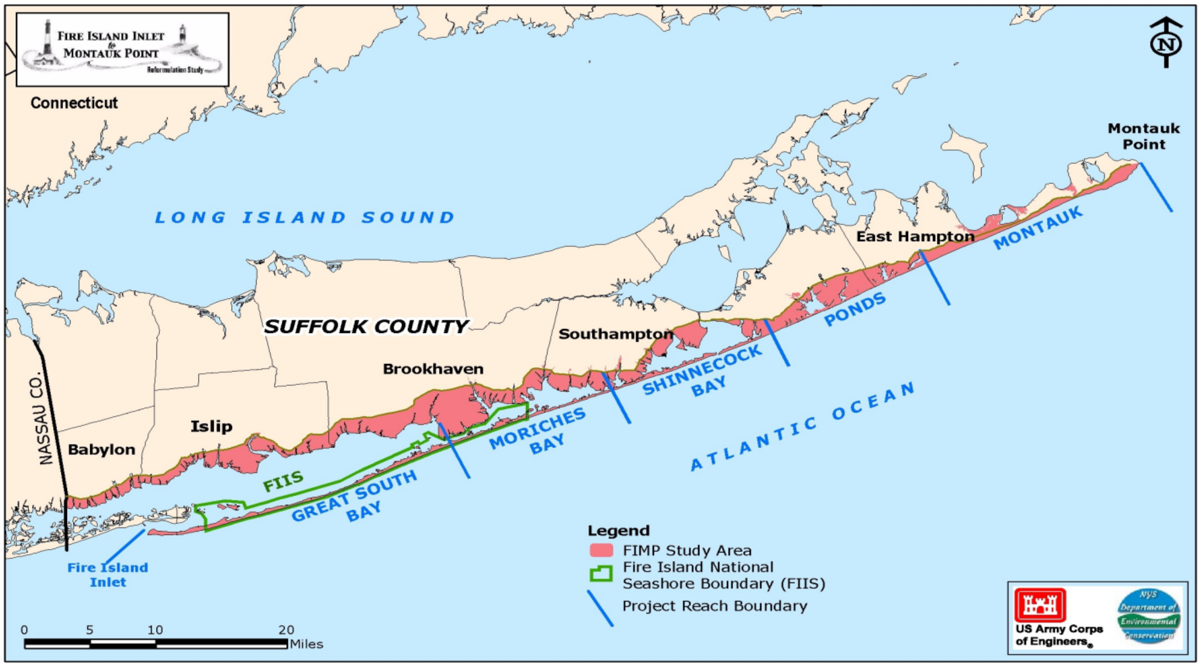
Fire Island Inlet to Montauk Point Reformulation Study Draft Environmental Impact Statement



Fire Island Inlet to Montauk Point Reformulation Study Area:
Project Reach Boundaries

U.S. Army Corps of Engineers
New York District

July 2016

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

BCP	Breach Contingency Plan
BFE	Base Flood Elevation
BRP	Breach Response Plan
C	Celsius
CBRA	Coastal Barrier Resources Act of 199
CDP	Census Designated Place
CEHA	Coastal Erosion Hazard Area
CENAN	U.S. Army Corps of Engineers, New York District
CMI	Conservation Management Institute
CMP	Coastal Management Program
CRP	Comprehensive Restoration Plan
CWA	Clean Water Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DCR	Division of Coastal Resources
DMA	Disaster Mitigation Act
DO	Dissolved oxygen
DOI	United States Department of the Interior
E	Endangered
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
F	Fahrenheit
FEMA	Federal Emergency Management Agency
FEMA	Federal Emergency Management Agency
FIIP	Fire Island Interim Project
FIIS	Fire Island National Seashore
FIMP	Fire Island Montauk Point
FIMP EIS	Fire Island to Montauk Point Environmental Impact Statement
FIRM	Flood Insurance Rate Map
FP&M	Fanning, Phillips & Molnar
FVC	future vulnerable condition
FWOP	Future Without Project Condition
FWOP	not introduced
GAI	GAI Consultants, Inc.
GEIS	Generic EIS
GIS	geographic information system
GMP	General Management Plan
HEP	Habitat Evaluation Procedures
HMGP	Hazard Mitigation Grant Program
HMP	hazard mitigation plan
HRE	Hudson Raritan Estuary
HTRW	Hazardous, Toxic, and Radioactive Wastes
IRG	Interagency Reformulation Group

JMA	John Milner Associates
LII	Long Island Index
LIPA	Long Island Power Authority
LIRR	Long Island Railroad
LWRP	Local Waterfront Revitalization Plan
LWRPs	Local Waterfront Revitalization Programs
MFCMA	Magnuson-Stevens Fishery Conservation and Management Act
mg/l	milligrams per liter
MHW	mean high water
MLW	mean low water
MREI	minimum real estate impact
MSL	mean sea level
MTA	Metropolitan Transportation Authority
NEPA	National Environmental Policy Act of 1969
NFIP	National Flood Insurance Program
NFIP	National Flood Insurance Program
NGVD	National Geodetic Vertical Datum
NLAA	Not Likely to Adversely Affect
NMFS	National Marine Fisheries Service
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priority List
NPS	National Park Service
NRC	National Research Council
NRHP	National Register of Historic Places
NTU	nephelometric turbidity units
NWI	National Wetland Inventory
NY SEMO	New York State Emergency Management Office
NYCRR	New York Code of Rules and Regulations
NYCRR	New York Codes Rules and Regulations
NYNHP	New York Natural Heritage Program
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
NYSECL	New York State Environmental Conservation Law
NYSEMO	New York State Emergency Management Office
NYSOPRHP	New York State Office of Parks, Recreation and Historic Preservation
o	Degree
OFD	Oceanfront Dune District
ppt	parts per thousand
R	rare
SAV	submerged aquatic vegetation
SC	Suffolk county: not introduced.
SCAT	Suffolk County Accessible Transportation
SCDHS	Suffolk County Department of Health and Safety
SCDIT	Suffolk County Department of Information Technology
SCDP	Suffolk County department of Planning

SCDPRC	Suffolk County Department of Parks Recreation and Conservation
SCDPW	Suffolk County Department of Public Works
SCT	Suffolk County Transit
SEQR	State Environmental Quality Review
SHPO	State Historic Preservation Office
T	threatened
TAMU	Texas A & M University
TAR	Tidewater Atlantic Research, Inc.
TEC	Target Ecosystem Characteristics
TFSP	Tentative Federal Selected Plan
TNC	The Nature Conservancy
USACE	where introduced
USACE NYD	what is
USCB	United States Census Bureau
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
V	Vulnerable
WRCRA	Waterfront Revitalization and Coastal Resources Act
WRDA	Water Resources Development Act

CONVERSION FACTORS FOR MEASURES USED IN THIS ENVIRONMENTAL ASSESSMENT

English to Metric

Multiply	By	To get
Acres	0.4046873	Hectares
Square feet	0.092903	Square meters
Miles	1.6093	Kilometers
Feet	0.3048	Meters
Inches	2.54	Centimeters
Tons (short)	0.90718	Metric tons
Pounds	0.45359	Kilograms
Gallons	3.78533	Liters
Cubic yards	0.76456	Cubic meters

Metric to English

Multiply	By	To get
Hectares	2.47104	Acres
Square meters	10.764	Square feet
Kilometers	0.62137	Miles
Meters	3.2808	Feet
Centimeters	0.3937	Inches
Metric tons	1.1023	Tons (short)
Kilograms	2.2046	Pounds
Liters	0.26418	Gallons
Cubic meters	1.3079	Cubic yards

Fire Island to Montauk Point
Draft Environmental Impact Statement

EXECUTIVE SUMMARY

Proposed Action: The Fire Island Inlet to Montauk Point, New York Combined Beach Erosion Control and Hurricane Protection Project is designed 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. The Tentatively Selected Plan includes a combination of: (1) inlet modifications (continuation of authorized navigation projects, dredging, downdrift placement of dredge, placement of dune and berm, and monitoring); (2) non-structural measures (primarily building retrofits, with limited relocations and buy-outs); (3) breach response for barrier islands; (4) beach and dune fill with renourishment: up to 30 years, approximately every 4 years; (5) sediment management; (6) groin modifications; (7) coastal process features; (8) adaptive management; and (9) integration of local land use regulations and management.

Location of Action: The 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. 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.

Type of Statement: Draft Environmental Impact Statement

Lead Agency: U.S. Army Corps of Engineers, New York District

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Executive Summary

The United States Army Corps of Engineers (USACE), New York District, is the lead Federal agency for the Fire Island Inlet to Montauk Point, New York Combined Beach Erosion Control and Hurricane Protection Project (FIMP) (hereafter referred to as "Project"). The primary goal of the Project is 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. The 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 (see Figure ES-1).

The New York District is currently leading the planning effort for the proposed action in this environmental impact statement (EIS), with the National Park Service (NPS)-FIIS and the U.S. Fish and Wildlife Service (USFWS) as the responsible cooperating agencies and New York State, represented by the New York State Department of Environmental Conservation (NYSDEC), as the local sponsor. A Memorandum of Understanding (MOU) between the U.S. Army and the Department of Interior was signed in July 2014 that provides the foundation for "…developing a plan that is mutually acceptable for hurricane and storm damage reduction, including identifying and evaluating natural and nature-based measures that contribute to coastal storm damage risk reduction, in the general reformulation study for the FIMP project. (MOU, 2014 – See Pertinent Correspondence – Appendix L) Given the complex system and the large number of stakeholders, an Interagency Reformulation Group (IRG) was established to provide executive level leadership for the study from the key federal and State agencies. The IRG developed and signed a vision statement that identified the broad objectives for the study.

This Draft EIS presents the results of the New York District's evaluation of various alternatives intended to manage damages caused by storm events, and assesses the environmental impacts of the selected Project. This Draft EIS fulfills the requirements of the National Environmental Policy Act of 1969 (NEPA) and is in accordance with the President's Council on Environmental Quality (CEQ) Rules and Regulations for implementing NEPA (Title 40, Code of Federal Regulations [CFR], Sections 1500-1508), the USACE's *Procedures for Implementing NEPA* (Engineering Resolution [ER] 200-2-2), and other applicable Federal and state environmental laws.

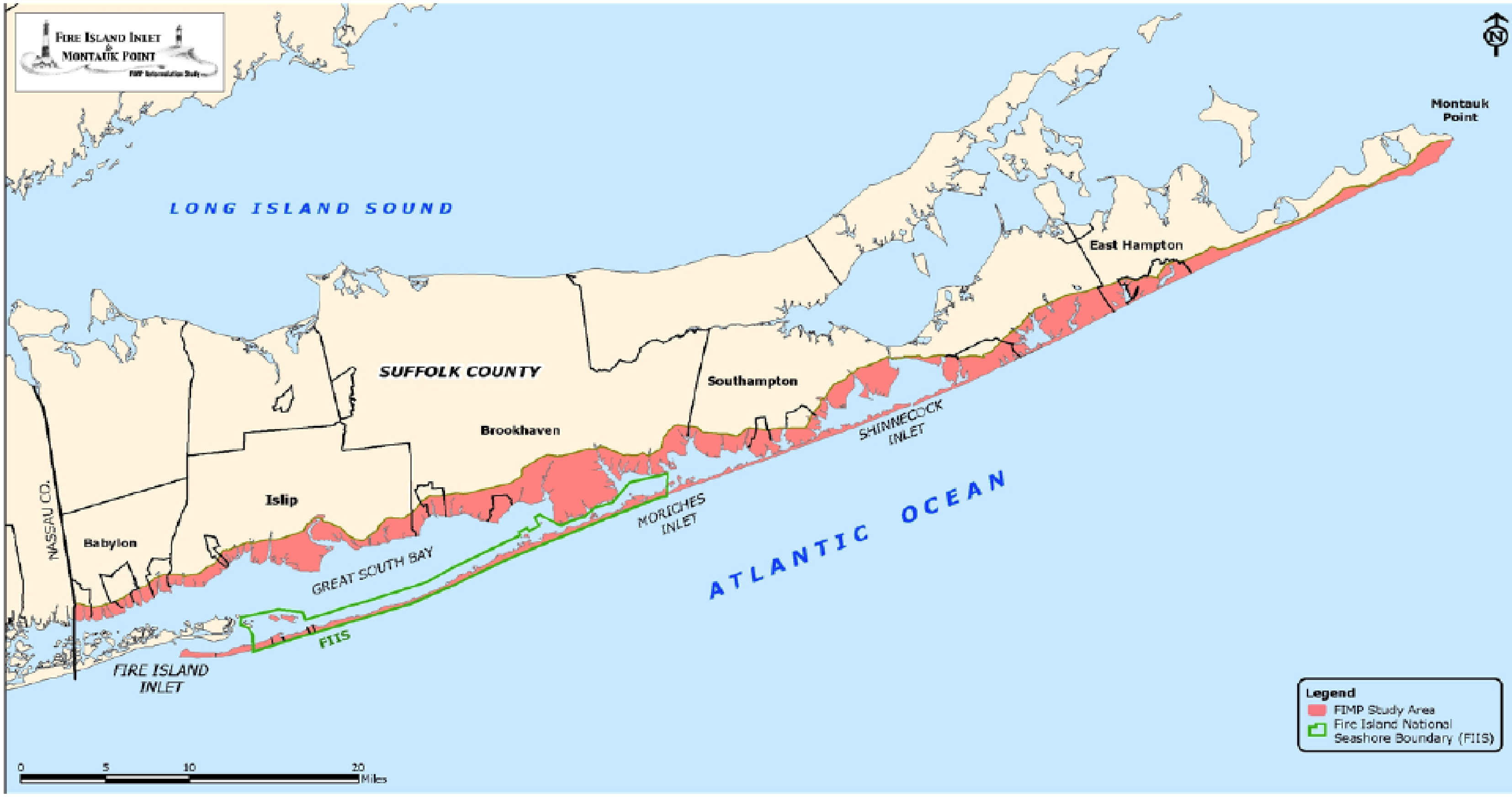

Figure ES-1. EIS Study Area

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 water levels 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. Failure to identify a long-term solution to manage the risk of coastal storm damages may lead to potential loss of life, physical and environmental damage, municipal infrastructure damage and harm to economic activity within the Project area.

In May 2009, a Draft Formulation Report was provided to the key government partners and stakeholders that identified problems, opportunities, objectives and constraints, analyzed alternatives, and proposed several alternative plans for consideration. Based on the comments received and subsequent discussions among the stakeholders and public, a Tentative Federally Supported Plan (TFSP) was jointly identified by the Corps of Engineers and the Department of Interior and submitted to the New York State Department of Environmental Conservation (DEC), the non-federal sponsor, in March 2011. The TFSP identified a plan that met the study objectives and the requirements of both the Corps' and DOI.

On October 29, 2012, Hurricane Sandy made landfall near Atlantic City, NJ, where it collided with a blast of arctic air from the north, creating conditions for an extraordinary historic 'super storm' along the East Coast with the worst coastal impacts centered on the northern New Jersey, New York City, and the Long Island coastlines. Coastal erosion and damages within the FIMP study area as a result of Hurricane Sandy were severe and substantial. There were three breaches of the barrier island, multiple overwashes, extensive shorefront damages, and extensive back bay flooding. Post-Sandy measurements of beach and dune volume loss on Fire Island indicated that the subaerial beach lost 55 percent of its pre-storm volume equating to a loss of 4.5 million cubic yards. A majority of the dunes either were flattened or experienced severe erosion and scarping.

Utilizing funding from the Disaster Relief Appropriations Act of 2013 (P.L. 113-2), the Corps in partnership with New York State has undertaken stabilization efforts on Fire Island and in Downtown Montauk, in order to reestablish a protective beach and dune in vulnerable areas.

Due to the significant changes brought about by Hurricane Sandy, a reanalysis of the TFSP was undertaken to take into account these changes to the landform, development patterns, and risk.

The post-Sandy TFSP was provided to New York State in May 2013, who agreed in concept with the plan. With sponsor support, the TFSP has been identified as the Tentatively Selected Plan (TSP), subject to refinement, based upon public and agency comment. The public and agency review process will also be the basis for finalizing a TSP that meets the requirements of being mutually acceptable to the Secretary of the Army and Secretary of the Interior. The Federal and non-Federal partners have agreed that there are plan details that still need to be finalized. This GRR identifies several plan elements that will continue to be refined during the public and agency review process.

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 berm 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 original authorization also provides for the construction of up to 50 groins, grass planting on the dunes, interior drainage structures at Mecox Bay, Sagaponack Lake and Georgica Pond, and beach re-nourishment for a period of ten years after initial construction.

This authorization has been modified by 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), which modified the cost-sharing percentages and the period of renourishment. As mentioned previously the reformulated FIMP project is also eligible for funding under PL 113-2, which would be at “full federal expense” for initial construction.

Construction of two (2) groins in East Hampton in the vicinity of Georgica pond (Reach 4) were completed in September 1965. Eleven groins in West Hampton Beach (Reach 2) were completed in 1966, with an additional four (4) groins completed in 1970.

Due to severe erosion in the community of Westhampton Dunes located west of the Westhampton groins, an interim project was approved in 1995 that provided for a beach berm and dune, tapering of the western two existing groins, construction of an intermediate groin between the two, and periodic renourishment for up to 30 years. Initial construction was completed in 1997 and renourishment took place in 2001, 2004, 2008, and also in 2014, following Hurricane Sandy, utilizing funding per P.L. 113-2.

An Interim Breach Contingency Plan (BCP) was approved in 1996 that authorized the Corps to respond quickly to close breaches within three (3) months. The BCP was used following Hurricane Sandy to close two breaches of the barrier islands at Smith Point County Park, and at Cupsogue County Park.

An interim project was also approved in 2002 for beach nourishment along 4000 ft. of the vulnerable shoreline immediately west of Shinnecock Inlet, which was constructed in 2006. Following Hurricane Sandy, this area was renourished in 2013, utilizing funds appropriated through P.L 113-2.

Utilizing funding from the Disaster Relief Appropriations Act of 2013 (P.L. 113-2), the Corps in partnership with New York State has undertaken stabilization efforts on Fire Island and in Downtown Montauk, in order to reestablish a protective beach and dune in vulnerable areas. These projects were approved in 2014, and construction initiated in 2014. Construction of the Downtown Montauk Stabilization Project was completed in 2016, construction of the Fire Island to Moriches Inlet (FIMI) Stabilization Project is scheduled to be completed in 2018.

The New York District's proposed plan, known as the Tentatively Selected Plan (TSP) includes a combination of: (1) inlet modifications (continuation of authorized navigation projects, dredging, downdrift placement of dredge, placement of dune and berm, and monitoring); (2) non-structural measures (primarily building retrofits, with limited relocations and buy-outs); (3) breach response for barrier islands; (4) beach and dune fill with renourishment: up to 30 years, approximately every 4 years; (5) sediment management; (6) groin modifications; (7) coastal process features; (8) adaptive management; and (9) integration of local land use regulations and management. Figure ES-2 provides an overview of the TSP. The TSP is intended to:

- Reduce the threat of potential future damages due to the effects of storm-induced flooding, wave attack, and shore recession;
- Mitigate the effect of and reduce or offset current long-term erosion trends;
- Minimize impact of improvement projects on environmental resources and adjacent shore areas;
- Reestablish degraded coastal processes to reduce storm damage and restore or enhance environmental functioning; and
- Reduce the need for ongoing protection measures and consider the long-term demand for public resources.

A "Vision Statement for the Reformulation Study" that integrates the policies of the Corps of Engineers, the State of New York and the National Park Service was developed in 2004 and commits the partner agencies to recognize the following during the plan formulation process:

- Decisions must be based upon sound science, and current understanding of the system.
- Flooding will be addressed with site specific measures that address the various causes of flooding.
- Priority will be given to measures which both provide protection, and restore and enhance coastal processes and ecosystem integrity.
- Preference will be given to nonstructural measures that protect and restore coastal landforms and natural habitats.
- Project features should avoid or minimize adverse environmental impacts and address long-term demands for public resources.
- Balances dune and beach replenishment considering storm damage reduction and environmental considerations.
- Consideration will be given to alteration of existing shore stabilization structures, inlet stabilization measures, and dredging practices.

In addition to the TSP, the EIS analyzes three other alternatives: (1) the No-Action Alternative (or Future Without-Project [FWOP]); (2) Alternative 1, which would involve similar actions as the TSP, but with minor changes in the amount of beachfill and changes in the adaptive management approach (there would be no set renourishments); and (3) Alternative 2, which would involve similar actions as the TSP but no relocation or buyouts would occur, and adaptive management and land use regulations and management would not be integrated. Table 2-4 of the EIS presents a summary comparison of each of the alternatives, but is not repeated in this Summary.

TENTATIVE FEDERALLY SUPPORTED PLAN

In May 2009, a draft Formulation report (USACE 2009) was provided to the key government partners and stakeholders that identified the problems, opportunities, objectives and constraints, analyzed alternatives, and proposed several alternative plans for consideration. Based on the comments received and subsequent discussions among the stakeholders and public, a Tentative Federally Supported Plan (TFSP) was jointly identified by the Corps of Engineers and the Department of Interior and submitted to the New York State Department of Environmental Conservation (NYSDEC), the non-Federal sponsor, in March 2011. The TFSP was identified as the NED Plan, since this is the plan that maximized net benefits, and satisfied the requirement (constraint) to be mutually acceptable with the Secretary of the Army and Secretary of Interior.
In March 2011, the USACE and DOI transmitted a summary of the TFSP to the State of New York to request their concurrence. By letter dated December 29, 2011, the State provided comments on the TFSP and requested clarification and further detail of the proposed project features and implementation steps.

Coordination was ongoing when Hurricane Sandy struck on October 29 2012, and caused extensive damage to the Project Area, and created several breaches of the barrier island. Two of the breaches were closed. The breach within the OP Wilderness Area, which remains open. DOI is currently monitoring the breach and is preparing an Environmental Impact Statement to determine how to best manage the breach.

Following Hurricane Sandy, the Corps took the following actions in order to update the TFSP. The effort included the following updates:

- The Corps updated the structure inventory and shoreline conditions, based upon post-Sandy changes.
- The Corps updated the hydrodynamic modelling that was done previously, to account for the breach that occurred in the Wilderness Area.
- The Corps updated the economics life-cycle model to account for the existing breach in the Otis Pike Wilderness Area, and also to reflect the new information available about expected breach growth rates.
- The Corps accounted for post-Sandy efforts undertaken by the Corps, and by others. This includes repair of the existing projects, the Fire Island and Downtown Montauk Stabilization Projects, and nonstructural plans that have been implemented by several entities.

The Corps updated the TFSP in response to these changed conditions, and the risk and vulnerability within the study area demonstrated by the hurricane. The changes made to the TFSP, include:

- A dune alignment on Fire Island located further landward that reflects the post-Sandy beach and dune condition and is consistent with the post-Sandy Fire Island to Moriches Inlet (FIMI) Stabilization Project.

- A Proactive Breach Response Plan within Smith Point County Park and the FIIS Lighthouse Tract to provide a greater level of risk-reduction to these two heavily impacted areas.
- A 30-yr commitment for periodic renourishment and a Breach Response Plan for years 31-50.
- A Conditional Breach Response Plan on to NPS owned lands that provides for a decision-making process to consider if the breaches will close naturally, prior to implementing mechanical closure.
- Refinement of the coastal process features, with an emphasis on features that contribute to coastal storm risk management.
- Recognition that changes in land management regulations by non-USACE entities that complement the features recommended for FIMP.

This updated plan was provided to New York State in May 2013. New York State agreed in concept with this plan in June 2013, recognizing that further refinements to the plan would be taking place. In August 2015, the Corps advised New York State of their intent to proceed with this updated plan as the Tentatively Selected Plan (TSP).

Consistent with the Corps' process, the TSP is still subject to refinement, based upon public and agency review. The updates to the plan to arrive at the TSP have not been fully vetted within the Corps and DOI; however, the Corps and DOI have entered into an MOU in July 2014 in which both parties committed to finalizing the FIMP report, consistent with the Vision Statement. The Corps, NYS, and DOI agreed to use the public and agency review process to finalize a plan that is mutually acceptable to the Secretary of the Army and Secretary of the Interior.

There are several elements of the TSP that the Corps, DOI, and New York State have agreed to continue to develop concurrent with the public and agency review process that may affect the final plan. This includes 1) the scope and extent of the coastal process features, 2) refinement of breach response protocols, 3) refinement of adaptive management, and 4) refinement of land management. The Corps and DOI recognize that there are additional needs and opportunities to provide for coastal process features which replicate the cross-island transport of sediment, provide barrier island resiliency, and long-term sustainability. With respect to the breach response protocols, the involved agencies have agreed that refinement of the decision-making protocols to better specify how the decisions related to breach closure would be made. Adaptive management is recognized as an important element of the selected plan, but the framework for adaptive management has not been defined. It is the intent of the agencies to identify the conditions under which changes in the plan could be made, and the framework for decision-making that would constitute an adaptive management plan. Land management is recognized as an important tool to manage future risks. The Federal and State agencies have agreed to continue to identify the land management measures that are available to manage these risks, and how these measures will work in conjunction with the TSP.

The specific features of the TSP are described below:

Inlet Modifications

- 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 and Nonstructural

- Addresses approximately 4,400 structures within 10 year flood plain using nonstructural measures, primarily through building retrofits, with limited relocations and buy-outs, based upon structure type and condition.
- Includes road raising in four locations, totaling 5.91 miles in length, which will reduce flooding to 1,020 houses.

Barrier Islands

- Breach Response
  - 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.
- Beach and Dune Fill
  - Provides for a continuous 90 ft. width berm and +15 ft. NGVD dune along the developed shorefront areas fronting Great South Bay and Moriches Bay on Fire Island and Westhampton barrier islands.
  - On Fire Island the alignment follows the post-Sandy optimized alignment that includes overfill in the developed locations and minimizes tapers into Federal tracts.
  - Periodic Renourishment would take place about every 4 years for a 30 year period after initial construction. For years 31 through 50, there would be Proactive Breach Response in those reaches, which continues to provide some storm risk management, albeit less than what was provided by the periodic renourishment.

Sediment Management at Downtown Montauk (Montauk Beach) and Potato Road

- Provides for placing about 120,000 CY on front face of existing berm at each location approximately every 4 years as advance fill to offset erosion.
- The Potato Road feeder beach is contingent upon implementation of a local pond opening management plan for Georgica Pond.

Groin Modifications

- Shorten existing Westhampton groins (1-13) between 70 — 100 ft. to achieve coastal processes reestablished after relocation of Ocean Beach water supply wells. Final modifications will be determined during PED.
- Modify the existing Ocean Beach groins (shorten and lower) after relocation of Ocean Beach water supply wells. Final modifications will be determined during PED.
-

Coastal Process Features

- 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.

Adaptive Management

- Will provide for monitoring for project success, relative to the original objectives and the ability to adjust specific project features to improve effectiveness.
- Climate change will be accounted for with the monitoring of climate change parameters, identification of the effect of climate change on the project design, and identification of adaptation measures that are necessary to accommodate climate changes as it relates to all the project elements.

Integration of Local and Land Use Regulations and Management

- Local land management regulations to include enforcement of federal and state zoning requirements, as a necessary complementary feature for long-term risk reduction.

A summary of the potential environmental impacts associated with the TSP follows. The USACE would implement best management practices in the design, construction, and operation of the TSP to avoid and minimize environmental impacts to the extent practicable. Throughout Chapter 4 of the EIS, measures that would be taken to avoid and minimize impacts are discussed, as appropriate, for each resource.

Topography, Land Formation, Key Geologic Characteristics. The TSP would reduce the frequency and volume of the barrier overwash and reduce the number of the barrier breaches. Beneficial topographic and geomorphological effects are anticipated, including raising the protective capacity of the Study Area.

Water Resources. Structural measures would reduce risk of flow and water levels during storm surge. Impacts from continued rise in population and development would be same as the FWOP. Sea level rise would result in less potential for saltwater in groundwater compared to the FWOP.

Vegetation (Uplands). The TSP would reduce the frequency and volume of the barrier overwash and reduce the number of the barrier breaches. There would be less sediment input within the estuaries adjacent to the barrier islands, which would decrease the long-term formation of salt marsh and submerged aquatic vegetation (SAV) beds. The TSP would help counter the impacts associated with the projected rise in sea level and the associated negative impacts to plant communities.

Wetlands. The TSP would reduce the risk of coastal risk management and provide protection to wetlands. The TSP would not require filling any wetlands and would not produce significant changes in hydrology or salinity affecting wetlands.

Fish and Wildlife. The TSP would reduce the frequency and volume of the barrier overwash and reduce the number of the barrier breaches. This would reduce the biological impacts related to breaches compared to the FWOP. Avian habitats associated with the marine intertidal, inlets, barrier islands, dunes and swales, upland, bayside beach and back bay areas will likely be less impacted because there would be less coastal erosion and breaching of beaches, dunes, and shorelines. Beach narrowing would also be lessened as a result of storm events, which would improve the quality of this habitat, which is utilized by many species.

Rare Species and Habitats. 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. Because no major changes in the marine offshore habitat is anticipated under the TSP, impacts to marine offshore rare species and habitats are not anticipated. Localized dredging of sand for the TSP are expected to continue in the same manner although more frequently. The increase in renourishment would be completed for the next 30

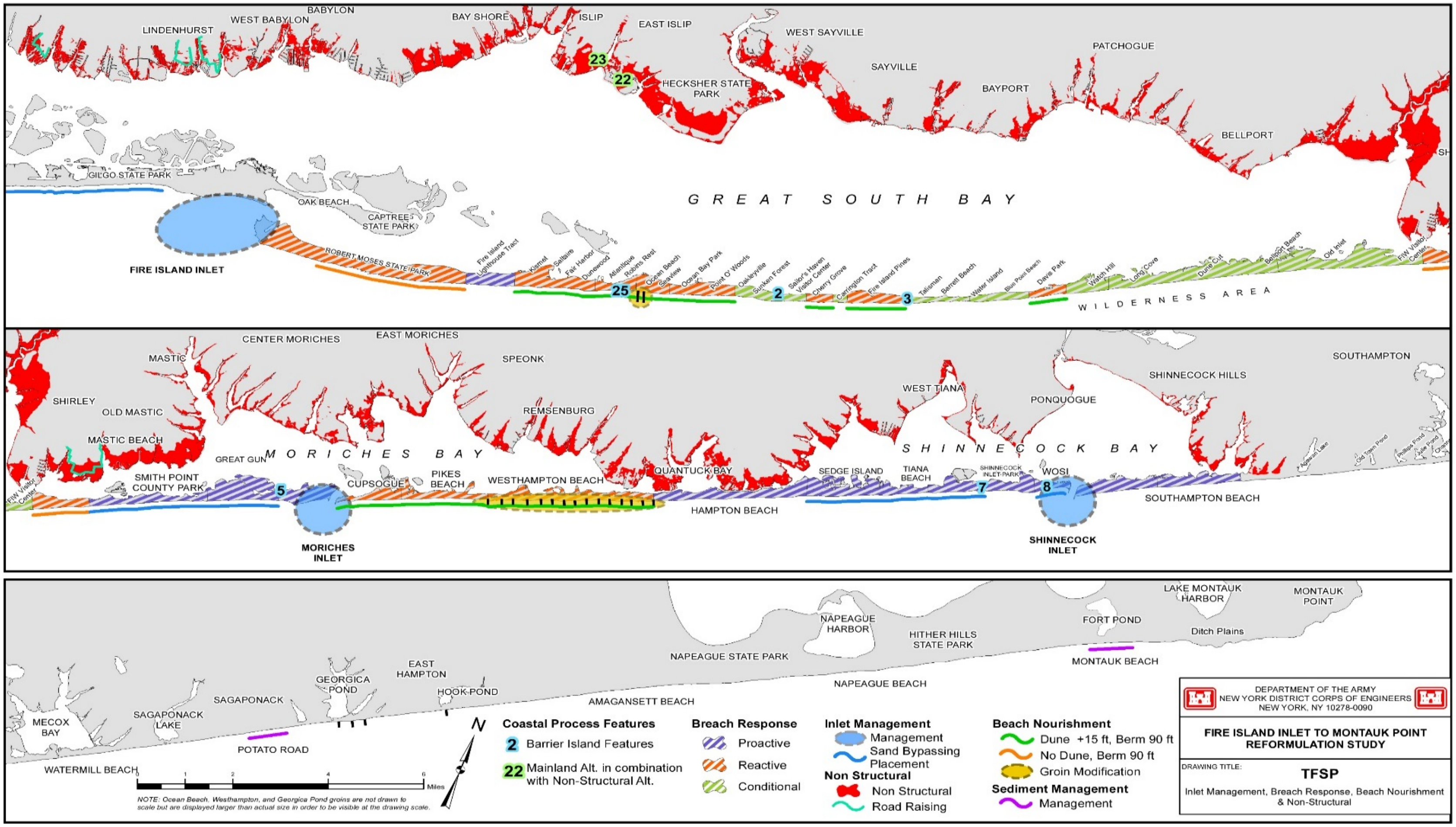

Figure ES-2. Overview of the TSP

years which would entail dredging fill from offshore borrow areas. The TSP could have a positive impact on dunes in the barrier island ecosystem that are outside of the Study Area but close enough that they may potentially be impacted. It is likely that impacts would be similar but not as intense as impacts within the Study Area. The TSP would likely reduce the risk of coastal storm damage. Although vehicular use for beach renourishment may negatively impact nesting birds by disturbing them or destroying their nests or some types of vegetation by crushing the plants themselves or their seedlings. The use of best management practices will reduce the likelihood of impacts.

Recreational Resources. Beach erosion would be greatly reduced in the areas proposed for renourishment. The placement of beach fill in the designated areas would protect recreational uses. Due to the reduced likelihood of breaching and inundation of the bay shore, recreational areas are much less likely to be damaged or destroyed. Storm-induced breaching or creation of inlets along barrier island areas which can result in the permanent loss of recreation land areas would be minimized under the TSP and potential damage from future storms to recreational features and facilities such as piers and marinas, beaches, trails, campsites, golf courses, fishing areas, and birding areas would also be minimized. During construction activities, a certain amount of short-term disruption is unavoidable. This would primarily include access to the beach, interruption of pedestrian routes along the beach, and noise from trucks and other heavy machinery.

Socioeconomics and Environmental Justice. With the implementation of the TSP, the extent of storm damage in the Study Area communities would be reduced. Thus, access to businesses would be less likely to suffer directly through structural damage or indirectly through interruption of access or utility service. Based on the analysis of impacts for resource areas, few long-term significant impacts from construction or operation of the TSP are expected. Impacts may occur in areas where environmental justice populations were identified; however, it is expected that any impacts would affect all populations within the Study Area equally. Therefore, no unavoidable adverse impacts would be disproportionately borne by minority and/or low-income populations as a result of the TSP. Implementation of the TSP would improve conditions in the Study Area and therefore would not have a disproportionate adverse impact on any low-income or minority populations.

Cultural Resources. Dredging from selected borrow areas has the potential to directly adversely impact previously unrecorded shipwreck sites. Dune, berm, and beachfill projects involving beach scraping or re-grading to move material could be expected to expose and potentially directly adversely impact previously unrecorded archaeological deposits.

Land Use and Development, Policy, and Zoning. By reducing the risk of coastal storm risk management, the TSP could have a positive impact on land use development, policy, and zoning. Non-structural measures of TSP include: (1) a building retrofit plan for approximately 4,400 structures, and (2) four road raisings. The building retrofit plan involves a 100-year level of protection for all structures inside the 10-year floodplain (approximately 44 in Shinnecock Bay, 857 in Moriches Bay, and 3,110 in Great South Bay). Building retrofit measures are proposed, and could include limited relocation or buyouts based upon structure type and condition. Although erosion and adverse effects of storm events would continue, the TSP would reduce losses in beach frontage on Fire Island, and reduce the potential for structural damage and loss of homes and businesses on Fire Island and along the bay shore.

Transportation. By reducing the risk of coastal storm damages, the TSP could have a positive impact on transportation resources within the Study Area. Although transportation resources would continue to be influenced by storms, hurricanes, sea level rise, coastal erosion, flooding, breaching, and overwash, the TSP would reduce the potential for adverse impacts to traffic, transportation, access, and circulation that are expected under the FWOP. The four road raisings would significantly reduce storm-related disruption to the existing road network. Additionally, relocation or buyouts could reduce transportation needs.

Aesthetics and Scenic Resources. Implementing the TSP would require the use of large construction equipment, which would create temporary visual impacts within the Study Area. A potential major difference between the TSP and the FWOP would involve buyouts. Any buyouts of properties could result in a conversion to open space. Restoration of the natural features of the land would be expected to enhance the shoreline visual quality. Storms and coastal processes would continue to cause short- and long-term impacts to visual resources under the TSP scenario. Impacts from these natural processes would result from storm and flooding events that may cause significant erosion or breaching of beaches, dunes, and shorelines, and cause structural damage to homes located within the floodplain areas. Sea-level rise associated with climate change is also expected to contribute to long-term impacts. Implementation of the TSP, including set renourishments, would minimize these impacts.

Coastal Zone Management. As detailed in Appendix G of the EIS, the TSP would be consistent with the State Coastal policies and the Local Waterfront Revitalization Program (LWRP) policies.

Air Quality. The TSP would temporarily produce emissions associated with diesel-fueled equipment relating to dredging activities. The localized emission increases from the diesel-fueled equipment will last only during the construction period, thus any potential impacts will be temporary in nature. The TSP, FWOP, and alternatives are not 'de minimis' under the General Conformity requirements (40 CFR§93.153) and would have to comply through the following options that are under coordination with NYSDEC: use of available Surplus NOx Emission Offsets (SNEOs) generated by the Harbor Deepening Project, establishment of a Marine Vessel Engine Replacement Program (MVERP), the purchase of Environmental Protection Agency (EPA) Cross-State Air Pollution Rule (CSAPR) ozone season oxides of nitrogen allowances, statutory exemption, elongation of the construction schedule so as to avoid triggering GC, and/or State Implementation Plan accommodation. The final combination of the above options will be coordinated and tracked through the Regional Air Team (RAT). The TSP is anticipated to be the most efficient approach to coastal management for the study area, and thus is anticipated to generate the lowest pollutant emissions.

The FWOP scenario may result in greater pollutant emissions due to the repeated coastal management projects that would need to be conducted as individual projects or emergency actions (i.e., the FWOP represents less efficient implementation of coastal management). For example, additional mobilization and demobilization, emergency response conditions, and other elements associated with numerous individual projects would continue to be needed under the FWOP scenario, which could reduce the overall efficiency of protecting the coast, which would in turn lead to increases in pollutant emissions. Further, from the pollutant perspective, there is the potential that not all of the individual projects would necessarily trigger General Conformity, resulting in no offsetting of construction emissions associated with non-triggering 'de minimis' projects.

Noise. Sources of noise for the TSP would include dredging equipment, bulldozers (or similar equipment), and a pump-out station (if used). Construction activities would result in short-term minor increases in noise generation as a result of the operation of construction equipment. No long-term significant impacts would occur.

If the TSP is not implemented, no additional Federal actions would be taken to provide for coastal storm risk management. The FWOP Alternative analysis of damages assumes the following will occur:

- 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, and
- After storm events beaches tend to recover when long-period waves move sand from the nearshore back onto the beach.

Although coastal risk management from small storm events is provided by local topographic features and landforms, future large storm events would cause extensive damages to the area. Because no major changes to the shorefront are expected, the existing level of coastal risk protection would be less effective as sea level changes and severe storm surges become more frequent.

The FWOP fails to meet any of the objectives or needs of a coastal storm risk management plan, but it provides the base against which Project benefits are measured. The FWOP would be implemented if Project costs were to exceed project benefits, thus indicating that risk management measures are not in the Federal interest under current USACE guidelines. The USACE has calculated that the annual damages for the FWOP would be approximately $138.4 million, versus $64.6 million for the TSP, meaning the TSP would provide approximately $74 million in annual benefits. The TSP would provide a benefit-to-cost ratio (BCR) of 1.5.

Greenhouse Gases. The TSP is being planned in response to damage caused by severe storm events that eroded beaches along the Long Island coastline, which is an anticipated effect of climate change. The generation of greenhouse gas (GHG) emissions associated with the project's construction activities will be temporary in nature, spanning only the construction period. Reduction of GHG emissions will be considered in the selection of mitigation options, as feasible. The TSP is anticipated to be the most efficient approach to coastal management for the study area, and thus is anticipated to generate the lowest GHG emissions.

The FWOP scenario may result in greater GHG emissions due to the repeated coastal management projects that would need to be conducted as individual projects or emergency actions (i.e., less efficient implementation). For example, additional mobilization and demobilization, emergency response conditions, and other elements associated with numerous individual projects would continue to be needed under the FWOP scenario and could reduce the overall efficiency of protecting the coast, which would lead to increases in GHG emissions.

1.0 INTRODUCTION AND PURPOSE AND NEED FOR AGENCY ACTION

The U.S. Army Corps of Engineers (USACE), New York District is conducting a comprehensive analysis of the environmental impacts of alternatives for shore protection and storm damage reduction for the south shore of Long Island, New York, from Fire Island Inlet to Montauk Point. This Fire Island Inlet to Montauk Point Draft Environmental Impact Statement (FIMP DEIS) has been prepared pursuant to the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 et seq.). This chapter includes background information on the project (Section 1.1); describes the purpose and need for agency action (Section 1.2); presents information on storm history and previously authorized and constructed projects relevant to this DEIS (Section 1.3); discusses the problem and causes (Section 1.4); provides a general discussion of the Study Area ecosystems and habitats (Section 1.5); and concludes with a section on the organization of this DEIS (Section 1.6).

National Environmental Policy Act

NEPA requires the preparation of an EIS for every major Federal action that could significantly affect the quality of the human environment. NEPA's main purpose is to provide environmental information to decision makers and the public so actions are based on an understanding of the potential environmental consequences of a proposed action and its reasonable alternatives.

1.1 BACKGROUND

As shown on Figure 1-1, the DEIS 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 1.6 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.

Figure 1-1. DEIS Study Area

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 as well as the critical coastal habitat and environmentally sensitive areas, such as the Fire Island National Seashore. 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-year 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 water levels 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 current study is called a Reformulation, because it seeks to reexamine the Project that was originally formulated in the 1950's. This Reformulation came about in part due to a referral to the Council on Environmental Quality in response to a 1978 EIS that was prepared for the project subsequent to passage of NEPA in 1969. As a result of the referral, USACE agreed to reformulate the Project with particular emphasis on identifying and evaluating alternatives that considers cumulative impacts on the overall coastal system. The goal of the Reformulation Study is to identify an economically viable, environmentally acceptable plan that addresses the storm damage reduction needs of the Study Area and is acceptable to the key federal, state, and local stakeholders (USACE 2016). Included within the study area is the Fire Island National Seashore (FIIS). The authorizing law for FIIS specifies that any plan for coastal storm risk management with the boundary of FIIS be mutually agreeable with the Secretary of the Interior and Secretary of the Army.

In support of this DEIS, the New York District, in cooperation with Federal, State and local agencies, has been conducting Reformulation Study to evaluate several storm damage reduction plans for the Study Area (“Reformulation Study”) (USACE 2009a). The Reformulation Study focuses on identifying a long-term solution to reduce the risk of coastal storm damages in the Project Area in a manner which considers the risks to human life and property, while maintaining, enhancing, and restoring ecosystem integrity and coastal biodiversity. The Reformulation Study is discussed in greater detail in Chapter 2.

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 2009 USACE 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 that were being formulated were necessary. The New York District has prepared an updated 2016 Reformulation Study (USACE 2016) to document the post-Sandy proposed action for this DEIS. As discussed in Chapter 2, the proposed action for this DEIS, as well as the reasonable alternatives, were developed in part, through the efforts associated with the 2009 USACE Study and the post-Hurricane Sandy efforts documented in the updated 2016 Reformulation Study. (GRR 2016 appendix E)

Within the study area, sediment along the ocean shoreline has a net east to west alongshore movement, in response to waves and currents during normal conditions and during storms. This alongshore movement of sand shapes 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 (storms generally greater than a 2% annual chance of exceedance) through the episodic transport of sand over the island through overwash or breaching.

Given the complex system and the large number of stakeholders, a collaborative planning approach has been utilized to involve the key stakeholders and the public. An Interagency Reformulation Group (IRG) was established that provided executive level leadership for the study from the key federal and State agencies. The IRG developed a vision statement that identified the broad objectives for the study. The IRG also established various Technical Management Groups that included agency members, as well as non-governmental organizations and academia.

On October 29, 2012, Hurricane Sandy made landfall near Atlantic City, NJ, where it collided with a blast of arctic air from the north, creating conditions for an extraordinary historic ‘super storm’ along the East Coast with the worst coastal impacts centered on the northern New Jersey, New York City, and the Long Island coastline. Hurricane Sandy’s unusual track and extraordinary size generated record storms surges and offshore wave heights in the New York

Bight. The maximum water level at The Battery, NY peaked at +12.4 feet NGVD, exceeding the previous record by over 4 feet. Coastal erosion and damages within the FIMP study area as a result of Hurricane Sandy were severe and substantial. For example, post-Sandy measurements of volume loss of the beach and dunes on Fire Island indicated that the subaerial beach lost 55 percent of its pre-storm volume equating to a loss of 4.5 million cubic yards. A majority of the dunes either were flattened or experienced severe erosion and scarping
As a result of Sandy, further refinements were made to the TFSP, in order to arrive at the Tentatively Selected Plan (TSP), (GRR Chapter 5, Plan Formulation).

The GRR and DEIS will serve as a decision document for implementation of the reformulated FIMP project, in accordance with the Disaster Relief Appropriations Act of 2013 (P.L. 113-2). As an "authorized, but unconstructed" project, the reformulated FIMP project is eligible for funding under PL 113-2 for initial construction at full federal expense.

1.2 PURPOSE AND NEED FOR AGENCY ACTION

As described in Section 1.4, 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 flooding during no-breach conditions. Flooding becomes worse when there is a breach of the barrier island, which allows for more storm water from the ocean. These problems have occurred repeatedly in the past, resulting in damages to the existing environment.

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. The project authorization was modified again by Section 31 of the Water Resources Development Act (WRDA) of 1974. The authorization was further modified by section 502 of the WRDA of 1986 (P.L. 99-662). For portions of Fire Island to Montauk Point, other than the portion from Moriches Inlet to Shinnecock Inlet, Section 103 of the WRDA of 1986 (P.L. 99-662) defined the cost sharing of the first cost to be 65 percent Federal. In addition, Section 156 of the WRDA of 1976, as modified by Section 934 of the WRDA 1986, modifies the existing authorization to provide for continued renourishment not to exceed 50 years from initiation of construction of each of these reaches. The WRDA of 1992 further modified the project to extend the period of periodic nourishment to 30 years from the date of project completion for Moriches to Shinnecock Inlet, with the non-Federal share not to exceed 35 percent of the total project cost. The WRDA of 1999 further modified the project authorization, requiring the Corps to submit to Congress a mutually acceptable plan for the Fire Island Inlet to Moriches Inlet Reach (USACE 2009a).). The authorizing law for FIIS specified that any plan for shore protection with the boundary of FIIS be mutually agreeable with the Secretary of the Interior and Secretary of the Army.

The New York District is currently leading the planning effort for the proposed action in this DEIS, with the National Park Service (NPS)-FIIS and the U.S. Fish and Wildlife Service (USFWS) as the responsible cooperating agencies and New York State, represented by the New

York State Department of Environmental Conservation (NYSDEC), as the local sponsor. As such, each of these agencies has a purpose and need for action, as discussed below.

USACE-New York District. The New York District plans, designs, and constructs coastal storm risk management projects and flood risk management projects in five northeastern states. Congress and New York State have asked the New York District to develop a comprehensive long-term plan of coastal storm risk management for areas along the ocean and mainland shore areas protected by barrier islands that are prone to flooding, erosion and other storm damage. As such, the purpose and need for the New York District action is to evaluate and recommend a long-term, comprehensive plan to protect these areas from flooding, erosion, and other storm damage, while concurrently maintaining, preserving, or enhancing the natural resources (USACE 2009a). The New York District action is intended to:

- Reduce the threat of potential future damages due to the effects of storm-induced flooding, wave attack, and shore recession;
- Mitigate the effect of and reduce or offset current long-term erosion trends;
- Minimize impact of improvement projects on environmental resources and adjacent shore areas;
- Restore degraded coastal processes to reduce storm damage and restore or enhance environmental functioning; and
- Reduce the need for ongoing protection measures and consider the long-term demand for public resources (USACE 2009a, USACE 2016).

NPS. NPS has a role in the project approval process because a Special Use Permit would be required from the NPS before the implementation of any actions in the park jurisdiction. FIIS was established by Public Law 88-587 on September 11, 1964, and placed under the jurisdiction of the U.S. Department of the Interior, National Park Service (NPS). FIIS encompasses much of Fire Island, with only Robert Moses State Park on the far western end of the barrier island excluded. The boundaries of the seashore extend 1,000 feet into the Atlantic Ocean and 4,000 feet into the Great South and Moriches Bays. The islands and marshlands adjacent to Fire Island are also included in FIIS. Since its establishment, NPS has prepared a number of documents that set the policies and management policies for the FIIS. A General Management Plan (GMP) and the EIS on the GMP were accepted in 1978. A Resource Management Plan was approved August 9, 1993. NPS also has a Wilderness Management Plan which provides management guidelines to achieve the requirements of the Wilderness Act and the specific legislative history applicable to the Fire Island Wilderness.

As they relate to this project, the objectives of the NPS are summarized below.

- Preserve and enhance the serenity and natural beauty of the island, which includes protection of the beaches, dunes and other natural features fundamental to the concept of the FIIS.
- Manage Fire Island to enhance natural processes and mitigate the impacts of human interference with these processes.

- Provide for and continue to serve the recreational needs of Fire Island's users, who are largely drawn from Nassau and Suffolk Counties and from New York City, making the seashore accessible to a cross section of the national and regional population.
- Identify and preserve cultural resources.
- Protect and preserve natural plant and animal communities.
- Maintain and/or restore all areas not required for public or administrative use to a natural condition using aesthetically appealing and environmentally compatible methods.
- Maintain and provide only those dune crossings (vehicular and pedestrian) required for the proper use and preservation of the area.

USFWS. USFWS also has a role in the project approval process through the Fish and Wildlife Coordination Act of 1953 (P.L. 85-624). In addition, under the Endangered Species Act of 1973 (P.L. 93-205), USFWS will issue a Biological Opinion on the plans for the protection of endangered or threatened species in the project area. In addition, a portion of Fire Island lies within the Coastal Barrier Resources System, which is administered by USFWS pursuant to the Coastal Barrier Improvement Act of 1990. The objectives of the USFWS as they relate to this DEIS are as follows:

- Minimize disruption to the area’s wildlife resources.
- Avoid disturbance to the federal listed threatened piping plover (*Charadrius melodus*), and other such listed species that may occur in the project area and related borrow area.

New York State. The State as local sponsor has actions to take as well, including approval of project funding and a project cooperation agreement as well as NYSDEC’s Water Quality Certification and Coastal Zone Management (CZM) Compliance. These actions are subject to the State Environmental Quality Review (SEQR), which places requirements on state agencies similar to those of NEPA on federal agencies. As a local sponsor, NYSDEC’s basic mandate is to protect the environment of New York State, and from other relevant policies, particularly those of SEQR, of the Coastal Erosion Hazard Areas Act of 1981 (article 34 of the NYS Environmental Conservation Law) and of Section 401 of the federal Clean Water Act. In addition, NYSDEC maintains lists of locally threatened and endangered species that require special protection. The objectives of New York State can be summarized as follows:

- Proposed actions should minimize impacts on the environment, broadly defined to include, in addition to natural, air, and water resources, elements such as land used population patterns, community character, visual resources, historic and archaeological resources, noise levels, transportation and other infrastructure, and community facilities.
- NYSDEC has identified the Fire Island coastline as one most prone to erosion hazards, and has mapped a coastal erosion hazard area along its length. Activities within the coastal erosion hazard area should be limited and restricted to avoid exacerbation of erosion hazards and to protect natural protective features.
- Non-structural actions to minimize erosion damage are preferred to structural features. Erosion protective structures, if required, should be designed to minimize damage to other man-made property, natural protective features, or other natural resources.
- Avoid disruption to the state- listed threatened and endangered species that may occur in the project area and related borrow area.

1.3 STORM HISTORY AND PREVIOUSLY AUTHORIZED AND/OR CONSTRUCTED PROJECTS

The south shore of Long Island has repeatedly suffered devastating impacts from storms of both extra-tropical (northeasters) and tropical origin, including major northeasters in 1950, 1962, 1979, 1984, 1991, 1992 and 1993. Hurricanes resulting in significant damage include the great unnamed storm of 1938, Carol in 1954, Donna in 1960, Gloria in 1985, and Bob in 1991. The 1938 hurricane was particularly notable. As a result of that hurricane, twelve new inlets, including Shinnecock Inlet, were formed along the south shore, barrier breaches and numerous smaller breakthroughs occurred. All but Shinnecock were filled with wrecked cars, broken trees, structural debris and millions of tons of sand. Between the summer of 1995 and the winter of 1995-96, storms continued to take their toll on Fire Island. Hurricanes Felix and Luis, the November 14-15, 1995 northeaster, and the blizzard of 1996 have all contributed to continuing damages. A comparison of April 1995 aerial photographs to conditions in February 1996 showed that ten houses had been removed from their coastal lots and destroyed. At Smith Point County Park, a very popular recreation area, over 200 feet of beach was lost in the blizzard, exposing the infrastructure to future storms (USACE 2009a).

On October 29, 2012, Hurricane Sandy made landfall over the New York coast. Flooding along the coast, other overland flooding, and wind damaged communities throughout New York adding to damage suffered the previous year from Hurricane Irene and Tropical Storm Lee. In particular, communities in Nassau, Suffolk, Rockland, and Westchester Counties suffered substantial damage. These four counties were identified by the U.S. Department of Housing and Urban Development (HUD) as the most impacted and distressed counties in New York, excluding New York City. Within Suffolk County specifically, more than 11,840 owner-occupied homes were damaged, and more than 1,700 rental properties suffered substantial damage or were destroyed in Suffolk County, according to FEMA’s housing damage estimates. The estimated real property damage to these homes is over $1.4 billion (HUD 2013).

Coastal erosion and damages within the FIMP Study Area as a result of Hurricane Sandy were severe, substantial, and devastating. Post-Sandy measurements of volume loss of the beach and dunes on Fire Island indicate that on average the beach lost 55 percent of its pre-storm volume equating to a loss of 4.5 million cubic yards. A majority of the dunes on Fire Island either were flattened or experienced severe erosion and scarping. The wind and storm surge associated with Hurricane Sandy caused numerous overwashes and three breaches occurred on south shore barrier island system of Long Island. Two of those three breaches were on Fire Island and within the boundaries of Fire Island National Seashore: one within the Otis Pike Fire Island High Dune Wilderness and another in Smith Point County Park. In response to breaching of the barrier island, the Department of Environmental Conservation in concert with Suffolk County requested assistance from USACE to close the Smith Point and Cupsoque County Park breaches under the Breach Contingency Plan (BCP). The breaches at Cupsogue County Park and Smith Point County Park were closed in November 2012 and December 2012, respectively. The breach within the Fire Island Wilderness Area is being evaluated by the National Park Service, and is under evaluation in a separate EIS to make a decision on future actions. At this time, no closure activities have been initiated (USACE 2014 A/B).

A team from the U. S. Geological Survey (USGS) went to Fire Island before and after Hurricane Sandy to survey the beach and assess morphological changes. The following excerpt from their field report provides a summary of the impacts along Fire Island immediately after the storm (USGS 2013):

> *The impacts to the island were extensive. The majority of oceanfront homes in the communities within Fire Island National Seashore were damaged or destroyed. Enormous volumes of sand were carried from the beach and dunes to the central portion of the island, forming large overwash deposits, and the island was breached in multiple locations. With few exceptions, lower-relief dunes were overwashed and flattened. High dunes, which are more commonly found within undeveloped portions of the island, experienced severe erosion and overwash. The elevation of the beach was lowered and the dunes form vertical scarps where they survived.*

In response to these storms, actions have been undertaken which have influenced the existing barrier island condition. These actions include those directly affecting the shore front area including fill, inlet stabilization, shore protection projects, and development on the dune. In addition, the cultural manipulation of the barrier island is demonstrated by other activities including bulkheading of the bay shoreline, dredging to improve accessibility to the island via ferry, and mosquito ditching, undertaken in the majority of the park area. These prior actions highlight the human commitment to manage the Project Area and further highlight how these management decisions have influenced the present condition of the island. A summary of the actions that have been undertaken follows.

Fill. Since 1955, more than 6.4 million cubic yards of fill have been added to the Project Area. Generally, the volumes of material presented below come from volume computations contained within historic sediment budgets of the area, which although representative of the size of the operation, do not capture the configuration of the placement operation. Based upon anecdotal evidence, these fill volumes were generally placed in an emergency response to a storm event. As such, material was frequently placed in a dune configuration to rebuild the dune lost during the storm event. Although the details of historic operations are not available, recently undertaken fill projects have resulted in structures built on or within the primary dune. In most emergency conditions, dune placement practices have been to place the dune as far landward as possible, often with existing structures located on, or immediately adjacent to the newly constructed dune. Once houses are located on the dune, building restrictions have historically been ineffective in preventing the "infilling" development of lots adjacent to existing structures, which ultimately resulted in additional construction on the dune. As a result of a combination of emergency fill actions and subsequent development, there are approximately 310 structures currently within the existing primary dune. Research undertaken by McCluskey and Nordstrom (1985), indicate that the presence of houses and sand fences on dunes along Fire Island reduces the amount of windblown sand transported to landward side of the dune (USACE 2009a).

Inlet Stabilization. The dynamic nature of inlet formation and migration along the Project has been influenced by the stabilization of both Moriches Inlet, and Fire Island Inlet. Moriches Inlet, which originally opened in 1931 was originally stabilized by local interests for improvements in water quality, and navigation. Subsequent efforts have been undertaken, including a Federal navigation project constructed in the early 1980's. Fire Island Inlet, which establishes the western boundary of Fire Island, has changed significantly over time, migrating west to its present location (a total distance of about 5 miles) between 1825 and 1940 (USACE 2009a).

Navigation Channel Maintenance Dredging. Presently both Shinnecock Inlet and Fire Island Inlet are routinely dredged to maintain navigability in the inlets. Moriches Inlet is not routinely maintain and is not considered navigable. Sand from each inlet is bypassed to the westerly beaches. The present inlet configurations, as established through periodic dredging provide greater tidal exchanges in the back bays than had historically existed in the unstabilized condition. In addition to these two inlets, numerous bay channels maintained by federal, state, and local governments have also altered bay bottom topography and circulation patterns (USACE 2009a).

Bayshore Changes to Fire Island. The bayside shore of Fire Island has been dramatically altered by measures to improve access and living conditions, associated with the development of the barrier islands. In addition to shore normal channels which have been dredged to allow ferry access, the majority of the shoreline within the developed communities has been stabilized, primarily with bulkheading. In areas where existing salt marshes remain, they have been largely impacted by efforts to create and maintain mosquito ditching. Much of the existing salt marsh on Fire Island presently remains impacted by these past practices (USACE 2009a).

In advance of any long-term solutions, several interim projects have been completed recently or are underway to protect vulnerable areas. These projects will reduce the threat of storm damage until the results of the Reformulation Study and the General Reevaluation Report are available and the results potentially implemented. The interim projects were intended to be soft solutions that could be modified by the results of the Reformulation Study and the General Reevaluation Report, and would not limit or constrain alternatives for consideration. The interim projects include the following:

1. The Breach Contingency Plan;
2. Moriches Inlet to Shinnecock Inlet "Westhampton" Interim Project;
3. Fire Island Interim Project;
4. The West of Shinnecock Inlet Interim Project; and
5. Fire Island Inlet to Moriches Inlet Stabilization Project (USACE 2009a, USACE 2016).
6. Downtown Montauk Interim Stabilization Project

A discussion of these interim projects follows.

Breach Contingency Plan. This plan provides an emergency response to close breaches rapidly. A breach is an opening or gap that develops in a barrier island, allowing the ocean water and bay water to meet. However, this is only a response action, which restores the barrier island to an elevation of +9 ft NGVD[1] (spring high tide is +3 foot NGVD) in order to provide a limited

[1] NGVD stands for National Geodetic Vertical Datum of 1929. Regulatory floodplains are defined by the elevation of the base flood in relation to the elevation of the ground. It is a system that has been used by surveyors and engineers for most of the 20th Century as the basis for relating ground and flood elevations.

level of protection, to provide the basis for future efforts (a 5 year level of protection). A barrier island where the BCP has been implemented is characterized by low-lying areas likely to be overwashed and subsequently breached again during relatively minor events. This plan is in effect throughout the barrier island portion of the project area, which is approximately 57 miles. Under this plan, breach closure activities will be initiated within 72 hours of a breach (USACE 2009a).

Westhampton Interim Project. This project is protecting dunes in the Village of Westhampton area and effected mainland communities north of Moriches Bay. The project provides for a protective beach berm 90 feet wide and a dune of +15 foot NGVD, tapering of the western two existing groins (groins 14 and 15) and construction of an intermediate groin (groin 14a) between these two. The project also includes periodic nourishment, as necessary to ensure the integrity of the project design, for up to 30 years. Beachfill for this interim project also includes placement within the existing groinfield to fill the groin compartments and encourage sand transport to the areas west of groin 15. The interim plan was determined to be in the Federal interest to provide protection until the findings of the reformulation effort are available. Initial construction of the project was completed in December 1997. The interim project was subsequently renourished in 2001, 2004 and 2008, requiring less sand at longer intervals than was estimated when designed. Due to severe erosion experienced due to Hurricane Sandy in 2012, approval was received from HQUSACE to repair the project to the pre-storm conditions, and repair the project to its design condition. A contract was awarded in Sept 2014 with about 750,000 cubic yards of sand placed (USACE 2009a), (GRR 2016 Appendix A)

Fire Island Interim Project. The Fire Island Interim Project was initiated in 1995, when the New York District provided a public notice, which summarized the expected scale and scope of an interim project along Fire Island. The Fire Island Interim project was designed to be consistent with the design for the Westhampton Interim Project. In 1997, the New York District prepared a Technical Support Document and Environmental Assessment, which served as the basis for coordination with the State Sponsor and involved agencies. Based upon the findings of the Environmental Assessment, the New York District determined the need to prepare an Environmental Impact Statement. Public scoping meetings were held in December 1997. A Draft Report and EIS was subsequently prepared, dated May 1999. Following Issue Resolution Conferences with the involved agencies, the Fire Island Interim Report and EIS were sent out for public review in December 1999, with public meetings held in January 2000. In order to move forward with finalizing the report, the New York District required input from the State of New York, regarding their support for the project. The State of New York provided comments, but never officially responded with a position on the interim project. Based on the lack of non-federal sponsor support for this project, efforts were instead focused on developing a comprehensive plan as part of the reformulation study. The extensive agency and public input received on the Fire Island interim project has been considered in development of plans in the Reformulation Study (USACE 2009a).

West of Shinnecock Inlet Interim Project. This project reduces the potential for breaching in the area immediately west of Shinnecock Inlet in the Town of Southampton. The West of Shinnecock Interim Project was initiated in 1995. The New York District prepared a public notice in August 1995, providing information on the expected scale and scope of the interim project, which utilized design criteria comparable to that used for the Westhampton Interim Project. Design and evaluation of the West of Shinnecock Interim was completed in 1999, and contained in a Draft Decision Document and Draft EA dated December 1999. The report was subsequently distributed for public review, finalized and approved in May 2002. The recommendations include beach nourishment along the 4000 ft long shoreline immediately west of the inlet, and renourishment every 2 years for a period of 6 years, to protect the area until the completion of the Reformulation Study. The project was constructed in March 2005, and received limited placement of sand as part of the maintenance dredging of Shinnecock Inlet, but no renourishment during the authorized period of renourishment between 2005 and 2011. Due to severe erosion experienced due to Hurricane Irene in 2011 and Hurricane Sandy in 2012, approval was received from HQUSACE to repair and restore the beach and dune to the design conditions. Two contracts were awarded with a total of about 500,000 CY of sand placed (USACE 2009a).

Fire Island Inlet to Moriches Inlet Stabilization Project. The Fire Island to Moriches Inlet (FIMI) project includes one reach within the overall FIMP Project area. In 2014, the New York District prepared an environmental assessment (USACE 2014a) for the FIMI Stabilization Project, which was developed to reinforce the existing dune and berm system along the island. The stabilization effort was developed as a one-time, stand-alone construction project to repair damages caused by Hurricane Sandy and to stabilize the island. The FIMI Stabilization Project has its own independent utility, and as developed does not limit the options available in the overall FIMP Reformulation Study or pre-suppose the outcome of the Reformulation Study. The selected design includes beachfill at Robert Moses State Park, Fire Island Lighthouse Tract, all of the communities outside of Federal Tracts, and Smith Point County Park. Beachfill is not included in any Major Federal Tracts, except Fire Island Lighthouse which was requested by the National Park Service to protect the Lighthouse and the only access road to the communities on Fire Island (USACE 2014a/b). The Project is designed with advance fill to maintain design conditions for a period of 5 years, and it is estimated that the residual effect of the fill placement would last another 5 years. After the residual effect of beachfill has diminished, there is further residual effect of 10 years that is provided by the acquisition and relocation of structures. The report and NEPA documents (USACE, 2014a) for this project were approved in July 2014, and a Project Partnership Agreement was executed in August 2014. Construction was initiated in September 2014, and is currently underway. The plan features contained in the TSP are similar to those included in the Fire Island stabilization effort. The total period over which residual effects are expected is 20 years (USACE 2014a/b).

Downtown Montauk Stabilization Project. The area of downtown Montauk was heavily impacted by Hurricane Sandy. Based upon this need, the Corps in partnership with New York State initiated a stabilization project under the authority of Public Law 113-2. A study was completed and approved in November 2014 that recommended a 3,100 ft. geotextile reinforced dune as a one-time project to stabilize the area until a long-term solution could be implemented. The reinforced dune extending from South Emory Street to Atlantic Terrace motel in downtown Montauk and tapers into high dunes at both ends of the project area. The dune will provide protection to the shorefront commercial and residential buildings in downtown Montauk. A Project Partnership Agreement was entered into in February 2015. Construction was initiated in October 2015, and was completed in April 2016.

In addition to the measures described above, which have been constructed as elements of the FIMP Project, there are a number of other related construction activities that have taken place in the project area along the Atlantic Ocean shoreline. These include measures which have been implemented either as other Federal initiatives, State actions, or undertaken by local municipalities, taxing districts, or by individual homeowner. Collectively, these actions have had a dramatic influence on the functioning of the existing coastal system. The types of efforts undertaken in the Study Area generally include the following:

- Inlet Stabilization Measures. This includes the structural measures that have been implemented over time at the three inlets within the Study Area including: Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet.

- Major Structural Measures. This includes major hard structural elements that have been built in the Study Area, which are considered major features in that they have an ongoing effect on the system, including: Groins at Ocean Beach, Bulkhead at Smith Point County Park, State Groins at Georgica Pond and Hook Pond, a Groin at Ditch Plains, and the Montauk Point Revetment.

- Beachfill Operations. There are a number of beach fill projects that have been constructed along the Study Area of varying scope and intensity. Historic fill operations have been undertaken including major efforts following storms in 1938, 1962, and a number of local projects that have been recently constructed in the 1980’s and 1990’s.

- Individual/small scale structural measures. Within the Study Area, there are a number of smaller scale structures built by individual property owners or community groups to protect their residences. This includes small groins, bulkheads, revetments, geotextile-type structures, tetrapod structures, and other measures (cars buried in dunes). These structures are often only intermittently exposed, and are found at locations throughout the Study Area. In many instances these structures provide a good indication of past erosion dune to storm events. Although these structures are acknowledged, these have not been inventoried (USACE 2009a).

A more detailed discussion of these efforts is contained in the USACE 2009a report, the *Fire Island Inlet to Moriches Inlet Fire Island Stabilization Project Final Environmental Assessment* (USACE 2014a/b) and 2016 GRR Appendix A.

1.4 DESCRIPTION OF THE PROBLEM

This chapter provides an overview of the risks of storm damages in the Study Area. The principal problems are associated with extreme water levels 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 measure of risk reduction to the mainland, which can be compromised by a breach. Specific measures need to be considered to address maintaining a stable barrier island. The barrier islands are also vulnerable to overwash and breaching during significant storm events, which is an important coastal process that contributes to the long-term sustainability of the system, but also impacts development both on the barrier island and the back bay;
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 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 restore system functioning;
8. It is clear that reestablishing longshore transport should be given priority, as restoration of all other processes is contingent upon a balanced sediment transport system.

As discussed in Chapter 2, these summary points were critical considerations in the formulation process of identifying and, subsequently, evaluating alternatives to address these problems and opportunities. An essential element of plan formulation includes assessment of the likely future condition in the absence of the proposed project. The history of storm activity and response in the Study Area provides a basis for predicting what is likely to happen in the future and comparison to the "with-project" condition. The long history of storm activity, the documented impact of storms on the area, and the human response following these storms present a persuasive argument for investment in storm damage reduction efforts in the Study Area. Storms have repeatedly impacted the existing development in the Study Area and caused extensive damage along the shorefront and back-bay areas. It is important to note that historic storms impacted the area occurred prior to the expanded development that exists today. Should storms of the same magnitude occur today, they would impact a much more densely developed area, generating far greater damages and considerable consequences to life and safety. While the storm history and the resulting damage described earlier in this chapter is impressive, they pale in comparison to the level of destruction that could be expected from similar storms in today's communities.

The storm history has been used as the basis for predicting conditions that we would expect in the future without a project. This future condition anticipates that the following will occur:

- Storms will likely occur in a manner similar to those storms that have historically occurred;
- The impact of these storms will likely worsen due to sea level rise;
- Impacts to the human environment will be greater than the past due to additional development and increased population density that currently exists;
- Future development will be undertaken consistent with existing regulations, which minimizes the risks to future development (i.e. FEMA standards for building 1st floor elevations) (USACE 2009a).

1.5 SCOPE OF THIS EIS

This DEIS analyzes the environmental impacts of the reasonable alternatives that would achieve the purpose and need discussed in Section 1.2. The reasonable alternatives are described in Chapter 2. Chapter 2 also identifies potential 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 (Section 2.3.4). In order to analyze the environmental impacts, it is first necessary to understand the existing conditions. These existing conditions are presented in Chapter 3 ("Affected Environment"). The evaluation of environmental impacts is based on an initial or generic set of analyses conducted for natural and cultural resources and a series of assessment topics pertinent to the project Study Area defined as the shoreline from Fire Island Inlet to Montauk Point, the offshore borrow areas, the bays north of the barrier islands and beaches, and the towns and communities of Suffolk County whose jurisdictions encompass the shore areas. Chapter 4 presents these potential impacts. Cumulative effects are also presented in Chapter 4. Chapter 5 presents the compliance and consistency of the TSP with major relevant policies.

1.6 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 1-1 and depicted in Figures 1-2 and 1-3. These ecosystem and habitat definitions provide the framework for the characterization of the affected environment and for assessing and comparing the impacts of alternatives addressed in this DEIS.

1.6.1 Marine Offshore Ecosystem

The marine offshore ecosystem includes habitat that consists of the deep water areas (ranging from 30 to 100 feet) of the Atlantic Ocean. 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 within the Study Area is primarily sand. The marine offshore zone is relatively homogeneous throughout the entire coastline of southern Long Island, including the Study Area from Fire Island inlet eastward to Montauk Point. The bottom or benthic zone substrate is primarily a ridge and swale complex and consists of fine to medium grained sand. Typically ocean wave heights are less than 3 feet (USACE 2006b), although waves between 3 and 10 feet occur roughly 25 percent of the time, and waves exceeding 10 feet occur only about 1 to 3 percent of the time.

Table 1-1. FIMP Ecosystem and Habitat Designations

Ecosystem/Habitat	Definition
Marine Offshore Ecosystem	
Marine Offshore	Subtidal marine habitat ranging in depth from 30 to 100 feet; includes pelagic and benthic zones
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 back bay areas.
Back bay 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
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 back bay areas, this habitat also includes bayside beach.

Source: Tetra Tech 2008.

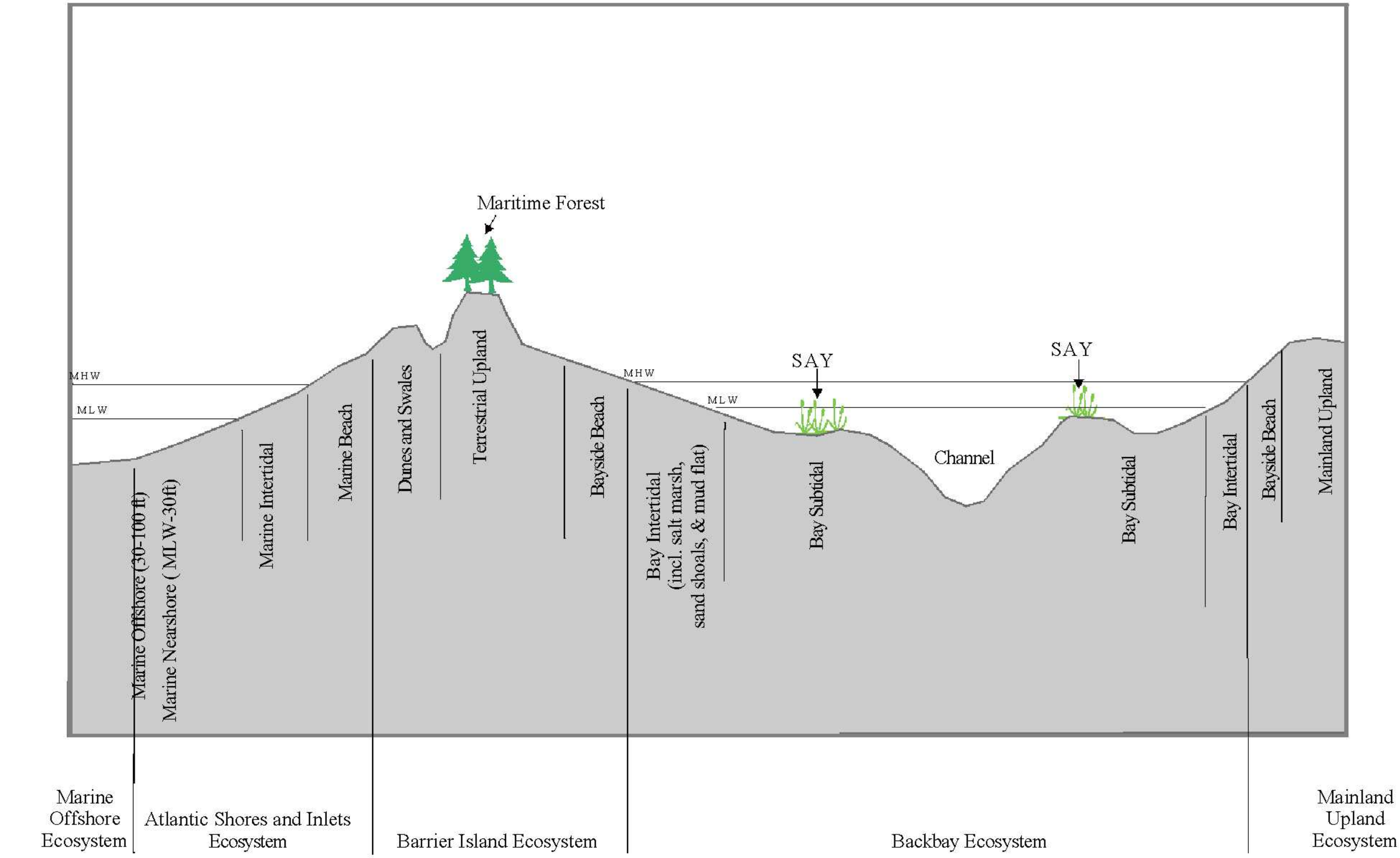

Figure 1-2. Transect Showing Ecosystems and Habitats Present in Study Area

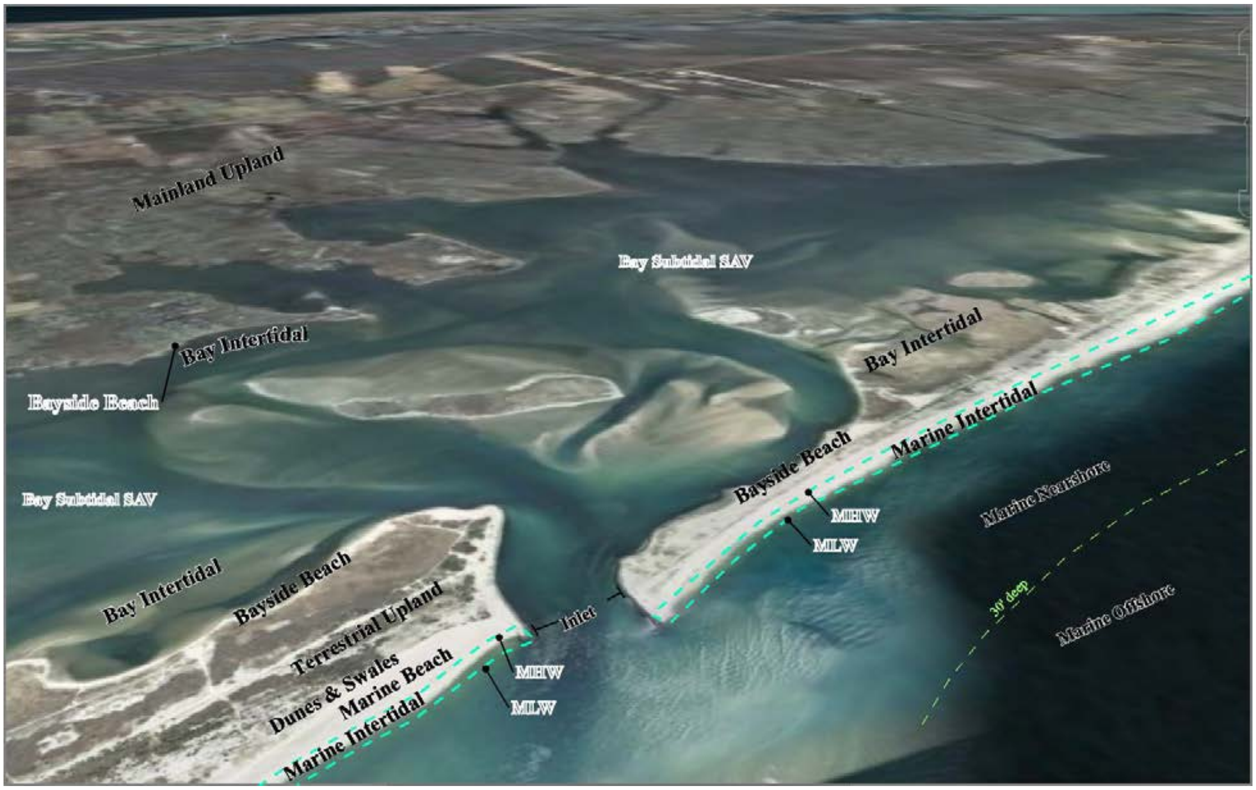

Figure 1-3. Birds Eye View Showing Representative Habitats in Study Area

Note: Habitat Boundaries are approximate, for general illustration only. Drawing not to scale.

1.6.2 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.

1.6.2.1 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).

1.6.2.2 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).

1.6.2.3 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.

1.6.3 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).

1.6.3.1 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).

1.6.3.2 Terrestrial Upland

The upland habitat extends from the landward boundary of the dunes and swales habitat on the ocean side to MHW on the bay side of the barrier island. This habitat type includes vegetated upland, developed land, maritime forest, and bayside beach habitat. Of the 330 barrier island acres cover type mapped by the USACE in 2001–2002, approximately 30percentwas vegetated upland habitat (USACE 2003a). A comprehensive vegetation mapping study for the FIIS found that approximately 70 percent of the 4,075 vegetated acres analyzed was represented by upland habitat associations (e.g., maritime deciduous shrub forest, coastal oak heath forest) (CMI 2002). Also included in the terrestrial upland habitat are areas of residential and commercial development.

1.6.3.3 Maritime Forest

Maritime Forest is a terrestrial upland habitat that is typically located in sheltered hollows landward of dunes and swales. These areas are defined by salt tolerant vegetation, high salinity and salt spray adapted soils and vegetation assemblages dominated by trees and shrubs (e.g., Sunken Forest). Of the 330 barrier island acres cover type mapped by the USACE in 2001–

2002, approximately 20 percent was forested (USACE 2003a) with forested habitat representing 28 percent of the vegetated habitats within the FIIS (CMI 2002). There are an estimated 3,700 acres of bay intertidal habitat within the Study Area (USACE 2005d).

1.6.3.4 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 back bay 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 2009a).

1.6.4 Back bay Ecosystem

The back bay ecosystem includes all intertidal and subtidal areas below MHW from the bay side of the barrier island to the mainland. Habitats within the back bay ecosystem include bay intertidal (including salt marsh, sand shoals, and mud flats) and bay subtidal (including submerged aquatic vegetation [SAV]). Great South Bay, Moriches Bay, and Shinnecock Bay represent the majority of the back bay ecosystem.

1.6.4.1 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).

1.6.4.2 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).

1.6.5 Mainland Upland Ecosystem

The mainland ecosystem extends from the landward limit of the back bay intertidal MHW line to the landward limit of the Study Area. In the eastern portion of the Study Area, where the barrier island and back bay 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 back bay 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.

1.7 ORGANIZATION OF THIS DEIS

This DEIS is organized as follows:

Chapter 1, Introduction and Purpose and Need, presents background information on the project; describes the purpose and need for agency action; presents information on storm history and previously authorized and constructed projects relevant to this DEIS; discusses the problem and causes; provides a general discussion of the Study Area ecosystems and habitats; and concludes with a section on the organization of this DEIS.

Chapter 2, Alternatives, describes the DEIS alternatives in detail and includes a discussion of alternatives considered and eliminated from detailed analysis. It includes a summary comparison of potential environmental impacts of the alternatives and identifies the Preferred Alternative for the DEIS.

Chapter 3, Affected Environment, describes the environment that each alternative could affect.

Chapter 4, Environmental Impacts, presents potential environmental impacts from the alternatives and discusses unavoidable adverse impacts and management and mitigation measures.

Chapter 5, Compliance with Environmental Requirements, discusses the consistency of the TSP with major relevant policies.

Chapters 6 and 7 provide the references and list of preparers.

The appendices include technical information that supports the environmental analyses and documentation of the NEPA process followed in preparing this DEIS.

2.0 ALTERNATIVES

This Draft Environmental Impact Statement (DEIS) 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 and coastal biodiversity. The 2000 LIDAR was selected as representative of the beach condition, as opposed to more recent LIDAR, because this LIDAR set captured a relatively healthy dune and berm along many much of the barrier island. These 2000 conditions are representative of the baseline condition for the project, which assumes the construction of Post-Sandy beach fill projects along Fire Island, Westhampton, West of Shinnecock and Downtown Montauk. This chapter: (1) discusses the process that was utilized to determine the reasonable alternatives that are assessed in this DEIS; (2) describes the reasonable alternatives; and (3) discusses other alternatives that were considered but eliminated from detailed study. This chapter also presents a summary comparison of the impacts of the reasonable alternatives, based on the information contained in Chapter 4 of this DEIS. For a complete history of the extensive planning process to arrive at the selected plan, refer to 2016 GRR appendix E.

2.1 DEVELOPMENT OF ALTERNATIVES

There are potentially many ways to reduce the risk of coastal storm damages. In order to fully scope out the various alternatives, and ensure that the alternatives being evaluated address the critical needs of the project, an Interagency Reformulation Group (IRG) was assembled. The IRG consisted of representatives from the New York District, New York State, the cooperating agencies (National Park Service [NPS] and U.S. Fish and Wildlife Service [USFWS]), as well as representatives from National Marine Fisheries, and the Environmental Protection Agency. An initial step in the process of developing potential alternatives was to develop a Vision Statement for the project. This Vision Statement provides a foundation upon which potential alternatives could be considered. In its current form, the Vision Statement has been coordinated with project stakeholders, and within the New York District, and has been established as the approach for moving forward to address storm damages. The Corps and DOI have entered into an MOU in July 2014 in which both parties committed to finalizing the FIMP report, which is consistent with the Vision Statement. The Corps, NYS and DOI agreed to use the public and agency review process to finalize a plan that is mutually acceptable to the Secretary of the Army and Secretary of the Interior (2016 GRR appendix L).

The Vision Statement identifies the following main points:

- No plan can reduce all risks,
- Decisions must be based upon sound science, and current understanding of the system,
- Flooding will be addressed with site specific measures that address the various causes of flooding,
- Priority will be given to measures which both provide protection, and restore and enhance coastal processes and ecosystem integrity,
- Preference will be given to non-structural measures that protect and restore coastal landforms and natural habitats,

- Project features should avoid or minimize adverse environmental impacts and address long-term demands for public resources,
- Dune and beach replenishment must balance storm damage reduction and environmental considerations,
- Consideration should be given to alteration of existing shore stabilization structures, inlet stabilization measures, and dredging practices (USACE 2009a).

In formulating potential alternatives, the IRG characterized the existing physical, social, environmental and cultural conditions of the Study Area. The IRG used these characterizations to assess the effects that potential alternatives would have on the Study Area. This approach seeks to identify opportunities for reducing storm damages through the least intrusive measures, and in a manner which would allow for restoration and enhancement of the natural coastal processes which can meet the dual objectives of reducing storm damages and enhancing the environment (USACE 2006c).

In May 2009, a draft Formulation Report (USACE, 2009) was provided to the key government partners and stakeholders that identified the problems, opportunities, objectives and constraints, analyzed alternatives, and proposed several alternative plans for consideration. Based on the comments received and subsequent discussions among the stakeholders and the public, a Tentative Federally Supported Plan (TFSP) was jointly identified by the Corps of Engineers and the Department of Interior and submitted to the New York State Department of Environmental Conservation (NYSDEC), the non-Federal sponsor, in March 2011. The TFSP identified a plan that met the study objectives and the requirements of both the Corps' and DOI.

On October 29, 2012, Hurricane Sandy made landfall near Atlantic City, NJ, where it collided with a blast of arctic air from the north, creating conditions for an extraordinary historic 'super storm' along the East Coast with the worst coastal impacts centered on the northern New Jersey, New York City, and the Long Island coastlines. Storm damages within the FIMP study area, including flooding, erosion, and wave damages, as a result of Hurricane Sandy were severe and substantial. There were three breaches of the barrier island, multiple overwashes, extensive shorefront damages, and extensive back bay flooding. Post-Sandy measurements of beach and dune volume loss on Fire Island indicated that the subaerial beach lost 55 percent of its pre-storm volume equating to a loss of 4.5 million cubic yards. A majority of the dunes either were flattened or experienced severe erosion and scarping (Hapke et al, 2013).

Due to the significant changes brought about by Hurricane Sandy, a reanalysis of the TFSP was undertaken to take into account these changes to the landform, development patterns, and risk.
The post-Sandy TFSP plan was provided to New York State in May 2013, who agreed in concept with the plan. With sponsor support, the TFSP has been identified as the Tentatively Selected Plan (TSP), subject to refinement, based upon public and agency comment. The public and agency review process will also be the basis for finalizing a TSP that meets the requirements of being mutually acceptable to the Secretary of the Army and Secretary of the Interior. The Federal and non-Federal partners have agreed that there are plan details that still need to be finalized. This GRR identifies several plan elements that will continue to be refined during the public and agency review process. That proposed action is now referred to as the "Tentatively Selected Plan" (TSP), and is described in Section 2.3

This GRR will serve as the decision document for implementation of the reformulated FIMP project. As an “authorized, but unconstructed” project, the FIMP Reformulation study is being completed with funds authorized by P.L. 113-2 at full federal expense. Per P.L. 113-2, the initial project construction is eligible for 100% federal funding, subject to approval of the Report and execution of a Project Partnership Agreement.

Each alternative, except the No-Action Alternative (also known as the “Future Without Project Condition” [FWOP]), has key components that provide a comprehensive alternative; the key components are: Beach Restoration (Beach and Dune Fill), Sediment Management (including Inlet Modification), Groins (including Groin Modification), Breach Response Plan (BRP), Coastal Process Restoration Measures, Non-Structural Methods, and Adaptive Management. A brief discussion of these key components follows.

Beach Restoration (Beach and Dune Fill). Beach restoration generally involves the placement of compatible sand from an offshore source (borrow area) on an eroding shoreline to restore its form and to provide an adequate protective geometry. Beach restoration may include the following options: (1) beach and dune fill, (2) dune fill only, (3) beachfill only or (4) beachfill placement in response to extreme events to close breaches (e.g., a Breach Response Plan [BRP]). Selection of the desired configuration depends on site conditions, and must consider whether fill placement is intended to combat shore erosion, flood inundation, or both. A beachfill typically includes a berm backed by a dune and both elements combine to prevent inundation damages to leeward areas. Periodic renourishment is normally required to offset long-term and storm-induced erosion. At locations where long-term and storm-induced erosion are severe, renourishment and rehabilitation may prove costly. Beach restoration represents a quasi-natural method for reducing flooding and erosion damages, and is an important element for constructed storm damage reduction measures that must combat severe erosion. Beach restoration is commonly used in concert with other structural features (e.g. offshore breakwaters, groins, buried seawalls etc.). Quantities of offshore sand can sometimes be minimized by utilizing material otherwise available in the active littoral system, such as at stabilized inlets and nearby navigation channels. Common examples of alternative sand sources include the beneficial use of dredged inlet materials, inlet sand bypassing that acts to mechanically move beach sands across gaps (inlets) in the littoral system, stockpiles, feeder beaches and beach scraping (USACE 2009a).

Sediment Management (including Inlet Modification). Sediment management includes a range of measures designed to improve the littoral transport of material. These measures include those associated with improving the littoral transport at inlets, and also include the establishment of feeder beaches, designed to improve the effectiveness of sediment transport to downdrift shorelines. Tidal inlets, either stabilized or unstabilized, represent littoral drift disruptions. Areas updrift (east in the Study Area) may be subject to accretion as longshore sediment transport is trapped. A portion of longshore sediment transport entering the inlet will also be transported cross-shore and be distributed into flood or ebb shoals adjacent to the inlet. The remaining portion of longshore sediment transport will bypass the inlet and nourish the downdrift beaches. Trapping of longshore sediment transport, either updrift or within the inlet and shoals, may create sediment transport deficits downdrift that may result in shoreline erosion. The erosion experienced downdrift of inlets may be marked and can more significant than experienced outside of the inlet vicinity. As this erosion can be partly assigned to sediment trapping caused by the inlet, measures to enhance/restore littoral drift across the inlets in the study have been investigated. These measures include dredging of inlet shoals and channels and/or excavating updrift deposits with placement downdrift, and other inlet design modifications (e.g., modification of inlet cross-sections to reduce shoaling) to aid natural bypassing. The sediment management measures were recommended for further evaluation, including consideration for improving longshore transport (USACE 2009a).

The goal of inlet modification is to develop alternatives that provide reliable navigation through the Federal navigation channels and maximize sand bypassing in order to restore, to the extent possible, natural sediment pathways and reduce adjacent shoreline erosion. Inlets are a complex, and dynamic system. History has shown that modifications at inlets can result in unintended, negative secondary effects. For this reason, when conducting this analysis, preference was given to alternatives that could achieve the objectives with a minimal amount of change, have a low risk, and would be readily reversible or adaptable. At the inlets, measures were recommended for further consideration to balance the objectives of: (1) reliable navigation, (2) offsetting localized sediment disruption, and (3) uninterrupted regional sediment transport. In addition to altering sediment transport pathways, inlets also serve as a conduit for floodwaters to enter the bays during storm events. Therefore, modifications of current inlet design and dredging practices that may provide measures to limit storm surge propagation through the inlets that leads to bay flooding have also been explored (USACE 2009a).

Groins (including Groin Modification). Groins are coastal structures, normally constructed perpendicular to the shoreline, which act to interrupt longshore sediment transport. Groins serve to protect the shoreline fronted by these structures, but may adversely impact downdrift shorelines. Adverse impacts of groin fields may be mitigated through beachfill placement and/or groin transitions or it may be best to remove or modify existing groins. Groins generally extend from the dune/beach interface to mean sea level (MSL) water depths on the order of 10 to 12 feet and are designed to impound sand. At a single groin, the updrift impoundment of sand is generally offset by an equivalent amount of erosion downdrift of the structure. Groins are often constructed in series or fields to provide protection for continuous shoreline segments. In this arrangement, erosion is displaced to the most downdrift groin, rendering the downdrift area susceptible to accelerated erosion. Erosion downdrift of a groin field can be mitigated through the use of low, tapered groin transitions and/or beach nourishment. Groin fields can also be designed to transition to areas of lower erosion losses or to terminal structures, such as jetties. Furthermore, groin compartments should be filled initially in order to promote sand bypassing throughout the groin field. Groins fields may be particularly effective at areas characterized by significant longshore sediment transport or high erosion rates. Groins are, however, vulnerable to storm-induced or offshore erosion losses. These losses may be reduced by the use of T-groins that may be an effective solution in areas of severe erosion, such as in the vicinity of tidal inlets. T-groins combine the features of traditional groins and breakwaters by reducing both alongshore and cross-shore beach erosion losses (USACE 2009a).

Breach Response Plans (BRPs). Breaching refers to the condition where severe overwashing forms a new inlet which permits the exchange of ocean and bay waters under normal tidal conditions. The breach may be temporary or permanent depending on a number of factors; however, the breach must have a scoured depth below mean lower low water in order for water to exchange between the ocean and bay over a complete tidal cycle (to meet the definition of a breach). Factors which lead to the formation of a breach include narrow barrier island width, relatively low dune elevation, and relatively small island cross-section volume above some critical elevation. Once a breach has formed, the likelihood of it remaining open to form a permanent inlet depends on a number of factors including, size of the initial opening, adjacent bay side bathymetry, presence of other inlets, longshore drift rate, and ocean-bay tidal phase differences. Breaches left unchecked, as evidenced by breach closure efforts in 1980 and 1993 just east of Moriches Inlet, will result in significant damages that could be avoided if pre-breach measures were planned to allow for rapid closure procedures. Previous studies have also shown that delayed closure will also result in increased overall closure costs (USACE 2009a).

As part of the Fire Island to Montauk Point Project, it may be necessary to close breaches along the Barrier Islands within the project area, to prevent additional flooding within the bays during major storm events and to reduce impacts to areas adjacent to the breach. It is cost-effective to close breaches quickly rather than wait to close breaches after they enlarge (see Appendix I for a more detailed discussion of BRPs).

It is acknowledged that barrier island breaching can be beneficial to coastal processes and ecological services within the ocean, barrier and bay system along the south shore of Long Island. There will be three types of Breach Response measures along project shorelines: Pro-Active Breach Response, Reactive Breach Response, Conditional Breach Response in Large, Publicly-owned Tracts of Land along Fire Island, and Conditional Breach Response in the Wilderness Area.

BREACH RESPONSE PLANS

Proactive BRP is triggered when protection is compromised. This trigger would be an evaluation of the level risk reduction against breaching, and serve as a trigger when the beach and dune are lowered below a 25-year design level of risk reduction.

Reactive BRP is triggered when a breach has occurred. A breach is defined as the condition where a channel across the island permits the exchange of ocean and bay waters under normal tidal conditions.

Conditional BRP is a plan that applies to the large, federally-owned tracts within Fire Island National Seashore (except the Lighthouse Tract), where the breach response team determines if a breach is closing naturally or if mechanical closure is needed. Conditional Breach closure provides for a 90 ft. wide berm at elevation 9.5 ft. only.

(Note: The designation of which shoreline areas will be covered by each type of response is shown in Figure 2-2, which is presented later in this chapter).

Coastal Process Features. As part of this Reformulation, a restoration framework was established which identified the objective of reestablishing coastal processes. The key difference between the restoration of coastal processes and restoration of a specific landform, is that reestablishing coastal processes emphasizes realigning the processes with the natural functioning rather than achieving a specific habitat. The restoration framework identified five key physical processes to be targeted for restoration, including: (1) alongshore transport, (2) cross-island transport, (3) dune growth and evolution, (4) bay shoreline processes, and (5) estuarine circulation and water quality. There are a number of measures that can be applied to achieve these objectives, which are presented further in the screening of coastal process features. The coastal process features can generally fall in the types of effort to include: (1) restoring the process by removing or modifying the source of the disturbance, (2) restoring the process by mimicking what would occur naturally, with sustainable features, or (3) restoring the process by mimicking what could occur naturally, with features that require continued management to achieve the objectives. Coastal process alternatives were recommended for further study (USACE 2009a).

Non-Structural Measures. There are three main categories of non-structural plans: (1) building retrofits, (2) acquisition of threatened properties, and (3) land use management options (refer to GRR section 5.4.2.4). Building retrofits include raising the structure above the design flood, providing an impermeable barrier around the structure, wet floodproofing, or relocating the structure out of the flood plain. Wet floodproofing techniques allow floodwaters to enter the crawlspace or unfinished levels of the structure but relocates and protects utilities from damage. Unlike floodproofing, acquisition of structures in the flood plain will prevent all damage to structures and may provide land for public use and conservation. However, buyouts may decrease the local tax base by removing land from private ownership. Land use management options include zoning regulations and other measures that restrict further development in areas where continued development is expected. Land use management is an effective way of controlling flood plain development and thereby minimizing future increases in the potential damage associated with flooding. Although land use regulation may be recommended, implementation of these measures is the responsibility of state or local governments, and would likely be an element of a Floodplain Management Plan. Non-structural techniques can also supplement the protection provided by other structural features, and can be evaluated as combined or stand-alone measures (USACE 2009a).
The impact of nonstructural plans is to alter damages to the individual structures and reduce the aggregate damages occurring at each flood stage. It is important to note that the nonstructural measures target the more frequently flooded structures have the greatest impact at the lower flood stages. Even though the first floor structure itself may be elevated above the flood levels, the building foundation and other property such as cars, garages, and outbuildings will still be flooded and will suffer damage. This included building retrofits that protect 4,401 structures and road raising. The road raising will protect an additional 1,054 (5.91miles) structures and be located in the following communities:

1. Amityville – 6,600 ft
2. Lindenhurst – 5,300 ft
3. Lindenhurst – 9,000 ft
4. Mastic Beach – 10,500 ft

Adaptive Management. The challenge with developing a plan that integrates the land management, acquisition, and scheduled renourishment of the project is the uncertainty that exists. These elements introduce uncertainty to a situation that is already uncertain due to the complexities of evaluating the system, projecting renourishment, projecting the functioning of the inlets, and the unknowns regarding future climate change. With all these uncertainties it is suggested that the implementation of the project adopt an incremental adaptive management approach. This approach would establish: (1) data collection that would be implemented to have an improved understanding of the physical, social and environmental setting, (2) modeling efforts (engineering and formulation) to analyze the data, and (3) an adaptive management framework that would establish the overall objectives, decision rules, and identify the adaptations to the plan that could be accomplished with the project. This adaptation strategy is based upon the concept that with the passage of time the trends become established and more appropriate strategies can be executed. It is expected that this adaptation strategy would require a periodic review of the project execution (10-yr basis) and recommendations for the adaptation of the project, based upon the findings. It is expected that the adaptive management plan would integrate the lifecycle management of the project, as it relates to the following elements:

- Beach Restoration (Beach and Dune Fill). Improved understanding of beachfill performance, refinement of renourishment triggers and allowable variability in design, accounting for alignment changes based upon non-structural plan implementation, consideration of durations.
- Sediment Management (including Inlet Management). Improved understanding of inlet functioning, the volume and frequency of bypassing, and the optimal alternatives for achieving the long-term objectives for inlet management.
- Breach Response. Improved understanding of breaching processes and consequences, refinement of the breach triggers and the implementing procedures, optimization of maintenance requirements, and the improved integration of habitat improvements.
- Restoration. Identification of relative effectiveness of alternatives, identification of design improvements, and better definition of overall restoration success objectives.
- Non-Structural. Improved delineation of structure vulnerability, and identification design details, identification of implementation effectiveness, identification of acquisition effectiveness, identification of the effectiveness of land management regulations.
- Climate Change. As presented in the without project damages section, damages are likely to increase in the future without the project. Under historic or moderate increases in sea level rise, it is likely that adaptive management measures could accommodate these changes. Under more extreme rates of sea level rise, or more dramatic climate change conditions, adaptive management would allow for consideration in the relative effectiveness of the different solutions (USACE 2009a).

2.2 DESCRIPTION OF NO ACTION ALTERNATIVE (FUTURE WITHOUT PROJECT CONDITION)

The No-Action Alternative (or 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 DEIS. 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 DEIS. The FWOP represents the most likely future scenario based on reasoned, documentable forecasting using historic data, current practices, and trends.

The following assumptions were made to establish the framework of the FWOP:

1. Storms will occur in a manner and frequency similar to those that have historically occurred.
2. Sea level rise will continue and increase the impact of the storms. There is a range of sea level rise that is possible in the future.
3. Future development will be undertaken consistent with existing regulations.
4. Maintenance of the navigation channels through the existing inlets (Fire Island, Moriches, and Shinnecock Inlets) and in the back bays will continue consistent with past practices to provide navigation and bypass material.
5. Local interests will continue to maintain the existing beaches through periodic beach fills and beach scraping similar to what is currently being done.
6. The Breach within the Wilderness Area of the Fire Island National Seashore that opened during Hurricane Sandy will remain open indefinitely.
7. Periodic renourishment of the Westhampton Interim Project will continue until 2027.
8. The one-time post-Sandy FIMI Fire Island Stabilization Project is constructed (schedule to be completed in 2018).
9. The one-time post-Sandy Downtown Montauk Stabilization Project is constructed (completed in 2016).
10. The interim Breach Contingency Plan (BCP), that includes a process to close breaches within 3 months and which was approved as an interim action pending the outcome of the Reformulation study, will not continue. Breaches of the barrier island will continue to be closed (with the exception of the Wilderness Area breach) but will take a year to close in the absence of a streamlined process for Federal participation.

In summary, the without project condition, which serves as the baseline for comparison of the alternatives assumes that the post-Sandy stabilization efforts on Fire Island and Downtown Montauk are in-place, and that the existing breach in the Wilderness Area remains open indefinitely. Maintenance of the three federal navigation projects, and renourishment of the Westhampton Interim project are all expected to continue in the future.

2.2.1 Report Content and Organization

In defining the FWOP, the following elements were considered of particular importance in establishing the framework of what has occurred and what is likely to occur in the Study Area as it relates to storm damage reduction. The elements are broken down into three primary categories: anthropogenic elements (made by or resulting from human activities), storms and coastal processes, and habitats. These elements and how they are addressed for the FWOP are described in detail below.

2.2.1.1 Anthropogenic Elements

1. Inlet and Navigation Channel Maintenance. Management of the Federal Inlets (Fire Island, Moriches, and Shinnecock Inlets) and their corresponding approach and backbay navigation channels would occur as authorized throughout the study period and would remain consistent with past practices and Congressional authorizations to provide navigation, address critical locations, and to bypass or place dredged material in designated locations as coordinated with local governments. Although the FWOP assumes that these areas would be maintained to provide navigation through the next 50 years, they might not necessarily be maintained in precisely the same way or to their current condition. Different dredge areas, and/or bypass and placement strategies might be utilized to meet navigation goals and beneficially use dredged materials.

2. Existing Coastal Structures. Under the FWOP, the majority of the significant hard structures (e.g., jetties, bulkheads, groins) in the Study Area were assumed to have a life span equal to or greater than 50 years or would be repaired to meet their current function. Existing structures and their influence on storm damage reduction and response is accounted for under the FWOP analysis of damages and impacts.

3. Localized Beach Maintenance. Periodic beach fills (or beach placement of sand from designated sand i.e., beach nourishment) and beach scraping (or re-grading to move material from the foreshore and placing it on the backshore at the foot of the dunes) would continue to maintain some threshold beach condition. This condition was based on a review of historic activities including the extent of local and private activities (see Section 1.3). These activities are typically designed to maintain a minimum beach width specific to the area and a dune height of approximately 13 to 16 feet. The local nourishment measures would generally occur when erosion is at or near the dune line, particularly at locations where smaller, local projects have been previously built, such as at Saltaire, Fair Harbor, Dunewood, Lonelyville, and at Fire Island Pines. Outside of these communities it is anticipated that this protection would focus on maintaining a minimum height of the dunes, and width for the barrier islands in order to prevent breaching, and protect the east/west access, either by protecting paved and dirt roads, or ensuring access along the beach. The FWOP anticipates that future funding and/or regulatory procedures might limit the size, scope, and timing of local projects; but even with these conditions, it is expected that within their available resources, local groups would continue to maintain a minimum beach and dune condition. This condition has been accounted for under the FWOP.

4. Interim Storm Protection Projects. No Federal interim storm protection projects would be considered in place except for the interim projects described in Section 1.3 of this DEIS.

5. Breach Closure. The Interim Breach Contingency Plan (BCP), which is presently in place, will not be considered as part of the FWOP. The existing BCP was approved as an interim action pending the outcome of this DEIS. The BCP is designed to ensure that funding and permits are in place to allow immediate breach closure (within 3 months of occurrence). However, a continuation or modification of the existing BCP is being evaluated among the possible alternatives for this DEIS. It is recognized that even in the absence of a BCP, breaches in the barrier islands would be closed either through natural closure or human intervention. These actions/processes would be considered as part of the FWOP. This condition is based on the historic pattern of repeated breach closures after the storms of 1938, 1954, 1962, 1980, & 1992, and the State's affirmed policy to close breaches (NYS 2008).

The only policy identified that specifically considers leaving breaches open applies to the Wilderness Area of the Fire Island National Seashore. The Wilderness Management Plan policy states that prior to mechanical closure occurring within the designated wilderness area, the breach is to be assessed for the possibility of natural closure and other alternatives. Given the timeframe of past closures, breach within the wilderness area and elsewhere on the Fire Island are assumed to occur within approximately 12 months under the FWOP. Breaches are expected to be closed using design standards similar to those established in the BCP. To date there are no pro-active breach/overwash prevention activities taking place on Fire Island.

6. FIIS General Management Plan (GMP). On June 15, 2015, the Fire Island National Seashore's Draft General Management Plan/Environmental Impact Statement ("Draft GMP/EIS") was released for a 90-day public review and comment period (NPS 2015). The GMP is a comprehensive plan that defines the park's purpose and management direction and provides the overarching guidance necessary to coordinate all subsequent planning and management. The Final GMP/EIS will address public comments received by September 17, 2015 and is expected to be released in 2016/17.

Coastal Erosion Hazard Area (CEHA) Program. New York State has identified the entire Atlantic Ocean shoreline of Fire Island as a CEHA. The entire beach and nearshore area, as well as the primary dune to a point 25 feet landward of the landward toe of the dune, are designated as natural protective features. New construction is not permitted in these areas and pre-existing development is strictly limited to a 25 percent increase in ground coverage area. NYSDEC will continue to administer the statewide CEHA management and regulatory programs in the Study Area through its Coastal Erosion Management Unit. The Coastal Erosion Management Unit oversees and sponsors many of the beach fill activities discussed above.

The Coastal Erosion Hazard Areas Act (ECL Article 34 and 6 NYCRR Part 505) directs the New York State DEC to identify and map coastal areas that are subject to erosion, and landforms such as beaches, bluffs, dunes and nearshore areas that protect coastal lands and development from the adverse impacts of erosion and high water. These areas are identified on Coastal Erosion Hazard Area (CEHA) Maps prepared by the New York State DEC. Lands within CEHA jurisdiction are subject to regulation under Article 34 and Part 505, which limits land use to protect these sensitive areas and limit high risk development. ECL Article 34 and 6 NYCRR Part 505 allow for local municipalities to administer their own local CEHA program, if the local municipality passes a CEHA law, the program is approved by DEC, and the program meets the minimum standards of 6 NYCRR Part 505. Local programs are required to use the DEC issued CEHA maps.

1. State and Local Actions. In establishing the FWOP, the status of other hazard mitigation programs in the Study Area was reviewed. The Disaster Mitigation Act (DMA) of 2000 requires states and local governments to prepare hazard mitigation plans (HMPs) to remain eligible to receive pre-disaster mitigation funds. The program is administered by the New York State Emergency Management Office (NY SEMO), and the New York State HMP is a guidance document for communities developing local HMAs.

In response to the DMA and NYS HMP, Suffolk County and the majority of its multiple communities have developed a Multi-Jurisdictional, Multi-Hazard Mitigation Plan (Suffolk County HMP) (Suffolk County Department of Fire, Rescue, and Emergency Services [SCDFRES] 2014). This document was approved by FEMA on July 14, 2014. The Suffolk County HMP outlines 16 mitigation objectives, including education, building acquisition, relocation, and retrofit, and code strengthening. The scope of these actions is undetermined at this time and not provided for in the Suffolk County HMP. Depending on the level of funding and participation, the effects of the implementation of the Suffolk County HMP on the FWOP cannot be reasonably determined. Therefore, the existing condition was used in the FWOP analysis of damages.

It is expected that in the coastal ponds region, as has historically occurred and in a manner which is consistent with current practices, the East Hampton and South Hampton Trustees would continue to open and close the openings between the ponds and the ocean, generally twice a year. It is expected that there might be some small scale dune rebuilding efforts that are undertaken utilizing material which is available within the flood shoals of these ponds.

2. Federal, State, and Local Policies. Compliance with and enforcement of several Federal, state, and local rules, regulations, and policies, except where noted (i.e., CEHA Program FIIS GMP), was assumed to remain consistent throughout the FWOP. These include and are not limited to the Clean Water Act, Endangered Species Act, National Historic Preservation Act, Coastal Zone Management Act, CEHA Program, FIIS GMP, Federal Emergency Management Agency (FEMA), Coastal Barrier Resources Act (CBRA), Local Waterfront Revitalization Programs (LWRPs), and numerous local zoning and public policy laws and regulations. In the context of land management measures, it has been determined that sufficient land use regulations exist within the Study Area.

Although no new regulations were recognized as necessary, it is acknowledged that adjustments to these land use regulations could be made to improve the effectiveness of their application and enforcement. NYS has noted that currently few agencies at the local, state, or Federal level provide adequate enforcement of existing regulations. Further stating that construction of large numbers of non-conforming structures has continued to increase in the Study Area despite the recommendations of management plans and land use and coastal policies (NYS 2008). Although the NYSDEC has indicated that several improvements to its CEHA Program should be considered as part of the FWOP. However, the timing and outcome of these improvements cannot be reasonably predicted at this time. In addition, the timing and level of future noncompliance with the regulations would also be difficult to model. Therefore, the FWOP makes the assumption that existing land use regulations will be enforced or at the least improved upon. As a result, it is not possible to evaluate the economic effects of improved enforcement in the context of the alternative analysis.

3. Population Increase. Suffolk County's population is projected to continue to increase slowly (by 240,000 [or 16%]) by the year 2035) (SCDFRES 2014). Continued increases in population and income would inevitably lead to increased development, increased traffic, as well as an increased demand for recreation and beach facilities. The high price and demand for shorefront property would create strong economic incentives to reconstruct buildings that have been damaged or destroyed by erosion or waves. The increase in housing and infrastructure needs as it relates to population increase and its effects on the FWOP are discussed in the following section.

4. Housing/Development. The greatest impact to upland habitats in the FWOP is the continued development associated with the projected increase in population. The need for additional housing and infrastructure is likely to result in a loss of open space and natural habitats within the Study Area. To some extent the development will be offset by local government efforts for acquisition of open space. Suffolk County has a long term acquisition planning effort in place to preserve open space. Open space and recreational resources are discussed further in Chapter 3 of this DEIS. Zoning, public policy, land and water use, and development patterns of the towns and communities in the project area are also discussed in detail in Chapter 3.

With respect to the FIIS, any new development is restricted by law to the existing communities, with new development within FIIS's Dune District being restricted to residential properties only. While development will continue in this area, it is expected that virtually all of it, with the exception of a few scattered parcels, will consist of the replacement of existing structures with new or rebuilt ones. The majority of the communities in the project area participate in the National Flood Insurance Program (NFIP), which requires the adoption of FEMA floodplain mapping and certain minimum construction standards for building within the floodplain. Implementation and enforcement of institutional controls are effective tools to restrict development in "at-risk" or environmentally sensitive areas. As discussed above, it is anticipated that existing regulations will be enforced and that future development will not be subject to frequent storm damage. Accordingly, the FWOP anticipates limited impacts to new housing, development and infrastructure in regards to storm damage.

The FWOP anticipates that institutional controls, notably the CEHA Act, are the most important constraint on rebuilding of existing storm damaged structures. The FWOP assumes once structure damage exceeds 50 percent of the structure value (substantially damaged) the building will be rebuilt above regulated Base Flood Elevation (BFE) landward of the CEHA where it is possible on its existing lot. If the existing lot will not allow rebuilding landward of the CEHA, it is assumed that buildings will not be rebuilt. It is acknowledged that variances may be granted to reconstruct some substantially damaged buildings within the CEHA, but such conditions cannot be predicted at this time. The CEHA regulations have been instituted along the Atlantic Ocean shoreline within the project area, but do not address development along the bay shoreline. Regardless of the CEHA controls, the NYSDEC has indicated that they do not consider current enforcement of CEHA to be adequate (NYSDEC 2008a) and intends to make improvements to the program, including map updates and improving implementation, oversight, and enforcement. However, as mentioned above, these improvements have not been carried through the FWOP analysis of damages.

2.2.1.2 Storms and Coastal Processes

1. Storms. The history of storm activity and response in the Study Area provides a basis for predicting what is likely to happen in the future. There is a long history of storm activity, documented impact, and the human response. This history of storm and storm response is used as the basis for estimating and evaluating the conditions under the FWOP. The FWOP analysis of damages assumes that the following will occur:

    - 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, and
    - After storm events beaches tend to recover when long-period waves move sand from the nearshore back onto the beach.

2. Sea Level Rise. Sea level rise is a factor that is critical for consideration in evaluating the FWOP. For purposes of the FWOP, an estimate for future sea level rise is based on the historical rate of change for the gauge at Sandy Hook. The relative sea level rise during the next 50-year period is predicted to be approximately 7.7 inches at Sandy Hook, NJ. Sea level rise is described in detail in Chapter 3 of this DEIS.

3. Topography. The topography of the shorefront is quite variable, both spatially and temporally, as can be characterized by the dune and beach conditions. In general, the baseline condition of the beach in the Project area is relatively wide, with a dune that is relatively high and wide. To be able to characterize the storm response under a range of future conditions, another topographic condition was established, which is termed a "future vulnerable condition" (FVC). The FVC represents a more vulnerable condition, which has been observed in the Study Area, and is similar in nature to conditions that existed in the mid-1990s, but with consideration for ongoing fill actions, such as the Fire Island Inlet to Moriches Inlet Stabilization Project. Projection of FWOP topography condition for this

DEIS is undertaken in a life-cycle analysis which allows the shoreline conditions to vary between the baseline condition and FVC (USACE 2006c).

4. Coastal Processes. The FWOP assumes that existing conditions and trends for longshore sediment transport, cross-island sediment transport, dune development and evolution, bayside shoreline processes, and estuarine process would continue.

2.2.1.3 Habitats

The environment of the FIMP Study Area is a complex, dynamic system that is influenced by natural processes and human policies and programs. Study area habitats are assumed to change in the FWOP in response to numerous factors including ongoing natural succession (natural change in the vegetative communities), sea level rise, coastal erosion and related erosion control activities, periodic breaching and overwash, as well as land use changes and infrastructure development. These factors may impact all of the Study Area habitats and major changes under the FWOP are addressed through the modeled changes in topography, breach frequency, and erosional trends as discussed above. In addition, a FIMP Habitat Evaluations Procedure (HEP) modeled several important habitat types in the project area and provides a FWOP analysis, as well as an analysis of potential alternatives (USACE 2009b).

In assessing the FWOP, no major changes in offshore habitats are anticipated. Localized dredging of sand for beach nourishment projects is expected to continue in a manner where borrow areas locations are dredged once, and are not repetitively disturbed. This includes the Westhampton Interim Project, potential breach closures, and other locally implemented actions taken in response to continued erosion. Monitoring of prior dredging activities suggests that the benthic communities and other biological resources within these borrow sites will not be altered on a long-term basis. Other possible changes to offshore habitats and natural resources would most likely be associated with changes in fishing trends or fisheries management.

In the FWOP, the Atlantic shoreline would remain the most dynamic habitat in the Study Area. However, due the nature of these habitats ecological communities are well adapted to changes to the physical environment. Sensitive species, including the piping plover and the least tern, that rely on dune habitats will continue to receive protection throughout the FWOP under the ESA. However, their populations and habitat will continue to receive increasing pressures by the development, population, sea level, and recreational use increases that the Study Area is predicted to experience. These impacts will be assessed within the impact assessment sections of this document. Beach nourishment projects will continue and be addressed in the FWOP as discussed in previous sections. Topography changes under the FWOP are also discussed above.

The FWOP habitats and natural resources of the barrier islands will be influenced by continued sea level rise, breaching/overwash and related sediment transport, erosion control and post-storm restoration activities, and development and redevelopment. It is expected that the processes of overwash and breaching would continue to occur, but to different degrees, these storm-driven processes would be offset by human response activities. As a result, it is expected that the remnant features associated with breaching and overwash would be limited in magnitude by human intervention, and that the human intervention would also likely alter the physical conditions, so as to limit the temporal persistence of these features as sparsely vegetated areas. It is expected that these areas would subsequently revegetate to a level consistent with what has been observed in the Study Area. The presence of bulkheading along portions of the barrier island is likely to limit the natural succession of habitat in response to sea level rise.

In the FWOP it is expected that future changes will occur within the estuaries and along the bay shores. It is expected that changes in the estuary will continue as a result of increases in sea level, and also due to future barrier island breaches. As is the case for the barrier island condition, it is expected that the spatial and temporal magnitude of the hydrodynamic changes in the estuary due to breaching and overwash would be reduced by human intervention. While there may be short-term changes in the inlet regime associated with barrier island breaching, the predominant conditions affecting the bay hydrodynamics would be represented by the current inlet conditions.

These physical changes would have short-term impacts on the FWOP bay water quality. During the period of time that a breach would be open, there would be altered tidal exchange, allowing higher tides and increased flooding and potentially increased wave energy along the mainland, and changed salinity distribution. Because the existing natural resource communities in the bays are currently subject to wide range of water quality conditions, short-term hydrodynamic changes associated with breaches are not anticipated to result in long term alterations to bay habitats.

As discussed above, barrier island breaching and overwash would contribute to sediment input into the estuaries adjacent to the barrier islands. As discussed above, the magnitude of the sediment transport would likely be reduced by human intervention. The sediment input to the bay may contribute to both the degradation and the long-term formation of salt marsh and submerged aquatic vegetation beds. The possibility for such habitat creation or degradation is highly dependent upon the location of the breach or overwash and its temporal extent.

2.2.2 FWOP Analysis of Damages

The development in the Study Area is vulnerable to damages from three mechanisms, inundation due to storm surge, undermining due to storm erosion and shoreline change, and structural failure due to intense wave impact. For purposes of storm damage analysis, the development in the Study Area was divided into two assessment areas, shorefront development and non-shorefront development. The shorefront development area includes portions of the Study Area within the zone of likely erosion and wave impact. The non-shorefront development includes those areas outside of that area but only includes the northern side of the barrier island and the mainland. Under the FWOP shorefront development was considered to be vulnerable to damages from all three mechanisms, whereas non-shorefront development was considered to be vulnerable to only inundation. The storm damage analysis considered physical damage to structures, building contents, automobiles, as well as nonphysical costs such as cleanup, temporary housing, and public emergency costs.

It was determined for the overall Study Area that under the FWOP, the number of shorefront buildings potentially at risk from erosion would increase from 370 to 1,316 during the 50-year project life (GRR 2016). Furthermore, the number of buildings at risk within the 100 year floodplain would increase from 9,249 to 19,054 if breaches were left open for 12 months in every bay under a future storm damage condition. The barrier island buildings within this same floodplain would increase from 2,418 to 3,238. Under the FWOP, Back Bay inundation damages to the mainland and barrier island were annualized at $115,400,000, breach-related inundation and structure failure damages were annualized at $8,311,600, and annualized shorefront damage to critical asset areas totaled $12,848,000 (GRR 2016). Overall, FWOP total storm damages were annualized for the life of the project at $138,374,000 (GRR 2016).

2.2.3 FWOP Overview

Future coastal conditions are likely to be shaped as much by human intervention as by natural processes. Some actions, such as the ongoing inlet and navigation channel maintenance and the Fire Island Inlet to Moriches Inlet Stabilization Project, are clearly defined in existing reports or agreements. Other interim actions such as the BCP and continued beach maintenance projects at several FIIS communities are under evaluation. The FWOP condition assumes many of these interim actions as indicated above will not continue without implementation of a Federal action recommended by this Study. In many cases the continuation or modification of these actions is being evaluated as components of the possible alternatives for this Study.

The FWOP assumes that breaches in the barrier islands will either close naturally, or will be closed through mechanical means. The only policy identified that specifically considers leaving breaches open is limited to the Wilderness Area of the Fire Island National Seashore. It is expected that in the absence of a streamlined implementation plan, as currently exists with the BCP, that with the need to obtain approval, permits and funding, it is estimated that closure would take between 9 and 12 months to close a breach, as was the case in 1980 and 1992. The breaches are expected to be closed using design standards similar to those established in the BCP.

As previously stated, the FWOP represents the most likely future condition in the absence of implementation the TSP in this DEIS. Using the elements, existing conditions, and assumptions discussed above, and a baseline condition through the Project's life can be determined based on reasoned, documentable forecasting. With the baseline condition known, any range of alternative plans can then be reasonably compared to the FWOP. The impacts on the natural and human environment under the FWOP are described in Chapter 4.

2.3 PREFERRED ALTERNATIVE (TENTATIVELY SELECTED PLAN)

The TSP has been identified as the plan that reasonably balances the policies of the US Army Corps of Engineers 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 Project Area. The vulnerable breach locations are shown in Figure 2-1. The components of the TSP, which provide a comprehensive plan as shown in Figure 2-2, are described in Section 2.3.1 through 2.3.7.

2.3.1 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 feet NGVD dune and berm would occur in identified placement areas, as needed.

2.3.2 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 feet of freeboard.

As part of the Reformulation study in areas where project measures are recommended; e.g., beach fill, nonstructural protection, etc., a public access assessment will be made to determine the level of existing access, identify gaps and restrictions, and propose necessary measures to ensure that any recreation benefits provided are available to the public at large, and not limited to local residents only, while also ensuring that the use of the area is appropriate to its environmental setting and carrying capacity. Nonstructural measures by definition, are those activities which can be undertaken to move what is being damaged out of harm's way, rather than attempting to alter the movement of water. Nonstructural measures include a variety of techniques, including land-use, acquisition and relocation, or retrofit of existing structures. The nonstructural features provide both storm damage protection and to restore coastal processes and ecosystem integrity

Included in the non-structural plan is road raising, as a means to achieve storm damage reduction 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 2-1). Also included would be the long-term relocation of facilities in Smith Point County Park to minimize renourishment requirements.

In establishing the FWOP the status of other hazard mitigation programs in the study area was reviewed. Many of the communities have prepared Flood Mitigation Plans and may be eligible for FEMA grants through the Hazard Mitigation Grant Program (HMGP) administered by the NY State Emergency Management Office (SEMO). Nonstructural storm damage reduction programs that incorporate flood proofing or other building retrofit measures are the most likely hazard mitigation actions to be implemented under these programs. Following Hurricane Sandy, there are a number of home elevations that have been implemented through these programs. The elevation of homes through these programs has been accounted for, based upon the information available from the local governments. No forecast of future elevation of floodplain structures is projected

Table 2-1. 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 is 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.

2.3.3 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 Mid 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 landward, consistent with the FIMI Project. 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. .

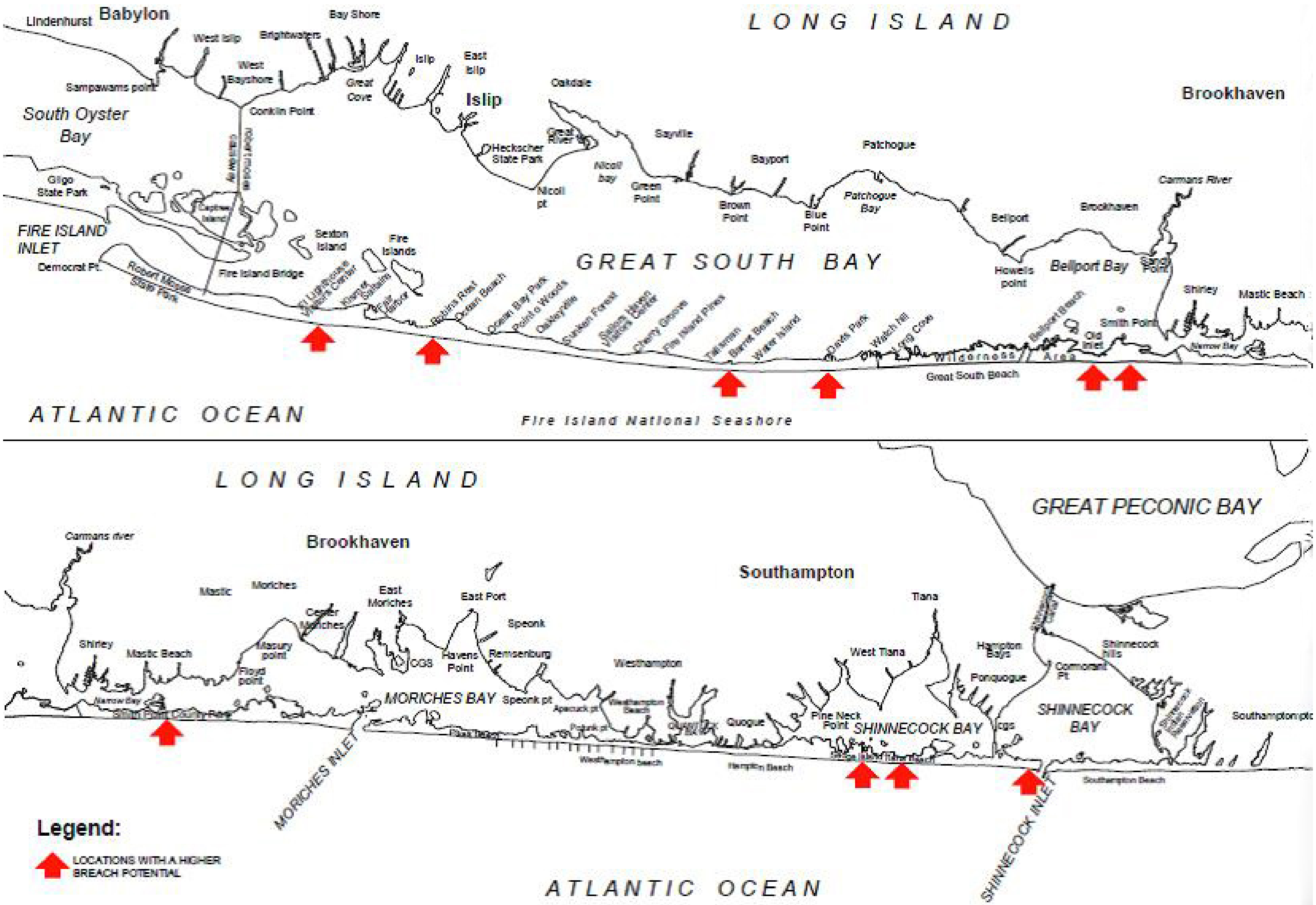

Figure 2-1. Vulnerable Breach Locations in the Study Area

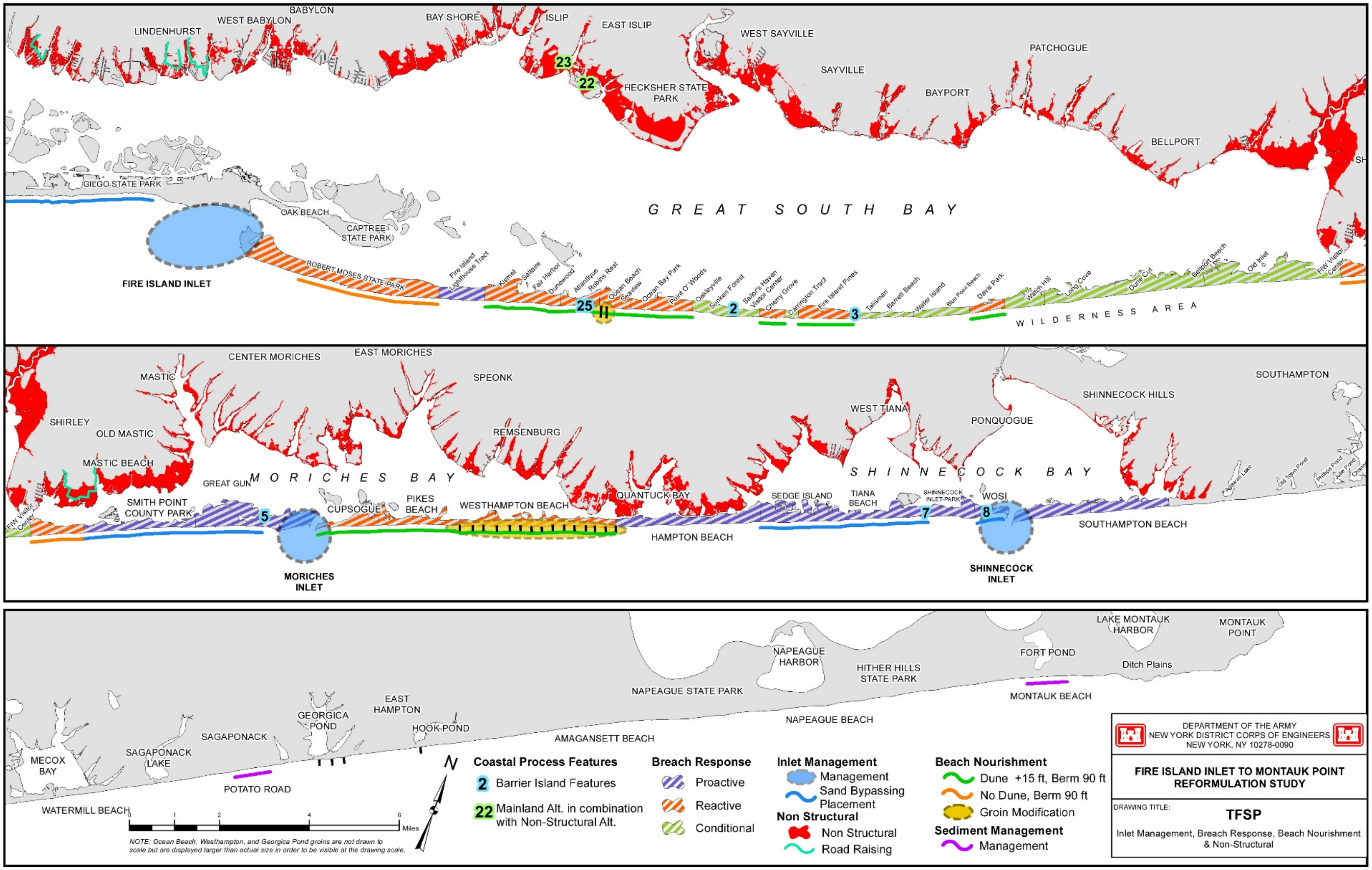

Figure 2-2. Overview of the TSP

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 2-2). 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. Borrow areas for fill are shown in Figures 2-3 through 2-7.

Table 2-2. 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 beach is degraded to an effective width of 50 feet, and the level of risk reduction offered is equivalent to a 25-year return period. 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 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 feature could reduce the renourishment requirements for the shoreline downdrift of the groins. The existing groins at Ocean Beach would be modified by shortening and lowering the height of the structure, once the Ocean Beach water supply is relocated. The groin modification alternative partially fulfills the vision objectives, but offers limited reduction in storm damages when considered as a stand-alone alternative. Groin modification itself, can be considered as a coastal process feature. Opportunities exist for beneficial reuse of the stone, which may be needed for other coastal process features.

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 beach condition 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. Specifically, in the area of Potato Road, the implementation of this plan would be contingent upon the development of a local management plan for Georgica Pond, to address the effects of the pond opening and measures to minimize the consequences of such an action. 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, would allow for future changes or improvements to inlet management, over time.

Coastal Process Restoration Methods. Collaborative planning supported by the IRG established specific objectives through the development of a Restoration Framework (USACE 2009b). 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 restoration 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 Restoration 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 2016).

Figure 2-3. Active Borrow Sites for Coney Island, Rockaway, and Long Beach

Note: Coney, Rockaway, Long Beach, and Jones Borrow Areas are identified, but not used for FIMP. The potential impacts of dredging all the borrow areas identified in the figure are presented in Section 4.14.4

Figure 2-4. Active Borrow Sites for Jones Beach

Note: Coney, Rockaway, Long Beach, and Jones Borrow Areas are identified, but not used for FIMP. The potential impacts of dredging all the borrow areas identified in the figure are presented in Section 4.14.4

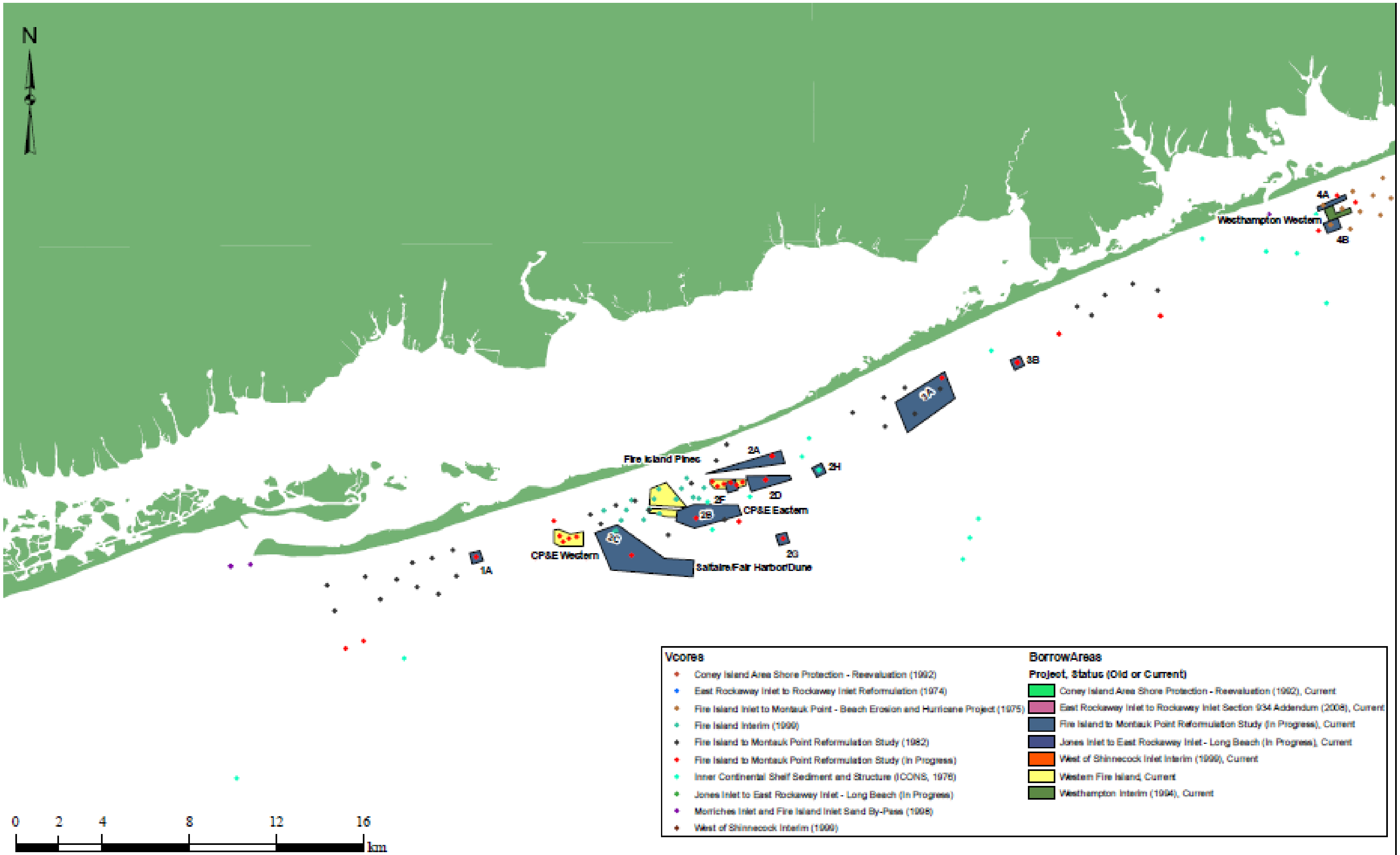

Figure 2-5. Active Borrow Sites for Fire Island

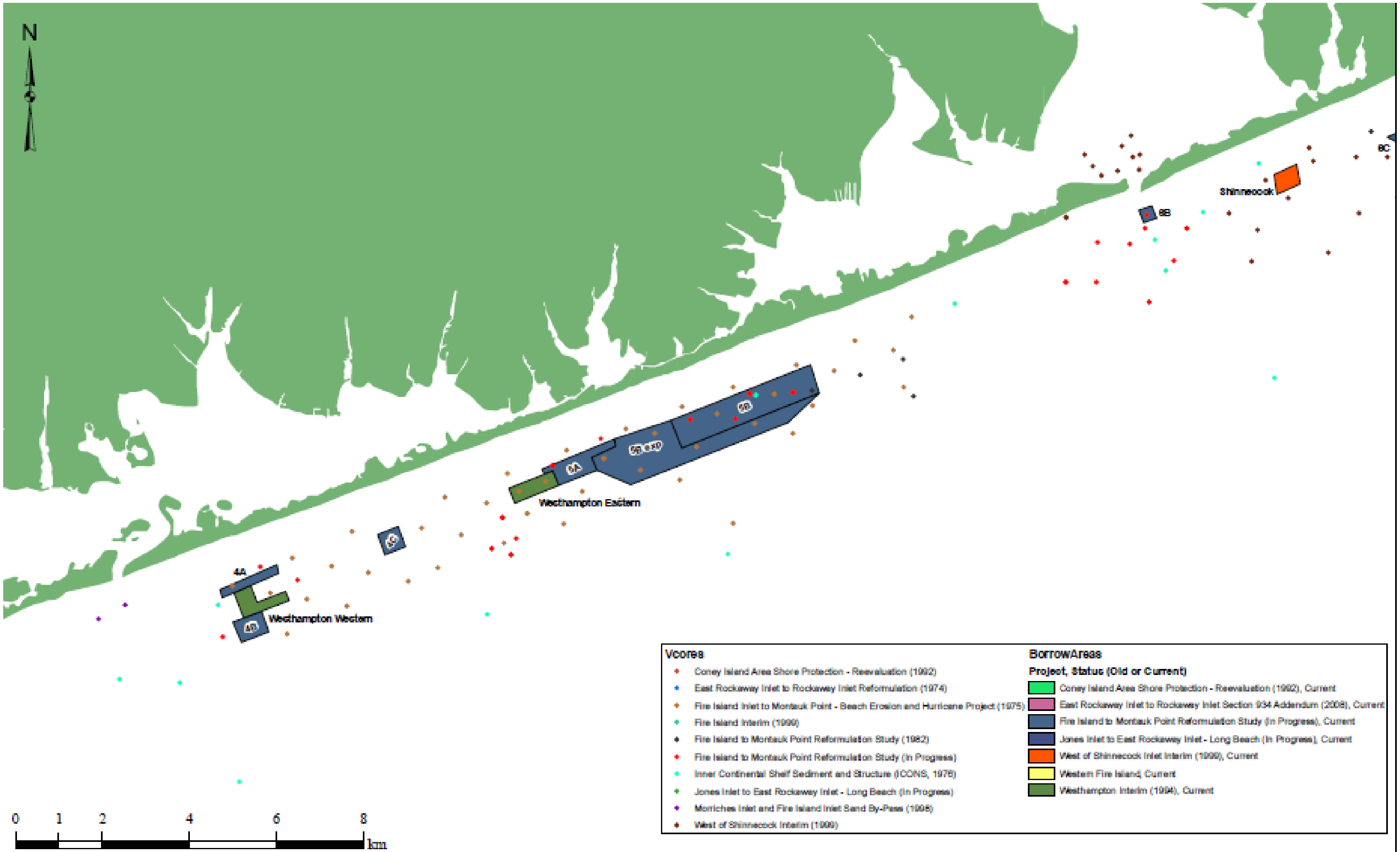

Figure 2-6. Active Borrow Sites for Westhampton

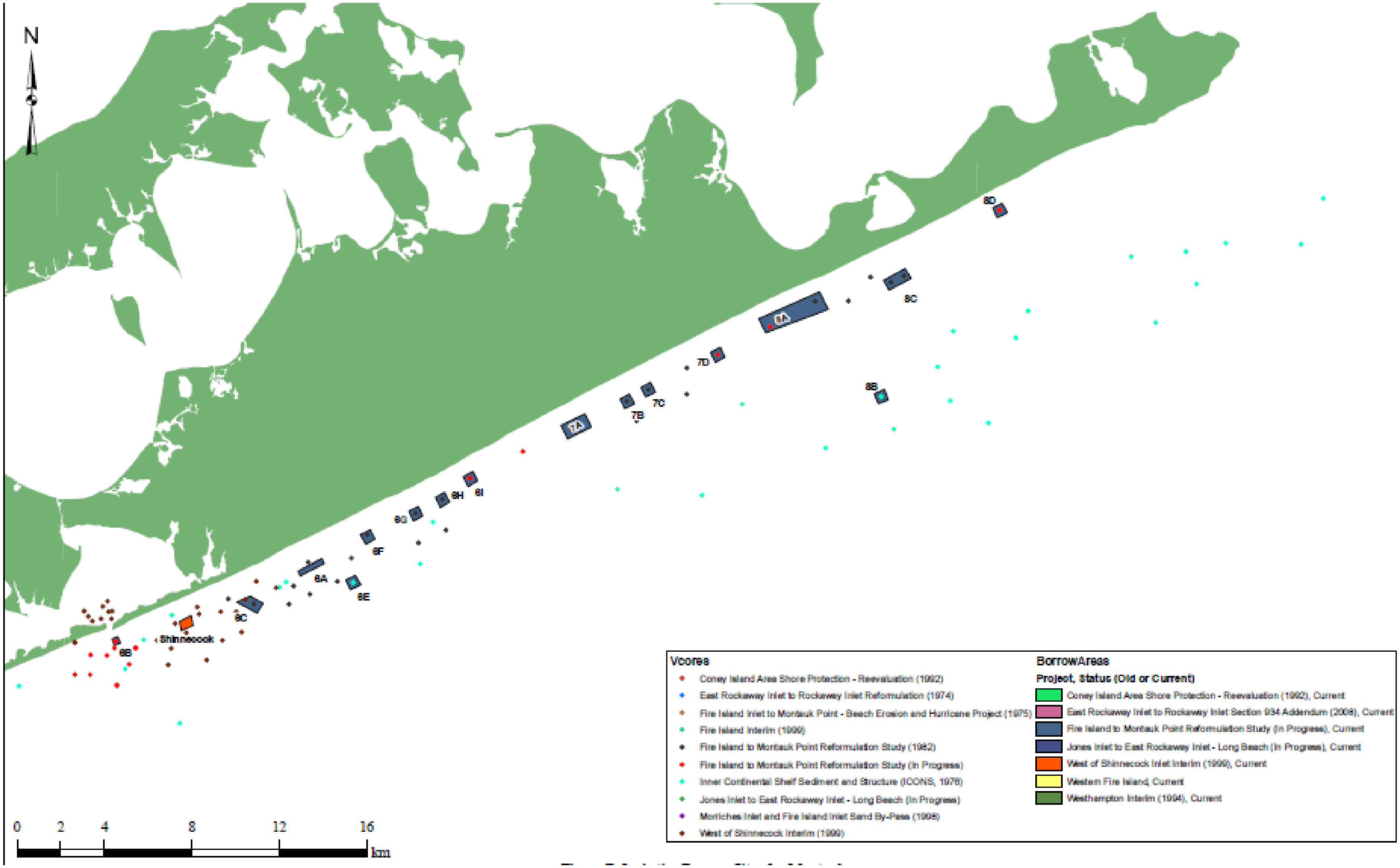

Figure 2-7. Active Borrow Sites for Montauk

2.3.4 Project-Based Features/Coastal Process Features

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 restoration opportunities for 6 sites. Appendix K of this DEIS 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 restoration 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 restoration versus reduced area), and to present a range of possible options (GRR section 5.4).

The project-based features for habitat restoration include the following:

- 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, and re-grade shoreline
- Restore marsh through plantings and enhance submerged aquatic vegetation (SAV) beds.

Table 2-3 provides a comprehensive listing of the proposed project-based features/coastal process features included in the TSP. Appendix K provides further details.

Table 2-3. Proposed Project-based Features/Coastal Process Features Included in the TSP

Site		Goal/Target	Description
	Barrier Islands		
	T-2 Sunken Forest		
Alternative 1		Eroding bayside shoreline	Remove bulkhead adjacent to marina, re-grade shoreline and stabilize using bio-engineering *Phragmites*
Alternative 2		Upper beach and dune	Enhance upper beach/dune width/slope/height, reduce disturbance by removing the boardwa a dune walkover, and restoring dune at cuts
Alternative 3		Upland and interior dune areas	Restore interior upland and dune areas of the site to natural conditions by removing all hard removing boardwalks and dune walkovers, closing off and re-grading all disturbed areas/roa one to provide access from marina)
	T-3 Reagan Property		
Alternative 1		Eroding bayside shoreline	Re-grade eroding bayside shoreline and stabilize using bio-engineering (vegetated gabions)
* Alternative 2		Upper beach and dune	Enhance upper beach/dune width/slope/height, reduce disturbance by closing off some acces trails, removing sand fence, raise boardwalks above dunes and restore dune
Alternative 3		Bulkheaded areas of bayside shoreline	Bury bulkhead, re-grade shoreline and create intertidal area, stabilize shoreline using bio-eng
	T-5 Great Gun		
*Alternative 1		Existing salt marsh	Enhance salt marsh by restoring hydrologic connection via culvert beneath the road
	T-7 Tiana		
*Alternative 1		Bayside shoreline and upper beach and dune	Restore salt marsh by removing fill material, using herbicide to control *Phragmites*, re-gradi replanting. Restore dune at access cut and provide access via a dune walkover.
*Alternative 2		Upland and interior dune areas	Remove parking lot, re-grade to natural contours, plant
*Alternative 3		Bay submergent vegetation	Enhance existing SAV beds
	T-8 WOSI		
*Alternative 1		*Phragmites* control throughout site	Enhance the existing salt marsh through the use of herbicides to control *Phragmites*.
Alternative 3		Eroding bayside shoreline	Use bio-engineering measures to stabilize approximately 1,500 feet of eroding island shoreline.

Site		Goal/Target	Description
	Mainland		
	T-25 Atlantique to Corneille		
Alternative 2		Salt marsh creation	Create new salt marsh by excavating and regrading upland areas and bay shoreline, and planting species.
Alternative 1		Shorebird nesting habitat	Create additional dunegrass habitat.

Note: All Alternatives shown for a site are recommended as a combined plan for site. Alternatives marked with * have been identified as top priority measures by the New York District and partner agencies

2.3.5 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).

2.3.6 Integration of Local Land Use Regulations and Management

Land use and development management alternatives include regulations and policies that could reduce the risk of storm damages to existing development in high risk areas and reduce development pressure in those areas. At-risk areas generally include areas vulnerable to flooding, erosion or both. The FIMP Reformulation Study process developed land management recommendations for the Study Area which are applicable to the Fire Island Study Area addressed by this Stabilization project. Appendix J of this DEIS and Appendix H of the 2016 GRR presents an extensive summary of the land use regulations, the additional challenges and opportunities inherent with the different alternatives, and recommendations to more effectively address the development and redevelopment concerns in the hazard areas, and a summary of how the Project advances efforts to remove development from high risk areas through acquisition and adaptive management. However, because the USACE does not possess authority to modify or implement local land use regulations— this power rests at the municipal and state levels —this DEIS does not propose any federal actions related to land use and development alternatives.

2.3.7 Comparison of the TFSP versus TSP

In comparison to the pre-Sandy TFSP, the adjustments that have been made include the following:

- The TFSP recommended a Conditional BRP in the portion of Smith Point County Park east of the pavilion and TWA Flight 800 Memorial, with a conventional beachfill plan for the remainder of Smith Point County Park. The updated TSP recommends a Proactive BRP for this area, to more closely match the plan features, and level of risk reduction that has been provided by the Fire Island Stabilization Project.

- The TFSP recommended a beachfill alignment along Fire Island located seaward of the existing development, a line previously identified as the Minimum Real Estate Impact Alignment. The updated TSP recommends a dune alignment that is located further landward, consistent with the Fire Island Stabilization Project.

- The TFSP identified a 50-yr period of renourishment that could be modified based upon adaptive management considerations. The TSP has been modified to recommend a 30-yr commitment of Federal and non-Federal renourishment that 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.

- The TFSP described land management regulations in general terms. The TSP identifies the improvements in land management regulations that will be recommended for implementation by others to complement the features recommended for FIMP. Project Features that contribute to coastal storm risk management by enhancing the resiliency of the natural system and its ability to recover after storm events include the following:

    - Sunken Forest – Reestablishes the natural storm risk management conditions of the 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 the natural storm risk management condition 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 storm risk management features by reestablishing the dune, salt marsh, and enhancing the SAV beds.
    - WOSI – Reestablishes the bay shoreline natural storm risk management features by reestablishing the existing salt marsh.
    - Corneille Estates – Reestablishes bay shoreline natural storm risk management features by reestablishing bayside beach habitat.

- The TFSP recommended a Conditional BRP that would include steps to allow for a delayed response in closing a breach if it was determined that a breach was closing naturally. The TSP includes a period of up to 60 days to allow for a decision to be made on whether to allow the natural processes to address the closure of the breach

2.4 ALTERNATIVE 1 (PLAN 2B IN USACE 2009)

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 (Figure 2-8). 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.

Restoration Measures. 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.

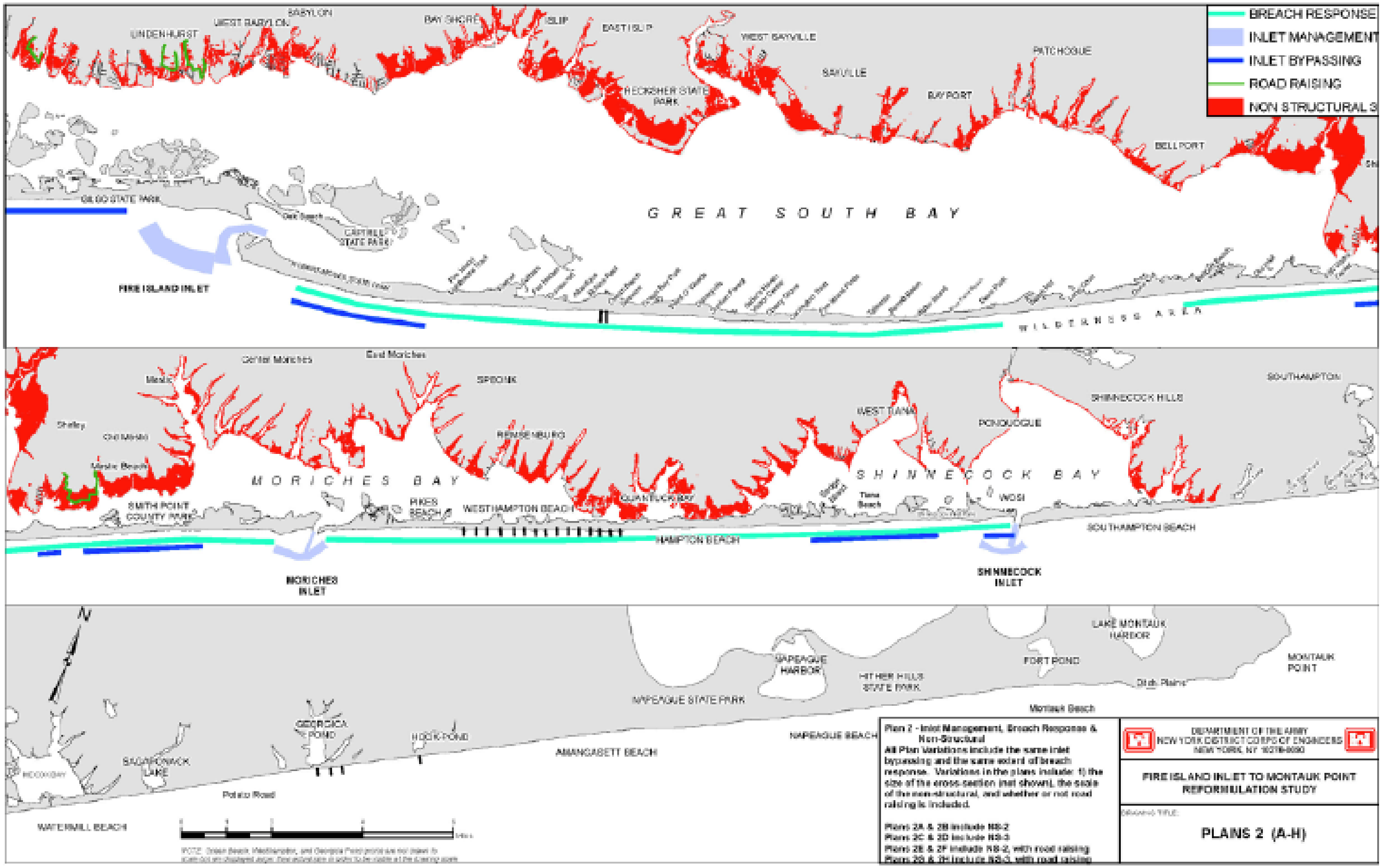

Figure 2-8. Overview of Alternative 1

2.5 ALTERNATIVE 2 (PLAN 3A IN USACE 2009)

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 (Figure 2-9).

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

Groin Modification Plan. Same as TSP.

Breach Response Plan (BRP). Same as TSP.

Restoration Measures. 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.

Adaptive Management. There would be no adaptive management.

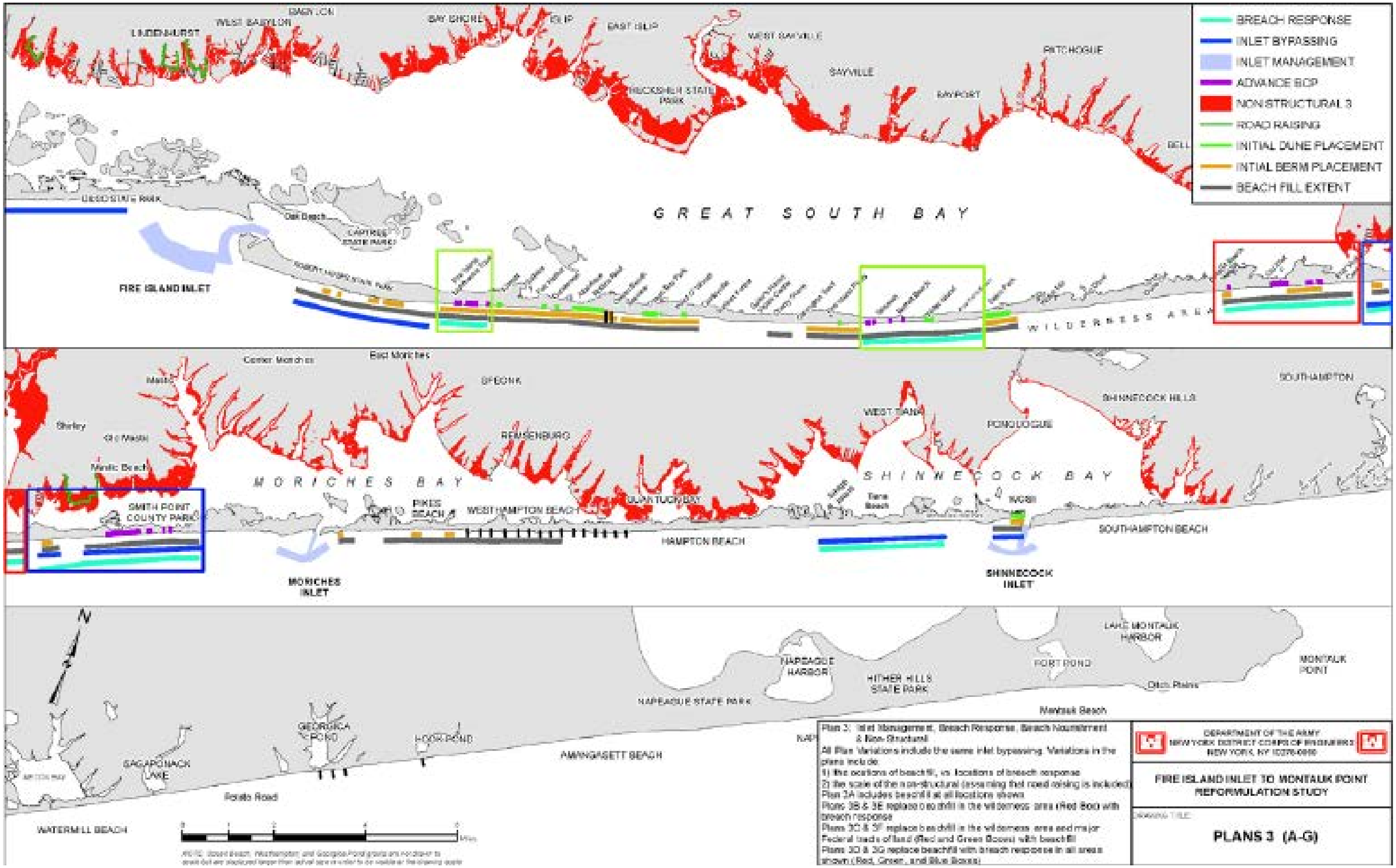

Figure 2-9. Overview of Alternative 2

2.6 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

For this DEIS, the following alternatives were considered but eliminated from detailed study for the reasons stated.

2.6.1 Levees and Floodwalls

Levees and floodwalls are generally considered the most direct method to protect the back bay/mainland areas from tidal inundation. Levees and floodwalls are not suited to protect against wave action, and are not considered for oceanfront applications. They protect developed areas by providing a continuous line of protection around a group of structures and are often described as local protection measures. The line of protection may be made of earthen materials, concrete, rock, metal sheetpiling or a combination of materials. Along the mainland shorefront, protective features would tie into high ground at each end of a project segment. In general, levees (dike or embankment, comprised of rock or earthen materials, protecting low land areas from flooding) are less expensive than floodwalls (comprised of concrete and/or sheetpiling) but require more land. If a large area is to be protected, the numerous rivers or canals draining into the bays will either require closure gates and drainage facilities such as pump stations or will require the line of protection to surround the water course on both sides, frequently extending inland to high ground. This often requires significant roadway and bridge relocation as the existing structures are usually too low to cross over the levee or floodwall. The levee/floodwall line of protection must be accompanied by an extensive interior drainage system to impound and/or pump stormwater runoff. The initial screening of alternatives considered levees and floodwalls. These measures were eliminated from general application, in that they were not economically viable, due to the mainland site constraints, and generally not supported by sponsors and stakeholders.

2.6.2 Storm Closure Gates

Flood control closure gates are designed to prevent storm surges from entering tidal inlets and/or canals. As mentioned previously, closure gates are also included in levee and floodwall features for canal and creek closures. In the present context, closure gates could be considered at Fire Island, Moriches and Shinnecock Inlets, as well as Narrow Bay and Quogue and Quantuck Canals. Storm closure gates constructed at these locations could reduce inundation damages by limiting storm tidal flows into Study Area estuaries. While several types of closure gates exist, they can be primarily classified as either mobile or fixed systems. Mobile systems can be raised, lowered or otherwise removed when there is no threat of coastal flooding. Fixed systems restrict flow during storms by inducing hydraulic losses and/or limiting flow area. The initial screening considered the relative cost and effectiveness of closure gates at the locations described above. The initial screening concluded that the cost for these structures exceeds the maximum benefits that could be derived, and that there were concerns regarding the environmental impact of these alternatives. As a result, these storm closure gate measures were not recommended for further consideration. As presented above, the inlet modification structures would be a necessary component of any plan that would include beachfill fronting the ponds. These water control structures at the ponds were eliminated from consideration, since they were not locally supported because of the impact these structures would have on the ability of the Town Trustees to manage the ponds as they historically have. Alternatives will consider if modifications to the inlet management practices could reduce tidal flow. At the coastal ponds, consideration was given for water control structures, that similar to inlet closure gates, would provide a mechanisms to control the inflow and outflow of water from the ponds. These measures were developed as an alternative to the present practice, which is both the regularly scheduled and storm-induced opening and closing of the ponds. These inlet closure structures would be a necessary component of any plan that would include beachfill fronting the ponds. These water control structures at the ponds were eliminated from consideration, since they were not locally supported because of the impact these structures would have on the ability of the Town Trustees to manage the ponds as they historically have.

2.6.3 Offshore Breakwaters

Offshore breakwaters are typically rubble-mound structures built seaward of the shoreline, and act to reduce wave energy reaching the shoreline. Offshore breakwaters may be built as a long continuous structure or as a series of shorter, segmented structures. The advantages of segmented breakwaters include cost-effectiveness and design flexibility. The effect of breakwaters is to cause gradients in wave energy in the lee of the structures that promote sediment deposition behind the breakwaters. When properly designed, these depositional features should not interrupt longshore sediment transport in a way that negatively impacts adjacent shorelines. As with other coastal structures, offshore breakwaters are often combined with beach restoration. For example, beach restoration may serve to reduce storm-induced damages, while the offshore breakwater system serves to reduce long-term erosion. The need for structural features combined with beach nourishment is particularly acute near inlets, where both long-term and storm-induced erosion may be severe. Beachfill and offshore breakwater combinations provide needed shore protection, and, when properly designed, will permit sand bypassing of the inlet. If located too far offshore, for instance, offshore breakwaters located near inlets may interfere with inlet behavior. Consequently, it is often advisable to locate the structures closer to shore where they would act as artificial headlands or combined with tradition groins to form T-groins. Breakwater placement closer to shore reduces construction costs and enhances fill stabilization relative to breakwaters located further offshore.

Based upon the initial screening, offshore breakwaters, as stand-alone features were not universally recommended for further consideration. Offshore breakwaters were not recommended for further consideration as structures combined with beachfill. Based upon the initial screening, breakwaters tend to be comparable to other coastal structures in stabilizing beachfill, but the costs associated with breakwater construction are much higher than other available methods. Offshore breakwaters were considered further in conjunction with inlet modification alternatives, including the integration of breakwaters and groins in T-groin configurations.

2.6.4 Seawalls

Seawalls are generally used to protect upland structures from wave impact and erosion damage. Seawalls are typically rather massive structures as they are intended to resist the full force of storm waves. Seawalls normally require extensive toe protection to preclude scour. Vertical seawalls are generally high and are often judged to be socially and aesthetically unacceptable. Moreover, vertical seawalls are vulnerable to catastrophic failures that may be attended by accelerated upland erosion. A rubble-mound seawall consisting of relatively large armor units and armored backslope provides a high level of stability when subjected to direct wave forces. An exposed rock structure in the absence of beach restoration does not abate shoreline erosion, because it does not provide the sand necessary to offset erosion processes. Seawalls are typically located landward of the active littoral zone, therefore, shoreline erosion is not affected. An alternative to a conventional rubble-mound or vertical seawall is a buried rubble-mound seawall placed landward of the shoreline; the rubble-mound seawall is often coupled with beach restoration. Example applications of a buried seawall are described in Headland (1992) and Basco (1998). The buried seawall has the appearance of a sand dune and is only exposed during severe events. When used in concert with beachfill, the seawall provides the last-line-of-defense storm protection, while the beach restoration combats long-term shoreline erosion. Based upon the initial screening, seawalls as stand-alone measures were not recommended for further consideration. Seawalls, in the form of a reinforced dune, were considered further in the secondary screening to determine their applicability when considered in combination with beachfill.

2.7 SUMMARY COMPARISON OF THE ALTERNATIVES

To aid the reader in understanding the differences among the alternatives, this section compares the environmental impacts of the alternatives. Section 2.7.1 presents a comparative table to highlight differences among the alternatives. The information in that table is summarized from Chapter 4 of this DEIS. Section 2.7.2 summarizes the cumulative impact analysis based on information in Chapter 4 of this DEIS. Finally, Section 2.7.3 discusses proposed mitigation measures.

2.7.1 Key Findings and Comparative Differences Among Alternatives

Table 2-4 provides a broad comparison of the impacts of the alternatives. Details supporting the information in Table 2-4 are found in Chapter 4.

Table 2-4. Summary Comparison of the Alternatives

Resource	FWOP	TSP	Alternative 1	Alternative 2
Topography, Land Formation, Key Geologic Characteristics	Natural processes will continue to impact existing conditions. Local communities will continue to implement projects to maintain the shoreline and navigable inlets and bays. Areas of low elevation will experience the effects of sea level rise sooner than higher areas, and encroachment of water along all of the margins of the barrier islands will result in an overall narrowing of islands, lowering the protective capacity of the Study area.	The TSP would reduce the frequency and volume of the barrier overwash and reduce the number of the barrier breaches. Beneficial topographic and geomorphological effects are anticipated, including raising the protective capacity of the Study Area.	Similar actions and impacts as the TSP; however, less beachfill in the Barrier Islands (Fire Island at developed locations) and Westhampton (fronting Moriches Bay) would result in a greater potential for barrier island breaching, overwash, and impacts. Renourishment would only occur when cross-section falls below the design level of 25-years, resulting in greater impacts over time than the TSP.	Similar actions and short-term impacts as Alternative 1; however, non-structural measures of Alternative 2 would be smaller. Because there would be no adaptive management, the long-term impacts would be similar to FWOP.
Water Resources	Ongoing projects and activities would continue to result in impacts to surface waters in the mainland area. The continued rise in population and development could result in continued surface water degradation from increased land clearing, impervious surfaces, stormwater runoff and other point and non-point sources. Associated impacts to water quality could include increases in water pollutants. Sea level rise could result in increased saltwater in groundwater.	Structural measures would reduce risk of flow and water levels during storm surge. Impacts from continued rise in population and development would be same as FWOP. Sea level rise would result in less potential for saltwater in groundwater compared to FWOP.	Similar actions and impacts as the TSP; however, less beachfill would result in a greater potential for barrier island breaching, overwash, and impacts. Renourishment would only occur when cross-section falls below the design level of 25-years, resulting in greater impacts over time than the TSP.	Similar actions and short-term impacts as Alternative 1; however, non-structural measures of Alternative 2 would be smaller. Because there would be no adaptive management, the long-term impacts would be similar to FWOP.
Wetlands	Storms and coastal processes have exerted strong influences within the Study Area including wetlands found in the mainland. This influence is likely to increase as sea level rises and degradation of wetlands and	TSP would reduce the risk of coastal storm damages and provide protection to wetlands. TSP would not require filling any wetlands and would not produce significant changes in	Smaller build-up of dune and less beachfill would result in greater barrier island breaching and overwash than TSP, and associated impacts on wetlands would be more likely. Additionally, because there are	Similar actions and short-term impacts as Alternative 1; non-structural measures would be smaller. Because there would be no adaptive management, the long-term impacts would be similar to FWOP.

Resource	FWOP	TSP	Alternative 1	Alternative 2
	associated plant communities will continue. Continued development will also result in loss of open space and loss of wetlands.	hydrology or salinity affecting wetlands.	no set renourishments, potential impacts to wetlands would increase over time.	
Vegetation	Current trends affecting vegetation are expected to continue; vegetation communities will change in response to various factors including natural succession, sea level rise, coastal erosion and related erosion control activities, periodic dune breaching and overwash, as well as land use changes and infrastructure development. The need for additional housing and infrastructure is likely to result in a loss of open space and natural vegetation. In addition to direct loss of vegetation as a result of development, remaining plant communities in the vicinity of the development will likely decline in quality as a result of decreased water quality from stormwater runoff and increased occurrence of invasive species such as common reed. Other changes in plant communities bordering bays will continue as a result of increased frequency of breaches due to the expected rise in sea level. Barrier island breaching and overwash would contribute to sediment input within the	The TSP would reduce the frequency and volume of the barrier overwash and reduce the number of the barrier breaches. There would be less sediment input within the estuaries adjacent to the barrier islands, which would decrease the long-term formation of salt marsh and SAV beds. The TSP would help counter the impacts associated with the projected rise in sea level and the associated negative impacts to plant communities.	Smaller build-up of dune and less beachfill would result in greater barrier island breaching and overwash than TSP, and associated impacts on vegetation would be more likely. Additionally, because there are no set renourishments, potential impacts to vegetation would increase over time.	Similar actions and short-term impacts as Alternative 1; non-structural measures would be smaller. Because there would be no adaptive management, the long-term impacts would be similar to FWOP.

Resource	FWOP	TSP	Alternative 1	Alternative 2
	estuaries adjacent to the barrier islands. The sediment input to the bay may contribute to both the degradation and the long-term formation of salt marsh and SAV beds. The projected rise in sea level will likely cause other long-term changes to the plant communities. Increases in water levels within the bays will cause a shift in the plant community zones, especially salt marsh habitat that borders these bays. Zones of low marsh will be inundated and will relocate into zones that were previously occupied by high marsh plant communities. This shift will continue inland resulting in a net decrease in vegetated area.			
Fish and Wildlife	The ongoing projects and activities would continue to result in short-term impacts to fish and wildlife living within the habitats of the Study Area as a direct result of dredging and sediment placement activities. Additionally, biological impacts related to breaches would occur and could include: 1. increase in bay tidal flushing would result in a reduction of "small form" algal blooms;	The TSP would reduce the frequency and volume of the barrier overwash and reduce the number of the barrier breaches. This would reduce the biological impacts related to breaches discussed under the FWOP. Avian habitats associated with the marine intertidal, inlets, barrier islands, dunes and swales, upland, bayside beach and back bay areas will likely be less impacted because there would be less coastal erosion and breaching of beaches, dunes, and shorelines. Beach	Smaller build-up of dune and less beachfill would result in greater barrier island breaching and overwash than TSP, and associated impacts on fish and wildlife would be more likely. Additionally, because there are no set renourishments, potential adverse impacts to fish and wildlife would increase over time.	Similar actions and short-term impacts as Alternative 1; non-structural measures would be smaller. Because there would be no adaptive management, the long-term impacts would be similar to FWOP.

Resource	FWOP	TSP	Alternative 1	Alternative 2
	2. Increased tidal flushing is also likely to promote accelerated clam growth; 3. The number and variety of shellfish predators is likely to increase as a result of the rise in salinity levels; 4. "Opportunistic" species are likely to first re-colonize the disturbed area and gradually be replaced by a greater variety of "equilibrium" species; 5. The fresh sand deposits and new beach areas are likely to attract nesting shorebirds and colonial shorebirds (e.g., least terns, piping plovers and roseate terns); 6. Tidal marshes are likely to stay in early stages of vegetative succession and remain highly productive; 7. The increases in tidal flushing and water clarity are likely to benefit eelgrass growth. Continuation of the ongoing short- and long-term impacts on dune nesting and beach foraging areas would be expected for many species of birds. Avian habitats associated with the marine intertidal, inlets, barrier islands, dunes and swales, upland, bayside beach and back	narrowing would also be lessened as a result of storm events, which would improve the quality of this habitat, which is utilized by many species.		

Resource	FWOP	TSP	Alternative 1	Alternative 2
	bay areas will likely continue to be impacted as a result of the lack of comprehensive plans and programs in place to control and repair coastal erosion and breaching of beaches, dunes, and shorelines. If beaches continue to narrow as a result of major and minor storm events, over time this could contribute to the decreased size and quality of this habitat, which is utilized by many species.			
Rare Species and Habitats	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.	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. Since no major changes in the marine offshore habitat is anticipated under the TSP, impacts to marine offshore rare species and habitats are not anticipated. Localized dredging of sand for the TSP are expected to continue in the same manner although more frequently. The increase in renourishment would be completed for the next 30 years which would entail dredging fill from offshore borrow areas. The TSP could have a positive impact on dunes in the barrier island ecosystem that are outside of the Study Area but close enough that they may potentially be impacted. It is likely that	Alternative 1 would involve similar initial actions as the TSP; consequently, the potential impacts to rare species and habitats would initially be similar to those as the TSP. However, because Alternative 1 would result in smaller build-up of the dune and less beachfill, barrier island breaching and overwash, and the associated impacts on rare species and habitats would be more likely. Additionally, because Alternative 1 does not include any set renourishments, the potential negative impacts would increase over time.	Alternative 2 would involve similar initial actions as the TSP; consequently, the potential impacts to rare species and habitats would initially be similar to those as the TSP. However, like Alternative 1 there would be smaller build-up of the dune and less beachfill under Alternative 2 compared to the TSP. This would result in a greater potential for barrier island breaching and overwash, and the associated impacts on rare species and habitats would be more likely. Additionally, because Alternative 2 does not include any set renourishments, the potential negative impacts would increase over time.

Resource	FWOP	TSP	Alternative 1	Alternative 2
		impacts would be similar but not as intense as impacts within the Study Area. The TSP would likely reduce the risk of coastal storm damage. Although vehicular use for beach renourishment may negatively impact nesting birds by disturbing them or destroying their nests or some types of vegetation by crushing the plants themselves or their seedlings. The use of best management practices will reduce the likelihood of impacts.		
Land Use and Development, Policy, and Zoning	Land use policies and programs would continue to be influenced by storms, sea level rise, coastal erosion, flooding, breaching, and overwash. Human activities would continue to follow land use and zoning regulations devised to prevent and respond to potential damage from these natural forces. Projects would continue to be planned and implemented, including: erosion control activities, breach closure, beach fill and dredging activities, inlet and navigation channel maintenance, sand bypass, installation of stabilization structures, housing and other development. Erosion would continue, particularly in the areas in need of beach nourishment. This could result in reduced beach frontage on Fire Island, increased potential	By reducing the risk of coastal storm damages, the TSP could have a positive impact on land use development, policy, and zoning. Non-structural measures of TSP include: (1) a building retrofit plan for approximately 4,400 structures, and (2) four road raisings. The building retrofit plan involves a 100-year level of protection for all structures inside the 10-year floodplain (approximately 44 in Shinnecock Bay, 857 in Moriches Bay, and 3,110 in Great South Bay). Building retrofit measures are proposed, and could include limited relocation or buyouts based upon structure type and condition. Although erosion and adverse effects of storm events would continue, the TSP would reduce losses in beach frontage	Alternative 1 would involve similar initial actions as the TSP; consequently, the potential impacts on land use development, policy, and zoning would be similar to TSP. Alternative 1 would result in a smaller build-up of the dune, less beachfill, and does not include set renourishments; consequently, barrier island breaching and overwash would be more likely.	Alternative 2 would involve similar initial actions as the TSP; consequently, the potential impacts on land use development, policy, and zoning would be similar to TSP. However, like Alternative 1, there would be a smaller build-up of the dune and less beachfill under Alternative 2 compared to TSP. The non-structural measures of Alternative 2 would only involve a 100-year level of protection for all structures inside the 6-year floodplain (approximately 3,200 structures). Unlike the TSP and Alternative 1, however, no relocation or buyouts would occur under Alternative 2. Because there would be no adaptive management, the long-term impacts would be similar to those of the FWOP.

Resource	FWOP	TSP	Alternative 1	Alternative 2
	for structural damage and loss of homes and businesses on Fire Island and along the bay shore.	on Fire Island, reduce the potential for structural damage and loss of homes and businesses on Fire Island and along the bay shore.		
Recreational Resources	Storm-induced breaching or creation of inlets along barrier island areas can result in the permanent loss of recreation land areas, reducing the availability of recreational uses for residents and visitors. Sea level rise is a factor that will affect recreational resources in the FWOP. As sea level rises, some shorefront lands that are currently above water will become submerged, including some recreation lands.	Beach erosion would be greatly reduced in the areas proposed for renourishment. The placement of beach fill in the designated areas would protect recreational uses. Due to the reduced likelihood of breaching and inundation of the bay shore, recreational areas are much less likely to be damaged or destroyed. Storm-induced breaching or creation of inlets along barrier island areas which can result in the permanent loss of recreation land areas would be minimized under the TSP and potential damage from future storms to recreational features and facilities such as piers and marinas, beaches, trails, campsites, golf courses, fishing areas, and birding areas would also be minimized. During construction activities, a certain amount of short-term disruption is unavoidable. This would primarily include access to the beach, interruption of pedestrian routes along the beach, and noise from trucks and other heavy machinery.	Same as TSP, but less protective due to less beachfiill.	Same as TSP. However, because there would be no adaptive management, the long-term impacts would be similar to those of the FWOP.

Resource	FWOP	TSP	Alternative 1	Alternative 2
Socioeconomic Conditions and Environmental Justice	The economy on the barrier islands will continue to be driven by the tourism and service industries, including retail operations catering to summer month tourists. The Suffolk County mainland's economy will continue to be diverse. Under the FOWP, commercial, residential, public, and other infrastructure are expected to be subject to increasing economic losses from storms. The resultant total accumulated funds needed to repair and recover could impair the ability of the county to fund other initiatives, such as the acquisition of open space for natural preserves and recreational areas. Under the FWOP, minority and/or low-income communities are not expected to incur disproportionately high or adverse health, safety, or economic injury. Any future damage or economic loss would affect all populations within the Study Area equally.	With the implementation of the TSP, the extent of storm damage in the Study Area communities would be reduced. Thus, access to businesses would be less likely to suffer directly through structural damage or indirectly through interruption of access or utility service. Based on the analysis of impacts for resource areas, few long-term significant impacts from construction or operation of the TSP are expected. Impacts may occur in areas where environmental justice populations were identified; however, it is expected that any impacts would affect all populations within the Study Area equally. Therefore, no unavoidable adverse impacts would be disproportionately borne by minority and/or low-income populations as a result of the TSP. Implementation of the TSP would improve conditions in the Study Area and therefore would not have a disproportionate adverse impact on any low-income or minority populations.	Same as TSP.	Same as TSP. However, because there would be no adaptive management, the long-term impacts would be similar to those of the FWOP.
Cultural Resources	Continued erosion could expose prehistoric land surfaces that may contain the remains of the	Dredging from selected borrow areas has the potential to directly adversely impact previously	Same as TSP.	Same as TSP. However, because there would be no adaptive management, the long-

Resource	FWOP	TSP	Alternative 1	Alternative 2
	area's early inhabitants. A breach in the barrier island and lack of stabilization could permit wave, wind; and other actions to cause irreversible damage and loss to archaeological sites in breach areas. Unknown archaeological resources-including sites located beneath the barrier islands or shipwrecks, buried in the nearshore area—could be uncovered, damaged, or destroyed as a result to a breach.	unrecorded shipwreck sites. Dune, berm, and beachfill projects involving beach scraping or re-grading to move material could be expected to expose and potentially directly adversely impact previously unrecorded archaeological deposits. Retrofits and acquisitions have the potential to adversely impact historic properties.		term impacts would be similar to those of the FWOP.
Transportation	Transportation could be significantly affected if a breach and/or flooding washed out portions of roads. In addition, parking areas and access roads at Robert Moses and Smith Point Parks could be inundated, preventing access to those parts of the barrier island. The water access could be adversely affected if docking facilities on the bay side were damaged by a breach. However, it is unlikely that all docking facilities would be rendered unusable; and Fire Island could continue to be accessed via water, albeit at a reduced level. Fire Island protects the south shore communities of Long Island's bay shore. Under the FWOP, if a breach were to occur, low-lying areas would	By reducing the risk of coastal storm damages, the TSP could have a positive impact on transportation resources within the Study Area. Although transportation resources would continue to be influenced by storms, hurricanes, sea level rise, coastal erosion, flooding, breaching, and overwash, the TSP would reduce the potential for adverse impacts to traffic, transportation, access, and circulation that are expected under the FWOP. The four road raisings would significantly reduce storm-related disruption to the existing road network. Additionally, relocation or buyouts could reduce transportation needs.	The potential impacts on transportation resources would be similar to the TSP with the exception that renourishments would not be set, and therefore, not as frequent. Consequently, at times, adverse impacts on transportation resources from breaching of beaches, dunes, and shorelines could be more pronounced.	The potential impacts on transportation resources would be similar to the TSP with the exception that there would be no relocation or buyouts, nor any adaptive management. Consequently, the long-term impacts on transportation resources would be similar to those of the FWOP.

Resource	FWOP	TSP	Alternative 1	Alternative 2
	experience increased inundation and tidal impacts that could wholly or partially obstruct portions of the road network: in those areas.			
Visual Resources	Ongoing projects and activities would continue to impact the visual resources, although these impacts would be periodic, short-term, and localized to area where dredging and beach nourishment activities are taking place. The use of large construction equipment, such as dredge barges and excavators, would visually interrupt the natural landscape during construction activities. Long-term impacts to visual resources are also associated with the expected population increase, which will result in increased traffic, increased development that would contribute to the loss of open space and natural habitats, and an increase in the numbers of visitors, all of which would produce a negative impact to the scenic quality of the region. Continued impacts from natural processes may cause significant erosion or breaching of beaches, dunes, and shorelines, and cause structural damage to homes located within the floodplain areas. Sea-level rise associated with climate change is also expected to contribute to long-term impacts.	TSP would require the use of large construction equipment as discussed for FWOP. Long-term impacts associated with population increase would be same as FWOP. A potential major difference than the FWOP would involve buyouts. Any buyouts of properties could result in a conversion to open space. Restoration of the natural features of the land would be expected to enhance the shoreline visual quality. Storms and coastal processes would continue to cause short- and long-term impacts to visual resources under the TSP scenario. Impacts from these natural processes would result from storm and flooding events that may cause significant erosion or breaching of beaches, dunes, and shorelines, and cause structural damage to homes located within the floodplain areas. Sea-level rise associated with climate change is also expected to contribute to long-term impacts. Implementation of the TSP, including set renourishments, would minimize these impacts.	The potential impacts would be similar to the TSP, with the exception that renourishments would not be set, and therefore, not as frequent. Consequently, at times, the visual impacts associated with erosion or breaching of beaches, dunes, and shorelines could be more pronounced.	The potential impacts would be similar to the TSP, with the exception there would be no relocation or buyouts, nor any adaptive management. Consequently, there would be no conversion of land to open space and the long-term impacts on visual resources would be similar to those of the FWOP.

Resource	FWOP	TSP	Alternative 1	Alternative 2
Air Quality, Noise and GHG's	The FWOP scenario may result in greater pollutant emissions due to the continued coastal management that would need to be conducted as individual projects or emergency actions (i.e., less efficient implementation). For example, additional mobilization and demobilization, emergency response conditions, and other elements associated with numerous individual projects would continue to be needed under the FWOP scenario, which could reduce the overall efficiency of protecting the coast, which may in turn lead to increases in pollutant emissions. Further, from the pollutant perspective, there is the potential that not all of the individual projects would necessarily trigger General Conformity, resulting in no offsetting of construction emissions associated with 'de minimis' projects. With regard to noise, the dominant land use in the Project area is coastal beach and residential housing, which generally have outdoor day-night sound levels that range from 59 to 78 A-weighted decibel. The ongoing projects and activities associated with the FWOP scenario would not result	The TSP would temporarily produce emissions associated with diesel-fueled equipment relating to dredging activities. The localized emission increases from the diesel-fueled equipment will last only during the construction period, thus any potential impacts will be temporary in nature. The TSP would trigger General Conformity requirements and the associated emissions of NO_x would have to be fully offset using a variety of options successfully implemented for the Harbor Deepening Project and the Hurricane Sandy related ABU Projects. Coordination of these options would be conducted through the Regional Air Team (RAT), which includes NYSDEC, EPA Region 2, New York District, and others. The TSP is anticipated to be the most efficient approach to coastal management for the study area, and thus is anticipated to generate the lowest pollutant emissions. Sources of noise for the TSP would include dredging equipment, bulldozers (or similar equipment), and a pump-out station (if used). Construction activities would result in short-term minor increases in noise generation as	The potential impacts on air quality, noise, and GHGs would be similar to the TSP, with the exception that renourishments would not be set, and therefore, would not be as frequent. The pollutant and GHG emissions would, however, be higher when renourshiment events did take place because it is anticipated that more volume of sand would be needed per event.	The potential impacts on air quality, noise, and GHGs would be similar to the TSP, with the exception there would be no relocation or buyouts, nor any adaptive management. This could result in more frequent emergency response actions and more associated maintenance actions associated with protecting the coastline. In addition, the efficiency of coastal protection is anticipated to be negatively affected which would increase both pollutant and GHG emissions.

Resource	FWOP	TSP	Alternative 1	Alternative 2
	in significant changes to noise in the area. The FWOP scenario may result in greater greenhouse gas (GHG) emissions due to the repeated coastal management projects that would need to be conducted as individual projects or emergency actions (i.e., less efficient implementation). For example, additional mobilization and demobilization, emergency response conditions, and other elements associated with numerous individual projects which would continue to be needed under the FWOP scenario could reduce the overall efficiency of protecting the coast, which would lead to increases in GHG emissions.	a result of the operation of construction equipment. No long-term significant impacts would occur. The TSP is being planned in response to damage caused by severe storm events that eroded beaches along the Long Island coastline, which is an anticipated effect of climate change. The generation of GHG emissions associated with the project's construction activities will be temporary in nature, spanning only the construction period. Reduction of GHG emissions will be considered in the selection of mitigation options, as feasible. The TSP is anticipated to be the most efficient approach to coastal management for the study area, and thus is anticipated to generate the lowest GHG emissions.		

2.7.2 Cumulative Impacts

This section presents a summary of the cumulative impacts presented in Section 4.13.4. 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).

2.7.2.1 *Dredging Impacts*

The dredging of the borrow areas could potentially and directly impact the Marine offshore and artificial Structure/Reef communities present in open water areas. Although offshore communities would be disturbed, such disturbance would be of a temporary nature and would occur in dynamic/high energy environments where species have adapted to these: conditions. Preconstruction surveys would ensure that impacts to highly diverse areas containing substantial surf clam populations are avoided or minimized. 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.

Borrow Areas appendix B in the GRR provides a detailed discussion of the studies that have been undertaken to identify potential sources of suitable sand for both the initial construction and periodic nourishment. Potential borrow areas were evaluated based on a set of screening criteria including: 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. Potential borrow sources including upland (quarry), navigation channel maintenance dredging, shoal mining, and offshore borrow areas. Table 5 of Appendix B – Borrow Areas summarizes the results of the Borrow Delineation and Table 6 of Appendix B presents the Available Borrow Volumes.

Appendix B- Borrow Areas recommends utilizing the lowest impact borrow areas first for the initial construction, while continuing to perform pre-and post-dredging monitoring to get a better understanding of the sediment transport processes before utilizing other borrow sites during periodic nourishment. In addition to the three inlets, six borrow areas were selected for initial construction: 2C, 2H, 4C, 5Bexp, 6I, 8D. Figures 2-4 – 2.7 shows the delineation of the selected borrow areas and the table below lists their respective initial construction quantities.

Table 2-5 Borrow Areas – Initial Construction

Borrow Area	Location	Volume (cy)
2C	Kismet to POW	299,000
2H	Cherry Grove to Davis Park	250,000
4C	Cupsogue to Westhampton	923,000
5Bexp	Sedge Island to SPW	1,326,000
6I	Potato Road	120,000
8D	Montauk Beach	120,000
Fire Island Inlet*	Gilgo Beach to RMSP	2,341,000
Moriches Inlet*	SPCP to Great Gun	512,000
Shinnecock Inlet*	SPW to WOSI	549,000
		Total 6,440,000

*Includes Ebb Shoal.

2.7.2.2 *Sand Placement Impacts*

Sand placement activities have the potential to directly affect several shoreline communities. Although a temporary loss of shallow nearshore/intertidal habitat would occur, a new sandy bottom should 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 coordinates 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.

2.7.2.3 *Non-Structural Actions*

Relocation and buyouts would produce beneficial impacts in the Study Area by: (1) reducing the potentially affected population and resources; (2) creating open space or other non-residential/non-commercial uses, which would restore the natural features of the land and enhance the shoreline visual quality; and (3) reducing the demand on transportation resources. Although road raisings would create short-term adverse impacts from construction, the long-term benefits would include improved transportation, access, and circulation. These positive impacts would be counteracted by potential population increases and increased development in the Study Area (GRR 2016 section 5.4.2.5).

2.7.3 Potential Mitigation Measures/Best Management Practices

This section presents a summary of the potential mitigation measures/best management practices (BMPs) that the New York District proposes to use for the purpose of avoiding or minimizing adverse impacts on numerous species that may use coastal habitats in the Project area, including species of concern (see Section 3.6.1). 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. Potential mitigation measures/BMPs have been developed as described below.

- The New York District will conduct surveys during the spring/summer, and prior to construction activities, to identify and to document all known Federal or state-listed wildlife species observed in the Project area, and will initiate consultation with appropriate state and Federal agencies. 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.

- The New York District will plant 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, and developing a variable density planting scheme on the south side of the dune slopes.

- The New York District will contact the USFWS 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 information regarding the conditions of the Project (including all BMPs).

The action alternatives would include efforts to minimize impacts on barrier island vegetation and the sandy habitat of the piping plover, red knot, and the seabeach amaranth. 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 saltmarsh, fresh-water wetland, or other habitats may be avoided or substantially minimized. With respect to the piping plover, red knot, and the seabeach amaranth, specifically, the New York District proposes the following BMPs:

- 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.

- Time-of-Year Restrictions, which will provide for limited activities between April 1 and September 1 to protect piping plovers and May 1 to November 1 to protect seabeach amaranth. The Proposed Plan allows that, if breeding piping plovers are not observed in a proposed Project area, or are not within 1,000 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 active breeding of piping plover, utilizing a 300-ft protective buffer zone.

- Surveying and monitoring of the action area for threatened and endangered species during the spring and summer nesting seasons. Monitoring will include identification of suitable habitats, nesting areas, symbolic fencing, and signage.

- Intensive protection of breeding piping plovers on all suitable habitats in the action area from human disturbance (e.g., Off-road vehicles [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.

- 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 USFWS. 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.

- 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 March 15 until the birds fledge, if there are plovers present). Such closures will be identified in the symbolic fence plan.

- Productivity and population surveys will be conducted each year. Surveys will be recorded and summarized, and plover locations will be recorded on maps, indicating areas surveyed and habitat types.

- The storage of equipment and materials shall be confined to within the construction site and/or upland areas greater than 100 feet from the tidal wetland boundary (intertidal zone).

- If present, there shall be no disturbance to vegetated tidal wetlands outside the boundaries of the placement area as a result of the construction activity.

- Excavated sediments shall be placed directly into the Project site. All fill shall consist of "clean" sand material, to maintain suitable piping plover and seabeach amaranth habitat.

Given the BMPs summarized above, and the local implementation of existing USFWS protection measures, impacts associated with the proposed Project 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 impacts.

3.0 AFFECTED ENVIRONMENT

The Fire Island Montauk Point (FIMP) Study Area (Study Area) covers an approximately 83-mile long oceanfront area along the south shore of Long Island in Suffolk County, New York (Figure 1-1). The Study Area includes approximately 50 miles of barrier islands and 33 miles of mainland fronting the Atlantic Ocean between Fire Island Inlet and Montauk Point. The Study Area also includes bay areas behind the barrier islands, and portions of mainland Long Island situated behind, or north of, the bay areas. The Study Area includes portions of the towns of Babylon, Islip, Brookhaven, Southampton, and East Hampton, as well as a number of villages and hamlets located on both the barrier islands and the mainland. The town boundaries of the mainland towns of Babylon, Islip, Brookhaven, and Southampton also extend south to encompass the barrier island portions of the Study Area. The mainland portion of the Study Area generally extends landward (north) to Montauk Highway. The Study Area includes Fire Island National Seashore (FIIS), a 26-mile portion of the barrier islands that is administered and managed by the United States Department of the Interior (DOI), National Park Service (NPS).

The FIMP Study Area encompasses the Atlantic Ocean shorefront along approximately 50 miles of the barrier islands and 33 miles of the mainland, and also includes an additional approximately 72 miles of shorefronts and coastal bay areas along the back side of the barrier islands and the mainland north of the bays. The primary coastal bays are:

- Great South Bay, formed by 26 miles of the Fire Island barrier;
- Moriches Bay, formed by 5 miles of the Fire Island barrier and a 9-mile section of the Westhampton barrier island; and,
- Shinnecock Bay, formed by the easternmost 6.5 miles of the Westhampton barrier island and a 3.5-mile barrier island section of Southampton.

The following sections describe the existing environmental setting in the Study Area by resource topic, including various natural, socio-economic, and cultural resources.

3.1 TOPOGRAPHY, LAND FORMATIONS, KEY GEOLOGIC CHARACTERISTICS

The geology of the inner continental shelf fronting the south shore of Long Island is characterized by Holocene sediments of variable thickness. These sediments generally consist of either organic-rich muds (backbarrier deposits typically found in the sheltered waters leeward of a barrier island) or modern marine and inlet-filling sands. The area west of Moriches Inlet is typified by a seaward-sloping wedge-shaped deposit of backbarrier sediments underlying marine sand. This sedimentary layer thins towards Moriches Inlet. Although there are some isolated pockets of backbarrier sediments, marine sands generally lie directly over Pleistocene sediments in the area between Moriches and Shinnecock inlets with a maximum thickness of approximately 3 feet. The Holocene sediments east of Shinnecock Inlet typically consist of a thin layer of sand and gravel overlying Pleistocene sediments.

The Study Area comprises generally low lying, morainal shorelines and barrier beach. From Montauk Point west to Southampton (approximately 33 miles), headlands formed by

Ronkonkoma moraine and outwash deposits are eroded, forming a narrow beach and a series of small bays (i.e., ponds). Eroded sediments along this reach are transported westward by wave action.

The headland section comprises three geomorphic types: steep bluffs, connecting beach with low dunes, and sandy beach with continuous high dunes. The first type are steep bluffs that rise to 60 feet or more above sea level with narrow beaches of coarse sand and gravel; these features characterize the shoreline from Montauk Point westward for a distance of approximately 10 miles (Figure 3.1-1). The second type, approximately 4 miles in length, consists of connecting beach that provides a link between two areas of deposition of the Ronkonkoma moraine and includes Napeague Beach; a low sandy beach backed by dunes characterizes the shoreline (Figure 3.1-1). The third geomorphic type consists of sandy beaches with long continuous dunes that rise to an elevation of 20 feet above sea level; this area is 19 miles long and extends to Southampton (Figure 3.1-1). Lying just north of the shoreline are several small ponds or bays that have been cut off from the ocean by bay mouth bars and narrow barrier beaches, which are periodically breached during and after storms. The larger of these bays include Agawam Lake, Mecox Bay, Sagaponack Lake, Georgica Pond, and Hook Pond. To the north of the ponds, the dominant topographic relief of the area is provided by the Ronkonkoma morainal ridge.

The wind and storm surge associated with Hurricane Sandy (2012) caused numerous overwashes and three breaches occurred on south shore barrier island system of Long Island. Two of those three breaches were on Fire Island and within the boundaries of Fire Island National Seashore: one at Old Inlet (within the Otis Pike Fire Island High Dune Wilderness) and another in Smith Point County Park. In response to breaching of the barrier island, the Department of Environmental Conservation in concert Suffolk County requested assistance from USACE to close the Smith Point and Cupsoque County Park breaches under the Breach Contingency Plan (BCP). The breaches at Cupsogue County Park and Smith Point County Park and were closed in November 2012 and December 2012, respectively. Two of the three breaches were closed, the breach within the Wilderness Area of FIIS has remained open and is being monitored by the DOI, and is under evaluation in an EIS to determine future management actions for the breach. The breach at the "Old Inlet" area within the Fire Island Wilderness Area is being evaluated by the National Park Service to create a baseline from which to measure changes in the breach. At this time, no closure activities have been initiated.

Breaches and overtopping of the barrier island occur periodically in conjunction with larger storms. During Hurricane Sandy two breaches occurred along Fire Island and one along the reach between Moriches Inlet and Shinnecock Inlet. The overwash occurred along approximately 45 percent of the island. The physical impacts of a breach or severe overwash at Great South and Moriches Bays include:

- Increase in bay storm water levels if breach is large enough to expose bayshore to open ocean conditions;
- Increase in bay storm water levels due to presence of large persistent breach or ocean storm tide levels overwashing the barrier island;
- Changes in bay circulation patterns, residence times, and salinity due to breaches;

- Increase in sediment shoaling in navigation channels and shellfish areas due to a major breach;
- Increased transport and deposition of sediment to bay including creations of overwash corridors.

Barrier Island breaching often results in the formation of flood tidal deltas on the bay side of the barrier. These breaches are likely to provide suitable substrate for future SAV growth or the development of emergent tidal marshes, if the elevation is sufficient. These flood tidal deltas typically benefit a variety of wildlife species, especially shorebirds, by increasing the available foraging and loafing area, and potential nesting sites. Flood tidal deltas and the dynamic sand spits associated with bay inlets also provide optimal habitat for the rare plants, seabeach amaranth and sea beach knotweed. Overwash deposits are beneficial to natural accumulation of sand on the barrier, but suggests regional processes favor northward migration of the barrier from its present location.

3.2 WATER RESOURCES

Water resources considered part of the affected environment encompass both surface water and groundwater. The quality and availability of surface water and groundwater and potential for flooding are addressed in this section.

Surface water resources within the Study Area include ponds, rivers, creeks, streams, bays, and the Atlantic Ocean, all of which are important in terms of their economic, ecological, and recreational value, and their contribution to human health. The Long Island Intracoastal Waterway extends approximately 50 miles along Long Island through the bays and barrier beaches from Fire Island Inlet to the southern end of Shinnecock Canal, and is an important part of the economic vitality of the area. Groundwater is commonly used for potable water consumption, agricultural irrigation, and industrial applications.

Floodplains are defined as those areas adjoining the channel of a river, stream, lake, ocean, or other water body that are prone to flooding (Tetra Tech EMI 2007). Inundation dangers associated with floodplains have prompted Federal, state, and local legislation that limits a majority of development in these areas to recreation and preservation activities. Executive Order 11988, *Floodplain Management* (42 FR 26951, 3 CFR 1977), requires Federal agencies to take action to reduce the risk of flood damage, restore and preserve the natural and beneficial values served by floodplains, and minimize the impacts of floods on human safety, health, and welfare.

The presence of the existing barrier island system and topography reduces widespread inundation of low lying areas on the mainland. The Inlets along the Barrier Island and Narrow Bay act both as hydraulic conveyances and hydraulic constrictions which severely limit the storm surge volume entering Great South, Moriches and Shinnecock Bays. As the tidal surge spreads out away from the inlets, the corresponding flood stage decreases. This attenuation of ocean surges becomes less pronounced for larger storm events which can overwash and breach the barrier island. Therefore, the flood problem along the mainland is linked to the topographic condition of the barrier system. Flooding occurs as a result of surge propagating through the inlets, but more severe mainland flooding can occur as a result of overtopping or breaching of a degraded barrier island, which brings more storm ocean water into the bay system during the times of moderate to severe storms.

The numerical model framework developed for FIMP is the state of the art and most advanced and comprehensive modeling study involving storm surge and barrier island system breaching and morphology. The numerical model includes all the necessary processes to accurately simulate the inlet and barrier island overwash processes and breaching processes in a system-wide and comprehensive manner for the complete FIMP project area, considering the three bay and inlet system (GRR 2016 Appendix A).

3.2.1 Surface Water

Surface water within the Study Area includes over 80 miles of coastline of the Atlantic Ocean, several hundred miles of bay shoreline, including ocean frontage along Long Island (USACE 1999f). The three large bays and the Atlantic Ocean are the dominant surface water features, with the bay inlets providing hydrologic connectivity between bay and ocean waters, and numerous tidal rivers and creeks located along the northern shore providing freshwater input.

Great South Bay, located within the westernmost section of the Study Area, is the largest bay, with a surface area of approximately 110 square miles, although the westernmost portion of the bay located in Nassau County is not included in the Study Area. Moriches and Shinnecock bays, located to the east of Great South Bay, are similar in size: Moriches Bay has a surface area of approximately 16 square miles and Shinnecock Bay has a surface area of approximately 15 square miles (USACE 1999f). The westernmost end of Moriches Bay is hydrologically connected to Great South Bay via Narrow Bay, and the Quantuck and Quogue canals provide hydrologic connectivity with Shinnecock Bay to the east. All three bays are separated from the Atlantic Ocean by the barrier island complex.

Great South Bay consists of two distinct basins, east and west, relative to the location of Fire Island Inlet. East of the inlet, bay width vary from between 2-5 miles with water depths averaging roughly 8 feet. The basin west of Fire Island Inlet includes South Oyster Bay and portions of Great South Bay; the west basin is characterized by widths that are generally less than 1.5 miles. Water depths to the west of the inlet are shallow, averaging approximately less than 3 feet (USACE 2004c). Two major river systems discharge into Great South Bay; the Connetquot River and the Carmans River (Figure 3.2-1), with the entire drainage area for the bay estimated to be 378 square miles (USACE 1999a). The Carmans River, located near the eastern end of the bay, is part of the Wertheim National Wildlife Refuge, and is one of only four rivers located on Long Island that are considered relatively undisturbed (USACE 1999c). Both the Carmans River and Beaverdam Creek drain into Bellport Bay between Howell Point and Smith Point. Near the middle of the northern shore of Great South Bay, the Connetquot River drains into Nicoll Bay near the Town of West Sayville. The Patchogue River and Swan River, located west of Bellport Bay and the Carmans River, drain into the Patchogue Bay, located between Blue Point and Howell Point.

Moriches Bay is generally 6 to 7 feet in depth and is approximately 14 miles in length, with widths ranging from 0.2–0.4 mile (USACE 1999f). Drainage area for the bay is estimated to be 75 square miles (USACE 1999a). Some of the larger waterbodies that ultimately drain into Moriches Bay are the Forge River, located near the western end of the bay, and the Seatuck Creek and East River systems, located along the northern shore in the townships of Brookhaven and Southampton (which drain into Seatuck Cove) (Figure 3.2-1). Numerous smaller creeks and rivers also drain into the bay, including Mud, Senir Areskoak, and Orchard Neck creeks, and the Terrell and Speonk rivers. Several other coves are located along the northern shore of Moriches Bay including Radio, Tuthill, and Hart coves. Quantuck Bay and Quogue Canal are located along the western end of the bay, connecting Moriches Bay to the western end of Shinnecock Bay (USACE 1999a, 1999f).

Shinnecock Bay is approximately 9 miles long, extending east from the Village of Southampton to the Village of Quogue located along the western edge of the bay (Figure 3.2-1) (USACE 1999f). Average water depth of Shinnecock Bay is 6 feet and width of the bay ranges from 0.4–2.8 miles. Penniman and Stone creeks drains into the western portion of the bay and, to the east, Weesuck Creek and Tiana Creek drain into the bay between Pine Neck Point and East Point. Heady Creek and Taylor Creek drain into the bay near the Shinnecock Indian Reservation. The Shinnecock Canal is located north of Cormorant Point in the eastern end of the bay and is hydrologically connected to Great Peconic Bay on the northern shore of Long Island. The drainage area for Shinnecock Bay is estimated to be 25 square miles (USACE 1999a). East of Shinnecock Bay, many smaller bays and ponds occur in the Study Area, including Mecox Bay, Georgica Pond, Wainscott Pond, Hook Pond, Fort Pond, and Oyster Pond (USACE 1999a, 1999f).

The New York State Department of Environmental Conservation (NYSDEC) provides an inventory of all of the waterbodies in the state, including those located in Suffolk County, along with an assessment of their impairment status based on available information (NYSDEC 2002). A majority of the freshwater systems in Suffolk County are listed as having impaired segments, including Beaverdam Creek, Bellport Bay, Carmans River, the lower section of Connetquot River, lower section of Forge River and coves, Great South Bay, Heady and Taylor creeks, Mecox Bay, Moriches Bay, Narrow Bay, Nicoll Bay, Patchogue River and Bay, Quantuck Canal, Quogue Canal, Shinnecock Bay and Inlet, Shinnecock Canal, upper section of Swan River and tributaries, lower section of Terrel River and tributaries, Tiana Bay, and Weesuck Creek and tributaries (NYSDEC 2002). None of the Atlantic Coastline located along Suffolk County is listed as having any known impacts. The NYSDEC report contains additional details and justification for each of the waterbodies' impairment status.

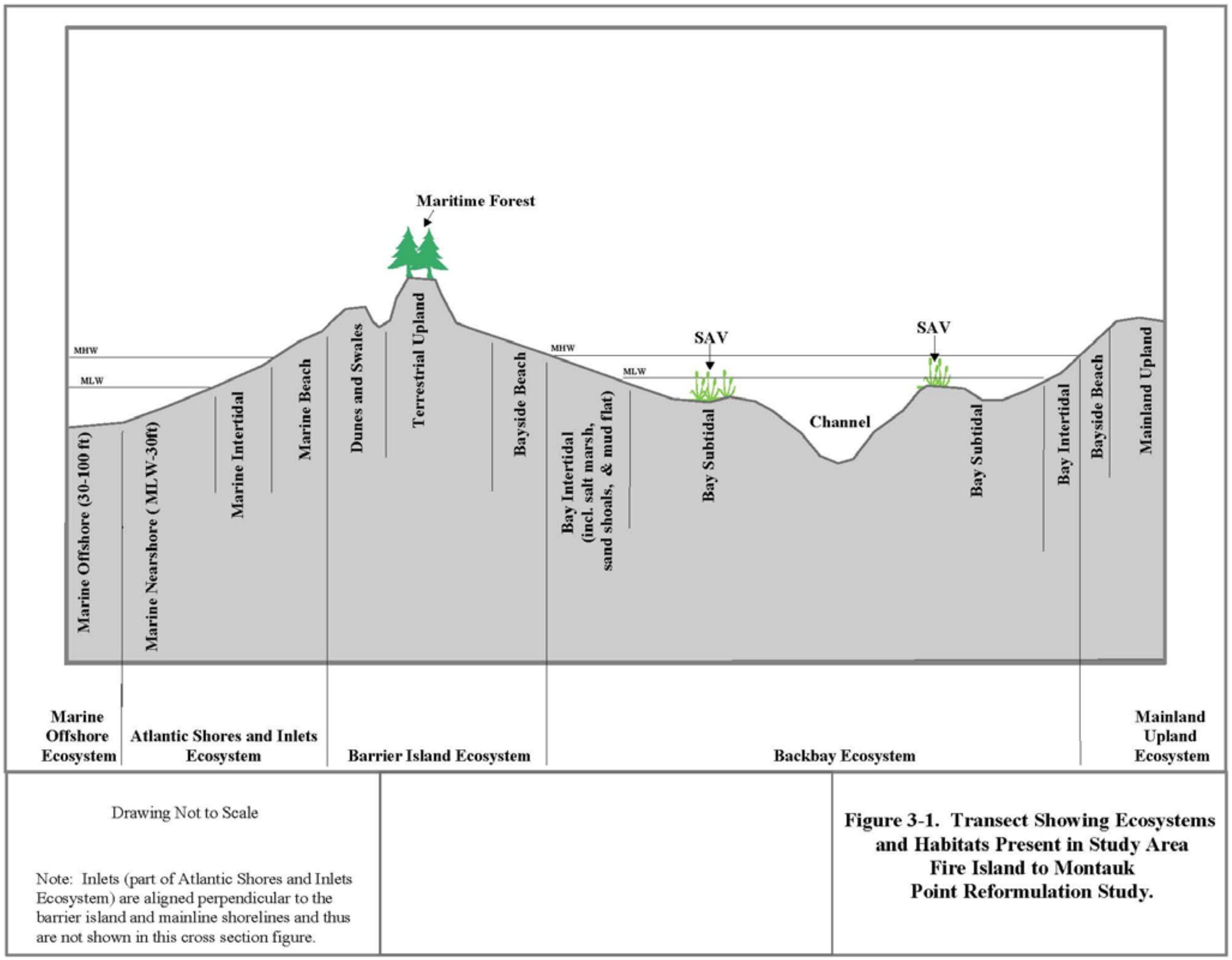

Figure 3.1-1. Transect Showing Ecosystems and Habitats Present in Study Area FIMP Reformulation Study

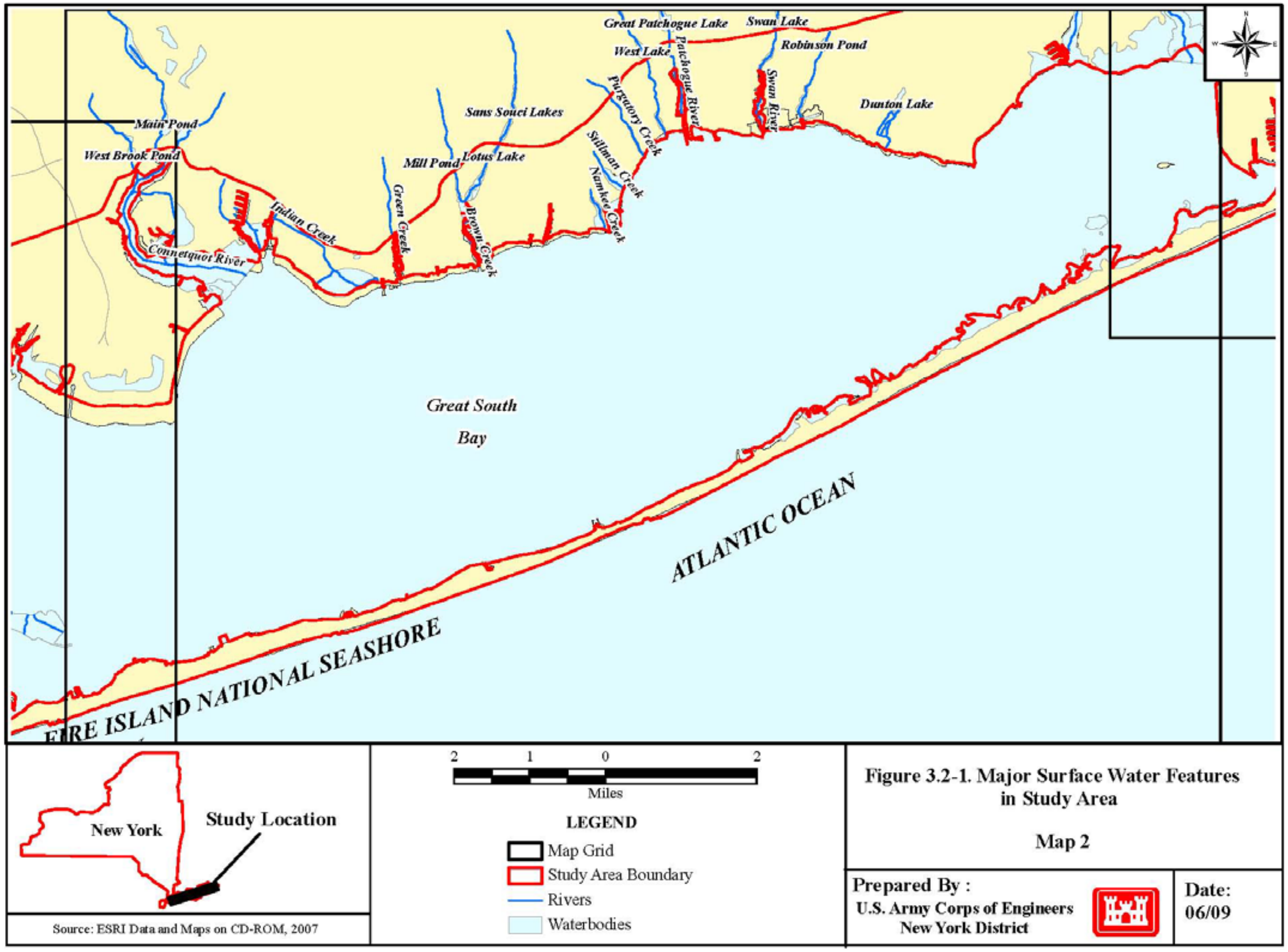

Figure 3.2-1. Major Surface Water Features in Study Area

3.2.1.1 Surface Water Quality – Bays

Multiple sources of water quality data exist for this region, including recent data that were collected by USACE between June and November 2005 within the Study Area that included salinity, temperature, dissolved oxygen, and turbidity. These data are summarized below (USACE 2006a).

Spatial and temporal salinity distributions in the bays along the south shore of Long Island are dependent upon two major factors: (1) freshwater inflow rates that vary both yearly and seasonally, and (2) exchange rate of sea and bay waters through tidal inlets (Pritchard 1983). Salinity levels are dictated by the balance among the following: (1) saltwater inflow through bay inlets, (2) flow exchange between bays, and (3) freshwater flow entering the bay via major rivers and creeks (Pritchard 1983). Salinity values in the Study Area ranged from 17.3 parts per thousand (ppt) at Great South Bay in June to 29.80 ppt at Shinnecock Bay in September, with results indicating that salinity decreased by bay from east to west (USACE 2006a). A high variation in salinity levels was observed within Great South Bay, and this is most likely the result of the variable influx of freshwater from the many tributaries supplying the Great South Bay. The higher salinity levels observed for the two bays located to the east of Great South Bay are likely attributed to the lower number of freshwater sources that flow into Moriches and Shinnecock bays. As a result of tributary discharges and reduced tidal exchange, average salinity values in Great South Bay are the lowest of the bays in the Study Area.

Temperatures within all bay areas showed an expected seasonal trend, increasing from May to August and then decreasing to the lowest observed temperatures in November, and corresponded to all ambient air temperatures. Temperature values range from 9.79° Celsius (C) (49.6° Fahrenheit [F]) in Moriches Bay to 26.15°C (79.07°F) in August at Great South Bay. No significant differences in temperature were observed either spatially or temporally and no general geographic patterns of increase or decrease were evident. However, long-term water quality data indicate that average bay temperatures increase from east to west (USACE 1999f). The data also suggest that temperatures tend to increase with distance from the inlet – particularly within Great South Bay – most likely from the influx of freshwater. The spatial and temporal distributions of temperature in the bays are dependent upon season, and from the exchange rate of ocean and bay waters through tidal inlets. The temperature is dictated by a balance among ocean water, freshwater, and solar radiation.

Dissolved oxygen (DO) values ranged throughout the sampling period (June through November 2005). Shinnecock Bay had the greatest recorded range, from 4.27 milligrams per liter (mg/l) to 12.80 mg/l in September. No significant differences in DO existed either spatially or temporally, and no general geographic patterns of increase or decrease were evident.

Turbidity values ranged in Great South Bay from 0.00 nephelometric turbidity units (NTU) in August to 10.80 NTU in November. Mean turbidity in all bays for the entire sampling periods was between 1.70 NTU in Moriches Bay to 5.40 NTU in Great South Bay. No significant differences in DO existed either spatially or temporally and no general geographic patterns of increase or decrease were evident.

Jetty construction and dredging of the navigational channels have resulted in the relative stability of the inlets (USACE 1999a). This stability has led to an increase of bay flushing relative to pre-stabilization conditions because the maintained inlets permit the continual exchange of bay and ocean waters. Alternately, unstabilized inlets are vulnerable to closure as evident from inlet records. For instance, no inlets to Moriches Bay existed for a period of nearly 100 years from 1839 to 1931. It is likely that submerged aquatic vegetation (SAV) beds and associated eelgrass (*Zostera marina*) were absent from the bay during this period due to low salinity and water clarity conditions. Furthermore, estuary records available for the majority of the 20th century indicate that tidal ranges for Moriches and Shinnecock bays have constantly increased, presumably improving water quality in the bays. With respect to the Fire Island Inlet, the hydraulic efficiency of this inlet has probably diminished over the last few decades as a result of the limited maintenance that has been performed in this area, which has contributed to the amount of sediment deposition-- or shoaling-- that has taken place within the inlet channel (USACE 1998). This has most likely resulted in reduced flushing of Great South Bay.

There is little to no information available on current water quality conditions for coastal ponds on the south shore, which include Mecox Bay, Sagaponack Lake, and Georgica Pond (Suffolk County Department of Health and Safety [SCDHS] 1996). Georgica Pond is highly stratified with the less dense fresh water runoff overlying the more dense sea water with limited mixing of the two. The salinity of Mecox Bay depends on the status of its inlet (i.e. open or closed) and is associated with flushing of sea water from the Atlantic Ocean.

3.2.1.2 Surface Water Quality – Offshore Atlantic Ocean

Offshore waters in the proximity of Fire Island Inlet have an average temperature of approximately 15 °C (59 °F) (SCDHS 1996). The SCDHS data indicate that average ocean temperature increases from east to west (from 12 to 15 °C [53.6 to 59 °F]). The average salinity is approximately 31 ppt.

USACE collected water quality data at several stations off the Long Island coast near Shinnecock Inlet on a monthly basis from May 2005 through April 2008 as part of borrow area investigation (USACE 2008a). Water quality data were collected at the bottom, middle, and surface of the water column at depths that varied from approximately 8 feet to 60 feet. Surface temperatures were generally lowest in February and March, ranging from 2.61 to 4.63 ºC, and highest in August, ranging from 18.82 to 21.87 ºC. Surface temperatures throughout the year averaged 12.03 ºC. Water temperatures in the middle of the water column averaged between 11.56 and 12.03 ºC with lowest values observed during February and March (2.34–4.20 ºC) and highest temperatures observed during August or October (17.45–21.64 ºC). Bottom temperatures averaged 11.31 ºC, and ranged from 2.03 to 4.22 ºC in February to 18.82–20.83 ºC during August (USACE 2008a).

Dissolved oxygen (DO) values ranged from a minimum of 2.08 to 5.28 mg/l observed during January and July and a maximum of 18.50 to 21.32 mg/l in July and December, averaging between 7.35 and 9.59 mg/l for the entire three-year study. Salinity throughout the water column varied from 21.60 to 39.31 ppt for the entire three-year study. Values for pH were between 5.6

and 8.4, averaging 7.9 to 8.1, and turbidity readings averaged between 2.75 and 13.38 NTU for the three years of data reviewed (USACE 2008).

In addition, between July and October 2015, additional field work was conducted in the proposed borrow areas. This field work included the collection of water quality data, benthic grab sampling, sediment characterization, and fish trawling. The water quality data from that field work is consistent with the information presented above. The specific data from that field work is found in Appendix L of this DEIS.

By definition, sea level change (SLC) is a change (increase or decrease) in the mean level of the ocean. Eustatic sea level rise is an increase in global average sea level brought about by an increase to the volume of the world's oceans (thermal expansion). Relative sea level change takes into consideration the eustatic increases in sea level as well as local land movements of subsidence or lifting. Long Island is one of many areas in which the land is subsiding. This Reformulation effort considers a range of future sea level rise projections, including the historic rate as the low boundary, and accelerated rates of sea level rise, as described below.
Historic information and local MSL trends used for the Study Area are provided by the NOAA/NOS Center for Operational Oceanographic Products and Services (CO-OPS) using the tidal gauge at Sandy Hook, New Jersey. The historic sea level change rate (1935-2013) is approximately 0.0128 ft/year or about 1.3 ft/century.

Recent climate research has documented observed global warming for the 20th century and has predicted either continued or accelerated global warming for the 21st century and possibly beyond (IPCC 2013). One impact of continued or accelerated climate warming is continued or accelerated rise of eustatic sea level due to continued thermal expansion of ocean waters and increased volume due to the melting of the Greenland and Antarctic ice masses (IPCC, 2013). A significant increase in relative sea level could result in extensive shoreline erosion and dune erosion. Higher relative sea level elevates flood levels which may result in smaller, more frequent storms that could result in dune erosion and flooding equivalent to larger, less frequent storms.

The current guidance (ETL 1100-2-1 dated 30 Jun 2014) from the Corps states that proposed alternatives should be formulated and evaluated for a range of possible future local relative sea level change rates. The relative sea level rates shall consider as a minimum a low rate based on an extrapolation of the historic rate, and intermediate and high rates which include future acceleration of the eustatic sea level change rate. These rates of rise correspond to 0.7 ft, 1.1 ft, and 2.4 – 6 ft over 50 years for the low, medium and high rates of relative sea level rise.
Most of the analysis contained within this report applies the historic rate of sea level rise. The use of the historical rate of sea level rise for planning purposes is acknowledged to be a conservative approach. Including a higher rate of sea-level rise would result in a larger amount of damages, and could show the need for plans that would only be required under higher accelerated sea level rise conditions. Consistent with Corps guidance, the alternative evaluation was conducted using the historic rate of RSLC in order to select a plan. Following selection of the plan, the TSP has been evaluated to show the effectiveness of the plan under the intermediate and high rate of RSLC.

3.2.1.3 Surface Water Quality – Freshwater

Freshwater is present within the Study Area primarily in the form of fresh surface water drainages (rivers and tributaries) and groundwater seepage. Water quality data collected over several years from the Carmans, Patchogue, and Swan rivers were summarized by Zaikowski et al. (2007), the results of which are reviewed here. Zaikowski et al. (2007) collected temperature, pH, DO, and salinity data from 1997 to 2005 at five freshwater stations and one tidal area station in each of the three river systems. These three tributaries are representative of the range of land development pressures typical of the Study Area. The Carmans River, a portion of which traverses the Wertheim National Wildlife Refuge, is located within relatively undisturbed habitat and contains many adjacent wetland areas. The Swan River is subject to intermediate pressures from a mix of residential and commercial development, but does contain adjacent wooded areas, bogs, and marshes. Maritime activities within the Patchogue River system have been ongoing since the colonial period, and this river system is subject to the greatest population densities and development pressures of the three rivers being discussed. The Patchogue River and to some extent the Swan River have been subject to anthropogenic modifications to accommodate shipping traffic, and contain several bulkheads and boat slips. The Patchogue River does not contain any adjacent wetland systems and receives waters from two sewage treatment plants (Zaikowski et al. 2007).

Freshwater DO levels at the most upstream sampling station of all three rivers and within the southernmost sampling station within the bay was above 6.0 ppm for all seasons and depths, with the exception of very warm days that had been preceded by nights with calm winds and little wave action, where lower DO levels were observed. However, these low DO levels were observed to increase by the afternoon. For example, DO readings taken on the morning of August 22, 2005, in Bellport Bay were 4.9 ppm at the surface and 1.8 ppm at the bottom. By late afternoon surface level DO readings at the same location had increased to 7.0 ppm at the surface and 5.9 ppm near the bottom. Overall, mean DO readings were higher during colder months (October 15–April 14) compared to warmer months (April 15–October 14) of the year, with the fall increase observed during the month of October for all stations, with the exception of one station located in the Patchogue River, which retained hypoxic (oxygen depletion) conditions throughout the winter. Mean DO readings during the warmer months were 7.5 ppm for the Carmans River, 4.3 ppm for the Patchogue River, and 5.3 ppm for the Swan River (standard deviation of 2.5–3.3 for all three sites). Mean DO readings for the colder months were 10.2 ppm for the Carmans River, 7.6 ppm for the Patchogue River, and 9.7 ppm for the Swan River (Zaikowski et al. 2007).

DO data collected from tidal sections of the rivers indicate year-round hypoxia is present in the Patchogue River, with warm season hypoxia affecting the Swan River, and occasional warm season hypoxia affecting the deepest waters of the Carmans River. This hypoxia is attributed to the limited amount of vertical mixing that takes place as less dense freshwater flows into the estuary and remains stratified on top of the much denser saline water of the bay. The lack of wind and wave action further reduces the potential for mixing to occur, and these conditions are exacerbated during the warmer months of the year when warmer surface waters trap hypoxia water at the bottom of the tributaries. Additionally, the narrow inlets connecting the bays to the ocean waters prevent adequate flushing of oxygenated bay waters into the hypoxic river bottoms.

The development of these hypoxic conditions results in very low DO levels in the tidal areas of these rivers. The hypoxic conditions within the Swan River that occur during the warmer months beginning in May result in part from stagnant canal waters that discharge into the river along the eastern shore, which were observed to contain anoxic water from approximately 2.0 to 5.9 feet below the surface. These conditions improved by fall, and by mid-October normal conditions returned to the Swan River. Low DO values persisted at two of the five freshwater stations along the Patchogue River, with a third station containing anoxic conditions between approximately 10.8 and 15.8 feet below the surface for much of the year. A canal feeding into the Patchogue River was also a source of hypoxic water, and limited tidal flushing that occurs in this river also contributed to these conditions (Zaikowski et al. 2007).

Salinity levels in the Carmans River was lower in comparison to salinity levels obtained for the Patchogue and Swan rivers, with salinity levels in the Carmans River averaging 8 ppt lower than salinity levels observed within the Patchogue and Swan river systems. The difference in salinity levels for the Carmans Rivers was attributed to its more gradual tidal zone and wider mouth in comparison to the other two rivers, which allows for gradual infiltration of saltwater into the river system and more efficient tidal flushing action. The Patchogue and Swan river tidal zones have been artificially modified and their mouths and tidal zones have been impacted by road crossings and other manmade structures. Mean salinity values in the Carmans River ranged from 11.9 (July 7, 2000) to 14.1 (August 21, 2005), with mean salinity values in the Patchogue and Swan rivers ranging from 18.5 ppt (Swan River, August 21, 2005) to 21.3 ppt (Patchogue River, July 7, 2000). Although specific temperature data were not provided in the article, average temperature during the warmer months within the Patchogue and Swan rivers was reported to be 2 ºC warmer in comparison to average temperatures observed in the Carmans River (Zaikowski et al. 2007).

3.2.2 Groundwater

Shallow groundwater levels are located throughout Suffolk County, but are more prevalent in low-lying coastal areas, near surface waterbodies (including wetlands, marshes, and bogs), and along historical drainageways. Precipitation, and the subsequent recharging of groundwater aquifers, is the sole source of fresh groundwater on Long Island. Fresh groundwater levels on Long Island fluctuate seasonally and annually in conjunction with precipitation trends (Tetra Tech EMI 2007). However, salt water intrusion into the groundwater aquifers has increased as a result of sea level rise and depletion of freshwater within the system, especially in shallower areas of the aquifers (Suffolk County 2007). All of the fresh water provided to Long Island residents originates from groundwater sources, and land development pressures have resulted in a recent decline in groundwater levels, most notably in the western part of Suffolk County where population density is the highest.

Groundwater provides nearly all of Long Island’s drinking and municipal water and is a critical resource for communities in the Study Area. The single unconfined aquifer in Suffolk County is the Glacial Aquifer, which occurs at or near the soil surface. Areas where the groundwater depth is less than 10 feet are particularly susceptible to saltwater intrusion and flooding (Tetra Tech EMI 2007), and portions of the Glacial Aquifer are subject to saltwater intrusion, largely as a result of depletion of freshwater in the system. This aquifer has been negatively impacted by heavy use and discharge of septic systems over the past several decades, and the general water quality of this aquifer decreases from east to west as population densities increase (Tetra Tech EMI 2007). Use of this aquifer is not possible in the western portion of the county due to excess contamination, and consequently lower, confined aquifers are currently being used in this area. Contaminated groundwater can also impact bay waters, as up to 25 percent of freshwater input into the bays of the Study Area is attributed to groundwater seepage (USACE 1999a).

Confined aquifers in the mainland portion of the Study Area include the Magothy and Lloyd aquifers, which underlie the Glacial Aquifer, and are currently not subject to degradation from contaminants. However, increased use of these aquifers, particularly following contamination of the overlying Glacial Aquifer, has led to modest depletion of these freshwater sources. Shallow aquifers are also associated with the barrier islands, including Fire Island. A 3-year study initiated in 2004 by the National Park Service determined that groundwater flow at Fire Island is primarily controlled by the effects of wave setup and tidal pumping, which together elevate the water table near the ocean shore (NPS 2007b).

The U.S. Geological Survey (USGS) maintains six groundwater monitoring wells within Suffolk County. They monitor wells at Brookhaven National Laboratory, Long Island Research Farm, and in the communities of Islip, Bridgehampton, Coram, and Mattituck. All of these monitoring wells collect data for the Glacial Aquifer. Summary data from 2005 and 2006 noted that the highest groundwater levels at the Coram monitoring station (60.90 feet above National Geodetic Vertical Datum [NGVD]) and the lowest groundwater levels were found at the Mattituck monitoring station (1.13 feet above NGVD) during that time period (USGS 2008).

3.2.3 Floodplains

Suffolk County is mostly surrounded by coastal waters, which places much of the coastline within the 100-year and 500-year floodplains (Tetra Tech EMI 2007). The 100-year floodplain designation defines areas that have a 1 percent chance of flooding in any given year, and the 500-year floodplain designation defines areas that have a 0.2 percent chance of experiencing a flood during any given year. Much of the Study Area is prone to flooding due to the low, flat topography and the large amount of rain and snowfall that is received. All of the Study Area is located at less than 100 feet above mean sea level (MSL), with a majority of the south shore of the mainland having an elevation of less than 20 feet above MSL. Outlying barrier islands, including Fire Island, and areas immediately along the coast typically have an elevation of less than 5 feet above MSL. A total of 40 notable flooding events have impacted Suffolk County between 1962 and 2007 (Tetra Tech EMI 2007).

Floodplains located within the Study Area include the barrier island, back bay, and mainland floodplains within Suffolk County. The 100-year floodplains have been mapped by the Federal Emergency Management Agency (FEMA), however, sea level rise and potential changes in barrier island structure are expected to increase the area of impact for a 100-year flood, as well as floodplain areas in general (USACE 2006c). Much of the development that has taken place along the shorelines of the Study Area over the last 75 years was not subjected to the requirements of the National Flood Insurance Program or related local floodplain management ordinances, and many mainland areas located along the south shore of Long Island are particularly vulnerable to flooding due to the low, flat topography typical of this area.

Reoccurring floods have affected approximately 126 square miles of the mainland within the Study Area, extending as far inland as Montauk Highway (Tetra Tech EMI 2007). It is estimated that over 9,000 structures are located within the 100-year floodplain of the mainland modeled by USACE for this study, and many more structures could be impacted from flooding if a breach event were to occur within each of the three major bays during a 100–year flood event (USACE 2006c).

Storms that affect Long Island can be classified as northeasters or hurricanes. Northeasters mainly affect the northeastern U.S. and Atlantic Coast of Canada, and are characterized by strong northeasterly winds that move in ahead of a storm front (Tetra Tech EMI 2007). Extra-tropical cyclones are a type of northeaster that consist of fronts and horizontal temperature gradients that produce everyday weather phenomena such as cloudiness, mild showers, gales and thunderstorms. Northeasters occur from September through April, and may also be classified as severe winter storms. However these storms may form at any time of the year (Tetra Tech EMI 2007). Severe or extreme northeasters can cause significant beach and dune erosion, coastal flooding and property damage within the Study Area. Damage levels tend to increase when the storm tracks up the coastline on an inland track.

When classified as severe winter storms, northeasters can produce heavy snowfall within a short period of time (4 inches or more within a 12-hour period) or blizzards (low temperatures accompanied by winds gusting to greater than 35 mph, reducing visibility to 0.25 miles or less from blowing snow for 3 hours or more), they may be accompanied by strong, gusty winds that form snow drifts, produce sleet or freezing rain, and cause ice storms. Severe winter storms can also cause flooding. A total of 23 notable northeasters have impacted the Suffolk County area between 1931 and 2006 (Tetra Tech EMI 2007).

Flooding may occur from overflow of inland or tidal waters, rapid accumulation of runoff or surface waters, mudslides resulting from water accumulation, heavy rainfall and high groundwater levels (Tetra Tech EMI 2007). Flooding may occur over a period of days or develop in a matter of hours. FEMA uses three categories to describe floods: riverine, coastal, and shallow. Other types of floods include ice jams, alluvial fan, dam break, and flooding associated with local drainage or shallow groundwater. The most common types of floods that occur in the Study Area are coastal and riverine flooding, whereas groundwater flooding affects relatively small portions of the Study Area (Tetra Tech EMI 2007).

Coastal flooding results when land along the ocean coast and inland areas becomes submerged by increased sea levels that occur above the normal tidal range. Storm surges, hurricanes, and severe storms are the most common causes of coastal flooding, which can erode beach, dune and bluff habitats; result in the loss of wetlands; allow saltwater to intrude into both surface and groundwater sources; increase groundwater tables; and, impact recreational areas including beaches, parks, open space, and coastal structures such as piers, bulkheads, and bridges (Tetra Tech EMI 2007).

Riverine floods are the most common type of flooding, occurring when water overflows channel banks and inundates low-lying areas. Spring rain events, heavy thunderstorms, and snowmelt all contribute to the potential for riverine flooding to occur. While most riverine flood events occur over a period of several days, flash flooding may result when unusually large amounts of precipitation fall within a short timeframe. Conditions for flash flooding are also present when significant snow pack is melted during warm spring rains. Low-lying areas and areas located downstream from dams have the greatest risk of being affected by flash floods. Natural communities that are most affected by flooding are wetland and marsh habitat located within a floodplain (Tetra Tech EMI 2007).

3.3 WETLANDS

Wetlands (e.g., marshes, swamps, bogs) are categorized as special aquatic sites by the U.S. Environmental Protection Agency (USEPA). Wetlands are defined by the USACE and the USEPA as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (Environmental Laboratory 1987). In addition to wetlands, other special aquatic sites defined by the USEPA include areas such as vegetated shallows (e.g., SAV) and areas that may be unvegetated, including sand flats and mud flats. Wetlands and other special aquatic sites as defined by the USEPA are afforded protection under Section 404 of the Clean Water Act (CWA) and in some cases Section 10 of the River and Harbors Act as well.

The NYSDEC Freshwater Wetlands Permit Program recognizes wetlands that are greater than 12.4 acres (5 hectares) and occur outside of the influence of the ebb and flow of the tides. The NYSDEC Tidal Wetlands Permit Program recognizes both vegetated and unvegetated areas as occurring within the areas of the influence of the tides. Common categories subject to tidal wetlands regulation include unvegetated coastal shoals, bars, and mudflats, vegetated intertidal marsh and high marsh, and the littoral zone that includes lands under tidal waters (not included in any other tidal wetland category) that are no deeper than 6 feet at mean low water (MLW). New York State defined freshwater and tidal wetlands are generally afforded protection under Article 24 (freshwater wetlands) and Article 25 (tidal wetlands) of the New York State Environmental Conservation Law (NYSECL). Adjacent upland areas (100 feet from freshwater wetlands and 300 feet or the 10 foot elevation mark from tidal wetlands) are also regulated by Articles 24 and 25 of NYSECL.

The following sections describe the wetland communities that occur in the Study Area, and are organized based on the ecosystem and habitat framework defined for the Study Area (see Section 3.2). The descriptions are derived through examination of National Wetland Inventory (NWI) and USACE cover type maps compiled for the Study Area. Additionally, vegetation studies specifically within the barrier island ecosystem performed by USACE and the National Park Service (NPS) were also used to characterize the affected environment where applicable. Generally, the wetlands are discussed according to freshwater and tidal classifications. Although the wetlands of the Study Area support a diversity of vegetation assemblages, wildlife communities, rare, threatened and endangered species, this section focuses on the types and general characteristics of the Study Area’s wetlands. Vegetation, fish, wildlife, and sensitive species and habitats found within these wetlands are discussed in greater detail in Sections 4.4 – 4.7.

3.3.1 Marine Offshore Ecosystem

The marine offshore habitat is characterized as oceanic waters from 30 to 100 feet deep. These areas do not meet the criteria for definition as a wetland under Section 404 of the CWA or NYSECL Article 25 (tidal wetlands). However, these areas would be considered territorial seas subject to regulation under Section 10 of the Rivers and Harbors Act, as well as Section 404 of the CWA.

3.3.2 Atlantic Shores and Inlets Ecosystem

3.3.2.1 Marine Nearshore

The marine nearshore habitat is characterized as oceanic waters from MLW to a depth of 30 feet. These areas do not meet the criteria for definition as a wetland under Section 404 of the CWA. However, these areas would be considered territorial seas subject to regulation under Section 10 of the Rivers and Harbors Act, as well as Section 404 of the CWA. In addition, any area within this habitat type categorized as Littoral Zone as defined by the New York State Tidal Wetlands Program (i.e., tidal areas seaward to 6 feet deep at MLW) would be regulated under NYSECL Article 25 (tidal wetlands).

3.3.2.2 Marine Intertidal

The marine nearshore habitat is characterized as oceanic waters from mean high water (MHW) to MLW. Although exposed at low tides, the marine intertidal habitat is generally unvegetated with a sand or rock substrate that does not support areas that would meet the criteria for definition as a wetland under Section 404 of the CWA. However, these areas would be considered part of the territorial seas subject to regulation under Section 10 of the Rivers and Harbors Act, as well as Section 404 of the CWA. In addition, any area within this habitat type categorized as Littoral Zone as defined by the New York State Tidal Wetlands Program (i.e., tidal areas seaward to 6 feet deep at MLW) would be regulated under NYSECL Article 25 (tidal wetlands).

3.3.2.3 Marine Beach

The marine beach habitat lies above MHW, is generally unvegetated or only sparsely vegetated, and does not support areas that would meet the criteria for definition as a wetland that would be regulated under Section 404 of the CWA. However, the majority of this area would be a regulated adjacent area under NYSECL Article 25 (tidal wetlands). The seaward features of the barrier are, from sea to land, comprised of a submerged beach profile, a shoreface, a berm and finally, a coastal dune. This natural shorefront encompasses a range of geometries depending on wave climate, sand supply and condition of the near shore bar. Specifically, the beach may erode under large waves and elevated water levels to assume a storm or “winter” profile. The beach may recover post-storm to assume a “summer” profile.

Historic Shoreline Rate-of-Change (SRC) values for the FIMP study are were first documented in Gravens et al. (1999), which examined three non-overlapping time intervals using available shoreline data sets. The first period, representative of the epoch prior to significant human influence on the barriers, is 63 years long (1870 to 1933). The second period, representative of initial development on the barriers and the initiation of human intervention with natural processes, including inlet stabilization and significant beach fill placements, is approximately 46 years long (1933 to 1979). The third period, representative of modern times and reflecting more recent beach nourishment practices, is approximately 15 years long (1979 to 1995), (GRR Table 3).

3.3.2.4 Inlets

The majority of the inlets habitat does not meet the criteria for definition as a wetland under Section 404 of the CWA or NYSECL Article 25 (tidal wetlands). However, these areas would be considered navigable waters of the U.S. subject to regulation under Section 10 of the Rivers and Harbors Act, as well as Section 404 of the CWA. Some portions of the inlets habitat occur within the Littoral Zone regulated by NYSECL Article 25 (tidal wetlands). The regulated adjacent area would apply to these areas as defined by Article 25.

There are three stabilized inlets in the Study Area: Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet, all of which are Federal navigation projects. A fourth inlet has formed within the Wilderness Area of the Fire Island National Seashore as a result of a breach in the barrier island during Hurricane Sandy. Coastal inlets play an important role in nearshore processes. Inlets are the openings in coastal barriers through which water, sediments, nutrients, planktonic organisms, and pollutants are exchanged between the open sea and the protected embayments behind the barriers. These existing inlets contribute to flooding in the back-bay that occurs during storm events. In addition, inlets are important economically because harbors are often located in the back bays, requiring that the inlets be maintained for commercial navigation. At many inlets, the greatest maintenance cost is incurred by periodic dredging of the navigation channel.

Tidal inlets experience diurnal or semidiurnal flow reversals and are characterized by large sand bodies that are deposited and shaped by tidal currents and waves. The ebb shoal is a sand mass that accumulates seaward of the mouth of the inlet. It is formed by ebb tidal currents and is modified by wave action. The flood shoal is an accumulation of sand at the bayward opening of an inlet that is mainly shaped by flood currents (USACE, 2002). However, not all of the sediment in the littoral transport stream is trapped at these shoals; a large proportion may be bypassed by a variety of mechanisms, particularly at inlets that have already developed mature shoals with a volume approaching equilibrium.

Typically, jetties are built to stabilize a migrating inlet, to protect a navigation channel from waves, or to reduce the amount of dredging required to maintain a specified channel depth. However, jetties can profoundly affect sand bypassing and other processes at inlets and adjacent shorelines (USACE, 2002). The stabilized inlets do not function as natural inlets in several respects. First, the stabilized inlets are maintained by jetties (only one jetty in the case of Fire Island), are periodically dredged, and do not migrate as natural inlets do. Second, the stabilized FIMP inlets are judged to be more of a sand sink than natural inlets. Natural inlets tend to facilitate bypassing of littoral drift over a series of shallow shoals relatively close to the shore.

The jetties act to confine flows within a relatively narrow area compared to natural inlets; they also act to deepen the inlet throat and shift the ebb tidal delta further offshore than a natural inlet. Accordingly, the inlets have acted to trap sand at least during their formative stages (GRR section 2.1.9).

3.3.3 Barrier Island Ecosystem

3.3.3.1 Dunes and Swales

The majority of the dunes and swales habitat is upland (CMI 2002, USACE 2003a). Wetland communities within this habitat type are generally small and limited to the interdunal swales that may support freshwater and brackish plant species. The most common wetland type is scrub-shrub communities defined as freshwater wetlands with a predominance of woody shrubs adapted for saturated conditions. Dominant shrub species found within these wetlands are highbush blueberry (*Vaccinium corymbosum*), cranberry (*Vaccinium macrocarpon)*, and bayberry (*Myrica pensylvanica*). In high salinity areas, groundsel tree (*Baccharis halimifolia)* and marsh elder *(Iva frutescens)* increase in dominance. Freshwater emergent wetlands are also found in the interdunal area, but are less common. These wetland communities are defined by a predominance of persistent emergent vegetation. Dominant herbaceous species in the swale habitat include common three-square (*Scirpus pungens*), beakrush (*Rhyncospora capitellata*), dwarf spikerush (*Eleocharis parvula*), twig-rush (*Cladium mariscoides*), purple gerardia (*Agalinis purpurea*), and sundews (*Drosera* spp.).

Regardless of wetland type, the invasive common reed (*Phragmites australis*) is typically present in varying densities (CMI 2002, Edinger et al. 2002, and USACE 2003a). NWI maps depict many small freshwater wetlands as occurring on the barrier islands, much of which is included within the dunes and swales habitat. Wetland areas within the dunes and swales habitat would likely be within USACE jurisdiction and receive protection under the Section 404 of the CWA. In addition, there are 16 currently mapped New York State Freshwater wetlands totaling 392 acres on the barrier islands that would be protected under the NYSECL Article 24 (freshwater wetlands). Mapped New York State Freshwater Wetlands for the barrier islands are listed and shown, in table and figure format, in Appendix A.

3.3.3.2 Terrestrial Upland

Wetlands within the terrestrial upland habitat are nontidal, freshwater wetlands that support forested, scrub-shrub, and emergent communities. These wetlands occur primarily in small, isolated depressions within the greater upland terrestrial community. Freshwater forested wetlands are the most common type in the upland interior of the barrier island ecosystem. Common overstory species in these communities include shadbush (*Amelanchier canadensis*), red maple (*Acer rubrum*), and black gum (*Nyssa sylvatica*). Freshwater scrub-shrub wetlands include shrub swamps found on the shores of open water, in isolated wet depressions, or in transitional areas between wetlands and uplands. Shrub swamps are dominated by several shrub species including, highbush blueberry, bayberry (*Myrica pensylvanicum*), arrowwood (*Viburnum recognitum*), and red chokeberry (*Aronia arbutifolia*). Freshwater emergent wetlands are the least common of the wetland communities and are dominated by peat moss (*Sphagnum* spp.), sedges (*Carex* spp.), bulrushes (*Scirpus* spp.), rushes (*Juncus* spp.), swamp rose mallow (*Hibiscus palustris*), yellow-eyed grasses (*Xyris difformis*), and goldenrods (*Solidago* spp.). Although uncommon, open water supports submerged aquatic plants such as fragrant waterlily (*Nymphaea odorata*), yellow pondlily (*Nuphar luteum*), and pondweeds (*Potamogeton* spp.) (CMI 2002, Edinger et al. 2002, USACE 2003a).

A comprehensive vegetation mapping study for the FIIS found that less than 1 percent of the 4,075 vegetated acres analyzed was represented by freshwater wetland habitat associations (CMI 2002). Wetland areas within the upland terrestrial habitat would likely be within USACE jurisdiction and receive protection under the Section 404 of the CWA. In addition, there are 16 currently mapped New York State Freshwater wetlands totaling 392 acres on the barrier islands that would be protected under the NYSECL Article 24 (freshwater wetlands). Mapped New York State Freshwater Wetlands for the barrier islands are listed in Table A-1 in Appendix A.

3.3.3.3 Maritime Forest

The terrestrial upland habitat is primarily comprised of maritime forest habitat (CMI 2002, USACE 2005d). The wetland communities described in the terrestrial upland section (see above) are representative of those found in this habitat.

3.3.3.4 Bayside Beach

The bayside beach habitat lies above MHW, is generally unvegetated, and does not support areas that would meet the criteria for definition as a wetland that would be regulated under Section 404 of the CWA. However, this area would typically be a regulated “adjacent” area under NYSECL Article 25 (tidal wetlands).

3.3.4 Back bay Ecosystem

3.3.4.1 Bay Intertidal (including Salt Marsh, Sand Shoal, and Sand/Mud Flats)

Unlike the marine intertidal habitat, the bay intertidal habitat supports large areas capable of supporting emergent vegetation. Salt marsh is the primary community type within the bay intertidal habitat. Salt marsh communities are prevalent on the bayside of the barrier island ecosystem and along the bayside shore of the mainland. Salt marshes are classified as estuarine emergent wetlands, and they generally contain two distinct vegetation “zones”, which can be distinguished by the assemblage of plant species present (Edinger et al. 2002). These zones are referred to as low and high salt marsh and are primarily associated with differences in hydrology. Low salt marsh occurs in zones that are regularly flooded by semidiurnal tides. These areas are almost completely composed of salt marsh cordgrass (*Spartina alterniflora*). Other species that are found in very low densities include salt marsh sand-spurry (*Spergularia marina*), and lesser sea blite (*Suaeda maritime*) (Edinger et al. 2002). High salt marsh is found in areas that are periodically flooded by spring tides and flood tides. High salt marsh is dominated by salt meadow cordgrass (*Spartina patens*) and/or salt marsh cordgrass. Other species include spikegrass (*Distichlis spicata*), black grass (*Juncus gerardi*), switch grass (*Panicum virgatum*), sea lavender (*Limonium carolinianum*), *Salicornia* spp., and slender salt marsh aster (*Aster tenuifolius*) (Edinger et al. 2002). Significant tracts of salt marsh are found in the Great South Bay, Moriches Bay, and Shinnecock Bay (U.S. Fish and Wildlife Service [USFWS] 1981a). Notable examples are the extensive salt marshes in Wertheim and Seatuck National Wildlife Refuges and Hecksher State Park. Salt shrub wetlands are common in the transition areas o elevations above daily tidal influence. Shrub species common to this zone include groundsel-tree (*Baccharis halimifolia*), coastal sweet pepperbush (*Clethra alnifolia*), blueberry, cranberry, bearberry, poison ivy (*Toxicodendron radicans*), greenbriar (*Smilax* spp.), salt marsh elder (*Iva frutescens*), and rugosa rose (*Rosa rugosa*) (Edinger et al. 2002). Salt marsh grasses are typically scattered throughout.

A comprehensive vegetation mapping study for the FIIS found that approximately 21 percent of the 4,075 vegetated acres analyzed was represented by low (11 percent) and high salt marsh (10 percent) (CMI 2002). Of the 330 barrier island acres cover type mapped by the USACE in 2001–2002, approximately 7 percent was salt marsh and 4 percent was characterized as bayside intertidal flats (USACE 2003a). There is an estimated 2,984 acres of salt marsh and 375 acres of sand shoal/mud flat habitat associated with the barrier islands (USACE 2005e).

In addition, monotypic and mixed stands of common reed are common in the salt marshes of the back bay ecosystem (USGS-NPS 2001, CMI 2002). A comprehensive vegetation mapping study for the FIIS found that approximately 8 percent of the 4075 vegetated acres analyzed was represented by common read marsh (CMI 2002). Common reed is an aggressive, invasive species that forms dense stands in typically in areas where the soil has been disturbed. These stands tend to be monocultures, but other species such as groundsel-tree, marsh elder, poison ivy, spotted jewelweed (*Impatiens capensis*), and several other species are often present particularly along the wetland /upland transition zone (USGS-NPS 2001).

The bay intertidal habitat is characterized as bay waters above MLW to MHW. Areas with emergent vegetation within this habitat meet the criteria for definition as a wetland under Section 404 of the CWA. Unvegetated areas, such as mudflats and SAV, are considered as other special aquatic sites and are also afforded Section 404 of the CWA protection. All areas within this habitat would also be regulated by the Section 10 of the River and Harbors Act as well as regulated under NYSECL Article 25 (tidal wetlands).

3.3.4.2 Bay Subtidal

The bay subtidal habitat is characterized as bay waters below MLW. These areas do not meet the criteria for definition as a wetland under Section 404 of the CWA. However, these areas would be considered navigable surface waters subject to regulation under Section 10 of the Rivers and Harbors Act, as well as Section 404 of the CWA. In addition, any area within this habitat type categorized as Littoral Zone as defined by the New York State Tidal Wetlands Program (i.e., lands under tidal waters up to 6 feet deep at MLW) would be regulated under NYSECL Article 25 (tidal wetlands).

3.3.4.3 SAV

Areas that support only submerged vegetation are not considered wetlands under USACE and USEPA definitions, but are instead classified as other special aquatic sites categorized as vegetated shallows (Environmental Laboratory 1987). These areas would be considered navigable surface waters subject to regulation under Section 10 of the Rivers and Harbors Act, as well as Section 404 of the CWA. In addition, any area within this habitat type categorized as Littoral Zone as defined by the New York State Tidal Wetlands Program (i.e., tidal areas seaward to 6 feet deep at MLW) would be regulated under NYSECL Article 25 (tidal wetlands).

3.3.5 Mainland Upland Ecosystem

Above MHW of the back bay ecosystem, the mainland upland habitat type includes several freshwater forested, scrub-shrub, and emergent wetlands. In addition, upland areas of this habitat type that are within 300 feet of New York State-regulated tidal wetlands would be subject to regulation as “adjacent areas” under NYSECL Article 25 (tidal wetlands).

Several forested wetland communities are present on the mainland and are generally characterized by the dominant overstory species. Red maple swamps associated with black gum and shadbush are common, with an understory consisting of cinnamon fern (*Osmunda cinnamomea*). The less common Atlantic white cedar (*Chamaecyparis thyoides*) swamp is also present in this habitat. Scrub-shrub wetlands on the mainland may be dominated by a large variety of shrub species including highbush blueberry, inkberry (*Ilex glabra*), maleberry (*Lyonia ligustrina*), and bayberry. Emergent wetlands may be dominated by peat moss, yellow-eyed grasses, bluejoint grass (*Calamagrostis canadensis*), and clubmosses (*Lycopodium* spp.) (Edinger et al. 2002). Coastal ponds are also present that may contain an associated wetland fringe. The transition from upland to wetland community around these ponds is typically characterized by an upper scrub-shrub wetland, followed by a lower emergent wetland fringe that transitions into the open water of the ponds (Edinger et al. 2002).

Wetland areas within the upland terrestrial habitat would likely be within USACE jurisdiction and receive protection under the Section 404 of the CWA. In addition, there are approximately 200 currently mapped New York State Freshwater wetlands totaling over 3,800 acres within the mainland upland habitat that would be protected under the NYSECL Article 24 (freshwater wetlands). Mapped New York State Freshwater Wetlands for the mainland upland habitat are listed and shown, in table and figure format in Appendix A. Finally, mainland upland areas within 300 feet of New York State-regulated tidal wetlands and within 100 feet of New York State-regulated freshwater wetlands also would be regulated under Articles 24 and 25 of NYSECL.

3.4 VEGETATION

The Study Area is a complex array of marine, estuarine, coastal, and terrestrial ecosystems. The following sections provide a description of the vegetation assemblages and communities that are expected to be associated with these ecosystems and habitats.

3.4.1 Marine Offshore Ecosystem

Rooted vegetation is uncommon in the deep marine offshore waters, primarily because of lack of light for photosynthesis. However, phytoplankton (autotrophic or eukaryotic algae) are typically abundant in offshore waters, especially near the water surface where light is more abundant. Examples of phytoplankton include diatoms (eukaryotic algae), *Cyanobacteria* or blue-green algae (prokaryotic algae), dinoflagellates (eukaryotic algae) and coccolithophores (single-celled algae, protists, and phytoplankton belonging to the division haptophytes). Phytoplankton were selected as indicators for the marine offshore habitat in the FIMP Conceptual Model (USACE 2006a).

3.4.2 Atlantic Shores and Inlets Ecosystem

3.4.2.1 Marine Nearshore

Due to depth, substrate, and wave action, the marine nearshore habitat is not suitable for the establishment and maintenance of aquatic vegetation except in more quiescent, shallow areas such as the adjacent bays, where SAV may become established. Phytoplankton also are abundant in this habitat and are indicators for the marine nearshore habitat in the FIMP Conceptual Model (USACE 2006a).

3.4.2.2 Marine Intertidal

The dynamic nature of high energy wave action in much of the marine intertidal habitat and the lack of stable surface areas for attachment, generally limits the establishment of aquatic vegetation in this area. Vegetated areas are generally limited to the extreme eastern portion of the Study Area near Montauk Point. In this area, the rocky intertidal habitat found here provides suitable substrate for macroalgae (i.e., seaweed) species to attach. These macroalgae provide food and habitat for benthic invertebrates, fish, and birds. Typical macroalgae forms that grow attached to rocks include sea lettuce (*Ulva lactuca*), green fleece (*Codium fragile*), and rockweed (*Fucus vesiculosis)*. In the rocky intertidal habitat, macroalgae is an indicator for the marine intertidal habitat in the Conceptual Model (USACE 2006a).

3.4.2.3 Marine Beach

The marine beach habitat is made up of sand and is typically unvegetated or only sparsely vegetated, and not subject to regular inundation. Sparse herbaceous vegetation with less than 5 percent cover, as well as beach debris, tire ruts, small ephemeral pools, and old wrack lines generally characterize this habitat (USACE 2003a). In undeveloped areas, the marine beach (high tide line to dunes) habitat can have between 10 percent and 30 percent vegetation coverage, including annual species of American beachgrass (*Ammophila breviligulata*), sea rocket (*Cakile edentula*), seaside goldenrod (*Solidago sempervirens*), and seaside spurge (*Euphorbia polygonifolia*) (USACE 2006a.). In areas of high recreational use, human disturbance tends to inhibit vegetative growth.

The marine beach habitat does not support a wide diversity of plant species relative to other barrier island communities due to poor nutrient content and low moisture holding capacity of the sandy substrate. However, this habitat supports several species of rare plants and animals. For example, the Federally threatened and state endangered seabeach amaranth *(Amaranthus pumilus*) and state listed rare seaside knotweed (*Polygonum glaucum*) are adapted to the conditions in this habitat, and have been documented at several locations in or nearby the marine beach habitat within the dunes and swale habitat (USFWS 2007d). The seabeach amaranth and seaside knotweed are indicator species for the marine beach habitat in the FIMP Conceptual Model (USACE 2006a).

3.4.2.4 Inlets

Similar to the marine offshore and nearshore habitats, vegetation is generally uncommon in the inlets primarily due to water depth and high velocity of water flow through the inlets. However, various forms of macroalgae are known to occupy rock stabilization structures and jetties at inlets.

3.4.3 Barrier Island Ecosystem

3.4.3.1 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. However, the foredune is often subjected to wave action during storm events. Freshwater ponds, wetlands, and sparsely vegetated shrub or forested communities are often included in this habitat designation.

Dunes and swales provide important microhabitat for vegetation such as beach grasses, other annual herbaceous species, and shrubs. The initial establishment of dune vegetation acts to trap sediment and enhance dune stability, creating suitable conditions for establishment of other biota and later successional vegetation. Dunes and swales can be subdivided into several distinct habitat types, including the foredune and primary dune slopes, crest, and back or stabilized secondary dunes. Vegetation communities are often defined by the dunes’ distance from the shoreline.

FIMP Conceptual Model indicator species for the dunes and swales habitat include American beachgrass, panic grass (*Panicum* spp.), glassworts (*Salicornia* spp.), seabeach amaranth, and a variety of shrubs and herbaceous perennials. American beachgrass is a pioneer plant that dominates the dunes and swales habitat type, especially in areas most exposed to wind and salt spray such as the ocean face of the foredune and crests of dunes. Just inland of this zone, at the toe of the dune, American beachgrass occurs along with panic grass, dusty miller (*Artemesia steleriana*), and beach pea (*Lathyrus japonica*) with glassworts found in swale and wetland areas. On the primary dunes, American beachgrass is dominant along with seaside goldenrod and sea rocket (CMI 2002, USACE 2003a).

On the backside of the primary dunes, shrub species of beach heather (*Hudsonia tomentosa*), bearberry (*Arctostaphylos uva-ursi*), and bayberry (*Myrica pensylvanica*) are common. As distance from the primary dune increases, so do the diversity, dominance, and height of shrub vegetation. As with the herbaceous community, this community often is interspersed with significant areas of bare sand. Vegetated upland areas of the shrub community are typically dominated by beach plum (*Prunus maritima*) and bayberry, but also includes other relatively common species such as shadbush, bittersweet *(Celastrus scandens)*, common juniper *(Juniperus communis)*, Japanese honeysuckle *(Lonicera japonica)*, raspberry *(Rubus* spp.*)*, greenbriar, and poison ivy (CMI 2002, USACE 2003a). Wetlands, or swales, also are found within the inter-dune zone and are discussed in Section 4.3.

3.4.3.2 Terrestrial Upland

Terrestrial upland habitat of the barrier island may be vegetated with a variety of herbaceous, scrub-shrub, and tree species. Primary vegetated communities include Maritime Deciduous Scrub Forest, Pitch Pine Dune Woodland, Maritime Holly Forest, and Acidic Red Maple Swamp (CMI 2002, USFWS 2007d). Developed and disturbed areas are frequently colonized by non-indigenous vegetation such as common reed. Freshwater wetland, swales, and ponds are also included in this habitat type and are discussed in Section 4.3. Pitch pine (*Pinus rigida*) as well as red maple swamp forest, maritime scrub, and maritime oak/holly forest are noted indicator species and community types for the terrestrial upland habitat in the FIMP Conceptual Model (USACE 2006a).

3.4.3.3 Maritime Forest

The majority of the vegetated terrestrial upland within FIIS is characterized as maritime forest communities (CMI 2002). USACE studies also support the predominance of maritime forest within the vegetated portions of the terrestrial upland habitat on the barrier islands (USACE 2003a, 2005d). Maritime forest communities are generally located toward the bayside on secondary dune systems, and are dominated by stunted tree species generally less than 20 feet in height. Common woody species in forested uplands include pitch pine, American holly (*Ilex opaca*), and black cherry (*Prunus serotina*) (CMI 2002, USACE 2003a). Understory vegetation can be sparse, however, many of the forested and shrub communities on the barrier island are densely vegetated with invasive or potentially nuisance native species such as poison ivy, greenbriar, Japanese honeysuckle, Virginia creeper (*Parthenocissus quinquefolia*), and multiflora rose (*Rosa multiflora*).

Pitch Pine Dune Woodland and Maritime Holly Forest communities occur on the barrier islands within the Study Area (CMI 2002). These maritime woodland/forest communities are unique to Long Island and considered to be of regional and/or national significance. An excellent example of the Maritime Holly Forest occurs within FIIS and is referred to as the Sunken Forest, a mature stunted maritime forest dominated by American holly, sassafras (*Sassafras albidum*), and shadbush. The forest canopy is dominated by American holly trees of up to 300 years in age (CMI 2002, USACE 2003a) Other woody species common to this community type include shadbush and sassafras, as well as black gum (*Nyssa sylvatica*), black cherry, and black oak (*Quercus velutina*). The shrub layer is generally sparse, but includes occasional bayberry, highbush blueberry, and huckleberry (*Gaylussacia baccata*). Similar to other forest types on the barrier islands, portions of the Maritime Holly Forest in FIIS are densely vegetated with potentially nuisance species such as greenbriar, Virginia creeper, poison ivy, and Japanese honeysuckle. The Sunken Forest is identified as an indicator community for the maritime forest habitat type in the FIMP Conceptual Model (USACE 2006a).

3.4.3.4 Bayside Beach

The bayside beach habitat is a transitional zone located between the upland and intertidal bay habitats of the back bay ecosystem and is included in the terrestrial upland habitat designation. The bayside beach extends from MHW on the bay side landward to the upland habitat and is included in the terrestrial upland habitat. It is generally characterized as narrow beach areas devoid of vegetation and comprised mostly of sand. Within the Study Area much of the bayside beach has been eliminated due to bulkhead construction, immediate upland development and/or severe erosion.

3.4.4 Back bay Ecosystem

3.4.4.1 Bay Intertidal (including Salt Marsh, Sand Shoals, and Sand/Mud Flats)

Intertidal vegetation in the bay intertidal habitat is primarily limited to tidal salt marsh and shrub communities. These wetland communities are discussed in greater detail in Section 4.3. Other vegetation in the bay intertidal habitat of the back bay ecosystem includes species of macroalgae. The presence of hard manmade structures such as bulkheading and rip-rap in the intertidal zone provide surfaces for the growth of these species. Sand shoals and mudflat habitats consist of unvegetated areas in the intertidal zone with either sand or mud substrates. Thin strands of *Phragmites* are often found in highly disturbed areas along barrier island bay shoreline.

3.4.4.2 Bay Subtidal

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. Most subtidal areas are unvegetated; however, vegetated SAV habitat is a subtidal habitat that is discussed separately because of its ecological importance and sensitivity. FIMP Conceptual Model indicator macroalgae species such as green sea lettuce and *Cladophora* (green filamentous algae), as well as phytoplankton (brown tide) are found within this habitat type (USACE 2006a).

3.4.4.3 SAV

SAV habitat consists of bay subtidal areas that support submerged aquatic vegetation such as eelgrass and widgeon grass (*Ruppia maritima),* along with species of macroalgae. The dominant SAV within the Study Area is eelgrass, with widgeon grass found in areas of lower salinity. Some of the factors controlling the nature and distribution of SAV are availability of suitable substrate, suitable depth, nutrient loading, water current, and availability of light. Light is one of the most limiting environmental factors affecting eelgrass distribution. Hence, any event that causes the bays to deepen greater than approximately 8 feet or reduce light penetration (such as from increased sedimentation, turbidity or nutrient flows) will negatively affect SAV distribution. Additionally, mainland stressors such as increased development and point and nonpoint source pollution also are linked to impacts on SAV health. Eelgrass, widgeon grass, and macroalgae are FIMP Conceptual Model indictors for the SAV habitat occurring within bay subtidal areas.

3.4.5 Mainland Upland Ecosystem

The mainland upland ecosystem contains various upland habitats occurring in a mosaic with largely residential and commercially developed lands, and includes mainland wetlands and coastal ponds as well. Natural vegetation on the mainland primarily consists of various pine–oak forests on upland slopes and forested swamps and emergent marsh along stream channels, pond margins, and in low lying depressional areas. Vegetation communities found on the mainland include pitch pine–oak forest, pitch pine–heath woodlands, pitch pine–scrub oak barrens, dwarf pine plains, successional old field, and successional shrubland. Wetland communities include forested wetlands, shallow emergent marsh, shrub swamp, coastal plain pond shore, red maple–hardwood swamp, and coastal plain Atlantic white cedar swamp (Edinger et al. 2002). In addition, the primary coastal ponds included in the mainland upland habitat are Georgica Pond, Mecox Bay, and Sagaponack Lake. These ponds may contain SAV as well as emergent species such as *Phragmites*, purple loosestrife (*Lythrum salicaria*) and intertidal and high marsh species.

The developed areas on the mainland generally are disturbed and densely developed. 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, maintained lawns, and landscaping with ornamental plants have been introduced, which replaced or competed with native flora. Land use on the mainland is composed primarily (62 percent) of low-, medium, or high-density developed land. Other land cover/land uses are shrub cover (1 percent); cultivated cropland (3 percent); deciduous, evergreen, or mixed forest (10 percent); and grassland, pasture, hayfield or other herbaceous cover (9 percent). The remaining 4 percent is barren land that is dominated by sand, clay, or rock.

Based on community mapping performed by the USACE in 2004, the predominant cover type found in upland areas of the mainland upland ecosystem is Pine Barrens. Less common are coastal oak–hickory, coastal oak–holly, and red maple forest. Pine barrens, also referred to as pitch pine–oak forest, are dominated by pitch pine and xeric oak species such as black oak, white oak (*Quercus alba*), and scarlet oak (*Quercus coccinea*), which are well adapted to the sandy and xeric soil conditions prevalent in central and eastern Long Island. The understory often contains either sparse or dense thickets of heath shrubs such as huckleberry, blueberry (*Vaccinium pallidum*), and bearberry. The remaining upland woodlands and barrens communities include several vegetation communities that are considered uncommon, or rare, and often harbor unique species adapted to prairie-like conditions.

Undeveloped parcels and parklands continue to support the native plant communities, whereas secondary successional woodlands characterize the developed portions along with cultural landscapes. The largest, most expansive areas of natural vegetation occur on the east end of the

Island adjacent to Hither Hills State Park, Suffolk County Parkland, and Montauk Point State Park. Large tracts of vegetated uplands also occur east of Shinnecock Island Reservation and in the vicinity of Sagaponack.

3.5 FISH AND WILDLIFE

The following sections provide a description of the invertebrate, finfish, bird, mammal, amphibian, and reptile species/communities that are expected to be associated with the ecosystems and habitats described in Section 3.2. The species described in the following sections represent the indicator species defined in Table 2 of the Phase 3 Conceptual Model report for the FIMP Study Area (USACE 2006a). In addition to the fish and wildlife indicator species (also referred to as representative species) discussed in the following subsections, additional species lists presented in Appendix C of this DEIS, are provided to supplement these indicator species. The additional species listed in Appendix C also are known to occur within the FIMP Study Area habitats, and are described in other relevant USACE reports as referenced.

3.5.1 Marine Offshore Ecosystem

3.5.1.1 Marine Offshore Invertebrates

The benthic invertebrates of the marine offshore habitat include a variety of taxa common to generally clean, well-oxygenated, coarse, sandy marine habitats. Marine invertebrates living within the benthos of the marine offshore ecosystem provide an important food source for bottom feeding fish, of which many species are considered commercially and recreationally important. Many species living in the benthos are sensitive to pollution and changes in water quality, and they are often used as indicators of environmental quality.

Marine benthic invertebrates are bottom-dwelling species that can be grouped into two categories: infaunal, or benthic invertebrates that live within the substrate, and epifaunal or epibenthic invertebrates, which live on the surface of the substrate. Other invertebrates discussed in this section include pelagic forms of invertebrates, or those that swim and move freely within the water column, and commercial and recreationally important invertebrates that occur within the marine offshore habitat of the Study Area.

Common benthic invertebrates classified as indicator species within the marine offshore environment include polychaete worms (phylum Annelida), amphipods (phylum Arthropoda), sand dollars and sea stars (phylum Echinodermata), horseshoe crabs (*Limulus polyphemus*), and *Yoldia* species of mollusc (phylum Mollusca). Common epibenthic species of invertebrates include various species of shrimp belonging to the Decapoda order of the subphylum Crustacea. Pelagic species of invertebrates common to the marine offshore environment include jellyfish (phylum Cnidaria) and zooplankton (e.g. radiolarians and foraminerans). Commercially and recreationally important invertebrates of the marine offshore environment include bivalve clams and scallops (phylum Mollusca, class Bivalvia), including Atlantic surf clam (*Spisula solidissima*) and ocean quahog (*Arctica islandica*), American lobster (*Homarus americanus*), squid species such as long-finned squid (*Loligo pealeii*) and short-finned squid (*Illex illecebrosus*), and various crab species (phylum Arthropoda).

Surf clams inhabit relatively shallow waters of the surf zone to a depth of about 180 feet (National Oceanic and Atmospheric Administration [NOAA] National Marine Fisheries Service [NMFS] 2000), but most commonly occur at depths less than 240 feet in well-sorted, medium-sized sand in turbulent areas beyond the breaker zone (Jacobson et al. 2006). Off the coast of Long Island, surf clam beds extend from the marine beach habitat to marine offshore depths of approximately 150 feet (USFWS 2007d). Commercial landings of surf clams in the State of New York exceeded $4,000,000 in 2004 and this species is considered a valuable resource to the state (NYSDEC 2008b). Several surf clam stock assessments conducted by NYSDEC and USACE determined higher concentrations of surf clam can be found within waters west of Fire Island Inlet in comparison to waters east of the inlet (USACE 2002b), however surf clam densities can be expected to fluctuate in space and time as evidenced by historical data (NOAA NMFS 2000). Site-specific densities cannot be assumed to remain constant, and it is not uncommon to find extremely patchy and localized distributions of this species. Surf clams collected in three USACE reference studies often included juvenile representatives (USACE 2000b, 2004a, 2008), however, these densities were often low. A 2001 surf clam survey conducted by USACE in borrow areas located within the Study Area reported the highest concentrations of surf clam within the area of Fire Island Pines and areas west of Shinnecock Inlet (USFWS 2007d), however, the sampling locations selected for this study were not intended to quantify surf clam populations for the entire Study Area.

In general, the ocean quahog is considered a marine offshore species with adults most commonly occurring in dense beds of waters ranging from 26 feet to a depth of 200 feet (USFWS 1997b). One of the USACE reference studies reviewed reported collection of ocean quahog, and this was limited to a single occurrence during a three-year study conducted west of Shinnecock Inlet (USACE 2008).

A review of the USACE three-year study conducted within a portion of the marine offshore habitat of the Study Area located in the vicinity offshore of Shinnecock Inlet (USACE 2008a) also identified several other species of invertebrates collected within waters having a depth of between 30–60 feet (see Appendix C, Table C-1). Scientific names that include an asterisk in Appendix C, Table C-1 are also considered indicator invertebrate species for the marine offshore habitat. In addition to epibenthic invertebrates collected during the USACE 2008a study, benthic sediment cores collected within the marine offshore habitat identified between 77 and 127 different benthic invertebrate taxa (USACE 2004a, 2008a).

3.5.1.2 Marine Offshore Finfish

The pelagic zone of the marine offshore habitat generally contains schools of adult and juvenile fish populations that occupy the mid- to upper areas of the water column (USFWS 1997b). The pelagic zone within the Study Area is home to a number of finfish species including several species of skate (predominantly *Raja* and *Leucoraja* spp.), and commercially and recreationally valuable fish species including, but not limited to, hake species (*Gadidae* spp.), scup (*Stenotomus chrysops*), bluefish (*Pomatomus saltatrix*), Atlantic butterfish (*Peprilus triacanthus*), striped bass (*Morone saxatilis*), herring species (Clupeidae spp.), and Atlantic mackerel (*Scomber scombrus*). The marine offshore habitat is also frequented by benthic finfish species such as American sandlance (*Ammodytes americanus*), winter flounder

(*Pseudopleuronectes americanus*), summer flounder (*Paralichthys dentatus*), windowpane (*Scophthalmus aquosus*), and monkfish (*Lophius americanus*) as documented by USACE (2006a).

Appendix C, Table C-2 provides a list of additional finfish common to the marine offshore habitat of the Study Area, which was compiled from a list of historic domestic commercial, recreational, and foreign finfish species landings in the north and middle Atlantic regions, including the New York Bight *(*the large gulf area of the Atlantic Ocean extending generally from New Jersey to Long Island) (NOAA 1997) and finfish collected within the marine offshore habitat (between 30–60 feet) located in the vicinity of Shinnecock Inlet (USACE 2008a). Scientific names that include an asterisk in Appendix C, Table C-2 are FIMP Conceptual Model indicator finfish species for the marine offshore habitat.

With regard to borrow areas, between July and October 2015, additional field work was conducted in the proposed borrow areas. That field work included fish sampling. As discussed in greater detail in Appendix L, during monthly fish sampling in borrow area 2C, 36 distinct species were captured. Of these, 28 support a commercial industry and 10 have EFH in that area. Overall, the most abundant species was longfin squid (*Doryteuthis pealeii*); winter skate (*Leucoraja ocellata*) had the greatest biomass. Within borrow area 5C, 47 distinct species were captured. Of these, 28 support a commercial industry and 10 have EFH in that area. The longfin squid was also the most abundant species and winter skate had the greatest biomass.

3.5.1.3 Marine Offshore Birds

The Study Area, including the marine offshore ecosystem, is part of the Atlantic flyway that is used by a wide array of avifauna during migrations and is home to a host of pelagic avifauna species (birds that spend most of their time on the ocean; petrels, shearwaters, gannetts, cormorants, sea ducks, etc.) during certain portions of the year. Common species observed in the area throughout the year include species of scoter (*Melanitta* spp.), greater shearwater (*Pufinus gravis*), and northern gannett (*Morus bassanus*) (USACE 2003a, Coastal Research and Education Society of Long Island [CRESLI] 2006).

3.5.1.4 Marine Offshore Mammals

Mammals use the marine offshore habitat of the Study Area primarily as a migration corridor. Whale indicator species identified for this habitat in the FIMP Conceptual Model include the pygmy-sperm whale (*Kogia breviceps*) and the Federally and state endangered North Atlantic right whale (*Balaena glacialis)* (USACE 2006a).

3.5.1.5 Marine Offshore Reptiles and Amphibians

No amphibian species are known to use the marine offshore ecosystem. However, studies identified below have demonstrated that the New York Bight is an important developmental habitat for several Federally protected sea turtles.

Sea turtles have been known to occur in the waters surrounding the Study Area, however their nesting has been documented only as far north as New Jersey (National Research Council [NRC] 1990). Several species of sea turtles, including the Federally and state endangered Kemp's ridley *(Lepidochelys kempii*), the Federally and state threatened green *(Chelonia mydas)*, and the Federally and state threatened loggerhead (*Caretta caretta*), are known to feed during the summer months in nearby Long Island Sound and Long Island's eastern bays; these species are known to pass through the marine offshore areas of the Study Area as well (CRESLI 2006, USACE 2006a, USFWS 2007d). The green turtle has a North Atlantic distinct population segment. The Federally and state endangered leatherback sea turtle (*Dermochelys coriacea*) is often observed in Long Island's offshore waters during the late summer (CRESLI 2006, USFWS 2007d). The hawksbill sea turtle *(Eretmochelys imbricata)* may also pass through marine offshore areas. These sea turtles are identified as indicator species in the FIMP Conceptual Model for the marine offshore habitat (USACE 2006a).

3.5.2 Atlantic Shores and Inlets Ecosystem

3.5.2.1 Atlantic Shore and Inlet Invertebrates

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, 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.

3.5.2.2 Atlantic Shore and Inlet Finfish

Many marine and anadromous fish species inhabit the nearshore marine habitat of the Study Area. Anadromous fish are those species that spend a majority of their life cycle within the marine environment, but return to freshwater habitat to spawn. Finfish species representative of the marine nearshore habitats of the Study Area include benthic species such as winter and summer flounder, pelagic species including Atlantic silverside (*Menidia menidia*), anchovy species (family Engraulidae), bluefish, striped bass, Atlantic mackerel, and herring species. In addition to these species the USFWS has identified over 60 fish species that utilize the productive ecosystem of the Study Area for foraging and migration (USFWS 1997b). Recreational and commercially important species that are associated with the Long Island nearshore area include Atlantic menhaden, common weakfish (*Cynoscion regalis*), tautog (*Tautoga onitis*), black sea bass (*Centropristis striata*), Atlantic croaker (*Micropogonias undulatus*), northern kingfish (*Menticirrhus saxatilis*), spot (*Leiostomas xanthurus*), and American sandlance (USFWS 1997b). Anadromous species known to utilize the marine nearshore habitats during migration into freshwater habitats including the Hudson River, are Atlantic tomcod (*Microgadus tomcod*), Atlantic sturgeon (*Acipenser oxyrhynchus*), alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), American shad (*Alosa sapidissima*), and striped bass (USFWS 1997b, 2007d).

In the spring and summer there is a general movement of finfish inshore and somewhat towards more northerly locations, while in the fall and winter the movement is offshore and southerly, with some species undertaking long coastal migrations to semi-tropical waters. The marine nearshore habitat supports a variety of pelagic and benthic finfish, some of which have recreational or commercial importance. Fish communities are similar in distribution and composition to the marine offshore habitat, and dominant species reported in the New York–New Jersey Harbor Estuary include spotted hake, windowpane flounder, little skate (*Leucoraja erinacea*), and American fourspot flounder (*Hippoglossina oblonga* [USFWS 1997b]). Other species that can be expected to frequent the marine nearshore area are Atlantic butterfish, winter flounder, smooth dogfish (*Mustelus canis*), and northern searobin (*Prionotus carolinus)* (USFWS 1997b, 2007d).

The marine intertidal habitat provides limited habitat for fish depending on the tidal cycle, and consequently fish diversity in this habitat type is relatively low. Indicator finfish species found in the marine intertidal habitat include prey species such as Atlantic silverside and anchovies, as well as migratory species such as bluefish and northern kingfish (USACE 2006a), which are typically present seasonally and utilize the habitat for feeding on flood tides.

Because of its location along the Montauk headlands in the eastern portion of the Study Area, the rocky intertidal and subtidal waters of this reach provide habitat for important commercially finfish species. Tropical fish species such as triggerfish belonging to the family Balistidae, also can be found in this habitat, however these finfish are not normally associated with the northeastern coastline.

Inlets represent important areas where the exchange and circulation of bay waters takes place, with Fire Island Inlet being crucial in maintaining the high productivity rate of Great South Bay

(USFWS 1991). The daily tidal flushing maintains salinity and water quality levels that contribute to the diversity of marine and wildlife species associated with the bay ecosystem. Salinity levels may play an important role in the spawning of common weakfish and in the life cycles of other finfish.

Indicator finfish species found in the inlet habitat of the Study Area include pelagic species such as hake and skate, and benthic species such as windowpane (USACE 2006a). The American sandlance is another benthic species, which feeds on plankton within the inlets of the Study Area, and is also an important species of prey for predatory fish. Other FIMP Conceptual Model indicator species common to the inlet habitat that are considered bait and/or forage species include Atlantic silverside, killifish (order Cyprinodontiformes), cunner (*Tautogolabrus adspersus*), anchovies, northern puffer (*Sphoeroides maculatus*), pipefish species (family Syngnathidae), and sticklebacks (family Gasterosteidae). Commercial and recreationally important indicator species of the inlet habitat include winter and summer flounder, scup, tautog, Atlantic butterfish, bluefish, herring species, striped bass, weakfish, black sea bass, and American eel (*Anguilla rostrata*). Inlets are also prime feeding areas for adult striped bass and bluefish, which congregate in the deeper waters (USFWS 1991).

3.5.2.3 Atlantic Shore and Inlet Birds

A 2002–2003 avian survey (USACE 2003a) of the barrier island focused on species presence and habitat use of birds in nearshore, inlet, open back bay waters, and barrier island terrestrial and wetland habitats. Notable observations of species over nearshore areas of the ocean include rafts of several hundred scoter, migrating flocks of several hundred cormorants (*Phalacrocorax* spp.), and groups of several hundred foraging northern gannet (USACE 2003a). Loons (*Gavia* spp.) and the red-breasted merganser (*Mergus serrator*) also are common during the winter in the marine nearshore waters (CRESLI 2006). Recreationally important sea and diving ducks also utilize the marine nearshore habitat for foraging. Shallower marine nearshore and marine intertidal waters provide feeding habitat for a variety protected birds, including the state special concern osprey (*Pandion haliaetus*), state threatened common tern (*Sterna hirundo*), state threatened least tern (*Sterna antillarum*), and the Federally and state endangered roseate tern (*Sterna dougallii*). The marine intertidal habitat is an important feeding area for many species of FIMP Conceptual Model’s indicator shorebirds, colonial waterbirds, gulls (*Larus* spp.), and waterfowl, including sandpipers (e.g., spotted sandpiper [*Actitus macularia*], and *Calidris* spp.), as well as the Federally and state endangered piping plover (*Charadrius melodius*). Federal and state listed species are discussed in detail in Section 3.6.

The rocky intertidal zones of the eastern portion of the Study Area, and other areas where the habitat is structurally more diverse, typically support greater food sources and a relatively greater use by birds. In the eastern portion of the Study Area, thousands of sea and diving ducks, gulls, and other waterfowl utilize the rocky intertidal and nearshore areas for staging or over-wintering. Recreationally important ducks, including scaup (*Aythya* spp.) and American black duck (*Branta bernicla*), use inlets for the variety of prey items available for forage. Loons, as well as more common birds such as numerous species of gull, grebe (*Podiceps* spp.), and cormorant, also utilize the inlets habitat. The above species/groups are indentifies as the FIMP Conceptual Model indicator species for the marine intertidal and inlets habitats (USACE 2006a).

As shown in Appendix C, Table C-3, an estimated 47 bird species are known to utilize marine beach habitat and adjacent dune habitat for resting, nesting, and feeding activities at some stage in their life cycle (Bull 1985, DeGraff and Rudis 1986, Stokes and Stokes 1996, Sibley 2000, USACE 2003a). This list includes several marine beach FIMP Conceptual Model indicator shorebird species including Federally endangered and threatened species such as the common tern, least tern, and piping plover (USACE 2006a). As noted in Table C-3, most of the 47 species utilize the marine beach habitat for foraging activities and stopover areas during migration.

3.5.2.4 Atlantic Shore and Inlet Mammals

Harbor seals are the most common marine mammal in the marine nearshore and inlets habitats. Gray seals may also be found in these habitats. The marine intertidal habitat also provides habitat for harbor and gray seals. In the eastern portion of the Study Area, large seal populations may be found hauling out on rocks in the marine intertidal zone during certain seasons. Shinnecock Inlet is noted as an important haul-out area for harbor seals in the winter (USFWS 2007d). Harbor and grey seals represent the FIMP Conceptual Model indicator species for the marine nearshore, marine intertidal, and inlets habitats. The indicator species for the marine beach habitat is the red fox (*Vulpes vulpes*), which is known to frequent this habitat as well as the adjacent dunes and swales habitat (USACE 2004d).

3.5.2.5 Atlantic Shore and Inlet Reptiles and Amphibians

FIMP Conceptual Model indicator reptiles found in the marine nearshore habitat include the Kemp’s ridley, loggerhead, and hawksbill sea turtles (USACE 2006a). Juvenile loggerhead sea turtles regularly use Shinnecock Bay in the summer, and adults and juveniles occur in nearshore waters along Long Island's south shore (USFWS 1997b). Inlets are known to provide a conduit between the ocean and bays for the Kemp’s ridley, loggerhead, and hawksbill sea turtles, as well as the diamondback terrapin (*Malaclemys terrapin*) (CRESLI 2006, USFWS 2007d). These species are identified as the FIMP Conceptual Model indicator species for the inlets habitat (USACE 2006a).

3.5.3 Barrier Island Ecosystem

3.5.3.1 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 3.5.2.1 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.

3.5.3.2 Barrier Island Birds

The upland habitats of the barrier island ecosystem support a variety of bird species. One hundred sixty-two (162) species of songbirds and various raptors utilize upland areas of the barrier islands within the Study Area (USACE 2003a). Based on USACE surveys conducted in 2002 and 2003, relative to the amount of habitat surveyed throughout the FIMP Study Area, upland forests of the barrier island ecosystem had the second highest species richness and abundance of all community types surveyed, with an average of 32.0 individuals observed per acre (USACE 2003b). Collectively, bird observations within the shrub, forest, and mixed forest/shrub communities accounted for about 30 percent of all bird sightings during spring migration and the breeding season, and 50 percent of all observations made during the fall migration and wintering seasons (USACE 2003a).

Based on 2002–2003 avian surveys, 32 of the 162 bird species documented on the barrier island were observed in the dunes and swales habitat (USACE 2003a). This includes many of the shorebirds and gulls that are found in the marine beach habitat of the Atlantic shores and inlets ecosystem as described and listed in Appendix C, Table C-3. In addition, numerous other species are commonly found within the more protected areas behind the dune. The state special concern horned lark (*Eremophila alpestris)* is known to breed and winter in the Study Area and the snow bunting (*Plectrophenax nivalis*) is a winter visitor with flocks ranging from dozens to several hundred. These species, along with the state-endangered short-eared owl (*Asio flammeus*), have been identified in the FIMP Conceptual Model as indicator species for the dunes and swales habitat. The snowy owl (*Nyctea scandiaca*) is a regular visitor to the south shore of the barrier island, often spotted within the dunes and swales habitat and is also considered a dune and swales habitat FIMP Conceptual Model indicator species (USACE 2006a). These owls can also be found within the terrestrial upland habitat as well.

Many species of migratory neotropical, resident passerine, and migratory passerine species breed and forage within the terrestrial upland habitat of the Study Area. FIMP Conceptual Model indicator species/groups listed for this habitat type include hawks such as the state special concern sharp-shinned hawk (*Accipiter striatus*) and state special concern Cooper's hawk (*Accipiter cooperii*), which have been documented during migration (USACE 2003a, 2006a, USFWS 2007d). Warblers, such as the yellow warbler (*Dendroica petechia*) known to use barrier island thickets for breeding, and the yellow-rumped warbler (*Dendroica coronata*) known to winter on the barrier islands are indicator species for maritime forest habitat (USACE 2006a).

Freshwater wetlands within the terrestrial upland habitat often support Canada geese (*Branta canadensis*), wading birds, rails, and ducks.

A variety of birds use the sandy bayside beach habitat for resting and feeding, including several endangered/threatened/special concern taxa as discussed in Section 3.6 (e.g., osprey, common tern, least tern, piping plover). Species expected to use this habitat include those identified for the marine beach habitat. However, these species typically do not nest in bayside beach habitat found within the Study Area (Bull 1985, DeGraff and Rudis 1986, Stokes and Stokes 1996, Sibley 2000, USACE 2003a).

3.5.3.3 Barrier Island Mammals

A summer 2002 mammal survey documented 13 terrestrial mammal species occurring on the barrier island (USACE 2004d). The white-footed mouse (*Peromyscus leucopus*) was the most common captured species, with the meadow vole (*Microtus pennsylvanicus*), masked shrew (*Sorex cinereus*), and woodland vole (*Microtus pinetoru*m) being captured in much lesser numbers. Mammals most commonly observed through incidental observation or field sign during this survey included the white-tailed deer (*Odocoileus virginianus*), cottontail rabbit (*Sylvilagus floridanus*), grey squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), and red fox (USACE 2004d). Many of these species utilize multiple barrier island habitats for different life requisites and are often observed passing through most of the communities in the Study Area as they forage and travel. Table C-4 in Appendix C lists common mammal species and their habitat associations in the Study Area.

Mammals most likely to be found within bayside beach habitat include the white-footed and house mouse, masked shrew, and red fox (USACE 2004d). Red fox often den in the dunes and swales habitat where they favor wind-carved and overhanging dunes (USFWS 1983, USACE 2004d). Raccoons prefer heterogeneous cover (USFWS 1983) and forage nocturnally along freshwater marshes, bayside salt marshes, and mosquito ditches. Meadow voles occur in the dunes and swales habitat with abundant grass or sedge cover. The white-tailed deer, red fox, and raccoon are identified in the FIMP Conceptual Model as the indicator species for the dunes and swales habitat. These same species as well as the white-footed mouse and voles are identified as indicator species for the terrestrial upland habitat (USACE 2006a).

Populations of whitetail deer on Fire Island have dramatically increased in the past 20 years (Art 1990). Deer populations increased faster on the western half of the Study Area, which contains numerous residential communities, than in the eastern half within its undeveloped park areas (O’Connell and Sayre 1989). This increase in deer has led to public concern about possible over-population of deer, their effect on the resources of the Study Area, and the possible correlation between deer populations and parasites such as ticks. During the day, these ungulates find shelter in the thickets and woodland of the terrestrial upland area. During the night, they will venture into more open areas of the dunes and swales habitat and ocean-side beach to forage on rockweed, sea lettuce, and other herbaceous vegetation.

3.5.3.4 Barrier Island Reptiles and Amphibians

Life histories of herpetiles are complex and they typically rely on several habitat types for various phases of their life cycles, using several different barrier island habitats at different times. Several species require water or wetland habitats for most of their life cycle and are dependent upon specific terrestrial habitat types that are located in proximity to wetlands or waterbodies for nesting and/or foraging purposes. Most species that occur on the barrier island are relatively sensitive to brackish conditions, yet 15 herpetile species (10 reptiles and five amphibians) are considered likely to occur within the myriad of community types found on Fire Island (Conner 1971, USFWS 1983, DeGraaf and Rudis 1986, Brotherton et al. 2003, USACE 2004d). Table C-5 in Appendix C provides herptile species that have been confirmed on Fire Island through field-based surveys since 1983, and identifies the barrier island communities that these species typically utilize (USACE 2004d).

As noted in Table C-5 in Appendix C, 10 of the 15 species likely to be encountered in the barrier island ecosystem are closely associated with the dunes and swales and terrestrial upland habitat during some portion of their life cycle and many of these species will utilize both upland (i.e., maritime forest) and wetland communities within these habitats. FIMP Conceptual Model indicator species for these habitats include Fowler's toad (*Bufo fowleri*), state special concern eastern spadefoot toad (*Scaphiopus holbrookii*), spotted turtle (*Clemmys guttata*), eastern box turtle (*Terrapene carolina*), and eastern hog-nosed snake (*Heterodon platyrhinos*), state endangered eastern mud turtle (*Kinosternon subrubrum*) and tiger salamander (*Ambystoma tigrinum*), and diamondback terrapin (USACE 2006a).

Although many of the reptiles and amphibians occurring on the barrier islands may occasionally utilize the dunes and swales habitat, box turtles, eastern spadefoot toad, Fowler's toad, and green frogs, are the species most likely to be encountered in this habitat (USFWS 1983, USACE 2004d). Fowler's toad is the most abundant herpetile found on the island and the most commonly observed (USFWS 1983, Brotherton et al. 2003, USACE 2004d). This species utilizes a variety of terrestrial habitats on the barrier island and reproduces in shallow water with little or no current. Eastern spadefoot toads prefer sandy soils and are common in the interdunal area at Napeague Beach (USFWS 1982). Box turtles spend much of their time in woodland area or in the transition zone to shrub (USFWS 1982), but will lay eggs in sandy, open areas such as barrier island dunes (USACE 2004d). In addition, diamondback terrapins are known to inhabit salt marshes, tidal flats, and lagoons/wetlands located behind primary dunes, and nest in the sandy areas and dunes adjacent to these habitats.

Similar to the marine beach habitat, the bay beach habitat of the Study Area is of limited habitat value as breeding habitat for most reptile and amphibian species. The diamondback terrapin is known to use these areas primarily for foraging, but typically utilize sandy areas within dunes and swales or terrestrial upland habitats for breeding (USFWS 1982).

3.5.4 Back bay Ecosystem

3.5.4.1 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. 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.

3.5.4.2 Back bay Finfish

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/mud flats, and salt marsh habitats. Finfish identified as indicator species within the bay intertidal habitat of the Study Area include the forage/bait species Atlantic silverside, killifish, and cunner (USACE 2006a). Commercially and recreationally important indicator finfish of the bay intertidal habitat include tautog (blackfish), common weakfish, bluefish, black sea bass, striped bass, and herring species.

Representative finfish species identified for the sand shoal and mud flat habitat in the Study Area include various species of juvenile fish, killifish, and the commercially and recreationally important winter flounder, summer flounder, and bluefish. Within the salt marsh habitat of the Study Area, indicator finfish species considered in the FIMP Conceptual Model include the forage/bait species Atlantic silverside, killifish, and cunner, and the commercially and recreationally important tautog, common weakfish, bluefish, black sea bass, striped bass, and herring species.

The bay subtidal habitat of the Study Area includes bayside aquatic areas located below the MLW, and includes channels and the deeper areas of the bay that are always inundated. A variety of finfish utilize bay subtidal waters that retreat from the bay intertidal habitat on ebb tides, as many species are attracted to different subtidal depths and substrate types (e.g., shallow unvegetated sand and mud, vegetated areas, mid-depth, etc.). Forage and bait species such as cunner, killifish, Atlantic silverside, northern puffer, pipefish, and sticklebacks are recognized by the FIMP Conceptual Model as indicator finfish species of the bay subtidal habitat. Winter flounder, American eel and blackfish, are all considered to be commercially and recreationally important indicator species of the bay subtidal habitat (USACE 2006a).

Epiphytic invertebrates that inhabit SAV beds provide a food source for a variety of fish. USACE has identified the following species as indicator forage/bait finfish species for SAV habitats within the Study Area: cunner, Atlantic silverside, killifish, northern puffer, pipefish, and sticklebacks (USACE 2006c). Additionally, the following commercial and recreationally important finfish species are also included as indicator finfish species for SAV habitats: tautog, common weakfish, bluefish, black sea bass, striped bass, herring species, winter flounder, and American eel. The USACE surveyed back bay habitats with beach seines as part of a SAV study conducted within the bay habitat of the Study Area in 2004 and 2005. A total of 16,413 finfish representing 49 species were collected from June through October of 2004, and a total of 4,691 finfish representing 41 species were collected from May through November of 2005 (USACE 2004c and USACE 2006d). The dominant species collected within the SAV beds in the 2004 study was the fourspine stickleback (*Apeltes quadracus*), which represented 32 percent of the total catch. Atlantic silverside was the next most abundant species, followed by blackfish and grubby (*Myoxocephalus aenaeus*). In 2005 Atlantic silverside was the most abundant species collected, representing 26 percent of the total catch, followed by bay anchovy, and Atlantic tomcod. In addition to the indicator species described for the bay intertidal and SAV habitats, Appendix C, Table C-7 provides a list of other finfish species collected by beach seine in 2004 and 2005 within the back bay SAV habitats. Scientific names that include an asterisk in Table B-7 are indicator finfish species for SAV habitat within the Study Area.

3.5.4.3 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 back bay 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.

3.5.4.4 Back bay Mammals

Intertidal back bay areas provide marginal habitat for marine mammals. The FIMP Conceptual model indicator species, harbor seal, makes occasional use of bay intertidal areas as well as deeper bay areas in winter, and are likely the only mammal typically occurring in the back bay subtidal areas (USFWS 1991, USACE 2006a)

3.5.4.5 Back bay Reptiles and Amphibians

Diamondback terrapins are known to forage in the tidal creeks of marshes and even in the open bays of the back bay ecosystem. They feed on marine snails, clams and worms. Typically, diamondbacks come ashore to lay their eggs in June, which hatch later in the summer. No amphibians are associated with these deeper portions of the back bay. Reptiles known to use this portion of the back bay include the loggerhead, green, and Kemp's ridley sea turtles. These sea turtles often use sheltered estuaries and bays, as well as other important habitats such as SAV during their juvenile years (CRESLI 2006). The diamondback terrapin is identified as the FIMP indicator species for the bay intertidal habitat and bay subtidal habitats, whereas the sea turtles are identified for SAV habitat.

3.5.5 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 back bay 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.

3.5.5.1 Mainland Upland Invertebrates

Within the coastal pond habitat of the mainland upland ecosystem, the USACE has identified oysters (phylum Mollusca, class Bivalvia) as the representative species of consideration for this habitat within the Study Area, including Georgica Pond (USACE 2006a).

3.5.5.2 Mainland Upland Finfish

USACE has identified migratory and resident species such as trout (subfamily Salmonidae), and anadromous species such as eels (order Anguilliformes) as indicator species likely to occur within the coastal pond habitat of the Study Area (USACE 2006a). Within the freshwater wetland habitats of the mainland upland ecosystem, commercially and recreationally important species of anadromous fish including salmonids (family Salmonidae), herring species and eels are listed as the indicator fish species. The freshwater wetland habitat may also provide habitat for stocked fish species of trout, including rainbow trout (*Oncorhychus mykiss*) and brook trout (*Salvelinus fontinalis* [USACE 2006a]).

3.5.5.3 Mainland Upland Birds

The habitat diversity provided by the proximity of the upland areas to marshes and tidal creeks along the bays supports a variety of bird and wildlife species. Many of the bird species described for the terrestrial upland of the barrier island ecosystem can also be found within the vegetated habitat of the mainland upland. The coastal ponds along the south shore of the mainland, especially the larger brackish ponds, support migrating and wintering waterfowl. Similar to the intertidal areas of the barrier island, periodically exposed shoreline areas provide significant foraging opportunities for shorebirds as well as foraging and breeding opportunities for osprey.

3.5.5.4 Mainland Upland Mammals

Similar to the barrier island ecosystem, mammals most typical of the mainland ecosystem include the white-tail deer, domestic or feral cats, cottontail rabbits, mice and voles and those listed in Appendix C, Table C-4. Other common mammals that occur include bats (e.g. little brown bat), raccoon, Virginia opossum, and red fox.

3.5.5.5 Mainland Upland Reptiles and Amphibians

Amphibian abundance is likely greater on the mainland than on barrier islands due to the presence of more freshwater wetlands. McCormick (1975) reported 12 amphibians known or expected to occur at Fire Island, East Fire Island, and the William Floyd Estate. These species are likely to be present wherever freshwater ponds and other wetland types exist on the mainland. Species of amphibians recorded and expected to occur in the mainland portion of the Study Area would be similar to those listed in Appendix C, Table C-5.

3.6 RARE SPECIES AND HABITATS

3.6.1 Species of Concern

The Endangered Species Act (ESA) of 1973 (16 USC 1531-1543, P.L. 93-205) establishes legal protection for fish, wildlife, plants, and invertebrates that are Federally listed as endangered or threatened. Two Federal agencies, the USFWS in the Department of the Interior, and the NOAA Fisheries in the Department of Commerce, share responsibility for administration of the ESA. The USFWS is responsible for terrestrial and avian listed species, as well as freshwater aquatic species. NOAA, through the Protected Resources Division of the National Marine Fisheries Service (NMFS), is responsible for marine aquatic species. In addition to species protected under the Federal ESA, the State of New York protects state designated rare species under the New York Endangered Species Act (6 New York Code of Rules and Regulations [NYCRR] Part 182), the New York State Environmental Conservation Law (NYSECL), Section 9-1503, Part 193 (Protected Native Plants), and the New York Freshwater Wetlands Act (NYSECL Article 24). Table 3.6-1 provides the listed species that may occur within the Study Area, and their Federal and/or state status. Table 3.6-2 lists each species and presents a summary of the habitats that they may utilize within the Study Area

The New York District will initiate consultation with the USFWS to identify any Federally threatened, endangered, or other species of concern, and any significant habitats or other natural landscape features of concern, that may be directly or indirectly affected by Project construction and operation in the Study Area. The New York District is preparing a draft Biological Assessment for USFWS assessing the potential Project impacts on the listed species under their jurisdiction (Appendix B). The NMFS has concurred with the District’s Not Likely To Adversely Affect determination regarding the potential effects of the Federal project on whales, marine turtles and Atlantic sturgeon (Appendix B).

Based on habitat and life history assessments, it has been determined that the following Federally listed species are likely to occur in the FIMP Study Area (USACE 2014b):

- Piping Plover (*Charadrius melodus*), Federally Threatened;
- Roseate Tern (*Sterna dougallii*), Federally Endangered;
- Rufa red knot (*Calidris canutus rufa*), Federally Threatened; and
- Seabeach amaranth (*Amaranthus pumilus*), Federally Threatened

These Federally listed species are found within essentially the same habitats. 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. The piping plover population on has supported as many as 54 pairs of piping plovers (in 2008), declining to 27 pairs in 2013. According to USFWS, Hurricane Sandy created approximately 200 acres of new potential overwash habitat located within the project area (USACE 2014b).

Table 3.6-1. Federal- and State-Listed and Candidate 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]
Seaside knotweed	*Polygonum glaucum*	Not listed	Rare [S3]
Birds			
Common loon	*Gavia immer*	Not listed	Special Concern
Common tern	*Sterna hirundo*	Not listed	Threatened
Cooper's hawk	*Accipiter cooperii*	Not listed	Special Concern
Foster's tern	*Sterna forsteri*	Not listed	Special Concern
Least tern	*Sterna antillarum*	Endangered	Threatened
Northern harrier	*Circus cyaneus*	Not Listed	Threatened
Osprey	*Pandion haliaetus*	Not listed	Special Concern
Peregrine Flacon	*Falco peregrinus*	Delisted	Enndangered
Piping plover	*Charadrius melodus*	Threatened	Endangered
Rufa red knot	*Calidris canutus*	Threatened	Threatened
Roseate tern	*Sterna dougallii*	Endangered	Endangered
Short-eared owl	*Asio flammeus*	Not Listed	Endangered
Fish			
Atlantic sturgeon (New York Bight Distinct Population Segment)	*Acipenser oxyrinchus*	Endangered	Not Listed
Shortnose sturgeon	*Acipenser brevirostrum*	Endangered	Endangered
Reptiles and Amphibians			
Diamondback terrapin	*Malaclemys terrapin*	Species of Concern	Special Regulations
Eastern Hognose Snake	*Heterodon playrhinos*	Not listed	Special Concern
Fence lizard	*Sceloporus undulates*	Unlisted	Threatened
Green sea turtle	*Chelonia mydas*	Threatened	Threatened
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened	Threatened
Eastern mud turtle	*Kinosternon subrubrum*	Threatened	Threatened
Eastern box turtle	*Terrapene Carolina*	Not listed	Special Concern
Spotted turtle	*Clemmys guttata*	Not listed	Special Concern
Tiger salamander	*Ambystoma tigrinum*	Not listed	Endangered
Mammals			

Common Name	Scientific Name	Federal Status	New York State Status
Harbor seal	*Phoca vitulina*	Not listed	Protected
Finback whale	*Balaenoptera physalus*	Endangered	Endangered
Humpback whale	*Megaptera novaeangliae*	Endangered	Endangered
Right whale	*Eubalaena glacialis*	Endangered	Endangered
Sei whale	*Balenoptera borealis*	Endangered	Endangered

Sources: NYSDEC 2015, USFWS 2015, USACE 2014a

Table 3.6-2. 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 Seaside knotweed	Marine Beach
Birds	
Common loon	Inlets, Bay Intertidal, Bay Subtidal
Common Tern Least Tern	Marine Nearshore, Marine Intertidal, Marine Beach, Terrestrial Uplands, Bayside Beach, Bay Intertidal
Cooper's hawk Peregrine falcon	Terrestrial Upland
Foster's tern Roseate tern	Marine nearshore, Marine Intertidal, Marine Beach
Osprey	Marine Nearshore, Marine Intertidal, Bay Intertidal, Bay Subtidal
Northern Harrier	Terrestrial Upland, Mainland Upland, Dunes and Swales, Wetlands
Piping Plover	Marine Beach, Terrestrial Upland, Bayside Beach, Bay Intertidal
Red Knot	Marine Intertidal, Rocky Shores, Marine Beach, Bayside Beach, Bay Intertidal
Short-eared Owl	Dunes and Swales
Fish	
Atlantic sturgeon Shortnose sturgeon	Marine Offshore, marine Nearshore
Reptiles and Amphibians	
Diamondback terrapin	Dunes and Swales, Terrestrial Upland, Bay Intertidal, Bay Subtidal
Fence lizard	Dunes and Swales
Green turtle Kemp's ridley Loggerhead	Marine Offshore, Marine Nearshore, Bay Subtidal, SAV Inlets
Eastern box turtle Eastern hognose snake	Dunes and Swales, Barrier Island-Terrestrial Upland
Eastern mud turtle Spotted turtle Tiger salamander	Barrier Island – Terrestrial Upland
Mammals	

Common Name	Common Associated Habitat
Harbor seal	Marine Offshore, Marine Nearshore
Finback whale Right whale Sei whale Humpback whale	Marine Offshore

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

3.6.1.1 Plants

The state ranking for plants and significant habitats differs slightly from the ranking of wildlife species. State plant rankings include endangered (E), threatened (T), rare (R), and exploitably Vulnerable (V). The NYNHP considers these species within these rankings likely to become threatened in the near future throughout all or a significant portion of their range within the state if causal factors continue unchecked. A brief narrative is provided for the sandplain gerardia and seabeach amaranth below.

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.

Seaside Knotweed

This is an annual low-growing plant. It is found on coastal beaches and on the shores of protected bays and salt ponds. These plants can be found on a broad section of barrier beach that contains a series of salt water ponds. The plant is rare in New York State with fewer than 43 existing populations but about half of them are small with less than 100 plants. The populations of this plant have remained relatively stable since it was first documented in 1861 and New York State harbors the largest number of populations in the world.

3.6.1.2 Birds

All of the birds noted below were documented within the Study Area during breeding bird surveys, with the exception of short-eared owl (NYSDEC 2005). The short-eared owl and other species uncommon to Long Island during the breeding season are often documented in the Study Area during spring or fall migrations (USACE 2003a, NYSDEC 2005).

Common Loon

Common loons breed across most of Alaska and Canada, south to Washington, Montana, Minnesota, Wisconsin, Michigan, New York and New England. In New York, Common Loons breed on the lakes of the Adirondack Mountains and in the St. Lawrence River region. Loons winter along the coast and on open lakes nearby. FIIS serves as wintering habitat for the common loon. While Common Loons are symbolic of quiet, secluded places, they also inhabit somewhat developed lakes. Larger lakes of 25 acres or more are generally preferred. The presence of both shallow and deep water is also important. Shallow water is used for foraging, nurseries and shelter, while deep water is necessary for adult diving and social interaction.

Common Tern

This species is a small, colonial nesting sea bird whose diet commonly consists of fish. McCormick (1975) identifies common tern as a non-pelagic bird species that has probable or definite breeding habitats within the Study Area. Cashin (1994) found that the common tern nests in areas including barrier beach dunes, dredge material disposal areas, and marsh islands. These birds return to their breeding grounds in April–May and leave by early October. Nest structures range from sparse ground or a shallow scrape in the sand to nests made of dead vegetation and debris. Suitable colony sites include barrier beach dunes, dredged material areas, offshore islands, and salt marshes. Common tern breeding sites within the barrier beach Study Area include Fire Island Sunken Forest, Fire Island Wilderness, and Fire Island Long Cove (NYSDEC 1997).

Cooper's Hawk

This species is listed by the State as a special concern species. Cooper's hawks are found in woodland settings and travel through dense tree canopies at high speeds in 39 pursuit of other birds. Although this species is more often in woodlands, in an urban setting it can be found in parks, neighborhoods, fields, yards, and within trees along busy tree-lined streets. The diet of the Cooper's hawks is mostly of medium-sized birds such as European starling, mourning dove, rock pigeon, American robin, northern flicker, and quail, pheasants, grouse, and chickens. Occasionally, Cooper's hawks rob nests and also eat chipmunks, mice, squirrels, and bats. Cooper's hawks' nests are often built in pines, oaks, Douglas-firs, beeches, spruces, among other species found in dense woods. Cooper's hawks are known to occur in southern New York State year around.

Foster’s Tern

Forster's Terns are a recent addition to New York's avifauna with the first nest found in the state in 1981. New York State is the northern extent of their eastern range. They are currently threatened by habitat loss and historically, in parts of their range, populations have likely been affected environmental toxins (1960s-1970s) and hunting for feather collection by the millinery trade, or hat making industry (1880s). As populations increase in New York State they may be restricted by habitat availability, human disturbance and rising sea levels due to climate change. In New York State, Forster's terns nest on marsh islands located in bays off the south shore of Long Island. They often nest on wrack material that has been deposited on top of cordgrass stands during flooding and storms. This material is useful because it is elevated higher than the usual high water line and may float during floods.

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).

Northern Harrier

The northern harrier or "marsh-hawk" is a raptor that feeds primarily on voles (*Microtus* spp.), mice, other small mammals, and small birds. The species is common in the Study Area during the breeding season (NYSDEC 2005). Adult male harriers overwinter in the area, along with juveniles born the same year (England 1989). Adult female harriers generally migrate. When the females arrive by the third week of February, they find the males already occupying historic breeding territories. Nests are generally built on the ground near the upland fringe of tidal marshes, in dense strands of common reed, or in thickets of mixed common reed and poison ivy (England 1989).

Osprey

This species is not a protected species, but is listed by the state as a species of special concern. In New York, osprey can be found along the coastline, and on lakes and rivers, but there are two main breeding populations, one on Long Island and the other in the Adirondack Mountains. The female lays one to four, but usually three, eggs in the spring in a large nest of sticks constructed at the top of a dead tree, but nesting platforms and other human-made platforms are also commonly used. The nest is often used year after year and tends to grow in size over time as more material is added before each nesting season. The young fledge at about eight weeks of age and remain in the vicinity of the nest for about two months. Osprey are typically in New York State from April to September. Ospreys within the Study Area typically nest on man-made elevated platforms or at the tops of dead trees.

Peregrine Falcon

The Peregrine falcon is a State-protected species (endangered) and is ranked "S3B" by NYNHP, indicating that there are typically 21 to 100 breeding occurrences or limited breeding acreage in the State. In 1999, the USFWS removed the Peregrine falcon from the Federally protected threatened and endangered species list. Peregrine falcons often nest on ledges or holes on the faces of rocky cliffs, but will nest on human-made structures such as bridges and tall buildings, especially near or in urban areas. In the New York City area, wintering birds frequent buildings and open areas with plentiful prey in more natural settings. Peregrine falcon diets primarily consist of birds, ranging from songbirds to small geese, and also bats and other small mammals. The current Peregrine falcon range within the State includes the Adirondacks, the New York City area, and the Hudson Valley.

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). Individual birders have documented red knot presence at: Democrat Point (west end of Fire Island-August 2012 – 2 red knots), Robert Moses State Park (August 2013 – 8 red knots), and Smith Point County Park (September of 2011 – 4 red knots) (USACE 2014a).

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 back bay 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).

Short-eared Owl

This species is a medium sized owl averaging 13–17 inches in length. Generally, this owl prefers open country, and is a resident of mixed and tall grass habitats throughout the year. Short-eared owls are known to breed on Long Island, but based on breeding bird atlas data, there are no confirmed observations of breeding pairs within the Study Area (NYSDEC 2005). Within the coastal lowland habitat, the short-eared owl prefers to nest in sand dunes on bare sand and a low density of beach grass cover. Short-eared owls hunt over the marshes, dunes, and fields for its preferred food, the meadow vole. One short-eared owl was documented during a single survey event during the 2002–2003 USACE avian surveys (USACE 2003a).

3.6.1.3 Fish

Atlantic Sturgeon (New York Bight Distinct Population Segment)

This species is an anadromous fish that may grow to 14 feet, weigh as much as 800 pounds, and live to 60 years of age. Atlantic sturgeon can also be found throughout the Hudson River system and surrounding coastal waters. Atlantic sturgeon are similar in appearance to Shortnose sturgeon, but can be distinguished by their larger size, smaller mouth, different snout shape, and scutes. The New York Bight population segment of Atlantic sturgeon is listed as endangered. Males migrate into freshwater during March and April, one month before females. They do not school together but meander singly. Females begin spawning as soon as they reach spawning grounds. Females lay 1 million to 2-1/2 million eggs in flowing water up to 60 feet deep. Both males and females may remain in the river until late fall before migrating back to the Atlantic. After hatching, the young tend to remain in their natal areas up to five years before beginning their journey to the ocean. Immature Atlantic sturgeon may also wander in and out of the Atlantic coastline. Today, less than 90 percent of the historic population of Atlantic sturgeon survives. Primary causes for the decline include overfishing, damming of rivers, and degradation or loss of habitat

Shortnose Sturgeon

The Shortnose sturgeon is a Federally endangered anadromous fish, meaning it spends most of its life in brackish or salt water and migrates into freshwater to spawn. Shortnose sturgeon can be found throughout the Hudson River system. These fish spawn, develop, and overwinter well upriver of the Tappan Zee Bridge, and prefer colder, deeper waters for all life stages. Shortnose sturgeon use the lower Hudson River when traveling to or from the upriver spawning, nursery and overwintering areas. However, the Hudson River below Tappan Zee is not considered optimal Shortnose sturgeon habitat. Although the sturgeon may transit the bay in the 43 spawning season, it would not be expected in the near shore shallow waters of the Lower Bay.

3.6.1.4 Reptiles and Amphibians

Diamondback Terrapin

In the late 1800s to early 1900s turtle soup was a popular delicacy. Overharvesting greatly reduced populations. Since 1990, the harvest of terrapins has been regulated in New York State. Yet they continue to struggle with predation, pollution and development of habitat, and drowning in commercial and recreational crab pots. This species can be found in brackish waters of coastal salt marshes, tidal creeks, estuaries, bays and coves. From late May until early July nesting females can be found on beaches that retreat from the water to lay their eggs.

Eastern Hognose Snake

A secretive reptile, eastern hognose snake burrows in loose soil or leaf litter in search of toads, its primary prey. Populations appear to be scattered and local, restricted to areas with good breeding habitat for toads. Low levels of development may actually benefit this species by renewing breeding habitat for American toad (large puddles, barren ponds, even ruts and ditches). Hognose snakes bask in woodland openings, edges, and utility corridors, especially in early spring and autumn. Open canopy woodlands, brushy fields, high floodplains of large streams, especially with sandy substrates. Also glaciolacustrine sand plains (especially with “pine barrens” vegetation), pine plantations and pine-oak forests.

Fence Lizard

This species is a variable and wide-ranging species. A New York State native, it occurs in only a few isolated colonies in the southeastern part of the state, preferring dry, rocky hillsides within oak or oak-pine forests. Naturally occurring fence lizard populations are confined to the Hudson Highlands region of the state. These areas are characterized by steep slopes with extensive open rocky areas that are surrounded by mixed-deciduous, oak-dominated, forests. The introduced population on Staten Island has been documented in sandy openings and pine woods within post oak-blackjack oak barren communities.

Green Sea Turtle

Within the Study Area, the green sea turtle is found primarily within the Peconic Bay and Long Island Sound from June through October (Baumann et al. 1989). The green turtle also has a North Atlantic distinct population segment. During the months of November and December, stray individuals have been recovered, but do not survive well in the frigid waters. The green turtle feeds on sea grasses. While in the open ocean, young green turtles are probably carnivorous and feed on invertebrates such as jellyfish. The macroalgae, sea lettuce, and green fleece serve as the primary food sources for juvenile and adult green sea turtles in the Study Area, and probably dictate their distribution to an extent; however, a detailed study of their feeding habits does not exist (USACE 1999b).

Kemp’s Ridley Sea Turtle

The Kemp’s ridley sea turtle is considered an abundant turtle within the New York Bight (the large gulf area of the Atlantic Ocean extending generally from New Jersey to Long Island) (USACE 1999b). This species utilizes offshore areas primarily in the Peconic Bay (USACE 1999b). Although the majority of the individuals are reported from the Long Island Sound and Peconic Bay region, the few individuals observed in the Great South Bay have been cold-stunned individuals found in the winter months (Meylan et al. 1992). All the Kemp’s ridley sea turtles that have been discovered in the waters surrounding the Study Area have been juveniles of 2–5 years of age (USACE 1999b). Essentially, they utilize the area for development and growth time. Evidence from the Okeanos Foundation study indicates that these turtles remain only one season and do not return. Kemp’s ridleys forage on spider and green crabs typically observed in the Study Area from June through October (USACE 1999b).

Leatherback Sea Turtle

The leatherback turtle's range extends from Cape Sable, Nova Scotia, south to Puerto Rico and the U.S. Virgin Islands (USACE 1999b). Critical habitat for the leatherback includes the oceanic waters located between mean high tide and a 600-foot depth offshore. Leatherback sea turtles nest south of the Study Area, from Georgia to the U.S. Virgin Islands. In the New York Bight, leatherback juveniles and adults are the most commonly observed sea turtle found in our area from May through November (USACE 1999b). Although they utilize the offshore region within the Study Area, they are not found within the back bay areas. They commonly feed on jellyfish and ctenophores. It is estimated that 500–800 individuals visit the region annually (Sadove and Cardinale 1993).

Loggerhead Sea Turtle

Numerous studies have been conducted documenting the abundance and distribution of the loggerhead sea turtle (USACE 1999b). The loggerhead sea turtle has a similar distribution pattern to that of the Kemp's ridley, with a somewhat greater number of individuals found in the New York Bight (USACE 1999b). In the Study Area, the loggerhead turtle is present only for brief periods during migrations to and from the preferred foraging areas of Long Island (USACE 1999b). Two groups are represented in the area. One group consists of juveniles that are found in the Peconic Bay and Long Island Sound, and the second group is found off the south shore of Long Island up to forty miles offshore (Baumann et al. 1989).

Eastern Mud Turtle

The eastern mud turtle is the rarest turtle species in New York State. The species is rare in New York because of its limited distribution, small number of populations, and low numbers of individuals. It is limited to Long Island and nearby islands, which represent the extreme northeastern edge of its U.S. range. Since 1990, eastern mud turtles have been documented at only seven wetland complexes in the state. The largest and most secure population contained approximately 68 marked turtles in 1996, the next largest is currently estimated at 35 individuals, and the rest appear to be much smaller or have been insufficiently surveyed. Since 1984, researchers have documented population declines at several sites in New York. In addition, since 1994, researchers have not found any new populations in the state. In 2008, researchers determined that, among the few populations known to exist, one population most likely was extirpated, and another was on its way to extirpation. At the population on its way to extirpation, in 1989 researchers captured approximately 20 adult eastern mud turtles, in subsequent years they documented a continual decline in the population, and in 2001 they captured only two adults. Most of the other populations in the state appear to be small or have been insufficiently surveyed.

Eastern Box Turtle

The species are found throughout the southeastern portion of New York State. This terrestrial turtle inhabits a variety of habitats, including woodlands, field edges, thickets, marshes, bogs, and stream banks. Typically, they are found in well-drained forest bottomlands and open deciduous forest. They will use wetland areas at various times during the season. During the hottest part of a summer day, they will wander to find springs and seepages where they can burrow into the moist soil. Activity is restricted to mornings and evenings during summer, with little to no nighttime activity, except for egg-laying females. Box turtles have a limited home range where they spend their entire life, ranging from 0.5 to 10 acres (usually less than 2 acres). From October to April, box turtles hibernate by burrowing into loose soil, decaying vegetation, and mud. They tend to hibernate in woodlands, on the edge of woodlands, and sometimes near closed canopy wetlands in the forest. Box turtles may return to the same place to hibernate year after year. As soon as they come out of hibernation, box turtles begin feeding and searching for mates.

Spotted Turtle

Spotted turtles are active from March to October and may be seen singly or in groups basking in the sun. The breeding season extends from March to May. In May, at the end of breeding season, females leave the breeding pools in search of nesting areas. They may wander a good distance and, unfortunately, many are killed crossing roadways. An open site, such as a meadow, field, or the edge of a road, is most often chosen for nesting. Loss of habitat has been largely responsible for the major decline of the spotted turtle throughout its entire New York range. In the early 1900's, it was reported to be the most common turtle in the vicinity of New York City. This turtle is very sensitive to pollution and toxicants and disappears rapidly with declining water quality. To further stress the species, pet collecting is currently responsible for the annual loss of significant numbers. Much concern has been expressed for this small reptile as local populations disappear.

Tiger Salamander

The tiger salamander is one of the largest terrestrial salamanders in the United States. The tiger salamander spends most of its life underground, as do other members of the group referred to as "mole salamanders." On Long Island, it emerges from its burrow in February or March to migrate at night, usually during rain, to the breeding ponds. In New York, the tiger salamander is found only on Long Island with most of the known breeding colonies restricted to the central Pine Barrens. In the absence of natural pools or ponds, it may breed in man-made depressions filled with water. Loss of habitat has been responsible for the extirpation of this species from heavily developed western Long Island. Recent surveys have identified about 90 breeding ponds in New York, confined to eastern Nassau County and Suffolk County. Its status at these remaining sites is tenuous because of pesticides and other contaminants, threat of development, and other land use patterns.

3.6.1.5 Mammals

Harbor Seal

Harbor seals are the most abundant seals found in New York State. They spend their time in coastal oceanic waters and can be found basking on sand bars, rocks, or remote beaches during low tide within estuaries, bays, and rivers. When resting in water, their heads bob at the surface resembling a floating bottle and thus is termed "bottling." The best places to observe the species include FIIS.

Finback Whale

Second in size only to the blue whale, the finback reaches about 70 feet (21 m) in length and weighs up to 70 tons (64 metric tons). In autumn, these whales migrate several thousand miles to equatorial waters. During winter, they fast almost completely, living off their fat reserves. Mating occurs throughout the winter and young are born a year later between December and April. Fin whales are found in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes, and less commonly in the tropics. They occur year-round in a wide range of latitudes and longitudes, but the density of individuals in any one area changes seasonally.

Humpback Whale

Humpback whales occur in all oceans of the world, although they are uncommon in Arctic regions. During the summer months, humpbacks migrate to higher latitudes to feed. In the North Atlantic Ocean, there are separate feeding populations in the Gulf of Maine - Nova Scotia area, the Newfoundland - Labrador area and Greenland. The different Atlantic populations all migrate to and mix on the tropical breeding and calving grounds in the West Indies from January through March. After calving and/or breeding, humpbacks return to the northern feeding areas. Humpback whales are among the most endangered of the large whales. Recent population estimates indicated about 2,000-4,000 individuals remaining in the western North Atlantic. Like other whales, this species has suffered greatly from exploitation by hunters. The humpback is the most common large whale recovered annually in New York's stranding program.

Right Whale

Right whales are found in the North Atlantic and North Pacific oceans. Five North Atlantic "high-use" areas have been identified: coastal Florida and Georgia; the Great South Channel east of Cape Cod, Massachusetts; Cape Cod Bay and Massachusetts Bay; the Bay of Fundy; and Browns and Baccaro Banks south of Nova Scotia. The majority of the population spends spring and summer off the coast of New England, and moves to waters off southern Canada for the latter part of summer and winter. The right whale is the world's most endangered large whale. Presently, the population is estimated to total no more than 600 individuals, 300-350 of which can be found in the North Atlantic Ocean. The population was originally decimated by hunting which began 800 years ago. Major threats presently include collision with ships, entrapment or entanglement in fishing gear, habitat degradation (especially in feeding areas), and disturbance by vessels.

Sei Whale

In autumn, these whales migrate several thousand miles to equatorial waters. The mating season occurs from December to April, during which time they eat very little or fast, living off their fat reserves. Sei whales are found in the North Atlantic Ocean ranging from Iceland south to the northeastern Venezuelan coast, and northwest to the Gulf of Mexico. There are also records from

Cuba and the Virgin Islands. Sei whales are seen infrequently in U. S. waters. This whale breeds and feeds in open oceans, and is generally restricted to more temperate waters. Unlike most Rorqual whales, the Sei whale feeds mostly by filtering plankton while swimming (skim feeding), but is also known to gulp-feed krill, shrimp, and small fish.

3.6.2 Habitats of Concern

3.6.2.1 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.

Several habitats within the Study Area have been designated as EFH for multiple managed fish species, including marine offshore, marine nearshore, marine intertidal, inlets, bay intertidal, sand shoals and mudflats, salt marsh, bay subtidal, and SAV. In compliance with Section 305(b)(2) of the MSA, the Study will include an assessment of the potential effects of the proposed alternatives on EFH (Appendix D of this DEIS). This EFH assessment includes all pelagic and benthic fish habitat adjacent to Long Island, approximately 1,000 feet seaward of MLW plus coastal and open Atlantic Ocean areas. The Study Area contains EFH for various life stages for up to 37 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 Study Area and corresponding latitude and longitude coordinates is provided in Appendix D, along with the EFH species lists for each of the numbered grids. The tables provided in Appendix D include designations for which life stages are covered by EFH for each species.

Fish residency within waters located within the impact region of the Study Area is highly variable spatially and temporally. Some species are restricted to offshore waters, while others may occupy both nearshore and offshore waters, and migrate within and around the bays. In addition, some species are well adapted for life within open ocean or pelagic waters, while others are primarily associated with the benthos or demersal waters. These habitat preferences can also vary among the different life stages of the species, and finfish studies conducted within and in the vicinity of the Study Area confirm that seasonal abundances are highly variable, as many species are highly migratory. Species that have been afforded EFH designation throughout the entire Study Area for various life stages include summer flounder, winter flounder, windowpane flounder, scup and bluefish. EFH for other species in much of, but not the entire Study Area, include haddock, Atlantic butterfish, whiting, Atlantic salmon, red hake, ocean pout, king mackerel, Spanish mackerel, cobia, sand tiger shark, blue shark, white shark and bluefin tuna.

3.6.3.2 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).

Within the Dunes and Swales habitat, the maritime freshwater interdunal swale community, which occupies the low-lying and wet areas between the dunes, generally supports a variety of plants designated as rare or unique by the NYSDEC Natural Heritage Program and hence, has been designated as a Significant Habitat by NYSDEC.

The Sunken Forest is one of three locations where maritime forests persist on the eastern seaboard. The Sunken Forest is from 200 to 300 years old and is located within Fire Island National Seashore, near the Sailors Haven marina and visitor center. Because of its uniqueness as a maritime forest community, the Sunken Forest is of particular ecological importance and warrants special protection.

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 back bay ecosystem as it provides nursery areas for finfish and a niche for colonization of epiphytic algae and invertebrates.

3.6.3 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 is 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).

3.7 LAND USE DEVELOPMENT, POLICY, AND ZONING

Suffolk County contains numerous municipal jurisdictions. While the Federal, state and county governments each have regulatory authority, the local governments have regulatory jurisdiction with respect to land management, principally through zoning, local laws, and ordinances enacted to protect environmental features (e.g., freshwater and tidal wetlands). In addition, Fire Island National Seashore (FIIS) was established by Public Law 88-586 on September 11, 1964, and is administered by the NPS under the DOI, a Federal agency with land use and environmental management authority.

This section discusses the settlement history of the Study Area as a background to the existing land use and future planning goals and trends. Various Federal, state, and local policies, laws, and programs will be reviewed as context for the interrelated framework of planning goals and mechanisms available that, together, ultimately strive to balance growth and development with the protection and preservation of environmentally sensitive areas, community values and a way of life that is strongly connected to the coastal environment. It also includes a synopsis of local land use and zoning as well as a survey of local laws and ordinances of the towns and incorporated villages that are part of the Study Area.

3.7.1 Land Settlement History

3.7.1.1 Mainland

The human settlement of Long Island, including the Study Area, began with the arrival of Native Americans more than 10,000 years ago. This native population, originally groups of hunter-gatherers, developed over time into more settled groups incorporating small-scale subsistence farming and fishing to supplement their diets. Native settlement continued into the period of contact with European settlers. Permanent European occupation in New York began with the founding of the Dutch fort at New Amsterdam (present-day Manhattan) in 1626. English settlers founded the communities of Southold and Southampton in 1640.

New Netherland included parts of Connecticut, New York (including all of Long Island), New Jersey, Pennsylvania, Delaware, and Maryland (URS 2006). Between 1652 and 1678, England and the Netherlands engaged in a series of conflicts over territorial possession in the New World. The Treaty of Breda in 1667 established that the lands of the colony of New Netherland would be recognized as English colonies. These conflicts had limited effects on the east end settlers, who were isolated from the mainland and were occupied with agriculture, fishing, lumbering, building permanent structures, and trading among themselves, Native Americans, and the colonists across Long Island Sound. Suffolk County was officially formed in 1683.

The Board of Trustees of the Freeholders and Commonality of the Town of Southampton was established under the Dongan Patent of 1686, introduced by New York Governor Dongan. The document granted the Freeholders and Commonality of the Town access and rights to over 25,000 acres of land (including common underwater land, rights-of-way to the water, marshland, and common areas), and established the Board of Trustees to act as stewards for these title lands. The Dongan Patent instituted the first official government in the Town of Southampton. The Dongan Patent also provided the foundation for the Brookhaven and East Hampton town governments.

Following a defeat of General Washington's troops in a battle for control of Manhattan in August of 1776, the British occupied the expanse of Long Island for the duration of the Revolutionary War. After independence, the east end of Long Island saw the growth of industries based on the available natural resources, including lumbering and paper production, production of charcoal, and shipbuilding. These products were mostly sold on the island, to the expanding population living in developing towns and village centers. Most towns were self-sufficient agrarian communities with smaller satellite villages. These townships and villages grew, and new settlements began as people sought more land for agriculture.

The construction and improvement of road systems increased the ability of Suffolk County farmers and manufacturers to sell their products to locations off the island, such as Manhattan and other parts of the mainland. In 1834, the Long Island Railroad (LIRR) Company's construction of a railroad traversing the center of the island began. Rather than acting merely as a conduit for travel to Boston or the transport of agricultural goods, the railroad allowed the dense populations of New York City to first visit, and then settle, the south shore of Long Island. The development of the LIRR South Shore Branch in 1867 opened Great South Bay to visitors from the city.

From 1850 to 1920, Suffolk County changed from a mainly rural area dependent on agriculture, whaling, and shipbuilding to a more diversified economy that expanded to include tourism, defense manufacturing, and other industries. Newly arrived European immigrants increased the density of New York City, which in turn increased the value of the open spaces in Suffolk County. The expanding industrial centers were served by the railroad system, and population increased in adjacent areas.

Tourism developed in the 1840s with the construction of inns and sporting clubs along the coastline of Great South Bay, and David S.S. Sammis' construction of the Surf Hotel on Fire Island in 1856. Suburbanization on the south shore of Long Island began with the development of small vacation cottage communities. Families from New York City used these communities, often centered on coastal areas or manmade canals, seasonally. As travel from the city to Long Island became more efficient, these homes became winterized and formed the nucleus for year-round suburban communities. Early suburbanization from the late 19th century to the 1940s was marked by the development of belts of lower density residential communities that were dependent on urban development for employment, commerce, and services. Buildings generally were constructed on individual lots to house a single family. Trolley, railroad, and increasingly, the private automobile provided transportation. This period laid the groundwork for the increased development and population growth that would follow.

The largest wave of suburbanization in the United States occurred after World War II, and Long Island was a major location for this trend. A series of events contributed to the population explosion on Long Island, including the construction of the Queens Midtown Tunnel in 1940, the 1944 GI Bill which provided housing loans to World War II veterans at low interest rates and waived the requirement of a down payment, and the dramatic increase in birth rates of the post-war “Baby Boom”. All of these factors played important roles in the development of Suffolk County. Between 1930 and 1970, Suffolk County’s population increased by 600 percent, with the greatest growth between 1950 and 1970 when the population quadrupled (Texas A & M University [TAMU] 2002).

Much of this post-war growth occurred in the low-lying bay front areas along the south shore of the island, before the enactment of National Flood Insurance Program and related local floodplain management ordinances. There are over 19,000 buildings in the regulated flood hazard zone in the Study Area, of which more than 3,300 are located in areas vulnerable to wave impacts. Development density is greatest in the western sections of Suffolk County, in the towns of Babylon, Islip, and Brookhaven, which have 91 percent of the county population in 62 percent of the land area. Populations in many areas of the western portion have reached largely stable levels and there is little available land for future development. The eastern areas of Southampton and East Hampton are markedly less densely developed, but population levels are continuing to rise. From 1990 to the present, the greatest growth in population has occurred in Southampton and East Hampton (Suffolk County department of Planning [SCDP] 2005).

3.7.1.2 Barrier Islands

Fire Island was used to access various important natural resources, and was also used as a base for whaling prior to settlement. By the late 18th century, Fire Island’s reputation as a dangerous place, inhabited by pirates, was long established; shipwrecks were common along Fire Island during this time. To reduce the number of groundings and shipwrecks, the Federal government began to build lighthouses for safe navigation. President George Washington authorized the construction of the Montauk Point Lighthouse in 1972. The first lighthouse was built at Fire Island Inlet in 1825, and the second lighthouse was built in 1858 at Shinnecock Inlet.

Controversy over land ownership also discouraged settlement on the barrier islands until the late 19th century. The Dongan Patent of 1686 conveyed shore lands and lands under water to the towns, but did not include lands south of the bayshore, such as Fire Island. In 1845, David S.S. Sammis purchased land to build the Surf Hotel on Fire Island. However, the ownership of the land was contested, and litigation lasted well into the 1920s.

The Great Partition of 1878 was the basis for the eventual settlement of lawsuits and land claims, and allowed for the secure purchase and ownership of land on Fire Island. The Great Partition coincided with the rise of the Chautauqua movement[1] of adult education and self-improvement in the 1890s. The summertime Chautauqua Assemblies became common on Fire Island at that time, and served to introduce Fire Island to a large number of people, who were lodged in tents

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[1] The name *Chautauqua* comes from the original *New York Chautauqua Assembly* that was held at a campsite on its namesake lake in New York State. Chautauqua gatherings or *assemblies* provide entertainment and culture to communities through prominent speakers, singers, writers, and other cultural figures of the day.

and bungalows. To accommodate these visitors, there is regular ferry service from the bayshore to Fire Island.

Soon after the Great Partition, and in part fostered by the Chautauqua movement, the establishment of permanent communities began. The first of these, the Point O' Woods Association, began in 1898. Other communities were developed through the years, and the youngest community, Dunewood, was most recently formed in 1958. The number of buildings and the summer population began to grow. According to historical aerial photograph interpretation, approximately 950 structures existed on Fire Island in 1928. This number grew slowly to 1,260 in 1955, and the number had doubled to about 2,400 in 1962. The number of structures reached about 3,500 in the 1970s and now stands at approximately 4,150. The Villages of Saltaire (year-round population 43) and Ocean Beach (year-round population 138) have the greatest number of buildings on the barrier island; all of the communities on Fire Island have greatly increased populations during the summer months from an influx of day visitors, short-term renters, and seasonal homeowners.

3.7.2 Land Development Patterns

3.7.2.1 Mainland

The mainland portion of the Study Area is developed with approximately 73 percent characterized as low- mid- or high-density development (USGS 2003). The remaining use is 11 percent woody cover (forest or shrub), 9 percent grassland, hayfield, or pasture, 3 percent cultivated cropland, and 4 percent barren land that lacks significant vegetated cover and is dominated by rock, sand, or clay (USGS 2003).

There are two distinct segments included along the mainland portion of the south shore of Long Island. The first mainland segment includes areas located (north of) the barrier islands and bays and includes approximately 72 miles of shoreline directly abutted by Shinnecock, Moriches, and Great South bays, extending east to Southampton. The extent of this section ranges from the shoreline of the back bays northward, generally to Montauk Highway.

Towns that are located either wholly or partially within this mainland segment include Babylon, Islip, Brookhaven, and Southampton. Communities on the mainland in the Town of Babylon include the villages of Amityville, Lindenhurst, and Babylon and the hamlets of Copiague and West Babylon. Mainland areas of Islip include the communities of West Islip, West Bayshore, Bayshore, the Village of Brightwaters, Islip and East Islip, Great River, Oakdale, West Sayville, Sayville, and Bayport. The Town of Brookhaven, the largest municipality on Long Island, includes the communities of Blue Point, the Village of Patchogue, East Patchogue, Bellport, Brookhaven, Shirley, Mastic, Mastic Beach, Moriches, Center Moriches, and East Moriches. There are seven incorporated villages within Southampton's boundaries, each with its own village administration. Five of these are located at least partially within this mainland segment include Southampton, and the mainland portion of the Village of Quogue and the Village of Westhampton Beach. As with other towns on the mainland, a number of unnamed hamlets or residential areas also occur within the administrative boundaries of these towns. These areas are administered directly by the towns in which they occur and are therefore not discussed separately. Figure 3.7-1 shows the boundaries of the villages and hamlets within the Study Area. The second segment of the mainland extends approximately 33 miles from Southampton east to Montauk. This segment directly abuts the Atlantic Ocean, contains only a few small back bay areas, and extends northward from the Atlantic Ocean generally to Montauk Highway (Route 27).

Included in this mainland segment, either wholly or partially, are the towns of Southampton and East Hampton. Associated with each of these towns are several incorporated villages. Villages in this mainland segment associated with Southampton include the Village of Southampton and the newly incorporated (2005) Village of Sagaponack; the Town of East Hampton includes the Village of East Hampton. The remaining portions of the towns of East Hampton and Southampton contain a number of named, but unincorporated hamlets or residential areas such as Montauk Beach and Amagansett. These areas are administered directly by the towns in which they occur and are therefore not discussed separately.

3.7.2.2 Barrier Island Communities

The barrier island includes development and several land use categories distinguished by the dominant vegetated cover present. Approximately 32 percent of the upland area is low-, medium-, or high-density development (USGS 2003). Other land cover represented includes forest cover (5 percent), shrub cover (4 percent), herbaceous cover (3 percent), and barren land (57 percent) that lacks significant vegetated cover and is dominated by sand, clay, or rock (USGS 2003).

A number of barrier islands characterize the barrier island portion of the Study Area and extend approximately 50 miles from Fire Island Inlet to Southampton. The barrier island chain includes the following communities and land uses:

- Fire Island, which extends approximately 30 miles west from Fire Island Inlet to Moriches Inlet, and includes Robert Moses State Park, FIIS, Smith Point County Park, and 17 residential and primarily seasonal communities, villages, and hamlets;
- The 16-mile barrier island containing Westhampton and Tiana Beach extending from Moriches Inlet to Shinnecock Inlet, and including Cupsogue County Park, the Village of Westhampton Dunes, Hampton Beach, and Tiana Beach; and,
- The 4-mile long barrier spit extending from Shinnecock Inlet to Southampton, and including the Town of Southampton.

<u>Fire Island Barrier</u>

The 2,940-acre Fire Island barrier is narrow, with widths ranging from a few hundred feet at Talisman to a half-mile at Saltaire. From west to east, Fire Island comprises Robert Moses State Park, 17 residential beach communities, and Smith Point County Park. All of these areas except Robert Moses State Park, which is on the west side of the island, are located within FIIS. Since the mid-20th century, the island has boomed into a summer destination for residents of New York City, Long Island, and beyond. Consequently, its developable land is almost completely built. The remainder of the island has been Federal park land since Congress authorized enabling legislation for FIIS in 1964. This law allowed NPS to acquire land on Fire Island through donations and condemnation. FIIS has not acquired additional lands within its legislative boundaries since the mid-1970s.

Robert Moses State Park encompasses the westernmost 4.5 miles of the island. The park consists of an open beach area covered with dunes and natural grasses. The central (non-waterfront) area is composed of landscapes ranging from a sunken forest to wilderness to grassy dunes. FIIS begins at the state park's eastern edge, and encompasses the remaining 26 miles to Moriches Inlet. FIIS also includes surrounding waters and 25 smaller bay islands. Directly east of Robert Moses State Park and the FIIS western boundary are 13 of the island's 17 residential communities, from Kismet east to Oakleyville and includes the hamlets of Kismet, Fair Harbor, Dunewood, Lonleyville, Atlantique, Atlantique Beach, Robbins Rest, Corneille Estates, Ocean Bay Park, Point O'Woods, and Oakleyville and the villages of Saltaire and Ocean Beach. These communities span the island from the bay to the ocean, and are occupied primarily during the summer months, although small year-round populations live in the incorporated villages of Saltaire and Ocean Beach, and various other locations.

Continuing east from Oakleyville, the prominent landscape feature is the Sunken Forest, a native preserve accessible from the FIIS Sailors Haven Visitors Center. Sunken Forest is a unique maritime forest that is protected by dunes from direct exposure to the Atlantic Ocean. The hamlets of Cherry Grove and Fire Island Pines are east of Sunken Forest. The communities of Barrett Beach, Water Island, and Davis Park are interspersed with undeveloped FIIS property to the east of Fire Island Pines. The Watch Hill Visitor Center near Davis Park is a popular recreational area and the gateway to the Otis G. Pike Wilderness Area. A private beach under the jurisdiction of the Village of Bellport is located within the 8-mile-long Otis G. Pike Wilderness Area, which stretches to the east of Davis Park.

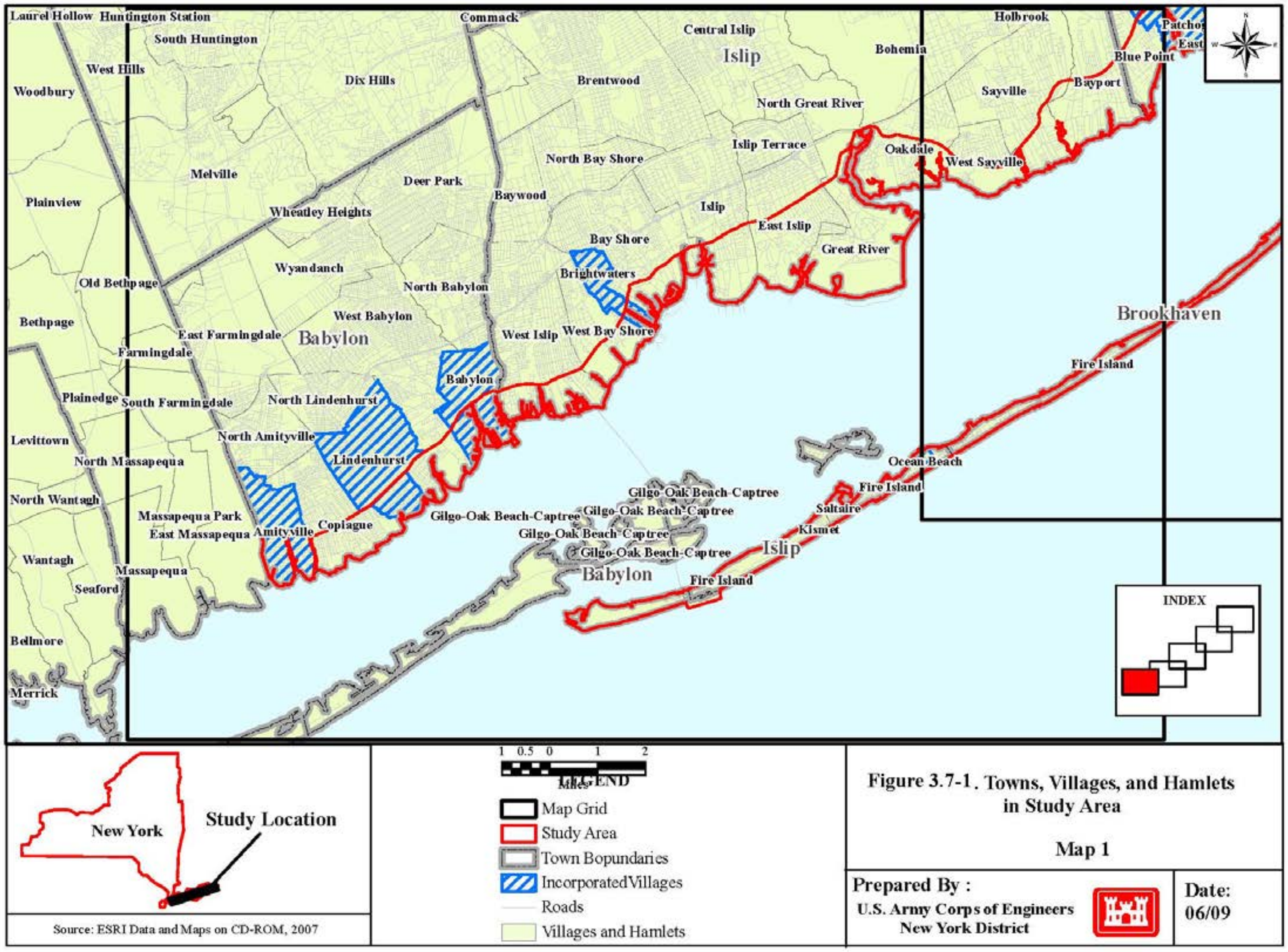

Figure 3.7-1. Towns, Villages, and Hamlets in Study Area

The residential communities on Fire Island are within the towns of Brookhaven and Islip. Because they are also within the FIIS, any development must occur within established community Development Districts. Each community has a distinctive character, based in part on its history. Saltaire and Ocean Beach, for example, were both developed as real estate promotions. Oakleyville started as a base for construction workers, and Point O' Woods was established as an educational and religious community. Fair Harbor was founded in 1923 as a summer haven for working families, while Water Island grew around a well-known resort hotel founded in 1890. As a result of their various backgrounds, the communities of Fire Island now vary in size, density, and land use. Following is a brief description of each community, from west to east.

- Kismet includes a small commercial area around the ferry dock. It is rustic, with large lots and wide sidewalks. Most of the wood houses have been built since the postwar boom, but a few newer homes are interspersed with the old.

- East of Kismet, at the widest point of the island, is Saltaire, one of the island's two incorporated villages. Kismet is characterized by large lots and plentiful open spaces spanning the ½-mile between the bay and ocean. Because of Saltaire's strict zoning, the only commercial businesses are located in a small area near the marina. This community includes only single-family rentals and accommodates children by providing day programs and lifeguard-protected beaches.

- Fair Harbor includes a small bayside commercial area. Its 400 houses are built at a higher density than Saltaire's. Wooden boardwalks connect the homes, which are surrounded by lush vegetation.

- The smaller communities on the island include Dunewood, Lonelyville, and Atlantique. Dunewood was established in 1958 as the first planned community on Fire Island. This community includes 100 homes and is zoned for only residential use. Lonelyville is one of the island's oldest and most private settlements. Most homes are vintage beach cottages, some dating back to the early 20th century. Atlantique is accessible only by the sandy Burma Road or private boat. Atlantique Town Park is managed by the Town of Islip and has extensive recreational facilities.

- Robbins Rest has 40 homes ranging from cottages to modern structures, and land is developed at a relatively low density. Fire Island Summer Club is one of the smallest communities. The houses are individually owned but the land is leased from the club, which maintains a private clubhouse and tennis courts. Corneille Estates is a 2-block-long area with large lots and abundant foliage. The island's only elementary school, Woodhull School, is located immediately next to Ocean Beach.

- The Village of Ocean Beach is one of the most densely built locations on all of Long Island. It has a thriving bayside commercial area and many recreational facilities. Outside the commercial area, Ocean Beach's residential community consists of 600 homes. Ocean Beach maintains the island's only police department.

- East of Ocean Beach is Seaview, which features a mix of architectural styles on large, private lots, as well as the island's only synagogue. The municipal line between the towns of Brookhaven and Islip straddles Seaview, at times bisecting individual parcels. The next community to the east is Ocean Bay Park, which includes many seasonal rental properties and a bayside commercial district.

- Point O'Woods, the oldest and most private community, contains about 120 homes. This community includes expensive shingle-style homes situated on large lots, surrounded by lush vegetation. Point O' Woods' exclusive nature is characterized by private ferry service and stringent residency standards. Oakleyville is the island's smallest settlement, with about a dozen homes. It is very private, located at the edge of the Sunken Forest.
- Cherry Grove is located east of the Sunken Forest. Cherry Grove contains 300 cottages, a dock, and a commercial area.

- Fire Island Pines is the largest community, with more than 700 homes, a community-owned harbor, and an exclusive commercial area. It is zoned for large-lot development, and includes some of the island's largest homes and ancillary structures.

- In contrast to the Fire Island Pines, Water Island is a small community of about 50 homes. It is strictly residential and only recently accessible by ferry service.

- Davis Park, to the east, is one of the most popular destinations for Long Island residents. Within Davis Park, the Town of Brookhaven manages Leja Beach, which is open to the public.

- Smith Point Suffolk County Park is the county's largest ocean-front park and covers the remaining 6 miles of Fire Island from Smith Point to Moriches Inlet. Activities at Smith Point include swimming, scuba diving, surfing, saltwater fishing, and both tent and RV camping. Outer beach access, food concession, playgrounds, and showers are also provided (Suffolk County Department of Parks Recreation and Conservation [SCDPRC] 2007).

Moriches Inlet to Shinnecock Inlet Barrier

Much of the land in this barrier island segment falls within the Town of Southampton, including the incorporated villages of Westhampton Dunes and Westhampton Beach. The western portion of the Town of Southampton is predominantly residential with open space and recreational uses, particularly on the barrier islands. Some of the larger open spaces are found at the inlets, including Cupsogue Beach County Park on the east side of Moriches Inlet and Shinnecock County Park (which is both east and west of Shinnecock Inlet, but is primarily west of the inlet). Between these county lands are primarily single-family homes, although there are also some recreational beach clubs that contain multi-family residences. The residential development density generally decreases from west to east, with residential lots averaging about 1 to 2 acres (0.4 to 0.8 hectares [ha]) in size in the area between the villages of Westhampton Dunes and Westhampton Beach. There are also town open spaces (e.g., the Town Beach east of Cupsogue Beach County Park and other small beach access points).

Shinnecock Inlet to Southampton Barrier

Continuing west from Shinnecock Inlet on the next barrier island segment is the incorporated Village of Southampton in the Town of Southampton. Similar to the western portion of the Town of Southampton, the eastern segment is predominantly residential with open space and recreational uses, and includes Shinnecock County Park. Developed areas are dominated by single-family homes with a decrease in development density to 5-acre lots and the lot sizes and houses tend to increase in size. There are fewer beach clubs in the eastern section of the Town of Southampton than in the areas west of Shinnecock Inlet.

3.7.3 Public Policy and Planning

The Federal, state, and county governments each have regulatory authority over general land management and development in the Study Area, primarily through enacting laws and establishing policies that protect environmental features. The local governments have primary regulatory jurisdiction with respect to land development and management, principally through zoning, and local laws and ordinances. In addition, FIIS is administered by the NPS under the DOI, a Federal agency with land use and environmental management authority.

In New York State, the primary responsibility for zoning land use regulations rests with local municipalities, including towns and incorporated cities or villages. However, in the case of shorefront areas potentially subject to flooding or coastal erosion and for Fire Island in particular, a number of other Federal and state zoning and other land use regulations pertain, as described below.

The exceptions to Federal, state, or county level land use regulatory authority within the Study Area are the Poospatuck and Shinnecock reservations. The Poospatuck Reservation is located in the hamlet of Mastic in the southeastern part of the Town of Brookhaven. The Unkechaug Nation is located on the Poospatuck Reservation, the smallest reservation in New York State, roughly 72.3 acres. The Unkechaug Nation possesses sovereign status and has its own constitutional government led by a tribal chief and a six-member council (Newsday 2005). As of the 2000 U.S. Census, 271 people of the Unkechaug Nation reside on the Poospatuck Reservation (USCB 2000). The Shinnecock Reservation is located adjacent to the Town of Southampton, along the eastern side of Shinnecock Bay. The Shinnecock Nation is self-governing and is a state-recognized Native American Indian group. At the time of the 2000 U.S. Census, 504 members of the Shinnecock Indian Nation resided on this reservation (USCB 2000).

The State of New York has delegated most zoning and land use regulation authority to local municipalities and land uses are therefore regulated by the zoning codes of each of the five towns and incorporated villages in the Study Area. Those towns and villages that come under the purview of the FIIS have conformed their Fire Island zoning regulations to the Federal zoning requirements.

3.7.3.1 Federal Law and Policy

Federal Emergency Management Agency

An organization that affects land use regulation in the Study Area is the Federal Emergency Management Agency (FEMA). Any community seeking to register with the Federal Insurance Association, which allows homeowners to obtain flood insurance, must join FEMA's National Flood Insurance Program (NFIP). Community participation is required as a prerequisite for individual property owners within that community to be able to purchase flood insurance. This requirement is in place to ensure that the appropriate public entities have effectively established floodplain regulations in a given community. Public law prohibits any non-participating community from receiving financial assistance for damages to buildings in a flood hazard area. The process of joining NFIP requires adoption of a local flood damage prevention code and development of a Flood Insurance Rate Map (FIRM). In this process, a community identifies its responsibilities and incorporates building standards into its building code. FEMA has the authority to acquire FEMA-insured properties from willing sellers that have been damaged by flooding; but in practice, FEMA does not regularly use this authority.

Coastal Barrier Resources Act

The Coastal Barrier Resources Act of 1990 (CBRA) established the Coastal Barrier Resources System, which consists of specifically identified undeveloped coastal barriers along the United States coastline. The USFWS is the responsible agency for administering CBRA. Coastal barriers include barrier islands, bay barriers, and other geological features that protect landward aquatic habitats from direct wind and waves. CBRA units are prohibited from receiving Federal monies or financial assistance or insurance for new development in CBRA areas. The CBRA, however, identifies exceptions to this restriction, including non-structural shoreline stabilization similar to natural stabilization systems; the maintenance of channel improvements, jetties, and roads; necessary oil and gas exploration and development; essential military activities; and scientific studies. The USFWS is responsible for consulting with Federal agencies that propose spending Federal funds within the system. Regional directors of the USFWS are responsible for administering the CBRA program in this region (USFWS Region 5).

The eastern portion of Robert Moses State Park is located in Fire Island Unit NY-59 (the identifier or designation under CBRA). The majority of Fire Island, however, is located within the Fire Island Unit NY-59P, which is an "otherwise protected area" not within the CBRA. The incorporated villages of Saltaire and Ocean Beach are excluded from the "otherwise protected area" designation, as are the communities on Fire Island, including Lighthouse Tract, Kismet, Fair Harbor, Lonelyville, Atlantique, Robbins Rest, Seaview, Ocean Bay Park, Point O' Woods, Cherry Grove, Fire Island Pines, Water Island, and Davis Park.

There are also four designated CBRA units in the Town of Southampton:

- Sagaponack Pond—which includes the pond and lands between the pond and the ocean. Flood insurance is not available for new construction or substantial improvements after November 16, 1990.

- Mecox—which includes Mecox Bay and the shoreline to the west, with the exception of an excluded area along Flying Point Road. Flood insurance is not available for new construction or substantial improvements along the bay after November 16, 1990, and is not available for the lands west of the bay after October 1, 1983.

- Southampton Beach—which includes the barrier and bay east of the Shinnecock Inlet. Flood insurance is not available for new construction or substantial improvements to Southampton Beach after October 1, 1983, and is not available for the inlet and bay west of the inlet after November 16, 1990.

- Tiana Beach—which is the barrier east of the Shinnecock Inlet. Flood insurance is not available for new construction or substantial improvements after November 16, 2001.

There are also a number of CBRA units in the Town of East Hampton. Generally, these units are found at or near coastal ponds where spits have formed, separating the ocean from the pond. In East Hampton, these units are found in the Village of East Hampton, at Georgia Pond, and Hook Pond. There is a unit in Napeague, where the South Fork narrows and flattens such that the area is highly susceptible to coastal erosion, and also at the ponds in Montauk Point (e.g., Lake Munchogue and Big Reed Pond).

Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) of 1972 establishes broad goals for waterfront redevelopment including: the redevelopment of deteriorating urban waterfronts and ports (for urban residential, recreational, commercial, shipping or industrial purposes); and waterfront revitalization planning, design, engineering, land acquisition and low-cost construction. Comprehensive coastal management involves balancing the competing interests of coastal protection, restoration and development. The National Coastal Zone Management (CZM) Program, authorized by CZMA, is a partnership between the Federal government and coastal states, authorized by CZMA. Under the CZM program, coastal states are encouraged to redevelop deteriorating urban waterfronts and ports, and to preserve and protect sensitive natural, historic, cultural, and aesthetic coastal features along their waterfronts. Under the CZM Program, coastal states have worked with local governments and other partners to provide education and technical assistance in land use planning, design, and project facilitation for waterfront redevelopment.

Disaster Mitigation Act of 2000

The Disaster Mitigation Act of 2000 (DMA 2000) refers to Federal legislation that amended portions of the U.S. Code relating to disaster relief. The DMA 2000 promotes an orderly and continuing means of assistance by the Federal government to state and local governments supporting pre-disaster hazard mitigation program development and modifies the national post-disaster Hazard Mitigation Grant Program (HMGP). DMA 2000 encourages broadening the scope and coordination of local and state pre-disaster planning and response; promotes sustainability by encouraging individuals, states, and local governments to protect themselves by obtaining insurance coverage to supplement (or replace) government assistance; and seeks to assist the efforts of the affected states in expediting the rendering of aid, assistance, and emergency services, and the reconstruction and rehabilitation of devastated areas.

3.7.3.2 New York State Law and Policy

Coastal Erosion Hazard Areas Act

Due to the erosion-prone nature of parts of the New York coastline, The Coastal Erosion Hazard Areas Act (ECL Article 34 and 6 NYCRR Part 505) directs the New York State DEC to identify and map coastal areas that are subject to erosion, and landforms such as beaches, bluffs, dunes and nearshore areas that protect coastal lands and development from the adverse impacts of erosion and high water. These areas are identified on Coastal Erosion Hazard Area (CEHA) Maps prepared by the New York State DEC. Lands within CEHA jurisdiction are subject to regulation under Article 34 and Part 505, which limits land use to protect these sensitive areas and limit high risk development. ECL Article 34 and 6 NYCRR Part 505 allow for local municipalities to administer their own local CEHA program, if the local municipality passes a CEHA law, the program is approved by DEC, and the program meets the minimum standards of 6 NYCRR Part 505. Local programs are required to use the DEC issued CEHA maps

New York State has identified the entire Atlantic Ocean shoreline of Fire Island as a CEHA. The entire beach and nearshore area, as well as the primary dune to a point 25 feet landward of the landward toe of the dune, are designated as natural protective features. New construction is not permitted in these areas and pre-existing development is strictly limited to only a 25 percent increase in ground coverage area.

Four of the five municipalities with land use jurisdiction on Fire Island (towns of Babylon and Brookhaven, and villages of Saltaire and Ocean Beach) administer the CEHA management programs. NYSDEC administers the regulatory program within the Town of Islip. State law provides for NYSDEC to revoke certification of local CEHA management programs, if local administration is not consistent with statewide minimum standards, and to assert regulatory jurisdiction over these areas. Thus, continuous future enforcement of New York's CEHA law and regulations is assured for Fire Island's ocean shorelines. East of Fire Island, both the towns of Southampton and East Hampton administer their CEHA programs.

Waterfront Revitalization and Coastal Resources Act

In 1981, the New York State Legislature enacted the Waterfront Revitalization and Coastal Resources Act (Article 42 of the Executive Law), to implement the New York State Coastal Management Program (CMP) as a Federally approved coastal management program under the CZMA. The CMP and Article 42 establish a balanced approach for managing development and providing for the protection of resources within the state's designated coastal areas by encouraging local municipalities to prepare Local Waterfront Revitalization Programs (LWRPs) in accordance with state requirements. The state program encompasses 44 required policy statements for managing coastal resources. The future actions of all levels of government must be consistent with these policies. A town or incorporated village adapts state coastal policies to local conditions and once the program is approved, state and Federal agencies follow the local policies through a process called Coastal Zone Consistency Review.

The New York State CMP was approved by NOAA in September 1982. The New York State DOS, through its Division of Coastal Resources, is the lead agency responsible for administration of the CMP. The Waterfront Revitalization and Coastal Resources Act (WRCRA) provides DOS with the authority to establish a coastal program, develop coastal policies, define the coastal boundaries, establish state consistency requirements, and provide a coordination mechanism. The CMP contains 44 coastal policies that are implemented through regulatory and management authorities assigned to a number of state agencies. Twenty-seven (27) of these policies are contained in the WRCRA. The NYSDEC has regulatory authority over many development and land use activities in the coastal area through a number of resource protection statutes that focus on wetlands (Tidal Wetlands Act; Freshwater Wetlands Act), erosion and flooding hazards (Coastal Erosion Hazard Areas Act), water and air quality, and disposal of hazardous and toxic wastes. The Office of General Services has jurisdiction over most of the state's underwater lands, whereby the use of these lands may be conveyed to the general public through the issuance of grants, easements, or leases. The State Environmental Quality Review Act provides the mechanism to ensure that the actions and programs of other state agencies give adequate consideration to the policies of the CMP, among other policies. Upon NOAA approval and a state public notice of that approval, a LWRP becomes incorporated into the CMP, at which time Federal consistency provisions of the program also apply to the local program.

The existing New York State-designated coastal area administered under this Act includes all of the area within the Great South Bay (and including a portion of the south shore of the Long Island mainland), and the area within the Atlantic Ocean out to the three-mile territorial limit. A LWRP may expand the coastal boundary to include additional areas that would benefit from being included in the coastal area. Through the LWRP, the CMP works with local communities to address public access, water quality, coastal habitat, and community development through improved local planning and zoning.

3.7.3.3 Suffolk County Planning and Policy

Article XIV of the Charter of the Suffolk County Code establishes and defines the powers, duties, and responsibilities of the Suffolk County Planning Department and the Suffolk County Planning Commission. The Planning Commission serves to protect the public interest and investment, and to provide local officials with planning expertise on inter-municipal and area-wide impacts of proposed municipal actions. The code allows the commission to recommend a comprehensive zoning plan or any other recommendations involving the performance of the planning function by towns or villages. The commission may, on request of any town or village in Suffolk County, furnish the town or village with requested planning services. Further, each municipality must refer to the Planning Commission local zoning or subdivision actions that would affect real property lying within one mile of an airport or a nuclear power plant or within five hundred feet of certain structures. The commission may approve or disapprove the action and may make recommendations for modifications of the action (SCDP 2008)

The Suffolk County Planning Department provides advice to the County Executive and the Legislature regarding development and preservation to maintain the county's quality of life and the natural environment. It serves as staff to the Planning Commission and provides a variety of information to the public. The department assists the commission in long-range planning by coordinating planning efforts with other local, state and Federal agencies. The department is also responsible for all buying and selling of county real estate and the leasing of facilities for county use.

Various county plans and programs relevant to the Study Area are described below.

Agricultural and Farmland Protection Plan

Since the 1970's, Suffolk County has been at the forefront of farmland preservation through the acquisition of environmentally sensitive lands. The protection and preservation of environmentally sensitive lands, parklands, and historic farmlands has been a high priority. The Suffolk County Planning Department *Agricultural and Farmland Protection Plan: The Economy of Agriculture* presents their plan for the continued protection of agriculture and farmland (SCDP 1996)

Land Acquisition Program

In 2003, the Planning Department published *Land Acquisition Program: A Summary of Authorizing Legislation and Program Requirements* (SCDP 2003b) as a means to further understanding of the following 12 land acquisition programs as tools for local municipalities.

- Farmland Development Rights Program
- Open Space Preservation Program
- Drinking Water Protection Program
- Land Exchange Program
- South Setauket Woods Conservation Area Program
- Land Preservation Partnership Program
- Community Greenways Fund Program
- New Drinking Water Protection Program
- Multifaceted Land Preservation Program
- Review of Tax Lien Properties For Parks/Environmental Value
- Transfer of Development Rights for Suffolk County Department of Health Services Board of Review Variance
- Donation of Property to the County for Park Purposes

Open Space Acquisition Policy Plan

The Suffolk County *Open Space Acquisition Policy Plan* (SCDP 2007b) presents policies and goals for the 21st century and takes a case-by-case approach to land acquisition, and overall, provides a foundation for the open space policy objectives of the county. The estimated final build-out that some estimate will be achieved within the next two decades provides the impetus for the coordinated effort to provide a guiding framework that can be utilized in conjunction with Smart Growth Principles and development planning. In the western portion of Suffolk County, there is far less land available for open space acquisitions than in the eastern portions; therefore, it is it critical to acquire any such land before the county is completely built-out. The open space program has targeted preservation in three main categories: natural resources, farmlands, and recreational use lands (SCDP 2007b).

Smart Growth Policy Plan for Suffolk County

In March 2000, the Suffolk County Legislature adopted a resolution that required the preparation of a "Smart Growth Master Plan" for the County. The Suffolk County Planning Department prepared the *Smart Growth Policy Plan for Suffolk County* in October 2000. This master plan was required under Resolution No. 212-2000, which established a "Smart Growth" Policy for Suffolk County Implementation," and was adopted by the Suffolk County Legislature and signed by the County Executive on March 30, 2000. Also in March 2000, the County Planning Commission published a document entitled *Smart Communities Through Smart Growth – Applying Smart Growth Principles to Suffolk County Towns and Villages*. This document outlines Smart Growth principles very similar to the goals set out by the legislation. The purpose of the county's Smart Growth Policy Plan is to measure some of the various laws, regulations, policies, and programs of Suffolk County against Smart Growth principles and to recommend changes to encourage smart growth. The Smart Growth principles on which the recommendations are:

- Encourage consultation and collaboration among communities;
- Direct development to strengthen existing communities;
- Preserve open spaces, natural and historic resources, and working farms;
- Encourage compact and orderly development;
- Provide for a variety of housing and transportation choices;
- Encourage predictable, certain, efficient, and final permitting processes; and,
- Ensure consistency of government policies and programs.

In November 2003, the Planning Department published *Suffolk County Smart Growth Committee Report -Analysis and Prioritization of the Recommendations of the Smart Growth Policy Plan for Suffolk County*. The Smart Growth Committee reviewed the policies and goals outlined in the earlier documents and prioritized the 43 recommendations for implementing Smart Growth principles in the county according to the eight major Smart Growth Principles outlined in Resolution 212-2000. Suffolk County is approaching the limits of its growth as it relates to available open land and is implementing strategies that will balance preservation with appropriate development and redevelopment is considered critical (SCDP 2003a).

South Shore Estuary Reserve Comprehensive Management Plan

Under the authority of the CZMA, the New York State Legislature created the South Shore Estuary Reserve Council. The New York State DOS, Division of Coastal Resources, assisted the South Shore Estuary Reserve Council with development of the Comprehensive Management Plan for the Estuary Reserve. The Reserve extends from the Nassau County/New York City line eastward about 75 miles, to the Village of Southampton in Suffolk County. From south to north, the Reserve extends from the mean high tide line on the ocean side of the barrier island to the inland limits of the drainage areas.

On April 12, 2001, the Council adopted the *South Shore Estuary Reserve Comprehensive Management Plan,* marking a major milestone for Reserve communities, water-dependent businesses, and residents. The plan provides a blueprint for the long-term health of the Reserve's bays and tributaries, its tidal wetlands and wildlife, and its tourism and economy. The plan calls for more than 75 actions to be implemented over the subsequent five years at an estimated cost of $98 million. This will be met from a variety of funding sources including the Clean Water/Clean Air Bond Act, the Environmental Protection Fund, and the Environmental Initiative through the New York State Department of Transportation (NYSDOS 2004).

Narrow Bay Floodplain Protection and Hazard Mitigation Plan

Another Suffolk County Planning Department document that is applicable to the proposed action is the *Narrow Bay Floodplain Protection and Hazard Mitigation Plan* (Narrow Bay Plan) (SCDP 1997). The Narrow Bay plan was funded by a Hurricane Hazard Mitigation Grant provided by the New York State Emergency Management Office (NYSEMO) to fund the preparation of a local pre- and post-hurricane property acquisition plan for both vacant and developed parcels in an area that is vulnerable to coastal flooding during severe storm events. This plan covers a portion of the coastal zone in Suffolk County that includes the Narrow Bay floodplain on the Mastic/Shirley peninsula. Implementation of this plan rests on voluntary participation and the availability of funds to execute land transactions.

According to the Narrow Bay Plan, the Narrow Bay area is particularly vulnerable to tidal flooding due to storm events because of the area's low elevation and close proximity to the barrier island. This plan indicates that the tidal flooding risk in the Narrow Bay floodplain would be dramatically increased should a breach in Fire Island occur. In general, the shoreline of Smith Point County Park is prone to breach creation.

As of June 9, 1993, the county had acquired 196 sites in the Narrow Bay area totaling 37.4 acres through tax lien procedures. The Narrow Bay Plan recommends that Suffolk County take a proactive role in assuring that these parcels are used to curtail floodplain development. Specifically, the plan recommends that certain parcels be designated as parks (those county-owned properties within the Conservation Area, an area within the Coastal Environmental Hazard Zone) and relocation sites (those county-owned properties located landward of the Coastal Environmental Hazard Zone and greater than or equal to 6,000 square feet). In addition, the plan recommends that certain county-owned properties (those less than 6,000 square feet or those within the Hazard Zone but landward of the Conservation Area) be sold to an adjacent owner with a restrictive covenant, in order to limit the future development of substandard lots and to discourage any further development in the floodplain. Further, 12 vacant county-owned properties, totaling less than one acre, are recommended to be held by the County until the future status of the adjacent lot(s) is determined. One small county-owned property along Bellport Bay, north of the Town of Brookhaven beach facility on Grand View Drive, is recommended for transfer to the town for park purposes.

In 1996, prior to finalization of the Narrow Bay Plan, Suffolk County enacted Resolution No. 1011-1996 entitled, Accepting and Appropriating a Grant from NYS Authorizing a Land Exchange Program and Adopting a "Narrow Bay Floodplain" Protection & Hazard Mitigation Plan in the Mastic/Shirley Area. This resolution formalizes Suffolk County's adoption of the voluntary land exchange program described in the plan, and prevents county-owned, tax lien parcels within the Study Area from being sold at auction. In addition, this resolution accepts a $34,997 grant from FEMA via NYSEMO to assist the county in the conduct of property appraisals, which are required before the county can complete any land exchanges with interested property owners.

Suffolk County Multi- Jurisdictional, Multi-Hazard Mitigation Plan

Under the DMA 2000, counties must submit comprehensive Hazard Mitigation Plans to FEMA to be eligible for future pre-disaster mitigation funding. To comply Suffolk County Department of Fire, Rescue & Emergency Services [SCDFRES] prepared the *Suffolk County Multi-Jurisdictional, Multi-Hazard Mitigation Plan* (HMP) and in December 2007 submitted the draft HMP to the NYS Emergency Management Office for approval and FEMA review (Tetra Tech EMI 2007).

The Planning Committee identified eight mitigation goals for hazard reduction planning:

- Save lives and reduce injury;
- Avoid, minimize or reduce damage to property to critical facilities, infrastructure and those properties known to receive or experience repetitive damages;
- Reduce exposure to risk, while protecting or restoring natural processes to the maximum extent possible;
- Consider the wise uses of land in known or identified hazard areas;
- Encourage the development and implementation of long-term, cost-effective and environmentally sound mitigation projects;
- Promote hazard mitigation awareness and education throughout Suffolk County;
- Improve community emergency management capability (i.e., prepare, respond, recover, mitigate); and,
- Maintain economic viability after a hazard event (Tetra Tech EMI 2007).

The jurisdictions located in the FIMP Study Area that participated in the MHP include: the Town of Babylon and the villages of Amityville, Babylon, Bellport, and Brookhaven. The Town of Southampton attending planning meetings; the Town of Islip is currently preparing their own Hazard Mitigation Plan.

3.7.3.4 Local Planning and Policy

Town of Babylon

The Town of Babylon's *Draft Comprehensive Plan* (March 1998) is committed to the protection of environmental and natural resources including the barrier islands and beaches and the Great South Bay. Strategies are recommended to protect sensitive natural resources including a Land Conservation Zoning District and establishing a Town Open Space Fund. For the barrier beaches, the Plan suggests coordination with the USACE to manage erosion and implement beach nourishment projects. The Plan also states that recreational planning should consider beach dynamics, and facilities should be designed for ease of relocation, repair, and replacement. In addition, the Plan recommends that areas unsuitable for recreational use should be protected so that they may develop their full potential for wildlife habitat.

The Comprehensive Plan includes five major themes for the future of the Town:

- maintain and strengthen the Town's suburban character;
- respond to the changing population;
- improve the quality of life in economically distressed areas;
- promote jobs and economic development; and,
- foster stewardship of sensitive natural resources.

The Plan recommends implementation of the findings of the town's *1994 Barrier Beach Study*. Key recommendations of that report include:

- To promote public education about the barrier ecosystem;
- To continue the town's Dune Management Program;
- To manage Gilgo/West Gilgo beach oceanfront erosion through beach nourishment, dredging, sand by-passing, and dune restoration; and,
- To restore the Oak Beach shorefront environment through the use of dredge materials, thereby protecting town properties, providing non-structural erosion control, and returning the hardened beaches to a more pristine condition.

Town of Islip

The Town of Islip's *Comprehensive Plan* (1979) is based upon the principle of improving the quality of living for every Islip citizen. The Plan recommends that the town follow locally-operated environmental protection programs that meet regional goals. The Plan identifies Fire Island as "a major natural asset and recreational resource for the town" that should serve as both a natural and protective barrier for Great South Bay and mainland and a recreational resource in a natural setting.

Town of Brookhaven

The Town of Brookhaven is currently in the process of updating its Comprehensive Plan. Brookhaven's Comprehensive Plan 2030 will provide a framework to guide the community to a more sustainable future. The plan employs a holistic and multidisciplinary approach to balancing the factors that influence development and prioritizing planning and strategies that builds upon the previous Comprehensive Plan. The Plan seeks to integrate policies and strategies to guide development for the next 20 years, such as: Smart Growth, sustainable community, and growth management principles.

In the Town of Brookhaven's *Final 1996 Comprehensive Land Use Plan*, a prime objective for the town's coastal zone is to balance the preservation and restoration of significant environmental resources, ecological habitats, and surface waters with the need to develop additional water dependent facilities, provide opportunities for public access, maintain the characteristics of the waterfront, and minimize conflicts. Specific to Fire Island, the Plan recommends that breaches be filled as they occur.

The Town of Brookhaven also has a *Draft Local Waterfront Revitalization Plan* (LWRP) (1989). Although not an adopted plan, the Plan states the following goals:

- To preserve significant environmental resources and ecological habitats;
- To provide and improve water-dependent facilities as needed;
- To provide and improve public access to the waterfront; and,
- To maintain and enhance the waterfront and harbor and south shore bay areas.

Village of Patchogue

In 1959, a *Master Plan* was prepared for the Village of Patchogue, which was updated in 1979 by the County. One recommendation included in the update is that action should be taken to halt shoreline erosion at Shorefront Park.

The *Patchogue River Maritime Center Plan* (November 1999) recognized the Village as one of six major maritime centers in the 70-mile-long South Shore Estuary Reserve area. A *maritime center* is an area of concentrated commercial *water-dependent* and *water-enhanced uses*. The Plan also identifies the following goals:

- To maintain and provide water-dependent and water-enhanced uses as needed;
- To ensure prudent protection of the environment; and,
- To improve the overall condition and attractiveness of the area to support Village residents, water-related business activities, and visitors alike.

Recommendations include urging the Village to work with the USACE to implement the maintenance dredging in the Patchogue River and to nourish the beach front.

The Village draft LWRP was completed in 1989, but has not been adopted. The LWRP indicates that a Waterfront Development zoning district and a General Waterfront zoning district were added to the Village Zoning Ordinance in June of 1983, but have not been applied to any parcels. It was recommended that the FIIS ferry terminal property be zoned General Waterfront. Also recommended is the maintenance dredging of the Patchogue River channel to a depth of 12 feet, as well as “spurs” extending from this channel to service private enterprises.

Town of Southampton

The Town of Southampton’s *Comprehensive Plan Update Implementation Strategies* entitled *Southampton Tomorrow* (March 1999) updates the town’s first Comprehensive Plan (1970). It contains the following goals: protecting valuable natural, historic, and scenic resources; enhancing public facilities; maintaining diversity in the local economy; and providing more travel choices for local residents. With regard to water resources, the Plan calls for the following:

- Improvement of the quality of surface and bay waters by reducing nutrient loading, toxins, and sedimentation.

- Implementation of comprehensive conservation management plans for the Peconic and South Shore estuaries, which focus on harbor management, intermunicipal waterbody management, local waterfront revitalization, and protection and enhancement of the town's fin and shell fisheries.

An update to the 1999 Comprehensive Plan, *Town of Southampton Comprehensive Plan-Transportation Element,* was adopted in November 2004. Land use strategies essential to this plan include preservation, and Smart Growth Principles, and access management strategies (Village of Southampton 2004).

The Town has a LWRP (January 1994) that was never adopted. It outlines waterfront revitalization issues, problems, and opportunities. In general, the LWRP recommends the preservation of natural coastal protective features and processes. With respect to conservation-based development, some important recommendations include: implementation of a vigorous coastal protection policy with conservation areas or marine sanctuary zones designated for protection from damaging human impacts, and the creation of a coastal zone protection district to encourage land use patterns that accommodate growth, while respecting the environmental sensitivity of the coast. The LWRP recommends the preparation of medium and long-term plans for use of barrier islands that recognize the islands' vulnerability, integrates environmental considerations with economic planning and policies, and defines specific measures for maintaining biological diversity. In addition, the LWRP stresses a policy of dune restoration, to better safeguard public and private property from flooding and erosion. The LWRP also calls for strategic retreat in ocean fronting areas and major changes in Federal flood insurance regulation and policies, as well as an aggressive policy of prohibiting the construction of new hard shore parallel structures, wherever practicable, on all natural shoreline areas.

The Board of Trustees of the town possess responsibilities that include preserving public access to the water, advising the town board on coastal related issues, informing the public of coastal issues and policy, maintaining and protecting surface water quality, regulating dock and bulkhead construction and impacts, promoting sustainable harvest of commercial shellfish and finfish, providing a safe marine environment, and inspecting all structures built on the bay bottom.

Village of Quogue

The Village of Quogue is located within both the barrier island and mainland ecosystems. In January 1997, the village prepared a Generic EIS (GEIS) to evaluate potential impacts from coastal erosion control measures for their community. With regard to coastal erosion control, the Final GEIS makes the following statements: "Any impairment of the highly rated beaches of the south shore, such as the lining of beaches with bulkheads or other hard engineering structures, will diminish their overall quality. The high value of this beachfront property in Quogue depends greatly upon the maintenance of these natural environmental qualities, specifically the sandy beach and dune. Emplacement of bulkheads, which will gradually and inevitably degrade the beach, will lower the long-term investment value of beachfront property. Beach nourishment can be used to supply sand not naturally available, but these projects are expensive and therefore are generally used only for highly urbanized areas."

Village of Southampton

The Village of Southampton is located within both the barrier island and mainland ecosystems. The Village of Southampton's *Comprehensive Plan* (May 2000) applies to both areas.

Village of Sagaponack

The Village of Sagaponack was incorporated in September of 2005, to maintain and preserve its unique character as a hamlet. *The 2007 Village of Sagaponack Comprehensive Plan* (2007) incorporates many of the land use policies as well as the extensive planning and zoning studies of the Town of Southampton. Although the Village of Sagaponack never developed into a commercial center, the 1980's brought intensive residential development pressure to Sagaponack's farmland, residents value the preservation of the Village's historic agricultural character and its rural architectural heritage and the Comprehensive Plan reflects those values.

Town of East Hampton and Associated Villages

The Town of East Hampton's *Comprehensive Plan* (2005) presents a vision statement and goals for the future of East Hampton. The town is committed to sustaining its natural and cultural resources and rural character, with a commitment to a "green" community, the environment, saving energy, and preserving open space. Key goals include the following: maintain, and restore where necessary, East Hampton's rural and semi-rural character and the unique qualities of each of the historic communities; protect and restore the environment, particularly groundwater; and reduce total build-out to protect the natural and cultural features identified in goals one and two.

The *Town of East Hampton Local Waterfront Revitalization Program* (LWRP), dated December 1999, serves as the town's Coastal Management Component of the Comprehensive Plan. The LWRP has been adopted by the town, and was approved by New York State DOS in December 2007 (NYSDOS 2007). The LWRP aspires to coordinate local and state policies for many commercial and recreational uses of the coast. It puts forth coastal policies, structured on the 44 statewide coastal policies and adapted to reflect local needs, for managing and conserving coastal resources. The LWRP serves as the guide for consistency review, a process for state and Federal agencies to review actions affecting the town's coast based on LWRP policies, and a means to require adherence to town guidelines. Regarding flooding and erosion issues, the LWRP examines hardened shorelines and natural shores, and mitigating measures to offset damage from hard structures.

The LWRP states that the town should promote efforts to eliminate the scouring effect of the state and Federal groins on the Wainscott beach. The LWRP recognizes the importance of identifying areas of critical erosion and flooding potential so measures can be taken to protect resources and property. Appropriate responses may include increased setbacks or limiting expansion of existing residences in hazard areas. The LWRP states that hard erosion control structures should not be permitted on south ocean shores and that the town should consider whether pre-existing structures should be rebuilt in high hazard areas following a catastrophic storm. Further, the LWRP states that where erosion control measures are appropriate, structural vs. non-structural measures, perpendicular vs. shore-parallel structures, and soft structures vs. hard structures must be evaluated. In areas already damaged by erosion, the LWRP recommends that the town rebuild the protective dune to prevent blowout or breach.

Village of East Hampton

The *Draft Generic Environmental Impact Statement (DGEIS) and Village of East Hampton Comprehensive Plan* (adopted February 15, 2002) provides a vision for the future whose principal theme is that the Village should remain a residential community with extraordinary natural beauty, historic integrity, and special charm. The Village is committed to preserving its character, heritage, and quality of life. The Plan recommends that the Village protect and manage its natural resources by identifying and acquiring important open spaces and continuing stewardship of wetlands, beaches, dunes, and critical wildlife habitat areas. The Plan also stresses the need to provide and manage Village beaches and beach safety.

3.7.4 Current Land Use and Zoning

In NYS, land use regulatory authority is vested in towns, villages, and cities. However, many development and preservation issues transcend local political boundaries. In Suffolk County, each town and village is empowered by the Municipal Home Rule Law to plan and zone within its boundaries (SCDP 2000c). The local governments regulate and control land management, through zoning and local laws and ordinances enacted to protect environmental features.

The State of New York has delegated most zoning and land use regulation authority to local municipalities, and land uses are therefore regulated by the zoning codes of each of the five towns and incorporated villages in the Study Area. Those towns and villages that come under the purview of the FIIS have conformed their Fire Island zoning regulations to the Federal zoning requirements. Table 3.7-1 provides a survey of local laws and ordinances that relate to developmental and land use related areas of concern and together with a town or village’s zoning code, provide the basis for land use control in the Study Area.

3.7.4.1 Land Use

Suffolk County

Land use in Suffolk County is categorized as low density residential, medium density residential, high density residential, commercial, industrial, institutional, recreational and open space, agriculture, vacant, transportation, utilities, and waste handling (SCDP 2007).

These land uses are distributed throughout the county as follows: 23.5 percent of the land in was used for recreational purposes, 20.6 percent for medium density residential, 12.8 percent for transportation, 11.5 percent for low density residential, 9.6 percent for vacant land, 7 percent for agriculture, 4.6 percent for institutional, 3.6 percent for high density residential, 2.9 percent for commercial, 2.6 percent for industrial, 0.9 percent for utilities, and 0.3 percent for waste handling (SCDP 2007, Tetra Tech EMI 2007). The land use categories for the towns located in the FIMP Study Area are illustrated in Table 3.7-2.

Over the last 15 years, there has been an increase in acreage in all land use categories except for the vacant and agricultural land categories, which have decreased. Suffolk County is approaching the limits of its growth as it relates to available open space. According to the Suffolk County Department of Planning, open space includes forests and agricultural land, undeveloped shorelines, undeveloped scenic lands, public and private parks, and preserves. It also includes water bodies, such as bays, lakes, and streams (SCDP 2005). In 2000, open space covered 23.4 percent of Suffolk County land (Long Island Index [LII] 2004). With a rapid population growth, there is a demand for open space preservation, which will continue to support the tourist industry and water quality in Suffolk County (SCDP 2007b). In 1999, 83,000 acres of land in the five eastern Suffolk County jurisdictions were available for development.

Table 3.7-1. Local Regulatory Controls

	Coastal Erosion Hazard Areas	Flood Damage Protection	Wetlands/Freshwater Coastal and Interior Wetlands	Dredge and Fill /Excavation/Removal of soil	Stormwater Management and Erosion and Sediment Control Plan	Sand Dunes and Ocean Beach Management Plans	Open Space / Historic Preservation	Conservation Easements /Recreational Preserves	Agricultural Protection	Vegetation or Tree Ordinance	Transfer of Development Rights	Environmental Review	Building Construction Code	Site Plan Subdivision Review	Tax Exemption for Capital Improvements
Town of Babylon	√	√	√	√√			/√			√		√	√	√	√
Village of Amityville															
Village of Babylon			√										√	√	√
Village of Lindenhurst		√										√	√	√	√
Town of Islip			√	√						/√		√	√	√	
Village of Brightwaters		√											√	√(Z)	
Village of Ocean Beach*													√		
Village of Saltaire	√	√												√	
Town of Brookhaven	√	√	√	√						√		√	√		√
Village of Bellport		√	√	√									√	√	
Village of Patchogue		√	√										√	√	
Town of Southampton	√	√	√			√	√√	√	√	√		√			
Village of Quogue	√	√	√	√		√				√		√	√	√	
Village of Sagaponack	√	√	√												
Village of Southampton	√	√				√*	√			√		√		√	
Village of Westhampton Beach	√	√		√						√		√	√	√	

Village of Westhampton Dunes															
Town of East Hampton	√(Z)	√(Z)					√	√	√						
Village of East Hampton	√	√	√			√	√					√	√	√	

Source: Municipal Codes of the Towns and Incorporated Villages of Suffolk County
Notes: √ = local entity has specific local laws or other regulatory controls addressing issue.
√(Z) = regulatory control is specially contained/addressed within the zoning ordinance.

Table 3.7-2. Upland Land Use Acreage by Town

	Babylon[1]	Islip[1]	Brookhaven[1]	Southampton[2]	East Hampton[2]	Total
Low density residential	107	2,008	13,711	15,194	7,953	10%
Medium density residential	6,196	21,546	40,125	10,935	5,768	21%
High density residential	5,559	4,342	6,319	580	405	4%
Commercial	1,505	2,430	4,707	2,182	619	3%
Industrial	2,254	3,063	2,963	789	266	2%
Institutional	1,243	4,552	11,832	2,244	294	5%
Recreational & open space	11,411	14,624	42,989	24,041	14,872	27%
Agriculture	31	81	3,971	7,940	1,495	3%
Vacant	564	1,637	13,392	15,023	10,899	10%
Transportation	6,801	13,068	23,587	9,318	4,075	14%
Utilities	134	546	2,466	493	243	1%
Waste Handling	146	213	537	224	107	.3%
TOTAL	**35,951**	**68,110**	**166,599**	**88,963**	**46,996**	**406,619**

[1] Source: 2007 Existing Land Use Inventory Western Suffolk County (SCDP 2007a)
[2] Source: 1999 Existing Land Use Inventory Eastern Suffolk County (SCDP 2000a)

Town of Babylon

The Town of Babylon, with 52.3 square miles of land area, is the smallest town in Suffolk County. The Study Area within Babylon is primarily residential. Coastal areas in the Town of Babylon are heavily developed, with an estimated 3,438 buildings in the 100-year floodplain. Communities in this area include Bayside Park, Copiague, and the incorporated villages of Lindenhurst, Amityville, and Babylon.

Suffolk County also sustains water-dependent uses such as commercial marinas, boatyards, and fishing docks; these uses are important factors in the economic vitality of the area. Additionally, the towns that comprise the FIMP Study Area each control the rights to the adjacent underground lands in accordance with grants dating back to the 1600s. However, where the New York State Office of Parks, Recreation, and Historic Preservation administers state parks with in these municipalities, the state is responsible for administering these underwater lands. Additionally, where the FIIS occupies municipal lands, the NPS is responsible for administering these underwater lands (NYSDOS 2004).

Town of Islip

The Town of Islip is 105 square miles in area, and is primarily residential, with open space uses throughout the town and commercial development concentrated along Montauk Highway. Ninety-two (92) square miles of the town fall within the FIMP Study Area. Communities in this area include West Bayshore, Bayshore, the Village of Brightwaters, Islip, East Islip, Great River, Oakdale, West Sayville, Sayville, and Bayport. Residential development consists largely of medium-density detached homes on lots ranging from ½ to ¼ acre. Somewhat higher-density developments are found in West Bay Shore just south of Montauk Highway, in West Sayville near the county park, and in other scattered pockets throughout the town.

Town of Brookhaven

Brookhaven is the largest town on Long Island, with 259 square miles of land area. Within the sections of Brookhaven in the FIMP Study Area, development is generally less concentrated than that found in Islip (with the notable exception of the area that includes Shirley and Mastic), and there are a number of undeveloped parcels. Communities in this area include Blue Point, the Village of Patchogue, Bellport, Brookhaven, Shirley, Mastic, Mastic Beach, Center Moriches, and East Moriches.

Residential development is predominantly medium-density, particularly in Blue Point, Patchogue, Shirley, Mastic, and Mastic Beach. Bellport, Brookhaven, and East Moriches also have significant medium-density residential development, but developed lots are interspersed with undeveloped or agricultural land, and this variety gives an impression of a less densely developed area. East Moriches also appears less dense than actual lot sizes would indicate, because of a mix of low- and medium-density residences. Concentrations of higher-density housing are found along the Patchogue River in Patchogue, west of the Bellport Park Golf Course, and in the southwest part of Shirley/Mastic Beach. Low-density single family homes are spread throughout the Study Area, particularly in the southern part of Bellport, Brookhaven, and along the creeks and coves of Center and East Moriches.

Within Brookhaven, retail commercial development is found along the Montauk Highway, especially in downtown Patchogue and in Shirley; there are also some small shops along the highway in Center Moriches. Industrial uses, including boating and maritime industrial uses, are found along the Patchogue River. There are also major open spaces and recreational amenities, including the Bellport Park Golf Course at South Country Road and South Howell's Point Road, Smith Point County Marina near the Smith Point Bridge, and Wertheim National Wildlife Refuge between Shirley and Brookhaven. There are also a number of smaller neighborhood parks and playgrounds.

Town of Southampton

The Town of Southampton's 160.2-square-mile land area contains a variety of physical features. Mainland communities located on Moriches and Shinnecock bays tend to be low-lying and existing development in these areas is vulnerable to tidal inundation during storm events. The mainland communities east of the bays are susceptible primarily to the effects of tidal surge, waves, and erosion during storm events. Land use is characterized as follows: 24 percent of development in the town is residential, 8 percent of development is agricultural, and 34 percent is unused or undeveloped. The remainder is recreational, commercial, industrial, or institutional. The majority of the undeveloped land lies in the western section of the town, in the Pine Barrens area surrounding Sunrise Highway. The greatest trend in local land use is the conversion of agricultural land to residential uses (Southampton 2000). In 2000, the average population density was 393 persons per square mile, an increase from 330 persons per square mile in 1990. Approximately 2,706 structures in the town lie within the 100-year floodplain. The summer population is estimated as nearly triple the year-round population.

The Town of Southampton encompasses 160 square miles of land area, and is bordered to the west by the Town of Brookhaven, to the north by the Town of Riverhead, to the east by the Town of East Hampton, and to the south by the Atlantic Ocean. The Town of Southampton also includes the Incorporated Villages of Westhampton Dunes, Westhampton Beach, and Quogue (west of Shinnecock Inlet) and Southampton east of the inlet.

The west portion of the Town of Southampton is predominantly residential with open space and recreational uses, particularly the barrier islands. Some of the larger open spaces are found at the inlets, including Cupsogue Beach County Park on the east side of Moriches Inlet and Shinnecock County Park (which is both east and west of Shinnecock Inlet, but is primarily west of the inlet).

Between these county lands are primarily single-family homes, although there are also some recreational beach clubs that contain multi-family residences. The residential development density generally decreases from west to east, with residential lots averaging about 1-2 acres in size in the area between the villages of Westhampton Dunes and Westhampton Beach. There are also town open spaces (e.g., the Town Beach east of Cupsogue Beach County Park), that are smaller in size than the county parkland. Retail and commercial uses are concentrated along County Road 27 (Montauk Highway), as well as the main streets and commercial roads within the incorporated villages.

The eastern section of Southampton is similar in its residential development pattern, although it also features agricultural uses inland from the shoreline. There are also fewer beach clubs, and the residential development density decreases, with 5-acre lots and somewhat larger house sizes. Commercial development is found primarily along Montauk Highway, which runs along the entire length of the northern border of the Study Area, concentrated in the villages and hamlets.

There is a mix of other uses in Southampton. The largest institutional use found within the Study Area is the Long Island University-Southampton College. In addition, the Shinnecock Indian Reservation is located east of the Shinnecock Canal along New York State Route 27A in the central part of the town. There are scattered and small industrial uses, but no major areas devoted to industrial use.

Town of East Hampton

The Town of East Hampton consists solely of mainland communities east of the protective barrier of Fire Island. Communities within this 73.3-square-mile town are quite varied in terms of their susceptibility to flood damages. Some are in predominantly low-lying areas that are subject to storm surge, wave setup, erosion, and tidal inundation during storm events, and others are high on the bluffs and primarily at risk of damages due to bluff erosion. Though the long-term shoreline change rates are relatively moderate, the beaches remain subject to significant erosion during storm events. The effects of storm erosion, though more severe, are often temporary as the beach rebuilds over time. Approximately 95 structures in the Town of East Hampton are located within the 100-year floodplain. In 2004, the major land use percentages by category were: residential (37.6 percent), open space (34.7 percent), transportation and utilities (10 percent), and vacant (10.9 percent). In 2000, the population in the Town of East Hampton was 21.8 percent greater than its 1990 level.

The western portion of the East Hampton Study Area is predominantly residential with a moderate distribution of agricultural, open space, and recreational uses. The eastern portion is largely recreational lands and open space with a concentration of low, medium and high-density residential development south of Montauk Highway.

Residential development consists largely of single-family homes on lots ranging from 1/2 to 5-acres in size. Higher density development is located within close proximity to Montauk Highway in the central and eastern sections of the Study Area. There are no significant industrial uses, although they are found in small areas.

Lower density residential development as well commercial business and office centers are found in the Village of East Hampton. In addition, the hamlets, such as Montauk and Napeague, contain greater concentrations of commercial business activities, including retail uses and hotels.

3.7.4.2 Zoning

The State of New York has delegated most zoning and land use regulation authority to local municipalities and land uses are therefore regulated by the zoning codes of each of the five towns and incorporated villages in the Study Area. General zoning is discussed for each town below and shown in Table 3.7-3. Those towns and villages that come under the purview of the FIIS have conformed their Fire Island zoning regulations to the Federal zoning requirements.

<u>FIIS Federal Zoning Regulations</u>

When Congress enacted FIIS-enabling legislation, the law mandated the Secretary of the Interior to establish Federal zoning regulations. These regulations provide standards for local zoning to protect and preserve Fire Island, and they exist solely as an overarching law to which local ordinances must conform. FIIS Federal Zoning Regulations provide a set of standards for the use, maintenance, renovation, repair, and development of property within FIIS. The standards are intended to protect land within the National Seashore using several means. These include: controlling population density and protecting natural resources, limiting development to single-family homes, and prohibiting any new commercial or industrial uses. The NPS is responsible for enforcing the Federal zoning standards in the communities and villages; despite the presence of Federal regulations, however, local governments maintain regulatory jurisdiction. The Federal government ensures local compliance with the Federal law by maintaining the power of condemnation. As long as local zoning ordinances conform to standards issued by the Secretary of the Interior, the Federal power of condemnation is suspended.

Table 3.7-3. Local Land Use Controls on the Barrier Islands

	Babylon	Islip	Brookhaven	Southampton	East Hampton
Minimum lot size	12,500 sq ft	6,000 sq ft	7,500 sq ft	15,000 sq ft	N/A
Maximum building coverage	-	25%	35%	20%	N/A
Zoning districts	- Residence - Multiple Residence - Business - Light Industrial - Heavy Industrial - Planned Hotel - Planned Industrial	- BAA (Fire I. Residential); - AAAB (Dune Dist. Overlay)	- Residential, - Commercial, - Oceanfront - Dune	- Residential - Business (Village and Hwy) - Office - Light Industrial - Resort Waterfront	N/A
Building height	30'-0"	28'-0"	28'-0"	28'-0"	N/A
Conforms with Federal	yes	yes	yes	yes	N/A

Source: Municipal Zoning Ordinances 1998.

Prior to 1980 Federal zoning controls focused on limitations on the number of bathrooms permitted in a single-family home, and setback and frontage requirements. Current Federal zoning controls have a 35 percent lot occupancy requirement, establish that base building heights must conform to the minimum elevation established by the Federal flood insurance program, and require a minimum lot size of 4,000 square feet.

Town of Babylon

The town board designated the following seven zoning types: residential, multiple residences, commercial, light industrial, planned hotel, and planned industrial. Residential standards permit single-family residential and municipal uses only, while the multiple residences district permits multi-family housing. Residential building heights are not to exceed 30 feet. The majority of the mainland portions of the Town of Babylon are zoned residential, with the exception of a business zoning district that runs along most of the length of Montauk Highway at the northern Study Area boundary.

The Town of Babylon's 2-mile parcel on the western tip of Fire Island is encompassed by Robert Moses State Park. Although the area is currently zoned as a residential district, the town's Draft Comprehensive Plan of March 1998 recommends amending its zoning to a land conservation district. Because the state park is not included in FIIS, Federal zoning regulations do not mention Babylon's jurisdiction on Fire Island. New development in Robert Moses State Park is not likely, and the land conservation district zoning should act to keep the park as a natural area.

Village of Amityville

Within the Study Area, the Village of Amityville includes a combination of residential and business zoning districts. The majority of the parcels along Montauk Highway at the northern border of the Study Area are zoned for business use. The remainder of the village within the Study Area is primarily zoned residential and includes a Floating Home Zoning District, which permits any vessel that is moored or docked to be used as a one-family dwelling.

Village of Lindenhurst

Most of the Study Area within the Village of Lindenhurst is zoned residential or business. Parcels zoned A Residence are generally found in the southern portion of the Study Area along Great South Bay and west of Little Neck Creek, while the C Residence Zoning District is generally found east of Little Neck Creek. The parcels along Montauk Highway as well as certain parcels along Neguntatogue Creek and Strongs Creek are zoned Business.

Village of Babylon

With few exceptions, the majority of the Study Area within the Village of Babylon is zoned residential. A Retail Business Zoning District is located along a portion of Main Street at the northern Study Area boundary and along the western Village boundary, and a Marine Commercial Zoning District is found in the southeast portion of the Study Area along Great South Bay and Sumpwams River. There is also a zoning district that permits only multiple residences designed primarily to provide living and dining accommodations for persons over the age of 62.

Town of Islip

The Study Area within the Town of Islip contains a number of zoning districts. Most of the residential districts permit single-family dwellings, churches, municipal parks, rail stations, and agriculture or nursery uses. The exceptions include the Residence C District, which permits only senior citizen dwellings; the Residence CAA District, which allows for only one- or two-family dwellings; and the Residence CA District, which permits only apartment houses and garden apartments, as well as single-family dwellings. Other uses are permitted in these districts with a special permit. The General Service districts allow such uses as medical care and day-care facilities, while the business and industrial districts allow commercial and industrial uses, respectively, and others. In addition, a Planned Landmark Preservation Overlay District exists in the Study Area to protect areas having a special historic or aesthetic character.

The town board designated two zoning types for the portion of the town located on Fire Island: Fire Island Residential (Residence BAA District -Single Family Dwelling) and Dune District Overlay. The zoning standards are in full compliance with the Federal regulations and consistent with the FIIS GMP. Along with residential and commercial development standards intended to protect the barrier beach from further over development, a special Ocean Front Dune District (AAAB) is superimposed onto the BAA zoning district. The minimum lot size allowed in Residence BAA is 6,000 square feet, and the maximum building coverage allowed is 25 percent. Residence AAAB boundaries, which cover the southern one-third of the island along the entire oceanfront, are based on Flood Hazard Boundary maps and the GMP. The code includes a flood damage prevention section that establishes areas of special flood hazard and penalties for noncompliance. Among the provisions for reducing flood hazards is the prohibition of sand dune disturbance, which is in compliance with state or local coastal erosion hazard area regulations.

Village of Brightwaters

The entire Study Area within the Village of Brightwaters is zoned Residence A, which has a minimum lot area of 5,000 square feet and allows a maximum height of two stories. However, no two-story house may be built on a lot less than 75 feet wide.

Village of Saltaire

The Village of Saltaire has three zoning districts: residential, commercial, and utility. The village zoning ordinance includes regulations for construction that conform to Federal zoning standards. The maximum building coverage per lot is 30 percent, and buildings cannot exceed 27 feet in height. Saltaire does not designate a special waterfront district, although specific setbacks for bayfront and oceanfront constructions exist. The regulations are in place to preserve the village as a family residential community, rather than curb development. The Village of Saltaire has adopted a flood mitigation plan that recommends updating Village laws and ordinances to mitigate flood hazards.

Village of Ocean Beach

The zoning standards of the Village of Ocean Beach are in accordance with the village comprehensive plan and FIIS GMP. The ordinance is designed to prevent overcrowding of land, as Ocean Beach is built up to 95 percent of its total area. Building lots must be a minimum of 4,000 square feet with a maximum of 30 percent lot coverage. A special section of the regulations states the relationship between the village and FIIS with respect to building permits and variances. In the Oceanfront Dune District, residential construction is inappropriate; the code states the distances from the water at which construction can occur. It does allow for the continuation of existing uses in the Dune District. The extensive Flood Damage Prevention article is intended to minimize the threat of damages resulting from flooding by regulating land use, requiring certain construction standards, and maintaining participation in the National Flood Insurance Program.

Town of Brookhaven

Within the mainland portions of the community, zoning districts in the Town of Brookhaven are a combination of residential, business, and industrial. In addition, the town, through Vision Long Island, has hired a code writer to create an overlay district to allow for three mixed use hamlet centers along Montauk Highway within the hamlets of Mastic and Shirley. A building moratorium was put in place to allow the completion and adoption of the new codes.

The town has three zoning types: residential, commercial, and an oceanfront dune district. Residential standards permit single-family residential and municipal uses only, while the commercial district permits typical retail uses while prohibiting multi-family housing and hotels. Residential lots must be at least 4,000 square feet with no more than 35 percent building coverage. The intent of the Oceanfront Dune District (OFD) is to acknowledge the importance of sand dunes and ensure their protection from storm damage and erosion. In the spirit of this ordinance, the town permits reconstruction of structures, vehicular crossings and snow fences, and allows for continuation of existing uses. The code also introduces building standards for the OFD that are sensitive to the fragile environment. The flood damage prevention section of the code states requirements for construction within coastal high hazard areas, including a ban on man-made dune alterations.

Village of Patchogue

The Village of Patchogue contains a mix of residential, residence/professional office, commercial, and industrial zoning districts. Along the northern border of the Study Area, the most prominent zoning districts are the D-2 Business and the D-3 Business. Another prominent zoning district is the E-Industrial district along the east and west sides of the Patchogue River. The RPO-Residence, Professional Office Zoning District is evident along both sides of South Ocean Avenue. In addition, a large portion of the Study Area within the Village of Patchogue is within the A-Residence Zoning District along Bay Avenue, which forms the eastern Village boundary, and along the southern portion of the Study Area fronting Great South Bay.

Village of Bellport

The Study Area encompasses the entire Village of Bellport, which contains five zoning districts: Residence A, Residence AA, Residence B, Business E, and Professional Business. The majority of the Village is zoned residential, except for the area surrounding the intersection of South Country Road and Bellport Lane/Station Road, which is zoned for business and professional business uses.

Town of Southampton

The Town of Southampton has five zoning types: residential, business (village and highway), office, light industrial, and waterfront. Residential lots must be at least 15,000 square feet with no more than 20 percent building coverage. As part of the waterfront district, no buildings, other than public buildings can be located in tidal wetlands. Also, structures on beaches are limited to walkways crossing dunes in un-vegetated areas.

The majority of the Study Area within the Town of Southampton is in residential zoning districts that feature a minimum lot area ranging from 15,000 to 200,000 square feet. Small pockets of land are located within light industrial, commercial, and open space conservation zoning districts that are distributed throughout the Study Area. The Shinnecock Indian Reservation land is located in a special zoning district and the town has no regulatory jurisdiction over these lands.

The town zoning code, Chapter 330, contains several articles and sections that regulate the Atlantic coast lands of the town. Zoning also regulates land use and development along the Atlantic coast through special purpose “overlay districts.”

Article II “Residence Districts” establishes the basic residential zoning districts of the town, of which there are four along the Atlantic shoreline: R-40 in the Westhampton part of the town; R-80 in the Tiana Beach area; R-60 in Bridgehampton west of Mecox Bay; R-80 east of Mecox Bay; R-60 west of Sagaponack Pond; and R-120 east of Sagaponack Pond. Each of these districts allows single-family dwelling units on minimum lots as follows: R-40, 40,000 square feet; R-60, 60,000 square feet; R-80, 80,000 square feet; and R-120, 120,000 square feet. Dimensional standards are also mandated.

The town’s Tidal Wetlands and Ocean Beach Overlay District, recognizes that the tidal wetlands and the ocean beach of Southampton create an important and rare environment that is essential to fish and shellfish populations; provides essential habitat in the East Coast migratory flyways; and is fundamental to the scenic character and recreational potential that supports both the tourist and recreational economies, as well as the year-round residents’ enjoyment of their homes. The town recognized, in adopting this special district, that this environment is fragile and—given the pressure of and the limited suitability for development, and the need to protect the general public’s right of access to the water—adopted this special district overlay to provide additional standards beyond those existing in the underlying (or traditional) zoning districts. The requirements of the two special overlay districts are as follows.

- Tidal Wetlands. No private construction is permitted in a tidal wetland. When a private landowner lays claim to a tidal wetland, the town may inspect the property to examine such claim and issue a determination of rights within 120 days. If the title is valid, not more than 10 percent of that land area may be filled in the upland portion for construction. Channel construction shall be limited to those channels to provide minimum boat access to contiguous upland areas where there are no suitable alternatives that have a lesser ecological impact. Bulkheads are prohibited, except in tidal wetlands in the Resort Waterfront Business District, or when necessary to protect the natural environment from erosion, silting, or an imbalance in the ecological system. In all cases, it is recognized that approval is contingent on the approval of the town trustees, as well as other agencies.

- Ocean Beach Regulations. No building, structure, or floating facility is to be maintained on the public ocean beach, except when found necessary to protect the natural environment from excessive erosion or silting. If a private landowner presents valid proof of title to lands on an ocean beach, that land cannot be excavated or re-graded, nor can the natural crest of the dune be disturbed, unless it is part of a protective works program approved by the town. A private landowner shall not construct a building or structure on the ocean beach, with the exception of one access walkway over the dune crest with at least 2 feet of clearance over dune grasses, should they exist.

In 1986 the zoning code was amended to establish the town’s Tidal Floodplain Overlay District. The establishment of this district is based on the known exposure of the Atlantic shoreline properties to coastal storms that present dangers to public life and health as well as property hazards. The district is based on flood hazard elevations, including the A, A5, A6, A7, and A8 zones, and the V7 and V8 zones, as shown on the Flood Insurance Rate Maps prepared for the town by FEMA (in June 1983). The district also establishes certain standards, as follows.

- Subdivisions. Layout of subdivisions requires a minimum width of 150 feet on both sides of Dune Road. All subdivisions must have the approval of agencies that have jurisdiction over wetlands prior to Planning Board approval.

- Location of Buildings and Structures. All new and replaced buildings must be set back no less than 100 feet inland from the dune crest; in the case of small lots, this may be accomplished with a reduction of a front yard set back by 50 percent, and accessory buildings may be put in that portion of the front yard not deemed to be the minimum for determining that relief. In the event that there is no dune crest to establish that minimum, an application for a building permit is to be processed by the Planning Board as a special exception use. On all water frontages, all buildings and structures must be set back at least 75 feet from the upland edge of a tidal wetland, with the exception of an accessory structure, and provided approvals are granted by the town trustees and other agencies.

Another section of the town zoning code that address the Study Area's Atlantic shoreline is Section 161 "Building in Ocean Shoreline Hazard Areas." This section establishes a minimum setback from the shoreline to provide protection from long-term erosion and to minimize flood damage from a 100-year storm. This section allows modifications to front yards similar to that allowed in the Tidal Floodplain Overlay District. It also requires that the applicant meets the floodplain requirements of the town (Chapter 169) and incorporates flood-proofing, does not allow grading or soil disturbance within 100 feet of mean high water, outlines special requirements for septic, water supply, and utility systems, and prohibits structures that may increase flood damage or accelerate erosion; prohibits new construction or restoration of bulkheads, groins, jetties, breakwaters, revetments, seawalls, docks, piers or wharves; allows only clean sand to be deposited on the shoreline, and prohibits parking between the structure and the shoreline.

Virtually all of the eastern section of the Study Area is located within the Agricultural Overlay District. It is the intention of this district to protect agricultural lands within the town and encourages clustering and the transfer of development rights. The district regulations have no special applicability to the shoreline area.

Village of Southampton (Mainland)

The majority of the Study Area within the Village of Southampton is located in residential zoning districts that feature a minimum lot area ranging from 7,500 to 120,000 square feet. The Study Area also features a distribution of medical, light industrial and commercial zoning districts along Main Street, Montauk Highway, and other segments of connecting streets.

Village of Quogue (Barrier Island)

The majority of Study Area within the Village of Quogue is located in residential zoning districts that feature a minimum lot area ranging from 20,000 to 43,500 square feet. The additional zoning districts in the Study Area are B-1 and B-2 Business. The residential zoning districts within the Village of Quogue permit one-family residences, churches, schools (except Residence A-1 and

A-2 districts) as a special permit use, parks, playgrounds, recreational areas, public libraries, fire stations, municipal offices or government buildings when authorized by a special permit.

Permitted uses in the B-1 district include one-family dwellings (as permitted in A-5 zoning district), parks, playgrounds or recreational areas, business or professional offices, personal service shops, retail stores, retail food stores. The B-2 district permits the same uses as B-1 with the exception of retail food and other food dispensing establishments, automobile dealers, repair garages and gasoline service stations.

Village of Sagaponack

The Village of Sagaponack is divided into three single family residential districts (R-40, R-80 and R-120) and an Open Space Conservation and Park District. The Village also utilizes overlay districts in order to apply uniform land use control in categories of land sharing certain characteristics: the Tidal Wetlands and Ocean Beach Overlay District, the Tidal Floodplain Overlay District, and the Agricultural Overlay District. The majority of the Study Area is located within the Agricultural Overlay District; a district designation that is used to encourage and make economically feasible the preservation of open rural lands for agricultural purposes. A portion of the Village is covered by the Ocean Beach Overlay District where all new and replaced buildings and structures are required to be set back from the crest of an ocean beach dune in accordance with the regulations set forth in the Village's Coastal Erosion Hazard Act. However, there exists an exception for some lots that are too shallow to comply with the front yard setback reduction.

Village of Westhampton Beach (Mainland and Barrier Island)

The majority of Study Area within the Village of Westhampton Beach is located in residential zoning districts that feature a minimum lot area ranging from 7,250 to 40,000 square feet. The Village also features a Marina District in which structures are held to a minimum lot area of 150,000 square feet. The Study Area within the village also features three business districts, as well as separate industrial and hotel districts.

Village of Westhampton Dunes (Barrier Island)

The Village of Westhampton Dunes was incorporated as a village in 1995. The village generally follows the Zoning Code of the Town of Southampton. The entire village is located in the residential (R-40) zoning district.

Town of East Hampton

The town board designated three zoning types: residential, commercial, and a special use (parks and conservation) district. The town of East Hampton has adopted zoning measures to target sensitive natural areas for preservation and open space.

The most prevalent zoning districts in East Hampton are residential and park conservation. The residential zoning districts feature a minimum lot sizes ranging from 20,000 to 200,000 square feet. The Study Area also features pockets of land within neighborhood central business, resort, and waterfront districts. Land within A3 Residence District is located in either the Agricultural Overlay District or the Harbor Protection Overlay District. According to the town zoning code, in general, residential, commercial and industrial are not permitted in the Park and Conservation zoning district. Permitted uses include park activities, nature preserve or sanctuary and camping. Uses such as beach, golf, and yacht clubs, as well as fire stations, police stations, or post offices, and bus shelters are permitted upon issuance of a special use permit. Upon issuance of a special permit, additional uses allowed in this district include mariculture, research and development, marina, and recreational uses.

A flood overlay district is mapped along the Flood Hazard Area of the town. According to the Zoning Code for the Town of East Hampton, the purpose of the Flood Overlay Zone District is to "regulate the amount and nature of development, especially residential development, in areas of the town that have historically shown a propensity and vulnerability to damage caused by wind driven ocean and by waters during storms." Within this district, structures are mandated to conform to construction standards and designed with methods, practices, materials, and utility equipment that are resistant to flooding and protect against flood damage.

As recommended by the LWRP, a Coastal Erosion Overlay District, consisting of four zones, was recently added to the zoning code in order to better protect the shoreline and to regulate projects designed to control or prevent flooding and erosion of coastal and upland areas which could impact coastal resources.

Village of East Hampton

The majority of the Village of East Hampton is located in residential zoning districts that feature a minimum lot area ranging from 40,000 to 160,000 square feet. Smaller, narrow lots form the commercial core of the Village. There is primarily commercial retail zoning, but there are also small office and business professional office space districts distributed throughout the Study Area.

3.8 RECREATIONAL RESOURCES

Recreation opportunities are plentiful in the Study Area, as described in the following subsections. Figure 3.8-1 depicts the locations of the major recreation areas in the Study Area.

3.8.1 Barrier Island

Nearshore, beach, and upland areas of the barrier islands provide abundant recreational opportunities, particularly during the summer months.

Sunbathing, beachcombing, and swimming are popular in both public and privately owned areas. Thirteen (13) communities have lifeguard-protected beaches on the ocean side of the island and seven have lifeguard-protected beaches on the bay side. In several locations along the barrier islands, beaches are reserved exclusively for residents' use. Some public beach areas allow vehicular access and overnight camping is permitted in certain areas. Generally, the bayside beaches are roped-off swimming areas near the town's marina or dock, and tend to attract families with children. In Saltaire and Ocean Beach, the beach areas are next to the village parks, bay beaches, and commercial areas.

Other than swimming, popular water sports include surfing, sea kayaking, windsurfing, water-skiing, canoeing, and sailing. There are approximately 10 marinas on Fire Island. Area businesses rent windsurfing boards hourly, and stores on the mainland sell and rent other equipment such as sea kayaks and jet-skis. Several Fire Island communities have organized sailing programs and regularly schedule races and regattas throughout the season.

Local sport fishing in the Great South Bay and Atlantic Ocean is an activity for which Fire Island is well known, and the Study Area features a wide array of fish species plus shellfish and crabs, each of which has a prime fishing season. Commercial and recreational fishermen fish the bayside of the island for finfish and shellfish. In addition, several local charter companies on Captree Island and the mainland offer deep-sea fishing excursions to the Atlantic.

Fire Island also features a variety of land-based recreation facilities, such as tennis courts and softball fields. There are miles of beach, inland paths, and boardwalks available for hiking, walking and jogging. Bicycles are commonly used, both for recreation and as a mode of transportation along the concrete or sand paths that connect the communities.

The primary public recreation areas and their facilities are described below:

Robert Moses State Park

The Robert Moses State Park is located in the westernmost portion of the Study Area. The Park is the oldest in the State Park system, is open year-round, and provides access to 5 miles of beach. The reported total average annual attendance was 3.5 million visitors, with an average weekday attendance of 33,000 and a weekend daily average of 50,000 visitors. The majority of visitors to the park arrive by car; there are 8,209 parking spaces at the park. Occasionally the parking lot reaches its capacity and overflow traffic is directed to Jones Beach. During the swimming season when a lifeguard is on duty, higher parking fees associated with park use (New York State Office of Parks, Recreation and Historic Preservation [NYSOPRHP] 2007a).

Fire Island National Seashore

The Fire Island National Seashore (FIIS) abuts the east side of Robert Moses State Park. The park includes approximately 19,580 acres of marine and terrestrial property, including 6,240 acres of Federal lands and 13,340 acres of non-Federal lands, of which about 12,423 acres are public lands and 916 acres are privately owned (NPS 2008a). The Fire Island Lighthouse is on the western part of Fire Island National Seashore, adjacent to Robert Moses State Park. The Fire Island Lighthouse area offers exhibits, a nature trail, and interpretive programs (NPS 2008c). Within the FIIS, three major recreational areas are open to the public: Sailors Haven, Watch Hill, and Smith Point. Sailors Haven is the site of the Sunken Forest, an ecological preserve that features an elevated boardwalk for public access (NPS 2007a). Sailors Haven has a 42-slip marina, snack bar, and souvenir shop. Picnic facilities and lifeguard protection are also provided. Watch Hill is the largest public site at FIIS, with a 188-slip marina, restaurant, grocery, and souvenir shop (NPS 2007a). Along with lifeguard protection on its Oceanside Beach, Watch Hill has 25 camping facilities, open from May through October. There is also a small public facility with a picnic area and restrooms at Barrett Beach/Talisman, the island's narrowest point (NPS 2008c).

Otis G. Pike Wilderness Area

The Otis G. Pike Wilderness Area, established by Congress in 1980, is located within FIIS (east of Watch Hill) and administered by the NPS. The Wilderness Area covers approximately 1,380 acres, including 17 acres that were recently added to the NPS lands (NPS 2007a). Visitor activities include hiking, canoeing, kayaking, and camping.

Smith Point County Park

Smith Point County Park(owned and operated by Suffolk County), to the east of the Otis G. Pike Wilderness Area, is technically within the boundaries of FIIS, but is managed by the Suffolk County Parks Department. This 6-mile-long park is accessible by car and has public beach access, a visitor center, and camping facilities for 75 vehicles (SCDPRC 2007). Most of the developed recreational areas are found near of the terminus of William Floyd Parkway.

Town of Islip

The Town of Islip manages several parks on Fire Island exclusively for resident use. Atlantique Town Beach offers many amenities including a 157-slip public marina, restrooms, grill area, basketball court, handball court, and playgrounds. Until recently, the town also managed Barrett Beach, a facility near Talisman that has a marina, playground, and picnic facilities. In 1998, the title for this property was transferred to the NPS.

Town of Brookhaven

The Town of Brookhaven manages two public beaches, Leja Beach in Davis Park and Great Gun Beach in Smith Point County Park. Leja Beach has a public marina, picnic area, swimming beach, and playground. Great Gun Beach has a lifeguard-protected swimming area, playgrounds, and restrooms (Brookhaven 2007).

Municipality of Bellport

The Municipality of Bellport manages a beach within the Otis G. Pike Wilderness Area exclusively for its residents. The area has a private dock, visitor center/concession building, and oceanfront picnic deck. Access to Bellport Beach is provided by the Bellport ferry, a service provided exclusively for Bellport residents (Bellport 2008).

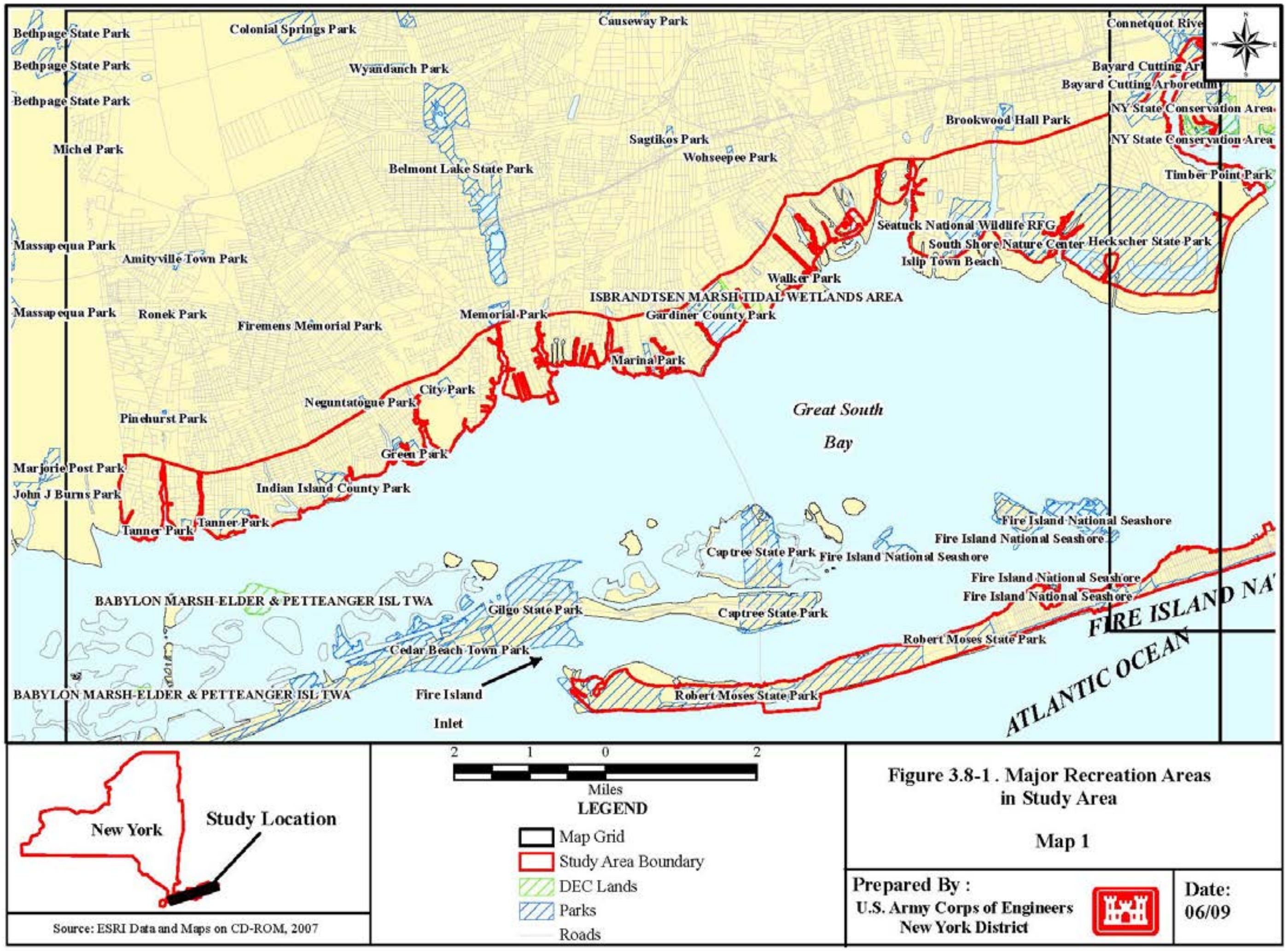

Figure 3.8-1. Major Recreation Areas in Study Area

3.8.2 Back bay

The sheltered waters of the back bay area provide for various commercial and recreational fishing opportunities. Historically, Great South, Moriches, and Shinnecock bays have been used for clamming and other shell fishing. Although clam beds have declined over the past several decades, recent efforts to reestablish populations have been implemented. Other uses of the back bay include certain water related sports such as sea kayaking, windsurfing, and sailing. Swimming also occurs at Heckscher State Park in Great South Bay (NYSOPRHP 2007b).

Several Federal, state, and county public land areas also provide for nature observation, bird watching, and hunting, particularly for waterfowl. These include the back bay portions of FIIS and Wertheim National Wildlife Refuge.

A relatively large proportion of the back bay contains residential and commercial developments. These areas are in private ownership and are generally not open or accessible to the public.

3.8.3 Mainland

There are an abundance of recreational areas maintained by various jurisdictions within the Study Area along the southern coast of mainland Long Island. Town-owned beaches, boat launches, and parks are interspersed with those maintained by Suffolk County and New York State. In addition, three Federal wildlife refuges and one national seashore lie within the Study Area. This section provides a summary of recreational areas along the southern shore of mainland Long Island.

3.8.3.1 Municipal Recreational Resources

A total of five municipalities encompass the Study Area along the southern edge of mainland Long Island. Each of these municipalities owns and operates a combination of recreational areas including beaches, parks, fishing piers, boat launches and marinas, golf or country clubs, and nature preserves. In most of the towns, swimming is the most popular recreational activity. The five abutting towns offer approximately 17 beaches, many of which are associated with a town owned park (Babylon 2008, Brookhaven 2007, East Hampton, 2008, Islip 2007, Southampton 2007). Some of the beaches, such as Sand Spit Park and Corey Creek, are open to the general public, whereas others are limited to town residents only (Brookhaven 2007). Many of these beaches are equipped with toilet facilities and food concessions. Supervision is provided during summer months, when parking permits are typically required.

The protected creeks, rivers, bays, and shoreline make Long Island's south shore a popular location for boating and fishing. Approximately 40 marinas exist along the mainland. Recreational boaters use these marinas primarily to anchor or tie their boats for a short- or long-term stay, and many provide a range of repair, storage, and sales services. In addition, public and private ferry services operate from marinas and transport people between the mainland and Fire Island for recreation as well as residential purposes.

Municipal parks provide a variety of recreational opportunities. Many of the 17 bayside parks plus roughly a dozen inland parks contain soccer fields, volleyball courts, tennis courts, walking trails, paved paths (for rollerblading and biking), picnic pavilions, and barbeque pits.

Golfing is popular with residents and visitors in the area. Approximately 10 public and private golf and country clubs are situated on the south side of Long Island within the Study Area (Navteq 2007). The majority of the courses are public, but two (Quogue Field Club and Southward Ho Golf Course) are privately owned and managed facilities.

Four nature preserves owned and managed by The Nature Conservancy (TNC), a non-profit entity, are situated within the Study Area. Atlantic Double Dunes Sanctuary and the Center for Conservation in East Hampton, and Ruth Wales Sanctuary and Pine Neck Reserve in South Hampton provide opportunities for various passive recreational activities such as nature appreciation and education related to the ecosystems present (TNC 2007a). Other activities include nature walks and bird watching. Double Dunes is open for guided tours during the summer season only (TNC 2007a).

The Center for Conservation features an organic native plant garden and a native wildflower meadow, and educates visitors about environmentally-friendly forms of landscaping. The Center itself acts as a lesson in low-energy building techniques. A geothermal heating system uses ground temperature to aid in the heating and cooling of the building, while solar panels assist in providing electricity for the facility (TNC 2007b).

3.8.3.2 County Recreational Resources

Suffolk County manage numerous recreational resources include but not limited to : Copiague Neck, Gardiners, Sans Souci, Smith Point, West Sayville, Timber Point, Shinnecock, Cuspquoge Theodore Roosevelt and Terrel River County parks. Most of these facilities offer swimming, camping, playgrounds, picnicking, food concessions with dining areas, restrooms, showers, and special events during the summer seasons. Smith Point, Suffolk County's largest ocean front park, also offers scuba diving, surfing, saltwater fishing, and outer beach access (SCDPRC 2007).

3.8.3.3 State Recreational Resources

Several New York State parks and one arboretum are located within the Study Area on mainland Long Island (LIE 2008). Bayard Cutting Arboretum State Park is a 690 acre facility that features a landscape garden created by Frederick Law Olmstead. It is situated adjacent to the southern extent of Connetquot River State Park Preserve, a 3,473-acre preserve set aside for the protection of game species. Fifty miles of hiking, horseback riding, cross-country ski and nature trails are available (NYSOPRHP 2007c). Heckscher State Park is located east of these parks on the shore of the Great South Bay. The 69-campsite campground at this 1,469 acre park was named as one of the top 100 campgrounds in the country and provides 20 miles of trails for hiking, bicycling, and cross-country skiing. Swimmers can utilize the Great South Bay or the swimming pool complex. Other attractions enjoyed by the more than a million visitors include picnic areas, a boat launch ramp, playing fields, and a playground. In addition, the 32-mile Long Island Greenbelt Trail passes through the park (NYSOPRHP 2007b, LIE 2008).

On the east end of Long Island, Napeague and Hither Hills state parks offer camping and a variety of other recreational opportunities; including biking, swimming, and fishing along two miles of oceanfront beach and a 40 acre freshwater lake. The unique “walking dunes” of Napeague Harbor are located within the Park (LIE 2008). Further east are the 99-acre Shadmoor State Park (named for the abundance of shadbush that grow there) that features more than 2,400 feet of ocean beach access by two stairways, and the 415-acre Camp Hero State Park. Camp Hero State Park encompasses an historic military installation and offers a variety of landscapes and excellent surf fishing locations (NYSOPRHP 2007d). At the eastern end of Long Island located on the South Fork is the Montauk Downs State Park. This 160-acre park is known for its championship-length 18-hole golf course. The724-acre Montauk Point State Park is located at the extreme eastern tip of the South Fork of Long Island. The Park also contains the historic Montauk Lighthouse, known as the oldest lighthouse in New York State. The park is one of the premier wild reserves in the State and offers unique views (LIE 2008).

3.8.3.4 Federal Recreational Resources

Federal recreational resources encompassed by the mainland portion of the Study Area are Seatuck, Werthiem, and Amagansett National Wildlife Refuges, and a portion of FIIS, all of which are managed by the DOI. Seatuck and Amagansett refuges are havens for shorebirds and other species of migratory birds including Federally Endangered roseate terns and Federally Threatened piping plovers (USFWS 2007a, NPS 2008c). Werthiem NWR contains one of the last undeveloped estuary systems remaining on Long Island and approximately 300 species of birds have been documented there (USFWS 2007b).

The William Floyd Estate is part of FIIS and located on the mainland at Mastic Beach. The 613-acres include the 25-room "Old Mastic House," twelve outbuildings, the family cemetery and the surrounding forest, fields, marsh and trails (NPS 2008c).

3.9 SOCIOECONOMIC CONDITIONS AND ENVIRONMENTAL JUSTICE

The various communities, villages, and hamlets located within the Study Area are associated with, and governed by, towns. Therefore, socioeconomic information may apply to the towns overall, and unless otherwise noted, data are not specific to the communities, villages, and hamlets within the jurisdiction of each town. However, they are included where available. Further, data for Suffolk County also are provided as a basis for comparison and context.

3.9.1 Community Services

3.9.1.1 Barrier Island

Seventeen (17) communities are included within the authorized boundary of the Fire Island National Seashore (Armstrong et al 2001). Many of the Fire Island communities have individual volunteer fire and ambulance services, and several communities have local medical service. Some of the barrier island communities have their own emergency services. The Village of Ocean Beach has a volunteer fire and Emergency Medical Department, as well as a police department and seasonal (July and August) a licensed nurse practitioner holding office hours (Ocean Beach 2006). The Village of Saltaire has a volunteer fire company; in 1986 it became the first fire department providing ambulance services and emergency medical services on Fire Island (Saltaire 2008a). When called upon, the fire company also assists neighboring communities (Saltaire 2008a). A doctor is available in Saltaire during regular office hours from July to Labor Day, and on intermittent weekends during the spring and fall months; this service is not available from November to April (Saltaire 2008b).

Suffolk County also provides police for the island. NPS is responsible for enforcing conservation laws on Federal property, and the U.S. Coast Guard enforces boating safety regulations in surrounding waters.

3.9.1.2 Mainland

Most of the larger mainland towns have their own fire, ambulance, and police services. Suffolk County also provides a wide range of other public services including the Office of Emergency Management, handicapped services, health centers, and public bus service. The County also has a network of public parks that are used by County citizens. Citizens in Suffolk County also participate in a wide array of civic organizations including senior citizen clubs, environmental organizations, and fraternal, historical, business, and service groups.

3.9.2 Economic Conditions

3.9.2.1 Barrier Island

The barrier islands consist of small residential and seasonal communities. Therefore, the economy on the barrier islands is primarily driven by tourism and the service industry, and lacks other sectors of the economy such as manufacturing and agriculture. Services found on the barrier islands include retail shops that cater to the large influx of tourists during the summer months, as well as retail establishments for purchasing basic necessities for both residents and visitors. The largest employment industries on the barrier islands include the educational services, and health care and social assistance industry, followed by the arts, entertainment, and recreation, and accommodation and food services industry and the construction industry (USCB 2013a).

Fire Island is a seasonal recreation area, with a seasonal economy from April through October. Peak economic activity occurs during summer months of June, July, and August. The seasonal nature of Fire Island is evident in the island’s year-round population of 366 individuals as compared with its significantly larger seasonal population of approximately 20,000 individuals (USCB 2013b and USACE 2014b).

The retail sector comprises the majority of economic activity, accounting for more than three-quarters of employment. Key businesses in the retail sector include restaurants, grocery stores, and liquor stores. These types of businesses are important to the local economy, given that Fire Island has a high proportion of seasonal renters and second-home owners whose objective is to enjoy the island's recreational and vacation resources. In addition, there is limited access to the bayshore of Long Island, which creates a more captive market and greater demand for convenient goods and services (USACE 2014b).

Economic activity on Fire Island is generally based around the ferry terminals and marinas on the island, because these are the access points for residents and day visitors. Businesses tend to be located on the bay side of Fire Island, and along the primary routes from the bay to the ocean beaches, e.g., Broadway in Saltaire and Harbor Walk in Fire Island Pines. Some service sector businesses operate out of home offices, including real estate offices, accounting services, and desktop publishing. Since private vehicles are restricted on Fire Island, transportation routes on Fire Island are limited to boarded and paved walks in the villages and communities and sand pathways in less developed areas. Travel between villages and communities is somewhat restricted on Fire Island, resulting in relatively isolated communities or clusters of communities. People travel on Fire Island by walking, riding bicycles, and taking water taxis. The water taxis transport people between communities and villages on Fire Island that otherwise would be too distant or difficult (due to sand pathways) to access by foot or bicycle. Personal belongings and purchases are transported from the ferries and local shops to residences via small wagons. The primary economic activity in the villages and communities is described below and is organized by ferry stops, the mode by which most individuals travel to the residential communities and visitor centers on Fire Island (USACE 2014b).

3.9.2.2 Mainland

In 2013, the largest employment industries in Suffolk County include educational services, and healthcare and social assistance industry (26 percent), the retail trade industry (12 percent), and the professional, scientific, and management, and administrative and waste management services (11 percent) (USCB 2013a). In 2008, employment growth in the Nassau-Suffolk region declined during an unfavorable national economic climate. The number of jobs in the region decreased through 2010 However, total non-farm employment in February 2011 saw in increase of 7,900 jobs, up to 1.2 million since February 2010. Between March 2010 and March 2011, there was employment growth in a few categories, the largest employment growth occurred in the education and health services and leisure and hospitality industries. The larges job losses occurred in government, construction, and manufacturing.

Tourism also contributes significantly to the economy in Suffolk County. Easter Suffolk County is a major tourist and second-home destination, with one of the largest concentrations of second homes of any county in the United States (SCDP 2011). There are approximately 37,000 second homes in eastern Suffolk County, which draws approximately 140,000 part-time residents with large purchasing power to the area during the summer and on weekends. This second home economy adds considerably to the economy of Suffolk County, especially in the summer months.

The value of agricultural production in Suffolk County was $243 million in 2007, the highest of any county in New York State. As of 2007, there were 34,000 acres of farmland in the County, primarily in eastern Suffolk County. Farmland acreage in the County declined for decades after

World War II as farmland was sold to residential developers. Since the 1990s, the number of acres of farmland has remained fairly steady. Some farms have converted to the low labor, high value production of sod, ornamental and nursery plants, and grapes. Once famous for oysters, potatoes, and ducks, Suffolk County is becoming well-known for its quality wines.

The county's 2013 per capita personal income was $56,940, ranking fifth in the New York State and was 105 percent of the state average, $54,462, and 127 percent of the national average, $44,765. The total personal income in 2013 was $85 billion, this represents a ranking of fifth highest of all county in New York State and accounted for eight percent of the state total (BEA 2014).

Through 2010, there were more than 49,000 business establishments with payroll in Suffolk County. The largest numbers of businesses are in the construction category; followed by retail trade, professional and technical services, health care, and financial activities. Sixty-two percent of Suffolk's businesses employ fewer than five persons, and 78 percent of businesses in Suffolk employ fewer than 10 persons.

Overall, Suffolk County's unemployment rate in 2014 was 5.3 percent, an improvement over the 2013 unemployment rate of 6.5 percent (BLS 2015). This decrease in the county unemployment rate is a further improvement over the 2011 rate of 7.6 percent, and 2012 unemployment rate of 7.8 percent. These rates are lower than both the U.S. and New York State unemployment rates yet slightly higher than neighboring Nassau County. While the poverty rate in Suffolk County is one of the lowest of all counties in New York State, 6.4 percent of the county's population were reported to be living in poverty in 2013 (USCB 2013a). It is important to note that since Suffolk County is a relatively high cost area, poverty here can be understated as the national poverty threshold in 2013 was $23,834 for a family of four (USCB 2013c).

3.9.3 Population

3.9.3.1 Barrier Island

As of the 2013 American Community Survey 5-year estimates, a population of 509 was report for the barrier island communities of Ocean Beach, Saltaire, and the Fire Island CDP (USCB 2013b). 2010 Census reported a population of 408 and 491 in 2000 (USCB 2013b) (Table 3.9-1).

Table 3.9-1. Historic Population for Fire Island Communities

Location	2000	2010	2013
Ocean Beach	43	79	81
Saltaire	138	37	62
Fire Island CDP	310	292	366
Total, Fire Island	**491**	**408**	**509**

Source: USBC 2013b

3.9.3.2 Mainland

The population of Suffolk County overall increased by 5.2 percent between 2000 and 2010, from 1,419,369 to 1,493,350; this exceeds the growth rate for New York State for the same period (USCB 2013b). An estimated 1,495,803 persons lived in Suffolk County in 2013 (USCB 2013b), a 5.4 percent increase from the 2000 Census; this exceeds the 2.6 percent growth rate for New York State for the same period.

Suffolk County's population is projected to continue to increase slowly for the next 25 years. Based on current trends and a gradual reduction in the amount of vacant land available for residential development, Suffolk County's population is projected to increase by 240,000 or 16 percent between 2010 and 2035. Table 3.9-2 presents projected population growth in town within the Study Area between 2010 and 2035.

Of the towns within the Study Area in Suffolk County, the largest percentage increase in population between 2010 and 2035 is expected in the Town of East Hampton (31 percent), followed by the towns of Southampton (27 percent) and Brookhaven (25 percent).

Table 3.9-2. Population Projection of Study Area Towns

Location	2010	2015	2020	2025	2030	2035
Babylon	213,603	223,300	228,100	231,600	233,800	235,300
Brookhaven	486,364	522,400	554,900	579,300	595,500	607,000
East Hampton	21,457	23,700	25,400	26,600	27,500	28,200
Islip	335,543	344,200	353,000	359,500	363,700	366,500
Southampton	57,452	63,900	67,400	69,900	71,700	73,100
Suffolk County	1,493,350	1,579,900	1,648,800	1,700,200	1,734,300	1,758,300

Source: SCDP 2011.

The eastern end of Suffolk County, including the towns of East Hampton and Southampton, is less populated but is expected to undergo continued growth. The western portion of the Study Area contains the majority of the Study Area's population and is markedly more densely populated than the eastern portion.

3.9.4 Housing and Household Size

3.9.4.1 Barrier Island

Seasonal, occasional or recreational use housing accounts for approximately 93 percent of housing units on Fire Island. Table 3.9-3 features housing data for the Fire Island Communities.

Table 3.9-3. 2013 Census Data for Fire Island Communities – Housing

Location	Total Housing Units	Occupied Housing Units	Owner Occupied Housing Units	Renter Occupied Housing Units	Vacant Units	Housing for Seasonal, Occasional or Recreational Use
Ocean Beach	595	39	39	0	556	553
Saltaire	475	29	25	4	446	444
Fire Island CDP	3123	124	111	13	2,999	2,911
Total, Fire Island	**4,193**	**192**	**175**	**17**	**4,001**	**3,908**

Source: USCB 2013b

3.9.4.2 Mainland

Suffolk County, has 70 percent owner-occupied housing rate (USCB 2013b). According to the SCDP, the amount of land that is vacant and available for future home development is becoming more limited than in the past (SCDP 2011).

The average household size in Suffolk County has decreased over the past several decades; the average household size in 2010 was 2.93 people (SCDP 2011). These represent lower numbers than the average household size of 3.04 in 1990 and its peak of 3.7 in 1967 (SCDP 2011).

Table 3.9-4 provides housing data for mainland communities.

Table 3.9-4. 2013 Census Data for Mainland Communities - Housing

Location	Total Housing Units	Occupied Housing Units	Owner Occupied Housing Units	Renter Occupied Housing Units	Vacant Units	Housing for Seasonal, Occasional or Recreational Use
Babylon	4,673	4,521	3,398	1,123	152	0
Brookhaven	1,274	1,063	896	167	211	48
East Hampton	1,891	593	434	159	1,298	1,161
Islip CDP	6,656	6,334	5,242	1,092	322	0
Southampton	2,976	1,292	978	314	1,684	1,550
Suffolk County	569,196	497,347	397,731	99,616	71,849	45,337

Source: USCB 2013b

3.9.5 Income

3.9.5.1 Barrier Island

In 2013, the median family income in Ocean Beach Village was $53,750 and per capita income was $36,333. The median family income for the Village of Saltaire was $219,167 and per capita income was $114,792. In Fire Island CDP, the median family income was $81,875 and per capita income was $32,747 (USCB 2013a).

Many of the communities of the barrier islands are part of larger towns and villages of the mainland; therefore, income information for residents of the barrier island are included within the per capita and family income estimates provided for the five major towns of the mainland Study Area and presented below.

3.9.5.2 Mainland

There is significant variation in the per capita and family income among Study Area towns on the mainland, as shown in Table 3.9-5. However, per capita income in most of the Study Area is above the state average. Median family incomes in Study Area towns are all higher than the median family income for New York State. In fact, in 2010 median family income in Suffolk County ranks 26th highest in the nation, and total personal income amongst residents in Suffolk County ranked 5th of all counties in New York in 2002 (SCDP 2011). Per capita income (2013 estimate, in 2013 inflation-adjusted dollars) for Suffolk County is $36,945 and median family income (2013 estimate, in 2013 inflation-adjusted dollars) is $100,652 (USCB 2013a).

Table 3.9-5. Per Capita and Family Income for Mainland Towns

Location	Median Family Income	Per Capita Income
Babylon	$115,754	$43,541
Brookhaven	$102,563	$38,930
East Hampton	$89,596	$96,923
Islip CDP	$107,960	$40,407
Southampton	$108,576	$82,077
Suffolk County	$100,652	$36,945
New York State	$70,670	$32,382

Source: USCB 2013a

3.9.6 Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations. This order requires that "each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities, on minority populations and low-income populations" (Executive Order 12898, 59 Federal Register 7629 [Section 1-201]).

The population in the Study Area was evaluated to determine the potential for the Project to adversely affect minority and/or low-income populations. The EPA's EJSCREEN, an environmental justice screening and mapping tool was used to determine the presence of environmental justice populations within the Study Area. The EJSCREEN uses estimates for Census Block Groups. Census Block Groups are statistical divisions of Census Tracts and are the smallest geographic unit the Census uses to report sample data (i.e. data which is only collected from a fraction of all households). Figure 3.9-1 shows the potentially affected areas within the Study Area. Census Block Groups within the outlined area were used to identify environmental justice populations.

The significance thresholds for environmental justice impacts are established at the county level. For this analysis of baseline conditions of the existing environment, individual Census Block Groups are assumed to contain disproportionately high percentages of minority or low-income populations if the percentage of minority or low-income persons in the Census Block Group exceeds 50 percent of the population within a Census Block Group, or if the percentage is meaningfully greater than the associated county. The percentage of minority populations in Suffolk County is 29.0 percent and the percentage of individuals below the poverty level is 6.4 percent (USCB 2012a, USCB 2012b) (Table 3.9-6).

In 2013 an estimated non-Hispanic Whites made up 71 percent of the population of Suffolk County (USCB 2013b). The largest minority group in the county is Hispanic, with 17 percent of the population in 2013; Black or African Americans represented seven percent of the population, Asians represented four percent of the population, and American Indians represented less than one percent (USCB 2013b).

Census Block Groups with environmental justice populations were identified in all five mainland towns within the Study Area. There were 36 Census Block Groups with populations greater than 50 percent minority. There were 55 Census Block Groups with low-income populations that were meaningfully greater than Suffolk County (i.e. 20 percentage points greater). No environmental justice populations were identified on the barrier island.

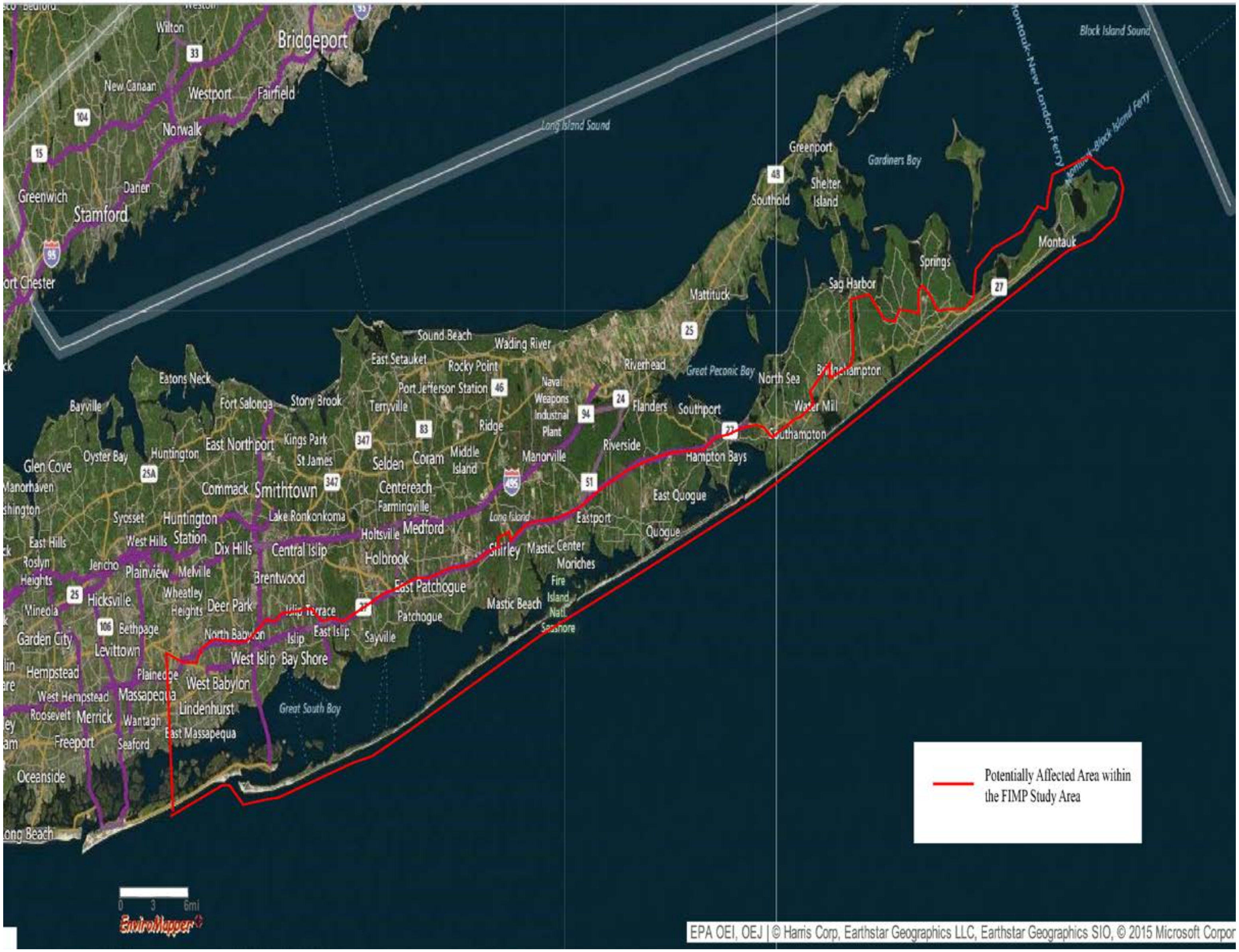

Figure 3.9-1. Potentially Affected Area within the FIMP Study Area

Table 3.9-6. Minority and Low-Income Populations for Study Area

Location	Percent Minority	Percent of People Below Poverty Level
Ocean Beach	0.0%	12.3%
Saltaire	17.7%	0.0%
Fire Island CDP	18.9%	3.7%
Babylon	14.3%	5.2%
Brookhaven	21.2%	6.3%
East Hampton	12.1%	2.4%
Islip	25.3%	2.8%
Southampton	25.1%	11.2%
Suffolk County	29.0%	6.4%

Source: USCB 2013a, USCB 2013b

3.10 CULTURAL RESOURCES

This section identifies the known and potential significant cultural resources, including archaeological and architectural resources, in the Study Area. This section is organized by geographic area into subsections addressing offshore, nearshore, barrier island, back bay, and mainland areas. Identification of cultural resources is necessary to assess the potential impacts of proposed activities on such resources in order to comply with the criteria of the National Historic Preservation Act of 1966, as amended, through 1992 (36 CFR Part 800, Protection of Historic Properties) and the Abandoned Shipwreck Act of 1987 (NPS 1990).

3.10.1 Offshore

This section identifies known and potential submerged archaeological resources in the offshore zone along the south shore of Long Island from Fire Island Inlet to Montauk Point. Findings are based on the results of a remote sensing survey as documented in Tidewater Atlantic Research, Inc.'s Remote Sensing Archaeological Survey of Borrow Areas 2A, 2B, 2C, 3A, 4A, 4B, 5A, 6A, 7A, and 8A, Atlantic Coast of Long Island, Fire Island to Moriches Inlet, Suffolk County, New York, Reformulation Study (Tidewater Atlantic Research, Inc. [TAR] 2002).

3.10.1.1 Shipwrecks

TAR conducted a remote sensing survey in 2000 to assess the potential for submerged archaeological resources in the offshore zone along Long Island's south shore (TAR 2001). Field investigations were carried out between May 7 and 25, 2000. Remote sensing data was collected using both proton precession magnetometers and a side-scan sonar. Eleven (11) survey areas were chosen for analysis in an area from approximately 10 miles east of Fire Island Inlet to approximately 14 miles west of Montauk Point.

Analyses of the magnetic and acoustic data from the 11 Long Island borrow areas identified 10 magnetic and/or acoustic anomalies. One of those anomalies was identified in Area 2A, four in

Area 4A, three in 5A, and one each in Areas 6A and 7A. Assessment of the target signatures suggests that five of the anomalies (2A-01, 4A-02, 5A-01, 5A-02, 7A-01) could be associated with shipwreck remains. Signature characteristics of the remaining five targets are suggestive of anchors, pipe, cable, or other single ferrous objects and are not recommended by TAR for additional investigation.

At the conclusion of this work, five target areas were identified as potentially sensitive for submerged archaeological resources. It is the conclusion of the study that the five target sites be avoided by establishing a 150-foot buffer zone around the center of each anomaly's coordinates.

To assess the buffer zone effectiveness, it is further recommended that the target environment at each site be periodically monitored to determine what, if any, change has occurred. In the event that they cannot be avoided, additional investigation is recommended to identify and assess the significance of the material generating each signature. Where material is found to be associated with shipwreck remains, it is recommended that sufficient data be collected to support a preliminary determination of National Register of Historic Places (NRHP) eligibility and identify any additional on-site research that may be necessary. These Phase II investigations could generate data that make positive associations with specific Long Island shipwrecks.

3.10.1.2 Drowned Terrestrial Sites

No underwater, former terrestrial archaeological sites have been identified off-shore of Long Island. The potential for the existence of significant, intact, or feasibly retrievable resources in this zone is low due primarily to the dynamic nature of this area (John Milner Associates [JMA] 2000).

3.10.2 Nearshore

This section identifies existing significant cultural resources, along Long Island's Atlantic shore (nearshore and beach) and inlets. The Area of Potential Effect consists of the beach and dune area shoreward of existing structures and roads.

There is a high potential for buried archaeological deposits within undefined portions of the Study Area underlying the beaches and dunes (JMA 2000). In areas that may be disturbed, it is recommended that core borings be taken in areas of disturbance that would be examined by a geoarcheologist knowledgeable of coastal sedimentology. If any preserved surfaces are identified in the borings, monitoring of construction activities in those locations for potential archaeological deposits may be necessary.

JMA's cultural resources study (JMA 2000) documented shipwrecks along the Atlantic side of the Long Island near-shore area, from Fire Island to Montauk Point. A Long Island shipwreck study, investigating wreck sites from Fire Island Inlet to Moriches Inlet, was previously completed for the USACE (Greeley-Polhemus Group 1997). An inventory was compiled for that report, which listed 155 wrecks in the Fire Island Inlet to Moriches Inlet portion of the Study Area. Those wreck sites are included in the JMA study. The number of undocumented shipwrecks potentially far exceeds the list of known shipwrecks in the Study Area.

A total of 453 vessels are known to have wrecked in the Study Area (JMA 2000). While the present disposition and exact location of most of the wrecks is not known, at least 120 of the ships were described as wrecked on, or near, the beach and likely fall within the nearshore habitat. At least 21 of the documented wrecks occurred offshore, and are believed to be located well away from the nearshore habitat as defined by the FIMP study. As many as six of these sites are well known to the local sport diving community. In addition to these 21 offshore wreck sites, numerous vessels have been scuttled to form six artificial reefs offshore of Suffolk County.

Of the 453 documented wrecks, at least nine were later re-floated and removed by wreckers and salvagers; numerous other ships also may have been removed after grounding near the beach (JMA 2000). There are no previously identified historically significant shipwrecks located within the near-shore habitat of the Study Area. Background research indicates that at least four historically significant ships have wrecked in the Study Area: Dutch ship *Prins Maurits* (1657), sloop *Woodcock* (1814), steam packet *Savannah* (1821), and steamer *Great Western* (1876) (Greeley-Polhemus Group 1997). Those wrecks, if located, are potentially eligible for listing on the NRHP due to their association with historical events. Researchers and the USACE recommended underwater archaeological fieldwork for the near-shore portion of the Study Area to identify any submerged cultural resources. Studies recommended include a low-water survey along the tidal zone and a near-shore remote sensing survey using magnetometry and side-scan sonar (Greeley-Polhemus Group 1997).

3.10.3 Barrier Island

This section identifies existing significant cultural resources, including archaeological and architectural resources, on the barrier island of Long Island's south shore from Fire Island Inlet to Shinnecock Inlet. The Area of Potential Effect consists of the beach and dune area shoreward of existing structures and roads. Potentially affected architectural properties were considered to be those visible from the beach itself (NPS 2004; JMA 2000).

Findings are based on a cultural resources study completed by the USACE (JMA 2000). Significant cultural resources were identified by a Phase 1A archaeological survey and a reconnaissance-level architectural resources investigation performed by JMA. A Phase 1B archaeological survey was also performed for a short section of coastline west of Shinnecock Inlet. Architectural resources include those identified by the NYSOPRHP / State Historic Preservation Office (SHPO) or listed or determined eligible for listing on the NRHP. Resources potentially eligible for listing on the NRHP as well as resources believed to be potentially impacted by such activities as dune enlargement, groin construction, or the raising of structures were also considered.

3.10.3.1 Archaeological Resources

Portions of two previously recorded historic archaeological sites are located within the Study Area, according to SHPO's archaeological site files. Site A103-05-000605, within Robert Moses State Park, was a recreational facility built for handicapped children in the early part of the 20^{th} century; the other site (Site A103-02-1579) is a complex of structures near Whalehouse Point used by the Coast Guard from the mid-19th century to the early 20th century. Both sites are located on sand dunes bordering Great South Beach. The Historic Preservation Field Services Bureau considers both sites to be potentially eligible for listing on the NRHP (Gray and Pape 2005).

A Phase 1B archaeological survey was conducted along the west side of Shinnecock Inlet, for a distance of approximately 4,000 feet, from 30 to 65 feet south of Beach Road. The eastern 990 feet of this survey area was disturbed from prior cut and fill activities. Six flakes and shatter of chalcedony were recovered from this area; the artifacts most likely represent inclusions within the re-deposited fill material. The remainder of the Phase 1B Study Area was deemed to be culturally sterile and is not sensitive for archaeological features.

Conversely, there is a high potential for buried archaeological deposits within undefined portions of the Study Area underlying the beaches and dunes. However, specific areas of high potential are probably quite localized and impossible to define precisely without further investigation (JMA 2000). In areas that may be disturbed, it is recommended that core borings be taken in areas of disturbance that would be examined by a geoarcheologist knowledgeable of coastal sedimentology. If any preserved surfaces are identified in the borings, monitoring of construction activities in those locations for potential archaeological deposits may be necessary.

3.10.3.2 Architectural Resources

Resources Listed or Determined Eligible for Listing on the NRHP – The following two resources located in whole, or in part, within the Area of Potential Effect that have been listed on the NRHP:

1) Fire Island Light Station (Town of Islip). Located about 5 miles from the western end of FIIS; listed in the NRHP on September 11, 1981.
2) Beach Road Historic District (Village of Southampton): This small district, listed in the NRHP on October 2, 1986, is located along Beach Road at the beginning of Western Barrier Beach and includes mansions that display a variety of early 20th century architectural elements.

Resources Potentially Eligible for Listing on the NRHP – JMA's architectural investigation identified several potentially eligible historic resources within the Study Area, related to the historical settlement and pre-resort development, vacation/resort industry, and maritime histories of the barriers (JMA 2000). Reconnaissance field surveys identified 22 potentially eligible resources that meet the 50-year age consideration of the NRHP. These potentially eligible resources are listed in Table 3.10-1. It is noted that a formal determination of eligibility requires an intensive, Phase II level survey of each property.

If Project/reformulation activities are proposed in proximity to NRHP-listed or eligible resources, evaluation under Section 106 of the National Historic Preservation Act to determine the effect of the proposed activity would be necessary. If a project is proposed in close proximity to other architectural properties identified as potentially eligible in the reconnaissance survey, intensive, Phase II level survey of these resources would be necessary. This type of survey would generally result in the preparation of a SHPO Building-Structure or District Inventory Form. This completed form would allow evaluation of NRHP eligibility by SHPO, and this eligibility evaluation would determine whether a Section 106 effects evaluation is necessary.

Table 3.10-1. Resources Potentially Eligible for Listing on the National Register

No.	Name/Description	Location
1	Tiana Beach buildings	Tiana Beach
2	Cottages	East of Triton Lane, Tiana Beach, Town of Southampton
3	Cottages	West of Dolphin Lane, Tiana Beach, Town of Southampton
4	Wood-framed house	East of Quogue Beach, Village of Quogue
5	Gabled roof, wood-framed cottages	East of Quogue Beach, Village of Quogue
6	Westhampton Beach house	Village of Westhampton Beach
7	House	West of Westhampton Beach, Village of Westhampton Beach
8	House	West of Westhampton Beach, Village of Westhampton Beach
9	Former Quogue Coast Guard Station	South side, Dune Road, Village of Quogue
10	Robert Moses State Park Tower	Fire Island
11	Colonial Revival house	Corneille Estates, Ocean Beach, Fire Island
12	Hip-roofed house	Corneille Estates, Ocean Beach, Fire Island
13	Dutch Gable, Wood-framed house	Ocean Bay Park, Fire Island
14	Gable-roofed house with shed dormers	Seaview, Fire Island
15	Former Point O'Woods Life Saving Station (present Fire Island Hotel and Resort)	Ocean Bay Park, Fire Island
16	Point O'Woods	Fire Island
17	Gable-front bungalow	Cherry Grove, Fire Island
18	Eaves front bungalow	Cherry Grove, Fire Island
19	One and one-half story, eaves front house	Cherry Grove, Fire Island
20	Gable and hip-roofed house	Cherry Grove, Fire Island
21	Eaves front bungalow	Cherry Grove, Fire Island
22	Eaves front house	Fire Island Pines

Source: JMA 2000

3.10.4 Back bay

Once more detailed alternatives are prepared, site specific research can be undertaken in areas that may potentially be impacted in order to obtain the information required to determine the presence or location of submerged archaeological resources in this portion of the Study Area.

3.10.5 Mainland

This section identifies existing potentially significant cultural resources, including architectural resources and districts, along Long Island's bayside shore. These data are based on a historic resources study completed in March 2006 by the USACE (URS 2006). The Area of Potential Effect consists of the area between the bayside shoreline and Montauk Highway (Routes 27A/85/80/27) to the north and within the 10-year floodplain. Cultural resources were identified based on a reconnaissance-level architectural resources investigation performed by URS.

Several of the identified resources were concluded to be potentially eligible for listing on the National Register of Historic Places (NHRP). The field survey did not include the formal identification of belowground archaeological resources. Although the primary focus of the survey was on individual buildings, districts, landscape features, historic sites, objects, and other structures were also considered.

3.10.5.1 Individual Properties Eligible for Listing on NRHP

The historic resources survey was intended to represent the full range of existing types and styles in aboveground resources, focusing on those 50 years and older and associated with the historical context of the Study Area. Other properties not presently inventoried or not included in the URS study may also exhibit potential for listing on the NRHP (URS 2006). One thousand four hundred and ninety (1,490) historic resources were surveyed; of those, 49 were identified as being potentially eligible for the NRHP as individual resources. To develop a preliminary list of properties likely eligible for listing on the NRHP, each inventoried property was evaluated for the presence or absence of criteria (setting, location, materials, feeling, workmanship, design, and association) included in National Register Bulletin 15: *How to Apply the Criteria for National Register Evaluation* (Andrus 2002). See Appendix E for a list of the properties that have been determined to be potentially eligible for listing on the NRHP. However, a formal determination of eligibility requires an intensive, Phase II level survey of each property.

The vast majority of historic resources within the Area of Potential Effect are residential properties associated with the time period of 1820–1960. Most of the 49 identified potential historic resources are located in the easternmost parts of the Area of Potential Effect; 11 are in Quogue and eight are in West Hampton Bay. 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 resources was early suburbanization, for which the period of significance falls between 1890 and 1920.

3.10.5.2 Districts Potentially Eligible for Listing on the NRHP: West of Shinnecock Inlet

According to National Register Bulletin 15 (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.

Past cultural resource surveys for the Area of Potential Effect, as well as several local level surveys identifying historic architecture in Suffolk County were reviewed and utilized in identifying these above ground resources (URS 2006), including the Society for Long Island Antiquities' sponsored investigation of historic architecture in Islip and the Southampton Cultural Resources Survey conducted by GAI Consultants, Inc. (GAI), with Fanning, Phillips & Molnar (FP&M). The combined GAI and FP&M study identified the following potential historic resources within the Town of Southampton proximate to the Study Area:

1) Canoe Place Historic District (approximately 20 historic resources located on Montauk Highway, Canal Road, and Canoe Place Road), significant for its association with the important settlement, transportation, and religion themes in Canoe Place area;
2) Remsenberg Historic District (approximately 30 historic resources located along South Country Road in Remsenberg), eligible for association with the settlement and history of Speonk/Remsenberg and for its buildings in the Federal, Greek, Italianate, and Romanesque Revival styles;
3) East Quogue Historic District (approximately 38 historic resources from Montauk Highway south to Tiana Bay), eligible for its association with the summer resort theme and for its collection of Queen Anne style buildings; and,
4) Quogue Historic District (approximately 16 historic resources along Main Street, Meetinghouse Road, Woodbridge Avenue and several side streets south of Montauk Highway), eligible for association with the Quogue Homestead Association and as a summer resort, as well as for its important collection of well-preserved Shingle and Queen Anne style residences.

An additional 10 potentially eligible historic districts were identified within the Area of Potential Effect (URS 2006). 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 Westhampton 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 more properties associated with seasonal use and resort activities are located further east. See Appendix F for a list of the districts and their components that have been determined to be potentially eligible for listing on the NRHP. It is noted, however, that a formal determination of eligibility requires an intensive survey of each district.

Because the 2006 URS survey sampled only 1 percent of a random 10 percent survey area on the mainland and was not a comprehensive survey of all potentially affected resources, Section 106 evaluation of the effect of the Project will be necessary for all proposed reformulation activities on the mainland. If a project is proposed in close proximity to other architectural properties identified in the reconnaissance surveys as potentially eligible for inclusion on the NRHP, intensive, Phase II level survey of these resources would be necessary. This type of survey would generally result in the preparation of a SHPO Building-Structure or District Inventory Form. This completed form would allow evaluation of NRHP eligibility by SHPO, and this eligibility evaluation would determine whether a Section 106 effects evaluation is necessary.

3.10.6 Native American Consultation

Within the FIMP study area are two Tribal Nations: the Shinnecock Indian Nation and the Unkechaug Indian Nation (Poospatuck). The Shinnecock Indian Nation is a Federally-recognized

Tribe. The Unkechaug Indian Nation does not have Federal status, but is recognized as a Tribe by the State of New York. A third tribal group, the Shirley-Mastics is affiliated with the Unkechaug Indian Nation. Both the Shinnecok Indian Nation and the Unkechaug Indian Nation own lands within the APE.

Meetings with representatives of both Nations were held between 2003 and 2006 to communicate the study's goals, discussion of potential impacts to cultural resources, and identification of flood-prone areas for further study.

3.11 TRANSPORTATION

This section discusses transportation systems including: highways and highway bridges, bus service, railroads, airports, and marine services.

3.11.1 Mainland

3.11.1.1 Highways and Highway Bridges

North of the Study Area is a large network of roadways (Figure 3.11-1). Interstate 495, the Long Island Expressway, runs west to east across Long Island from Queens to Riverhead. A number of highways provide east-west access including the Southern State Parkway, Sunrise Highway (Route 27) and Montauk Highway (Route 27A). The Montauk Highway generally represents the northern edge of the Study Area.

The FIMP Study Area is located within the NYS Department of Transportation Region 10 area, which encompasses both Nassau and Suffolk counties. Suffolk County maintains over 420 miles of roads, 140 bridges, culverts and miscellaneous structures, and operates 730 traffic signals. The Suffolk County Department of Public Works (SCDPW) is responsible for snow removal on County roads. In addition, the SCDPW constructs, maintains, and operates county properties; and also designs, constructs, and maintains county roads, sewerage systems, buildings and other facilities, such as bridges, docks and marinas (SCDPW 2008a).

New York State parkways that traverse Suffolk County include the Northern State, Robert Moses, Saktigos, Southern State/Heckscher and Sunken Meadow parkways. According to the Suffolk County geographic information system (GIS) roads data, there are 40.9 miles of Interstate, 49.6 miles of State Parkway, 357.8 miles of State Highway, and 104.41 miles of County Roads (Tetra Tech EMI 2007)

East of the Village of Southampton, Montauk Highway becomes Route 27 and is the only major east-west thoroughfare; and therefore, is a critical roadway in egress and ingress to this part of Long Island. There are a number of north-south thoroughfares in Suffolk County that link to the east-west routes, and are identified below:

- Moriches-Riverhead Road (Route 51) connects Sunrise Highway with Montauk Highway;

- Islip Road (Route 111) connects the Sunrise Highway to the Southern State Parkway and the Long Island Expressway; and,
- Nicholls Road (Route 97) connects the Long Island Expressway, Sunrise Highway and Montauk Highway.

There are local roadways within each of the communities on the mainland, adjacent to Great South Bay, Moriches Inlet, Shinnecock Inlet, and the Atlantic Ocean. Many of the villages are connected to major roadways via roadways of smaller capacity.

3.11.1.2 Railroad

In addition to the vehicular routes, the Montauk Branch of the LIRR provides passenger railroad service from Montauk Point to points west, including New York City. The LIRR is a subsidiary of the New York Metropolitan Transportation Authority (MTA), and is the busiest commuter railroad in North America, carrying an average of 288,000 customers each weekday on 728 daily trains throughout Long Island. Third-rail electric service is offered on the lines including to Babylon and Ronkonkoma, and diesel service is provided on the lines to Montauk (MTA 2008). The LIRR provides connecting service to Fire Island through the local ferry service.

3.11.1.3 Bus

Long Island Bus, a part of the MTA, provides bus service in Suffolk County. The bus routes serve the 48 LIRR stations as well as the beaches and numerous other locations within the county. Additionally, Suffolk County Transit (SCT) provides general public bus service as well as Suffolk County Accessible Transportation (SCAT), which provides curb-to-curb service to individuals with disabilities (SCT 2008a, 2008b).

3.11.1.4 Airports and Heliports

There are several public and private airports and heliports located in the towns in the Study Area. These include Republic Airport in Babylon, East Hampton and Montauk airports in East Hampton, Bayport Aerodome and MacArthur Airport in Islip, as well as Southampton Heliport and Francis S. Gabreski Airport in Southampton. The Gabreski Airport is also home to the 106th Rescue Wing of the Air National Guard (Tetra Tech EMI 2007, Suffolk County Department of Economic Development 2008). MacArthur airport is 4 miles north of the Sayville ferry dock.

3.11.1.5 Ferry Service and Marinas

The protected creeks, rivers, bays, and shoreline make Long Island’s South Shore an ideal location for maritime transportation. More than 60 marinas exist along the mainland (NYSG 2008). Recreational boaters use these marinas primarily to anchor or tie up their boats for a short- or long-term stay, and many provide a range of repair, storage, and sales services.

The three public ferry companies transport approximately one million visitors to Fire Island, and two private ferries provide service to Point O' Woods and Bellport Beach exclusively for their residents. The ferries operate from Bay Shore, Sayville and Patchogue to the communities on Fire Island. Ferry service schedules are coordinated with the LIRR schedule to assist passengers with the commute. Transportation service to the island is adequate for its current visitors, although demand may be limited by the cost of the ferry service, and the requirement to pay for parking on the mainland.

3.11.2 Barrier Island

According to the NPS (2008), it is estimated that 2.2 million people come to Fire Island annually, to one of the 17 private communities, the county park, one of the national seashore facilities, or to waters surrounding the island. Approximately one-third of these visits are recreational visitors to the FIIS. In addition, 3.5 million visitors travel to the Robert Moses State Park at the western end of the barrier island (NYSOPRHP 2008b).

3.11.2.1 Highways and Highway Bridges

Visitors access Robert Moses State Park, at the west end of Fire Island, via the Robert Moses Causeway, which is an extension of the Southern State Parkway, over the Great South Bay to Captree State Park and over the Fire Island Inlet. The Robert Moses Causeway also provides access to Ocean Parkway toward Gilgo State Park and Jones Beach State Park on Jones Beach Island. Traffic to Smith Point County Park turns south off Route 27A to the William Floyd Parkway (County Route 46), which provides access over Narrow Bay.

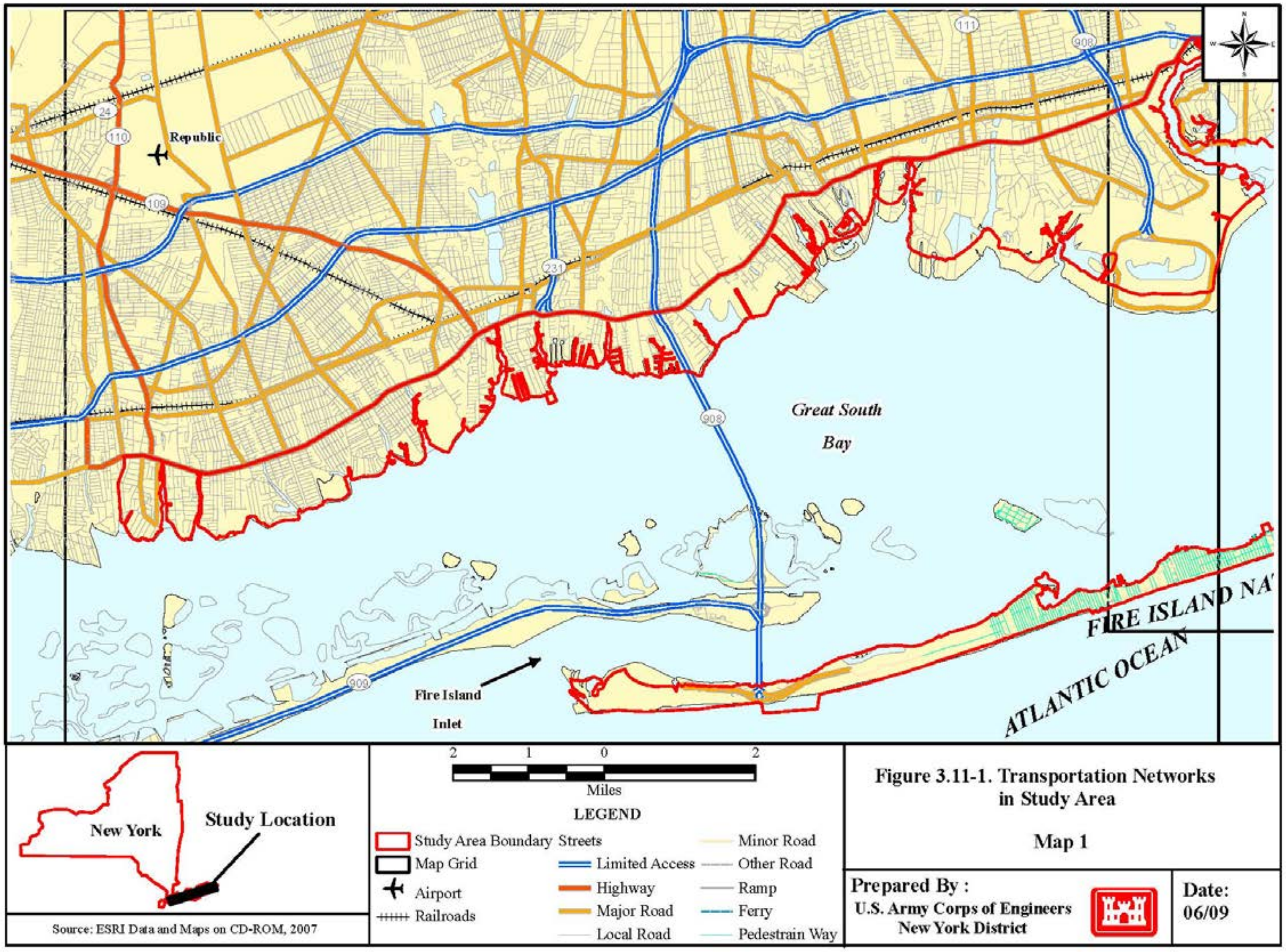

Figure 3.11-1. Transportation Networks in Study Area

Dune Road is the major east–west thoroughfare between Moriches Inlet and the western side of Shinnecock Inlet. Dune Road connects to the mainland via Jessup Lane and Beach Lane in Westhampton Beach, by Post Lane in Quogue, and by the Ponquogue Bridge in Ponquogue. East of Shinnecock Inlet, Dune Road also provides east-west access from the barrier island to the Village of Southampton via Halsey Neck Road, Cooper Neck Lane, First Neck Lane and South Main Street.

There are no paved roads between communities on Fire Island. Although there is access for emergency vehicles, other automobile transportation is limited to recipients of special permits.

3.11.2.2 Ferry Service and Marinas

Travel to the Fire Island communities and the FIIS is by ferry or private boat to the central area of the island where residential communities and the FIIS visitors' centers are located. Access to Fire Island is mainly by ferry service from Bay Shore, Sayville, and Patchogue, or private boat access.

Fire Island has 10 marinas that accommodate more than 1,000 boats. About one-third of the slips are leased on a transient basis, and the remainder are leased seasonally. Six of the marinas are private and four are public concessions. Only two facilities, those at Robert Moses State Park and at Seaview, operate year-round. Half of the marinas, including both FIIS facilities, include such amenities as grocery or supply stores.

Docking facilities for private boats are located in many communities, including Atlantique, Seaview, and Fire Island Pines. Talisman/Barrett Beach and Water Island, which were previously accessible only by private boat, began service by ferry in 1998. However, private boat remains the most common form of access to communities such as Lonelyville and Oakleyville, which have no direct ferry service, but are accessible by private boat.

3.11.2.3 Other Transportation

Two alternative modes of travel used by a small number of visitors to Fire Island are seaplane and bicycle. The only seaplane landing is the public landing at the Fire Island Pines harbor. The William Floyd Parkway Bridge over the Narrow Bay to Smith Point offers the only bicycle access to Fire Island, with a bicycle/pedestrian lane providing access to the county park and FIIS Otis G. Pike Wilderness Area Visitors' Center. The Robert Moses Causeway to Robert Moses State Park is too narrow to accommodate a bicycle lane.

Great Gun Beach, a Town of Brookhaven beach at Smith Point, is currently only accessible by private boat, and docking facilities are available for the day only. It is also accessible via 4-wheel drive vehicles, or on foot, from Smith Point County Park.

3.11.2.4 Evacuation Routes

Traffic congestion has increased on Long Island in the past 20 years due to increases in both population and the number of licensed drivers. In 2005, there were over one million licensed drivers in Suffolk County. Because Suffolk County's population and employment destinations are spread out over a large area, transportation via mass transit for intra-county travel can be difficult. Although there are major transportation corridors along the south shore of Long Island, a number of villages are only connected to major roadways via roadways of smaller capacity. Under certain conditions, roadway access to these communities can be severely restricted or blocked by flooding.

The Hurricane Evacuation Study for Suffolk County, completed in 1993 (cited in Tetra Tech EMI 2007), included a traffic flow analysis which was used to identify critical roadway links and intersections where congestion impacted estimated clearance times. The locations within the region that are known traffic congestion points, that directly impact evacuation within the Study Area include:

- Montauk Highway east of Southampton;
- Route 111 (Islip Avenue) and Southern State Parkway interchange;
- Wellwood Road and Sunrise Highway north of Lindenhurst;
- I-495 (Long Island Expressway) westbound; and,
- Ferry service between Fire Island and mainland.

The Suffolk County Evacuations Zones and Shelter Locations Map (April 14, 2006) indicate that the critical evacuation routes include: The Long Island Expressway, Sunrise Highway, and Montauk Highway in the east-west direction. In the north-south direction evacuation routes include: The Babylon-Northport Expressway, Robert Moses Causeway to Southern State, Nicholls Road, Ponquogue Bridge to Lighthouse Road, and Moriches Riverhead Road (Suffolk County Department of Information Technology [SCDIT] 2008).

3.12 VISUAL RESOURCES

The Study Area is home to several scenic, cultural and national landmarks including natural and coastal landscapes, and FIIS, which includes William Floyd Estates and Fire Island Lighthouse. The Study Area is a popular recreational and vacation destination and receives many visitors from nearby metropolitan areas. The scenic backdrop and cultural landscape provides a desirable setting for visitors who desire to escape from the rigors of city life.

A brief description of visual resources located within the Study Area is provided below, and additional information on visual aspects of the cultural resources of the Study Area is provided in Section 3.10.

Fire Island has a long history associated with its use by Native Americans for hunting, fishing, and maritime activities extending from the colonial period to the present day. Great South Bay has been the focal point for residential and economic development since the area was first settled. Due to the elements that continue to affect historic structures and facilities, there are relatively few intact historic structures within the Study Area that are greater than 50 years old (NPS 2008a). This is primarily due to the constant wind and wave action, and occasional storm surge that accelerate the deterioration of man-made structures located within the coastal zone.

The barrier beach and island components of the Study Area are a dynamic environment that is constantly changing as a result of natural, physical forces.

The Study Area provides many opportunities for wildlife viewing, especially within FIIS, and a variety of natural and scenic vistas may be appreciated. The aesthetic qualities of the Study Area are influenced by natural elements, including the numerous beaches and bays located within the Study Area that provide a scenic backdrop to landward visitors as wells as to those traveling the ocean, bay, and river waters that are a key component of the landscape. Recreational activities include exploring miles of beaches and trails, hiking, boating, kayaking, beachcombing, swimming, picnicking and camping, with facilities and services provided by several county parks located throughout the Study Area. All of these activities increase the visibility of the area's natural and built features and elements to visitors and residents.

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, The New York District is not proposing any actions in these areas that will impact these scenic resources of statewide significance.

For facilities under their jurisdiction, NYSDEC Program Policy DEP-00-2 provides guidance for assessment and mitigation of visual impacts, and is used by NYSDEC in their review of Project impacts to visual resources. According to DEP-00-2 a visual impact occurs when mitigating effects of perspective do not reduce the visibility of an object to insignificant levels, with beauty playing no role in the decision making process (NYSDEC 2000).

New York State Coastal Zone Management Program was approved by NOAA in 1982, and is administered through the NYSDOS, Division of Coastal Resources (DCR). The program contains policies and recommended measures to protect the visual quality and scenic resources of areas within the jurisdiction of NYSDOS DCS, including aesthetics and scenic resources associated with both the natural and cultural landscapes.

3.13 AIR QUALITY, NOISE AND GHG'S

3.13.1 Air Quality

Based on the National Ambient Air Quality Standards (NAAQS), Suffolk County is currently classified as 'moderate' nonattainment for the 2008 8-hour ozone standard and 'maintenance' of the 2006 particulate matter less than 2.5 microns ($PM_{2.5}$) standard (40CFR§81.333). The county is part of the Ozone Transport Region. Ozone is controlled through the regulation of its precursor emissions, which include oxides of nitrogen (NO_x) and volatile organic compounds (VOC). Sulfur dioxide (SO_2) is a precursor for $PM_{2.5}$ (USACE 2014a). The project is anticipated to emit emissions associated with diesel-powered construction activities and these emissions will be temporary in nature, spanning only the construction period.

3.13.2 Noise

With regard to noise, the dominant land use in the Project area is coastal beach and residential housing, which generally have outdoor day-night sound levels that range from 59 to 78 A-weighted decibel (USACE 2014a). The ongoing projects and activities associated with the FWOP scenario would not result in significant changes to noise in the area.

3.13.3 Greenhouse Gases

The FIMP construction project is being planned in response to damage caused by severe storm events that eroded beaches along the Long Island coastline, which is an anticipated effect of climate change. The generation of greenhouse gases (GHGs) emissions associated with the project's construction activities will be temporary in nature, spanning only the construction period. The primary GHG emitted from diesel-fueled equipment is carbon dioxide (CO_2). Although nitrous oxides (N_2O) and methane (CH_4) have significantly higher global warming potentials (298 times CO_2 for N_2O and 25 times CO_2 for CH_4)[2], they are emitted at significantly lower rates, resulting in minimal fractional increases in carbon dioxide equivalents (CO_2e) when compared with CO_2 alone.

In addition to the applicable regulated pollutants (Section 3.13.1), each Federal Agency project's NEPA assessments will consider and evaluate GHGs consistent with Council on Environmental Quality (CEQ) revised draft guidance on the consideration of GHGs emissions and the effects of climate change (CEQ 2014a)[2].

[1] EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2013*, April 2015.

[2] See *https://www.whitehouse.gov/administration/eop/ceq/initiatives/nepa/ghg-guidance*

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discusses potential environmental impacts for the four alternatives (No-Action Alternative [or FWOP], Tentatively Selected Plan [TSP], Alternative 1 and Alternative 2) as described in Chapter 2. The following resource areas are addressed: Topography, Land Formation, Key Geologic Characteristics (Section 4.1); Water Resources (Section 4.2); Wetlands (Section 4.3); Vegetation (Section 4.4); Fish and Wildlife (Section 4.5); Rare Species and Habitats (Section 4.6); Land Use and Development, Policy, and Zoning (Section 4.7); Recreational Resources (Section 4.8); Socioeconomic Conditions and Environmental Justice (Section 4.9); Cultural Resources (Section 4.10); Transportation (Section 4.11); Visual Resources (Section 4.12); and Air Quality and Noise (4.13). In addition, this chapter includes an analysis of other environmental conditions, including: Unavoidable Adverse Effects and Considerations that Offset Adverse Effects (Section 4.14.1); the Relationship Between Short-Term Uses of the Environment and Enhancement of Long-Term Productivity (Section 4.14.2); and Irreversible and Irretrievable Commitment of Resources (Section 4.14.3). The chapter concludes with an analysis of potential cumulative impacts (Section 4.14.4).

4.1 TOPOGRAPHY, LAND FORMATION, KEY GEOLOGIC CHARACTERISTICS

4.1.1 No-Action Alternative (FWOP)

Under the FWOP, natural processes as well as anthropogenic factors would continue to have an impact on the existing condition. As explained in Chapter 3, the topography of the project area is spatially and temporally variable due to the presence of dune and beach conditions. The existing condition is represented by a beach which is relatively wide and a dune which is relatively high and wide. To be able to characterize the storm response under a range of future conditions, another topographic condition was established, which is termed a "future vulnerable condition" (FVC). The FVC represents a more vulnerable condition, which has been observed in the Project. Projection of FWOP topography condition for this DEIS is undertaken in a life-cycle analysis which allows the shoreline conditions to vary between the baseline condition and FVC (USACE 2006c). Under the FWOP, the topography of the shoreline would be expected to vary between the baseline condition and the FVC, depending on the following factors (USACE 2006c):

- Existing Coastal Structures
- Expected Future Response
- Long-Term Erosional Trends
- Shoreline Undulations
- Sea Level Rise
- Storms and Ocean Surge
- Erosion Response
- Post-Storm Recovery
- Overwashing and Breaching
- Breach Locations
- Overwash and Breaching Frequency

- Breach Evolution
- Breach Growth
- Back-Bay Water Elevations
- Breach Sediment Transport
- Breach Evolution, Inlet Impact
- Anthropogenic events (e.g., inlet and beach maintenance)

Under the FWOP, future geomorphological processes on Fire Island are expected to be similar to that of the past and present, combined with issues of sea level rise. The present situation is that there is insufficient sediment coming to Fire Island to maintain the entire system.

The sediment deficits are greatest along the eastern portion of the island, but are buffered in the central and western area because of the contributions from an offshore source. The recent acceleration in sea-level rise coupled with the general negative sediment budget will result in continued beach erosion and dune displacement, with greater effects occurring in the eastern portion of the island. Therefore, the barrier island system is constantly undergoing dynamic changes and human occupation is being increasingly exposed to damage and risks, (Psuty et al. 2005).

Dunes stabilize the barrier island beaches; their elevation as well as plants help keep the dune swales able to resist erosion during heavy storm occurrences. There are a variety of administrative programs that are in place to decrease, or mitigate damage to the coastal features, and to encourage the retention and enhancement of the characteristics of the Fire Island National Seashore, (Psuty et al. 2005). It is expected that dune creation activities including revegetation will continue to occur under the FWOP.

Studies occur on Fire Island and will likely continue under the FWOP. For example, since 1993, global positioning system (GPS) surveys of the shoreline position are conducted at annual seasonal intervals along the full length of Fire Island (NPS 2005).

Five major storms have significantly impacted Long Island. In 1938, a Category 3 Hurricane known as the “Long Island Express” resulted in the formation of 12 new inlets on Long Island; Montauk temporarily was an island (TNC 2008). In March of 1962, an extratropical northeaster (known as the “Ash Wednesday” storm) resulted in 50 washovers as well as a new inlet having been formed in Westhampton (Pendleton et al. 2004). Further, a northeaster in December 1992 resulted in two breaches east of Moriches Inlet (Pendleton et al. 2004). Most recently, on October 29, 2012, Hurricane Sandy made landfall over the New York coast, causing massive flooding and substantial damage to Fire Island and Long Island. Coastal erosion and damages within the FIMP Project as a result of Hurricane Sandy were severe, substantial, and devastating. The majority of oceanfront homes in the communities within Fire Island National Seashore were damaged or destroyed. Enormous volumes of sand were carried from the beach and dunes to the central portion of the island, forming large overwash deposits, and the island was breached in multiple locations. With few exceptions, lower-relief dunes were overwashed and flattened. High dunes, which are more commonly found within undeveloped portions of the island, experienced severe erosion and overwash. The elevation of the beach was lowered and the dunes form vertical scarps where they survived.

Over the next 50-year period, Fire Island will encounter issues made greater by sea level rise, predicted to be approximately 7.7 inches at Sandy Hook, NJ. For purposes of the FWOP, an estimate for future sea level rise is based on the historical rate of change for the gauge at Sandy Hook, NJ. Areas of low elevation will experience the effects of sea level rise sooner than the higher areas, and encroachment of water along all of the margins of the barrier islands will result in an overall narrowing of islands, thereby lowering the protective capacity of the island (Psuty et al. 2005).

Under the FWOP, natural coastal processes and sea level rise together with human activities and development will continue to influence shoreline configuration and barrier island dynamics. Groins, jetties, seawalls and other "hardened" structures can provide short-term beach erosion protection, but can also have long-term negative influence on barrier island processes and stability by interrupting the natural sediment budget and littoral transport. Therefore, the USGS suggests that it is important that efforts to rebuild the island be guided by science, which accounts for presently altered shape and position of the barrier island (USGS 2013).

The New York District and local communities will continue to implement projects to maintain the shoreline and maintain navigable inlets and bays. For example, the narrow and low-lying Westhampton barrier will continue to be at risk for breaching during hurricanes and overwash during major storm surges. The Westhampton Interim Project was implemented to reduce erosion and breaching of the barrier. The project provides storm damage risk reduction protection to Westhampton beach areas as well as mainland communities north of Moriches Bay. The project included tapering of nearby groins to allow sand transport, as well as periodic beach renourishment. This project is planned to continue beach nourishment as needed until 2027. Similarly, the Fire Island Inlet to Moriches Inlet Stabilization (FIMI) Project was developed to reinforce the existing dune and berm system along the island, as a one-time, stand-alone construction project to repair damages caused by Hurricane Sandy. The selected design includes beachfill at Robert Moses State Park, Fire Island Lighthouse Tract, all of the communities outside of Federal Tracts, and Smith Point County Park. Beachfill is not included in any Major Federal Tracts, except Fire Island Lighthouse which was requested by the National Park Service to protect the Lighthouse and the only access road to the communities on Fire Island (USACE 2014b).

In the future, the Corps will continue to plan and implement periodic dredging of inlets to keep these channels and bay areas navigable. The dredged materials could then either be placed offshore and reintroduced into the longshore sediment transport system (i.e., sand bypass) or could be used for beach nourishment.

These erosion and shoreline protection plans predominantly rely on Federal and state funding; however, local communities have also privately funded beach erosion protection projects. In addition, communities on Fire Island agreed to impose a special tax to fund a beach nourishment project that would widen beaches and increase dune height (Davis Park 2012).

4.1.2 Preferred Alternative (TSP)

The TSP has been identified as the plan that reasonably balances the policies of the US Army Corps of Engineers and the Department of the Interior, as well as meets the needs from an engineering and economic point of view to restore and enhance the coastal zone of the Project. Implementation of the TSP, which is described in detail in Section 2.3, would consist of:

- Beach restoration (beach and dune fill, berms, and/or sand bypassing),
- Various Breach Response Plans (BRPs),
- Shortening of the existing Westhampton groins and removal of the existing groins at Georgica Pond and Ocean Beach,
- Non-structural plans (retrofits, floodproofing, relocation, acquisition of approximately 4,400 structures, and road raisings), preference will be given to Nonstructural measures that protect and restore coastal landforms and natural habitats
- Sediment Management (including inlet modifications),
- Coastal Process features ,
- 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, and
- Integration of adaptive management (renourishment for 30 years).

From a physical perspective, the TSP would alter the beach/dune profile, reducing the potential for breaching and overwash during storm events and creating greater stability of the barrier island features. By changing the natural coastal barrier processes of shoreline retreat, inlet formation and shoal accumulation, the TSP could affect coastal processes, such as longshore sediment transport, cross island sediment transport, dune development and evolution, estuarine circulation, and bayside shoreline processes, that are vital to maintaining coastal features (i.e., beach, dunes and barrier island). Topography of the shoreline as well as the geomorphological conditions would be expected to change between the baseline condition and the FVC, depending on the above TSP factors. Given the intent of this project to reduce the frequency and to reduce the number of the barrier breaches, beneficial topographic and geomorphological effects are anticipated with the Preferred Alternative. These features are still under refinement and will be finalized with the reports.

The TSP also 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. With regard to topography, land formation, and geologic characteristics, these project-based features would enhance the upper beach/dune width/slope/height, remove parking lots and re-grade to natural contours, reconfigure existing tidal channels, and remove.

With respect to borrow areas, sand would be removed, altering the bottom profile of the ocean floor. Sand taken from the borrow areas will be extracted to a depth no greater than 20 feet below the existing bottom. The total initial fill volume for the proposed action is estimated at approximately 6,440,000 cubic yards (cy). Following completion of the Project, substrate characteristics are expected to be similar to existing conditions. Assuming the large volume of offshore sand that is moving shoreward, removal of such small quantities in the borrow areas on sand ridges on the shoreface would not impact the morphodynamic system that occurs along Fire Island. In addition, given the immense size of the offshore sand ridges near our Project, relatively small borrow areas can provide ample sediments for nourishment projects with minimal or no impact to the onshore movement of sediments (NPS 2008).

4.1.3 Alternative 1

Alternative 1 would result in similar impacts 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).

4.1.4 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.

4.2 WATER RESOURCES

4.2.1 No-Action Alternative (FWOP)

Under the FWOP, current trends are expected to continue and natural processes as well as anthropogenic factors will continue to have an impact on the existing conditions. Water resources within the Project will change in response to various factors including natural succession, sea level rise, coastal erosion and related erosion control activities, periodic dune breaching and overwash, as well as land use changes and infrastructure development.

Water resources considered for analysis encompass both surface and groundwater. Impacts to the quality and availability of surface and groundwater and potential for flooding are addressed in this section. Surface water resources comprise lakes, rivers, and streams and are important for a variety of reasons including economic, ecological, recreational, and human health. Groundwater comprises the subsurface hydrologic resources of the physical environment and is commonly used for potable water consumption, agricultural irrigation, and industrial applications.

Other issues relevant to water resources include watershed area affected by existing and potential runoff and hazards associated with 100-year floodplains. Inundation dangers associated with floodplains have prompted Federal, state, and local legislation that limits development in these areas largely to recreation and preservation activities. Executive Order 11988, Floodplain Management, requires Federal agencies to take action to reduce the risk of flood damage; minimize the impacts of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains.

4.2.1.1 Surface Water

Ongoing projects, activities, and natural processes associated with the FWOP scenario would continue to result in impacts to surface waters in the marine offshore, nearshore, bay subtidal and intertidal, and mainland portions of the Project. Anthropogenic activities such as the continued presence of groins and jetties would continue to alter natural ocean shore processes and impact nearshore ocean waters. Other anthropogenic activities such as dredging and sediment placement activities associated with inlet and navigation channel maintenance, and dredging activities associated with the Coastal Erosion Hazard Area (CEHA) Program, would continue to affect surface waters in the bay subtidal and intertidal zones. While continued development pressure, as well as a continued decrease in mainland protection from storms and sea level rise would continue to negatively impact mainland streams and other surface waters.

Continued dredging in the bay subtidal and intertidal zone of estuarine waters (e.g., dredging inlets for navigation) at current levels would continue to impact water clarity and quality. However, dredging impacts would be localized to the boundaries of the dredging footprint and its associated turbidity perimeter. In addition, at current levels of dredging activity, water clarity, quality, and quantity in these areas would be expected to remain the same. However, rising population and uncoordinated use of the estuarine waters in the Project may require more frequent maintenance activities, and therefore increased impacts on this resource.

Under the FWOP scenario, ongoing projects and activities would continue to result in both short- and long-term impacts to surface waters in the mainland area. In addition, the continued rise in population and development could result in continued surface water degradation from increased land clearing, impervious surfaces, stormwater runoff and other point and non-point sources, if these were not adequately controlled. Associated impacts to water quality could include increases in water pollutants including petroleum-based substances, nitrogen and phosphorus used in fertilizers, sanitary system discharges, and eroded soil. Increases in pollutants such as nitrogen and phosphorus can increase the potential for algal blooms and brown tides to occur within the bay and estuarine habitats. Water pollutants also could affect average ambient water temperatures, pH, and/or dissolved oxygen in receiving waters, which in turn could negatively affect aquatic habitats.

While the above impacts from increased population and development would be expected under both the "with project," and "without project" condition, the FWOP condition would also decrease the coastal areas' ability to provide storm protection to mainland surface water resources. The resulting impacts to surface waters could be increases in salinity levels as storm surges are allowed greater access to interior areas. As marine and bayside beaches migrate inland as a result of sea level rise, this would result in a decreased amount and availability of fresh surface water in the Project.

Pritchard (1983) indicates that spatial and temporal salinity distributions in the bays along the south shore of Long Island are dependent upon two major factors: (1) freshwater inflow rates which vary both yearly and seasonally, and (2) exchange rate of sea and bay waters through tidal inlets. Salinity levels are dictated by the balance among: (1) saltwater inflow through bay inlets, (2) flow exchange between bays, and (3) freshwater flow entering the bay via major rivers and creeks.

Continual and ongoing maintenance of the existing jetties and dredging activities has led to increased flushing of the bay and mainland wetland systems. This has likely maintained higher salinity levels in certain bay area's then what would occur under more natural conditions if some of the inlets were to close. Therefore, the FWOP condition, particularly in light of projected future sea level rise, would likely result in maintaining or continuing an increase in salinity to surface water resources in certain bays and the freshwater streams. On the one hand, this has led to maintaining certain estuarine habitats such as submerged aquatic vegetation (SAV) beds in the bay; however, the current scenario has likely led to, and could further increase, the loss of freshwater habitats. The FWOP condition would therefore likely be consistent with these current trends.

4.2.1.2 Groundwater

Groundwater provides nearly all of Long Island's drinking and municipal water, and, as such is a critical resource for communities in the Project. The single unconfined Glacial Aquifer occurs at or near the soil surface. This aquifer can be negatively impacted by contaminants infiltrating the soils. In addition, saltwater intrusion can likewise negatively impact the quality of the Glacial Aquifer. Under the FWOP condition the level of saltwater intrusion into this aquifer should be consistent with current trends. These trends indicate that as more of this aquifer is used, saltwater is drawn further into the aquifer.

One potential scenario under the FWOP condition is that if sea level continues to rise without mitigation that may be gained from the project, saltwater could increase its influence further inland. This would further impact the unconfined Glacial Aquifer and put additional pressure on use of underlying confined aquifers such as the Magothy and Lloyd Aquifers.

4.2.2 Preferred Alternative (TSP)

The TSP has been identified as the plan that reasonably balances the policies of the US Army Corps of Engineers and the Department of the Interior, as well as meets the needs from an engineering and economic point of view to restore and enhance the coastal zone of the Project. Implementation of the TSP, which is described in detail in Section 2.3, would consist of:

- Beach restoration (beach and dune fill, berms, and/or sand bypassing),
- Various BRPs,
- Shortening of the existing Westhampton groins and modification of the existing groins at Ocean Beach,
- Non-structural plans (retrofits, floodproofing, relocation, acquisition of approximately 4,400 structures, and road raisings), preference will be given to Nonstructural measures that protect and restore coastal landforms and natural habitats
- Sediment Management (including inlet modifications),
- Coastal Process features that contribute to protecting areas from flooding, erosion, and other storm damage, while concurrently maintaining, preserving, or enhancing the natural resources (see Table 2-2), and
- Integration of adaptive management (renourishment for 30 years).

Structural measures would provide storm damage risk reduction for those areas with the greatest human development. This alternative would reduce the risk of flow and water levels during a storm surge. Furthermore, the length of storm surge inundation to the adjoining proposed structurally protected areas could be lesser than under the FWOP as there could be less storm surge to drain from the interior with the associated features in place. There would likely be no effects to flow or water levels attributable to the non-structural building retrofit plan and road raising. Shortening of the existing Westhampton groins and removal of the existing groins at Georgica Pond and Ocean Beach may have some minor effects to water flows.

Daily water stages (that does not include rainfall) in the TSP would be similar to that of the FWOP. Should the trend of climate warming and increased precipitation continue, there could be continued increases in run off associated with increased rainfall events which may affect the total volume of fresh water in the area as well as during storm damage peaks. Non-structural measures would have little, if any, significant indirect impacts on the flows or water levels. This alternative has the potential to increase flood stages in the immediate areas due to induced flooding.

Any impacts to water quality associated with the TSP would be minor, localized, and short-term, limited to the construction phase of the project. Under natural conditions, periodic breaching of the coastal barrier results in flushing portions of the back bay and improved water quality, as demonstrated at the existing breach in the Wilderness Area (USACE 2014a). Temporary increases in turbidity and potentially nutrient levels could occur during hydraulic dredging and placement of sand on the beaches. These impacts would be minor expected in view of natural turbid condition along the shore zone. No noticeable direct change in water quality of either the Atlantic Ocean or Great South Bay is expected with the TSP. With continuation of current trends related to shoreline management, water quality characteristics would be expected to remain the same, particularly with the continuation of current trends in storm patterns. The TSP will shift the ocean-side high-water line offshore from its present location, but will not alter water levels.

The TSP also 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. With regard to water resources, these project-based features would enhance salt marshes by restoring hydrologic connections and using herbicides to control *Phragmites*, plugging ditches to create pools, converting disturbed areas to salt marshes, reconfiguring existing tidal channels, and enhancing submerged aquatic vegetation (SAV) beds (see Table 2-3 for a more specific identification of these project-based features).

At the offshore borrow area locations, there is potential for short-term impacts to water quality, particularly increases in turbidity as a result of turbulence and dredging operations. Sand particles suspended by dredging are relatively dense and fall quickly back to the bottom, while the fine sediments stay in suspension longer than sand, sinking slowly. The net effect is wider broadcasting and dispersion of fine particles relative to sand and gravel. Dredging will cause a short-term reduction in water clarity down-current from the dredging activity (USACE 2014b). Surface sediments of the borrow area do possess a small percentage of silt which would be released into the water column. However, it is anticipated that the dynamic wave and current conditions of the project area would rapidly dissipate any suspended sediments. Any plume generated by the dredging operations will be restricted in size and duration, due to the sandy substrate and location of the borrow site. Additionally, it is not anticipated that there would be any release of pollutants or significant lowering of dissolved oxygen levels resulting from the project.

The potential for oxygen deprivation problems in borrow areas is a very real concern but no anticipated reduction of dissolved oxygen is expected. Reduced water circulation and increased siltation and sedimentation of fine material can lead to hypoxic or anoxic conditions that may be lethal to organisms utilizing a borrow area. These adverse impacts have been found to be minimal in areas with strong currents where oxygen can be quickly replenished (USACE 2014b). Proper design can alleviate the potential for oxygen deprivation problems by eliminating small deep borrow pockets; however, this generally entails modification of a larger surface area. The planned borrow area size and depth of sand removal for the TSP have been set to avoid deep stratified pits and to minimize the creation of anoxic zones, while also keeping the size as small as feasible.

4.2.3 Alternative 1

Alternative 1 would result in similar impacts 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). The difference in the amount of beachfill and no set renourishments associated with Alternative 1 will not result in any significant change of effect compared to the TSP.

4.2.4 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. These differences are not anticipated to induce any significant change in the impacts than analyzed for TSP.

4.3 WETLANDS

4.3.1 No-Action Alternative (FWOP)

Under the FWOP, current trends are expected to continue and natural processes as well as anthropogenic factors will continue to have an impact on wetland conditions. Wetlands within the Project will change in response to various factors including natural succession, sea level rise, coastal erosion and related erosion control activities, periodic dune breaching and overwash, as well as land use changes and infrastructure development.

As stated in Section 3.3, wetlands in the Project were identified and characterized based on the Cowardin (1979) classification system used by the National Wetland Inventory program, as well as by covertype mapping performed for this Study. The vast majority of the wetlands identified are associated with the marine, estuarine, and palustrine forested wetland systems. These wetland types can also be categorized as occurring within the marine offshore ecosystem, Atlantic shores and inlets ecosystem (marine nearshore, marine intertidal, and inlets habitats), barrier island ecosystem, back bay ecosystem, and mainland upland ecosystem areas. The following provides a description of the FWOP impacts to wetland resources based on anticipated changes to each of the habitat areas found in the Project.

4.3.1.1 Estuarine Wetlands – Marine Nearshore, Marine Intertidal, Inlets, and Back Bay Habitats

The estuarine system as described by Cowardin includes deepwater tidal habitats and adjacent tidal wetlands such as salt marsh habitat areas described for the back bay ecosystem of the Project.

Localized dredging of sand for beach nourishment projects, inlet and navigation channel maintenance, and projects associated with the Beach Contingency Plan (BCP) and CEHA Program are expected to continue in a manner where borrow area locations are dredged once, and would not be expected to be disturbed again within the next 50 years. These regular and ongoing activities would be expected to continue to impact estuarine habitats at a rate and extent consistent with current trends.

In addition, the FWOP condition would lead to further changes to estuarine wetland resources through changes resulting from sea level rise, placement of fill and structures that change hydrologic patterns and processes, and shoreline and bay erosion and deposition trends based on the existence of current beach erosion control structures and dredging maintenance activities. Some of these changes would likely be detrimental to estuarine habitats. These include continued changes to hydrology and sediment loads in these estuarine wetlands.

It is expected that other changes in plant communities bordering bays will continue as a result of increased frequency of breaches due to the expected rise in sea level. Barrier island breaching and overwash would contribute to sediment input within the estuaries adjacent to the barrier islands. The sediment input to the bay may contribute to both the degradation and the long-term formation of salt marsh and SAV beds. The possibility for such habitat creation or degradation is highly dependent upon the location of the breach or overwash and its temporal extent.

The projected rise in sea level will likely cause other long-term changes to the plant communities within the Project. Increases in water levels within the bays will cause a shift in the plant community zones, especially salt marsh habitat that borders these bays. Zones of low marsh will be inundated and will relocation into zones that were previously occupied by high marsh plant communities. This shift will continue inland resulting in a net decrease in the vegetated area.

4.3.1.2 Palustrine – Barrier Island and Mainland

Palustrine wetlands include all non-tidal forested, shrub, and emergent herbaceous wetlands that occur on the barrier islands and mainland portion of the Project. The vast majority of these wetlands are forested wetlands found on the mainland in areas not typically affected by current or projected changes occurring in the coastal system. However, palustrine wetlands that occur within the barrier islands would likely be impacted by the dynamic nature of the barrier islands. For example, under the FWOP the dune-swale complex will continue to be one of the most dynamic communities within the Project. However, wetlands within these communities are adapted to the dynamic nature of this environment and are typically able to recolonize newly created areas after natural disturbances. In natural barrier islands where no human activities occur these new habitats typically come available following natural disturbances; however, given that certain anthropogenic activities are eliminating habitats on barrier islands at an unnatural rate, the FWOP condition would likely have a negative impact on these habitats and the ability to protect these resources for the future. However, local towns and counties may implement small-scale dune rebuilding with flood shoals of coastal ponds. Such efforts would positively impact the vegetation communities associated with dune-swale complexes and offset any negative impacts associated with the existing condition.

Historically, storms and coastal processes have exerted strong influences within the Project including wetlands found in the mainland. With the FWOP scenario this influence is likely to increase. Although storm frequency and intensity are expected to remain relatively the same, the cumulative impacts of each storm will increase in association with the projected increase in sea level rise over the next 50-year period. An increase in the depth and inland reach of storm surges will most negatively impact non-tidal wetlands that are located on the mainland. These wetlands are not as tolerant to brackish or saline conditions, or adapted to storm disturbance in comparison to those species that colonize the dune-swale zones. These surges will likely result in an overall degradation to these plant communities. The ability for these degraded wetlands to restore and repopulate themselves will vary by community and will depend on the health and vigor of each prior to the event, as well as the surrounding land use.

As stated above, non-tidal wetlands are not typically directly affected by the dynamics occurring along adjacent coastal shoreline areas. However, FWOP conditions could have a detrimental effect on these resources through an increased inability for barrier island and back bay systems to adequately protect mainland resources. Other impacts may include specific changes to tidal hydrology and/or sediment loads. Increases or decreases in tidal action or sediment loads resulting from the projected future condition without the project will likely alter salinity levels, sediment depth, and vegetation composition at least in the transitional areas between the palustrine and estuarine wetland systems.

The greatest impact to barrier island and mainland palustrine wetland habitats in the FWOP is the continued development associated with the projected increase in population. The need for additional housing and infrastructure is likely to result in a loss of open space and natural habitats within the Project. In addition to direct loss of wetlands as a result of development, remaining plant communities in the vicinity of the development will likely decline in quality as a result of decreased water quality from stormwater runoff and increased occurrence of invasive species such as common reed (*Phragmites australis)*. Common reed is an aggressive invader of impaired wetland communities and is abundant throughout the Project. While development related impacts are expected to be comparable with or without the project, the cumulative impact of both increased development and decreased protection from normal coastal processes and projected sea level rise would likely have a greater impact on mainland wetlands.

4.3.2 Preferred Alternative (TSP)

The TSP would reduce the risk of coastal storm damages and provide protection to the wetlands discussed in Section 3.3. Because the proposed borrow areas for this project are located more than 1 mile offshore, there would be no wetlands affected by dredging operations. The following provides a description of the TSP impacts to wetland resources based on anticipated changes to each of the habitat areas found in the Project

4.3.2.1 Estuarine Wetlands – Marine Nearshore, Marine Intertidal, Inlets, and Back Bay Habitats

As discussed in Section 3.3.4, the bay intertidal habitat supports large areas capable of supporting emergent vegetation and areas with emergent vegetation within this habitat meet the criteria for definition as a wetland under Section 404 of the *Clean Water Act*. The TSP would build-up dunes, provide beachfill and beach nourishment, and provide sand bypassing at inlets. These actions would be expected to reduce the potential impacts to estuarine wetlands by reducing barrier island breaching and overwash. The sediment input to the bay may contribute to both the degradation and the long-term formation of salt marsh and SAV beds. The TSP would also reduce the potential impacts associated with the projected rise in sea level. The potential for inundation of low marsh zones would be reduced, less vegetation would be relocated into zones that were previously occupied by high marsh plant communities, and vegetated area would be stabilized.

4.3.2.2 Palustrine – Barrier Island and Mainland

The vast majority of the palustrine wetlands are forested wetlands found on the mainland in areas not typically affected by current or projected changes occurring in the coastal system. The proposed action would not require filling any wetlands and would not produce significant changes in hydrology or salinity affecting wetlands. However, palustrine wetlands that occur within the barrier islands would likely be impacted by the TSP. For example, under the TSP, the dune-swale complex would be built-up. Such efforts would positively impact the vegetation communities associated with dune-swale complexes. The TSP would also reduce the potential impacts of storms and coastal processes that have exerted strong influences on wetlands found in the mainland. Although storm frequency and intensity are expected to remain relatively the same, the cumulative impacts of each storm would increase in association with the projected increase in sea level rise over the next 50-year period. The TSP would reduce the depth and inland reach of storm surges that negatively impact non-tidal wetlands on the mainland.

As discussed in Section 4.3.1, the greatest impact to barrier island and mainland palustrine wetland habitats is the continued development associated with the projected increase in population. The need for additional housing and infrastructure is likely to result in a loss of open space and natural habitats within the Project. In addition to direct loss of wetlands as a result of development, remaining plant communities in the vicinity of the development would likely decline in quality as a result of decreased water quality from stormwater runoff and increased occurrence of invasive species such as common reed (*Phragmites australis)*. While development related impacts are expected to be comparable with or without the TSP, implementation of the TSP would lessen the impacts associated with development compared to the FWOP.

4.3.3 Alternative 1

Alternative 1 would involve similar initial actions as the TSP; consequently, the potential impacts to wetlands would initially be similar to those described in Section 4.3.2. However, because Alternative 1 would result in a smaller build-up of the dune and less beachfill, barrier island breaching and overwash, and the associated impacts on wetlands, would be more likely. Additionally, because Alternative 1 does not include any set renourishments, the potential negative impacts to wetlands would increase over time.

4.3.4 Alternative 2

Alternative 2 would also involve similar initial actions as the TSP; consequently, the potential impacts to wetlands would initially be similar to those described in Section 4.3.2. However, like Alternative 1, there would be a smaller build-up of the dune and less beachfill under Alternative 2 compared to the TSP. This would result in a greater potential for barrier island breaching, overwash, and associated impacts on wetlands. Additionally, because there would be no adaptive management under Alternative 2, the long-term impacts to wetlands would be similar to those of the FWOP.

4.4 VEGETATION

4.4.1 No-Action Alternative (FWOP)

Under the FWOP condition, current trends affecting vegetation are expected to continue; natural processes as well as anthropogenic factors will continue to have an impact on the existing vegetation conditions. Vegetation communities within the Project will change in response to various factors including natural succession, sea level rise, coastal erosion and related erosion control activities, periodic dune breaching and overwash, as well as land use changes and infrastructure development.

The Habitat Evaluation Procedure (HEP) is a modeling tool that is intended to provide a consistent method for evaluating impacts associated with project alternatives, by enabling a comparison between existing and future conditions within a given habitat, as well as a comparison of the impacts (adverse and beneficial) among different habitat types. A FIMP HEP model was employed to model several important habitat types in the Project, and to quantify the effects of various restoration alternatives on those habitats (USACE 2009b). The *Evaluation of Restoration Opportunities Using the HEP Method* final report is available at http://www.nan.usace.army.mil/Missions/CivilWorks/ProjectsinNewYork/FireIslandtoMontaukPointReformulationStudy/FIMPReports.aspx. The HEP model utilized the following community types to describe the Project:

- OCEANBEACH (ocean shoreline and intertidal zone);
- VEGBEACH (ocean upper beach zone);
- DUNEGRASS (dune face, dunes, interdunes, and swales);
- UPLAND (dunes, interdunes, and swales dominated by shrub, forest, or development);

- BAYBEACH (bay intertidal and bay upper shore zone); and,
- BAYSUBSAV (bay subtidal and SAV).

4.4.1.1 Marine Offshore Ecosystem

Under the FWOP no major changes in marine offshore habitats are anticipated. Localized dredging of sand for beach nourishment projects, inlet and navigation channel maintenance, and projects associated with the BCP and CEHA Program are expected to continue in a manner where borrow areas locations are dredged once, and would not be expected to be disturbed again within the next 50 years.

As discussed in section 3.4.1 rooted vegetation is uncommon in the deep waters of the marine offshore habitat but phytoplankton is abundant in the surface waters. Turbidity caused by dredging would reduce light penetration into the water but dredging impacts would be localized and given the temporary nature of the turbidity, phytoplankton is not likely be negatively impacted.

4.4.1.2 Atlantic Shores and Inlets Ecosystem

Under the FWOP, the Atlantic shoreline communities including the marine nearshore, marine intertidal, marine beach, and inlets will continue to be the most dynamic communities within the Project. The plant species within these communities are adapted to the dynamic nature of this environment and are able to recolonize after disturbance, whether this disturbance is due to natural causes such as storms or anthropogenic causes such as the placement of sand during beach maintenance activities. In addition to beach maintenance, local towns and counties may implement small-scale dune rebuilding with flood shoals of coastal ponds. Such efforts would be beneficial for propagation and maintenance of vegetation communities associated with dune-swale complexes.

4.4.1.3 Barrier Island Ecosystem

It is expected that other changes in plant communities bordering bays will continue as a result of increased frequency of breaches due to the expected rise in sea level. Barrier island breaching and overwash would contribute to sediment input within the estuaries adjacent to the barrier islands. The sediment input to the bay may contribute to both the degradation and the long-term formation of salt marsh and SAV beds. The possibility for such habitat creation or degradation is highly dependent upon the location of the breach or overwash and its temporal extent.

4.4.1.4 Back Bay Ecosystem

The projected rise in sea level will likely cause other long-term changes to the plant communities within the Project. Increases in water levels within the bays will cause a shift in the plant community zones, especially salt marsh habitat that borders these bays. Zones of low marsh will be inundated and will relocate into zones that were previously occupied by high marsh plant communities. This shift will continue inland resulting in a net decrease in vegetated area.

4.4.1.5 Mainland Upland Ecosystem

The greatest impact to upland vegetation under the FWOP is the anticipated land development associated with the continuing increase in population. The need for additional housing and infrastructure is likely to result in a loss of open space and natural vegetation within the Project. In addition to direct loss of vegetation as a result of development, remaining plant communities in the vicinity of the development will likely decline in quality as a result of decreased water quality from stormwater runoff and increased occurrence of invasive species such as common reed. Common reed is an aggressive invader of impaired communities and is abundant throughout the Project.

Historically, storms and coastal processes have exerted strong influences within the Project. With the FWOP scenario this influence is likely to increase. Although storm frequency and intensity could remain relatively the same, the cumulative impacts of each storm will increase in association with the projected increase in sea level rise over the next 50-year period. An increase in the depth and inland reach of storm surges will most negatively impact plant communities that are located in upland zones. These communities are not as tolerant to brackish or saline conditions, or adapted to storm disturbance in comparison to those species that colonize the beach and dune-swale zones. These surges will likely result in an overall degradation to these plant communities. The ability for these degraded communities to restore and repopulate themselves will vary by plant community and will depend on the health and vigor of each prior to the event, as well as the surrounding land use and plant communities. In other words a relatively healthy plant community containing native vegetation may recover faster than a community surrounded by developed land and invasive species and that receives stormwater runoff.

4.4.2 Preferred Alternative (TSP)

The TSP could have a positive impact on vegetation communities discussed in Section 3.4 by reducing the risk of coastal storm damages and providing protection. The following provides a description of the TSP impacts to vegetation based on anticipated changes to each of the ecosystems found in the Project.

4.4.2.1 Marine Offshore Ecosystem

Under the TSP no major changes in the marine offshore habitats is anticipated Localized dredging of sand for beach nourishment projects, inlet and navigation channel maintenance, and projects associated with the BCP and CEHA Program are expected to continue in the same manner although more frequently. The increase in renourishment, which would be completed over the next 30 years, would entail dredging from offshore borrow areas shown in Figures 2-3 through 2-7.

As discussed in Section 3.4.1 rooted vegetation is uncommon in the deep waters of the marine offshore habitat but phytoplankton is abundant in the surface waters. The increase in the frequency of dredging would not substantially change the severity of the turbidity caused by dredging compared to the TSP. Turbidity would reduce light penetration into the water but dredging impacts would be localized and given the temporary nature of the turbidity, phytoplankton is not likely be negatively impacted.

4.4.2.2 Atlantic Shores and Inlets Ecosystem

The TSP would build-up dunes, provide beachfill and beach nourishment, and provide sand bypassing at inlets. These actions would be expected to reduce the potential impacts to the Atlantic shores and inlets ecosystem by reducing barrier island breaching and overwash. The TSP would also reduce the potential impacts associated with the projected rise in sea level. Because the proposed borrow areas for this project are located more than 1 mile offshore, no rooted vegetation in this ecosystem would be directly affected by dredging operations.

The increase in the amount and frequency of ebb shoal dredging in some of the inlets may temporarily increase the turbidity levels in the immediate and surrounding area although it is not likely to negatively impact phytoplankton or SAV.

4.4.2.3 Barrier Island Ecosystem

The TSP could have a positive impact on the barrier island ecosystem within the Project by reducing the risk of coastal storm damage. Although vehicular use for beach renourishment may negatively impact some types of vegetation by crushing the plants themselves or their seedlings. For example, barrier island vegetation such as the ESA-threatened and state endangered, seabeach amaranth *(Amaranthus pumilus*) and state listed rare seaside knotweed (*Polygonum glaucum*) are adapted to the conditions in this habitat, and have been documented at several locations in or nearby the marine beach habitat within the dunes and swale habitat of the Project (USFWS 2007d). The use of best management practices will reduce the likelihood of impacts to these types of vegetation.

4.4.2.4 Back Bay Ecosystem

The TSP could have a positive impact on the bayback ecosystem within the Project by reducing the risk of coastal storm damage through the build-up of dunes and providing sand bypassing at inlets. The potential for inundation of low marsh zones would be reduced, less vegetation would be relocated into zones that were previously occupied by high marsh plant communities, and vegetated areas, including SAV would be stabilized. The protection of salt marsh has a further positive impact on the reduction of coastal storm damage because salt marsh and eelgrass attenuate waves, capture sediment, and stabilize sediment (Fonseca & Cahalan 1992; Knutson et al. 1982).

The implementation of ebb shoal dredging as part of the sediment management plan may have negative impacts on vegetation such as on seagrass. Changes in bathymetry, current velocity, and increases in turbidity and sedimentation caused by ebb shoal dredging can potentially lead to seagrass loss although the critical threshold and duration of these factors that seagrasses can tolerate varies among species (Erftemeijer & Lewis 2006). In light of these potential impacts these types of changes may not be different from year-to-year variations when compared to undredged areas (Sabol et al. 2005). Since seagrass is an important habitat in this ecosystem the ability to detect changes in its abundance and distribution is key. The long-term, monitoring and adaptive management plan would allow for future changes or improvements to inlet management, over time.

4.4.2.5 Mainland Upland Ecosystem

The TSP could have a positive impact on the mainland upland ecosystem within the Project by reducing the risk of coastal storm damage. The outcome of the TSP would likely reduce the potential for an increase in the depth and inland reach of storm surges which would most negatively impact plant communities that are located in upland zones. These upland types of vegetation (see Section 3.4.5) are not as salt intolerant as those in other ecosystems discussed in this section. Exposure to salinities outside of its tolerance may result in decreased survival and reproduction.

4.4.3 Alternative 1

4.4.3.1 Marine Offshore Ecosystem

Alternative 1 would involve similar initial actions as the TSP; therefore, the potential impacts on vegetation in the marine offshore ecosystem within the Project would be similar to those described in Section 4.4.2.1.

4.4.3.2 Atlantic Shores and Inlets Ecosystem

Alternative 1 would involve similar initial actions as the TSP; consequently, the potential impacts on vegetation in the Atlantic shores and inlets ecosystem within the Project would be similar to those described in Section 4.4.2.2. However, because Alternative 1 would result in a smaller build-up of the dune and less beachfill, barrier island breaching and overwash, and the associated impacts on this ecosystem would be more likely. Additionally, because Alternative 1 does not include any set renourishments or sediment management plan, the potential negative impacts to the ecosystem would increase over time and the long-term impacts to the ecosystem would be similar to those of the FWOP.

4.4.3.3 Barrier Island Ecosystem

Alternative 1 would involve similar initial actions as the TSP; consequently, the potential impacts on vegetation in the barrier island ecosystem within the Project would be similar to those described in Section 4.4.2.3. However, Alternative 1 would result in a smaller build-up of the dune, less beachfill, and does not include set renourishments; therefore, barrier island breaching and overwash would be more likely. The potential for negative impacts on ESA-threatened and state endangered, seabeach amaranth and state listed rare seaside knotweed which have been documented at several locations in or nearby the marine beach habitat within the dunes and swale habitat of the Project (USFWS 2007d) increases with Alternative 1.

4.4.3.4 Back Bay Ecosystem

Alternative 1 would involve similar initial actions as the TSP; consequently, the potential impacts on vegetation in the back bay ecosystem within the Project would be similar to those described in Section 4.4.2.4. However, Alternative 1 would result in a smaller build-up of the dune, less beachfill, and does not include set renourishments which may make barrier island breaching and overwash more likely. The increased likelihood of barrier island breaching and overwash increase the potential for negative impacts on the back bay ecosystem such as salt marsh and SAV erosion.

4.4.3.5 Mainland Upland Ecosystem

Alternative 1 would involve similar initial actions as the TSP; consequently, the potential impacts on vegetation in the mainland upland ecosystem within the Project would be similar to those described in Section 4.4.2.5. However, Alternative 1 would result in a smaller build-up of the dune, less beachfill, and does not include set renourishments which may make barrier island breaching and overwash more likely. The increased likelihood of barrier island breaching and overwash increase the potential for negative impacts on mainland upland ecosystems such as the inundation of seawater.

4.4.4 Alternative 2

4.4.4.1 Marine Offshore Ecosystem

Alternative 2 would involve similar initial actions as the TSP; consequently, the potential impacts on vegetation in the marine offshore ecosystem within the Project would be similar to those described in Section 4.4.2.1. However, Alternative 2 would result in a smaller build-up of the dune, less beachfill, and does not include a predetermined schedule for beach renourishment; consequently, barrier island breaching and overwash would be more likely. Additionally, because there would be no adaptive management under Alternative 2, the long-term impacts to the ecosystem would be similar to those of the FWOP.

4.4.4.2 Atlantic Shores and Inlets Ecosystem

Alternative 2 would involve similar initial actions as the TSP; consequently, the potential impacts on vegetation in the Atlantic shores and inlets ecosystem within the Project would be similar to those described in Section 4.4.2.2. However, the reduction of actions under Alternative 2 compared to the TSP would result in a smaller build-up of the dune, less beachfill, and no predetermined schedule for beach renourishment. These factors may increase the likelihood of barrier island breaching and overwash. Additionally, because there would be no sediment management or adaptive management under Alternative 2, the long-term impacts to the ecosystem would be similar to those of the FWOP.

4.4.4.3 Barrier Island Ecosystem

Alternative 2 would involve similar initial actions as the TSP; consequently, the potential impacts on vegetation in the barrier island ecosystem within the Project would be similar to those described in Section 4.4.2.3. However, the reduction of actions under Alternative 2 compared to the TSP would result in a smaller build-up of the dune, less beachfill, and no predetermined schedule for beach renourishment. These factors may increase the likelihood of barrier island breaching and overwash. The potential for negative impacts on ESA-threatened and state endangered, seabeach amaranth and state listed rare seaside knotweed which have been documented at several locations in or nearby the marine beach habitat within the dunes and swale habitat of the Project (USFWS 2007d) increases with Alternative 2. Additionally, because there would be no adaptive management under Alternative 2, the long-term impacts to the ecosystem would be similar to those of the FWOP.

4.4.4.4 Back Bay Ecosystem

Alternative 2 would involve similar initial actions as the TSP; consequently, the potential impacts on vegetation in the back bay ecosystem within the Project would be similar to those described in Section 4.4.2.4. However, Alternative 2 would result in a smaller build-up of the dune, less beachfill, and does not include set renourishments which may make barrier island breaching and overwash more likely. The increased likelihood of barrier island breaching and overwash increase the potential for negative impacts on the back bay ecosystem such as salt marsh and SAV erosion. Additionally, because there would be no sediment management plan or adaptive management under Alternative 2, the long-term impacts to the ecosystem would be similar to those of the FWOP.

4.4.4.5 Mainland Upland Ecosystem

Alternative 2 would involve similar initial actions as the TSP; consequently, the potential impacts on vegetation in the mainland upland ecosystem within the Project would be similar to those described in Section 4.4.2.5. However, Alternative 2 would result in a smaller build-up of the dune, less beachfill, and does not include set renourishments which may make barrier island breaching and overwash more likely. The increased likelihood of barrier island breaching and overwash increase the potential for negative impacts on mainland upland ecosystems such as the inundation of seawater. Additionally, because there would be no adaptive management under Alternative 2, the long-term impacts to the ecosystem would be similar to those of the FWOP.

4.5 FISH AND WILDLIFE

4.5.1 No-Action Alternative (FWOP)

The environment of the Project is a complex, dynamic system influenced by both natural processes and human policies and programs. Natural processes that affect the habitats in the Project include storms, hurricanes, sea level rise, ongoing natural succession, and physical processes including longshore and cross-island sediment transport, dune development and evolution, bayside shoreline and estuarine processes, coastal erosion, and periodic breaching and overwash. Human or anthropogenic forces include implementation of erosion control activities, breach closure, beach fill and dredging activities, inlet and navigation channel maintenance, installation of coastline stabilization structures, population increase, and housing development. All of these elements contribute in an interrelated way to the dynamic and complex wildlife habitat structure found within the Project. The area has a long history of storm activity combined with human response, and many wildlife species have adapted to these variables that impact the environment. The FWOP is likely to negatively impact some species through habitat degradation and/or loss, and at the same time benefit other species through habitat expansion.

The following section is organized to separately address the potential environmental consequences to individual ecosystems and the invertebrates, finfish, birds, mammals, and reptiles and amphibians they may contain.

4.5.1.1 Marine Offshore Ecosystem

Marine Offshore Invertebrates

The ongoing projects and activities associated with the FWOP scenario would continue to result in short-term impacts to invertebrates (planktonic, pelagic, epibenthic and benthic) living within the marine offshore habitats of the Project.. Dredging impacts would be localized to the boundaries of the dredging footprint and associated turbidity perimeter and are not expected to reoccur within the same borrow area location over the next 50 years. Results of a recent three-year study conducted within the dredging/borrow area located west of Shinnecock Inlet suggests that benthic invertebrate recovery and repopulation of borrow areas can expected to occur within a few months of dredging activities, and that the benthic invertebrate community structure is very dynamic both spatially and temporally (USACE 2008). The abundance and diversity of benthic invertebrate populations that are expected to occur within the Project can be expected to repopulate impact areas relatively quickly, depending on the seasonal timing of the disturbance and the size of the impact area.

Marine Offshore Finfish

Storms and coastal processes that transport sediment such as longshore and cross-island sediment transport can be expected to result in short-term impacts to finfish living within the marine offshore habitat of the Project due to decreased water quality caused by turbulent water conditions. However, due to the mobility of most finfish, these impacts are not expected to adversely impact local populations. These natural processes are expected to continue to occur at a relatively similar frequency and magnitude as to those that have occurred historically, and the FWOP scenario would not increase or reduce these short-term, periodic impacts to water quality or sediment transport.

The ongoing projects and activities associated with the FWOP scenario would continue to result in minor short-term impacts to finfish living within the marine offshore habitat of the Project as a direct result of dredging and sediment placement activities which could impact water quality and habitats associated with the disturbance area. Dredging impacts would be localized to the boundaries of the dredging footprint and associated turbidity perimeter and are not expected to reoccur within the same borrow area location over the next 50 years. Impacts to finfish from these activities are expected to be minor due to the mobility of fish and the short-term, localized area of disturbance.

Results of a recent three-year study conducted within the dredging/borrow area located west of Shinnecock Inlet suggests that dredging activities in borrow areas may provide a beneficial impact to certain benthic dwelling species, evidenced by the increased occurrence of the polychaete *Asabellides oculata*, which are known to create expansive “worm” mats or colonies in areas that contain high percentages of silt and clay sediments (USACE 2008). These colonies may be providing substantial forage material for benthic species, such as summer flounder

(*Pseudopleuronectes americanus*) and winter flounder (*Paralichthys dentatus*), and provide refuge areas for juvenile finfish. Results of the three-year study also suggested that borrow areas may contain a higher species diversity in comparison to surrounding areas resulting from the increase of prey species present within these areas, which in turn, may attract other predatory species.

The ongoing projects and activities associated with the FWOP scenario would continue to result in minor short-term impacts to finfish living within the marine offshore habitat of the Project. Dredging impacts would be localized to the boundaries of the dredging footprint and associated turbidity perimeter and are not expected to reoccur within the same borrow area location over the next 50 years. Impacts to finfish from these activities are expected to be minor due to the mobility of fish and the short-term, localized area of disturbance.

Another comprehensive five-year study conducted within the vicinity Project along the New Jersey shore between Asbury Park and Manasquan Inlet evaluated the effects of beach nourishment activities on finfish abundance and populations within the surf zone. Results of this study suggest that the increased turbidity can affect marine nearshore habitats and the species that occupy them. Specifically, these disturbances may attract northern kingfish (*Menticirrhus saxatilis*) but may have a negative effect on bluefish (*Pomatomus saltatrix*), which appeared to avoid the areas where active beach nourishment was taking place (Wilber et al. 2003). Results of stomach content analysis conducted during the study determined that fish feeding habits were not negatively impacted by the activities, and that most species are likely to utilize multiple resources and habitats for foraging in the event that localized prey items are diminished.

Storms and coastal processes that transport sediment such as longshore sediment transport and cross-island sediment transport can be expected to result in short-term impacts to finfish living within the marine offshore habitat of the Project due to the decrease in water quality that can be expected during turbulent water conditions. However, due to the mobility of most finfish, these impacts are not expected to adversely impact local populations. These natural processes are expected to continue to occur at a relatively similar frequency and magnitude as to those that have occurred historically, and the FWOP scenario would not increase or reduce these short-term, periodic impacts to water quality or sediment transport.

4.5.1.2 Atlantic Shores and Inlets Ecosystems

Longshore sediment transport is a naturally occurring process that maintains sediment requirements for marine nearshore, marine intertidal, and marine beach habitats (USACE 2006b). Maintaining a natural magnitude of sediment is key to providing habitat and species benefits, and for reducing the long-term erosion rates influenced by artificial structures (sediment transport deficits). Sediment transported via longshore processes is important in maintaining habitat requirements for many species of wildlife and finfish, including commercial and recreationally important species.

Inlets are a source of sediment sinks, and sediment accumulation in these areas may naturally form broad shoals and deltas as a result of longshore sediment transport (USACE 2006b). The build-up of sediment at each end of the inlet create tidal deltas that in turn control the volume of water entering the bays. Overtime, the build-up of sediments in the inlet areas create sand flats that provide platforms for new salt marsh growth. Additionally, the platforms associated with tidal and sand flats, widen the inlet area that provide additional protection to upland areas from sea level rise. Sediment may also be transported through the inlet and be deposited within the bay from both longshore and cross-island sediment transport processes. Human activities such as dredging interrupt the natural sediment deposition process within the inlet and navigational areas of the bays, and the placement of groin fields and jetties further block or redirect sediment transport into and through inlets areas, resulting in sediment accumulation on the updrift side of these man-made structures (USACE 2006b). Groin construction and inlet stabilization can result in increased cross-shore sediment transport, and likely would affect areas located outside of the Project.

Atlantic Shore and Inlet Invertebrates

Longshore and cross-island sediment transport processes are important in maintaining sandy marine intertidal habitats. Benthic invertebrates residing on the surface and within the sediments of marine nearshore, marine intertidal and marine beach habitats require adequate sediment for survival and reproduction. Storms and coastal processes that transport sediment can be expected to periodically impact benthic invertebrates living within the marine nearshore, marine intertidal, marine beach, and inlet habitats of the Project; however, these impacts are not expected to negatively affect invertebrate populations or community structure. Invertebrates living within the marine beach habitat are more likely to be negatively impacted by storm and coastal processes since erosion of the beach and dunes has the potential to substantially degrade, cover, or eliminate this habitat, and depending on the extent of damage, invertebrate populations in these areas may decline. These natural processes are expected to continue periodically, resulting in short-term impacts to benthic invertebrates at a frequency and magnitude relative to those that have occurred historically, and the FWOP scenario would not increase or reduce these impacts. USACE data for beach invertebrates captured in marine intertidal sediment cores and marine intertidal and marine beach pitfall traps collected as part of a beach nourishment investigation suggests that the abundance and diversity of epifaunal and infaunal invertebrate community is variable both temporally and physically, and the community structure may be influenced to a greater degree by tidal and erosional processes (USACE 2008).

Ongoing projects and activities associated with the FWOP scenario would continue to result in short- and long-term impacts to invertebrates living within the marine nearshore, marine intertidal, bay intertidal, and marine beach, and inlet habitats of the Project as a direct result of inlet dredging, periodic beach fills (i.e. beach renourishment), beach sediment removal or regrading activities, breach closure activities, the CEHA Program, human population increases, development activities within these habitats, and natural processes such as sediment transport, erosion, and flooding.

Storms and coastal processes that transport sediment such as longshore sediment transport, cross-island sediment transport, and dune development and erosion, can be expected to periodically impact benthic invertebrates living within the marine offshore, marine nearshore, inlet, bay subtidal, inlet, and marine and bay intertidal, marine beach, and inlet habitats of the Project; however, these impacts are not expected to negatively affect invertebrate populations or community structure. Invertebrates living within the marine beach habitat are more likely to be negatively impacted by storm and coastal processes since erosion of the beach and dunes has the potential to substantially degrade or eliminate this habitat. Naturally occurring sediment deposition also has the potential to degrade or eliminate the marine beach habitat, and depending on the extent of damage, invertebrate populations in these areas may decline. These natural processes are expected to continue periodically, resulting in short-term impacts to benthic invertebrates at a frequency and magnitude relative to those that have occurred historically, and the FWOP scenario would not increase or reduce these impacts.

Atlantic Shore and Inlet Finfish

Currents and tidal action are responsible for transporting finfish larvae from offshore areas into sandy nearshore and intertidal habitats that are necessary for their growth and survival. These growing larvae and juvenile finfish in turn provide a prey base for larger finfish species such as bluefish, and baitfish such as Atlantic silversides.

The ongoing projects and activities associated with the FWOP scenario would continue to result in minor short-term impacts to finfish living within the marine nearshore, marine intertidal, and inlet habitats of the Project as a direct result of dredging and sediment placement activities associated with inlet and navigation channel maintenance, and dredging activities associated with the CEHA Program, which could impact water quality and habitats associated with the disturbance area. Dredging impacts would be localized to the boundaries of the dredging footprint and associated turbidity perimeter and are not expected to reoccur within the same borrow area location over the next 50 years. Impacts to finfish from these activities are expected to be minor due to the mobility of fish and the short-term, localized area of disturbance.

A comprehensive five-year USACE study conducted within the vicinity of the Project along the New Jersey shore between Asbury Park and Manasquan Inlet evaluated the effects of beach nourishment activities on finfish abundance and populations within the surf zone of marine intertidal habitats that are similar to those found in the Project. Results of this study suggest that the increased turbidity can affect marine nearshore and marine intertidal habitats and the species that occupy them. Specifically, these disturbances may attract northern kingfish (*Menticirrhus saxatilis*) but may have a negative effect on bluefish, which appeared to avoid the areas where active beach nourishment was taking place (Wilber et al. 2003). Results of stomach content analysis conducted during the study determined that fish food habits were not negatively impacted by the activities, and that most species are likely to utilize multiple resources and habitats for foraging in the event that localized prey items are diminished.

USACE conducted a comprehensive five-year study south of the Project, along the New Jersey shore between Asbury Park and Manasquan Inlet, which evaluated the effects of beach nourishment activities on finfish abundance and populations within the surf zone. Although this study was not conducted in the Project, the physical characteristics of the marine nearshore and intertidal habitats are similar. Results of this study suggest that the increased turbidity can affect marine nearshore habitats and the species that occupy them. Specifically, these disturbances may attract northern kingfish (*Menticirrhus saxatilis*) but may have a negative effect on bluefish (*Pomatomus saltatrix*), which appeared to avoid the areas where active beach nourishment was taking place (Wilber et al. 2003). Results of stomach content analysis conducted during the study determined that fish food habits were not negatively impacted by the activities, and that most species are likely to utilize multiple resources and habitats for foraging in the event that localized prey items are diminished.

Storms and coastal processes such as longshore sediment transport and cross-island sediment transport can be expected to result in short-term impacts to finfish living within the marine nearshore, marine intertidal, and inlet habitats of the Project due to the decrease in water quality that can be expected during turbulent water conditions. However, due to the mobility of most finfish, these impacts are not expected to adversely impact local populations. These natural processes are expected to continue to occur at a relatively similar frequency and magnitude as to those that have occurred historically, and the FWOP scenario would not increase or reduce these short-term, periodic impacts to water quality or sediment transport.

The ongoing projects and activities associated with the FWOP scenario would continue to result in minor short-term impacts to finfish living within the marine nearshore, marine intertidal, and inlet habitats of the Project. These impacts would be a direct result of dredging and sediment placement activities associated with inlet and navigation channel maintenance, and dredging activities associated with the CEHA Program. These also could impact water quality and habitats associated with the disturbance area. Dredging impacts would be localized to the boundaries of the dredging footprint and associated turbidity perimeter, and are not expected to reoccur within the same borrow area location over the next 50 years. Impacts to finfish from these activities are expected to be minor due to the mobility of fish and the short-term, localized area of disturbance.

4.5.1.3 Barrier Island Ecosystem

Longshore and cross-island sediment transport provide material that contributes to the barrier island profile, including the formation of offshore sediment bars, beach slopes, beach berms, foredunes, dunes, and backdune areas (USACE 2006b). Barrier islands and dunes function as natural protective features of adjacent mainland areas, and require a balanced sediment budget for natural evolution of beach and dune profiles. Along the southshore of Long Island primary dune structures or foredunes naturally achieve a height of 15–30 feet above mean water level (USACE 2006b). Natural erosional processes can create scarped dune faces, as the removed sediment is transported offshore or over the dune crest as the crest shift inland. Dunes are also a source of sediment transported via cross-island processes and provide a buffer between the active intertidal and beach zones, and the more stable interior regions. Larger dunes can provide a buffer from erosional processes due to large volume of sand that is provided, and provide protection to inland areas from storm surges and wave penetration.

Cross-island sediment transport is a complex physical process that can have both positive and negative effects on fish and wildlife species, and the magnitude of cross-island sediment transport is largely influenced by the magnitude of longshore sediment processes (USACE 2006b). If sediment movement is large enough to cause significant sediment deposition over the dunes and into adjacent bay areas, this can contribute to sea level rise overwash and breaching of the barrier island, which can modify water quality conditions within the bay waters. While long- and short-term water quality impacts may occur when barrier islands are breached, this physical process contributes to the overall widening of the barrier island from creation of deltas and mud or sand flats, which reduce the susceptibility of future breaching.

Human activities such as the placement of groin fields and jetties further can block or redirect sediment transport that contributes to the build-up of barrier islands, and can contribute to long-term changes in habitat as a result of successional patterns throughout the Project and vicinity. The placement of sand fencing and the planting of beach grass can contribute to sand accumulation within the dunes and swales habitat. The placement of residential structures within the foredune or primary dune habitats can interfere with vegetative cover that stabilizes the dune sediment, sand accumulation, and habitat creation (USACE 2006b). Buildings and other man-made structures also interrupt wind flow currents and patterns, which contributed to aeolian sediment transport. Long-term affects to sediment transport that contribute to dune formation and build up can increase the frequency of barrier island breaches, and could compromise the continuity of foredune ridge formation and function.

Three coastal processes will apply to this ecosystem: cross-island sediment transport, dune development and evolution, and bayside shoreline processes. Some potential impacts/consequences are described in the 5 Processes.

Barrier Island Invertebrates

Longshore sediment transport contributes to beach evolution of the barrier island and bayside beach habitats. Habitats of the lower beach are important for the survival of invertebrates such as burrowing worms and crustaceans such as crabs (USACE 2006b). A wide variety of insects utilize the dune habitat of the barrier island. The vegetated areas of the dune face and crest provide cover and foraging areas, and the leeward side of the dunes that is vegetated with shrubs, bushes, and salt-tolerant tree species offer protection from physical elements for insects.

Cross-island sediment transport is a complex physical process that can have both positive and negative effects on invertebrates living with the sediments of the barrier island beaches and dune habitats. Beach erosion and sediment deposition from wind, wave, and storm action can remove, displace or cover suitable habitat. Positive effects of cross-island sediment transport include renourishment of eroded beach and dune faces, and the build-up of the barrier island height, width, and volume overtime. A seasonal pattern of sediment removal in the winter months and sediment deposition during the summer months provides a dynamic environment for invertebrate communities, and many of the species common to the Project are well adapted to the physical changes that effect the barrier island ecosystem.

Human activities such as the placement of groin fields and jetties can further can block or redirect sediment transport that contributes to the build-up of barrier islands, and the creation of invertebrate habitats. The placement of sand fencing and the planting of beach grass can contribute to sand accumulation within the dunes and swales habitat. The placement of residential structures within the foredune or primary dune habitats can interfere with vegetative cover that stabilizes the dune sediment, sand accumulation, and invertebrate habitat creation (USACE 2006b). Buildings and other man-made structures also interrupt wind flow and patterns, which contributed to aeolian sediment transport. Long-term affects to sediment transport that contribute to dune formation and build up can increase the frequency of barrier island breaches, and could compromise the continuity of foredune ridge formation and function, indirectly impact invertebrate communities within the barrier island ecosystem.

4.5.1.4 Back Bay Ecosystem

Natural processes that shape the back bay ecosystem include cross-island sediment transport, bayside shoreline processes, and estuarine processes.

Cross-island sediment transport can both positively and negatively impact back bay habitats. Shallows and sand flats created by sediment deposition provide habitat for a wide variety of worms, crustaceans, and other invertebrates, which provide a significant prey base that attract other forms of fish and wildlife (USACE 2006b). Cross-island sediment transport processes can negatively impact salt marshes as a result of sediment deposition that may occur from wind, wave, and storm action.

The stability of bayside shorelines contributes to the integrity of the barrier islands, provides a buffer to upland areas from wave action, and is important to maintaining diversity of the natural ecosystem in response to rising sea levels (USACE 2006b). Areas of the back bay ecosystem that are subject to high energy actions such as waves, winds and storm surges normally result in beach creation, but are also subject to erosion. Beach areas will migrate inland as sea levels rise. Lower energy action areas of the back bay ecosystem result in the creation of salt marshes and eel grass beds as a result of the deposition of fine-grained sediments by slow moving currents accumulate. As sea levels rise the continue deposition of fine-grained sediments and trapped organic detritus help to sustain the elevation of the salt marsh and eel grass bed communities. When barrier islands are breached, significant amounts of sediments can be deposited within the bayside habitats, and the influx of colder, saline waters can affect the water quality within the bay. The sediment deposits can be beneficial as they provide a sediment source for the creation of tidal flats, salt marshes, and eel grass beds, and the inflow of large volumes of seawater may also provide a benefit to SAV areas, by flushing out debris and creating new habitat for invertebrates and fish. When baysides of the barrier islands are widened by the creation of these natural elements breaches and flooding are less likely to occur. In addition, the tidal flats, salt marshes, and shallow waters located on the bayside of the barrier islands can serve as a platform for sediment deposits during wave overwash events, thereby contributing to the build-up process of the barriers.

Estuarine processes are important in maintaining water quality within the back bay ecosystem, as fresh water input from the mainland acts to flush out the system through the inlets. Estuarine circulation is also important for distributing plankton species and larval forms of benthic invertebrate species, and distributing phytoplankton, the tiny single-celled algae that form the basis of the estuarine food web (USACE 2005g). The benthos and estuarine shoals provide habitat, spawning and feeding grounds for various species of clams, shellfish, finfish, and horseshoe crabs.

Salt marshes also play a critical role in protecting water quality as they function as filters, absorbing and capturing pollutants associated with storm water runoff from upland areas. The ability of salt marshes to provide this benefit to water quality is decreases as the amount of development within upland watersheds increases. Increases in land clearing activities, installation of sewage and cesspool systems, and applications of pesticides and fertilizers increase the volume of nutrients and pollutants within the surface water runoff, and decreases the potential for the salt marsh areas to filter out nitrogen and phosphorus from entering the bay ecosystem. The increased nutrient loading into bay waters increases the likelihood and frequency for brown tide events to occur.

The presence of bulkheads and other hard structures that are associated with marina facilities increase the likelihood for scour to occur, which increases the potential for the redistribution of sediment material within the bay. Shoreline hardening can trap sediment material, prevent upland sediment sources from entering the bay, and decreases sediment distribution along the bay shorelines. These hardened structures along the shoreline also prevent the natural upland migration of the shoreline sediments that occur naturally as a result of sea level rise, and can result in their permanent loss or impairment.

Three coastal processes will apply to this ecosystem: cross-island sediment transport, bayside shoreline processes, and estuarine processes. Some potential impacts/consequences are described in the 5 Processes. Storms will cause overwash and breach formations (see excerpt below for additional content). SAV could benefit from additional flushing resulting from a temporary breach and that would create additional habitat for finfish and inverts (USACE 2006d).

Back Bay Invertebrates

Intertidal sand flats and shallow tidal areas created by cross-island sediment transport can support large densities of invertebrates (both infaunal and epifaunal), such as crustaceans, polychaete and oligochaete worms, and nematodes. Many invertebrates, including horseshoe crabs and other crab species, hard and soft shell clam species, and numerous species of shrimp utilize the bayside beaches, tidal flats, salt marshes, and SAV beds for one or more life history stages. The greatest impact to invertebrates living within the back bay ecosystem occurs from water quality impacts associated with storm water runoff, breaching of the barrier islands, and dredging activities.

Storm water runoff may contain pollutants and carry additional sediment into the bay ecosystem from upland areas and through freshwater discharges. As water quality conditions decrease the potential for algal blooms and brown tides to occur increases. These events can lower dissolved oxygen levels to levels that inhibit growth and survival of epifaunal invertebrates. The breaching of barrier islands impacts the water quality of the bay by altering the natural temperature and salinity profiles. Dredging projects conducted within inlet and channel areas can impact water quality within the bay, as a result of the increased volume of saline waters that enter the bay ecosystem, and reduction in water temperatures. These alterations to the water quality conditions can have negative impacts on invertebrate species, especially larval forms, which are particularly vulnerable to physical fluctuations in water parameters. Dredging activities can also impact natural circulation patterns within the bay and interrupt the natural sedimentation processes, as sediments are removed from the system. Additionally, dredging activities can contribute to the likelihood of flooding and overwash that results from a barrier island breach, since the tidal range in the bays can increase, with larger waves possible with the deeper waters (USACE 2006b). This further increases the likelihood that shallow tidal wetland and salt marsh areas will be impacted during flooding and breach events.

Macrobenthic invertebrates impacted by physical processes such as coastal storms and dredging activities are generally able to quickly recolonize disturbed areas, and the generally stable and diverse community of the back bay ecosystem would be expected to recovery relatively quickly. Opportunistic and fast growing species would be expected to recolonize disturbed areas first, followed by a gradual shift to a more mature invertebrate communities overtime (USACE 1999a).

Back Bay Finfish

Intertidal sand flats and shallow tidal areas created by cross-island sediment transport can support large densities of invertebrates (both infaunal and epifaunal), which attract commercially and recreationally important finfish species such as bluefish, and other finfish species such as Atlantic silversides, kingfish, mummichogs and other killifish. Eel grass beds which form within the subtidal areas of the overwash fan provide a foraging area and refuge for many species of finfish. The dominant finfish species collected within SAV beds of the Project as part of a USACE study conducted in 2004 and 2005 were Atlantic silverside, bay anchovy, cunner (*Tautogolabrus adspersus*) and Atlantic tomcod (USACE 2006d).

Similar water quality impacts to invertebrates discussed above can be expected to affect finfish living within the back bay ecosystem as a result of stormwater runoff, breaching of barrier islands and dredging activities. Both beneficial and negative impacts to finfish can result from With regard to the biological effects of barrier island overwashing and breach formation, and include both short- and long-term impacts. While the physical impacts associated with barrier island breaching and overwash may result in a disruption and/or, a major disruption and loss of existing habitat, there is the potential for recolonization and formation of new successional, and possibly enhanced habitats (USACE 1999a)t is balanced by re-colonization and even possible formation of new or enhanced habitats. Potential changes may be either short- or long-term. Short-term impacts, such as the scouring or smothering of intertidal marshes, is considered a negative impact, while there are usually detrimental. Longer-term impacts, such as the potential for SAV beds to become re-established on shoal deposits, is are generally considered beneficial. These beneficial and negative impacts would affect both invertebrate and finfish species living within the back bay ecosystem.

In aquatic systems, environmental conditions shaped by climatic events and anthropogenic influences are important factors affecting populations and, ultimately, the entire community. Changing environmental conditions may result in stresses that could alter or detrimentally influence one or more populations.

Although estuarine organisms may occur as a result of increased saline conditions that occur during barrier island breaching and overwash events, modeling conducted by USACE for the Project indicate that these events would not prevent the fluctuations in salinity and temperature. The results of the modeling in this report indicate that breaching will not preclude the survival of any of the ambient back bay species due to their mobility (USACE 1999a), although localized population shifts may occur. One of the benefits to finfish that may occur from the increased salinity associated with breach and overwash events, is the potential for more suitable habitat conditions for shellfish predators, such as sea stars (Class Asteroidea) and oyster drills

(*Urosalpinx cinerea* and *Eupleura caudate*), although this benefit would be short-term as all breaches that occur would be expected to be closed within the bay. Water salinities that may result from a breach have the potential to provide conditions that are more suitable for certain shellfish predators (i.e., sea stars and oyster drills). However, under the expected FWOP conditions, all breaches are likely closed within a 12-month period. The increased opportunity for predation by these species would be limited to the duration of the breach opening, and once the breach is closed, salinity levels would be expected to return to pre-breach conditions within a short period. This is not sufficient time to allow an ecological community to develop which is dependent upon a long term rise in salinity. If predation does occur, the effects are likely to be minimal. Once the breach is closed, bay water salinity and the ecological community structure is likely to return to pre-breach conditions.

The New York State Department of State commissioned a scientific literature review of “The Environmental Impacts of Barrier Island Breaching with Particular Focus on the South Shore of Long Island, New York” (Cashin 1996) which examined the biological impacts related to breaches. The following is a summary of their findings:

1. The increase in bay tidal flushing would result in a reduction of “small form” algal blooms;
2. Increased tidal flushing is also likely to promote accelerated clam growth. However, there may be a concomitant increase in the loss of planktonic larval stages from the bay as a result of excessive flushing. Without proper yearly recruitment, the standing stock of shellfish in the bays may gradually be depleted;
3. No definite conclusions were reached with regard to finfish or waterfowl populations;
4. The number and variety of shellfish predators is likely to increase as a result of the rise in salinity levels;
5. As can be expected following any significant environmental disturbance in a biological system, the “opportunistic” species are likely to first re-colonize the disturbed area and gradually be replaced by a greater variety of “equilibrium” species;
6. The fresh sand deposits and new beach areas are likely to attract nesting shorebirds and colonial shorebirds (e.g., least terns, piping plovers and roseate terns);
7. Tidal marshes are likely to stay in early stages of vegetative succession and remain highly productive; and
8. The increases in tidal flushing and water clarity are likely to benefit eelgrass growth.

There are additional adverse impacts that are likely to occur as a result of barrier island breaching. These include the immediate and direct loss of upland and wetland vegetation in the path of the new inlet opening, and the scour of back bay wetlands and submerged aquatic vegetation from within and adjacent to the inlet channel. Additional vegetation damage is also expected to occur over time along the newly exposed upland vegetated edge, as plants which were formerly surrounded by other vegetation or topographic barriers become stressed due to the increased exposure to wind, salt spray, drought, insects, disease, etc.

The potential for breaching events to destroy existing wetland and SAV beds areas would negatively impact both finfish and invertebrate populations that utilize these areas for breeding, foraging, and protection; however, the potential for intertidal marshes and SAV beds to become reestablished within the sediment deposit platforms and deltas once the breach is closed would minimize the long-term effects to finfish. It is possible that a breach occurring through the Fire Island barrier at a point where major wetlands and SAV beds currently exist could theoretically destroy a significant area of intertidal and subtidal habitat. However, intertidal marshes and SAV beds may re-establish on the bayside deposits or flood tidal deltas over time, once the breach is closed.

Overall, breaching and overwash impacts to finfish are expected to vary on a species-specific basis (USACE 1999a). The macrobenthic invertebrates are completely sessile and represent the single largest group of organisms that will be directly impacted by changes to either the oceanic or bayside benthos. The macrobenthic invertebrates associated with the “high energy” oceanic environment are typically capable of quickly recolonizing areas that are disturbed by coastal storms. The back bay environment is generally quiescent, allowing a more diverse and stable benthic community to develop. When disturbed by coastal storms, the back bay benthic community will generally respond first by re-colonizing with opportunistic species, followed by a gradual shift in species resulting in a more mature benthic community over time. The total re-colonization process is expected to take approximately 12 to 18 months (Naqvi and Pullen, 1982).

4.5.1.4 Mainland Upland Ecosystem

Birds

Under the FWOP scenario, continuation of the ongoing short- and long-term impacts on dune nesting and beach foraging areas would be expected for many species of wading birds, coastal seabirds and shorebirds. Avian habitats associated with the marine intertidal, inlets, barrier islands, dunes and swales, upland, bayside beach and back bay areas will likely continue to be impacted under the FWOP as a result of the lack of comprehensive plans and programs in place to control and repair coastal erosion and breaching of beaches, dunes, and shorelines. If beaches within the Project continue to narrow as a result of major and minor storm events, over time this could contribute to the decreased size and quality of this habitat, which is utilized by many bird species (shorebirds, wading birds and coastal seabirds) for nesting and foraging. If a series of storms is coupled with rising sea levels, eroding and accreting beach sediments may cause the locations of bird habitats to shift. Local bird populations may fluctuate and may eventually decline as a direct result of degraded foraging and nesting habitats. However, if changes in beach structure occur gradually, it is likely that bird species will adapt to the new conditions and continue to use the areas, as long as a sufficient prey base and nesting sites are available. A short-term minor benefit is that the periodic exposure of beach sediments resulting from storm events are important foraging areas to many species.

A possible effect of the FWOP may be the continual degradation of beach habitats following catastrophic storms if smaller-scale local restoration efforts cease or are scaled back due to the lack or reduction of available funding. In this case, erosion of beach dunes and swales would be expected to continue unchecked, which would result in long-term impacts to numerous bird species due to habitat loss during nesting seasons as sands shift during major storm events.

The continued development of housing and infrastructure to meet the demands of the increasing population may have the greatest impact on overall avian wildlife habitat quality over time.

Upland habitat types are at the highest risk from land development, as these areas are the most attractive sites for new development. This would be expected to result in reduced quantity and quality of available nesting habitat over time, as human population and presence increases.

Ongoing projects and activities associated with the FWOP would continue to result in short- and long-term impacts to birds utilizing the habitats within the marine intertidal, inlets, barrier islands, dunes and swales, upland, bayside beach and back bay areas of the Project as a result of habitat changes from periodic beach fills (i.e. beach nourishment), beach sediment removal or regrading activities, breach closure activities, the CEHA Program, population increases, development activities within these habitats, and natural processes such as sediment transport, erosion, and flooding. The FWOP is not expected to significantly affect marine offshore or marine nearshore bird habitats.

Mammals

The terrestrial mammalian species that utilize the Project will not likely sustain long-term impacts under the FWOP scenario but short-term impacts are expected. The habitats most commonly used by local terrestrial mammals include dunes and swales, uplands, and salt marsh areas. These areas can erode and undergo significant changes during major storm events, which can result in habitat loss or degradation over time. Loss and degradation of dune and swale habitats resulting from storms, and upland habitats resulting from human development, will have the greatest impact on terrestrial mammalian species. Species that are able to thrive in fragmented habitats (e.g., opossums [*Didelphis virginiana*], raccoons [*Procyon loto*], and gray squirrels [*Sciurus carolinensis*]) are likely to undergo population increases while species that are dependent on higher quality, contiguous habitat (e.g., common muskrats [*Ondatra zibethicus*] and species of shrews) are likely to experience population declines.

Aquatic mammals such as seals and whales that utilize the marine offshore, marine nearshore, inlet, and bay subtidal habitats of the Project will likely be temporarily displaced as a result of construction activities associated with the FWOP (e.g., dredging and sediment placement associated with inlet and navigation channel maintenance, and dredging associated with the CEHA Program). However, these highly mobile species are able to temporarily relocate to more suitable habitats and are likely to return to the Project after the activities and disturbance have ceased and water quality has improved.

Ongoing projects and activities associated with the FWOP would continue to result in short-term impacts to terrestrial mammals utilizing the habitats within the barrier islands, dunes and swales, upland, bayside beach and back bay areas of the Project as a result of habitat changes from periodic beach fills (i.e. beach renourishment), beach sediment removal or regrading activities, breach closure activities, the CEHA Program, population increases, development activities within these habitats, and natural processes such as sediment transport, erosion, and flooding.

Reptiles and Amphibians

The FWOP scenario is expected to result in long-term impacts to reptile and amphibian habitat. The dune and swale, and upland habitats that these species utilize for foraging, nesting, and breeding are sensitive, and may experience a high level of disturbance and loss of quality during major storm events. Many of these species, including snakes, frogs, and some turtle species, are sensitive to brackish conditions and may be unable to withstand habitats that frequently become inundated with salt water.

Human development is also expected to negatively impact reptile and amphibian habitat. As populations and housing demands increase in the area, the quality and amount of available habitat for these species will likely decrease.

Ongoing projects and activities associated with the FWOP would continue to result in short- and long-term impacts to reptiles and amphibians utilizing the habitats within the barrier islands, dunes and swales, upland, bayside beach and back bay areas of the Project as a result of habitat changes from periodic beach fills (i.e. beach renourishment), beach sediment removal or regrading activities, breach closure activities, the CEHA Program, population increases, development activities within these habitats, and natural processes such as sediment transport, erosion, and flooding.

4.5.2 Preferred Alternative (TSP)

The preferred alternative, or TSP, includes several components that strive to protect human interests and natural resources. This would be achieved by building up dunes and berms, while maintaining inlets and decreasing groins. Although adjustments would be made throughout the Project, most of the non-structural changes are proposed in the back bay ecosystems, while dune and beachfill plans are primarily proposed for the inlets and barrier islands, which are more exposed.

4.5.2.1 Marine Offshore Ecosystem

Invertebrates

The marine offshore environment would be impacted by dredging activities. Impacts of current dredge operations have been discussed in 4.5.1.1 under the No Action Alternative. The FTSP would have similar effects. An increase in dredging, however, may increase the localized impact in the offshore borrow areas. The already-established borrow areas are approximately 0.5 to 3 miles offshore. Dredging removes no more than 20 feet from the surface sediments, creating a shallow depression. Since the underlying sediment is similar in grain size and composition, however, suitable habitat should be available for rapid and complete re-colonization. Dredge activities may cause both a physical and biological disturbance to benthic invertebrates.

Physically, bottom sediment is suspended during dredge activities, resulting in increased turbidity and decreased water quality. Suspended particles usually remain within 15 to 40 m of activity, so adjacent areas would be minimally impacted (Spencer 1997), however, local oceanographic features will determine the extent of dispersal. Most sediment resettles within 30 minutes to 24 hours (Lambert and Goudreau 1996), with coarse pebbles and shell settling before smaller sand and clay (Ruffin 1995). The greatest turbidity and slowest dissipation rates generally result from dredging in shallow environments with high silt and clay (Tarnowski 2006). Current offshore borrow sites that would be used for the TSP are generally dominated by medium to coarse sediment (USACE 2008). Benthic invertebrates have been observed escaping from up to 8.25 inches of sand in a laboratory setting (Saloman et al. 1982). Therefore, dredge activities in the sandy, offshore borrow sites currently used should not result in long-lasting sediment plumes.

Mobile macroinvertebrates, such as crab, jellyfish, and squid species, are likely to avoid and evade dredge equipment. Therefore, they would not be impacted by dredging. Any organism that cannot escape the dredge, however, experiences immediate mortality. Benthic disturbance caused by a scallop dredge resulted in decreased infauna diversity (i.e., the number of species) relative to a control site; however, after 14 months, the diversity was not different (Currie and Parry 1996). Interestingly, the seasonal and temporal differences were more pronounced than any differences observed due to dredging. Though not ubiquitous, acute physical disturbance to benthic communities appears to be short-term, with full recovery after several months (Lokkeborg 2005). Abiotic and oceanographic factors, such as salinity, temperature, and oxygen, may affect invertebrate abundance and diversity more than dredge activities, though this is likely dependent on individual ecosystems (Hoffmann and Dolmer 2000). Even just a few months recovery time between dredging any one particular area should provide sufficient time for recolonization by benthic invertebrates due to their short life cycles, high reproductive potential, and recruitment of planktonic larvae from nearby areas (Naqvi and Pullen 1982). Recolonization by marine invertebrates in this area is estimated to occur in 12 to 18 months (Naqvi and Pullen 1982).

The West of Shinnecock Inlet Interim (WOSI) borrow site was surveyed by the US Army Corps of Engineers for 3 years following dredged sand used in a beach renourishment (2008). Minor changes in macroinvertebrate species occurrence were identified in pre- and post-construction surveys. For example, the third-most abundant macroinvertebrate prior to dredging was the New England dog whelk (*Nassarius trivittatus*), which was not observed in the 3 years post-construction. Between the borrow site and a control site, however, benthic infauna was most similar the first year after dredging. While there were some differences observed in benthic communities before and after dredging, the ecosystem is likely most influenced by natural fluctuations (USACE 2008).

Finfish

Finfish occupying the marine offshore environment are unlikely to be severely impacted by the preferred alternative. The only activity associated with the TSP that occurs in this ecosystem is dredging. Effects of dredging have been introduced in the FWOP analysis (Section 4.5.1.1). With the preferred alternative, these effects may only be enhanced due to increased dredging. Although indirect effects of dredging in designated borrow areas may impact finfishes, direct consequences are not probable. The ability of fishes to move through the ocean freely enables them to leave unsuitable habitat or conditions. It is likely that the noise and vibrations associated with dredge activities will cause fish to leave independently (Van Dolah et al. 1992), thus eliminating direct interactions between the animal and machine.

Even if individuals successfully avoid dredge activity, indirect effects may alter habitat or ecology of the area. One potential impact is the removal of habitat, such as hardbottom or sand mounds. The offshore borrow sites identified for this TSP consist of sand, so hardbottom habitat would not be impacted. Fish habitat and prey (i.e., benthic resources) may also be smothered by suspended sediment, though this is a greater concern for areas with silt and clay, which is not the dominant sediment type in the offshore borrow areas. Larger, coarser particles settle faster and provide more interstitial spaces for infauna. Trophic changes following a dredge event were not observed in either winter flounder or summer flounder (USACE 2001c). More unexpectedly, whiting and catfish, both highly dependent on non-motile benthic invertebrates, did not display any effect of dredging activities (Van Dolah et al. 1992). It has been suggested, though, that the health of predator species may be dependent upon the recovery of benthos, which can take up to 18 months (Peterson et al. 2001).

Whether prey resources are affected or not, it appears that some fish populations are able to remain unaffected or rebound quickly. A study comparing finfish communities before and after dredge activities used to renourish Folly Beach, SC found that recovery was achieved within 1 year (Van Dolah et al. 1994). Finfish assemblages, indexed by composition and abundance, near Asbury Park/Manasquan Beach, NJ were unaffected after offshore dredging (USACE 2001c). There has been evidence, too, for a positive effect of dredging on finfishes. Increased abundance has been documented, which was subsequently attributed to the release of nutrients and infauna resulting from sediment removal (Nelson and Collins 1987; Coastal Science Associates, Inc. 1990). Increased turbidity at a dredge site was implicated for increased larval fish recruitment (Van Dolah et al. 1992). Therefore, dredge activities and borrow areas are not necessarily detrimental to finfish populations.

Near Fire Island Reef, the polychaete *Asabellides oculata* creates worm-mats used by both juvenile and adult fishes for habitat and food (Kinney and Flood 2008). Following dredge activities, the occurrence of *A. oculata* was not different between the dredge site and an adjacent reference area, leading researchers to believe that factors other than dredging affected this ecologically important species (USACE 2008). Therefore, at least this one notable prey resource was not negatively affected by dredging. Finfish assemblages displayed similarities between all 3 years following dredging, with seasonal variability greater than interannual variability. Changes in species abundance, then, is more closely related to environmental factors (USACE 2008).

Both the FWOP and the TSP include dredging activities. Finfishes, highly mobile organisms, are unlikely to experience any direct effects from dredging. In some cases, increased diversity has been found in finfish assemblages following dredge activities. Therefore, the consequences associated with the preferred alternative are not likely to be much more drastic than the FWOP. The TSP may, however, increase these indirect effects due to a higher frequency of dredging.

Marine Mammals

Marine mammals that have been identified in the marine offshore ecosystem of the affected area include a variety of species. These particular species are extremely unlikely to directly interact with dredge operations or indirectly suffer from ecosystem modifications.

Direct impacts may result from collisions between an individual and dredge equipment. These marine mammals, however, are not likely to enter the Project. They are mostly migratory species that might pass by the area. If an animal entered the offshore portion of the Project, it would likely be for a brief period of time. Indirect impacts include dredge activities near feeding grounds that can lead to interference with filter feeding due to increased turbidity or noise. The borrow areas in the Project, however, do not occur on feeding grounds. Most of the marine mammals that migrate along the US East Coast feed on pelagic prey and are therefore found in deeper water, further offshore than the borrow sites. Additionally, these well-adapted swimmers are likely to easily avoid dredge operations.

Birds

The offshore ecosystem supports both migratory and non-migratory bird species. All of the birds found offshore are adept flyers, capable of traveling long distances in search of food. Dredge activities associated with the TSP are not likely to impact birds in the marine offshore environment.

These offshore avifauna spend days or weeks at sea, occasionally returning to shore to rest. Most of their prey consists of bait fish, such as herring, which form large schools offshore, beyond the Project. Offshore birds are not likely to interact with dredge activities, due to their transience and wide range. There is a small possibility that a seabird might perch on dredge equipment; however, if an individual found it unsuitable to rest, it may easily leave and find better habitat. The TSP would not impact the use of oceanic habitat by birds.

Reptiles and Amphibians

No amphibians are found in the marine offshore ecosystem; only sea turtles utilize this environment. Sea turtles may be passing through the offshore marine ecosystem but are not usually year-round residents in the waters off of Long Island where the Project is located. Therefore, impacts from the TSP may be seasonal or transient. The 5 sea turtle species listed generally use the waters adjacent to Long Island for feeding in the summer months. The majority of these sea turtles' lives are spent at sea; only a small portion is spent on land by the females in order to lay eggs.

A potential impact is direct contact between a sea turtle and dredging vessels, since boat collisions may result in up to 400 sea turtle deaths each year (NRC 1990). Incidental takes by the dredging industry have occurred from south Texas to New York, though a reduction has occurred over the past 30 years. A historical analysis by Dickerson et al. (2004) found that loggerheads were the most common species killed by dredge activities. The timing and type of dredge used may decrease probability of impact. In general, sea turtle abundance decreases at temperatures below 16°C, so dredging in the winter months is less likely to impact sea turtles, which is consistent with the District's NLAA determination, with which NMFS has concurred (Appendix B) . .

4.5.2.2 Atlantic Shores and Inlets Ecosystem

The Atlantic shores and inlets ecosystem consists of the area between marine offshore and dunes. This includes subdivisions of nearshore, intertidal, beach, and inlets. Although these subdivisions are interrelated, they support different organisms and are affected by the TSP differentially. In addition to the marine offshore ecosystem, the Atlantic shores and inlets would experience the greatest changes from the preferred alternative. Much of the dredged material collected offshore would be deposited along the marine intertidal and beach. Sediment management would occur at several sites along the shoreline. Groin modification would also occur in this ecosystem, primarily in the nearshore and intertidal regions. Dredging would occur in inlets to create depositional basins for sand bypassing. Biological abundance peaks in the summer, and reaches a minimum in the winter months (Spring 1981).

<u>Invertebrates</u>

Invertebrates in the Atlantic shores and inlets ecosystem that are likely to be impacted include polychaete worms, amphipods, sea stars, and small clams. Nearshore communities are similar to marine offshore ecosystems in composition.

The turbidity and subsequent settling of sediments associated with beach placement could bury organisms. Similar to offshore marine benthic invertebrates, though, the medium to large sand particles would settle quickly, unlike silt and clay. Natural perturbations in this habitat are not uncommon due to the high wave action. Organisms in this high-energy environment are therefore adapted to a relatively high degree of turbidity (Levison and Van Dolah 1996) and may be able to withstand most of the beach sand settlement. Mobile organisms, especially crustaceans, which may be found in the nearshore or inlet ecosystems, are expected to leave areas of undesired conditions, thus avoiding any negative impacts associated with dredging or deposition. Many of the benthic infauna are capable of burrowing and escaping layers of sediment, as outlined in Section 4.5.2.1. If non-motile benthic organisms were smothered and unable to survive, recolonization would likely follow the same timeline as in the offshore ecosystem. Therefore, within 12 to 18 months, nearshore areas would return to its pre-dredge state (Naqvi and Pullen 1982). Inlet invertebrate communities are similar to nearshore environments. Impacts, however, will be similar to those experienced by offshore communities, since the priority will be to dredge in order to remove deposited material. Dredging in inlets between the ocean and bay used for sand bypassing may cause mortality to local benthic communities but organisms should be able to survive sediment resettlement and/or recolonization.

Intertidal areas experience periodic inundation by seawater, but due to this fluctuation between the threat of desiccation and submersion, few organisms can colonize this harsh environment. Intertidal environments can occur on soft or hard bottoms. Invertebrates that colonize soft sediment are similar to the nearshore environment, with the highest biomass consisting of polychaete worms (USFWS 2007d). It is possible that, similar to the nearshore environment, these organisms may withstand turbidity and burial; if not, recolonization would occur quickly. For hardbottom, or rocky intertidal, habitats, many of the organisms are anchored to a solid surface. Deposition of dredged sand would not occur in these environments, so smothering is not an expected result of the TSP. Rather, shortening of the existing Westhampton groins and removal of the existing groins at Georgica Pond and Ocean Beach may result in the removal of habitat for intertidal benthic organisms. If adults are scraped or removed from the rocky intertidal, resettlement is unlikely. Planktonic larvae, however, may recruit to areas following recent perturbations. Complete removal of groin structure may negatively impact rocky intertidal invertebrates, but an area where organisms are removed is likely to be recolonized.

Invertebrates in the terrestrial habitat located between the high tide line and dune habitat will experience effects associated with beachfill activities. Fewer organisms live in the dry sand of the beach, particularly in the winter months (Van Dolah et al. 1994). However, air-breathing crustaceans such as ghost crabs (*Ocypode* spp.) are an important food source for higher trophic levels and frequently live in marine beach areas (McLachlan and Jaramillo 1995). Although many of these invertebrates are mobile, with the ability to escape upon experiencing noise and vibrations due to beach renourishment, mortality of ghost crabs has been recorded as up to 50% following these activities (Peterson 2000). Some macroinvertebrates will probably escape the beach area where sand is deposited, but direct mortality is also a likely consequence. Vulnerable insect and arachnid larvae may also be buried, resulting in injury or death. Recolonization by insects and arachnid species is expected to occur quickly, however, due to their ubiquitous nature. After deposition, sand will naturally redistribute along the shoreline (NRC 1995). Therefore, following deposition, sand movement will not significantly vary from natural conditions, so additional impacts will not occur.

Finfish

Finfish are highly mobile and capable of escaping unfavorable conditions. Dredge or depositional activities in the nearshore, intertidal, or inlet ecosystems may cause fish to vacate, but it is not likely that fish would be directly impacted. Changes in invertebrate prey resources may indirectly affect fish, but as discussed in Section 4.5.2.1, benthic disruptions do not necessarily affect predatory fishes (USACE 2001c). Use of the intertidal zone by marine finfish is minimal, so few individuals are likely to be affected in this specific area. Beachfill activities that may change prey or habitat will be temporary, and fish will likely repopulate as conditions stabilize. Especially in the surf zone, fish diets may change depending on developmental stage and/or prey availability (Hackney et al. 1996), which may allow these fish to adapt to changes such as beach renourishment (Greene 2002). Seasonal changes in finfish distribution may preclude potential impacts as well. During the winter months, both migratory and non-migratory fish species usually move offshore to seek thermal refuge from cold temperatures in shallow waters. Inlets are an important ecological feature to many species. Not only do these areas maintain the health of the estuary through daily flushing, but they also provide prey fish for adults and predator refuge for juveniles (USFWS 1991). Therefore, maintaining inlets through the TSP would greatly benefit many commercially and recreationally important fish. Impacts to the marine beach will not directly affect finfish, because their ecology is not dependent on this habitat.

Birds

Birds may be impacted by changes to the Atlantic shores and inlet environment. This group in this ecosystem is perhaps the most vulnerable to beachfill activity. Both migratory and year-round residents depend on this ecosystem for feeding, wintering, and/or breeding (Greene 2002). Beach habitat may be used for nesting and rearing, while estuarine and nearshore areas provide abundant prey (Peterson et al. 2001). Dredges, pipelines, and equipment may deter birds from using historic habitat. Species that use the marine beach to nest are more sensitive to habitat disruptions than those that use the beach for feeding (Greene 2002). Bird species that rely on prey in this ecosystem may follow displaced invertebrate or fish prey. Nests, eggs, or hatchlings may be smothered by sand placement. Adult breeding behavior may also be impacted. For example, the operation of dredge equipment during the least tern nesting season (April to September) may interfere with courtship, nesting, and rearing, or even force the animals to seek habitat elsewhere. Sand placement, both adjacent and within nesting areas, can negatively impact the breeding season (USFWS 1995). Less severe consequences that may be experienced by shorebirds include temporary avoidance, which would not be significantly detrimental. While the development of the shore has caused habitat loss for some avian species, beach renourishment, despite its risks, has restored important habitat (USACE 1998a). For instance, the Village of West Hampton Dunes increased nesting habitat of the piping plover without negatively impacting their ecology. Subsequent redevelopment of infrastructure, however, has affected habitat quality (Houghton et al. 1999).

Mammals

Of marine mammals, harbor and gray seals are the most likely to be impacted by the TSP in the nearshore and intertidal areas. Of terrestrial mammals, the red fox may be affected in the marine beach regions. These 3 species are very mobile, with the ability to easily relocate if a habitat or area is unsuitable. Therefore, direct impacts of the TSP, such as dredging, sediment placement, or groin modification may only temporarily displace these animals. Long-term, the building of beaches will benefit the seals and red fox by providing additional beach habitat. Shortening of the existing Westhampton groins and removal of the existing groins at Georgica Pond and Ocean Beach, however, may permanently remove haul out areas used by the seals. However, Shinnecock Inlet appears to be the most important haul-out area (USFWS 2007d); these rocky structures would not be altered under the TSP.

Reptiles and amphibians

No amphibians have been identified in this ecosystem. Sea turtles and diamondback terrapins use the nearshore and inlet areas of the Atlantic shores and inlets ecosystem. Juvenile sea turtles and diamondback terrapins frequent bays in the summer months, so they use inlets to move between the nearshore and bay. Dredging activities near inlets may deter summer activity, but the maintenance of inlets will ensure access between the 2 habitats. Sea turtles will generally migrate south as temperatures cool and overwinter in warmer, southern waters. Sand placement along intertidal and beach habitat will not impact any reptiles, because this habitat is not used by either sea turtles or terrapins. Sea turtle nesting areas are restricted to areas south of New Jersey (NRC 1990). Diamondback terrapins, though capable of living in full-strength seawater, prefer brackish ecosystems (Hart and Lee 2006). It is extremely unlikely they would be found beyond inlets. As winter approaches, the diamondback terrapin migrates into marsh creeks and enters a state of dormancy, so activity in the winter months is severely limited (Yearicks et al. 1981; Harden and Williard 2012). Since reptiles in this ecosystem are unlikely to occur on land, only dredge activities along inlets may have an impact. Winter dredging would eliminate a risk of interference with sea turtles (see Section 4.5.2.1) or diamondback terrapins.

4.5.2.3 Barrier Island Ecosystem

The barrier island ecosystem may be impacted by dune and berm construction outlined in the TSP. The dunes are likely to be the only part of this ecosystem directly affected, though. Sand placement may affect fish and wildlife, but it is proposed to align with natural dunes, so it should not greatly disrupt the general topography. It may increase dune and berm height in some areas, though. Indirect effects include a lower frequency of overwash, less breaching, and slight changes in wind-driven salt deposition inland. Fish and wildlife in barrier islands of the Project are only likely to be directly affected by sand placement in dune areas.

Invertebrates

Since aquatic benthic invertebrates are not common in this ecosystem, the dominant invertebrates consist of insects, spiders, and beetles. Invertebrate densities are relatively low however, so fewer individuals are susceptible to alterations in the environment. Alternatively, small populations may have a harder time recovering from any mortality events. In the building of dunes and berms, invertebrates may be smothered. Dune invertebrates would experience similar effects at organisms in the Atlantic shores and inlets ecosystem, as discussed in Section 4.5.2.2. Briefly, mobile macroinvertebrates may be able to escape smothering, but burrowing invertebrates and larvae will probably be buried. Recolonization is expected to occur quickly and completely. Invertebrates in upland, forest, or bayside habitat will not be affected by the TSP.

Finfish

The only finfish that may inhabit barrier islands would reside in freshwater, which will not be affected by activities associated with the TSP in this ecosystem.

Birds

A variety of bird species use areas in these barrier islands. Upland forests have the greatest diversity of species, which will not be affected by the TSP. Dunes and swales, however, support roughly 1/5 of the bird species found on barrier islands. Changes to dunes may impact the ecology of several bird species. Whether migratory or not, many birds depend on the dune environment for reproductive success. The effects of sand placement on these activities in the marine beach environment are discussed in Section 4.5.2.2. Similar effects would be expected in the dune environment. Nests, eggs, and hatchlings would all be susceptible to displacement or burial. Adult reproductive behavior, such as courtship, nest building, and brood rearing, may be altered due to dredge equipment or sand placement. With careful monitoring, negative impacts could be mitigated. Ultimately, increased beach and dune areas would provide many birds with additional nesting habitat (USACE 1998a). Predatory birds, such as owls and hawks, may experience an indirect effect on their foraging ecology. As dune height is increased, overwash events will decrease. The barrier island will then tend toward a more heavily vegetated state. Greater cover will make prey species, such as mice and voles, more difficult for predators to hunt. Many birds utilize upland, forest, and bayside areas of barrier islands, which will not be affected by the preferred action.

Mammals

The mammals observed in the barrier island ecosystem are diverse in morphology and ecology, but most have the ability to move about a wide range. For this reason, they may be found in almost any habitat of the barrier island (i.e., dunes, upland, forest and bayside). For this same reason, however, they are likely to voluntarily move away from a region of dune construction. Of the 14 mammals commonly found in barrier island, 12 utilize dune and swale habitat (Table B-4). The masked shrew is the only one with a strong association to dune habitat, but it also utilizes other habitats. The majority of the small mammals are quite adaptive, moving to new suitable habitat as necessary. The red fox frequently builds dens in dune habitat, so this mammal may be forced to leave while construction is underway. Long term, however, increased dune habitat provides more den opportunities. Building up of dunes is not expected to have a major effect on barrier island mammals. Temporary displacement may occur during construction activities, but mammals are expected to return to normal habitat utilization almost immediately. As introduced in the bird subsection, an indirect effect may be an ecosystem tending toward denser or more vegetation. If this is, indeed, detrimental to predatory birds, it will be beneficial to their small mammal prey.

Reptiles and amphibians

Since reptiles and amphibians use a variety of habitats throughout their lives, they may be found in several habitats of the barrier island ecosystem, most in or near aquatic waterbodies. Areas beyond dune habitat will not be impacted by the preferred alternative, so the focus is on dune-dependent reptiles and amphibians. Several species are identified as having some occurrence in the dune ecosystem (Appendix C), but the box turtle, eastern spadefoot toad, Fowler's toad, and green frog are most likely to inhabit dunes and swales (USACE 2004d). These species, therefore, are most likely to be impacted. Adults are probably able to avoid sand deposition, but eggs (e.g., those of the box turtles) and juveniles may be vulnerable to injury or death. Diamondback terrapins are likely to be found in salt marshes, flats, and lagoons behind primary dunes (Hart and Lee 2006). In winter months, however, they migrate up marsh creeks and become dormant (Harden and Williard 2012), thus avoiding all interaction with the TSP. Upon completion of dune building, most of the reptiles and amphibians in the barrier island ecosystem would benefit from the increased habitat and storm protection.

4.5.2.4 Back Bay Ecosystem

The back bay ecosystem consists of 5 habitat types: bay intertidal, sand shoal and mudflat, salt marsh, bay subtidal, and submerged aquatic vegetation (SAV). This dynamic environment experiences daily fluctuations in temperature, salinity, and water level. Since the preferred action does not propose any changes to this ecosystem, any impacts due to the TSP will be indirect. Erosion control on the ocean-facing beaches will result in less sediment naturally deposited in bays. Higher dunes and berms will decrease overwash and breach events. These indirect effects are discussed relative to fish and wildlife resources. Overall, however, back bay size and ecology is expected to remain the same.

Invertebrates

The back bay system supports a diverse group of invertebrate organisms, well adapted to a changing environment. The established macrobenthic communities are not expected to be affected by indirect effects of the preferred alternative. Many commercially and recreationally important species, such as mussels, clams, and lobsters, reside in bay ecosystems. Lobsters and crabs may use areas near inlets, so the maintenance of these will benefit their ecology (see Section 4.5.2.2 for effects of inlet dredging on invertebrates). SAV beds provide habitat for various invertebrates. Increased dune height, and subsequent reduced overwash, will protect SAV and its associated organisms.

Finfish

All fishes enter and exit the back bay ecosystem using inlets, which do not limit the number of individuals that may access the bay. Decreasing the probability of a breach event would not significantly impact fishes by excluding them from the bay. Sand bypassing at the inlets will ensure a variety of species are able to move freely into the back bay ecosystem. In addition to providing habitat for invertebrates, SAV protects larval and juvenile fishes. Therefore, improved growth of SAV in the absence of overwash will likely benefit early life history stages of fishes. The abundance of small invertebrates and fishes, in turn, will support the entire food web. Indirect effects that may be associated with the TSP will not impact bay fishes.

Birds

Most birds will not be affected by the indirect effects of the preferred alternative (i.e., reduced sediment deposition and fewer overwash or breach events). Reduced sediment delivery to the back bay system results in fewer areas that are sparsely vegetated. These somewhat barren areas may be preferred nesting or congregating grounds for shorebirds. However, these areas lack cover, exposing birds to predation and extreme weather. More SAV due to less frequent overwash provides a major food source for many birds, especially waterfowl. Less overwash will also increase the potential for surface ice, which may hinder feeding of diving birds.

Mammals

These back bay ecosystems have minimal capacity for marine mammal habitat. The harbor seal is the only mammal that may occur in the back bay, visiting the area in the winter months. The indirect effects associated with the preferred alternative will not impact the one marine mammal found in this habitat.

Reptiles and amphibians

No amphibians have been identified as utilizing the back bay habitat. Diamondback terrapins use habitat both in the bay and along the shore, but they are not expected to be impacted by the indirect effects of the preferred alternative. Sea turtles, including the loggerhead, green, and Kemp's ridley may be found in the deeper portions of the back bay ecosystem. All of the reptiles mentioned are likely to benefit from the protection of the back bay. Improved growth of SAV may also benefit these species, especially through the juvenile life stage, when many of these animals seek shelter in the vegetation of estuaries and bays. No impacts are expected to affect reptiles in the back bay.

4.5.2.5 Mainland Upland Ecosystem

The mainland upland ecosystem is made up of the land from MHW to the landward limit of the Project, roughly Montauk Highway. The only component of the preferred alternative that may impact this ecosystem is the non-structural building retrofit in conjunction with road-raising. These non-structural changes may alter existing structures or prevent further damage, but without making significant changes to the natural physical coastal processes, such as flooding or erosion. Finfish do not occur in mainland upland habitat, so they are not affected by TSP activities that occur on the mainland. The impacts of the preferred alternative, or TSP, are similar for invertebrates, birds, mammals, and reptiles and amphibians. Therefore, impacts on all 4 groups are discussed under the subtitle "Wildlife." This non-structural plan aims to maintain natural physical processes.

Wildlife (invertebrates, birds, mammals, and reptiles and amphibians)

The preferred alternative proposes retrofitting buildings and raising roads to protect existing structures. Therefore, new infrastructure is not part of this TSP. The major impact would stem from construction activities, not new development.

Construction may cause direct impacts to wildlife residing on the mainland upland habitat. Since construction would only occur on already-developed land, original habitat is not likely to be destroyed. Individual organisms may be eliminated by localized construction activities, but it would be temporary and brief. Once a building is retrofitted, it would not need further construction, so any associated impacts would not be repeated. Similar to other effects, slow-moving organisms may not be able to escape physical disturbance but mobile animals are likely able to leave an area before being impacted. Since most of the terrestrial animals that occur in the Project are mobile, only small invertebrates may not be able to evade construction activities. Therefore, direct construction impacts may be restricted to small, non-mobile invertebrates. Similar to other invertebrate communities that may be destroyed, recolonization is often rapid, pending available habitat.

An indirect effect of non-structural changes is the maintenance of natural physical processes, most notably erosion. The effects will be the same as those outlined in the FWOP. Based on other measures of the preferred alternative, however, erosion may be lessened. Therefore, a potential loss of habitat could be slower or to a lesser degree. The TSP would not increase erosion impacts in the mainland upland ecosystem.

Finfish

Finfish are not found in mainland upland areas and are therefore not affected by activities associated with the TSP in this ecosystem.

4.5.3 Alternative 1

Alternative 1 does not vary from the preferred alternative greatly. The biggest differences lie in the degree of beach and dune fill, as well as the frequency of renourishments. In general, the dunes would be less built up. Therefore, less dredge material would be collected and deposited. Additionally, Alternative 1 does not include set renourishments in its adaptive management strategy. Renourishments, then, would not occur on a given cycle; rather, they may occur as needed, which may be more or less frequently than outlined in the preferred alternative.

4.5.3.1 Marine Offshore Ecosystem

Alternative 1 will likely impact the marine offshore ecosystem similarly as the effects discussed in Section 4.5.2.1. Slightly lower dunes and less beachfill would require less dredge activities. Additionally, without set renourishments, it is unknown how often offshore dredge activities would occur in borrow areas. Therefore, the offshore marine environment may experience fewer dredge events, which would decrease the localized impacts of direct mortality and turbidity. The exact degree of decrease is unknown, however. Benthic invertebrates may experience higher survival associated with less dredging. Finfish, birds, mammals, and reptiles and amphibians are not likely to be impacted differently by Alternative 1 compared to the TSP, because most individuals will avoid or vacate the area of activity. This would not increase or decrease with Alternative 1.

4.5.3.2 Atlantic Shores and Inlets Ecosystem

Similar to the marine offshore ecosystem, the only group that may affected differently by Alternative 1 are benthic invertebrates. Since these individuals are generally slow moving, they lack the ability to evade dune and beach fill activities. Since Alternative 1 proposes slightly lower dunes, less sand would be deposited in the intertidal and beach area. There may be less mortality due to fewer organisms being buried. However, the actual deposition event, whether it results in a 13 or 15 foot dune, will probably have the same effect on invertebrates. Fewer beach renourishments, rather, will likely reduce mortality in these populations. Finfish, birds, mammals, and reptiles and amphibians are not likely to be impacted differently by Alternative 1 relative to the TSP.

4.5.3.3 Barrier Island Ecosystem

The fish and wildlife in this ecosystem may experience slightly different impacts from Alternative 1 compared to the preferred alternative. Sand placement in the dune ecosystem would have the same effect on all organisms as the preferred alternative, regardless of height. Without set renourishments, however, the burial of some invertebrates and the displacement of some larger animals (e.g., voles, toads, raptors) may be lessened if events occurred less frequently than outlined in the preferred alternative. Shorter dune height would not prevent as much overwash, so the terrestrial landscape may not become as densely vegetated as expected under the TSP. Due to this, predatory birds may not experience a change in the ability to sight prey. Similarly, small mammals may not receive refuge from raptors. The direct effects of sand placement is not likely to affect fish and wildlife in the barrier island ecosystem, but indirect effects on the overall ecosystem may be impacted by smaller dune height suggested in Alternative 1.

4.5.3.4 Back Bay Ecosystem

As mentioned in Section 4.5.3.3, Alternative 1 may result in greater overwash relative to the preferred alternative. In the back bay ecosystem, this may mean that SAV may not experience quite as much growth, so the ecological benefits would not be as great. Since invertebrates, finfish, reptiles, and birds all rely on SAV, they would still experience an improvement in habitat and food availability; however, it would not be to as great of a degree as in the preferred alternative. Alternative 1 may not provide quite as much erosion control as the preferred alternative, so the sparsely vegetated areas used by birds for nesting and congregating would not be as reduced. Additionally, increased physical processes (e.g., wind and tidal mixing) would help prevent ice formation, benefiting diving birds. In general, the indirect effects associated with dune height may be different between the TSP and Alternative 1, but actual consequences are likely to be minimal.

4.5.3.5 Mainland Upland Ecosystem

The mainland upland ecosystem would not experience a major difference between the preferred alternative and Alternative 1. Since Alternative 1 proposes slightly lower dune heights and no set renourishments, it is possible that storm damage protection may not be as great. Therefore, storm severity may be more extreme with Alternative 1. No direct effects on the mainland upland would change between the preferred alternative and Alternative 1.

4.5.4 Alternative 2

Alternative 2 would affect the dune height in a few specific areas, as well as plan for no renourishments. The sediment management plan outlined in the preferred alternative would be excluded. The non-structural plan would also be amended, with slightly less protection. No adaptive management is proposed. Therefore, the greatest change is in the non-structural plan and management strategies. Since the proposed dredge and beachfill activities are similar to the TSP, the major difference in impact lies in the mainland upland ecosystem.

4.5.4.1 Marine Offshore Ecosystem

The impacts on fish and wildlife in the offshore environment would be similar to the TSP. The major source of offshore impact results from dredge activities. In Alternative 2, dredge activities would be less due to no renourishments. Therefore, benthic invertebrates would still experience mortality during the first dredge event, but since subsequent dredging is not proposed, populations in borrow areas would not be required to recolonize after each dredge event. Finfish, birds, mammals, and reptiles and amphibians are not likely to experience a change in impact between the TSP and Alternative 2. These organisms would still be expected to avoid offshore dredging activity, regardless of the frequency.

4.5.4.2 Atlantic Shores and Inlets Ecosystem

With a lack of sediment management, sediment deposits would not be made at Downtown Montauk and Potato Road, which would impact the Atlantic shores and inlets ecosystem. Less sediment would need to be dredged from offshore borrow areas and deposited on shore. Therefore, survival would improve for benthic invertebrates in the nearshore and intertidal zones of this ecosystem. This benefit would only apply on a small scale, though, since only 2 areas would be excluded from sediment deposition. On a larger scale, Alternative 2 proposes no renourishments, which would benefit multiple areas. After sand deposition, recolonization would only need to occur once. In this ecosystem, only invertebrates may experience a change in impact from the preferred to Alternative 2. Finfish, birds, mammals, and reptiles and amphibians are not likely to be impacted differently. Changes in the non-structural plan would not affect this ecosystem.

4.5.4.3 Barrier Island Ecosystem

Only one particular region in the Project (undeveloped Fire Island locations) is proposed to have a slightly smaller dune height in Alternative 2 relative to the TSP. Therefore, only this one area may experience greater overwash. Effects of increased overwash on the barrier island ecosystem due to decreased dune height are outlined in Section 4.5.3.3. Briefly, vegetation would not be expected to increase as greatly as in the preferred alternative, so changes in the feeding ecology of predatory birds and small mammals are likely to be lessened. Without renourishments, though recolonization and disruptions would be minimized, erosion and storm effects would not be mitigated. Therefore, the barrier island ecosystem may experience more severe weather.

4.5.4.4 Back Bay Ecosystem

The back bay ecosystem is not likely experience greatly different impacts from Alternative 2 compared to the TSP. In the few areas on Fire Island where dune height would not be quite as tall, there may be greater overwash into Great South Bay. On this scale, however, the overwash would not create conditions significantly different from those described in Section 4.5.2.4. Without renourishments, however, erosion control would lessen over time. This area would not receive as much protection from storms and erosion.

4.5.4.5 Mainland Upland Ecosystem

The mainland upland ecosystem would be differentially affected by the non-structural plan of Alternative 2 relative to the preferred alternative. Alternative 2 outlines a modified plan, with fewer structures protected in a more restricted area. While the preferred alternative suggests the protection of approximately 4,400 structures, Alternative 2 covers 3,200 structures. Therefore, construction activities would be less. Since all of the proposed construction would occur on already-developed land, no major or long-lasting impacts were identified. Minor effects, such as physical disturbance or displacement, would be fewer for Alternative 2. Also, since Alternative 2 is restricted to the 6-year floodplain rather than the 10-year floodplain of the TSP, a smaller area would be affected. Impacts, then, would only occur in this smaller area. The actual direct impacts of the proposed retrofitting and road-raising would remain the same between the preferred alternative and Alternative 2. The difference, however, is that the affected area would be smaller with Alternative 2.

4.6 RARE SPECIES AND HABITATS

4.6.1 No-Action Alternative (FWOP)

Potential habitats for threatened and endangered species and species of special concern occur within many habitat types in the Project, for species of invertebrates, finfish, birds, mammals, reptiles and amphibians. As an important area of coastal refuge for numerous wildlife species of concern, the Project 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 Project 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.

4.6.2 Preferred Alternative (TSP)

The Project 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 New York District has prepared a draft Biological Assessment (BA) for the TSP (Appendix B), which has been provided to the USFWS for review as part of the ESA Section 7 consultation process. Sections 4.6.2.1 – 4.6.2.4 summarize the potential impacts of the TSP on threatened and endangered species and species of special concern. Additional details can be found in Appendix B. The NMFS has concurred with the District’s Not Likely to Adversely Affect determination regarding the potential adverse effects to aquatic species, such as whales, marine turtles and Atlantic sturgeon (Appendix B).

4.6.2.1 Species of Concern

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).

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 and Seaside Knotweed. 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.

Birds

Common Loon. Except during nesting season, common loons rarely come on shore. Common loons would be negatively impacted by breaches or overwashes that occurred during the nesting season, but would likely move from the area during other seasons.

Common, Foster's, 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.

Cooper's Hawk and Peregrine Falcon. Both species utilize the Project primarily during fall migration. These species are most likely to be impacted by any reduction in breaching and overwash events. Raptors are predominantly sight hunters requiring open area with limited vegetation to easily spot their prey and make a successful hunt. By reducing the potential for breaches and overwashes, natural succession of the barrier island will tend towards a more heavily vegetated shrubby or wooded environment, thereby providing more protective cover for small mammal and passerine prey species.

Northern Harrier and Short-eared Owl. These species utilize grassy harsh or dune areas for nesting and feeding. Only the northern harrier is known to breed in the Project. The short-eared owl is known to breed on Long Island. The TSP is not likely to impact these species, although it would improve conditions for succession from grassland to thicket habitat in locations where salt deposition is reduced.

Osprey. Ospreys within the project area typically nest on man-made elevated platforms or at the tops of dead trees. In addition, this species feeds exclusively on fish. Neither the nesting nor feeding habitats for ospreys are likely to be affected by the TSP.

Piping Plover. This species is known to nest within the Project 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 2014a, 2015). 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 back bay 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 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 Project 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 1999b). 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.

Fish

Atlantic and Shortnose Sturgeon. There is potential for Shortnose and Atlantic Sturgeon (both Federally listed as Endangered) to be present in the marine environment in the vicinity of the borrow areas. Sturgeon are benthic feeders and are relatively slow moving; therefore, if present in the borrow areas, there is potential for adverse impact to these species. However, as the species spawn in freshwater, only fully motile juveniles and adults are expected to be present in the saline waters in the Study Area. NMFS has concurred with the Districts Not Likely to Adversely Affect determination for those species under their jurisdiction, such as whales, marine turtles and sturgeon (Appendix B).

Reptiles

Diamondback Terrapin. The TSP would not directly impact this species. Protection of back bay habitats utilized by this species would benefit them.

Eastern Hognose Snake, Fence Lizard, Eastern mud Turtle, Eastern Box Turtle, Spotted Turtle, Tiger Salamander. The TSP would not directly impact these species. Protection of back bay habitats would benefit them.

Green Sea Turtle. This species is found primarily within the Peconic Bay and Long Island Sound of the Project from June through October. Dredging operations in the TSP may result in incidental taking and mortality of sea turtles; however nesting attempts may be considered an anomaly. Adult sea turtles are rarely found in close proximity to the coastline.

Kemp's Ridley Sea Turtle. This species is considered an abundant turtle within the New York Bight and utilized offshore areas primarily in the Peconic Bay. Dredging operations in the TSP may result in incidental taking and mortality of sea turtles; however nesting attempts may be considered an anomaly. Adult sea turtles are rarely found in close proximity to the coastline

Loggerhead Sea Turtle. This species has a similar distribution pattern to that of the Kemp's ridley, with a somewhat greater number of individuals found in the New York Bight. In the Project, the loggerhead turtle is present only for brief periods during migrations to and from the preferred foraging areas of Long Island. The TSP does not involve dredging or the disposal of dredged material in the back bay that might otherwise cause destruction of SAV beds.

Mammals

Marine mammals are found in the marine offshore, marine nearshore and marine intertidal and beach habitats. Species composition varies by habitat, however, the species characteristics and vulnerability to impacts is similar. The TSP is not likely to have any significant impact on the marine mammals that currently utilize the project area due to the limited spatial extent and duration of the construction phase of the project and the highly motile nature of these species.

The marine mammals that may move through the offshore areas and proposed borrow pit location (bottle-nosed dolphin, and harbor and hooded seals) are not likely to be affected by the TSP. This is primarily due to the fact that these species are highly mobile and feed upon prey species that are also pelagic. Given the slow-moving nature of a dredging vessel and the dredging operation, it seems likely that any marine mammals would be able to avoid the borrow site during active dredging periods. The occurrence of whales in the borrow area, if any, is expected to be very low. With the exception of the minke whale, most of the whales are likely to occur further offshore than the southernmost extent of the borrow pit. All have limited potential to enter the project area during the spring and fall migration periods; however, the amount of time that a whale would spend in the Project would likely be very brief.

Harbor seals typically utilize the intertidal zone for haul-out locations, that is, areas where the animals emerge from the water to rest on land. During the winter and early spring, the seals tend to frequent the lower energy environment on the back bay side of the barrier. Haul-out locations in the vicinity of the project area are typically isolated and consist of rocky or other "structured" environments, such as the rock jetties located at Shinnecock Inlet. However, harbor seals have historically made use of marshes, beaches, and sandbars on the south shore of Long Island. There are no known seal beach haul-out locations within the project area (USACE 2014a).

4.6.2.2 *Habitats of Concern*

Essential Fish Habitat

Several habitats within the Project have been designated as essential fish habitat for multiple managed fish species, including marine offshore, marine nearshore, marine intertidal, inlets, bay intertidal, sand shoals and mudflats, salt marsh, bay subtidal, and SAV. The Project contains EFH for various life stages for up to 35 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 and corresponding latitude and longitude coordinates is provided in Appendix D, along with the EFH species lists for each of the numbered grids. The tables provided in Appendix D include designations for which life stages are covered by EFH for each species.

Since no major changes in the marine offshore habitat is anticipated under the TSP, impacts to marine offshore EFH are not anticipated. Localized dredging of sand for beach nourishment projects, inlet and navigation channel maintenance, and projects associated with the BCP and CEHA Program are expected to continue in the same manner although more frequently. The increase in renourishment, which would be completed for the next 30 years which would entail dredging fill from offshore borrow areas shown in Figures 2-3 through 2-7.

As discussed in section 3.4.2 rooted vegetation is uncommon in the deep waters of the marine offshore habitat but phytoplankton is abundant in the surface waters. The increase in the frequency of dredging would not substantially change the severity of the turbidity caused by dredging compared to the TSP. Turbidity would reduce light penetration into the water but dredging impacts would be localized, and given the temporary nature of the turbidity, it is not likely to be negatively impact the habitat. All mobile organisms would be able to escape these temporary impacts and the sessile organisms would likely recover quickly. Best management practices would ensure that dredging would not occur when the presence of early life stages is likely in the area.

EFH in the Atlantic shores and inlets ecosystem including the marine nearshore, marine intertidal, and inlets may benefit from the TSP which would build-up dunes, provide beachfill and beach nourishment, and provide sand bypassing at inlets. These actions would be expected to reduce the potential impacts to the Atlantic shores and inlets ecosystem by reducing barrier island breaching and overwash. The TSP would also reduce the potential impacts associated with the projected rise in sea level.

The increase in the amount and frequency of ebb shoal dredging in some of the inlets may temporarily increase the turbidity levels in the immediate and surrounding area although it is not likely to negatively impact phytoplankton or SAV.

EFH in the back bay ecosystem include the bay intertidal, sand shoals and mudflats, salt marsh, bay subtidal, and SAV. The TSP could have a positive impact on the bayback ecosystem within the Project by reducing the risk of coastal storm damage through the build-up of dunes and providing sand bypassing at inlets. The potential for inundation of low marsh zones would be reduced, less vegetation would be relocated into zones that were previously occupied by high marsh plant communities, and vegetated areas, including SAV would be stabilized. The protection of salt marsh has a further positive impact on the reduction of coastal storm damage because salt marsh and eelgrass attenuate waves, capture sediment, and stabilize sediment (Fonseca & Cahalan 1992; Knutson et al. 1982).

The implementation of ebb shoal dredging as part of the sediment management plan may have negative impacts on vegetation such as on seagrass. Changes in bathymetry, current velocity, and increases in turbidity and sedimentation caused by ebb shoal dredging can potentially lead to seagrass loss although the critical threshold and duration of these factors that seagrasses can tolerate varies among species (Erftemeijer & Lewis 2006). In light of these potential impacts these types of changes may not be different from year-to-year variations when compared to undredged areas (Sabol et al. 2005). Since seagrass is an important habitat in this ecosystem the ability to detect changes in its abundance and distribution is key. The long-term, monitoring and adaptive management plan would allow for future changes or improvements to inlet management, over time.

4.6.2.3 Significant Habitats

Significant habitats within the Project include Shinnecock Bay, Moriches Bay, Great South Bay, Montauk Peninsula, and South Fork Long Island Beaches as Significant Habitats and Complex of the New York Bight Watershed as identified by the USFWS (USFWS 1997b). For more details on these habitats see Section 3.6.3.2. 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 Project have been designated as Significant Coastal Fish and Wildlife Habitats by the New York State Department of State (NYSDOS 2004). The impacts of the TSP on these Significant Habitats can be analyzed by habitat type.

Significant habitat in the Atlantic shores and inlets ecosystem include the rocky intertidal habitat in Montauk Point. This rocky intertidal zone has been designated as a rare community by NYSDEC Natural Heritage Program (USFWS 1997b). The TSP would build-up dunes, provide beachfill and beach nourishment, and provide sand bypassing at inlets. These actions would be not be expected to impact the rocky intertidal zone although best management practices would be implemented to insure their stability.

Significant habitat in the barrier island ecosystem includes dunes and swales. The TSP could have a positive impact on the barrier island ecosystem within the Project by reducing the risk of coastal storm damage. Although vehicular use for beach renourishment may negatively impact some types of vegetation by crushing the plants themselves or their seedlings. For example, barrier island vegetation such as the ESA-threatened and state endangered, seabeach amaranth and state listed rare seaside knotweed, round-leaf boneset and state listed rare pine-barren sandwort are adapted to the conditions in this habitat, and have been documented at several locations in or nearby the marine beach habitat within the dunes and swale habitat of the Project (USFWS 2007d). The use of best management practices will reduce the likelihood of impacts to these types of vegetation.

Significant habitat in the back bay ecosystem includes SAV. SAV is considered unique habitat within the subtidal region, and establishment of SAV is dependent on suitable water quality, substrate, depth, and water currents. The implementation of ebb shoal dredging as part of the sediment management plan may have negative impacts on vegetation such as on seagrass. Changes in bathymetry, current velocity, and increases in turbidity and sedimentation caused by ebb shoal dredging can potentially lead to seagrass loss although the critical threshold and duration of these factors that seagrasses can tolerate varies among species (Erftemeijer & Lewis 2006). In light of these potential impacts these types of changes may not be different from year-to-year variations when compared to undredged areas (Sabol et al. 2005). Since seagrass is an important habitat in this ecosystem the ability to detect changes in its abundance and distribution is key. The long-term, monitoring and adaptive management plan would allow for future changes or improvements to inlet management, over time.

4.6.2.4 Other Potentially Significant Areas

Although not part of the FIMP Project, Captree Island, Captree State Park, Oak Island, Oak Beach, Cedar Beach, and Gilgo State Park, are located north of Fire Island Inlet and may fall within the area of potential affects from proposed Project activities. See Section 3.6.4 for details on the species that occur in each area and the particular habitats that they utilize. Many of these species have federal or state protection and some have both. Marshes, tidal pools, and sand/mud flats provide nesting and feeding areas for wading birds, and provide habitat for migration stopovers for shorebirds. These areas are also important as a spawning and/or nursery ground for fish, crabs and forage fish species. Species use of these areas varies from year round, during migration, or seasonally.

Birds are known to nest in marshes on Captree Island (Captree State Park) and Oak Beach and state threatened birds are known to nest in common reed on Captree Island. The mosaic of tidal pools, marshes and sand/mud flats provides a rich summer feeding area for wading birds, and a migration stopover for shorebirds.

Oak Beach marsh on Oak Island is extremely productive, and is distinctive as one of the few remaining unditched salt marshes in the northeastern U.S. (USFWS 1991). This habitat supports a variety of breeding and nesting birds. The extensive tidal sand and mud flats are known for supporting high concentrations of shorebirds during migration 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. Federally listed endangered roseate tern and Federally threatened piping plover also nest on Cedar Beach. A population of seabeach amaranth (*Amaranthus pumilis*), a threatened species under the ESA, occurs at Cedar Beach.

Gilgo Beach is 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).

These Other Potentially Significant Areas can be analyzed by habitat type. The TSP could have a positive impact on marshes in the bayback ecosystem that are outside of the Project but close enough that they may potentially be impacted. It is likely that impacts would be similar but not as intense as impacts in within the Project. The TSP would likely reduce the risk of coastal storm damage through the build-up of dunes and providing sand bypassing at inlets. The potential for inundation of low marsh zones would be reduced, less vegetation would be relocated into zones that were previously occupied by high marsh plant communities, and vegetated areas. The protection of salt marsh has a further positive impact on the reduction of coastal storm damage because salt marsh attenuate waves, capture sediment, and stabilize sediment (Knutson et al. 1982).

The TSP could have a positive impact on dunes in the barrier island ecosystem that are outside of the Project but close enough that they may potentially be impacted. It is likely that impacts would be similar but not as intense as impacts in within the Project. The TSP would likely the risk of coastal storm damage. Although vehicular use for beach renourishment may negatively impact nesting birds by disturbing them or destroying their nests or some types of vegetation by crushing the plants themselves or their seedlings. The use of best management practices will reduce the likelihood of impacts.

4.6.3 Alternative 1

Alternative 1 does not vary from the preferred alternative greatly. The biggest differences lie in the degree of beach and dune fill, as well as the frequency of renourishments. In general, the dunes would be less built up. Therefore, less dredge material would be collected and deposited. Additionally, Alternative 1 does not include set renourishments in its adaptive management strategy. Renourishments, then, would not occur on a given cycle; rather, they may occur as needed, which may be more or less frequently than outlined in the preferred alternative.

4.6.3.1 Species of Concern

Alternative 1 would involve similar initial actions as the TSP; consequently, the potential impacts to rare species and habitats would be similar to those described in Section 4.6.2.1. Slightly lower dunes and less beachfill would require less dredge activities. Additionally, without set renourishments, it is unknown how often offshore dredge activities would occur in borrow areas. Therefore, species of concern may experience fewer dredge events, which would decrease the localized impacts of any direct mortality. Species of concern are not likely to be impacted differently by Alternative 1 compared to the TSP, because most would avoid or vacate the area of activity.

4.6.3.2 Habitats of Concern

Alternative 1 may result in greater overwash relative to the TSP. In the EFH, this may mean that SAV may not experience quite as much growth, so the ecological benefits would not be as great. Since invertebrates, finfish, reptiles, and birds all rely on SAV, they would still experience an improvement in habitat and food availability; however, it would not be to as great of a degree as in the TSP. Alternative 1 may not provide quite as much erosion control as the preferred alternative, so the sparsely vegetated areas used by birds for nesting and congregating would not be as reduced. Additionally, increased physical processes (e.g., wind and tidal mixing) would help prevent ice formation, benefiting diving birds. In general, the indirect effects associated with dune height may be different between the TSP and Alternative 1, but actual consequences are likely to be minimal.

4.6.3.3 Significant Habitats

The fish and wildlife within identified significant habitats may experience slightly different impacts under Alternative 1 compared to the TSP. Sand placement in the dune ecosystem would have the same effect on all organisms as the preferred alternative, regardless of height. Without set renourishments, however, the burial of some invertebrates and the displacement of some larger animals (e.g., voles, toads, raptors) may be lessened if events occurred less frequently than outlined in the preferred alternative. Shorter dune height would not prevent as much overwash, so the terrestrial landscape may not become as densely vegetated as expected under the TSP. Due to this, predatory birds may not experience a change in the ability to sight prey. Similarly, small mammals may not receive refuge from raptors. The direct effects of sand placement is not likely to affect fish and wildlife in the barrier island ecosystem, but indirect effects on the overall ecosystem may be impacted by smaller dune height suggested in Alternative 1.

4.6.3.4 Other Potentially Significant Areas

The fish and wildlife within other potentially significant area may experience slightly different impacts under Alternative 1 compared to the TSP. Sand placement in the dune ecosystem would have the same effect on all organisms as the preferred alternative, regardless of height. Without set renourishments, however, the burial of some invertebrates and the displacement of some larger animals (e.g., voles, toads, raptors) may be lessened if events occurred less frequently than outlined in the preferred alternative. Shorter dune height would not prevent as much overwash, so the terrestrial landscape may not become as densely vegetated as expected under the TSP. Due to this, predatory birds may not experience a change in the ability to sight prey. Similarly, small mammals may not receive refuge from raptors. The direct effects of sand placement is not likely to affect fish and wildlife in the barrier island ecosystem, but indirect effects on the overall ecosystem may be impacted by smaller dune height suggested in Alternative 1.

4.6.4 Alternative 2

Alternative 2 would involve similar initial actions as the TSP; consequently, the potential impacts to rare species and habitats would be similar to those described in Section 4.6.2.1. This alternative would affect the dune height in a few specific areas, as well as plan for no renourishments. The sediment management plan outlined in the preferred alternative would be excluded. The non-structural plan would also be amended, with slightly less protection. No adaptive management is proposed. Therefore, the greatest change is in the non-structural plan and management strategies. Since the proposed dredge and beachfill activities are similar to the TSP, the major difference in impact lies in the mainland upland ecosystem.

4.6.4.1 Species of Concern

The impacts to species of concern would be similar to the TSP. The major source of offshore impact results from dredge activities. In Alternative 2, dredge activities would be less due to no renourishments. There is potential for species to experience mortality during the first dredge event, but since subsequent dredging is not proposed, populations in borrow areas would not be required to recolonize after each dredge event. Identified species of concern are not likely to experience a change in impact between the TSP and Alternative 2. These species would still be expected to avoid offshore dredging activity, regardless of the frequency.

4.6.4.2 Habitats of Concern

The habitats of concern are not likely to experience greatly different impacts from Alternative 2 compared to the TSP. In the few areas on Fire Island where dune height would not be quite as tall, there may be greater overwash into Great South Bay. On this scale, however, the overwash would not create conditions significantly different from those described for the TSP. Without renourishments, however, erosion control would lessen over time. This area would not receive as much protection from storms and erosion.

4.6.4.3 Significant Habitats

The fish and wildlife within identified significant habitats may experience slightly different impacts under Alternative 1 compared to the TSP. Vegetation would not be expected to increase as greatly as in the preferred alternative, so changes in the feeding ecology of predatory birds and small mammals are likely to be lessened. Without renourishments, though recolonization and disruptions would be minimized, erosion and storm effects would not be mitigated. Significant habitats may experience more severe weather.

4.6.4.4 Other Potentially Significant Areas

Other potentially significant areas are not likely to experience greatly different impacts under Alternative 2 compared to the TSP. The overwash would not create conditions significantly different from those described under the TSP. Without renourishments, however, erosion control would lessen over time. This area would not receive as much protection from storms and erosion.

4.7 LAND USE AND DEVELOPMENT, POLICY, AND ZONING

4.7.1 No-Action Alternative (FWOP)

Under the FWOP scenario, land use policies and programs would continue to be influenced by storms, hurricanes, sea level rise, coastal erosion, flooding, breaching, and overwash. Human activities would continue to follow land use and zoning regulations devised to prevent and respond to potential damage from these natural forces. Projects would continue to be planned and implemented, including: erosion control activities, breach closure, beach fill and dredging activities, inlet and navigation channel maintenance, sand bypass, installation of stabilization structures, housing and other development.

Erosion would continue in the Project, particularly in the areas in need of beach nourishment. This could result in reduced beach frontage on Fire Island, increased potential for structural damage and loss of homes and businesses on Fire Island and along the bayshore, and lost recreational opportunities for visitors and residents who rely on the beaches for their recreational experiences. Should a severe storm event lead to a barrier island breach, business and residential structures located in the area of the breach and in low-lying areas near the bayshore would be expected to experience increased flooding and tidal surges, potentially leading to extensive damage to the structures and their contents, as well as possible utility service interruptions.

In the future, adverse effects of storm events are expected to increase. Storm damage could interrupt recreational and commercial boating in the Great South Bay. Breaches could form and major overwash could occur, possibly filling channels and preventing navigation in certain areas. Existing current and wave patterns could be changed and disrupted, leading to dislocated fishing and shell-fishing grounds. Marinas and other docking facilities could be damaged. Recreational boating, which is in great demand in the Great South Bay, would suffer from losses at existing marinas, and ferries may not be able to operate as they do under current conditions.

Federal, state, and local land use planning and zoning mechanisms will continue to manage and address issues relating to balancing land use and development pressures with the protection of environmentally and culturally sensitive areas. For example, NYSDEC (through CEHA) provides control over development in designated coastal erosion hazard areas. This has reduced the number of developable lots in the coastal erosion hazard area.

Local Waterfront Revitalization Programs (LWRPs) implemented under the authority of the Coastal Zone Management Act (CZMA) will continue under the FWOP condition. Local governments will continue to devise and adopt LWRPs and work towards New York Department of State (NYSDOS) approval.

Many local towns and villages have also passed laws addressing erosion hazard areas which regulate land use and new construction in environmentally sensitive coastal areas. These laws will endure into the future, and associated efforts to implement them will continue. In many communities, future planning efforts related to minimizing storm damages will be based on an approach to flooding and erosion that emphasizes non-structural or “soft” measures, including the preservation of areas with natural protective features and allowance of unobstructed coastal processes.

Suffolk County’s open space preservation efforts have resulted in more than 55,000 acres of permanently protected land (Suffolk County Department of Planning [SCDP] 2007b), and most of the communities in Suffolk County have special recreation resources, historic sites, and important natural areas. State and local planning will continue to maintain, protect, and create parks and preserves.

Four Suffolk County land acquisition programs currently have the most funding available, and will be the most important open space acquisition programs moving into the next decade:

- New Drinking Water Protection Program
- Multifaceted Land Preservation Program
- Save Open Space (SOS) Program
- Environmental Legacy Program (SCDP 2007b)

Increased public participation in retrofitting privately-owned homes to better withstand storms and reduce damages is expected in the future, as may be encouraged by various incentives. In addition, repair of existing structures damaged by storms is expected to continue. For example, a bill is currently pending in the New York State (NYS) Assembly that could amend NYS Real Property Tax Law to provide additional tax exemptions for capital improvements needed due to environmental damage. This would amend the existing NYS law; towns and incorporated villages would then need to amend their local laws if this exemption were to apply to homeowners in their municipalities.

4.7.2 Preferred Alternative (TSP)

The placement of beach fill in the designated areas would manage risk to the residential, recreational, and commercial uses by increasing protective sand volumes. Implementation of the TSP would reduce the likelihood and magnitude of damages for residents and businesses in the coastal barriers during non-catastrophic events. The TSP would also afford increased protection to the communities along the bayshore by reducing the likelihood of coastal barrier breaching. Due to the reduced likelihood of breaching and inundation of the bayshore, residential, recreational and commercial structures are much less likely to be damaged or destroyed, access to homes businesses is less likely to be interrupted, and utility service is less likely to be disrupted. In the near term, this additional protection will afford a window of opportunity for communities to undertake other adaptation actions to reduce the potential for flood and erosion damage.

By reducing the risk of coastal storm damages, the TSP could have a positive impact on land use development, policy, and zoning within the Project. Although land use policies and programs would continue to be influenced by storms, hurricanes, sea level rise, coastal erosion, flooding, breaching, and overwash, the TSP would reduce the potential for adverse impacts from these events in the Project. This would improve the ability of governmental entities to manage the Project. Human activities would continue to follow land use and zoning regulations devised to prevent and respond to potential damage from these natural forces.

With respect to land use development, policy, and zoning, the non-structural measures of the TSP are particularly notable. These measures include: (1) a building retrofit plan for approximately 4,400 structures, and (2) four road raisings. The building retrofit plan involves a 100-year level of protection for all structures inside the 10-year floodplain (approximately 44 in

Shinnecock Bay, 857 in Moriches Bay, and 3,110 in Great South Bay). Building retrofit measures are proposed, and could include limited relocation or buyouts based upon structure type and condition. Under the TSP, Federal, state, and local land use planning and zoning mechanisms would continue to manage and address issues relating to balancing land use and development pressures with the protection of environmentally and culturally sensitive areas. The TSP would be consistent with Suffolk County's open space preservation efforts (SCDP 2007b). Additionally, the TSP would be supportive of Federal, state, and local land use planning and zoning mechanisms to manage and address issues relating to balancing land use and development pressures with the protection of environmentally and culturally sensitive areas.

As discussed above, the CEHA law will remain in place to limit new development within the primary dune area. Although the TSP would in some areas extend the primary dune seaward, so that the landward toe of the dune would also move seaward, NYSDEC will not alter the coastal erosion hazard area as now mapped. Thus, the TSP would have no effect on land use regulation.

As discussed in Section 2.3, road raisings would achieve coastal storm 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 raisings 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 raisings 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. These road raisings would enhance protection to 1,054 houses (see Table 2-1).

Although erosion and adverse effects of storm events would continue in the Project, the TSP would reduce losses in beach frontage on Fire Island, reduce the potential for structural damage and loss of homes and businesses on Fire Island and along the bayshore, and reduce the impacts of lost recreational opportunities for visitors and residents who rely on the beaches for their recreational experiences.

Coastal Management Program (CMP). With respect to the CMP policies of New York State (NYDOS 2006), Appendix G identifies all policies that are potentially applicable to the proposed Project, along with an explanation of the Project's consistency with those policies. Additionally, Appendix G also identifies the Local Waterfront Revitalization Program (LWRP) policies for both the Town of East Hampton and the Village of Ocean Beach, and discusses the applicability and consistency of the proposed Project to those policies.

Coastal Barrier Resources Act (CBRA). The eastern portion of Robert Moses State Park is located in Fire Island Unit NY-59 (the 5 identifier or designation under the CBRA). The majority of Fire Island, however, is located within the Fire Island Unit NY-59P, which is an "otherwise protected area" not within the CBRA. The incorporated villages of Saltaire and Ocean Beach are excluded from the "otherwise protected area" designation, as are the communities on Fire Island, including Kismet, Fair Harbor, Lonelyville, Atlantique, Robbins Rest, Seaview, Ocean Bay Park, Point O' Woods, Cherry Grove, Fire Island Pines, Water Island, and Davis Park. CBRA and its amendments prohibit the spending of new federal expenditures that tend to encourage development or modification of coastal barriers that are within the defined Coastal Barrier Resource System (CBRS).

Based on the New York District's review, the following units of the CBRA are located within the proposed project area: Robert Moses State Park, CBRS map NY-59, Fire Island Unit; Big Reed Pond, Oyster Pond, and Montauk Point, CBRS map NY-53, NY-54 & NY-55; Napeague, CBRS map F10; Amagansett and Georgica/Wainscott Ponds, CBRS map BY-56/NY-56P & NY-57; Sagaponack Pond and Mecox, CBRS map NY-58 & F11; and Southampton Beach and Tiana Beach, CBRS map F12 & F13/F13P. However, the TSP would meet the provisions of Section 6 of the CBRA, which provides exceptions for expenditures of federal funds within CBRA units. The purpose of the TSP is to strengthen the natural protective features of Fire Island for coastal storm risk management; it does not seek to encourage encroachment of development or alterations to the coastal barriers. This activity falls under the CBRA's exception for "nonstructural projects for shoreline stabilization…designed to mimic, enhance, or restore a natural stabilization system." 16 U.S.C. §3505(a)(6)(G). The TSP meets §505(a)(6)(G)'s precondition that it be consistent with the CBRA's purposes:

- The TSP minimizes the loss of human life by replacing the beach to its original pre-Sandy condition in order to avoid further erosion and loss of Fire Island, and to reestablish the functionality of these beaches as part of the coastal barriers that contribute to the resiliency of upland communities. Additional loss of the beach could result in the damage to structures on Fire Island, damage and loss to structures within the back bay communities of the mainland of Long Island and potentially resulting in the loss of life.

- The TSP involves renourishing a beach with sand and not the development of buildings or structures that the CBRA seeks to avoid. By keeping Fire Island National Seashore and Smith Point County Park as a public beach, no further residential development in this coastal area will occur;

- The TSP minimizes damage to fish, wildlife, and other natural resources. Without the TSP, the beach can continue to erode, impacting the wildlife and natural resources of the project area.

4.7.3 Alternative 1

Alternative 1 would involve similar initial actions as the TSP; consequently, the potential impacts on land use development, policy, and zoning within the Project would be similar to those described in Section 4.7.2. Because the non-structural measures of Alternative 1 are the same as the TSP, these positive impacts would be the same as the TSP. However, Alternative 1 would result in a smaller build-up of the dune, less beachfill, and does not include set renourishments; consequently, barrier island breaching and overwash would be more likely.

4.7.4 Alternative 2

Alternative 2 would involve similar initial actions as the TSP; consequently, the potential impacts on land use development, policy, and zoning within the Project would be similar to those described in Section 4.7.2. However, like Alternative 1, there would be a smaller build-up of the dune and less beachfill under Alternative 2 compared to the TSP. The non-structural measures of Alternative 2 would only involve a 100-year level of protection for all structures inside the *6-year floodplain* (approximately 3,200 structures). Unlike the TSP and Alternative 1, however, no relocation or buyouts would occur under Alternative 2. Road raisings would be the same as for the TSP and Alternative 1. Additionally, because there would be no adaptive management under Alternative 2, the long-term impacts on land use development, policy, and zoning would be similar to those of the FWOP.

4.8 RECREATIONAL RESOURCES

4.8.1 No-Action Alternative (FWOP)

Many of the recreational areas within the Project are particularly sensitive to effects associated with coastal processes because they are located predominantly along waterfront and shoreline areas. Erosion (both ongoing long-term, and more acute storm-induced erosion), storm damages, and flooding/submersion and are the most important factors of the FWOP that could negatively affect recreation areas.

Continuous transport of sand along the Atlantic shoreline of the Project Area results in coastal erosion from the east to the west. The sand transport rate along the southern shore of the Project is 300,000 to about 500,000 cubic yards per year. The Montauk peninsula has been affected particularly hard because it is unprotected by barrier islands and lies directly in the historic pathway of numerous northeasters and hurricanes. Large amounts of sand have been taken from the vanished moraine and from the cliffs at Montauk and pushed west, blown by the prevailing northeast winds (Fagin 2006, as cited in Tetra Tech EMI 2007).

Coastal erosion can affect features such as beaches, dunes, bluffs, bays, cliffsides, wetlands, marshes, and manmade structures within public and private recreation areas. Beach erosion has been observed at several recreation areas, including Robert Moses State Park, along Westhampton Beach, at Smith Point County Park, and just west of Shinnecock Inlet. Dune erosion is common along segments of the Project where fronting beaches have been depleted, especially in the area of Fire Island.

Because beaches respond quickly to changing wave conditions that occur throughout the year, beach widths can fluctuate seasonally. However, the past hurricanes, tropical storms, and northeaster events have often resulted in significant erosional losses and other temporary and permanent changes to the County’s shorelines. The Long Island shorelines have historically experienced coastal erosion and related storm damage, and this is expected to continue in the FWOP scenario.

The USEPA identified over 155 beaches and parks in Suffolk County; a large subset of these are located in the Project area. Some of these beaches and parks are more susceptible to coastal erosion than others (USEPA 2004, as cited in Tetra Tech EMI 2007). According to Atlantic Coast of New York Monitoring Program, certain south shore beaches, parks, and residential and natural communities located within the southern CEHA zone that are moderately or highly susceptible to coastal erosion include (from west to east):

- **Jones Island Reach.** West Gilgo Beach, Gilgo Beach, Gilgo State Park, Cedar Beach, Oak Beach, and Captree State Park / Island;

- **Fire Island Reach.** Democrat Point, Great South Beach, Robert Moses State Park, Kismet, Saltaire, Fair Harbor, Lonelyville, Atlantique, Robbins Rest, Dunewood, Ocean Beach, Ocean Bay Park, Point O'Woods, Cherry Grove, Fire Island Beach/Fire Island Pines, Fire Island National Seashore, Davis Park, Bayberry Dunes, Moriches Inlet, and Smith Point County Park;

- **Westhampton Reach.** Cupsoque Beach, Westhampton Dunes, Potunk Point, Westhampton Beach, Hampton Beach, Quogue Beach, Tiana Beach, and Shinnecock Inlet;

- **Ponds Reach.** Southampton Beach, Watermill Beach, Mecox Beach, Sagoponack Inlet, and Wainscott Beach; and

- **Montauk Reach (South Fork or "The Hamptons").** East Hampton Beach, Atlantic Double Dunes, Amagansett Beach, Napeague Beach,,Montauk Beach, Montauk Point, and Montauk Park.

Storm-induced breaching or creation of inlets along barrier island areas can result in the permanent loss of recreation land areas, reducing the availability of recreational uses for residents and visitors. Historical occurrences can serve as examples of similar potential scenarios under the FWOP. For example, Shinnecock Inlet was created and Moriches Inlet was widened over 4,000 feet to the west as a result of storm-induced breaches in 1938. Ten additional inlets were created within the Project as a result of that storm.

Potential future storms could also damage or destroy existing recreational features and facilities such as piers and marinas, beaches, trails, campsites, golf courses, fishing areas, and birding areas.

Sea level rise is a factor that will also affect recreational resources in the FWOP. As sea level rises, some shorefront lands that are currently above water will become submerged, including some recreation lands. For example, Figure 4.8-1 depicts how the shoreline of the a portion of the Town of Islip (Hamlet of Bay Shore) on the mainland might change over the next 50 to 100 years in response to potential changes in the sea level increases. With this scenario, large recreational areas in Islip would be irretrievably lost, including all or significant portions of Gardiner County Park, Walker Park, Islip Town Beach, Seatuck National Wildlife Refuge, South Shore Nature Center, and Hecksher State Park. Similar projected shoreline changes could result from sea level rise, severe storm events, human development activities, and natural coastal processes.

The large population associated with the New York City metropolitan area results in high demand for recreational opportunities along the coastlines on Long Island, including the Project. Area beaches are a prime recreational resource attracting more than 20 million visitors annually and serve as the foundation of a multibillion-dollar regional tourism industry. The Suffolk County Legislature's Budget Review Office Impact on the Atlantic Ocean Beaches to the Economy of Suffolk County (2003) reported an estimated 9.1 million tourists visit Long Island annually, with 5.5 million visiting Suffolk County. An estimated 11.3 million people are estimated to visit south shore beaches in the Project area each year. Tourism accounts for an estimated $790 million or 1.65 percent of the County's economic activity. It is estimated that direct spending or output from recreational opportunities contributes approximately $255.7 million annually to the County's economy (measured in 1999 dollars), supporting 3,855 jobs and $99 million in labor income. If recreational areas are reduced or compromised in the future, there would be an expected reduction of recreation-related economic activity.

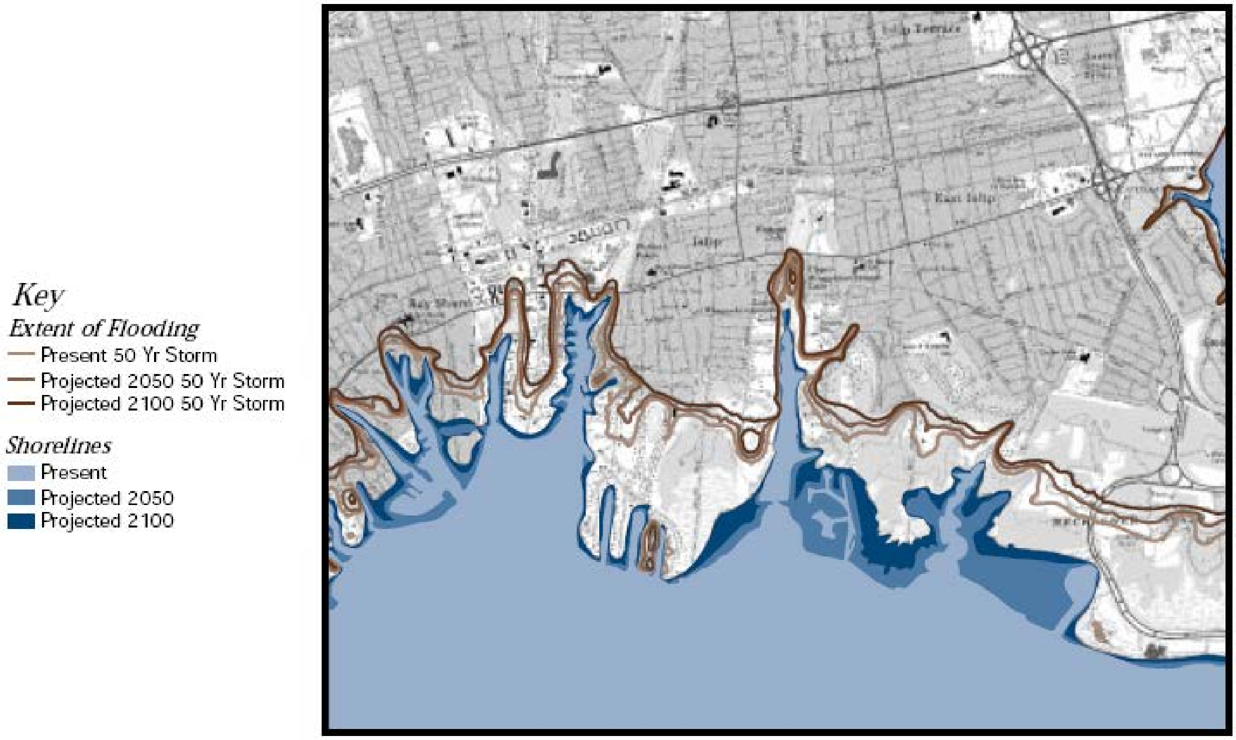

Figure 4.8-1. Projected Future Shoreline Change in Islip, New York

Source: Facazio 2000.

Note: The coastline inundation map depicts portions of the Town of Islip, including the Hamlet of Bay Shore and shows how the position of the shoreline and the extent of flooding might change over the next 50 to 100 years in response to potential changes in the rate at which sea level is rising. These mapping efforts are a part of an ongoing project by Jay Tanski, who is working on the use of computer-based tools of a Geographic Information System to provide decision makers with information about coastal conditions and processes at a scale they can use.

4.8.2 Preferred Alternative (TSP)

As discussed in Section 4.8.1, many of the recreational areas within the Project are particularly sensitive to effects associated with coastal processes because they are located predominantly along waterfront and shoreline areas. Erosion (both ongoing long-term, and more acute storm-induced erosion), storm damages, and flooding/submersion and are the most important factors of the TSP that could provide positive effects to recreational resources.

The USEPA identified over 155 beaches and parks in Suffolk County; a large subset of these are located in the Project and several areas were identified within the southern CEHA zone that are moderately or highly susceptible to coastal erosion. Under the TSP, beach erosion within the Project would be greatly reduced in the areas proposed for renourishment. The placement of beach fill in the designated areas would protect recreational uses. Due to the reduced likelihood of breaching and inundation of the bayshore, recreational areas are much less likely to be damaged or destroyed. During construction activities, a certain amount of short-term disruption is unavoidable. This would primarily include access to the beach, interruption of pedestrian routes along the beach, and noise from trucks and other heavy machinery.

Implementation of the TSP would minimize beach erosion at several recreation areas where erosion was observed, including Robert Moses State Park, along Westhampton Beach, at Smith Point County Park, and just west of Shinnecock Inlet. Dune and coastal erosion would also be minimized along segments of the Project.

Storm-induced breaching or creation of inlets along barrier island areas which can result in the permanent loss of recreation land areas would be minimized under the TSP and potential damage from future storms to recreational features and facilities such as piers and marinas, beaches, trails, campsites, golf courses, fishing areas, and birding areas would also be minimized.

As discussed in Section 4.8.1, recreational opportunities in Suffolk County along the coastlines on Long Island, including the Project attract millions of people each year contributing approximately $255.7 million annually to the County’s economy. The TSP would have a positive impact on recreation-related economic activity by reducing impacts to recreational areas to allow for their continued use.

4.8.3 Alternative 1

Alternative 1 would involve similar initial actions as the TSP; consequently, the potential impacts on recreational resources within the Project would be similar to those described in Section 4.8.2. Because the non-structural measures of Alternative 1 are the same as the TSP, these positive impacts would be the same as the TSP. However, Alternative 1 would result in a smaller build-up of the dune, less beachfill, and does not include set renourishments.

4.8.4 Alternative 2

Alternative 2 would involve similar initial actions as the TSP; consequently, the potential impacts on recreational resources within the Project would be similar to those described in Section 4.8.2. However, like Alternative 1, there would be a smaller build-up of the dune and less beachfill under Alternative 2 compared to the TSP. The non-structural measures of Alternative 2 would only involve a 100-year level of protection for all structures inside the 6-year floodplain. Road raisings would be the same as for the TSP and Alternative 1. Additionally, because there would be no adaptive management under Alternative 2, the long-term impacts on recreational resources would be similar to those of the FWOP.

4.9 SOCIOECONOMIC CONDITIONS AND ENVIRONMENTAL JUSTICE

4.9.1 No-Action Alternative (FWOP)

4.9.1.1 Socioeconomic Conditions

Community Services

Public services of the Fire Island communities such as volunteer fire and ambulance services, as well as local medical services and security/police, are expected to continue with the FWOP, taking projected population increases into account in terms of size and scope. Conservation laws will continue to be enforced by the National Park Service (NPS) and the U.S. Coast Guard will continue to enforce boat safety regulation in surrounding waters.

Similarly, the larger mainland towns having their own fire, ambulance, and police services will continue to do so under the FWOP, taking projected population increases into account in terms of size and scope. Suffolk public services including the Office of Emergency Management, handicapped services, health centers, and public bus service will continue, also taking projected population increases into account. The county's public parks that are used by County citizens will operate as present. Citizens in Suffolk County will continue to participate in a wide array of civic organizations including senior citizen clubs, environmental organizations, and fraternal, historical, business, and service groups.

Over the next 50 years, it is forecasted that sea level rise will continue and could result in more frequent and severe storms. Subsequently, it is anticipated that this could lead to the interruption of various community services as well to severe economic conditions due to substantial storm and flooding damage. However, Suffolk County and other local towns and villages in the Project Area, under the Disaster Mitigation Act of 2000, have begun planning that will better prepare their response to potential future hazardous conditions. This coordinated hazard mitigation planning is expected to continue in the FWOP scenario.

Economic Conditions

The economy on the barrier islands will continue to be driven by the tourism and service industries, including retail operations catering to summer month tourists. A small portion of the economy will still include people employed in the healthcare and medical services. In addition, incorporated villages such as Ocean Beach and Saltaire will still include those employed in government and government services.

The Suffolk County mainland's economy will continue to be diverse. Tourism will continue to contribute significantly to the economy in Suffolk County. Suffolk County will still be expected to lead all other New York State counties in the wholesale value of all agricultural products sold. Wine production will continue to grow in Suffolk County. Employment with defense related employers is expected to increase due to defense contract awards to Suffolk firms in over the past few years; this trend began in 2003, when defense contract awards to Suffolk firms totaled $609 million, up 53 percent over 2001.

According to the New York State Department of Labor's Long Term Occupational Projections for the Long Island Region (including both Nassau and Suffolk Counties), employment in all occupations is expected to increase by 10.5 percent between 2004 and 2014.

Under the FOWP scenario, commercial, residential, public, and other infrastructure in the Project are expected to be subject to increasing economic losses. For example, damages from the April 2007 northeaster totaled approximately $26 million. If storms of this magnitude become more frequent, the resultant total accumulated funds needed to repair and recover could impair the ability of the county to fund other initiatives, such as the acquisition of open space for natural preserves and recreational areas.

Population

The population of the Fire Island Communities is expected to remain relatively stable during the next several years, in part, due to limited property for development.

Suffolk County's population is projected to continue to increase slowly for the next 25 years. The population is projected to increase by 240,000 or 16 percent between 2010 and 2035 (SCDP 2011). The largest population increase is expected in the Town of East Hampton, estimated to increase by 31 percent between 2010 and 2035 (SCDP 2014).

The county's saturation population, which is "the population which can be expected if all available land were to be developed according to existing zoning," is 1.75 million persons; this number may be approached by around the year 2030 (Suffolk County Department of Planning 2005: 2). Projected saturation population of Suffolk County has decreased over the past few decades; projections were 3.4 million in 1962, but have been reduced due to changes in zoning, land preservation efforts, and lower average household size (SCDP 2005).

For the Town of Brookhaven, the population is projected to increase by approximately 3000 persons for each of the five years after 2008; by 2030 the town's population could increase by 100,000 (Urbitran Associates 2008). The population growth rate of Suffolk County has been 0.6 percent since 2000; Brookhaven's growth rate for this time period has been 0.9 percent (Urbitran Associates 2008). This growth and consolidation of population, largely within a 100-year floodplain, could be expected to compound the magnitude of economic impacts sustained from future storms and flooding events. There is potential in the FWOP scenario for a breach or inundation of the barrier islands; this could lead to increased flood damages, especially along the mainland communities bordering Shinnecock, Moriches, and Great South Bays.

Housing and Household Size

The amount of housing on the barrier island is expected to remain relatively stable due to lack of land available for new construction.

Housing needs are expected to increase in Suffolk County in general. From 2005 to 2020, approximately 70,000 new households are expected in Suffolk County; this development is likely to "involve more-intensive residential development within the county's western towns – primarily Brookhaven, Islip, and Babylon" (Burchell et al. 2005).

According to Census data, approximately 7,750 housing units that are deteriorated or overcrowded exist in the county; many of these units are located in Islip, Brookhaven, and Babylon (Burchell et al. 2005). Further, in approximately 94,000 of the units in these three towns, many residents spend a disproportionally high percentage of their income on housing. For example, for the owner occupied homes in this category, households spend approximately 50 percent of their income on housing; for the rented units, households spend approximately 30 percent of their income (Burchell et al. 2005). Additionally, new housing prices have doubled between 2000 and 2005 (Burchell et al. 2005). Many individuals that provide services to Suffolk County residents cannot afford to live within the county themselves, live in inadequate housing, or do live there because they purchased their homes decades ago (Burchell et al. 2005). Therefore the need for adequate and affordable housing exists, including workforce housing. To meet demand over the next 15 years for new, rehabilitated, or subsidized housing for Suffolk County's workforce, approximately 2,000 units are projected to be developed each year for the next 15 years (Burchell et al. 2005).

4.9.1.2 Environmental Justice

As discussed in Section 3.9.6, environmental justice areas of concern exist within the Project. The demographic trends, based current U.S. Census Bureau data, as identified in Section 3.9.6, will continue at current levels. Under the FWOP, minority or low-income communities are not expected to incur disproportionately high or adverse health, safety, or economic injury. The communities located in Suffolk County are racially diverse. The household incomes of families in the Project are above the New York State average. The median family income for barrier island communities is between $53,750 and $219,167 and for mainland communities it is between $89,596 and $115,754. While in the future, the area is expected to experience increasingly severe storms and flooding events, any associated damage or economic loss would be distributed similarly across a population that is largely affluent and diverse. There would be no disproportionately high and adverse impacts to any minority and/or low-income populations from the FWOP.

4.9.2 Preferred Alternative (TSP)

4.9.2.1 Socioeconomics

Suffolk County's population is projected to continue to increase slowly for the next 25 years. Continued increases in population and income would inevitably lead to increased development, increase traffic, as well as an increased demand for recreation and beach facilities.

Community Services

As discussed under the FWOP public services of the Fire Island communities are expected to continue under the TSP, taking projected population increases into account in terms of size and scope. Conservation laws will continue to be enforced by the NPS and the U.S. Coast Guard will continue to enforce boat safety regulation in surrounding waters. Also, under the TSP, larger mainland towns will continue to manage their own public services and will take projected population increases into account in terms of size and scope. By reducing the risk of coastal storm damages, the TSP could have a positive impact on community services by eliminating or reducing interruption of various community services.

Economic Conditions

As discussed under the FWOP the economy on the barrier islands will continue to be driven by the tourism and service industries, the Suffolk County mainland's economy will continue to be diverse, and employment in all occupations is expected to increase. With the implementation of the TSP, the extent of storm damage in the Projects communities would be reduced. Thus, access to businesses would be less likely to suffer directly through structural damage or indirectly through interruption of access or utility service.

Population

The population of the Fire Island Communities is expected to remain relatively stable during the next several years. The Suffolk County mainland's population is projected to moderately increase over the next two decades. The impacts sustained from future storms and flooding would be minimized with the implementation of the TSP reducing the magnitude of economic impacts from a growing population.

Housing and Household Size

As discussed under the FWOP, the amount of housing on the barrier island is expected to remain relatively stable due to lack of land available for new construction. Housing needs are expected to increase in Suffolk County in general. There is an existing need for adequate and affordable housing within the Project.

There is some concern that the TSP, by providing temporary protection, could increase homeowner confidence and induce growth in the coastal erosion hazard area. However, it is unlikely that a demand for new construction would result in significant impacts from the implementation of the TSP.

4.9.2.2 Environmental Justice

As discussed in Section 3.9.6, environmental justice areas of concern exist within the Project. Based on the analysis of impacts for resource areas, few long-term significant impacts from construction or operation of the TSP are expected.

Impacts may occur in areas where environmental justice populations were identified; however, it is expected that any impacts would affect all populations within the Project equally. Therefore, no unavoidable adverse impacts would be disproportionately borne by minority and/or low-income populations as a result of the TSP.

4.9.3 Alternative 1

4.9.3.1 Socioeconomics

Alternative 1 would involve similar initial actions as the TSP; consequently, the potential impacts on socioeconomic conditions within the Project would be similar to those described in Section 4.9.2. Alternative 1 would result in a smaller build-up of the dune, less beachfill, and does not include set renourishments; consequently, barrier island breaching and overwash would be more likely. Impacts to socioeconomic conditions similar to those discussed for the FWOP may occur if barrier island breaching and overwash occurred.

4.9.3.2 Environmental Justice

Alternative 1 would result in a smaller build-up of the dune, less beachfill, and does not include set renourishments; consequently, barrier island breaching and overwash would be more likely. If the area experienced barrier island breaching and overwash, any associated damage or economic loss would be distributed similarly across a population that is largely affluent and diverse. There would be no disproportionately high and adverse impacts to any minority and/or low-income populations from Alternative 1.

4.9.4 Alternative 2

4.9.4.1 Socioeconomics

Alternative 2 would involve similar initial actions as the TSP; consequently, the potential impacts on socioeconomic conditions within the Project would be similar to those described in Section 4.9.2. However, like Alternative 1, there would be smaller build-up of the dune and less beachfill under Alternative 2 compared to the TSP. The non-structural measures of Alternative 2 would only involve a 100-year level of protection for all structures inside the 6-year floodplain (approximately 3,200 structures). Unlike the TSP and Alternative 1, however, no relocation or buyouts would occur under Alternative 2. Road raisings would be the same as for the TSP and Alternative 1. Additionally, because there would be no adaptive management under Alternative 2, the long-term impacts on socioeconomic conditions would be similar to those of the FWOP.

4.9.4.2 Environmental Justice

Alternative 2 would result in a smaller build-up of the dune and less beachfill. The non-structural measures of Alternative 2 would only involve a 100-year level of protection for all structures inside the 6-year floodplain (approximately 3,200 structures). Unlike the TSP and Alternative 1, however, no relocation or buyouts would occur under Alternative 2. Road raisings would be the same as for the TSP and Alternative 1. Any associated damage or economic loss would be distributed similarly across a population that is largely affluent and diverse. There would be no disproportionately high and adverse impacts to any minority and/or low-income populations from Alternative 2.

4.10 CULTURAL RESOURCES

4.10.1 No-Action Alternative (FWOP)

The FWOP could potentially adversely affect archaeological, historic, architectural, or maritime resources described in Chapter 3. Under the FWOP, continued erosion could expose prehistoric land surfaces that may contain the remains of the area's early inhabitants. A breach in the barrier island and lack of stabilization could permit wave, wind, and other actions to cause irreversible damage and loss to archaeological sites in breach areas. Unknown archaeological resources-including sites located beneath the barrier islands or shipwrecks, buried in the nearshore area—could be uncovered, damaged, or destroyed as a result to a breach.

The Breach Contingency Plan outlines a process for treatment of archaeological sites in accordance with Section 106 of the *National Historic Preservation Act*, to avoid adverse impacts on such resources. Exposed sites or wrecks located adjacent to a breach would be investigated prior to sand placement to avoid adverse impacts from use of heavy equipment, as well as from the placement of sand over such resources. If peat layers preserving prehistoric land surfaces are exposed, surveys by trained personnel would be conducted to the extent feasible under conditions at that time. The investigation would determine if a site is potentially eligible to be listed on the National Register of Historic Places; if sand placement would have an adverse impact on the archaeological resources; and if additional studies would be required. The results of the investigation would be coordinated with NYSHPO. If the site is eligible for the National Register and would be impacted by sand placement, then the alternative of avoidance of the site would be explored. If avoidance is not feasible, then the Advisory Council on Historic Preservation (ACHP) and SHPO would be advised and a plan for the documentation of the eligible properties would be developed and undertaken prior to fill of the breach.

This plan would become operative if a breach occurred and the breach was not filled using emergency authorization within 30 days of the occurrence of the disaster or emergency. However, archaeological sites located at the breach would likely be destroyed when the breach was created and therefore, the FWOP could result in-the loss of archaeological resources. In addition, archaeological resources could be adversely impacted if it is necessary for the New York District to undertake-emergency measures within 30 days of the occurrence of a disaster or emergency. For those emergency actions that are undertaken soon after the occurrence of the emergency, a waiver will be sought from the SHPO, the Advisory Council, or the Secretary of the Interior, in accordance with current Federal regulations.

4.10.2 Preferred Alternative (TSP)

A Programmatic Agreement (PA) will be executed for this project to guide the continued identification and evaluation of historic properties and determine the appropriate treatment. The results of this analysis of potential effects to resources and the proposed PA will be coordinated with the NYSHPO, NPS, Shinnecocka and Unkechaug Indian Nations as well as local historic societies and other interested parties. The framework for a preliminary draft PA is included as an Appendix E.

4.10.2.1 Offshore

Borrow Areas

Under the TSP, dredging from selected borrow areas has the potential to directly adversely impact previously unrecorded shipwreck sites. To avoid impacts on cultural resources located within offshore borrow area, the borrow areas would require a remote sensing survey-including side scan sonar; magnetometer, and sub bottom profiling-to determine if there are any potential National Register of Historic Places-eligible remains of shipwrecks. All work would be coordinated with NYSHPO and other interested parties. All targets identified by this survey would be avoided during dredging if feasible. If avoidance is not feasible, then the targets would require additional investigations in the form of underwater archaeological surveys to determine which targets are the remains of wrecks and their National Register eligibility. A plan for documentation of all National Register-eligible wrecks would be developed and implemented in coordination with ACHP, NYSHPO, and other interested parties. Stabilization may serve to protect archaeological sites from destruction or irreversible damage.

Shipwreck Sites

The potential for the presence of previously unrecorded submerged archaeological resources, in the form of shipwreck sites in particular, is very high in the offshore zone of the Project. There are several recorded magnetic or acoustic anomalies that have been identified within a series of potential borrow areas along Long Island’s south shore (TAR 2002). Under the TSP, the use of borrow areas located in the offshore zone (see Figures 2-3 through 2-7) has a potential to directly adversely impact both previously identified and unrecorded shipwreck sites, as well as recorded anomalies that suggest the presence of shipwreck locations.

Drowned Terrestrial Sites

No underwater, former terrestrial archaeological sites have been identified off-shore of Long Island. The potential for the existence of such resources in this highly dynamic zone is low (JMA 2000), and consequently there is a low probability that TSP anthropogenic or natural coastal processes will expose and directly or indirectly adversely impact drowned terrestrial archaeological sites.

4.10.2.2 Nearshore

Archaeological Resources

There is a high potential for buried archaeological deposits within undefined portions of the Project underlying the beaches and dunes (JMA 2000). Under the TSP, dune, berm, and beachfill projects involving beach scraping or re-grading to move material could be expected to expose and potentially directly adversely impact previously unrecorded archaeological deposits. Natural processes such as storm action, long-shore sediment transport, and dune development and evolution also may contribute to the possible exposure of, and direct and indirect adverse impacts to, previously unrecorded archaeological sites.

There are no known historically significant shipwrecks located within the near-shore habitat of the Project. However, the potential for historically significant shipwreck remains located within the nearshore portion of the Project is high. Natural processes such as storm action, long-shore sediment transport, and dune development and evolution also may contribute to the possible exposure of and direct and indirect adverse impacts to previously unrecorded shipwreck sites in the nearshore zone.

4.10.2.3 Barrier Island

Archaeological Resources

Under the TSP, storm protection projects involving ground disturbance may have the potential to directly adversely impact previously unrecorded and recorded archaeological sites. Natural processes such as storm action, long-shore sediment transport, and dune development and evolution also may contribute to the possible exposure of, and direct and indirect adverse impacts to, previously unrecorded or recorded archaeological sites.

Architectural Resources

Under the TSP, storm protection projects and continued population increase and housing/development trends combine to create a high potential for direct and indirect adverse impacts to NRHP listed, eligible, or potentially eligible architectural resources in the barrier island zone.

The Fire Island Light Station (Town of Islip) and the Beach Road Historic District (Village of Southampton) are the only properties within the Project 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; NPS 2004), 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 Project (see Table 3.10-1).

4.10.2.4 Back Bay

Submerged Archaeological Resources

Under the TSP, dredging activity or natural processes such as storm action and bayside shoreline processes may contribute to the possible exposure of and direct and indirect adverse impacts to previously unrecorded archaeological sites.

4.10.2.5 Mainland

Archeological and Architectural Resources

Overall, the Project will afford additional coastal storm risk management to existing properties on the National Register, as well as the other identified structures. Conversely, under the TSP, storm protection projects (including non-structural plans associated with building retrofits and raisings and road raisings) and continued population increase and housing/development trends combine to create a potential for direct and indirect adverse impacts to previously unrecorded archaeological sites and/or NRHP listed, eligible, or potentially eligible architectural resources in the mainland zone of the Project.

The proposed non-structural alternative, including retrofitting, flood-proofing and other activities, have the potential to have an r effect on structures that are eligible or listed on the national register. In addition, road raising could have an effect on archaeological resources adjacent to the existing road rights-of way and other historic properties. Evaluation of all structures identified for non-structural measures will be assessed for their National Register eligibility prior to the implementation of any measures. Any proposed measures will be designed to avoid or minimize any adverse effects. Where adverse effects cannot be avoided, documentation of the properties and other forms of mitigation will be developed in consultation with the NYSHPO, the property owner(s), and other interested parties.

4.10.3 Alternative 1

The potential impacts of Alternative 1 on cultural resources would be similar to the TSP.

4.10.4 Alternative 2

The potential impacts of Alternative 2 on cultural resources would be similar to the TSP.

4.11 TRANSPORTATION

4.11.1 No-Action Alternative (FWOP)

The southern shore of Suffolk County is most at risk of inundation during a coastal storm. The towns along the south shore, including the mainland, back bay, and barrier islands are all vulnerable to storm surge, intense rains resulting in flooding, and severe wind damage. In the event of a major hurricane and direct land fall, Fire Island and its summer communities would be overrun by waves. The surging waters would cut off the eastern end of the South Fork at Napeague, making Montauk an island (Rather 2005, as cited in Tetra Tech EMI 2007). According to research by Scott Mandia, Professor of Physical Sciences at SUNY Suffolk, the following observations were made regarding the anticipated effects of a storm surge on Long Island:

- Category 1 hurricane would inundate virtually all of the immediate south shore of the Island, including the north side of Great South Bay the south fork (as well as the north fork of Long Island.). Montauk Point would be completely cut off from rest of south fork during a category 1 storm.

- Category 3 hurricane would result in the complete inundation of Montauk Highway (Rt. 27A) by floodwaters; therefore, this road would be considered impassable during the storm. Much of the north and south forks would be entirely under water during a category 3 hurricane.

- Category 4 hurricane would result in the highest storm surges in Amityville Harbor with a potential 29-foot surge. A Category 4 hurricane could inundate the entire towns of: Amityville, Lindenhurst, Babylon, West Islip, East Islip, Bayshore, Gilgo Beach, Cedar Beach, Great South Beach, Fair Harbor, Cherry Grove, Cupsogue, Westhampton Beach, Watermill Beach, Wainscott Beach, Amagansett Beach, Napeague Beach, Montauk, Jones Beach, and Tobay Beach (Mandia, cited in Tetra Tech EMI 2007).

Overview of Transportation Facility Vulnerability

The high winds and air speeds of a hurricane often result in power outages, disruptions to transportation corridors and equipment, loss of workplace access, significant property damage, as well as injuries and death. A large amount of damage can be inflicted by trees, branches, and other objects that fall onto power lines, buildings, roads, vehicles, or people. Suffolk County also has experienced flooding in association with hurricanes and tropical storms in the past.

A great portion of the inventory of transportation facilities and infrastructure in the county is at risk of being damaged or lost due to impacts of severe wind. Certain areas, infrastructure, and types of building are at greater risk than others due to proximity to falling hazards or their manner of construction. Potential losses associated with high wind events were calculated for Suffolk County transportation resources for an anticipated 100-year hurricane event.

Suffolk County used the Hazards U.S. – Multi-Hazard (HAZUS-MH) software package supplemented by local data, as feasible, to assess risk. HAZUS-¬MH assesses risk and estimates potential losses for natural hazards (Tetra Tech EMI 2007). The impact on transportation facilities is shown in the Table 4.11-1 below. It lists the probability of sustaining the damage category as defined by the column heading, for the 100-year wind event. Transportation features include airports, railroad, bus, and user defined New York State Department of Transportation (NYSDOT) facilities.

Table 4.11-1. Vulnerability and Probability of Damage to Suffolk County Transportation Facilities from Winds: 100-Year Hurricane Event

Name	Type	Town*	Damage Probability	Damage Probability	Damage Probability	Damage Probability
			Minor	Moderate	Severe	Complete
Republic	Airport	Babylon	38%	18%	6%	5%
Brookhaven	Airport	Brookhaven	13%	1%	0%	0%
East Hampton	Airport	East Hampton	0%	0%	0%	0%
Montauk	Airport	East Hampton	0%	0%	0%	0%
Francis S, Gabreski	Airport	Southampton	2%	0%	0%	0%
Heliport	Airport	Southampton	1%	0%	0%	0%
MacArthur	Airport	Islip	32%	8%	1%	1%
Bayort Aerodome	Airport	Islip	26%	5%	1%	0%
Bablyon	Railroad	Babylon	38%	18%	5%	5%
Amityville	Railroad	Babylon	38%	19%	6%	6%
Copague	Railroad	Babylon	39%	19%	6%	6%

Name	Type	Town*	Damage Probability Minor	Damage Probability Moderate	Damage Probability Severe	Damage Probability Complete
Lindenhurst	Railroad	Babylon	38%	19%	6%	6%
Eastport	Railroad	Brookhaven	6%	0%	0%	0%
Mastic-Shirley	Railroad	Brookhaven	11%	1%	0%	0%
Bellport	Railroad	Brookhaven	15%	2%	0%	0%
Patchogue	Railroad	Brookhaven	24%	4%	0%	0%
East Hampton	Railroad	East Hampton	0%	0%	0%	0%
Montauk	Railroad	East Hampton	0%	0%	0%	0%
Amagansett	Railroad	East Hampton	0%	0%	0%	0%
Sayville	Railroad	Islip	32%	8%	1%	1%
Oakdale	Railroad	Islip	34%	9%	2%	1%
Great River	Railroad	Islip	37%	12%	3%	2%
Islip	Railroad	Islip	37%	14%	3%	3%
Bay Shore	Railroad	Islip	37%	16%	4%	4%
Bridgehamton	Railroad	Southampton	1%	0%	0%	0%
Southampton	Railroad	Southampton	1%	0%	0%	0%
Hampton Bays	Railroad	Southampton	2%	0%	0%	0%
Westhampton	Railroad	Southampton	2%	0%	0%	0%
Inter County Travel	Bus	Babylon	39%	17%	5%	5%
Rayburn	Bus	Babylon	39%	18%	5%	5%
Harran	Bus	Babylon	38%	18%	6%	5%
Educational	Bus	Babylon	37%	20%	7%	7%
Baumann & Sons	Bus	Babylon	37%	20%	7%	7%
Laidlaw	Bus	Babylon	37%	20%	7%	7%
K Corr	Bus	Babylon	38%	18%	6%	5%
Hemon E. Swezey	Bus	Brookhaven	19%	3%	0%	0%
Amboy	Bus	Brookhaven	21%	3%	0%	0%
United	Bus	Brookhaven	25%	5%	0%	0%
Amboy	Bus	Brookhaven	32%	9%	1%	1%
Railroad Terminal	Bus	Brookhaven	33%	9%	1%	1%
Royal Cards	Bus	Brookhaven	25%	4%	0%	0%
Hampton Luxury Liner	Bus	East Hampton	0%	0%	0%	0%
Transit Supply	Bus	Islip	37%	16%	4%	4%
Towne Bus	Bus	Islip	38%	16%	4%	4%
Greyhound	Bus	Islip	37%	12%	2%	2%
Adelwerth	Bus	Southampton	4%	0%	0%	0%
NYSDOT Robert Moses Causeway	Road	Islip	38%	17%	5%	5%
NYSDOT Babylon	User Defined	Babylon	38%	18%	5%	5%
NYSDOT Patchogue	User Defined	Brookhaven	20%	3%	0%	0%
NYSDOT Shirley	User Defined	Brookhaven	10%	1%	0%	0%
NYSDOT East Hampton	User Defined	East Hampton	0%	0%	0%	0%
NYSDOT Hampton Bays	User Defined	Southampton	1%	0%	0%	0%

Source: Consolidated from Tetra Tech EMI 2007.
Notes: * Facility location may fall beyond the actual Project boundaries
Railroad = railroad station; Bus = terminal or company office/bus garage location; User defined = Specific NYSDOT facilities that were not defined in report.

Under the FWOP, transportation in the Project could be significantly affected if a breach and/or flooding washed out portions of roads. In addition, parking areas and access roads at Robert Moses and Smith Point Parks could be inundated, preventing access to those parts of the barrier island. The water access could be adversely affected if docking facilities on the bay side were damaged by a breach. However, it is unlikely that all docking facilities would be rendered unusable; and Fire Island could continue to be accessed via water, albeit at a reduced level.

Fire Island protects the south shore communities of Long Island's bayshore. Under the FWOP, if a breach were to occur, low-lying areas would experience increased inundation and tidal impacts that could wholly or partially obstruct portions of the road network: in those areas. Buses, taxis, and other autos using low elevation roadways that could be inundated would be adversely impacted. In addition; the structures and parking areas associated with waterfront ferry facilities would also experience increased flooding and potential structural damage if a breach were to occur.

The Emergency Response Plan and the Comprehensive All-Hazards Emergency Management Plan for Suffolk County (Suffolk County 2005), adopted by Suffolk County Legislature in August 2005, identifies areas of greatest concern and critical transportation routes for evacuating areas of greatest risk to a hurricane’s impact. All of Fire Island was noted to be an area of concern due to the lack of existing improved roadways, limited alternatives for egress routes, and vulnerability to breaching and cutting off certain parts of the barrier island from contiguous egress routes, all of which can present difficulties or obstacles to evacuation during times of storm emergency. Of special concern is Dune Road, the major east-west thoroughfare between Moriches Inlet and the western side of Shinnecock Inlet and again in the area of Mecox Bay. In addition, the plan identified the critical transportation routes within the project area as:

- Sunrise Highway (Route 27) and North Sea Road intersection, Southampton;
- Route 111 (Islip Avenue) and Southern State Parkway interchange;
- Montauk Highway (Route 27), east of Southampton;
- Wellwood Avenue and Sunrise Highway (Route 27), north of Lindenhurst; and
- Ferry service from Fire Island to the mainland.

In addition to these critical transportation routes, the Robert Moses Causeway, William Floyd Parkway, and Ponquogue Bridge could be vulnerable to storm damage.

Utility structures often suffer damages during storms, associated with falling tree limbs or other debris, which often results in blocked transportation routes. Such impacts also could cause a loss of power, which would cause and traffic signal and railroad disruptions. Extended disruptions to public transportation could also lead to delays in returning train, bus, and ferry services to normal service levels within the Project.

Major damage would also be expected at many of the approximately 50 marinas on the mainland, back bay and barrier island. Evacuation procedures would require significant advance coordination to accommodate large number of potential evacuees from Fire Island since there is no vehicular access to most barrier island communities.

Economic Impact of Transportation Damages

The economic impact associated with transportation structures was presented in the Suffolk County Multi-Jurisdictional Multi-Hazard Mitigation Plan (Tetra Tech EMI 2007). General replacement value for various facility types was estimated as follows:

- Railroad station - $2,572,400
- Bus facility - $1,286,200
- Ferry terminal - $1,286,200
- Port - $1,831,200
- Airport - $6,431,000

There are additional costs associated with replacement of railway bridges. The report did not estimate replacement value for roads and bridges in Suffolk County. The cost of bridge replacement is highly variable. However the median cost to replace bridges operated by the New York State Bridge Authority is approximately $35,000 per foot (New York State Bridge Authority 2008). Additional economic impacts are associated with the loss of workplace access and severely limited business activity.

4.11.2 Preferred Alternative (TSP)

Under the TSP, adverse effects to traffic, transportation, access, and circulation that are expected under the FWOP would be reduced. The existing road network would continue to function. Boat access to Fire Island would remain available. Storms analogous to historic trends, consisting of frequent minor to moderate events, are likely to result in minor adverse impacts to transportation, consisting primarily of inconvenience to residents and visitors due to minor roadway flooding. These impacts would be expected to be short-term, depending on storm frequency and severity.

By reducing the risk of coastal storm damages, the TSP could have a positive impact on transportation resources within the Project. Although transportation resources would continue to be influenced by storms, hurricanes, sea level rise, coastal erosion, flooding, breaching, and overwash, the TSP would reduce the potential for adverse impacts to traffic, transportation, access, and circulation that are expected under the FWOP. The four road raisings would significantly reduce storm-related disruption to the existing road network. Additionally, relocation or buyouts could reduce transportation needs within the Project.

4.11.3 Alternative 1

The potential impacts of Alternative 1 on transportation resources would be similar to the TSP with the exception that renourishments would not be set, and therefore, not as frequent. Consequently, at times, adverse impacts on transportation resources from breaching of beaches, dunes, and shorelines could be more pronounced.

4.11.4 Alternative 2

The potential impacts of Alternative 2 on transportation resources would be similar to the TSP with the exception that there would be no relocation or buyouts, nor any adaptive management. Consequently, the long-term impacts on transportation resources would be similar to those of the FWOP.

4.12 VISUAL RESOURCES

4.12.1 No-Action Alternative (FWOP)

The ongoing projects and activities associated with the FWOP scenario would continue to impact the visual resources of the Project, although these impacts would be periodic, short-term, and localized to area where dredging and beach nourishment activities are taking place.

Completion of the erosion control and beach fill projects would require the use of large construction equipment, such as dredge barges and excavators, that would visually interrupt the natural landscape during construction activities, such as those associated with inlet and navigation channel maintenance, interim storm protection projects (Westhampton Interim Project and Beach Nourishment and Maintenance Dredging at Smith Point County Park and Cupsogue County Park Project), the Interim Breach Contingency Plan, and the CEHA Program.

Long-term impacts to visual resources are also associated with the expected population increase within the Project, which will result in increased traffic, increased development that would contribute to the loss of open space and natural habitats, and an increase in the numbers of visitors to the Project, all of which would produce a negative impact to the scenic quality of the region. If coastal line stabilization structures are required in locations where they are not currently located, the implementation of these structures would also contribute to the long-term impacts to visual resources.

Storms and coastal processes would continue to cause short- and long-term impacts to visual resources under the FWOP scenario. Impacts from these natural processes would result from storm and flooding events that may cause significant erosion or breaching of beaches, dunes, and shorelines, and cause structural damage to homes located within the floodplain areas. Sea-level rise associated with climate change is also expected to contribute to long-term impacts. Depending on the extent of the damages, the level of funding available to repair these damages, and the timeframe in which the repairs are to be made, both short-term and long-term impacts to visual resources could result. The resulting construction activities associated with the repairs of the natural features and manmade structures within the Project and vicinity would contribute to the short-term and long-term impacts to visual resources.

The FWOP scenario would be expected to increase the timeframe for implementation of storm damage repairs, since construction funding would be allocated on a local or program level for individual projects. This could potentially result in local projects that may not consider cumulative or synergistic effects of other planned repair activities across the entire Project.

4.12.2 Preferred Alternative (TSP)

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 impacts to visual resources associated with the expected population increase within the Project would result in increased traffic, increased development that would contribute to the loss of open space and natural habitats, and an increase in the numbers of visitors to the Project, all of which would produce a negative impact to the scenic quality of the region. These impacts would be the same as the FWOP. A potential major difference than the FWOP would involve buyouts. Any buyouts of properties would result in a conversion to open space or other non-residential/non-commercial uses. Reestablishment of the natural features of the land would be expected to enhance the shoreline visual quality and provide a benefit to neighboring communities, resulting in a beneficial impact.

Storms and coastal processes would continue to cause short- and long-term impacts to visual resources under the TSP scenario. Impacts from these natural processes would result from storm and flooding events that may cause significant erosion or breaching of beaches, dunes, and shorelines, and cause structural damage to homes located within the floodplain areas. Sea-level rise associated with climate change is also expected to contribute to long-term impacts. Implementation of the TSP, including set renourishments, would minimize these impacts.

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, The New York District 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.

Construction activities would have short-term minor adverse effects on transportation and traffic. These effects would be primarily due to worker commutes, and delivery of equipment and materials to and from the construction sites and staging areas. Typically, construction activities and associated traffic would be conducted during normal business hours; however, construction would proceed during evening hours at certain locations where traffic or road-use restrictions would affect the schedule. Equipment would not be fixed in one location for long durations, but would progress along the construction right-of-way. Increased construction traffic would be temporary, and would subside at any particular location as construction progresses to subsequent segments of the Project.

The TSP would require street closures during the road raising phase of the Project. All closures would be subject to DOT approval under a street construction permit, and a traffic management plan would be submitted to DOT for review and approval. Closures would be temporary and diversions would be provided. Final geometry/roadway elevations will be established during the Design Phase of the Project. Prior to any road raising activities, individual properties will be identified that may/will be affected by road-raising activities. Affected owners will be notified and a public meeting scheduled to discuss the design the design and construction of road raising details. This public meeting will give individuals an opportunity to express any concerns or provide additional information that may determine if design modifications/refinements are required. This public meeting will occur after the local stakeholders have had the opportunity to review and approve the design details and will be conducted in coordination/cooperation with the NYCDOT.

4.12.3 Alternative 1

The potential impacts of Alternative 1 on visual resources would be similar to the TSP, with the exception that renourishments would not be set, and therefore, not as frequent. Consequently, at times, the visual impacts associated with erosion or breaching of beaches, dunes, and shorelines could be more pronounced.

4.12.4 Alternative 2

The potential impacts of Alternative 2 on visual resources would be similar to the TSP, with the exception there would be no relocation or buyouts, nor any adaptive management. Consequently, there would be no conversion of land to open space and the long-term impacts on visual resources would be similar to those of the FWOP.

4.13 AIR QUALITY, NOISE AND GHG'S

4.13.1 No-Action Alternative (FWOP)

The ongoing projects and activities associated with the FWOP scenario would continue to be reviewed with respect to General Conformity applicability and if individual projects were determined to be subject to the requirements of General Conformity, they would need to fully meet the conformity requirements. Taking the entirety of the FIMP-related projects in the TSP, General Conformity is applicable to the all elements of the Federal Action. The result is that the entirety of FIMP must meet General Conformity requirements, which represents the most stringent air quality mitigation requirements.

Under the FWOP, this may not be the case if any of the individual projects under an FWOP scenario are below the General Conformity applicability trigger levels. In this scenario, the FWOP could actually result in higher levels of emissions than implementing the TSP because projects that did not trigger General Conformity review would not be required to mitigate emissions. While the FWOP scenario may result in higher overall emissions from the individual projects, it is anticipated that it would not result in a significant change to air quality in the area.

4.13.2 Preferred Alternative (TSP)

The TSP will temporarily produce emissions associated with diesel-fueled equipment relating to dredging, beach sand placement, and related landside construction activities. The project is anticipated to be conducted from 2018 through2025. The localized emission increases from the diesel-fueled equipment will last only during the project's construction period (and only local to where work is actually taking place at any point in time), and then end when the project is over. Therefore, any potential impacts will be temporary in nature.

The TSP will take place in Suffolk County, New York and the General Conformity applicability trigger levels for 'moderate' ozone nonattainment areas are: 100 tons per year (any year of the project) for NO_x and 50 tons per year for VOC (40 CFR§93.153(b)(1)). For areas designated as 'maintenance' for $PM_{2.5}$, the applicability trigger levels are: 100 tons for direct $PM_{2.5}$ and SO_2 per year (40 CFR§93.153(b)(2)).

The General Conformity-related emissions associated with the project are estimated as part of the General Conformity Review and are summarized below, by calendar year below in Table 4.13-1. Emission calculations, as well as the draft Statement of Conformity (dSOC) and the Marine Vessel Emission Reduction Project (MVERP) which will serve as one mitigation vehicle for the project are provided in Appendix N.

Table 4.13-1. General Conformity-Related Emissions per Calendar Year, tons

Pollutant	Estimated Emissions, tons per year								
	2017	2018	2019	2020	2021	2022	2023	2024	2025
NO_x	0.0	182.8	241.3	204.8	131.6	124.3	117.0	102.4	14.6
VOC	0.0	6.9	9.1	7.7	5.0	4.7	4.4	3.9	0.6
$PM_{2.5}$	0.0	9.5	12.5	10.6	6.8	6.5	6.1	5.3	0.8
SO_2	0.0	0.11	0.14	0.12	0.08	0.07	0.07	0.06	0.01

4.13.3 Alternative 1

The potential impacts of Alternative 1 on air quality and noise be similar to the TSP, with the exception that renourishments would not be set, and therefore, not as frequent.

4.13.4 Alternative 2

The potential impacts of Alternative 2 on air quality and noise would be similar to the TSP, with the exception there would be no relocation or buyouts, nor any adaptive management.

4.13.5 Greenhouse Gases (GHG's)

It is important to note that CEQ 2014 does not mandate mitigation, only consideration of the effects of the proposed action and consideration of climate change when selecting proposed alternatives and mitigation of other environmental impacts.

The CEQ 2014 guidance on the consideration of GHGs in NEPA reviews focuses on two key points: 1) the potential effects of the proposed action on climate change as indicated by its GHG emissions, and 2) the implications of climate change for the environmental effects of the proposed action. Projects that emit more than 25,000 metric tons (tonnes) of carbon dioxide equivalents (CO_2e) emissions on an annual basis should provide quantitative estimates. Table 4.13-2 provides the annual CO_2 emissions by year, in tonnes. Note that N_2O and CH_4, while not estimated, only slightly increase the total CO_2e compared to the CO_2 estimates, as CO_2 is by far the most dominant GHG from diesel-fueled engines. GHG emission estimates are provided in Appendix N.

Table 4.13-2: GHG Emissions by Calendar Year, tonnes

GHG	Estimated Emissions, tonnes per year								
	2017	2018	2019	2020	2021	2022	2023	2024	2025
CO2	0.0	11,055	14,593	12,382	7,960	7,517	7,075	6,191	884

The TSP is not anticipated to exceed the 25,000 metric tons of CO_2e, the CEQ 2014 indicator level, and the project will not introduce permanent new mid nor long-term sources of GHG generation. In fact, it is anticipated that the TSP will help reduce emissions of GHGs. The very nature of the TSP-related projects are to enhance the resiliency of the coastline ecosystems by constructing dunes and related beach/coastal infrastructure to combat rising sea levels, erosion and flood damage to infrastructure.

The project includes the protection of Atlantic shores and inlet, barrier island, back bay, and mainland upland ecosystems and reestablishment of vegetation lost through erosion, all of which will contribute to carbon sequestering and dune structural resiliency during storms. The protection of these ecosystems provided by the TSP will enable the greater coastal ecosystem to continue to sequester carbon through sustainable vegetation growth as a result of the project and will minimize future storm damage further inland and associated reconstruction emissions. As a result, CO_2e generation during future emergency response clean up and restoration of the coastline will be avoided. Therefore, it is anticipated that the project will have a net-benefit long-term local impact related to climate change.

The FWOP and alternatives may produce a slight increase in GHG emissions due to the fact that the implementation of the TSP should be accomplished in a more efficient and organized matter than individual and emergency response projects.

4.14 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

An assessment of documented Hazardous, Toxic, and Radioactive Waste (HTRW) sites in the Project area was conducted by reviewing recent state and Federal data sources. Within Suffolk County, nine sites are listed on the EPA's National Priority List (NPL) (USEPA 2016). The NPL is the list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation. The nine NPL sites in Suffolk County are generally associated with contamination from landfills, past and present manufacturing facilities, and the Department of Energy's Brookhaven National Laboratory. None of the NPL sites are located along the coast or within the FIMP Study Area (see Figure 1-1).

The TSP would involve the disturbance of soils along the Study Area, as well as the use of sand taken from the borrow areas. None of the areas expected to be impacted are located where prior uses and regulatory database searches have indicated a potential for the presence of hazardous materials. All excavated soil would be handled and managed in accordance with all applicable City, state, and Federal regulations.

With regard to mainland non-structural actions, the TSP includes building retrofits, floodproofing, relocation, acquisition of approximately 4,400 structures, and road raising in four locations. These non-structural actions would generate minimal solid waste and no hazardous materials are expected to be encountered. Asphalt from the street raisings would be removed and disposed of or reused. All solid wastes would be handled and managed in accordance with all applicable City, state, and Federal regulations. As a result, the TSP would not result in potential significant adverse impacts due to hazardous materials during construction or operation.

4.15 OTHER ENVIRONMENTAL CONDITIONS

4.15.1 Unavoidable Adverse Effects and Considerations that Offset Adverse Effects

Some non-motile species that inhabit the borrow areas and beach will unavoidably be lost during dredging and beachfill. 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 dredging and beach access, interruption of pedestrian paths along the beach, and noise from trucks and other heavy equipment.

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. Minimization measures 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 plover (an endangered species) 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 saltmarsh, fresh-water wetland, or other habitats may be avoided or substantially minimized. Implementation of the action alternatives could potentially affect piping plover 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 two rare 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 material at 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 font the tidal wetland boundary (intertidal zone).

- If present, there shall be no disturbance to vegetated tidal wetlands outside the boundaries of the placement area as a result of the construction activity.

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

- Nest enclosures will be installed (under supervision of New York District biologists or designated representatives) on selected piping plover nests within 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.

4.15.1.1 Piping Plover

- Dredging will take place continuously 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 historic piping plover usage (April-September). 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 chicks unobstructed 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 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.

- Because of the continuous activity, it is doubtful that any plover would attempt to nest along the actual placement site. However, 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.

4.15.1.2 Seabeach Amaranth

- Biologist/botanist or designated representative will survey the area immediately prior to any construction activity within the seabeach amaranth growing season (May 1 to November 1). Approximately twice a month from June 15 to October 15, the construction area will be surveyed. Records shall include plant locations, numbers of plants, 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.

- If present, seeds of all plants transferred will be harvested and stored to be replanted at a later date. A portion of this seed shall be sent to a qualified nursery to attempt germination. If successful, germinated plants will be replanted in suitable habitats in the project area, including sites already nourished. These plants will be monitored to determine their ability to re-establish themselves under various conditions for future mitigation efforts under other projects.

- 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 second 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 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 plover and seabeach amaranth impacts.

4.15.2 Relationship between Short-Term Uses of the Environment and Enhancement of Long-Term Productivity

The New York District recognizes that protection of the shoreline is a continual effort. Using periodic renourishment is an ongoing effort. As stated above, the goal of the overall TSP project is to provide comprehensive management of the Project's shoreline. Renourishment efforts have a temporary and short term impact on the biological resources on and near the shore. Removal of material from offshore borrow sites has a long-term impact on the nature of the borrow sites. However, these impacts are not substantial since there are no special resources within the borrow sites and some resources remain after dredging.

The proposed TSP will utilize soft measure solutions (beach nourishment and dune repair/creation) to stabilize and enhance the natural stabilization system for portions of Fire Island which have been severely affected by recent coastal storms. Benefits of this project will include reduced probability of breaches and overwashes in the barrier island, affording protection of the coastal mainland and barrier island communities. In addition, the project will provide protection to the natural resources that utilize the back-bay habitats, which include both recreationally and commercially important species, and habitats of protected species.

4.15.3 Irreversible and Irretrievable Commitment of Resources

An irreversible commitment of resources is one in which the ability to use and/or enjoy the resource is lost forever. Sufficient quantities of similar sand will remain in circulation in the sediment transport system and there will be no net loss. There will be sufficient sand remaining in the dredged area for re-colonization by benthic organisms and support of marine biota. Under all alternatives, sands and fuels would be required.

An irretrievable commitment of resources is one in which, due to decisions to manage a resource for another purpose, opportunities to use or enjoy the resource as it now exists are lost for a period of time. Sufficient quantities of similar sand will remain in the vicinity of the borrow areas for alternative management uses. Under all alternatives, sands and fuels would be required.

4.15.4 Cumulative Impacts

The Council on Environmental Quality regulations (40 CFR 1508.7) that implement the *National Environmental Policy Act of 1969* (NEPA; 42 U.S.C. §§ 4321 *et seq.*) define cumulative impact as the "impact on the environment which results from the incremental impact of the action when added to past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. 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 for this DEIS on the TSP and alternatives, other actions associated with the Project, and other activities in the surrounding region with the potential to contribute to cumulative environmental impacts. The New York District conducted the analysis in accordance with the Council on Environmental Quality NEPA regulations and handbook, "Considering Cumulative Effects Under the National Environmental Policy Act" (CEQ 1997b). Relative to the categorization provided within Council on Environmental Quality guidance, the cumulative impacts of the Federal projects in the Project can be characterized as additive (potential renourishment every 4 years under the TSP, i.e., it is not a one-time event). The impacts are also interactive in that the stabilization of barrier beaches and Mainland shoreline may alter/reduce early successional communities such as maritime beach from evolving in overwash areas.

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 Project 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.

An important step in cumulative impacts analysis is identification of resources that could be impacted by the Proposed Action. Resources deemed to have no impacts from the Proposed Action were eliminated from the cumulative impacts analysis; resource areas that would not experience impacts could not contribute cumulatively to regional effects. Based on the impacts analysis, resources with minor adverse impacts from the Proposed Action were considered for inclusion in the cumulative impacts analysis. The following resources were included in the cumulative impacts analysis, based on the conclusion that the Proposed Action would have a minor adverse impact on the resource and could contribute to cumulative regional impacts.

- Soils
- Sediments (bathymetry and sediment)
- Water Quality (surface and ocean)
- Vegetation (including invasive species and terrestrial habitat)
- Wetlands (including aquatic habitat)
- Fish
- Benthic Community
- Wildlife
- Protected Species and Critical Habitat

Representative projects were researched and considered in broad categories of regional projects. Dozens of regional projects were identified, and those with a potential to introduce cumulative impacts in conjunction with potential effects of the Proposed Action were included in the analysis. Recent, on-going, and proposed actions planned over the next several years with a potential interaction with effects of the Proposed Action are described below. The discussion below addresses the potential for the TSP to result in cumulative effects on natural resources in the Project. It focuses on impacts related to dredging, sand placement, and non-structural actions (relocation, buyouts, and road raisings).

4.15.4.1 Dredging Impacts

The dredging of all borrow areas (including Coney, Rockaway, Long Beach, and Jones Borrow Areas identified in Figures 2-3 and 2-4, but not proposed for used for FIMP), could potentially and directly impact the Marine Deep-water and artificial Structure/Reef communities present in open water areas. Although offshore communities would be disturbed, such disturbance would be of a temporary nature and would occur in dynamic/high energy environments where species have adapted to these: conditions. Preconstruction surveys would ensure that impacts to highly diverse areas containing substantial surf clam populations are avoided or minimized.

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 Project. 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 Project 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.

4.15.4.2 Direct Sand Placement Impact

Coastal

Sand placement activities have the potential to directly affect several shoreline communities. As in the borrow areas, 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 should 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 coordinates and consults with USFWS in accordance with the ESA when projects in the Project 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.

Bay

The Marsh Islands are an integral part of the Bays targeted for restoration by the U.S. Army Corps of Engineers, The Port Authority of New York and New Jersey, National Park Service (Gateway), New York State Department of Environmental Conservation, New York City Department of Environmental Protection, the National Resources Conservation Service and the New York/New Jersey Harbor Estuary Program. Restoring salt marshes and coastal wetlands in the Bays are a critical component of Estuary Restoration.

The U.S. Army Corps of Engineers, New York District awarded a contract on March 23, 2012 to restore Black Wall and Rulers Bar Marsh Islands in Jamaica Bay, N.Y. The project was designed to beneficially use clean sand from the New York-New Jersey Harbor 50-foot deepening project to restore marsh habitat in Jamaica Bay.

Following completion of the placement of 375,000 cubic yards of Ambrose Channel sand that is being used to restore 42 acres of marsh at Yellow Bar Hassock Marsh Island, an additional 250,000 cubic yards of sand from the Ambrose Channel deepening project were beneficially used to restore 22 acres of marsh at the Black Wall and 12 acres of marsh at Rulers Bar.

Approximately 45.5 acres of salt marsh habitat were restored at Yellow Bar Hassock via placement of approximately 375,000 cubic yards of sand from Ambrose Channel. The 45.5 acres of marsh is comprised of approximately 13.1 acres of transplanted low marsh plant hummocks, 21,859 high marsh transition plants and 17,175 high marsh plants planted on 4.427 acres and 350 pounds of dispersed seed over 27.75 acres.

Ambrose Channel sand was also beneficially used in September and October 2012 to restore an additional 30 acres of marsh islands at Black Wall (155,000 cubic yards of sand, 20.5 acres) and Rulers Bar (95,000 cubic yards of sand – 9.8 acres).

4.14.4.3 Indirect Sand Placement Impacts

Sand placement activities also have the potential to indirectly impact Marine Intertidal; Marine Beach; Dunes and Swales. The primary indirect impact of the TSP to the Marine Intertidal and Marine Beach is the infusion of additional material into the predominantly east to west littoral drift. The positive cumulative effect of this condition is the additional accretion of materials along the south shore of the Project, which will provide additional risk management protection and the creation of additional intertidal and maritime beach habitat. The addition of materials into the littoral drift would also increase the amount of materials that will accrete in the ebb/flood shoals and inlets along the south shore. Additional maintenance of the inlets would be required. Due to the low benthic value of these inlets, no additional impacts other than those associated with maintenance dredging are expected.

The primary indirect impact of the TSP on the Dunes and Swales and Terrestrial Upland is the stabilization of these communities and the limiting of early successional communities associated with overwashing. The nourishment projects will increase the stability of the shoreline habitat, thereby promoting the succession of open sand, dunes and grassland to more stable shrublands. This change in dominant communities could indirectly impact shorebirds that require sparsely vegetated -sand/beach cobble areas for nesting: (such as the piping plover). However; these projects will not entirely prevent overwashing from occurring. This coastal process will still occur, although most likely with less frequency. Because of the continued-occurrence of overwashing, and sand placement along the shoreline communities which could mimic overwash conditions, the impact to these communities and nesting shorebirds is not considered substantial.

The Hudson Raritan Estuary (HRE) is within the boundaries of the Port District of New York and New Jersey, and includes 8 Planning Regions: 1) Jamaica Bay; 2) Lower Bay; 3) Lower Raritan River; 4) Arthur Kill/Kill Van Kull; 5) Newark Bay, Hackensack River and Passaic River; 6) Lower Hudson River; 7) Harlem River, East River, and Western Long Island Sound; and 8) Upper Bay. As a first step, the USACE, with participation of the regional stakeholders, has developed a Comprehensive Restoration Plan (CRP) that serves as a master plan and blueprint for future restoration in the HRE region. The CRP provides the framework for an estuary-wide ecological restoration program by utilizing restoration targets -Target Ecosystem Characteristics (TECs) developed by the region's stakeholders. The CRP Program goal is to develop a mosaic of habitats that provide society with renewed and increased benefits from the estuary environment. Each TEC is an important ecosystem property or feature that is of ecological and/or societal value including restoration of coastal wetlands, shellfish/oyster reefs, eelgrass beds, water bird islands, public access, maritime forest, tributary connections, shorelines and shallow habitat, fish crab and lobster habitat, reduction of contaminated sediments and improvement of enclosed and confined waters. The CRP provides a strategic plan to achieve the TEC goals, identify potential restoration opportunities and mechanisms for implementation. The HRE Feasibility Study will recommend specific restoration projects throughout the HRE Study Area that advance the CRP goals and provide solutions for water resource problems.

New York and New Jersey Harbor Deepening Contract Marsh Restoration project includes construction of four marsh restoration projects. Two marsh restoration projects at Woodbridge, NJ and Elders Point East, Jamaica Bay, NY (2006-2007, 40 acres of wetlands) were constructed as mitigation for the channel deepening. In 2009 through 2012, the project was modified to include the restoration of two additional Jamaica Bay marsh islands (Elders West and Yellow Bar Hassock) through the beneficial reuse of dredged material. In 2010 with 100 percent non-federal sponsor funding, 339,235 cubic yards of sand was beneficially used for the restoration of Lincoln Park, New Jersey.

4.14.4.4 Non-Structural Actions

Relocation and buyouts would produce beneficial impacts in the Project by: (1) reducing the potentially affected population and resources; (2) creating open space or other non-residential/non-commercial uses, which would restore the natural features of the land and enhance the shoreline visual quality; and (3) reducing the demand on transportation resources. Although road raisings would create short-term adverse impacts from construction, the long-term benefits would include improved transportation, access, and circulation. These positive impacts would be counteracted by potential population increases and increased development in the Project. Supplemental environmental documents will be done as need, per town(s) to better assess the effects of the non-structural actions.

4.14.4.5 Summary of Cumulative Impacts

The minor adverse impacts of the Project on the aforementioned resource areas would not increase to significant adverse impact levels when combined with past, present, or reasonably foreseeable future impacts from other regional projects. These minor impacts are primarily associated with construction of the Project. Cumulative adverse impacts on recreation, wetlands, water quality, sediment transport, fish and wildlife, and essential fish habitat would remain minor and short-term. This is due to the coastal storm protections afforded by the Project to regional projects that have or are planned to restore and/or protect coastal resources located within the Project area. Accordingly, the minor adverse impacts associated primarily with construction of the Project would be offset by the cumulative long-term beneficial impacts of the Project on, and in combination with, restorative regional projects.

Under the Selected Plan, the long-term significant adverse impacts on coastal resources within the Project area would remain at these levels in context to other regional projects. Implementation of the Proposed Action is not expected to have a significant cumulative adverse impact on any of the resource areas evaluated in this DEIS. Cumulative net positive impacts would be realized in the local socioeconomic environment and many resource areas where protection from coastal storm events is beneficial to the resource (e.g., vegetation, wildlife, recreation).

The Proposed Action would not significantly, cumulatively increase regional adverse impacts in the areas identified by the cumulative impact analysis methodology. Minor adverse and beneficial cumulative impacts are discussed in the following sections.

Soils

The Proposed Action would cumulatively contribute to beneficial long-term direct impacts that would occur from the resulting built structures that retain and capture littoral materials native to the beach communities and/or limit the effects of wave and storm surge erosion. Construction work on the groins and in conjunction with similar regional projects would result in continued protection of beach sands from wave action and erosion that result from significant storm events. Cumulative beneficial long-term direct impacts on soils would occur as a result of the Project and similar regional projects due to beach renourishment actions, where beach sands are replenished at prescribed intervals over project life cycles.

Cumulative minor adverse direct short-term impacts to soils would occur as a result of implementation of the Project due to such construction activities as clearing, grading, trench excavation, backfilling, and the movement of construction equipment within the project areas. Soil compaction and disturbance to and mixing of discrete soil strata cumulative impacts would be reduced through implementation of BMPs to control erosion and sedimentation during construction (e.g., installation of silt fences). Cumulative impacts would be reduced further because areas disturbed by construction activities (e.g., temporary access roads) would be restored at the end of project execution.

Sediments (bathymetry and sediment)

The Proposed Action would contribute to minor adverse indirect long-term impacts on sediment budgets. Construction of wetland, dunes and berms reduces sediment deposition and movement in Bays. Hardening of the bay's perimeter and changing the bay's physical contours may reduce sediment deposition in the bay. These change would cumulatively contribute to minor long-term adverse impacts on bathymetry, short-term direct adverse impacts to bathymetry in the Bays could occur due to construction activities where increased sediment generation could affect depth of the water column. These effects would be minor and short-term, limited to the period of construction. Implementation of BMPs to control sedimentation and erosion and the large extent of the Bays compared to the construction footprint would minimize adverse impacts on the overall bathymetry in the Bays.

Water Quality (surface and ocean)

Implementation of the Proposed Action would cumulatively contribute to long term benefits by directly addressing anticipated wave climate, and reducing future shoreline erosion. Sand placement projects have the potential to alter wave climates, but would have a long-term benefit by reducing future beach renourishment requirements.

The Proposed Action would cumulatively contribute to minor short-term direct adverse impacts to ocean waters due to disturbance of subsurface sediments during construction of the dunes, berm and dredging of sand from the offshore burrow area. Water quality would quickly return to baseline conditions after construction activities are completed. It is anticipated that these minor short-term direct adverse construction impacts would be further minimized by implementation of BMPs.

Minor direct short-term impacts to surface water quality would occur due to common construction activities such sand placement, grading, and the movement of construction equipment used during execution of the common project elements. Water quality impacts to surface water would primarily be related to increases in turbidity and suspended solids as a result of increased erosion and sedimentation, which would cause a short-term reduction in oxygen levels. These adverse construction impacts would be minimized by implementation of BMPs (e.g., silt curtains, work at low tide out of the water).

Vegetation (including invasive species and terrestrial habitat)

The Proposed Action would contribute positive benefits to regional terrestrial habitats in conjunction with other similar projects listed above. Projects initiated in the Region would benefit from the shoreline and inlet features of the Project, which would serve to impede extreme storm surges, such as those experienced during Hurricane Sandy, from destroying or impeding establishment of beach vegetation communities. Similarly, terrestrial habitats that are undergoing enhancement through regional project efforts along the shores of the Project will be exposed to less risk from storm surges.

Construction of wetland associated with Project, would have a footprint and maintained area that would have both long-term minor adverse impacts to other bayside beach habitats. In addition, areas within the limits of disturbance would have short-term minor adverse impacts to these habitats.

Wetlands (including aquatic habitat)

The Proposed Action would contribute positive benefits to regional aquatic habitats in conjunction with other similar projects listed above. Projects initiated in the region would benefit from the Project. For example, the Dune and berm system would reduce the potential for extreme storm surges, such as those experienced during Hurricanes

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Construction of the Atlantic Ocean Shorefront, as well as portions of the Bays, would have short-term minor adverse impacts on beach habitats, aquatic habitat, and potentially associated dune habitats at each nourishment area. These aquatic and terrestrial habitats are likely to be recolonized from nearby communities and benthic aquatic habitats are expected to-establish to a similar community within a 1 to 2-year period (USACE 1995). No permanent impacts associated with habitat structure and/or vegetation are anticipated in this segment. In fact, the project will have a net long-term benefit on these habitats by stabilizing the shoreline, increasing sediment the sediment budget, and minimizing future renourishment activities necessary to support a healthy North Atlantic Upper Ocean Beach community.

Fish

The Proposed Action would contribute positive benefits to regional fish species. Constructed wetland would create areas suitable for recruitment and protection for numerous fish species. It would provide living spaces for the food resource on which fish species rely and would provide shelter from attacks for the existing and surrounding fish communities.

The Proposed Action would contribute to minor short-term direct adverse impacts on adult and juvenile life stages of nearshore fish during construction, as mobile fish would be temporarily displaced from foraging habitat as they retreat from the area in response to construction activities. Construction related increases in turbidity and suspended solids will cause a short-term reduction in oxygen levels and reduce visibility for feeding. Impacts are expected to be minor, given the temporary nature of the disturbance and the availability of suitable adjacent habitat. Adult and juvenile life stages and their prey species would quickly reestablish themselves after completion of construction.

Additional minor short-term direct adverse impacts on nearshore fish communities would occur as a result of dredging sand from the borrow areas. According to the NPS environmental documents prepared for borrow efforts indicate the adverse impacts are not significant (NPS 2015). Additional minor short-term direct impact on benthic feeding fish species (e.g., windowpane, summer and winter flounder) would be experienced, due to temporary displacement during dredging for borrow areas. Impacts are considered minor because benthic feeding fish species are expected to avoid construction areas and feed in the surrounding area; therefore, would not be adversely affected by the temporary localized reduction in available benthic food sources. Because adverse effects to essential fish habitat would be minor, the essential fish habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations will be satisfied.

Minor short-term direct adverse impacts on nearshore fish communities would be realized by less mobile life stages (eggs and larvae) of nearshore fish, e.g., Atlantic butterfish, red hake, windowpane flounder, winter flounder, summer flounder, and scup, if present at the time of construction activities. Impacts would occur because of short-term changes to water quality, including resuspension of sediments in the water column and changes to the quality or quantity of soft bottom substrates. Impacts are considered minor, given the large extent of the Atlantic Ocean and the Bays compared to the project construction footprint. Implementation of BMPs to control sedimentation and erosion during construction would further minimize adverse impacts on eggs and larvae of nearshore fish species.

Benthic Community

The Proposed Action would contribute positive benefits to regional benthic shellfish species. Constructed wetland would create areas suitable for recruitment and protection for numerous shellfish species. They would also provide living spaces for the floral and faunal communities on which benthic species rely and would provide shelter. In addition, the wetland vegetation will provide shelter, moisture at low tide, and food especially for the sessile epifaunal and epiphytic groups. Gastropods, bivalves, and crustaceans are all common inhabitants of wetlands.

Minor short-term direct adverse impacts to benthic communities are anticipated from construction activities associated with the common project elements, including future periodic renourishment. Construction would cause increased sedimentation, resulting in the smothering of existing sessile benthic communities in the vicinity of construction areas. Some mortality of shellfish, and polychaetes is expected for individuals that cannot escape during the construction process. Motile shellfish species would be able to relocate temporarily outside of the immediate project area.

Wildlife

The Proposed Action would cumulatively contribute to the beneficial long-term direct and indirect impacts on protected species populations. Beach renourishment associated with the Project would support healthy North Atlantic Upper and Lower Ocean Beach communities; therefore, species that rely on that vegetation community would benefit for the Proposed Action and similar regional projects.

The Proposed Action would cumulatively contribute to short-term direct minor adverse impacts to the many species which includes endangered species too. The Proposed Action and similar regional actions may cause minor adverse impacts associated with short-term construction activities that may cause direct mortality of individuals or contribute indirectly to mortality of individuals due to temporary destruction of habitat on which a species relies.

Protected Species and Critical Habitat

The Proposed Action would cumulatively contribute to beneficial long-term direct impacts on federally and state listed threatened and endangered species. Vegetation stabilization and renourishment in the Project area would support healthy North Atlantic Upper Ocean and Lower Beach communities; therefore, habitats for seabeach amaranth, piping plover, red knot, roseate tern and other species that use this habitat would benefit for the 50-year life of the project. Overall habitat within the intertidal zone would increase as the beach is widened with beach fill and shortening of the groin structures. The physical characteristics of the intertidal habitat will not be altered because the grain size of fill material will be the same as that of project footprint native sand. USACE is engaged with the USFWS to ensure the latest reasonable and prudent measures for Piping Plovers and standard BMPs are incorporated into the projects' Plans and Specifications detailing specific conservation measures to be undertaken to minimize potential adverse effects to protected species under their jurisdiction.

The Proposed Action would cumulatively contribute to minor short-term direct impacts to threatened and endangered species. Shoreline intertidal, subtidal, upper beach, and dune wildlife habitats would be impacted due to construction activities. Wetland habitats would be impacted by changes in surface water quality from increases in near shore turbidity and suspended solids as. Terrestrial upper beach zone and dune communities, dominated by sand and beachgrass would experience minor short-term direct impacts due to construction of permanent pedestrian access ramps and walkways and placement of sand barriers. Placement of wetland would result in small losses of intertidal beach and subtidal aquatic habitats located within the footprints, although wetland attract benthic invertebrates and fish species that are food resources for, roseate tern, red knot, and osprey.

These activities will likely have impacts on the beach habitats of seabeach amaranth and the nesting habitat of the piping plover and roseate tern, and the beach foraging habitat for migrating red knots dependent on horseshoe crab reproduction on beaches in the Project area. Implementation of BMPs to limit construction activities during the breeding and migratory seasons and protect areas where seabeach amaranth populations are present should further minimize adverse impacts on these threatened and endangered species. No, or negligible impacts on threatened and endangered sea turtles and marine mammals are expected at the time of construction. The USACE has concluded consultation with NMFS (Appendix B).

5.0 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

This section discusses the compliance and consistency of the Tentative Federal Selected Plan (TSP) with major relevant policies.

5.1 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

As noted in Chapter 1, the TSP approval is subject to the regulations of the National Environmental Policy Act of 1969 (NEPA). Consistent with NEPA, this DEIS has been prepared to evaluate the potential impacts on the quality of the human and natural environments and presents Project alternatives. The Project must also obtain state approval and, thus, is subject to the regulations of the New York State Environmental Quality Act (SEQA), which places requirements on state agencies similar to those of NEPA.

5.2 FIRE ISLAND NATIONAL SEASHORE ACT AND GENERAL MANAGEMENT PLAN

Portions of the Study Area lie within the Fire Island National Seashore (FIIS), which was created by the Fire Island National Seashore Act in 1964 (P.L. 88-587). In addition, a portion of FIIS was established as the Otis G. Pike Wilderness Area in 1980 (P.L. 95-585) pursuant to the Wilderness Act of 1964 (P.L. 88577). The FIIS is managed by the National Park Service (NPS) under a General Management Plan (GMP). In its role as manager of the FIIS, the NPS must issue a Special Use Permit before the implementation of those components of the TSP that are located in the FIIS.

On June 15, 2015, the Fire Island National Seashore's Draft General Management Plan/Environmental Impact Statement ("Draft GMP/EIS") was released for a 90-day public review and comment period (NPS 2015). The GMP is a comprehensive plan that defines the park’s purpose and management direction and provides the overarching guidance necessary to coordinate all subsequent planning and management. The Final GMP/EIS will address public comments received by September 17, 2015 and is expected to be released in 2016.

The GMP seeks to manage the FIIS by restoring, to the extent possible natural process on the island, and to limit development to those areas that are already set aside for that purpose. For those properties within the FIIS owned by the Federal government, GMP policies recognize the difference between major landholdings, which can be managed to serve as natural recreation areas, and smaller tracts interspersed between the existing communities on Fire Island. Although the objectives of the GMP apply to all of the FIIS, the focus on restoration of natural processes and protection of natural resources is strongest on major Federal land holdings and in the Otis G. Pike Wilderness Area.

The TSP has been designed to avoid disturbance to the wilderness area, to keep to a minimum the placement of sand on major federal lands, and to focus sand placement and dune construction in developed areas. The U.S. Army Corps of Engineers (USACE), New York District, DOI, and NPS will coordinate throughout implementation of the TSP.

5.3 ENDANGERED AND THREATENED SPECIES ACT

The TSP will be in compliance with the Endangered Species Act of 1973 (ESA). Pursuant to Section 7 of the ESA, a draft Biological Assessment (BA) has been prepared for the piping plover and seabeach amaranth (see Appendix B) and a Formal Consultation with the U.S. Fish and Wildlife Service (USFWS) will be initiated by the New York District (District). Relevant sections of the BA have been integrated into the DEIS impact analysis. The TSP has been designed to include efforts to minimize impacts to barrier island vegetation and a program of minimization measures for the piping plover and seabeach amaranth would be included as part of the TSP.

Additionally, pursuant to Section 7 of the ESA, the National Marine Fisheries Service (NMFS) has issued their concurrence with the District’s Not Likely to Adversely Affect (NLAA) determination (Appendix B).

5.4 COASTAL RESOURCES BARRIER ACT AND COASTAL BARRIER IMPROVEMENT ACT OF 1990

The Coastal Barrier Act Resources (CBRA) and its amendments prohibit the spending of new federal expenditures that tend to encourage development or modification of coastal barriers that are within the defined Coastal Barrier Resource System (CBRS). Based on New York District review, only one unit of the CBRA, is located within the proposed Project area: Robert Moses State Park, CBRS map NY-59, Fire Island Unit. However, the proposed Project would meet the provisions of Section 6 of the CBRA, which provides exceptions for expenditures of federal funds within CBRA units. The TSP proposes nonstructural sand placement to strengthen the natural protective features of Fire Island for storm damage protection; it does not seek to encourage encroachment of development or alterations to the coastal barriers.

5.5 COASTAL ZONE MANAGEMENT ACT OF 1972

A Federal consistency determination in accordance with 15 CFR 930 Subpart C has been made. The New York State Department of State must review the New York District’s determination of the TSP’s consistency with the policies of the State’s Coastal Management Program (Coastal Zone Management Act of 1972, P.L. 92-583 and New York State Waterfront Revitalization and Coastal Resources Act of 1982). State consistency review will be conducted during the coordination of the DEIS.

5.6 SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT OF 1966, AS AMENDED

Coordination with the NYSHPO, local preservation groups and interested parties as well as consultation with the Shinnecock Indian Nation and the Unkechaug Indian Nation has been ongoing regarding the various investigations completed (Appendix F). To finalize the Section 106 process, a Programmatic Agreement (PA) will be executed and implemented to establish a process to continue to identify and evaluate historic properties as project activities associated with TSP are carried out. A preliminary draft PA based on the information gathered during the study can be found in Appendix E. Coordination and consultation on the results of the assessment of effects and the preliminary draft PA is ongoing.

5.7 CLEAN WATER ACT OF 1977

The Project is in compliance with the Clean Water Act of 1977 and subsequent amendments. Implementation of the TSP would not result in changes in water quality. All state water quality standards would be met. An application for a Section 401 water quality certification will be submitted to the New York State Department of Environmental Conservation (NYSDEC) with the release of this DEIS.

5.8 CLEAN AIR ACT OF 1970, CLEAN AIR ACT AMENDMENTS OF 1977, AND CLEAN AIR ACT AMENDMENTS OF 1990

The diesel-fueled construction emissions associated with the proposed TSP will be subject to General Conformity requirements (40 CFR§93.150-165) and the project will fully comply with the applicable regulations. The project's air quality mitigation will be coordinated with the Regional Air Team (RAT). Since the project will comply with General Conformity, air quality would not be adversely affected by this Project. This Project has been coordinated with EPA Region 2 and NYSDEC and is in compliance with Section 309 of the Clean Air Act. Upon completion of the draft EIS, EPA will be forwarded a copy for their review.

5.9 NEW YORK STATE COASTAL EROSION HAZARD AREAS ACT

Due to the erosion prone nature of parts of the New York coastline, the Coastal Erosion Hazard Areas Act (CEHA) (Article 34 of the Environmental Conservation Law) regulates construction in areas where buildings and structures could be damaged by erosion and flooding. NYCRR Part 505 provides procedural requirements for development, new construction, and erosion protection structures. The NYSDEC enforces the regulations if the city and county do not provide coastal hazard regulations. The entire Atlantic Ocean shoreline of Fire Island has been identified as a coastal erosion hazard area. The entire beach and nearshore area, as well as the primary dune to a point 25 feel landward of the landward toe of the dune, are designated as natural protective features. New construction is not permitted in these areas and pre-existing development is strictly limited to only a 25 percent increase in ground coverage area.

State law provides for the NYSDEC to revoke certification of local CEHA management programs if local administration is not consistent with statewide minimum standards, and to assert regulatory jurisdiction over these areas. Thus, continuous future enforcement of New York's CEHA law and regulations is assured for Fire Island's ocean shoreline.

All of the action alternatives must incorporate a buffer zone landward of the landward toe of the constructed or restored dune. This area must be included, together with the dune, within a permanent conservation area easement to assure that no development can occur within it. This would be consistent with Coastal Erosion Management Regulations. The Project would be considered as the beneficial deposition of material obtained from excavation or dredging, as permitted under the Coastal Erosion Management Regulations.

5.10 FISH AND WILDLIFE COORDINATION ACT REPORT

The Draft Fish and Wildlife Coordination Act Report (DFWCAR) is provided at the request of the U.S. Army Corps of Engineers (Corps) towards fulfillment of Section 2(b) of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*).

The purpose of the FWCA is to assure equal consideration and coordination of fish and wildlife conservation with other project purposes. DFWCAR provides the Service's comments on the biological and procedural issues relevant to the Corps' Fire Island Inlet to Montauk Point, Reformulation Study Project (FIMP). Section 2(b) of the FWCA requires that the final report of the Secretary of the Interior: (1) determine the magnitude of the direct, indirect, and cumulative impacts of the proposed projects on fish and wildlife resources, and (2) make specific recommendations as to measures that should be taken to conserve those resources. We have received the DFWCAR and will continue to coordinate with the USFWS to finalize the DFWCA R (appendix M).

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Code of the Village of Saltaire

Code of the Village of Patchogue

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