIONS (Please print or type all answers)

1. Applicants, or in the case of direct actions, Village of Ocean Beach agencies, shall complete this Waterfront Assessment Form (WAF) for proposed actions which are subject to the consistency review law. This assessment is intended to supplement other information used by the designated Village of Ocean Beach agency in making a determination of consistency.

2. Before answering the questions in Section C, the preparer of this form should review the policies and explanations of policy contained in the Local Waterfront Revitalization Program (LWRP), a copy of which is on file in the Village of Ocean Beach Village Clerk's office. A proposed action should be evaluated as to its significant beneficial and adverse effects upon the coastal area.

3. If any questions in Section C on this form are answered "yes", then the proposed action may affect the achievement of the LWRP policy standards contained in the consistency review law. Thus, the action should be analyzed in more detail and, if necessary, modified prior to making a determination regarding its consistency with the LWRP policy standards. If an action cannot be certified as consistent with the LWRP policy standards, it shall not be undertaken.

B. DESCRIPTION OF SITE AND PROPOSED ACTION

1. Type of agency action (check appropriate response):

__X_ (a) Directly undertaken (e.g. capital construction, planning activity, agency regulation, land transaction)
_____(b) Financial assistance (e.g. grant, loan, subsidy)
_____(c) Permit, approval, license, certification
_____(d) Agency undertaking action

2. Type of Approval Action Requested (check all that apply)
□ Site Plan Approval ☐ Variance
□ Rezoning ☐ Building Permit
□ Subdivision ☐ Special Use Permit
X Other

3. Describe nature and extent of action:
Atlantic Coast of Long Island, New York. The U.S. Army Corps of Engineers, New York District (CENAN) is proposing measures to provide shore protection and reduce storm damage reduction for the south shore of Long Island, New York, from Fire Island Inlet to Montauk Point (Fire Island Montauk Point Reformulation Project). Beach fill from offshore sites, and other associated actions, to be placed on Fire Island barrier island in Ocean Beach, resulting in a +15 ft dune and 90 ft berm. Project will minimize damage to natural resources and property from flooding and erosion by protecting natural features including beaches, dunes, barrier islands and bluffs.

4. Location: *The project is located along the Atlantic coast shoreline from the Fire Island inlet to the Montauk Point and includes the segment within the Village of Ocean Beach*.

5. Size of site: *The project includes the 2,000 foot segment of Atlantic coast shoreline within the Village of Ocean Beach.*

6. Present land use*: The project area is an existing beach within the Fire Island National Seashore*.

7. Present zoning classification: ___N/A_____

8. Describe any unique or unusual land forms on the project site (i.e. steep slopes, swales, ground depressions, other geological formations):
The project generally includes the existing berm and dunes along the shoreline.
_____

9. Percentage of site which contains slopes of 15% or greater: _N/A_____

10. Streams, lakes, ponds or wetlands existing within or contiguous to the project area?

(1) Name: ___N/A_____
(2) Size (in acres):_____

11. If an application for the proposed action has been filed with the agency, the following information shall be provided:
(a) Name of applicant
_____USACE- New York District_____
(b) Mailing address:
_____26 Federal Plaza, New York, NY 10278_____
(c) Telephone number: _917-790-8729 Robert Smith_____

12. Will the action be directly undertaken, require funding, or approval by a state or federal agency?
Yes X___No____If yes, which agency _US Army Corps of Engineers,_____

C. Waterfront ASSESSMENT (Check either "Yes" or "No" for each of the following questions)

1. Will the proposed action have a significant effect upon: YES NO
(a) Commercial or recreational use of fish and wildlife resources? ___NO___
(b) Scenic quality of the waterfront environment? ___YES___
(c) Development of future, or existing water dependent uses? _NO_
(d) Stability of the shoreline? ___YES___
(e) Surface or groundwater quality? ___NO___
(f) Existing or potential public recreation opportunities? ___NO___
(g) Structures, sites or districts of historic, archeological or cultural significance to the Village of Ocean Beach, State or Nation? ___NO___

2. Will the proposed action involve or result in any of the following: YES NO

(a) Physical alteration of land along the shoreline, land under water or waterways? ___YES___
(b) Physical alteration of two (2) acres or more of land located elsewhere in the waterfront area? _YES_
(c) Expansion of existing public services or infrastructure in undeveloped or low density areas of the waterfront? ___NO___
(d) Energy facility not subject to Article VII or VIII of the Public Service Law? ___NO___
(e) Mining, excavation, filling or dredging? ___YES___
(f) Reduction of existing or potential public access to or along the shore? ___NO___

(g) Sale or change in use of publicly-owned lands located on the shoreline or under water? __NO__
(h) Development within a designated flood hazard area? __NO___
(i) Development on a natural feature that provides protection against flooding or erosion? __YES__
(j) Diminished surface or groundwater quality? ___NO__
(k) Removal of ground cover from the site? __NO__

3. PROJECT YES NO

(a) If a project is to be located adjacent to shore:

(1) Will water-related recreation be provided? __NO___
(2) Will public access to the foreshore be provided? ___NO__
(3) Does the project require a waterfront site? _YES___
(4) Will it supplant a recreational or maritime use? _YES___
(5) Do essential public services and facilities presently exist at or near the site? __NO__
(6) Is it located in a flood prone area? _YES___
(7) Is it located in an area of high erosion? _YES___

(b) If the project site is publicly owned:

(1) Will the project protect, maintain and/or increase the level and types of public access to water-related recreation resources and facilities? _YES___
(2) If located in the foreshore, will access to those and adjacent lands be provided? __NO___
(3) Will it involve the siting and construction of major energy facilities? __NO___
(4) Will it involve the discharge of effluents from major steam electric generating and industrial facilities into waterfront facilities? _NO__
(c) Is the project site presently used by the community neighborhood as an open space or recreation area? __YES__

(d) Does the present site offer or include scenic views or vistas known to be important to the community? _YES___

(e) Is the project site presently used for commercial fishing or fish processing? _NO___

(f) Will the surface area of any waterways or wetland areas be increased or decreased by the proposal? _NO___

(g) Does any mature forest (over 100 years old) or other locally important vegetation exist on this site which will be removed by the project? _NO___

(h) Will the project involve any waste discharges into waterfront waters? _NO___

(i) Does the project involve surface or subsurface liquid waste disposal? _NO___

(j) Does the project involve transport, storage, treatment or disposal of solid waste or hazardous materials? __NO___

(k) Does the project involve shipment or storage of petroleum products? __NO__

(l) Does the project involve discharge of toxics, hazardous substances or other pollutants into the waterway? _NO___

(m) Will the project affect any area designated as a tidal or freshwater wetland? __NO___

(n) Will the project alter drainage flow, patterns or surface water runoff on or from the site? __NO___

(o) Will best management practices be utilized to control stormwater runoff into waterfront waters? _NO_

(p) Will the project utilize or affect the quality or quantity of sole source or surface water supplies? _NO_

(q) Will the project cause emissions which exceed federal or state air quality standards or generate significant amounts of nitrates or sulfates? _YES__

D. REMARKS OR ADDITIONAL INFORMATION: (Add any additional sheets to complete this form.)

Refer to the attached policy statement which discusses project consistency with relevant policies of the Local Waterfront Revitalization Program of the Village of Ocean Beach.

If assistance or further information is needed to complete this form, please contact Village of Ocean Beach Building Inspector at (631) 583-7018.

Preparer's Name Robert Smith_____
Title: Project Manager Agency: U.S. Army Corps of Engineers, N.Y. District
Telephone Number: ( )_____
Date:_____

APPENDIX G4

TOWN OF EAST HAMPTON POLICY STATEMENT

NEW YORK STATE DEAPRTMENT OF STATE
COASTAL ZONE MANAGEMENT PROGRAM

Policy Statement for the Town of East Hampton Local Waterfront Revitalization Program

Project: Fire Island Inlet to Montauk Point (FIMP) Reformulation Project

Applicant: U.S. Army Corps of Engineers, New York District

Applicable Policies: The Town of East Hampton Local Waterfront Revitalization Program (LWRP) policies (East Hampton 1999) were reviewed as to their applicability to the FIMP Reformulation Project. Based upon this review, 26 LWRP policies and sub-policies were identified as potentially applicable to the proposed Project. These policies are presented below, followed by an explanation of Project consistency. Policies that are clearly not applicable are not discussed.

Policy 4 Strengthen the economic base by encouraging the development and enhancement of those traditional uses and activities that have provided such areas with their unique maritime identity.

Determination – As applied to Three Mile and Montauk Harbors, the Tentatively Selected Plan (TSP) would insure that traditional uses of the south shore of Long Island would be enhanced and preserved. The TSP would stabilize the shoreline and manage the risk from coastal storm damage to the surrounding area, thus encouraging the development and enhancement of those traditional uses and activities that have provided Three Mile and Montauk Harbors with their unique maritime identity. Therefore, the District has determined that the TSP would be consistent with this policy.

Policy 5 Encourage the location of development in areas where public services and facilities essential to such development are adequate.

Determination – This policy is intended to further the rural pattern of the Town, which concentrates development in village and hamlet centers. The TSP would manage the risk of coastal storm damage to existing infrastructure along the south shore of Long Island from hurricane and storm surge flooding. Risk management would provide stability and enhancement to existing and future development Projects. The without Project condition would eventually impact development as contractors would be hesitant to develop in an unstable, unprotected environment. Therefore, CENAN has determined that the TSP would be consistent with this policy.

Policy 7 Significant coastal fish and wildlife habitat will be protected, preserved, and where practicable, restored so as to maintain their viability as habitats.

Policy 7a (Locally Significant Fish and Wildlife Habitats)
Locally significant coastal fish and wildlife habitat, as identified on the coastal area map, shall be protected, preserved, and where practicable, restored so as to maintain their viability as habitats.

Policy 7b (Protection of Diversity)

Protect to the maximum extent practicable the vulnerable plant and animal species and natural communities that have been identified on the state and federal levels by the New York Heritage Program, the NYSDEC protected native plant list (NYCRR 193.3), the NYSDEC list of endangered, threatened and special concern species and the federal list of endangered and threatened wildlife and plants (50 CFR 17).

Determination - All of Great South Bay and many adjoining marshes and natural areas are designated as Significant Coastal Fish and Wildlife Habitat (SCFWH). Policy 7 states that filling of shallows, grading, shoreline alteration and dredging are among generic activities most likely to affect protected habitats. These activities are integral to the proposed Project which consists of dredging sand from offshore borrow areas for placement on the Atlantic shoreline of Fire Island to create enhanced beach area and dunes for coastal storm risk management. No dredging will occur within State-designated SCFWH. No filling or grading will occur within marshes or wetlands; fill placement is limited to the Atlantic shoreline only. Fill placement along the Atlantic shoreline of Fire Island in the Project area will create wider beaches and dunes to minimize breaching and overwashing and consequent damage to habitats and communities on the barrier island and along the south shore of Long Island. There will be no change in existing tidal exchange patterns, only a continuation of the non-storm induced conditions.

A comprehensive assessment of potential Project impacts to threatened and endangered species and habitats was conducted and is presented in Chapter 4 of the Environmental Impact Statement (EIS) prepared for the Project and the Biological Assessment (BA) (see Appendix J of the EIS). The proposed activities would be undertaken in a manner consistent with this policy.

Policy 8 Protect fish and wildlife resources in the coastal area from the introduction of hazardous wastes and other pollutants which bio-accumulate in the food chain or which cause significant sub-lethal or lethal effect on those resources.

Determination – The material that may be obtained from the offshore borrow areas, consists primarily of clean, coarse-grained sand. The material that would be dredged and used for beach nourishment on the down drift beaches would not contain hazardous wastes or other pollutants that would bio-accumulate in the food chain or cause significant sub-lethal or lethal effects on those resources. Sediment re-suspension is likely to cause temporary increases in turbidity; however, these increases would be limited in duration and spatial extent and are not expected to significantly affect fish or aquatic wildlife in the Project areas. The proposed activities would not adversely affect fish and wildlife resources and would be undertaken in a manner consistent with this policy.

Policy 12 Activities or development in the coastal area will be undertaken so as to minimize damage to natural resources and property from flooding and erosion by protecting natural protective features including beaches, dunes, barrier islands and bluffs.

Determination – The Long Island south shore barriers, inlets, and associated beaches, dunes, and nearshore areas are natural “defenses” that help preserve coastal lands and property from damage and reduce the danger to resources and property resulting from flooding and erosion. The proposed activities would be conducted in the inlets, mainland (10-year floodplain non-structural building retrofits, floodproofing, relocation, and acquisition, and road raising in 4 locations), and

barrier islands. These properties and their associated coastal processes ordinarily provide varying levels of risk management measures to the barrier island upland areas, the south shore bays, and Long Island south shore mainland. The purpose of the Project is to implement measures that will augment and restore the natural protective capabilities of the barrier islands, inlets, and mainland.

The nourishment of beaches and dunes with appropriate material is an allowable activity pursuant to the coastal erosion hazard area regulations contained in 6 NYCRR Part 505 (see also Policy 35), and is a non-structural erosion control measure preferred over structural measures by the State in its tidal wetlands, erosion hazards, and coastal management program statutes and regulations (see Policies 17, 35, and 44). Restoring the natural protective characteristics of the barrier island, inlets, and associated beaches, dunes, and nearshore areas (resulting in the protection of the barrier island itself, the bay-system and the mainland of Long Island) would be consistent with and further promote Policy 12, which is to minimize damage to natural resources and property by protecting the naturally occurring protective characteristics and the associated physical processes.

Policy 15 Mining, excavation or dredging in coastal waters shall not significantly interfere with the natural coastal processes which supply beach materials to land adjacent to such waters and shall be undertaken in a manner which will not cause an increase in erosion of such land.

Determination – The proposed action includes the removal of material from offshore borrow sources. The borrow areas are located more than 1 mile offshore, where excavation and dredging has been demonstrated to have a negligible impact on the nearshore coastal processes, and will not cause an increase in coastal erosion. Best management practices will be followed during all dredging activities and the proposed dredging depth in the borrow areas will not reduce the flow of sediments to adjacent areas. Coastal processes along the shoreline sand placement areas will not be interfered with as only natural sands will be placed; no structures or shoreline hardening is proposed. The proposed activities are consistent with this policy.

Policy 16 Public funds shall only be used for erosion protective structures where necessary to protect human life, and new development which requires a location within or adjacent to an erosion hazard area to be able to function, or existing development; and only where the public benefits outweigh the long-term monetary and other costs including the potential for increasing erosion and adverse effects on natural protective features.

Determination – The Project will minimize breaching and overwashing of the barrier islands and is a necessary measure for storm damage reduction on the barrier islands as well as the south shore of Long Island. The Project will enhance and recreate natural protective features of the barrier islands through beach renourishment and berm construction. Benefits to the human and natural environments outweigh the expenditures of public funds. This has been demonstrated through the completion of a comprehensive economic assessment of the Reformulation Plan. The Project is consistent with this policy.

Policy 17 Non-structural measures to minimize damage to natural resources and property from flooding and erosion shall be used whenever possible.

Policy 17A (Only Non-structural Measures Permitted in Certain Reaches)
Along the south shore ocean facing reaches of the town, only non-structural measures to minimize flooding and erosion are permitted.

Determination – The proposed use of suitable dredged sand for beach nourishment and dune creation is a non-structural measure. The beach nourishment minimizes damage to natural resources and property from flooding and erosion by strengthening natural protective characteristics and providing the sediments necessary for these characteristics to function. The Project is consistent with this policy.

Policy 18 To safeguard the vital economic, social and environmental interests of the State and of its citizens, proposed major actions in the coastal area must give full consideration to those interests, and to the safeguards which the State has established to protect valuable coastal resource areas.

Determination – The Project will reduce the frequency and degree of breaches and overwashes of the barrier islands and mainland and thereby afford coastal storm risk management to the barrier as well as communities on the south shore of Long Island. In addition, several of the inlets (such as Fire Island Inlet and Moriches Inlet) are regionally important navigation inlets that must be stabilized and maintained. The areas adjacent to the inlet support regionally important water-dependent and water-related uses, including commercial fishing and recreational boating facilities, public parklands, and other uses. The physical character of the barriers must be maintained to protect these uses.

The south shore of Long Island also supports a variety of public recreational and commercial activities. The south shore of Staten Island's coastline must be maintained to protect these uses. The without Project condition would eventually impact public recreational and commercial activities. The Project would provide coastal storm risk management to an important public recreational area and adjacent commercial and residential properties with minimal short-term impacts to economic, social, and environmental resources. Therefore, the District has determined that the TSP would be consistent with and advance this policy.

Policy 19 Protect, maintain, and increase the level and types of access to public water related recreation resources and facilities.

Determination – The beach areas in the proposed Project area support a variety of public recreational activities (see also Policies 18 and 20). The TSP would result in positive impacts on recreation as a result of better coastal storm risk management in the Project area. The without Project alternative would result in increased flood risks and increased erosion, thereby decreasing recreational potential in the area.

Buffer areas approximately 1,000 feet in length will be closed during construction activities for safety reasons. Although a reduction in public access to the work site during construction would occur, this impact would be temporary. As beach placement activities are completed within each 1,000-foot compartment, the buffer is shifted accordingly. Public use of the beach area would be restored at that time. The proposed activities would be undertaken in a manner consistent with

this policy. Also, over the 50-year Project life the proposed activities would advance the policy to protect, maintain, and increase public access to and use of public water-related recreation resources and facilities.

Policy 20 Access to publicly-owned foreshore and to lands immediately adjacent to the foreshore or the water's edge that are publicly-owned shall be provided and it shall be provided in a manner compatible with adjoining uses.

Determination – Many of the lands and waters adjacent to and at the sites of the proposed activities are publicly-owned and accessible underwater lands and parklands that support a variety of public uses are present in the area (see also Policies 18 and 19). Based on the Policy 19 analysis above, the proposed activities would be undertaken in a manner consistent with and would advance this policy.

Policy 21 Water dependent and water enhanced recreation will be encouraged and facilitated, and will be given priority over non-water-related uses along the coast.

Policy 21A **(Water-related Recreation Improvement Sites)**
Water dependent and water-enhanced recreation will be encouraged and facilitated at sites recommended under "Opportunities for Improvement" and "Recreational Uses Compatible with New Development" in the analysis narrative of "Town of East Hampton Local Waterfront Revitalization Program" (East Hampton 1999) and in "Public Access and Recreation Improvements" in Projects, Section XIV of "Town of East Hampton Local Waterfront Revitalization Program" (East Hampton 1999).

Determination – Many of the lands and waters within the Project area are publicly-owned and currently support a variety of public water dependent uses such as fishing, boating and beaching. The Project will protect and enhance these uses in the long-term, with only staggered short-term loss of use during construction, as described under Policy 19. The proposed Project is consistent with and will advance this policy.

Policy 23 Protect, enhance and restore structures, districts, areas or sites that are of significance in the history, architecture, archeology or culture of the State, its communities, or the Nation.

Determination –The Fire Island Light Station (Town of Islip) and the Beach Road Historic District (Village of Southampton) are the only properties within the study area that are listed on the National Register, and none of these properties are in East Hampton. A number of other structures, each more than 50 years of age, which may possess the requisite characteristics and integrity to be eligible for the National Register are visible from the beach (JMA 2000), including: the Robert Moses State Park Tower; the former Point O' Woods Life Saving Station (presently the Fire Island Hotel and Resort), and houses in various communities in the study area (see Table 3.10-1 of the EIS). None of the properties listed in Table 3.10-1 are located in East Hampton. The Project will afford additional coastal storm risk management to existing properties on the National Register, as well as the other identified structures. The Project will not affect archaeological site or marine resources, such as shipwrecks. The Project will protect

cultural resources and is consistent with this policy.

Policy 24 Prevent impairment of scenic resources of statewide significance.

Determination – Portions of East Hampton have been designated as scenic resources of statewide significance (NYSDOS 2010). Although some of these portions of East Hampton are within the Project area, CENAN is not proposing any actions in these areas that will impact these scenic resources of statewide significance. Consequently, the Project will not impair scenic resources of statewide significance.

Policy 25 Protect, restore, or enhance natural and man-made resources which are not identified as being of statewide significance, but which contribute to the overall scenic quality of the coastal area.

Determination – Implementation of the TSP would require the use of large construction equipment, such as dredge barges and excavators that would visually interrupt the natural landscape during construction activities. These short-term impacts would be similar to visual impacts that currently occur and would not be significant. Long-term, the TSP would reduce the impacts from storm and flooding events that may cause significant erosion or breaching of beaches, dunes, and shorelines. By reducing these types of impacts, the TSP will contribute positively to the overall scenic quality of the coastal area.

Policy 30 Municipal, industrial, and commercial discharge of pollutants, including but not limited to, toxic and hazardous substances, into coastal waters will conform to State and National water quality standards.

Determination – The Project will not discharge pollutants. The Project is likely to result in sediment re-suspension and associated increases in turbidity during dredging in the borrow areas and during sand placement along the shoreline. These turbidity increases will be temporary and will not result in a violation of this policy.

Policy 35 Dredging and dredge spoil disposal in coastal waters will be undertaken in a manner that meets existing State dredging permit requirements and protects significant fish and wildlife habitats, scenic resources, natural protective features, important agricultural lands and wetlands.

The proposed dredging of clean, relatively coarse-grained accumulated sand from offshore borrow areas will not adversely affect significant coastal fish and wildlife habitats (see Policy 7), natural protective characteristics (see Policies 12, 14, 15, 17, and 18), or wetlands (see Policy 44).

The proposed dredging activities would take place in waters greater than 6 feet deep, and are therefore not required to meet the regulatory standards contained in the State's tidal wetlands land use regulations in 6 NYCRR Part 661. However, the use of the dredged material for beach nourishment in the areas adjacent to the Atlantic Ocean tidal wetland littoral zone would require a tidal wetlands permit (see Policy 44). The sand placement area is within state designated significant fish and wildlife habitats. The State tidal wetlands regulations in 6 NYCRR Part 661

indicate that the use of the dredge material for beach nourishment in an area adjacent to tidal wetlands is a generally compatible use; however, such a use is dependent on several character and resource values and the effects such nourishment and its associated dredged materials might have on intertidal wetlands and adjacent areas. The material to be dredged and used to nourish the beaches is compatible with the material currently on the beaches. The nourishment of beaches and dunes where necessary and appropriate is an activity that may be authorized pursuant to the coastal erosion hazard area regulations in 6 NYCRR Part 505 (see also Policy 12).

The Project will be implemented in such a manner as to avoid adverse impacts to these habitats during construction to the extent practicable. Long-term benefits to significant fish and wildlife habitats are anticipated as the placement of the beach fill would lead to larger and wider beach areas that could be used for breeding and nesting by shorebirds.

There is an overriding need to maintain the physical character of the barrier island and its associated natural protective characteristics, as well as the natural resource values of these characteristics. An EIS has been prepared for the Project which details the potential impacts to natural and cultural resources. In addition, all required permits, such as a NYSDEC Tidal Wetlands Permit, Section 401 Water Quality Certificate, Clean Water Act Section 404 permit, will be acquired and all permit conditions will be complied with.

Consultation and coordination with State and Federal resource agencies (US Fish &Wildlife Service, NOAA Fisheries, National Park Service and State Natural Resource agencies) will be conducted and species specific seasonal restrictions and mitigation measures will be put in place. The proposed activities will be conducted in a manner consistent with this policy.

Policy 38 <u>The quality and quantity of surface water and groundwater supplies will be conserved and protected, particularly where such waters constitute the primary or sole source of water supply.</u>

Policy 38A <u>Maintain water resources as near to their natural condition of purity as reasonably possible to safeguard public health.</u>

Determination – The Project will not affect water supply sources. Temporary increases in turbidity may occur during dredging and sand placement activities; however, these will be limited to construction periods and will be limited in spatial extent and duration. Best management practices will be implemented to minimize impacts. The Project is consistent with this policy.

Policy 41 <u>Land use or development in the coastal area will not cause national or State air quality standards to be violated.</u>

Determination – The Project will result in mobile air emissions sources during construction only. No stationary sources are proposed. A conformity analysis is being conducted for the Project and any required mitigation measures to offset temporary emissions increases will be implemented. A detailed air impact analysis is included with the EIS prepared for the FIMP Reformulation Project. The Project is consistent with this policy.

Policy 43 Land use or development in the coastal area must not cause the generation of significant amounts of the acid rain precursors: nitrates and sulfates.

Determination – Refer to the response to Policy 41; the Project is consistent with this policy.

Policy 44 Preserve and protect tidal and freshwater wetlands and preserve the benefits derived from these areas.

Determination – As demonstrated above in the Policy 35 analysis, the proposed activities would take place areas adjacent to the Atlantic Ocean littoral zone and intertidal wetland areas. The proposed activities are compatible uses according to the tidal wetlands land use regulations in 6 NYCRR Part 661. The proposed activities include one of the preferred non-structural erosion control measures identified in the State erosion hazard area regulations, the Coastal Policies contained in the State's Coastal Management Program document, the State tidal wetlands land use regulations, and Article 42 of the Executive Law and its implementing regulations in 19 NYCRR Part 600. The beach nourishment activities will result in physical changes to the intertidal area that will adversely affect some invertebrates at the site of the beach nourishment activities while the Project is being undertaken (see Policy 35 analysis). However, these adverse effects would not be significant, would be temporary, and would not result in significant adverse effects nor significantly impair the benefits derived from the tidal wetland areas. The proposed activities would be undertaken in a manner consistent with this policy.

References

East Hampton 1999 — East Hampton Town Board. "Town of East Hampton Local Waterfront Revitalization Program." December 3, 1999.

JMA 2000 — John Milner Associates, Inc. (JMA). 2000. Cultural Resources Baseline Study Fire Island Inlet to Montauk Point. Suffolk County, New York Reformulation Study. Prepared for The Greeley-Polhemus Group and the U.S. Army Corps of Engineers New York District.

NYSDOS 2010 — New York State Department of State (NYSDOS), Division of Coastal Resources. "East Hampton Scenic Areas of Statewide Significance." January 2010.

APPENDIX H

BACKGROUND AND APPROACH TO ENVIRONMENTAL ANALYSIS

H.1 STORMS AND COASTAL PROCESS

This section discusses the anticipated future conditions related to storms and coastal processes under the FWOP scenario. In particular, this section addresses storms, sea level rise, longshore sediment transport, cross-island sediment transport, dune development and evolution, bayside shoreline processes, and estuarine processes. To a great extent, these processes are interconnected and changes in one can alter aspects of another process. The myriad of elements that influence sediment transport result in a constantly changing shoreline habitat profile, where habitats and landforms are alternately being formed, altered, or removed as a result of natural events.

H.1.1 Storms

The history of storm activity and response in the Study Area can be used as a basis for predicting what is likely to happen in the future, regardless of whether the project is implemented. The long history of storm activity, documented impact, and the human response in the Study Area is relevant for estimating and evaluating the conditions under the FWOP for all resources addressed in this section, including natural and socio-cultural. Under the FWOP, the following are anticipated to continue:

- Storms will likely occur in a frequency, duration, and intensity similar to those that have historically occurred.
- Human response to these storms will be similar to what has historically occurred, with a concerted effort to recover and rebuild.
- There will be a continuation of local measures to proactively protect homes and businesses, particularly in high risk areas.
- Storm impact will likely worsen as sea levels rise.
- Future development will be undertaken consistent with existing regulations and will not be subject to frequent storm damage.
- After storm events, beaches will tend to recover when long-period waves move sand from the nearshore back onto the beach.

H.1.2 Sea Level Rise

Sea level rise is a factor that is critical for consideration in evaluating the FWOP. Historical water level data recorded by National Oceanic Atmospheric Administration (NOAA) indicates that sea level rise varies by geographic location. Historical water levels recorded by NOAA at monitoring stations near the Study Area showed a sea level rise of 11.4 in (28.96 cm) (or 3.90 mm/yr) during the 74-year period between 1932 and 2006 at Sandy Hook, NJ; sea level rise of 6.5 in (16.51 cm) (or 2.78 mm/yr) during the 59-year period between 1947 and 2006 at Montauk, NY, and sea level rise of 16.4 in (41.66 cm) (or 2.77 mm/yr) during the 150-year period between 1856 and 2006, at the Battery Park, NY (NOAA 2008b). Under current trends, it is estimated that sea levels will rise 14.4 in (36.58 cm) at Sandy Hook, NJ, 10.3 in (26.16 cm) at Montauk, NY, and 10.3 in (26.16 cm) at the Battery Park, NY by the year 2100.

The Intergovernmental Panel on Climate Change (IPCC) recently released its Fourth Assessment Report (AR4) summarizing climate change in the year 2007 (IPCC 2007). The report predicts the average global sea level rise at the end of the 21st century for a total of six model scenarios. A comparison summary of the IPCC global sea level predictions and the projected local sea level rise from NOAA historical trend data is shown below in Table H-1. The reader should note that the IPCC projections do not represent an upper bound for sea level rise due to limited understanding of important variables that drive global water levels.

Table H-1. Projected Sea Level Rise

Projected Local Sea Level Rise[1] (m at 2100 relative to 2006)			IPCC Global Sea Level Predictions[2] (m at 2090-2099 relative to 1980-1999)
Sandy Hook, NJ	**Montauk, NY**	**Battery Park, NY**	
0.37 m	0.26 m	0.26 m	0.18 m – 0.59 m

[1] NOAA sea level predictions are linearly extrapolated from the historic sea level trends published for each station.
[2] The range of predictions are compiled for the six Special Report Emission Scenarios outline in the AR4.
Note: 0.37m=14.4 in; 0.26 m = 10.3 in; 0.26 m = 10.3 in; .018m = 7.1 in; 59m = 23.2in.

H.1.3 Longshore Sediment Transport

Longshore sediment transport refers to the daily movement of sediment along the ocean coast. Longshore sediment transport can intensify during storms and hurricanes by transporting greater quantities of sediment during the time of the storm. In the Study Area the longshore sediment transport is generally from east to west, with localized as well as temporary reversals in direction. Sediment erodes from the cliffs and bluffs of Montauk and contributes to the longshore sediment transport to the west. Onshore and offshore sediments, as well as human actions such as beach nourishment, also provide a source for longshore transport. Longshore sediment transport contributes to the establishment and maintenance of protective features along the oceanfront.

Longshore sediment transport is important for larval distribution in the marine offshore, marine nearshore, and marine intertidal habitats. Longshore transport helps to maintain the marine beach habitat, which sustains organisms that depend upon this habitat and provides recreational areas for humans. In addition, longshore transport contributes sediment that subsequently is a source for cross-island sediment transport.

Natural occurrences and human activities can affect longshore sediment transport. The inlets in the Study Area are naturally occurring interruptions in the longshore sediment transport process; as the inlets are dredged and stabilized for navigation, the volume and direction of longshore sediment transport is further altered. Groin fields and jetties also interrupt, block, and redirect longshore flows, resulting in the accumulation of material on the updrift side of these structures. The long-term impacts associated with dredging and coastal structures varies based upon localized sediment transport regimes, and the size, effectiveness, and integrity of the structure. These impacts on longshore sediment transport can be both localized and regional in effect.

The existing conditions and trends for longshore sediment transport are discussed in more detail in Section 3.2.4.3. The FWOP assumes these conditions and trends will continue.

H.1.4 Cross-Island Sediment Transport

Cross-island sediment transport refers to the movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay. The movement of sand through the inlets also significantly contributes to this process. It is particularly important in areas of historic overwash such as Old Inlet or Smith Point County Park. Daily processes and seasonal conditions, such as storms, changes in sea level, and aeolian processes (i.e., wind erosion and deposition) support cross-island sediment transport.

During storms due to the surge of ocean waves, sand is deposited as "washover fans" behind dunes. This process contributes to the growth of the backbay side of the barrier island by the continuing accumulation of washover sediment or sand. Rollover occurs when this buildup of sand leads to the landward migration of the barrier island.

Cross-island sediment transport is observable in the following processes:

- Beach erosion/scarping and beach recovery;
- Dune erosion/scarping and dune rebuilding (through littoral and aeolian transport);
- Dune/island overwash (movement of sand and water across dunes and islands); and
- Barrier island breaching (cutting of a new channel across spit or island), inlet formation, and shoal evolution at inlets.

Cross-island sediment transport is complex and varies in amount and location year to year, and is strongly influenced by the longshore transport processes, as well as human activities occurring in an area. Cross-island sediment transport is critical in supporting the development of natural communities and biodiversity. Cross-island sediment transport, or lack thereof, has a dramatic effect on the barrier island habitats and the long-term geomorphic response of the barrier islands. Human activities that can directly and indirectly affect the scale and location of cross-island transport include: groin construction, breach closures, inlet stabilization, beach and dune nourishment, dune enhancement and construction – through trucking of sand, beach scraping, and sand fencing, dune removal to enhance water views, structures, and cuts in dunes for vehicles and access paths. Disruptions to cross-island sediment processes have local and immediate impacts, as well as regional and long-term impacts that effect the ongoing creation of barrier island and backbay habitats.

The existing conditions and trends for cross-island sediment transport are discussed in detail in Chapter 3 of the FIMP EIS. The FWOP assumes these conditions and trends will continue.

H.1.5 Dune Development and Evolution

Coastal dunes play an important role for the marine beach, and are particularly integral to the sand sharing system. Dunes accumulate sand at the upper margin of the beach. Dune growth is largely a product of wind transport, although water may also contribute to the accumulation

during storms. Dune development and evolution is related to the condition of the shoreline and occurs when sand is transported inland across the bare sand beach to gather in areas of vegetation that trap sediment and stabilize the dune form. During a storm, the sand may be removed due to wave erosion, but these areas quickly recover and collect new sand.

Dunes serve an important ecological function by providing habitat in the transition zone between exposed beach and the sheltered landward portion of the barrier island. Dunes act as a storage area for sand, which helps to reduce the effects of erosion during severe storms and conditions that add significantly to sediment transport along the barrier island. Dunes also act as a barrier to protect against storm surge and wave penetration.

Past human activities have affected dune development. Some activities focus on trapping sand and fostering sand accumulation and dune growth, such as erection of sand fencing and planting of beach grass. The development or presence of houses within the foredune or primary dune interferes with vegetation cover, the opportunity for sand accumulation, and the creation of associated wildlife habitat. Access paths and dune cuts also breach the natural dune system, and buildings and other structures alter wind flow and the pattern of wind transport. Currently, many local zoning laws restrict activities that could affect dune development. These laws are expected to endure into the future and limit future development that negatively affects dunes.

The existing conditions and trends for dune development and evolution are discussed in detail in Section 3.2.3.5. The FWOP assumes these conditions and trends will continue.

H.1.6 Bayside Shoreline Processes

Bayside shorelines are composed of narrow bayside beaches, sand shoals, mud flats, tidal creeks, and salt marshes. The bayside shoreline contributes to barrier island integrity, acts to buffer the upland from bay wave action, and is intregral in maintaining the diversity of the natural system in the face of rising sea level. The interaction of waves, winds, and wave- and tidally-conveyed longshore currents shape the bayside shorelines. The areas of higher energy tend to establish beaches, while more sheltered areas tend to establish salt marshes and beds of submerged aquatic vegetation (SAV). Beaches are more susceptible to erosion and would be affected by changes in sea level. Slower currents allow for the deposition of fine-grained sediment and the creation of salt marshes and mud flats. The cross-island sediment transport processes of breaching and overwash inject significant amounts of sediment into the gradual and ongoing sedimentation process for the bayside shoreline, contributing to the creation and expansion of these bayside areas and habitats. In addition to semi-diurnal high tides, tidal marshes are highly vulnerable to flooding during storm events. Natural bayside features reduce the risk of breaching and flooding along the barrier island.

Human activities have directly and indirectly impacted the bayside shoreline processes and habitats, and have impaired the ability of beaches, salt marshes, bay intertidal and subtidal, mud flats, and SAV beds to function as natural and protective features. These changes are primarily a result of inlet dredging and placement of material (e.g, sand bypass and beach nourishment), and through stabilization of the bay shorelines (e.g., bulkheads, sea walls, and marinas). Shoreline hardening can increase the amount of scour in adjacent areas and result in the redistribution of

material into the bay; can trap material and alter the alongshore distribution of material; and can prevent sediment landward of the structures from entering the bayside littoral system, resulting in the direct loss or alteration of bayside beaches, mud flats, and salt marshes. In addition, as sea level increases within the bays, these shore stabilization structures prevent the landward and upward migration of these natural features, thus resulting in their long-term loss or impairment.

The functionality of the overall system relies on bayside shoreline processes that establish essential habitats. These habitats support the feeding, spawning, and growth of fish, crustaceans, shorebirds, and other invertebrates. Bayside shoreline also acts as a natural filtration system by absorbing nutrients and trapping pollutants transported from uplands. The existing conditions and trends for bayside shoreline processes are discussed in Section 3.2.3. The FWOP assumes these conditions and trends will continue.

H.1.7 Estuarine Processes

Estuaries are areas of transition from which fresh water meets and mixes with salt water. Estuaries allow an exchange of water from land to the ocean, distribute sediments, and circulate water to support estuarine habitats. Estuaries are driven by the amount of freshwater input, bathymetry (bottom topography), water exchange through inlets, and wind. The exchange of water within the estuaries helps to maintain water quality by clearing the system of pollutants and discharge of materials or nutrients into the system.

Circulation patterns and sediment movement support the essential estuarine habitats and species, and associated shoreline habitats. These habitats include bay subtidal, sand shoals and mud flats, and submerged aquatic vegetation (SAV) beds. These habitats are vital to support the complex ecosystem within the estuary. Open bay subtidal habitats allow for circulation and mixing to occur, which aids in the distribution of plankton and larvae. Bay bottom provides habitat for shellfish and finfish. Sand shoals, bare sand, mud flats, and SAV (e.g., eelgrass beds) are important breeding, spawning, and feeding habitats for crustaceans, shellfish, finfish, and other species. These shallow areas also provide an important feeding habitat for shorebirds.

Salinity and temperature are characteristics of estuarine water quality that are affected by circulation. Water quality is also influenced by surface and ground water, point and non-point sources, variability in precipitation events, and regional changes in ocean circulation patterns. Storms can alter estuarine circulation through surges into the bay and breaches of the barrier islands. These breaches of the barrier islands can alter circulation patterns and salinity distribution by changing the location and amount of ocean water entering the bay.

As human population density increases, land clearing, application of fertilizers, discharge of sewage and cesspool systems, and other activities also increase the delivery of nutrients (such as nitrogen and phosphorus) to the estuary. The introduction of these materials alters the composition of the sediment on the surface of the bay bottom. Excessive nutrient loading into the bays can create “brown tides” or algal blooms, which can limit the growth of SAV beds.

The dredging of inlets to provide reliable navigation and to increase the exchange of water between the ocean and bays has altered the bottom composition, the bathymetry (through both

dredging and placement), and the salinity distribution in the bays by increasing the amount of ocean water entering the bay. The dredging of inlets has also moderated the amount and distribution of flow that comes through the inlets.

The existing conditions and trends for estuarine processes is discussed in Section 3.2.3. The FWOP assumes these conditions and trends will continue.