APPENDIX I

BREACH RESPONSE PROTOCOLS

Breach Response Protocols
Fire Island Inlet to Montauk Point Reformulation Study
October 2015

1. Introduction

The Fire Island Inlet to Montauk Point Storm Risk Management Project will encompass a variety of measures to reduce storm-induced damages to mainland and barrier island communities within the project area.

As part of the 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.

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 (see Attachment A, developed by New York State Department of State).

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. The designation of which shoreline areas will be covered by each type of response is shown in Figure 1.

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. Two degrees of morphological response to breaching were considered in this study: A ***partial breach*** is a storm-induced barrier island cut that has a scoured depth between MHW and Mean Low Water (MLW) while a ***full breach*** is a storm-induced barrier island cut that has a scoured depth at or below Mean Low Water (MLW). A partial breach will allow for water to exchange between the ocean and bay during a portion of the normal tidal cycle while a full breach will allow water exchange during the complete tidal cycle. The breach may be temporary or permanent (i.e., a new inlet) depending on the size of the breach, adjacent bay water depths, potential tidal prism, littoral drift, and water level and wave conditions following the storm.

2. Proactive and Reactive Breach Response

Proactive Breach Response plan is triggered when protection is compromised. This trigger would be an evaluation of the level of protection against breaching, and serve as a trigger when the beach and dune are lowered below a particular design level, comparable to a 25-year level of protection.

Reactive breach closure 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.

3. Conditional Breach Response

Implementation of conditional breach response requires action be taken to develop processes for conditional breach response within the large, publicly owned tracts along Fire Island, considered the undeveloped areas within the purview of the Fire Island National Seashore. Within the national seashore boundary, the NPS needs to determine the likelihood of natural closure. All areas of the barrier island between Moriches Inlet and Shinnecock Inlet will either be a Pro-Active or Reactive Breach Response and therefore not addressed by the conditional breach management procedures.

Within the large, publicly owned tracts of land along Fire Island there is a desire to determine the likelihood of natural breach closure before specific design or construction activities are undertaken to close breaches. This would entail monitoring and standardized decision protocols to determine whether or not a breach appears to be naturally closing on its own. The conditional breach protocol authorization will be a part of the overall FIMP work. Breach Response Protocols are to be re-examined and updated every five to ten years. The PPA should be updated if there are adjustments to the response protocols to ensure readiness. Other agreement documents, including Certified Real Estate and Water Quality Certificates should be ready to avoid delays of processing from Senior Leaders of Agencies, State and Local communities.

Details on actions during post-authorization design, annual/continuous monitoring, and before, during and after a breach, within these specific areas, are described below. Tasks that will be completed post-authorization, pre-construction should be clearly detailed in the General Reevaluation Report and EIS.

4. Conditional Breach Response Decision Team

The Decision Makers Are: Superintendent, Fire Island National Seashore; Commissioner, New York State Department of Environmental Conservation; County Executive, Suffolk County; Colonel, U.S. Army Corps of Engineers, New York District; Regional Administrator, U.S. Fish and Wildlife Service.

5. Science and Engineering Advisory Team

The Science and Engineering Advisory Team will include representatives from the National Park Service, U.S. Army Corps of Engineers, U.S. Geological Survey, the U.S. Fish and Wildlife Service, New York State Department of Environment Conservation and Department of State, and Suffolk County.

6. Locations Considered for Conditional Breach Response

The locations of the Large, Publically Owned Tracks of Land on Fire Island are listed below:

- East of Point of Woods to west of Cherry Grove
- East of Cherry Grove to Fire Island Pines (Carrington)
- East of FI Pines to west of Water Island (Talisman/Barrett Beach)
- East of Water Island to Davis Park

- East of Davis Park to Smith Point County Park (Wilderness Area – with requirements for EIS Development)
- Smith Point County Park to RV Campground.

7. Allowable Conditional Breach Closure Characteristics within the Large, Publically Owned Tracts

Breach closure will be accomplished, if the breach is not naturally closing (or is not predicted to close based on modeling results), within 45 to 60 days of the breach opening. Contracting procedures shall be started at the occurrence of the breach, but may need to be cancelled if the breach closes naturally. The cross-section of the breach closure would be at +9.5 ft NGVD height at a minimum, the breach cross-section would match the 0.0 ft NGVD shorelines on both the ocean and bay sides making smooth shorelines without indentations, and the cross-section slope would match adjacent bayside and ocean-side slopes. No cross-sectional sand maintenance of the breach closure template would be allowed after the breach closure.

If a breach closed naturally, no additional fill material would be allowed in that location to bring the section to the above cross-section characteristics. Only on the occurrence of a new breach, that did not close naturally in that location, would additional material be allowed to be placed to bring the cross-section to the +9.5 ft NGVD height and shoreline to shoreline width. There would be increasing likelihood of re-breaching and subsequent vulnerability in those locations that did not close naturally with the increased berm height.

Placement of additional sand material in the bay during the hydraulic construction closure of the breach could be included in the condition breach closure, to emulate flood shoal volumes of breaches allowed to remain open. Proposed volume and dimensions of any additional bay material placed during breach closure operations will need to be determined during the Pre-Construction Engineering and Design Phase.

8. Actions to be undertaken during the Engineering and Design Phase (post-authorization, pre-construction)

a) During Pre-Construction Engineering and Design, a Bayesian Model will be developed to aid in the determination of likelihood of natural closure of breaches in the large, publically owned tracts on Fire Island. Using a probabilistic, Bayesian approach, based on empirical physical, climatological and hydraulic data, time of year considerations, etc. a decision tool will be created for use by the Science and Engineering Advisory Team (see 5.c below) in their role in advising the decision makers regarding breach closure actions. Development and use of a Bayesian model will determine the likelihood of natural closure and confidence values for that likelihood. All available appropriate data will be used in the development of the Bayesian model, including data from USGS and its modeling efforts. Tabletop exercises will be conducted at the time of model development to run through multiple breaching and closing scenarios, to validate the modeling process for the Fire Island barrier island.

Data collection of conditions will be necessary to continually improve the validity of the Bayesian model as a tool for decision Advisory of closure actions. The majority of the data that

would be used in the Bayesian model would be physical and meteorological data. Data collection requirements are described below.

The Bayesian model developed under this effort will be exercised prior to and/or in the event of a breach by the Science and Engineering Advisory Team, and the model outcomes will guide the closure activities.

b) Develop a detailed, specific siting plan for additional water level gages within Great South Bay, Moriches Bay and Shinnecock Bay. This plan will be developed by the Science and Engineering Advisory Team. The water level gage data will be used for the development and yearly updating of the Bayesian model, and for post-breach monitoring of bay water levels. Determine if additional nearshore ocean wave gages are needed, and if so develop a siting plan.

c) Formation of the Science and Engineering Advisory Team. The Science and Engineering Advisory Team will advise decision makers for conditional closure within the large publically owned tracts on Fire Island, based on the Bayesian Model and specific post-storm and time of year conditions.

9. Post-Authorization Actions including Data Collection to Advisory Decision Tools for Conditional Breach Response Protocols

Physical Ongoing/Pre-Storm Monitoring

- Ocean Water Levels
- Bay Water Levels –continuous recording measurements Great South Bay, Moriches Bay and Shinnecock Bay, as determined by 4.b above.
- Continue data collection at Buoy 44025 and additional nearshore wave gages as determined by 4.b. above.
- Back Bay Bathymetry – 1500 ft north of barrier island
- Yearly LiDAR of the entire barrier island system: develop pre-storm conditions along all barrier islands. More vulnerable areas may require more frequent, specifically for those locations, especially pre-storm
- May: Annual assessment of vulnerable locations, topography: island height, width, slopes (see 6. below)
- Tide range/Phase changes
- Barrier Island Cross sectional cores in areas determined to be of high probability of breaching.
- Development of a communication and information plan (primary and alternate given that availability of power and facilities within the storm impacted area may vary from storm to storm).
- Environmental Monitoring

10. Annual Actions to Catalogue Barrier Island Conditions

A brief “letter” report will be prepared in late May of each calendar year to describe the condition of the barrier islands of the Atlantic Coast of New York, from Fire Island Inlet to Southampton. The letter report will summarize, from information gathered up to 1 May of the

calendar year, the highly vulnerable locations along the barrier island system with respect to barrier island breaching.

The annual survey will characterize the coastal barriers with physical parameters such as cross section width, height and volume. Locations that fall below a threshold percentile for each reach (for example: 50% on any two parameters: dune height, berm width, barrier width, cross sectional area/volume) should be identified. The threshold for reporting vulnerable locations will be determined and may not be uniform among different reaches. Reports should be clear that potential breaches are not limited to the identified locations and will identify the breach response type of the vulnerable areas.

The letter report will describe the breach closure protocols and reference all the required permits and coordination. The letter report will include multiple appendices (described below) to provide information needed to enact the breach closure protocols, if necessary, from 1 June of the present calendar year, to 1 June of the next calendar year. The letter report and appendices will be sent to all identified as part of Breach Protocol Team (as comprised of members from the Federal, State and Local Agencies who are partners in FIMP) in preparation for the summer hurricane season, and the fall-winter northeaster season.

2. The letter report will be prepared by the Corps, with Corps information and additional information provided by state and local agencies, and other Federal agencies. It will be shared with the entities listed for review prior to finalization.

3. Appendices:
A. Listing of Breaching Protocol Team
B. Listing of current breaching closure protocols
C. Federal Permits/State Permits
D. Updated Construction Documents – Plans and Specifications for Breach Closure
E. Fish and Wildlife Report – ESA mapping most recent available by May of the calendar year.
F. History of Beachfill/Risk Reduction Actions by Federal, State and Locals – from previous year 1 May to current Year 1 May.
G. Availability of Environmental Condition Data (ocean and bay water levels, waves, wind, etc.) as of 1 May of present year; listing of online sources.
H. Physical Monitoring Data collected 1 May past year to 1 May current year.
I. Aerial Photos – as recent as possible – spring of current year
J. September Condition Assessment of Federal Projects from prior calendar year from Corps Operations Division, including most recent condition surveys of navigation channels.
K. Written Topographic Assessment – May of present year
L. Confirmation of Permits/Contract Available for various breach closure alternatives – listing of available sources of breach closure material
M. Post-Storm Data Collection Resources: Confirmation of availability of equipment, resources
N. Annual Letter from the Corps to New York State – confirming protocols, Real Estate coordination
O. Informal Consultation with FWS: Provide Breach Response Protocols Updates to create an administrative record documenting that NAN coordinated with the FWS and that they concurred

that the Breach Response Protocols Update (has no change to the prior Section 7 decision) is not likely to adversely affect the species or habitat.
P. Explanatory information on breaches and natural processes, similar to the content inserted here as "Attachment A" to reinforce local officials' and residents' understanding of coastal processes as a basis for decisions, and to provide a realistic framework for breaches and adaptive management.

11. Immediately Pre-Storm Actions

Upon the incipient occurrence of a breach, monitoring of critical areas with possibilities of breaching identified either in the annual assessment or additional pre-storm information will begin during the pre-storm preparations. Both the Decision Team and the Science and Engineering Advisory Team will be activated at the incipient occurrence of a storm that may have breaching potential (predicted water levels and wave heights higher than a 25 year return period event). A protocol for data collection, methods of vulnerability assessments, and a clear plan for how these data and analyses will be disseminated to the group will be developed during Pre-Construction Engineering and Design. Data will be stored in a portal-type digital interface.

- Assistance from NPS rangers regarding barrier island physical conditions, identification of potentially breach-vulnerable locations.
- Photography of potential vulnerable locations
- Examine wave and water level conditions, and wave and water level predictions
- Exercise Bayesian Model, if pre-storm barrier island vulnerability and predicted storm climate indicates post-breach conditions favorable to natural breach closure, with the Science and Engineering Advisory Team
- Based on vulnerability assessment and wave conditions, pre-storm beach measurements will be taken at specific locations. If conditions appear stable, no measurements taken.
  If conditions are vulnerable, take island cross-section measurements to obtain conditions prior to the possible breaching (one day of RTKS in the field).
- Environmental Monitoring as required

12. Post-Storm Actions, with significant changes to topography alongshore for a Full Breach or Partial Breach:

- The Science and Engineering Advisory Team will come together to exercise the probabilistic Bayesian of breach closure, to predict natural breach closure or growth within fourteen days of breach occurrence. The Science and Engineering Advisory Team will report the results of the probabilistic model (with confidence limits) within twenty-one days of the breach occurrence. The Bayesian model may have to exercise multiple times if the naturally remains open through a storm season (August through April). If a full breach does not form, no breach closure activities will be enacted.
- **Weekly:** Topography/Bathymetry through the throat of the breach area
- Aerial Photography: including flood tide delta
- Ground Level Photography
- Continuous Mainland Water Levels while breach is open, with assessment of tide gauge data and water level recurrence intervals in the time period the breach remains open.

- Mainland Flood Marks immediately post-breach and in the event of a subsequent storm while breach is open
- ADCP: **weekly** current flow in the channels (new breach, Moriches and Fire Island Inlets)
- Bathymetry at Fire Island and Moriches Inlets
- Ocean Waves just outside the breaches area
- Shallow cores within the breach area
- **Weekly:** Water Quality: Temp/Salinity/Clarity after breaching

13. Mechanical Closure Activities:

Mechanical Closure procedures and contracting to be initiated with within 45 days of breach opening within the large publically owned tracts on Fire Island, if there is not clear indication of imminent natural breach closure, such as decreasing cross-section width or breach depth from day 30 onward, and the Bayesian model predicts that breach will remain open. Closure procedures will have to be by hydraulic placement due to the locations of the large, publically owned tracts and the time period for closing. Flexibility should be integrated into the Breach Response Project Agreements as part of the FIMP PPA, so breach closure work can be done by State, County or Municipal entities if dredging equipment is already mobilized by those entities for other dredging projects. No maintenance fill for breach closure will be allowed in the large, publically owned tracts; stabilization actions taken only when subsequent breaching occurs.

14. Actions Upon Natural or Constructed Breach Closure:

- Continuation of Pre-Storm/Ongoing monitoring items in 5. above
- Documentation of Breach Closure Activities

15. Funding Requirements

All costs incurred for the conditional breach response protocols including development of the Bayesian Model, water level gauging, pre-storm monitoring, post-storm monitoring, meeting of the science response teams and their activities to develop a recommendation on breach closure, the updating of protocols over the life of the project will be cost-shared as part of the authorized project measures.

Attachment A

Information on Coastal Barrier Breaches

Managing breaches of New York's coastal barriers has become increasingly important with the progress of development. Breaches occur periodically through a combination of sea level rise, erosion and storms. Before the 20th century most breaches closed naturally over time unless they were maintained by jetties and dredging. One study documented at least 31 breaches between 1500 and 1980 in the region from Fire Island Inlet to Shinnecock Inlet. Since 1900 most breaches have been closed by human actions. At Moriches (1931) and Shinnecock (1938) breaches were maintained as navigation inlets. From a geologic perspective breaches are episodic events that help form the coastal barriers by depositing sediment in shoals that widen the barrier and form a platform where aquatic plants help accumulate sand. Washovers, or sand driven up onto the barriers during storms, also help build sand volume. Management efforts that prevent breaches and washovers may destabilize the barriers by preventing retreat in response to sea level rise. The shore face will continue to erode and steepen, while the bayshore will shrink with encroaching sea level and lack of sediment input. This combination of factors could lead to thinning the barriers, loss of volume and possible catastrophic breaches in a major storm. It's important to understand coastal barrier processes and the role of breaches to formulate effective management plans. The need to reduce impacts while respecting essential natural processes underscores the importance of resilient land use planning.

The origin of the coastal barriers is uncertain but evidence indicates they have existed since the end of the last ice age. Processes that created the barriers include the deposition of outwash sediments from glaciers, erosion and transport of sand along the shore, and sediment reworking by storms and waves. Geologic records show that the barriers evolved as a result of shore face retreat in response to sea level rise. "The geophysical data from the inner shelf and shoreface suggest that Fire Island has migrated continuously, albeit intermittently, during the past 7,000 years from its previous position 2 km (1.2 mi.) offshore."ii There has been debate about the relative stability of parts of the coastal barrier. During the past 300 years eastern sections have been breaching more frequently and migrating landward faster than central Fire Island, where portions of the land form show ages of 750-1300 years before the present time.iii This is attributed to greater exposure to weather events toward the east end and increased sediment supply in the west.iv Western Fire Island has seen ocean side and bayside erosion, coupled with spit growth as sediment accumulates at Democrat Point. Current research indicates offshore sand formations may help stabilize central Fire Island by contributing substantial quantities of sand to the beach.v But the capacity of this source to continue the stability of central Fire Island may be drawing to a close, as the width of the island is thinning over time. "…the system will continue to migrate landward in response to a rising sea level…"vi

The current protocol for managing barrier breaches between Fire Island Inlet and Shinnecock Inlet is established in a Breach Contingency Plan (BCP) of the U.S. Army Corps of Engineers.vii Through the BCP a technical team will review breaches and initiate a process to fill them in if they are likely to remain open. The Army Corps and participating agencies recognize that the BCP and other management plans can reduce but not eliminate breaches, so some breaches are inevitable. More frequent breaches in the eastern region and accelerated shoreline retreat suggest

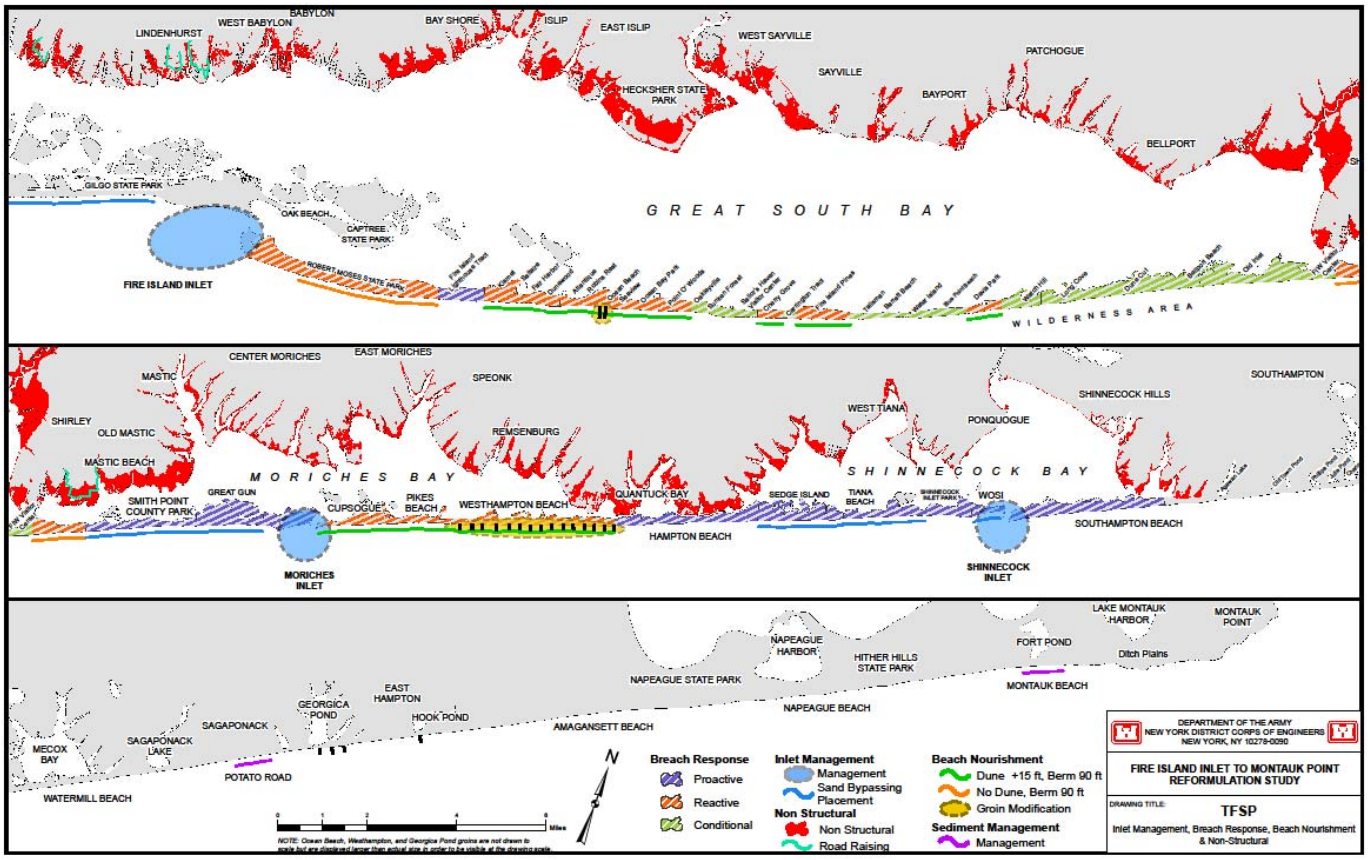
this area is more likely to experience new breaches in the future. In addition, flooding from storm water flowing into the bays through the existing inlets, which causes more damage in the region over the course of time, is not addressed by breach management. Efforts are underway to prepare a regional plan to reduce storm impacts. The success of these measures will depend to a large extent on the level of participation of all partners, private, local, state and federal, in utilizing their capacities to reduce impacts. Given the fact that some breaches are inevitable, and that healthy coastal barriers depend on restoring sediment processes that allow the barriers to migrate in response to sea level rise, efforts must be made to adapt if we are to reduce impacts to development. Breach management must be coupled with development management to carry out this adaptation. Communities surrounding the bays, on the barriers and the mainland, should use their land use authority to avoid flood and erosion damages. Where these damages occur elevation, relocation or voluntary acquisition should be considered as options to avoid repeat damages. Adaptive measures should be coordinated with management efforts at all levels. Cooperative planning among neighboring communities is one option for creating programs to address these needs.

If appropriate measures are taken, losses can be reduced to a manageable level. This would allow natural sediment processes to resume, including breaches, washovers and barrier migration, which are essential to maintain the barriers. Without these sediment processes the barriers will become increasingly unstable. "Processes such as wave run-up, overwash and barrier beaching, which occur during elevated storm surge are all necessary processes in enabling the efficient transfer of sediments, nutrients and marine water from the Atlantic Ocean across the barriers and into Great South Bay. A large body of scientific data and information published over the past 50 years shows that such transfers of sediment and water from the ocean to the bays are essential for the long-term maintenance of the barrier island and back-bay systems and their biologically diverse habitats and ecosystems." viii Preventing these natural processes could be harmful: "…interruption or prevention of these processes over a long period of time (lifetime of the Corps project [Fire Island Reformulation] is assumed to be 50 years) could have demonstrable, adverse effects."ix New York's coastal barriers will have to evolve over time if they are to be sustained. The present need is to adapt both development patterns and breach management to arrive at a point where communities can coexist successfully with their environment.

i Leatherman, Stephen P. and Joneja, Danielle, Final Report, Geomorphic Analysis of South Shore Barriers Long Island, New York: Phase I, National Park Service Cooperative Research Unit Report 47, 1980
ii Leatherman, Stephen P. and Allen, James R. editors, Geomorphologic Analysis of South Shore of Long Island Barriers, report to the U.S. Army Corps of Engineers, New York District, 1985. (page 269)
iii Leatherman and Allen, (pages 174-5)
iv Leatherman and Allen, (page 57)
v Hapke, Cheryl J., et al, A Review of Sediment Budget Imbalances along Fire Island, New York: Can Nearshore Geologic Framework and Patterns of Shoreline Change Explain the Deficit?, Journal of Coastal Research, May 2010, V. 26, no. 3, p. 510-522
vi Leatherman and Allen, page 62

vii US Dept. of the Army, Barrier Islands and Atlantic Coastline Fire Island Inlet to Montauk Point, Babylon to Southampton, NY, NYS-DEC Permit Number 1-4799-00015/00005, NYS Coastal Consistency Number F-2010-0878
viii Williams, S.J. and M.K. Foley, Recommendations for a Barrier Island Breach Management Plan for Fire Island National Seashore, including the Otis Pike High Dune Wilderness Area, Long Island, New York. Technical Report NPS/NER/NRTR—2007/075 National Park Service. Boston, MA, February 2007.
ix Leatherman and Allen, page 270

Figure 1. FIMP Project Components



FIMP Shorefront Components (Great South Bay and Moriches Bay) include:

- Conditional Breach Response in undeveloped areas of Fire Island National Seashore:
  - Breach Closure at elevation +9.5 ft NGVD
  - East of Point O'Woods to west of Cherry Grove
  - East of Cherry Grove to Fire Island Pines (Carrington)
  - East of FI Pines to west of Water Island (Talisman/Barrett Beach)
  - East of Water Island to Davis Park
  - East of Davis Park to Smith Point County Park (Wilderness Area)
- Fire Island Inlet sand-bypassing (every two years, ~380,000 CY)

- Beach and dune fill along developed communities
    - +15 ft NGVD dune, berm with a width of 90 ft.
- Removal of Ocean Beach Groins
- Breach Response in Smith Point County Park
    - Reactive Response in Developed areas (west limit to RV Campground)
    - Proactive Response in undeveloped areas (east of RV Campground to Moriches Inlet)
- Beachfill in Developed Portions of Smith Point County Park
- Moriches Bypassing (every two years, ~75,000 CY)
- Reactive Breach Response in Cupsogue Beach County Park
- Beachfill (continued renourishment) in Completed Westhampton Project
    - +15 NGVD Dune, berm width of 90 ft
- Modification of Westhampton Groin Field (tapering groins 70-100 ft)

APPENDIX J

LAND AND DEVELOPMENT MANAGEMENT

Land and Development Management

I. Context of Land Management Considerations in the Stabilization Effort

The Reformulation Study was undertaken to identify a long-term (50-year) plan to reduce the risk of storm damages, while maintaining, enhancing or restoring the existing environment. USACE coordinated with project stakeholders to establish the approach to formulating, evaluating, and recommending storm risk reduction projects for the study area under the reformulation effort. The team sought to identify opportunities to reduce storm damages through less intrusive measures, and in a manner which allows for restoration and enhancement of the natural coastal processes.

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 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.

An examination of the with-out project conditions in the study area noted that the existing collection of land use regulations is ineffective in addressing development and redevelopment in these at-risk areas, particularly in areas vulnerable to erosion. Conceivably, some alternatives implemented under this Project could exacerbate this problem. The following sections present a 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 Stabilization project advances efforts to remove development from high risk areas through acquisition and adaptive management.

II. Existing Land Management Authorities

Within the study area, federal, state and county governments each have regulatory authority, the local governments have regulatory jurisdiction with respect to land management, principally through zoning and through management of environmental features such as freshwater and tidal wetlands. 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, under the system known as “home rule”. 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.

<u>Fire Island National Seashore</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.

Federal zoning regulations provide a set of standards for the use, maintenance, renovation, repair, and development of property within FIIS. NPS has established three districts within its boundary, which are: 1) the Community Development District; 2) the Seashore District; and 3) the Dune District. The Community Development District comprises 17 communities and encompasses the existing communities and villages. In the Community Development District, existing uses and development of single-family houses are allowed. The Seashore District includes all land in FIIS that is not in the Community District. No new development is allowed in the Seashore District, but existing structures may remain.

The Dune District extends from Mean High Water (MHW) to 40 feet landward of the primary natural high dune crest which has been mapped by NPS. This district overlaps the other two districts. Only pedestrians, and necessary vehicles such as ambulances, are allowed in the Dune District. Like the Seashore District, existing legal structures may remain and may be repaired and maintained. The existing dune district was established based upon the dune condition in 1976 and adopted by Congress. The dune district has not been re-mapped, and presently is not an accurate representation of the existing dune. NPS developed federal zoning standards that became effective September 30, 1991 under 36 CFR Part 28. These set standards that local zoning must meet to be exempt from the condemnation authority of the Secretary of the Interior.

These standards include controlling population density and protecting natural resources, limiting development to single-family homes, and prohibiting any new commercial or industrial uses. NPS is not responsible for enforcing the federal zoning standards in the communities and villages, despite the presence of federal regulations. It is the responsibility of the local governments to maintain regulatory jurisdiction. The federal government ensures local compliance with the federal law by maintaining the power of condemnation; in cases where the law is not met, FIIS has statutory authority to purchase and condemn the non-compliant building. While local zoning ordinances conform to standards issued by the Secretary of the Interior, the federal power of condemnation is suspended. In practice, this authority has been seldom exercised, and Congress has not given funding to FIIS for this purpose in recent years.

FEMA

Other agencies also have responsibility to affect land use regulation in the project area. An organization that indirectly affects land use regulation 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). Participation in the NFIP requires a municipality to adopt a local floodplain management ordinance that regulates floodplain development and redevelopment following damage. The intent of the local ordinance is to reduce damage to buildings and property through the establishment of base flood elevations, building code requirements, and restrictions on allowable development in floodplain areas. Specific provisions include the requirement that the first finished floor or new construction must be elevated above the base flood elevation. All municipalities within the study area participate in the NFIP.

USFWS

The Coastal Barrier Resources Act of 1990 established the Coastal Barrier Resources System (CBRA), which consists of specifically identified undeveloped coastal barriers on the United States coastline. The U.S. Fish and Wildlife Service (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 in 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.

NYS CEHA

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 responsibilities for NYSDEC regarding towns, counties, and regulation of coastal erosion hazard areas are defined by these regulations. These regulations restrict development in the primary dune, which is defined as 25 ft landward of the landward toe of the dune. Since these regulations were more recently adopted, and since the locations of the dunes have changed over time, there are a number of pre-existing, non-conforming structures within the CEHA area.

NYS CMP

In 1981, the New York State Legislature enacted the Waterfront Revitalization and Coastal Resources Act (Article 42 of the Executive Law) to implement the State Coastal Management Program (CMP) at the state level. 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 area by encouraging local municipalities to prepare Local Waterfront Revitalization Programs (LWRPs) in accordance with state requirements.

III. Evaluation of Land Use and Development Implication of Coastal Storm Damage Features

The existing collection of land use regulations do not effectively discourage development or restrict building and rebuilding in high hazard areas along the coast.

Conceivably, some features proposed for coastal storm damage reduction could create additional land development challenges or intensify those that already exist. Alternately, some features could reduce these pressures. The following presents the alternatives, and land-use challenges and opportunities associated with them.

Breach Response. The breach response plans introduce some land use and development management challenges that would not be realized in the without project condition. Existing land management measures do not address rebuilding in breach locations, or locations that are likely to remain vulnerable to breaches in the future. Land and development management measures should

consider the need for restricting redevelopment in locations that are likely to remain as vulnerable to breaching and overwash. Not only will this address reducing development at risk, but is also important to facilitate continued breach response requirements, and can help provide a desirable habitat mosaic by maintaining an open bay to ocean connection.

Inlet Management. The inlet management plans do not introduce any specific land use and development management challenges.

Non-Structural. The non-structural plans could complement land use and development management opportunities that discourage development in high risk areas. A larger project benefit could obtained by acquiring rather than retrofitting structures in some situations, including instances where 1) buildings are in sparsely developed areas, where habitat connectivity could be achieved, or 2) buildings located at such low ground elevations that under future sea level rise conditions would be in the intertidal zone. If there is a local desire for structure acquisition rather than retrofit alternatives, these alternatives could consider if the additional costs for acquisition would be warranted to provide restoration of habitat to the underlying area.

Beachfill. Beachfill plans introduce both challenges and opportunities for land use management.

Along the shorefront area, the existing land management regulations that limit the investment in the primary dune have not proven effective. A number of structures exist within the dune, partially because they were constructed prior to the implementation of these regulations, and partially due to long-term changes in the dune position; development continues to occur in the primary dune. In the absence of a project, it is likely that the number of pre-existing, non-conforming structures would be reduced as a result of storms that would destroy these buildings beyond repair, with the acknowledgement that additional buildings would be at risk, due to the long-term evolution of the dune position. With a beachfill project in place, it is much less likely that the structures in the CEHA would be destroyed, and would likely persist.

Additionally, incentive to develop these areas could increase once a beachfill and dune project reduces the likelihood of storm damages in the area. The stabilization of the shoreline with a beachfill and dune plan increases the need for effective land management measures which function properly to avoid an increase in the level of infrastructure that is at risk in these areas.

It must be noted that these beachfill plans also create opportunities to address existing development that is at risk, and opportunities for reducing the amount of development and infrastructure at risk, over time.

Beach nourishment is recommended to protect public infrastructure, most notably in Robert Moses State Park, and Smith Point County Park. Relocation of public infrastructure in these areas would reduce the long-term requirement for renourishment.

The alignment recommended for beachfill can influence the amount of development in high risk areas. Construction of a beachfill and dune project requires real estate. These easements preclude development in the footprint of the project. As described in the main text of this HSRR, the

Stabilization effort is proposed for a more landward alignment. This alignment requires acquisition of buildings, prior to construction, and reduces the number of structures in the high-risk area.

At full build out, the Stabilization project will reduce development significantly within the high risk project areas. Forty two properties will be acquired in fee and removed from the erosion area. Six properties will be relocated to a lower risk area. More than six hundred properties will create perpetual easements where development is severely restricted. Greater detail of the real estate actions is provided within the Real Estate Appendix.

Groin modification.
The groin modification alternatives do not directly present land management or development management challenges. However, the implementation of the groin modification alternative in the vicinity of Ocean Beach could increase the vulnerability of the existing development and would require measures to reduce the risks to existing development, and would require the relocation of public infrastructure which is at risk.

IV. Land and Development Management Opportunities in Formulation

The Reformulation effort investigated land management alternatives to reduce the exposure of people and property to erosive forces in the study area. A table that highlights all of the possible land and development management alternatives that could implemented to address the existing land use challenges, and the issues that could evolve with implementation of a coastal storm reduction plan. This table, with supporting information, was considered by local municipalities and stakeholder groups to develop recommendations for alternatives to address these challenges.

These meetings have identified that the biggest challenge is addressing building and rebuilding in erosion-prone areas. These discussions have resulted in a framework to address these concerns, which generally consider solutions that improve upon or modify the existing set of regulations that are presently in place, rather than the introduction of new land-use regulations.

An important outcome of this supplemental screening was the identification of the techniques that should be evaluated for possible inclusion for Federal implementation in the recommended plan, and which techniques would be recommended for inclusion in a non-federally implemented Flood Plain Management Plan (FPMP) as a component of the overall collaborative plan. A number of the alternatives can be included in both. The USACE does not possess authority to modify or implement local land use regulations; this power rests at the municipal and state levels, and thus certain alternatives are assigned only to the FPMP. Table J-1 below shows where (in terms of authority to implement) each alternative can be evaluated.

Table J-1. Summary of Non-Structural Technique Evaluation

NON-STRUCTURAL TECHNIQUE	RECOMMENDED FOR FURTHER EVALUATION UNDER:		
	FIMP Reformulation Plan	Non-Federal Flood Plain Management Plan	
	USACE*	State	Local

Land Use and Regulatory Measures			
Zoning/Land Use Controls		+	+
New Infrastructure Controls		+	+
Landform and Habitat Regulations		+	+
Construction Standards and Practices		+	+
Tax Incentives		+	+
Building Retrofit Measures			
Relocation	+	+	+
Elevation	+	+	+
Free-Standing Barriers (mainland only)	+		
Dry Floodproofing (mainland only)	+	+	+
Utilities Protection	+	+	+
Land Acquisition			
Purchase of Property	+	+	+
Exchange of Property		+	+
Transfer of Development Rights		+	+
Easements and Deed Restrictions	+	+	+
Other			
Wetlands Protection & Restoration	+	+	+
Vegetative Stabilization	+	+	+
Post-Storm Response Planning	+	+	+
***** It is acknowledged that there are other Federal agencies (including the NPS, within the jurisdictional boundaries of FINS; FEMA; and USFWS) that have a Federal Role in these activities			

Participants agreed that land and development management alternatives that could be implemented to reduce development pressures, and the existing development in high hazard areas, where retrofits are not applicable.

Step 1: Improving the effectiveness of the existing regulatory program, by establishing a common funding source, establishing common and clearly communicated boundaries for regulated hazard areas, increasing training of local officials, and coordination to ensure consistent implementation across regulatory boundaries.
Step 2: Modification of statutes to allow for more effective implementation of the existing laws.
Step 3: Establishing a funding mechanism to acquire vacant parcels, or buildings that are at risk
Step 4: The establishment of a regional entity that would be responsible for various aspects related to land management and acquisition, and to fulfill the requirements of the local sponsor.
Step 5: Establishment of post-storm response plans to guide recovery following major, catastrophic events.

Step 1. Improving the effectiveness of the existing land-use regulations through establishment of common funding, and improved implementation of the law, generally includes the following:

Update the Existing Dune District in FIIS
The FIIS enabling legislation set the established dune location in 1978; this line does not reflect the current dune location. Effective implementation of the regulation would benefit from a common definition of the dune, and a common regulatory jusdiction with the CEHA Program. The federal law should be revised to create the same definition of a dune and the same requirement as contained in CEHA for a 10-year remapping process. This common mapping would require the

identification of and agreement on a common defining feature. Presently, the CEHA program is based upon the landward toe of the primary dune, plus 25 feet. The federal dune district is based upon the dune crest plus forty feet. Furthermore, the NYS process provides for a public hearing as input into the process, which is not a provision of the Federal dune district. Since the CEHA serves as the primary regulatory mechanism, has been applied throughout the state, and is more current than the dune district, it is recommended that the provisions within the FIIS enabling legislation be changed to identify that the dune district be coterminus with the CEHA line, and allowed to change with changes in the CEHA designation.

CEHA Improvements.
CEHA improvements include map updates, funding to adequately implement the program, and provisions for improved DEC monitoring of local implementation of CEHA. These improvements are described below:

Updating CEHA Maps Across the FIMP Area. CEHA requires review and remapping of dune locations every 10 years. Fire Island was completed 10 years ago and no remapping is scheduled. Other areas of the study were mapped even earlier. Dune positions change in response to storm activity. The routine remapping of CEHA is necessary to effectively implement the program, and should be scheduled on a routine 10-year basis.

Improve DEC monitoring and support of local implementation of CEHA and establish adequate funding for effective implementation of CEHA. DEC has delegated the implementation of CEHA to local communities in many instances. By regulation, DEC must conduct regular annual monitoring reviews for compliance by all delegated programs so that missteps are addressed, monitoring, management and communication can improve, consistent implementation can be acknowledged, and, where necessary, delegation can be withdrawn. At its current funding level, DEC cannot provide oversight and conduct adequate training for local implementation by municipalities that have assumed direct management, nor oversee and properly implement the law elsewhere. Effective funding of the program at the state level would allow for technical and legal support for municipalities who administer their program, and improve their effectiveness. Effective funding of this program is necessary regardless of any alternative implemented under FIMP, and is presumed to be a responsibility of the local sponsor.

Step 2. Modification of statutes to allow for more effective implementation of the existing laws.

CEHA Statutory changes. Make statutory and rule changes to enhance enforcement authority and provide indemnification by New York State for properly-administered local CEHA programs against takings claims (e.g.; Pine Barrens § 57-0123.6) to reduce the influence of potential litigation costs, including potential takings claims, on local program decision making. Presently, local municipalities are responsible for providing the legal defense in the instance where CEHA variance requests are taken to court. Often the cost of defending these lawsuits is comparable to the costs associated with acquiring properties, and beyond the means of the municipalities. State indemnification for properly administered CEHA programs would mitigate this issue.

Step 3: Establishing a funding mechanism to acquire vacant parcels, or buildings that are at risk

Improved implementation of the land use regulations can help address inappropriate building and rebuilding in the primary dune. It is acknowledged however, that even with such improvements, these programs would benefit from a funding mechanism made available to purchase vacant developable property, or for acquisition of vulnerable shorefront structures. This could serve as a means to acquire properties when enforcement of the regulations establishes a "takings", or in a broader application could be applied to reduce the number of structures within the CEHA area that would be vulnerable to storm damages.

Acquisition of structures as a stand-alone alternative was evaluated as a possible alternative along the shorefront. Analyses were undertaken to identify buildings falling within different hazard areas, and also at risk from storm damages. It should be noted that since CEHA maps the dune, regardless of the size and height that there may be structures within the CEHA (on the back crest of a high, wide dune) that are less vulnerable to damages than a similar structure on a low, narrow dune. In conjunction with this analysis, an extensive Real Estate analysis was undertaken to identify an approximate acquisition cost for structures which fall within the CEHA. In evaluating the acquisition alternatives, it became clear that acquisition could not be supported on NED analysis alone. The NED analysis evaluates the potential damages to a building, whereas the costs to acquire a building must consider the value of the structure and the property.

Within the study area, the Real Estate cost to acquire a structure was on average 4 to 5 times the value of the structure, which means that 25% of the real estate value is derived from the building. This cost differential makes it impossible to support acquisition on purely NED criteria, since it is impossible for the building to be damaged enough to offset the Real Estate costs. It is acknowledged that if there are additional benefits that could be realized, it could be possible to justify these efforts. It is possible that acquisition would also:

1. Provide additional habitat values by restoring the beach and dune to more natural condition,
2. Provide cost savings if the volume of material required for renourishment could be lowered,
3. Provide benefits associated with having a sustainable solution that would effectively reduce the need for long-term maintenance beyond the project life.

Recognizing this, and recognizing that environmental benefits could accrue from acquisition of buildings and restoration of the land, selective acquisition is considered further in the context of restoration alternatives. Recognizing the benefits of providing a more sustainable, long-term plan for the area, this is also something that could be considered further as a measure to be implemented as part of the overall collaborative plan.

It is acknowledged that the scope of the acquisition plan could range from a plan to acquire properties when there is a determination of a taking, to a broader scope that would allow for the acquisition of structures from willing-sellers in high-risk areas, and could also include an acquisition plan for breach vulnerable areas. With this larger concept, there are a number of aqusition scenarios that could be developed as an incentive for increased participation. These are presented below.

Voluntary sales with retained occupancy or lease-back programs. In the past, FIIS has purchased noncommercial residence at fair market value, reduced by up to 25% allowing for the right to no more than 25 years of retained occupancy, unless the house is destroyed. Federal leaseback programs are generally very restrictive but state, county or local programs may have provisions for retained occupancies or less restrictive lease-back arrangements. This type of program could encourage voluntary participation by landowners. Landowners who recognize the hazards presented by their location may find such programs attractive as it provides them a fixed sum upfront based upon a pre-storm appraisal and the opportunity to continue to use the structure for the term, or until it is destroyed. It allows homeowners to spread their risks, as a post-storm value for a destroyed and eroded parcel would be far less. The advantage for the public is that while structures will remain on the dunes and continue to inhibit natural dune growth, this voluntary approach could substantially reduce the controversies around immediate condemnation, reduces acquisition costs by at least 25%, and particularly for the secondary line of houses, will facilitate dune advancement over time, ultimately achieving a more sustainable dune.

Step 4. The establishment of a regional entity that would be responsible for various aspects related to land management and acquisition, and to fulfill the requirements of the local sponsor.

With the proposed alternatives identified in Steps 1-3, there would be a benefit to having a single regional entity who would be capable of addressing these needs, as well as fulfilling the requirements of a non-State, local sponsor. The formation of a Suffolk County Coastal Commission with authority to implement land management and authority (and sufficient funding) to acquire property, could ensure the following:

1. The local, non-State sponsor will be responsible for acquisition of lands necessary for construction of the project, and providing funds necessary, in excess of the Real Estate costs to meet the local share. A County-wide entity with the ability to undertake this would facilitate project sponsorship, and could address concerns expressed previously from Suffolk County regarding liability for the Project.
2. As described in the CEHA provisions, this entity could serve as a group who would be responsible for CEHA variances, and in defending legal challenges arising from CEHA.
3. This entity could be responsible for the acquisition of properties in the instance of regulatory takings,
4. This entity could also be responsible for implementing a willing-seller program to address structures that are at-risk in the erosion prone areas.

Step 5. Establishment of post-storm response plans to guide recovery following major, catastrophic events. It is acknowledged that no plan will reduce all risks. It is likely that over the project life that a storm will occur which will compromise the design, and result in damages. This could occur in areas that are protected, or areas that are not protected as a result of this project. New York State has suggested that they will require, as part of their Local Cooperation Agreements the development and implementation of local post-storm redevelopment plans. It is expected that these plans would be in place, and would provide direction for the rebuilding of communities in a more sustainable manner, which recognizes the storm risks. It is expected that New York State will oversee the creation of such plans, including their expected content and rationale.

While there is a limited role for the Corps' in the implementation of the land and development management measures, it is acknowledged that this is an integral component of any plan. It is important to ensure that adequate provisions are in place for the project to perform as expected, and does not result in increased development that is at risk. It is advised that the above land and development management measures be considered further in conjunction with the alternative plans, to ensure the functioning of the project, and to consider the longer-term sustainability of the project.

V. Recommended Integration of Appropriate Land Use and Development Management Measures

The Reformulation Effort includes a significant non-structural component to reduce storm damages along the mainland shoreline. These plans, however, do not include non-structural measures along the shorefront, which can reduce the potential for storm damages, and help to restore ecosystem integrity.

The land and development management alternatives relevant to the Stabilization effort generally include: 1) land management alternatives, and 2) acquisition alternatives. The implementation of these land use regulations are the responsibility of the local municipalities in conjunction with New York State, and within the FINS, the National Park Service.

The existing land use regulations were reviewed; based upon this review, it is recommended that the following alternatives be included an considered an incremental component of this overall project in order for Alternative Plans 3A and 3G to function as intended.

<u>Acquisition.</u>

Acquisition is the second tool that is available to address existing and proposed development. The acquisition of shorefront properties was evaluated for purposes of both storm damage reduction and habitat restoration. In both instances, the high price of the real estate results in these alternatives not being cost-effective. That being said, it is acknowledged that alternatives which acquire properties for purposes of a more landward beachfill alignment are cost-effective, but have the downside of requiring condemnation in order for the project to be constructed.

New York State and the National Park Service have indicated their interest in an acquisition program along the shorefront, which over time, with willing sellers could remove the most at-risk structures from the shoreline. While this alternative does not meet the NED or NER criteria for Corps participation, an acquisition plan along the shorefront would accomplish the Vision objectives, and would help with the implementation of the land use regulations.

Overall, these improvements in the land use regulations, and acquisition plans are critical for the Corps to make a determination that the proposed project will not induce development. The Corps will look for New York State as the sponsor to advance these floodplain management regulations, and be able to certify that sufficient land management regulations are in place, to avoid induced development as a result of the project. Construction of the project, and continued renourishment of the project would be dependent upon this certification from New York State.

VI. Consideration of the life cycle management of these plans.

The TFSP was developed with a 50-year project life, and 50 years of renourishment. This plan does not include provisions that would change the need for continued renourishment within the project life, or alter the conditions so that a different solution could be expected following the 50-year project life.

In order to change condition that would allow for a reduction in the long-term commitment for renourishment alternatives would need to be implemented that would reduce the infrastructure that is at risk, or remove infrastructure to allow for a more efficient use of resources. The integration of land and development management regulations identifies improvements in the application of land use regulations, acquisition planning, and post-storm response planning that could help to reduce the infrastructure at risk along the shorefront.

With this as a component of the overall plan, there are several approaches which could be undertaken in the life-cycle management of the project to achieve this. The options that have been identified include:

1 – A scheduled reduction in the scale of protection for the beachfill in a timeframe that coincides with the acquisition planning. Under this scenario a beachfill plan would be planned to be maintained for a shorter period of time, over which purchase of property would be offered to shorefront structures at risk. After this period of time, the scale of protection would be reduced, thus reducing the commitment of resources for continued renourishment. The benefit of this approach is that the reduction in protection is not dependent upon the acquisition occurring.
2 – A scheduled relocation of the proposed line of protection that coincides with the acquisition planning. Under this scenario, the beachfill plan would be linked with the proposed acquisition plan. After a period of time, the footprint of the project would be maintained in a more landward location on a scheduled timeframe. The difficulty with this initiative is that the movement of the dune on a prescribed timeframe would require guaranteed acquisition, and could not be guaranteed with a willing-seller program.
3 – Adaptive Management. Under this scenario, the beachfill plan and the acquisition plan could proceed independently. On a periodic basis, coinciding with the scheduled renourishment, the constructed project would be revisited to identify if opportunities exist for adjustment of the maintained profile based upon the relative success in implementing the acquisition plan.

Under any of these scenarios, it is important to 1) identify the time scale that would be necessary for the implementation of alternatives, and 2) identifying the effect that these changes would have on project economics.

It is recognized that the acquisition of shorefront property through a willing-seller program is not an instantaneous action, particularly with consideration for acquisition strategies that could allow for a homeowner to sell their property but be allowed to continuously use the property. The timeframes necessary for implementation of these measures suggests a timeframe measured in decades, not in years. Along the shorefront, consideration must be given for: the funding

availability for acquisition, the timing of interest in selling, and the staffing to process these acquisitions. When consideration was given for the time necessary to implement the non-structural alternatives along the mainland, accounting for staffing this effort, and funding these programs, it is expected that implementation of the mainland non-structural program would require 25 to 30 years. Discussions have also been held with agencies responsible for the relocation of public infrastructure along the shorefront. Input from these agencies indicates that major public works improvements, whether relocation or otherwise typically require 10 to 20 years, from conception to execution.

These timeframes suggest that if there is interest in reducing the long-term commitment for public investment in renourishment, a beachfill with a duration of 20 to 30 years could be considered in conjunction with an acquisition plan. As the project duration is shortened, it impacts the project economics. A sensitivity analysis was conducted which established that Alternative 3, built and maintained for 30 years, and subsequently replaced with a breach response plan, would have little effect on the project economics, and the economic viability. Achieving this objective, however, would require a larger investment in Real Estate to provide an alternative form of risk reduction for houses along the shorefront.

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 projecting renourishment, projecting the functioning of the inlets, and the unknowns regarding future climate change. With all these uncertaintities 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, 2) modeling efforts to analyze the data, and 3) an adaptive management framework that would establish the overall objectives, and the adtations 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.

VII. Stabilization Effort consistency with Land Management Recommendations of the Reformulation Study and the Stakeholders

As described in the main text of this HSRR, the Stabilization effort is the first constructable increment of the recommended plan, or TFSP, for the Fire Island to Montauk Point Reformulation Study. In response to the highly vulnerable condition following Hurricane Sandy's erosive forces, an expedited action was taken to stabilize this portion of the study area.

Consistent with the goals of the larger Reformulation effort, the Stabilization project emphasizes land management efforts to discourage building in high risk areas. Although USACE authority in land management decisions is limited to recommendations and complementary actions such as non-structural and acquisition actions, the Stabilization effort implements several actions consistent with sound land management policy.

Acquisition

The Stabilization effort proposed for a more landward alignment. This alignment requires acquisition of buildings, prior to construction, and reduces the number of structures in the high-risk area.

Limiting Development

At full build out, the Stabilization project will reduce development significantly within the high risk project areas. Forty two properties will be acquired in fee and removed from the erosion area. Six properties will be relocated to a lower risk area. More than six hundred properties will create perpetual easements where development is severely restricted. Greater detail of the real estate actions is provided within the Real Estate Appendix in the GRR.

Adaptive Management

Adaptive management will assess the timing and volumes of renourishment as the shoreline responds to continued coastal forces. Executive Order 11988 prohibits any action which encourages development within high risk areas.

APPENDIX K

FIMP COASTAL PROCESS FEATURES

K.1 DESCRIPTION OF FIMP HEP COASTAL PROCESS FEATURES

The Team identified the following conceptual coastal process features (CPF) for 6 sites. Descriptions of the sites and photographs (when available) are 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, costs, etc.

In this evaluation, is assumed that any maintenance events needed to ensure the habitat conditions at a site following restoration are maintained over the life of the project (i.e., vegetation removal, invasive species control, minimization of human impacts, etc.) would occur. It is recognized that should maintenance activities not occur, a general decrease in habitat quality would likely occur over time and these conditions are not accounted for in the HEP method. Although management will be necessary to ensure long-term sustainability of restored sites, it is assumed that management activities will be funded by project sponsors or funded under separate USACE authority.

For HEP analysis, six barrier island communities have been identified and include UPLAND, DUNEGRASS, VEGBEACH, OCEANBEACH, BAYBEACH and BAYSUBSAV. Community definitions were based upon cover types as determined by data collection at representative transects. In general, habitats representative of each of these communities are found along each of the 6 potential CPF areas selected for HEP and their general locations on the barrier island are shown in Figure K-1. The exception are sites located along the mainland and on islands, in which case the OCEANBEACH and VEGBEACH communities are not applicable, and in areas where natural or manmade disturbance has eliminated a community. In general, the following descriptions of habitats are applicable to the six communities when present in a CPF unless otherwise noted in the description of the CPF.

OCEANBEACH

This community includes the nearshore zone of the ocean and the beach intertidal zone extending from 30 feet (ft) (10 meters [m]) depth in the ocean landward to the average daily high tide line (i.e., wrack line). The community is characterized by unvegetated areas that are dominated by sand

VEGBEACH

This community includes the upper beach zone extending from the average daily high tide line (i.e., wrack line) landward to the toe of the primary (i.e., fore) dune. The community comprises bare or sparsely vegetated areas dominated by sand. Vegetation, when present is dominated by beachgrass (*Ammophila breviguluta*), but also includes beach pea (*Lathyrus maritimus*), seaside goldenrod (*Solidago sempervirens)*, beach heather (*Hudsonia tomentosa*), running dune grass (*Panicum amarum*), and dune bean (*Strophyostyles helvola*). Scattered species from the open sandy dune areas can also be found on the primary dunes, but only in low densities.

DUNEGRASS

The DUNEGRASS community includes the face of the primary dune (i.e., fore dune), dunes, interdunes, and swales that are dominated by sand or herbaceous cover. In general, this community is found in areas extending from the seaward toe of the primary dune landward to the bayside storm high water mark, or landward to the seaward edge of upland community. Dune grass is typically the dominant species, but the community often also includes a significant component of vine species. Shrubs, when present are typically stunted and cover less than 20% of this community. This community is well interspersed throughout the island from ocean to bay. The dominant vegetation is American beachgrass, but beach plum (*Prunus maritima*), sand bur (*Cenchrus tribulides*), seaside goldenrod, beach heather, switch grass (*Panicum virgatum*), and vines/shrubs such as poison ivy (*Toxicodendron radicans*), multiflora rose (*Rosa multiflora*), bayberry (*Myrica pennsylvanica*), and wax myrtle (*Myrica cyrifera*) also are found in this community type. Areas of the secondary dune with shrub densities > 20% are included in the UPLAND community type.

UPLAND

The UPLAND community occurs behind the primary dunes and includes shrub-dominated areas of the secondary dunes and stunted maritime forest that occur behind secondary dunes. Generally, this community is found in areas extending from the crest of the primary dune landward to the bayside storm high water mark. Vegetation is characterized by > 20% cover of non-wetland shrubs or trees. Herbs and/or vines are also common components of this community, but do not dominate (< 20% cover). Dominant species in this community include pitch pine (*Pinus rigida*), post oak (*Quercus stellata*), red cedar (*Juniperus virginiana*), American holly (*Ilex opaca*), sassafras (*Sassafras albidum)*, and cherry (*Prunus virginiana*). Dominant shrub/vine species include poison ivy, greenbriar (*Smilax rotundifolia*), serviceberry (*Amelanchier canadensis)*, multiflora rose, bayberry, and wax myrtle.

BAYBEACH

The BAYBEACH community includes bay intertidal areas and the bay side upper shore zone and extends from the bay LLW (low-low water) line landward to the point where the upland or dunegrass (i.e., non-wetland) community is encountered. This community may be dominated by sand, mud, or vegetated with wetland herb and/or wetland shrub communities and includes wetland and beach areas that are hydrologically connected to the bay and are not permanently inundated. Often, the invasive species common reed (*Phragmites australis*) dominates these wetland areas. However, these wetlands can be very diverse in terms of species composition and depending on hydrologic regime include the following species: salt marsh cordgrass (*Spartina alterniflora)*, salt meadow hay *(Spartina patens)*, seashore saltgrass *(Distichli spicata)*, black grass *(Juncus gerardi)*, sea lavender *(Limonium carolinianum)*, seabeach orach *(Atriplex arenaria)*, glasswort *(Salicornia spp.)*, cattail *(Typha spp.)*, American three-square (Schoenoplectus pungens), salt marsh bulrush *(Schoenoplectus robustus*), salt marsh fleabane *(Pluchea odorata)*, saltmarsh aster *(Aster novae-angliae)*, and shrubs such as blueberry (*Vaccinium corymbosum)*, arrowwood (*Viburnum dentatum*), inkberry (*Ilex glabra*), marsh elder *(Iva frutescens)* and groundsel tree *(Baccharis halimifolia).*

BAYSUBSAV

The BAYSUBSAV community includes permanently inundated areas from the bay LLW line bay ward to 500 feet from the shoreline and includes permanently inundated impounded areas (i.e., ponds). The 500-foot distance is arbitrary and was selected to facilitate HEP analysis of the BAYSUBSAV community, which could extend for several thousand feet in some areas of the study area. The BAYSUBSAV community is typically not vegetated and is dominated by bare sand substrate. However, submergent aquatic vegetation (SAV) beds, dominated by eelgrass (*Zostera marina*), are found in some areas of the BAYSUBSAV community.

K.2 SELECTED CPFS/ALTERNATIVES (RANKED AS HIGHEST PRIORITY: TABLE K-1)

K.2.1 CPF T-2 Sunken Forest

The Sunken Forest site includes all six HEP community model types. The most notable restoration needs at this location are the severely eroding and steep bayside shoreline banks, a bulkhead, and scattered invasive common reed (*Phragmites australis)* also referred to as *Phragmites,* along the bayside shoreline. In addition, an active public marina and numerous buildings and recreational facilities associated with the National Park Service are also located on approximately 25 percent of the site. The site is dominated by maritime upland forest. Sand trails and wooden boardwalks traverse much of the site and provide access to the beach.

Recreational use of the area is high. Trash was noted along the bay and ocean shorelines and evidence of vehicle use of the beach was documented. Vehicle access to the beach is provided via open cuts in the dune located beyond the area surveyed for the CPF. In general, bayside shoreline and estuarine processes have been negatively impacted in this area and appear to be most affected by hard structures such as a marina, bulk heading, buildings and various human activities along the shoreline and in aquatic and intertidal areas. Additionally, the dune development and evolution and cross-island sediment transport processes have also been negatively affected by placements of buildings and walkways within upland and dune areas and overall direct human use of the area. The negative impacts to cross-island transport may be somewhat offset by man-made cuts in the primary dune that allow for vehicle access to beach areas.

K.2.1.1 *CPF T-2-1, Eroding Bayside Shoreline*

The goal of T-2-1 is to enhance the eroding bayside shoreline and intertidal zone and remove bulkhead material located west of the marina. Components include:

- Remove 210 lf (1 ac) of bulkhead
- Regrade 900 lf (4.3 ac) of shoreline
- Add 2.2 ac of sand fill material to restore the intertidal zone along 900 lf of shoreline
- Remove 0.25 ac of debris from shoreline
- Manually remove 0.5 ac of *Phragmites*
- Stabilize 900 lf (4.3 ac) of shoreline with coir log bioengineering measures
- Plant 2.2 ac of the 900 lf shoreline, allow other disturbed areas to revegetate naturally

Specific activities would include regrading approximately 900 lf the shoreline to a slope < 2:1 and placement of sand material over approximately a 2.2-acre (ac) area to enhance the interidal zone and provide bay sediment. Approximately 2.2 ac of fill material will be used to restore the shoreline grade; of this, potentially 1.1 ac can be taken from the area of the existing bulkhead. Dredge material would be used onsite for additional gradient alterations and would support dredge material management activities. The bulkhead and other debris along the shoreline would be removed and disposed of in a suitable location. Coir logs and plantings would be utilized to stabilize the 900 lf of shoreline and minimize further erosion and loss of habitat (assuming that velocities and slope or conducive to this stabilization measure). Approximately 0.5 ac of *Phragmites* and 0.25 ac of debris would be removed manually as part of shoreline modification efforts. Desirable vegetation and faunal species are expected to recolonize communities of the site naturally once suitable habitat conditions are established.

Restoration measures are expected to enhance the existing BAYBEACH community and result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, erosion, shoreline modifications, and barriers to wildlife. The grade of the existing BAYBEACH community will be modified, but the overall width/size would not. There will be no changes in acreages of community types with this alternative.

By stabilizing the bay side shoreline and restoring the intertidal zone and intertidal vegetation, this alternative is expected to positively affect the bayside shoreline and estuarine coastal processes.

K.2.1.2 CPF T-2-2, Upper Beach and Dune

The goal of T-2-2 is to enhance the existing beach and dune system. Components of T-2-2 include:

- Regrade 1,800 lf (8.6 ac) of the dune face and slope
- Add additional 8.6 ac of fill material to restore dune, and area beneath walkway and at cuts
- Plant 3.2 acres of dune grass along 1,800 lf of ocean shoreline and in disturbed areas at cuts
- Raise and restore a 300 ft wooden boardwalk

Specific tasks would be to improve the slope of approximately 1,800 feet of the existing dune face to approximately 20-25% slope, plant the dune face with approximately 40% cover of vegetation, widen the VEGBEACH community to 120 feet, and plant the upper 40 feet of the VEGBEACH community with dune grass species such as beachgrass, beach plum, seaside goldenrod, and beach heather, and switch grass. Measures would also include raising the existing beach access boardwalk and restoring the dune/upland beneath it to a slope and width matching the adjacent

dunes and replanting as needed to stabilize the area. Approximately 8.6 ac of sand material will be needed for regrading dunes and dune replacement. In addition, open cuts through the due to the beach would be restored and planted to stabilize, and the overall area of disturbance would be reduced by restricting access to these areas and planting an additional 1 ac of dune grass. Structures associated with the NPS service and recreational facilities would remain, as would boardwalks and the sand road oriented east-west through the center of the site. Alternative natural materials such as rock, logs, etc. would be used to restrict access where feasible.

Restoration measures are expected to enhance the existing DUNEGRASS, and VEGBEACH communities and would result in some improvements to the HSI variables for percent cover of vegetation, slope, and minor improvements to impacts from human disturbance and shoreline modifications. Width would be increased, however, the HSI score for this variable was already at maximum score (1.0) prior to restoration and would not be changed. The size of each of these communities and the OCEANBEACH community is expected to change slightly and this change is reflected in HEP HU calculations. There will be no changes in acreages of community types with this alternative.

This alternative would make dunes more stable (i.e., by improving dune slope), restore the dune in access areas, and widen the beach and is expected to positively affect the longshore sediment transport and dune development and evolution processes. However, the activity would also have a negative effect on dune development and evolution by artificially modifying the dune structure and would negatively affect the cross-island transport process by closing off the area's most susceptible to overwashing. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

K.2.1.3 CPF T-2-3, Upland and Interior Dune Areas

The goal of T-2-3 is to restore upland and dune areas of the site to natural conditions. Components of T-2-3 include:

- Remove 4.1 ac of hard structures such as buildings, boardwalks, parking lots, paved areas
- Close off and regrade 4.1 ac of disturbed areas and trails (except one sand trail to provide access from marina to beach)

The effort includes the removal of several man-made structures on the site (covering approximately 4.1 ac), which includes 1,200 linear feet of wooden boardwalks, approximately 1,900 feet of linear paved areas, three large buildings, three maintenance buildings, and a bath house associated with recreational facilities. This measure includes regrading 4.1 ac of disturbed areas and allowing the site to return to conditions of natural barrier island communities such as dune and upland. Disturbed areas would be left to revegetate naturally. Access via one existing sand trail would be permitted on site to provide access to the Marina.

Restoration measures are expected to improve HSI scores for the UPLAND, DUNEGRASS, and VEGBEACH communities. Hard structures will be removed from existing disturbed areas but otherwise the site is expected to revert to natural conditions naturally. Improvements to the HSI variables include species richness, percent cover of vegetation, percent cover of trees and shrubs,

and barriers to wildlife, although increases will be relatively minor because the site overall scores relatively high in these areas prior to restoration. All communities will see some improvement in the HSI variables for magnitude of human impacts because fewer disturbances from humans is expected on site due to the removal of some facilities and public access ways and boardwalks. The DUNEGRASS community would increase by 0.3 ac, UPLAND would increase by 3.8 ac, and disturbed would decrease by 4.1 ac and this change is reflected in HEP HU calculations.

This alternative is expected to somewhat positively affect the cross-island transport process by removing hard structures that might impede overwashing of some portions of the site. However, overwashing is not likely in this area due to existing dune height, island width and presence of well-established upland communities.

K.2.2 CPF T-3 REAGAN PROPERTY

The Reagan site is similar to the Sunken forest in that a predominant restoration need at the site is the severely eroding bayside shoreline banks as well as scattered invasive *Phragmites* along the bayside shoreline. In addition, a significant portion of the site includes the highly developed community of Fire Island Pines. The entire bayside shoreline along this community is bulkheaded and as a result lacks a bayside intertidal zone. Vehicle cuts, pathways, sand fence, hard structures, and walkways from residential areas, heavily impact dunes along the ocean side of the site.

Upland areas adjacent to the residential community include sandy roads and trails, a power station, a helipad, and sand fence. Recreational use of the area is high and evidence of trash and vehicle use of the beach was documented. Access to the beach through the dune is via one wooden boardwalk, several small sand trails, and a major vehicle access point that connects the beach, residential area, and helipad.

Similar to the Sunken Forest site, the bayside shoreline and estuarine processes at the Reagan site have been negatively impacted and appear to be most affected by hard structures such as extensive bulk heading, boat slips, buildings and various human activities in the area, particularly those associated with the highly developed community of Fire Island Pines. Impacts have directly and indirectly affected the shoreline, intertidal, and aquatic areas of the site. Additionally, the dune development and evolution and cross-island sediment transport processes have also been significantly negatively affected by placements of boardwalks, sand fence, residential housing, and other hard structures within upland and dune areas, and overall direct human use of the area. The negative impacts to cross-island transport may be somewhat offset by man-made cuts in the primary dune that allow for vehicle access to beach areas.

CPF T-3-1, Eroding Bayside Shoreline

The goal of T-3-1 is to enhance the eroding bayside shoreline and intertidal zone. Components of T-3-1 include:

- Regrade slope of 1,00 lf (4.8 ac) of bay shoreline and upland
- Add 2.2 ac of sand fill to enhance/restore shoreline
- Install coir log bioengineering structures along 1,000 lf of shoreline
- Plant 1.2 ac of shoreline to stabilize

Specific measures would be to regrade the upland edge/shoreline to a slope < 2:1 and place sand material over approximately a 2.2 ac area to enhance the interidal zone and provide bay sediment. Dredge material may be utilized to restore grade in support of dredge material management activities. Soft bioengineering structures such as coir logs (or other) bioengineering measures and plantings would be installed to stabilize 1,000 feet of the shoreline. However, due to the velocity of water flow in this area, vegetated gabion bioengineering structures may be necessary to ensure the long-term stability of the site and protection of upland habitat. The shoreline would be planted with 2.2 ac of wetlands shrub and emergent vegetation to facilitate stabilization.

Restoration measures are expected to enhance the existing BAYBEACH community and would result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, erosion, shoreline modifications, and barriers to wildlife. The grade of the existing BAYBEACH community will be modified, but the overall width/size would not.

By stabilizing the bay side shoreline and recreating the intertidal zone and vegetation, this activity is expected to result in positive impacts to the bayside shoreline and estuarine coastal processes.

CPF Regan Property T-3-2, Upper Beach and Dune

The goal of T-3-2 is to enhance the existing beach and dune system and improve conditions within upland areas of the site. Components of T-3-2 include:

- Remove 400 lf (2 ac) of sand fence on dunes
- Regrade 1,300 lf (6.2 ac) of dune to improve slope, height, width
- Add 6.5 ac of fill material to enhance dune and close or reduce roads, trails, and dune cuts
- Raise one walkway over dune

Specific tasks would be to remove sand fence from dunes, improve the slope of the existing dune face to approximately 20-25% slope and 50 foot width (i.e., fore dune characteristics), plant the dune face with approximately 40% cover of vegetation, and widen the VEGBEACH community to 120 feet and planting the upper 40 feet (from the toe of dune slope toward the ocean) with dune vegetation. Several existing sand roads and trails would be closed off or reduced in width. Approximately 6.5 acres of sand fill material would be needed for dune restoration and to minimize sand roads and trails. Structures and access roads associated with the residential area, power station, and helipad would remain on site. One existing walkway from the residential area to the beach would be raised and the dune would be restored to a slope and width matching the adjacent dunes and replanted as needed to stabilize the area.

Restoration measures are expected to enhance the existing DUNEGRASS, and VEGBEACH communities and would result in some improvements to the HSI variables for percent cover of vegetation, slope, and minor improvements to impacts from human disturbance and shoreline modifications. Width would be increased for the dune face, however, the HSI score for this variable was already at maximum score (1.0) prior to restoration and would not be changed as a result. The size of each of these communities and the OCEANBEACH community is expected to change slightly and this change is reflected in HEP HU calculations. There will be no changes in acreages of community types with this alternative.

This alternative would make dunes more stable (i.e., by improving dune slope), restore the dune in access areas, and widen the beach and is expected to positively affect the longshore sediment transport and dune development and evolution processes. However, the activity would also have a negative effect on dune development and evolution by artificially modifying the dune structure and would negatively affect the cross-island transport process by closing off the area's most susceptible to overwashing. Although a relatively large cut in the dune would remain to provide access to residential areas and the helipad. Components of this alternative (i.e., dune enhancement) would support storm damage reduction project objectives.

CPF T-3-3, Bury Bulkhead and Restore Shoreline

The goal of T-3-3 is to bury the existing bulkhead along Fire Island Pines, regrade the shoreline to restore the intertidal zone, and to stabilize the area using bioengineering. Components of T-3-3 include:

- Regrade 2.9 ac area
- Add 5 ac of sand fill to bury bulkhead and extend shoreline
- Apply coir log bioengineering methods to stabilize 300 lf of shoreline
- Plant 1 ac of shoreline to stabilize
- Extend intertidal zone along 600 lf of shoreline

Bioengineering structures such as coir logs and plantings would be installed to stabilize the toe of the 300-foot section of sand that is placed over the bulkhead. However, due to the velocity of water flow in this area, vegetated gabion (or other) bioengineering structures may be necessary to ensure the long-term stability of the site and protection of upland habitat. The intertidal zone will be extended over approximately 600 feet of the site and 1 ac of it will be planted with salt marsh species to stabilize the site. Dredge material would be utilized to restore grade in support of dredge material management activities. Approximately 5 ac of fill would be needed to restore bury the bulkhead, rebuild the shoreline and extend the intertidal zone.

Restoration measures are expected to restore/enhance the existing BAYBEACH community and would result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, shoreline modifications, erosion, and barriers to wildlife, The size of the BAYBEACH and BAYSUBSAV communities are not expected to change and this change is reflected in HEP HU calculations.

Removal of hard structures and the recreation of intertidal areas and salt marsh along the bay shoreline is expected to positively affect the bayside shoreline and estuarine coastal processes.

K.2.3 CPF T-5 GREAT GUN

Great Gun recreational use area includes a major boat dock, helipad, wooden boardwalk, and several structures associated with the recreational area (i.e., outhouses, picnic tables, storage sheds). Numerous sand roads and trails are found throughout the site and numerous access roads and trails cut through the dune. The site also is characterized by a tidal marsh system comprised of an inundated saltwater pond and saltmarsh. However, due to tidal restrictions the tidal pond associated with this marsh is relatively stagnant and a significant component of the upper zones of the high marsh is dominated by invasive *Phragmites*.

This area is a public recreational facility, and use of the area is high. Vegetation loss and substrate disturbance from pedestrian and vehicle use of uplands and dune areas is significant throughout the site. Despite the recreational uses of the area, the dunes and beach are of relatively high quality in terms of vegetation, slope and width. The bayside shoreline and estuarine processes at the site have been negatively impacted and appear to be most affected by hard structures such as extensive bulk heading, boat slips, buildings, a playground/recreational area, and general impact from various human uses the area. Impacts have directly and indirectly affected the shoreline, intertidal, and aquatic areas of the site and in particular have altered hydrologic connection to a relatively large salt marsh community on site. Evidence of erosion is present on the bayside shoreline, but is not as severe as other sites such as Reagan and Sunken Forest. The dune development and evolution and cross-island sediment transport processes have also been significantly negatively affected by placements of boardwalks, sand fence, other hard structures within upland and dune areas, and overall direct human use of the area. However, the negative impacts to cross-island transport may be somewhat offset by man-made cuts in the primary dune that allow for vehicle access to beach.

CPF T-5-1, Existing Salt Marsh

The goal of T-5-1 is to restore the 1.14-acre degraded salt marsh and tidal pond at Great Gun. Components of T-5-1 include:

- Install a 48-inch culvert to reestablish hydrologic connection to the existing marsh
- Excavate 0.2 ac of the area to achieve suitable elevations for culvert installation
- Add 0.3 ac of sand fill over culvert to raise and restore sand road
- Plant excavated areas (0.2 ac) with salt marsh species

Specifically, a 48-inch metal culvert would be placed beneath a sand road to connect the existing marsh located on the western portion of the site with the degraded marsh located in the center and

eastern portion of the site. Some excavation may be required on 0.2 acres of the site to achieve desirable elevations for culvert installation and tidal flow. Approximately 0.3 ac of fill will be added above culvert to raise and replace sand access road. Some of excavated material may be resused on site. Planting is not proposed with this alternative since the increase in tidal flow is expected to create conditions favorable for desirable salt marsh species currently found on site to flourish, and to reduce the presence of *Phragmites*. However, areas disturbed during construction would be replanted. The existing sand road and boardwalk, which bisect the marsh system, would remain.

Restoration measures are expected to enhance the existing BAYBEACH community and would result in some improvements to the BAYBEACH HSI variables for percent cover of vegetation, invasive species, species richness, and some reduction in the magnitude of impacts from human disturbance to the marsh (road will be raised). The size of the BAYBEACH community would increase by 1.14 ac and UPLAND would decrease slightly as flooding is expected to result in the conversion of some fringe upland areas along the marsh to wetland shrub.

The enhancement of the existing degraded salt marsh is expected to positively affect the estuarine coastal process.

K.2.4 CPF T-7 TIANA

The Tiana CPF currently provides parking and access to the beach for recreational activities. The site is at a relatively narrow portion of the barrier island, however, the dunes and beach in this area are relatively wide and stable. On the bayside, overall the salt marsh is of relatively high quality. However, a portion of the site has been degraded due to flooding and runoff from the paved road, and use of the area as a boat launch point. Recreational use of the area is high and includes vehicle access to the beach. Access to the beach is provided by a large cut in the dune that extends from the end of the asphalt parking area.

Overall the bayside shoreline and estuarine processes at the site appear to be functioning naturally, considering the overall setting of the site. However, a small portion of the salt marsh and bay shoreline has been directly impacted by vehicles accessing the area to launch watercraft and from runoff from the adjacent road surface. The dune development and evolution process is affected by vehicle traffic on the upper beach and beach maintenance activities (i.e., sand deposition and dune building). This activity mimics sand accretion, which may or may not be the “natural trend in this area”. Cross-island sediment transport processes have been negatively affected by beach maintenance activities and other hard structures (i.e., asphalt parking lot and roads) within upland and dune areas. The negative impacts to cross-island transport may be somewhat offset by man-made cuts in the primary dune that allow for vehicle access to beach areas.

CPF T-7-1, Bayside Shoreline, Salt Marsh, and Upper Beach and Dune

The goal of T-7-1 is to restore salt marsh by removing fill material, regrading and replanting to area, restoring the dune at an oceanside access cut and providing access via a dune walkover, and restoring dunegrass/upland in those areas. Specific components of T-7-1 include:

- Remove 0.2 ac of fill bayside
- Regrade 0.2 ac area
- Plant 0.1 ac of regraded bayside shoreline
- Regrade and restore 200 foot wide vehicle access cut in the dune to slope and width of adjacent dune
- Fill cut with 1 ac of sand
- Plant 0.25 ac of restored dune with dune grass
- Install one dune walkover

On the bayside, approximately 0.2 ac of gravel, asphalt, and fill material, would be removed from the salt marsh and upland community. This portion of the site would be regraded and planted as needed to restore salt marsh and a narrow upland community along the road edge. On the oceanside, approximately a 200 foot-wide area of the dune and upper beach located at the vehicle cut would be restored to fore dune conditions such that approximately 200 feet of the existing dune face would be regraded to a slope of approximately 20-25%, planting the dune face with approximately 40% cover of vegetation, widening the VEGBEACH community to 120 feet, and planting the upper 40 feet of the VEGBEACH community with dune grass species that include beachgrass, beach plum, seaside goldenrod, and beach heather, and switch grass. One walkover would be installed to provide pedestrian access to the beach.

Restoration measures are expected to enhance, and in some cases restore, four of the six HEP communities (OCEANBEACH and BAYSUBSAV excluded), and would result in some improvements to the HSI variables for percent cover of vegetation, percent cover of trees and shrubs, species richness, erosion, shoreline modification, barriers to wildlife, and human factors/magnitude of human impacts. However, due to the small size of upland and salt marsh creation in disturbed areas, this alternative is expected to have an overall low change in habitat quality (HSI scores) for these habitats. This measure is expected to convert 0.38 of disturbed area to intertidal area (0.04), salt marsh vegetation (0.05), and dune grass (0.29)

The removal of fill and restoration of salt marsh in intertidal areas is expected to have a positive effect on the bayside shoreline and estuarine coastal processes. On one hand, dune development and evolution processes would be positively affected by restoring the dune in the open cut area. But, this would also negatively affect the cross-island transport process by closing off the area's most susceptible to overwashing. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

CPF T-7-2, Upland and Interior Dune

The goals of T-7-2 would be to remove all manmade structures from the interior areas of the site to allow the site to revert to more natural conditions. Specific components include:

- Remove 0.2 ac asphalt lot and regrade area
- Plant 0.2 ac of disturbed area with dune grass

Specifically, the 2 ac asphalt lot would be removed entirely and there would be no walkovers installed to provide access to the beach or bay shoreline. The primary asphalt road through the site would remain.

Restoration measures are expected to convert existing disturbed areas to DUNEGRASS, and would result in improvements to the HSI variables for, percent cover of vegetation, species richness, barriers to wildlife, and human factors/magnitude of human impacts. HSI scores for magnitude of impacts from humans and percent vegetation will also improve for most communities as less human activity is expected on site due to parking lot removal. This measure would convert 0.4 ac of disturbed area to dune grass.

The removal of the parking lot would positively affect the cross-island transport process by replacing disturbed area with natural habitat, particularly since the large dune cut would be left open under this scenario.

CPF T-7-3, Bay Submergent

The goals of T-7-3 are to enhance conditions of the BAYSUBSAV community by:

- Plant 1 ac of submergent aquatic vegetation

Restoration measures are expected to enhance the existing BAYSUBSAV community and would result in improvements to the following BAYSUBSAV HSI variables, percent cover of eelgrass and species richness. The community would be enhanced through this action, but the size of the BAYSUBSAV community would not change.

This alternative is expected to positively affect estuarine coastal processes by increasing the amount of desirable submergent aquatic vegetation in the area.

K.2.5 CPF T-8 WEST OF SHINNECOCK INLET (WOSI)

The WOSI CPF currently provides parking and access to the beach for recreational activities. The site is at a relatively narrow portion of the barrier island, however, the dunes and beach in this area are relatively wide and stable due to beach renourishment activities that were recently completed for the site. The dune currently has a wooden walkover that provides access for pedestrians to the beach. However, washouts have been occurring through the dune at this location and the foundation of the walkover is located within, rather than above, the dune.

Bayside, the site is characterized by an asphalt parking lot, relatively steep bayside dunes, and impacts to bayside dunes caused by pedestrian access from the parking lot to the bay shoreline. A relatively high quality salt marsh is located in the northeastern portion of the site, however the marsh does contain invasive *Phragmites*.

Recreational use of the bay and ocean shorelines areas is high. No vehicle access points are located within the CPF, but vehicle access is provided elsewhere along the beach and tire ruts have been documented on the beach. The state and Federally-listed seabeach amaranth and piping plover have been documented in the VEGBEACH community in the vicinity of this location.

Overall the bayside shoreline and estuarine processes at the site appear to be functioning naturally, considering the overall setting of the site. A small portion of the salt marsh and bay shoreline has been directly impacted by human use of the area for recreation, but impacts overall are relatively minor. The dune development and evolution process is affected by vehicle traffic on the upper beach, hard structures (i.e., boardwalk), and beach maintenance activities (i.e., sand deposition and dune building). This activity mimic's sand accretion, which may or may not be the "natural trend in this area". Cross-island sediment transport processes have been negatively affected by beach maintenance activities and other hard structures (i.e., asphalt parking lot, boardwalk, and roads) within upland and dune areas.

CPF T-8-1, *Phragmites* Control

The goal of T-8-1 is to use herbicides to control *Phragmites* in the existing 5 ac salt marsh and 4 ac of adjacent upland shrub communities. Specific components include:

- Apply herbicides to 9 ac area to control *Phragmites*

Restoration measures are expected to enhance the existing BAYBEACH community by removing the invasive species *Phragmites* from the site and making conditions more favorable for establishment of desirable native species. Restoration is expected to result in some improvements to the BAYBEACH HSI variables for invasive species, barriers to wildlife, and species richness. The size of the HEP communities would not change as a result of this measure.

The removal of *Phragmites* in the existing marsh is expected to positively affect the estuarine coastal process.

CPF T-8-2, Bayside Shoreline and Upper Beach and Dune

The goals of T-8-2 are to restore the dunes and shoreline at pedestrian access points currently located on the bay and ocean shorelines, install/raise pedestrian access walkovers, and reshape and stabilize the bayside shoreline to reduce erosion and improve wildlife access. Specific components of T-8-2 include:

- Regrade 1,400 lf (6.7 ac) of bayside shoreline slope to improve stability and intertidal zone and 0.2 ac of Oceanside shoreline to restore dune cut
- Add 0.1 ac of fill bayside to fill opening in bay shoreline and 0.5 ac of fill oceanside to fill dune cut
- Install a 30 lf wooden walkway to the bay
- Raise existing 200 lf walkway ocean side
- Plant 0.1 ac of dune oceanside with dune grass, and 1.7 ac of bay shoreline with emergents and shrubs to stabilize

Bayside, restoration measures include restoring a 0.2 ac pedestrian access area at the northern end of the parking lot and regrading approximately 1,400 feet of the bay side shoreline to a slope < 2:1, and placing approximately 3.4 ac of sand material to enhance the intertidal zone and provide bay sediment. Dredge material may be utilized to restore grade in support of dredge material management activities. A wooden walkway would be installed above the restored bayside dune to provide pedestrian access from the lot to the bay shoreline. Oceanside, the existing walkway would be raised above the dune and 0.5 ac of the dune would be restored to a slope and width matching the adjacent dunes and replanted as needed to stabilize the area. HSI scores for DUNEGRASS and VEGBEACH slope, height, and width are not expected to change due to the small size (< 10’ wide cut) of the affected area. This measure would result in conversion on 0.19 ac of disturbed habitat to dune grass habitat.

Restoration measures are expected to enhance four of the six HEP communities (OCEANBEACH and BAYSUBSAV excluded), and would result in improvements to the HSI variables for, percent cover of vegetation, species richness, erosion, shoreline modification, barriers to wildlife, and magnitude of human impacts. Approximately 0.19 ac of disturbed area would be converted to dune habitat with this alternative and this change is reflected in HEP HU calculations.

Regrading the bayside shoreline slope and increasing the shoreline intertidal areas is expected to have a positive effect on the bayside shoreline and estuarine coastal processes. Dune development and evolution processes would be positively affected by restoring the dune in the area of the existing boardwalk. But, this would also negatively affect the cross-island transport process by closing off the area’s most susceptible to overwashing. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

CPF T-8-3, Removal of all Hard Structures on Site

The goal of T-8-3 is to remove manmade structures from the site and allow the site to revert to natural conditions. Specific components include:

- Remove 0.4 ac asphalt parking lot
- Removal of walkway on oceanside
- Plant 0.4 ac of dune and plant species

Specifically, the 0.40-acre asphalt parking lot would be removed entirely and the regraded to mimic adjacent communities and the 200-foot long wooden walkover would be removed from the site. The disturbed area would be replanted with 0.15 ac of dune grass and 0.25 ac of upland species. No measures would be taken to regrade the bayside shoreline. The area beneath the walkway through the dune would be restored to conditions similar to adjacent dunes and the walkway would be removed. Due to the small size of impact from the walkover, the overall HSI scores for the slope, height and width of the DUNEGRASS and VEGBEACH communities are not expected to change as a result of this action. The primary asphalt road through the site would remain.

Restoration measures are expected to enhance dune and upland habitats on the site and would result in improvements to the HSI variables for percent cover of vegetation, percent cover of trees and shrubs, species richness, erosion, shoreline modification, barriers to wildlife, and human factors/magnitude of human impacts. The conversion of disturbed area would result in 0.13 additional acres of dunegrass and 0.27 acres of upland. Other HEP communities would also see some slight improvements due to the reduction of human activity in the area as a result of removing public access and parking.

The removal of the parking lot would somewhat positively affect the cross-island transport process by replacing disturbed area with natural habitat. Although the cut in the dune would not be restored under this scenario, the elevation and condition of the dune at this location is likely not conducive to breaching.

K.2.6 CPF T-25 ATLANTIQUE TO CORNEILLE

The area from Atlantique to Corneille (T-25) includes habitat representative of the six HEP community model types. The site is similar to the Reagan site in that well-vegetated upland and dune areas characterize the site and these communities are located adjacent to densely populated residential communities. Bayside portions of the shoreline are bulkheaded and include boat docks and commercial development. Other areas of the shoreline are experiencing accelerated rates of erosion, which is severe in some areas. Vehicle cuts and pathways are interspersed throughout the upland and dune communities and cuts in the dune provide access to the beach. Overall the dunes and beach in the area are of moderate size and width and experience moderate recreational use. Several buildings have been built within the fore dune area and appear to extend into the upper beach zone. The highly developed communities of Atlantiqe (to the west) and Corneille Estates (to the east) abut the site.

This site closely resembles the Reagan site. Bayside shoreline and estuarine processes have been negatively impacted and appear to be most affected by hard structures such as extensive bulk heading, boat slips, buildings and various human activities in the area, particularly those associated with the highly developed community of Fire Island Pines. Impacts have resulted in accelerated

shoreline erosion in unprotected areas and direct loss of shoreline and intertidal areas. Additionally, the dune development and evolution and cross-island sediment transport processes have also been significantly negatively affected by placements of boardwalks, sand fence, residential housing, and other hard structures within upland and dune areas, and overall direct human use of the area. However, some of the negative impacts to processes from the development may be somewhat offset by the presence of large undeveloped upland and dune areas within the site. These low-lying areas are relatively natural and likely have a positive effect on the five coastal processes.

CPF T-25-2, SALT MARSH CREATION

The goal of T-25-2 is to create new salt marsh by excavating and regrading upland areas and bay shoreline, and planting native salt marsh species. Specific components of T-25-2 include:

- Excavate 1.22 ac of upland along the bay shoreline to create salt marsh habitat
- Regrade 1.22 ac area
- Plant 1.22 ac of salt marsh vegetation

Approximately 1.22 ac of upland and bay shoreline would be excavated and planted with native salt marsh species such as cordgrass, salt meadow hay, black grass, and marsh elder shrub to promote salt marsh in this area.

Restoration measures are expected to restore/enhance the existing BAYBEACH community and would result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, shoreline modifications, and barriers to wildlife. Approximately 1.22 ac of upland area would be converted to intertidal salt marsh habitat.

The creation of salt marsh along the bay shoreline is expected to positively affect the bayside shoreline and estuarine coastal processes.

Table K-1: Summary of Restoration Ranks and Scores (1 highest to 57 lowest)

Site Name	HEP Site ID	Alternative Number	RANK - Net Gain in AAHU Score	RANK - Cost Per Habitat Unit	RANK - Matrix	HEP Prioritization Exercise	Process Targeted*
Tiana	T-7	1	21	10	6	1	B,E
Tiana	T-7	2	23	4	34	1	C,U
Tiana	T-7	3	24	7	2	1	B
Atlantique	T-28	1	55	43	33	1	D
Atlantique	T-28	2	49	53	3	1	D,L
Seatuck Refuge	T-23	1	8	20	22	1	B,E

Great Gunn	T-5	1	30	12	7	1	E
Great Gunn	T-5	2	25	13	24	1	D,U
Great Gunn	T-5	3	16	18	56	1	U
WOSI	T-8	1	10	1	30	1	E
WOSI	T-8	2	4	9	32	1	D
WOSI	T-8	3	6	3	35	1	D,U
WOSI	T-8	4	5	31	9	1	B,E
Seatuck Refuge	T-23	2	9	44	14	1	E
Atlantique to Corneille Estates	T-25	1	38	37	16	1	B,E
Islip Meadows	T-22	1	36	21	27	1	B,E
East Inlet Island	T-10	1	22	8	21	1	U,R
Seatuck Refuge	T-23	3	12	34	4	1	B,E
New Made Island	T-15	1	51	33	23	1	U,R
Islip Meadows	T-22	3	37	14	17	1	B,E
John Boyle Island	T-11	1	27	5	29	1	U,R
Atlantique to Corneille Estates	T-25	2	33	17	41	1	B,E
East Inlet Island	T-10	2	14	2	38	1	E
Atlantique to Corneille Estates	T-25	3	28	28	37	1	D,U
Reagan Property	T-3	2	32	30	47	1	D,U
Fair Harbor	T-29	1	54	45	40	2	D
Islip Meadows	T-22	2	41	51	20	2	E
Fair Harbor	T-29	2	48	55	10	2	L,D
New Made Island	T-15	2	53	26	49	2	U,R
New Made Island	T-15	3	56	25	52	2	U
John Boyle	T-11	2	34	15	53	2	U,R
East Inlet Island	T-10	3	11	16	54	2	U
John Boyle	T-11	3	26	11	55	2	U
Kismet	T-26	2	40	54	5	u	D,L

Kismet	T-26	3	42	50	19	u	D,L
Davis Park	T-24	1	18	6	39	u	D
Davis Park	T-24	2	13	36	44	u	D
Davis Park	T-24	3	17	35	18	u	D,L,U
Great Gunn	T-5	4	15	32	8	u	B,E
Georgica	T-9	3	1	27	31	u	D,L,E
Ocean Beach	T-14	1	7	47	11	u	D,L
Sunken Forest	T-2	4	19	41	15	u	B,E
Kismet	T-26	1	44	40	25	u	D
Ocean Beach	T-14	2	47	42	28	u	D
Ocean Beach	T-14	3	43	52	1	u	D,L
Sunken Forest	T-2	1	31	24	48	u	B,E
Reagan	T-3	1	39	19	45	u	B,E
Reagan	T-3	3	35	23	36	u	B,E
Atlantique	T-28	3	50	57	13	3	D,L
Fair Harbor	T-29	3	45	56	12	3	D,L
Sunken Forest	T-2	3	20	39	51	3	D,U
Sunken Forest	T-2	2	29	29	57	3	D
Warners Island	T-27	1	52	48	26	3	U,R
Warners Island	T-27	2	46	46	46	3	U,R
Warners Island	T-27	3	57	49	50	3	U
Georgica	T-9	1	2	38	43	3	E
Georgica	T-9	2	3	22	42	3	E

Notes:

High priority based on HEP Team prioritization assignment or rank between 1 and 19, or has NY DEC approval

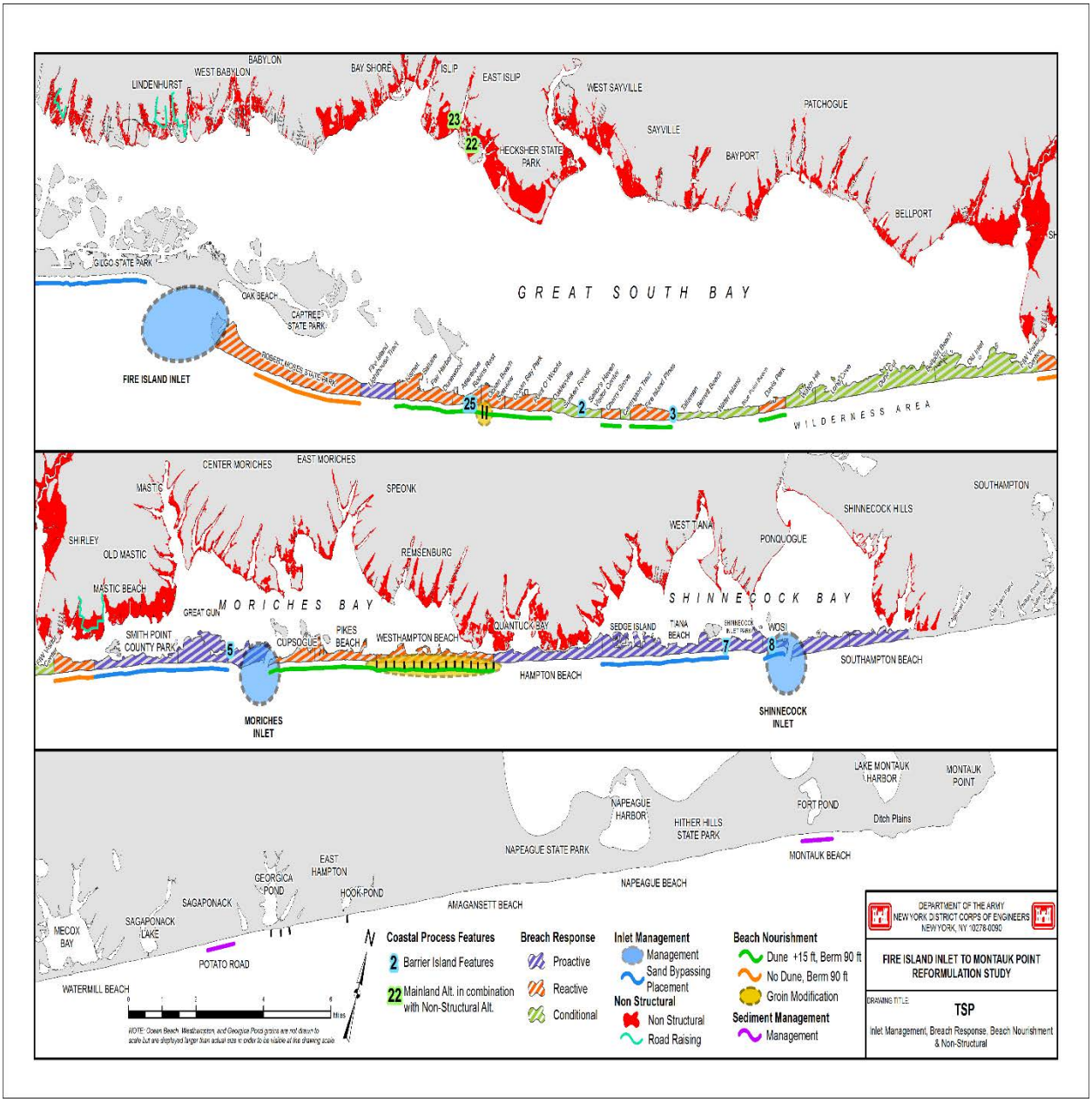
Moderate priority based on HEP Team prioritization assignment or rank between 20 and 38

Low priority based on HEP Team prioritization assignment or rank between 39 and 57, or not approved by NY DEC

Unknown priority - additional information is needed

*B = Bayside Process, C = Cross Island Transport, D = Dune Growth and Evolution, E = Estuarine Processes, L = Longshore Transport, R = Rare Species, U = Upland

Figure K-1: Site Locations



GPS Locations of the CPFs

Sunken Forest T-2		1
N	W	
40 39. 387	73 06.264	
Regan Property T-3		2
40 40.071	73 03.301	
Great Gun T-5		3
40 45.704	72 46.511	
Tiana T-7		4
40 49.976	72 30.659	
WOSI T-8		5
40 50.398	72 29.214	
Atlantigue to Cornielle T-25		6
40 38.616	73 09.910	

APPENDIX L

BORROW AREA REPORTS AND PROJECT PLANS

Biological and Environmental Services Related to Marine and Navigable Waterways Civil Works Activities in the New York District

Contract: W912BU-13-D-0010, Task Order CE01

Fire Island to Moriches Inlet (FIMI) Borrow Area Study for the Atlantic Coast Long Island, New York, Storm Damage Reduction Projects

Final Report
26 February 2016

Point of Contact:
Chris Soucier – Director
Phone (703) 387-2100
Fax (703) 243-1374
chris.soucier@tetratech.com

Tetra Tech, Inc.
1320 North Courthouse Road, Suite 600
Arlington, VA 22201

FOREWORD

This report entitled "Fire Island to Moriches Inlet (FIMI) Borrow Area Study for the Atlantic Coast Long Island, New York, Storm Damage Reduction Projects" was prepared by Tetra Tech, Inc., for Mr. Robert Smith, Environmental Branch, U.S. Army Corps of Engineers, New York District, under Contract No. W912BU-13-D-0010; Task Order: CE01.

Sources for Cover Photos (in order from left to right):
Top row:
Images: not attributed
http://www.nan.usace.army.mil/Missions/CivilWorks/ProjectsinNewYork/FireIslandtoMontaukPointReformulationStudy/FIMPWorkinProgress.aspx
Bottom row:
Images: James D'Ambrosio
http://www.nan.usace.army.mil/Media/Images.aspx?igcategory=All%20Photos

TABLE OF CONTENTS

LIST OF ABBREVIATIONS VI

1.0 INTRODUCTION 1

1.1 PROJECT DESCRIPTION AND LOCATION 2
1.2 OBJECTIVES 6
1.3 SUMMARY OF FINDINGS 6
1.3.1 BORROW AREA 2C 6
1.3.2 BORROW AREA 5B 6

2.0 METHODS 7

2.1 PHYSICAL DATA AND WATER QUALITY 7
2.2 BENTHIC GRABS 7
2.3 LABORATORY ANALYSIS 13
2.3.1 GRAIN SIZE 13
2.3.2 INVERTEBRATE ANALYSIS 13
2.4 FISH TRAWLS 14
2.5 DATA ANALYSIS 17

3.0 RESULTS 19

3.1 WATER QUALITY 19
3.2 BENTHIC GRABS 20
3.2.1 BENTHIC HABITAT AND SEDIMENT TYPES 20
3.2.1.1 Borrow Area 2C 20
3.2.1.2 Borrow Area 5B 31
3.2.2 BENTHIC INFAUNA 41
3.2.2.1 Borrow Area 2C 41
3.2.2.2 Borrow Area 5B 46
3.3 FISH TRAWLS 52
3.3.1 BORROW AREA 2C TRAWLS 52
3.3.1.1 MONTHLY COMPARISONS 52
3.3.1.2 REFERENCE SITE COMPARISONS 59
3.3.1.3 LENGTH-FREQUENCY DISTRIBUTIONS 61
3.3.2 BORROW AREA 5B TRAWLS 62
3.3.2.1 MONTHLY COMPARISONS 62
3.3.2.2 REFERENCE SITE COMPARISONS 70
3.3.2.3 LENGTH-FREQUENCY DISTRIBUTIONS 73

4.0 DISCUSSION 74

4.1 BENTHIC COMMUNITY COMPARISONS 74
4.1.1 BORROW AREA 2C 74
4.1.2 BORROW AREA 5B 76
4.2 FISHERIES CONSIDERATIONS 77
4.3 POTENTIAL IMPACTS AND RECOVERY IN FIMI BORROW AREAS 80

5.0 CONCLUSIONS 81

6.0 REFERENCES 82

Appendix A – Field Data Sheets
Appendix B – Water Quality Data
Appendix C – Benthic and Trawl Site Coordinates
Appendix D – Raw Laboratory Data; Grain Size
Appendix E – Raw Laboratory Data; Benthic infauna
Appendix F – Subcontractor Information

LIST OF TABLES

Table 1. Commercial Fisheries Landings from 2014 in New York that Generated Over $1 Million in Revenue 1
Table 2: Coordinates of the FIMI Borrow Areas 2
Table 3: Summary of Sample Collection Methods in the FIMI Borrow Areas 7
Table 4: Benthic Sampling Effort within the FIMI Borrow Areas 8
Table 5: Fish Sampling Effort within the FIMI Borrow Areas 14
Table 6: Average Water Quality Parameters by Month at FIMI Borrow Areas 2C and 5B 19
Table 7: Average Particle-size Distribution of Summer Benthic Grabs for Borrow Area 2C 21
Table 8: Dominant Sediment Type Based on Lab Analysis of Summer Benthic Grabs for Borrow Area 2C 21
Table 9: Average Particle-size Distribution of Fall Benthic Grabs for Borrow Area 2C 26
Table 10: Dominant Sediment Type Based on Lab Analysis of Fall Benthic Grabs for Borrow Area 2C 26
Table 11: Average Particle-size Distribution of Summer Benthic Grabs for Borrow Area 5B 31
Table 12: Dominant Sediment Type Based on Lab Analysis of Summer Benthic Grabs for Borrow Area 5B 32
Table 13: Average Particle-size Distribution of Fall Benthic Grabs for Borrow Area 5B 36
Table 14: Dominant Sediment Type Based on Lab Analysis of Fall Benthic Grabs for Borrow Area 5B 37
Table 15: Comparison of Average Benthic Parameters for Borrow Area 2C 41
Table 16: Benthic Community Composition in Borrow Area 2C 42
Table 17: Twenty Most Abundant Benthic Infauna Present in Borrow Area 2C in Summer 44
Table 18: Twenty Most Abundant Benthic Infauna Present in Borrow Area 2C in Fall 45
Table 19: Comparison of Average Benthic Parameters for Borrow Area 5B 46
Table 20: Benthic Community Composition in Borrow Area 5B 47
Table 21: Twenty Most Abundant Benthic Infauna Present in Borrow Area 5B in Summer 49
Table 22: Twenty Most Abundant Benthic Infauna Present in Borrow Area 5B in Fall 50
Table 23: Monthly Biomass (g) of Each Species for Borrow Area 2C 54
Table 24: Abundance and Composition of Monthly Trawls for Borrow Area 2C 56
Table 25: Presence of Macroinvertebrates Collected in Monthly Fish Trawls in Borrow Area 2C 58
Table 26: Monthly Comparisons of Catch Composition of On-site and Reference Trawls at Borrow Area 2C 60
Table 27: Monthly Biomass of Each Fish Species for Borrow Area 5B 64
Table 28: Abundance and Composition of Monthly Trawls for Borrow Area 5B 66
Table 29: Presence of Macroinvertebrates Collected in Monthly Fish Trawls in Borrow Area 5B 69
Table 30: Monthly Comparisons of Catch Composition of On-site and Reference Trawls at Borrow Area 5B 71
Table 31: Summary of Parameters and Comparison with Past Studies in New York Borrow Areas for 2C 75
Table 32: Summary of Parameters and Comparison with Past Studies in New York Borrow Areas for 5B 77
Table 33: Commercial Use and Essential Fish Habitat Overlap of Each Captured Fish Species 78

LIST OF FIGURES

Figure 1: FIMI Borrow Areas for Long Island, New York Storm Damage Reduction Projects 3
Figure 2: FIMI Borrow Area 2C 4
Figure 3: FIMI Borrow Area 5B 5
Figure 4: Benthic Grab Sampling Sites in FIMI Borrow Area 2C Collected in the Summer 9
Figure 5: Benthic Grab Sampling Sites in FIMI Borrow Area 2C Collected in the Fall 10
Figure 6: Benthic Grab Sampling Sites in FIMI Borrow Area 5B Collected in the Summer 11
Figure 7: Benthic Grab Sampling Sites in FIMI Borrow Area 5B Collected in the Fall 12
Figure 8: Benthic Sample Processing 13
Figure 9: Trawls Conducted for Monthly Fish Sampling in FIMI Borrow Area 2C 15
Figure 10: Trawls Conducted for Monthly Fish Sampling in FIMI Borrow Area 5B 16
Figure 11: Fish Sample Processing 17
Figure 12: Sediment Composition of Whole Summer Benthic Grabs by Site for Borrow Area 2C 24
Figure 13: Sediment Composition of Top Summer Benthic Grabs by Site for Borrow Area 2C 25
Figure 14: Sediment Composition of Whole Fall Benthic Grabs by Site for Borrow Area 2C 29
Figure 15: Sediment Composition of Top Fall Benthic Grabs by Site for Borrow Area 2C 30
Figure 16: Sediment Composition of Whole Summer Benthic Grabs by Site for Borrow Area 5B 34
Figure 17: Sediment Composition of Top Summer Benthic Grabs by Site for Borrow Area 5B 35
Figure 18: Sediment Composition of Whole Fall Benthic Grabs by Site for Borrow Area 5B 39
Figure 19: Sediment Composition of Top Fall Benthic Grabs by Site for Borrow Area 5B 40
Figure 20: Monthly Catch Per Unit Effort (CPUE) of the Most Commercially Important Species for Borrow Area 2C 58
Figure 21: Average Catch per Unit Effort (CPUE) of Monthly Fish Trawls for FIMI Borrow Area 2C 61
Figure 22: Length Frequency Distribution of Commercially Important New York Fish Species Collected in Borrow Area 2C Which Generated Over $1 Million in Revenue in 2014 62
Figure 23: Monthly Catch Per Unit Effort (CPUE) of the Most Commercially Important Species for Borrow Area 5B 69
Figure 24: Average Catch per Unit Effort (CPUE) of Monthly Fish Trawls for FIMI Borrow Area 5B 72
Figure 25: Length Frequency Distributions of Commercially Important Fish New York Fish Species Collected in Borrow Area 5B Which Generated Over $1 Million in Revenue in 2014 73

RECOMMENDED CITATION:

Tetra Tech, Inc. 2015. FIMI Borrow Area Study for the Atlantic Coast Long Island, New York, Storm Damage Reduction Projects. Final Report. Task Order CE01. Prepared For U.S. Army Corps of Engineers – New York District by Tetra Tech, Inc., February 2016.

LIST OF ABBREVIATIONS

°C	degrees Celsius
cm	centimeter
DO	dissolved oxygen
EFH	Essential Fish Habitat
ft.	feet
GPS	global positioning system
in.	inch
m^2	square meter
mg/L	milligrams per liter
NAVD	North American Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
NTU	nephelometric turbidity units
ppt	parts per thousand
QC	quality control
sp.	species
USACE	United States Army Corps of Engineers

This Page Intentionally Left Blank

1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), New York District is conducting a comprehensive feasibility-level reformulation of shore protection and storm damage reduction for the Atlantic Coast of Long Island, New York, FIMI Storm Damage Reduction Project (the Project). The habitats within the borrow area of the project must be assessed in order to monitor conditions before and after dredge activities. Tetra Tech, Inc. (Tetra Tech) conducted the benthic and fisheries assessment surveys as part of this program. Field work conducted between July and October 2015 included the collection of water quality data, benthic grab sampling, sediment characterization, and fish trawling at the FIMI Borrow Areas 2C and 5B.

There are potential impacts to fish from the dredging of sand for beach nourishment along the New York coast. Dredge activities affect the top portion of the seabed, creating a shallow depression in the borrow area. Impacts are generally localized and restricted to the dredge project footprint and the immediately surrounding area. Larger and more mobile organisms, such as crustaceans, finfish, and marine mammals, are not similarly confined to one area and will largely be able to avoid most of the dredging activity, though this is not universal, especially for bottom-dwelling animals and early life history stages. Additionally, many fisheries resources depend on benthos as a prey resource. Since benthic invertebrates are expected to experience 100% mortality if residing within dredged material removed from the borrow area, finfish abundance within the borrow area following dredging may be influenced by recovery of benthic resources within the borrow area.

Of particular interest to this fish study are commercially important species, as New York waters support a diversity of valuable fisheries. For the purposes of this report the commercially important species in New York waters are the eleven species that generated over $1 million of revenue individually in 2014 (Table 1; NOAA 2015a). Of these, five were finfish, five were bivalves, and one was a cephalopod. Northern quahogs (*Mercenaria mercenaria*) were the most valuable fishery, worth over $11.6 million. The most abundant species landed by weight was longfin squid (*Doryteuthis pealeii*), which brought in almost $5.5 million. In total, 107 different species were landed in New York State, grossing $53.9 million.

Table 1. Commercial Fisheries Landings from 2014 in New York that Generated Over $1 Million in Revenue

Commercial Fisheries Landings from 2014 in New York that Generated Over $1 Million in Revenue		
Species	**Pounds**	**Value**
Northern quahog	1,779,364	$11,605,093
Eastern oyster	418,782	$9,309,230
Longfin squid	5,141,198	$5,450,985
Golden tilefish	1,378,600	$4,247,077
Summer flounder	833,587	$2,999,627
Sea scallop	261,383	$2,965,019
Scup	3,190,441	$2,330,558
Silver hake	2,312,770	$1,927,415
Bay scallop	12,160	$1,452,886
Atlantic surf clam	1,982,642	$1,395,135
Goosefish	1,118,461	$1,312,200

Source: NOAA 2015a

1.1 PROJECT DESCRIPTION AND LOCATION

The USACE identified the FIMI Borrow Areas, 2C and 5B, for this benthic and finfish survey (Figure 1). The borrow areas surveyed for this study are both located on the Atlantic shore of Long Island, NY. Borrow Area 2C is located about 2 miles off of Cherry Grove, Fire Island, NY; and 5B is approximately 2 miles off of the coast from Quogue, NY. Borrow Area 2C is approximately 2 square miles, about 2.4 miles long on its longest side, and 1.1 miles wide at its widest, with depths of 51 to 78 feet (Figure 2). Borrow Area 5B is approximately 2 square miles, about 3 miles long on its longest side, and 0.7 miles wide, with depths of 24 to 64 feet. Borrow Area 5B, an area which is approximately 0.45 square miles, was dredged previous to the commencement of this study and is depicted in Figure 3. The coordinates of the borrow areas are defined according to the New York State Plane Coordinate System, Long Island Zone, NAD 83 coordinate system in Table 2.

Table 2: Coordinates of the FIMI Borrow Areas

Coordinates of the FIMI Borrow Areas 2C and 5B Coordinates in North American Datum 83		
Borrow Area	**Latitude**	**Longitude**
2C	1243159.377292	165921.860011
	1243032.973039	163393.751821
	1230663.283129	164477.228057
	1228250.353280	169996.990027
	1231600.352311	171296.988408
	1238735.182801	166210.790037
	1381679.707375	236208.585700
5B	1382350.323684	234053.971574
	1380000.323147	231846.973505
	1368150.325307	227146.973302
	1365580.327525	228234.974465
	1365190.326414	229200.973004
	1367020.325938	230031.973331
	1366900.327457	230596.974439
	1371143.855008	231980.882888

Tetra Tech completed the benthic and finfish survey of this site as described below. Sampling sites were targeted and identified using the vessel's onboard global positioning system (GPS) navigation system. Positioning data were recorded manually or electronically using a Trimble® Juno SB handheld GPS system with differential capability, or with the ESRI Collector application in an Apple iPad along with a mapping grade Bluetooth GPS receiver, at each of the sites identified for sampling. GPS points followed the WGS 84 coordinate system. Sampling locations were mapped using ESRI ArcGIS® Release 10.

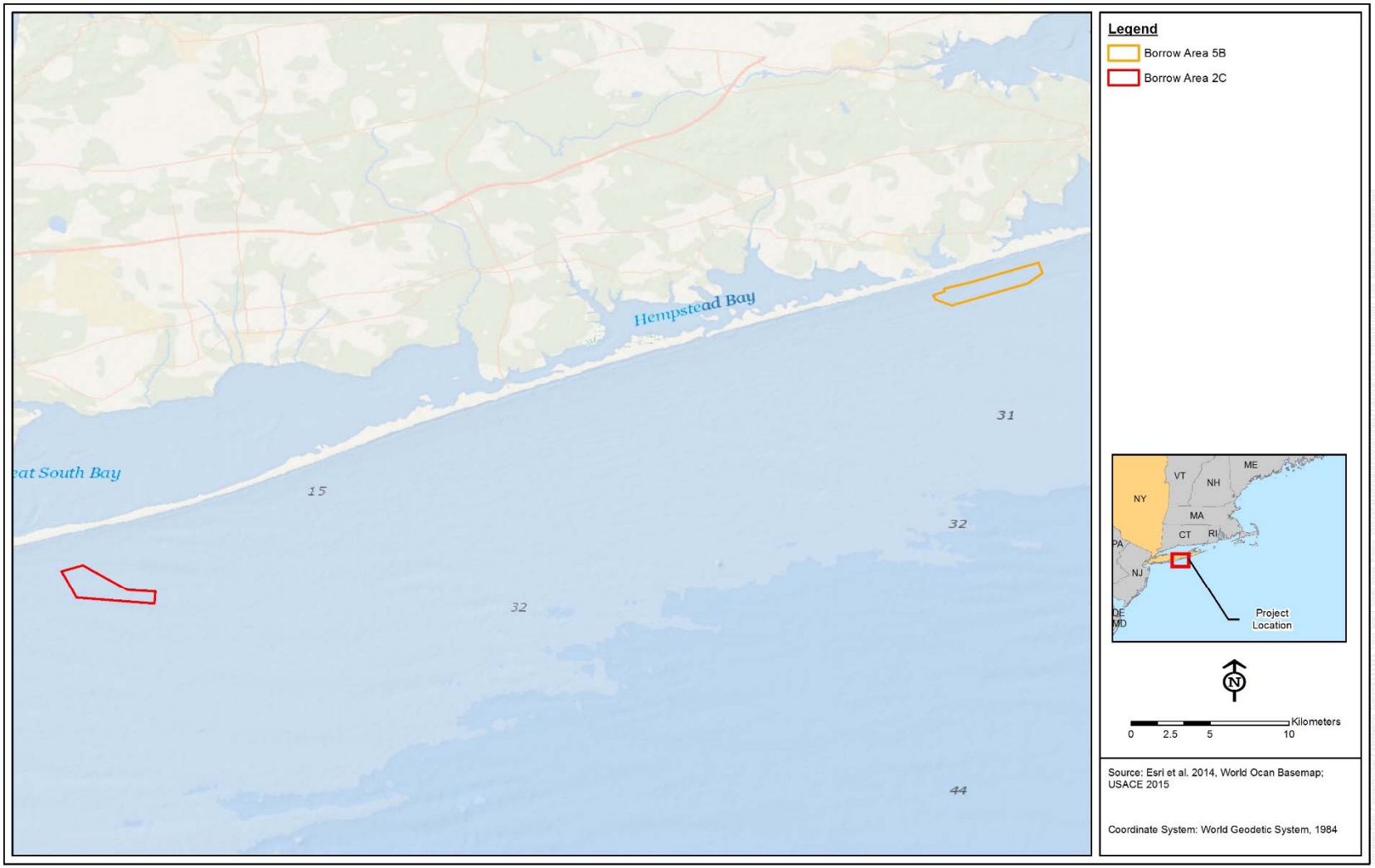


Figure 1: FIMI Borrow Areas for Long Island, New York Storm Damage Reduction Projects

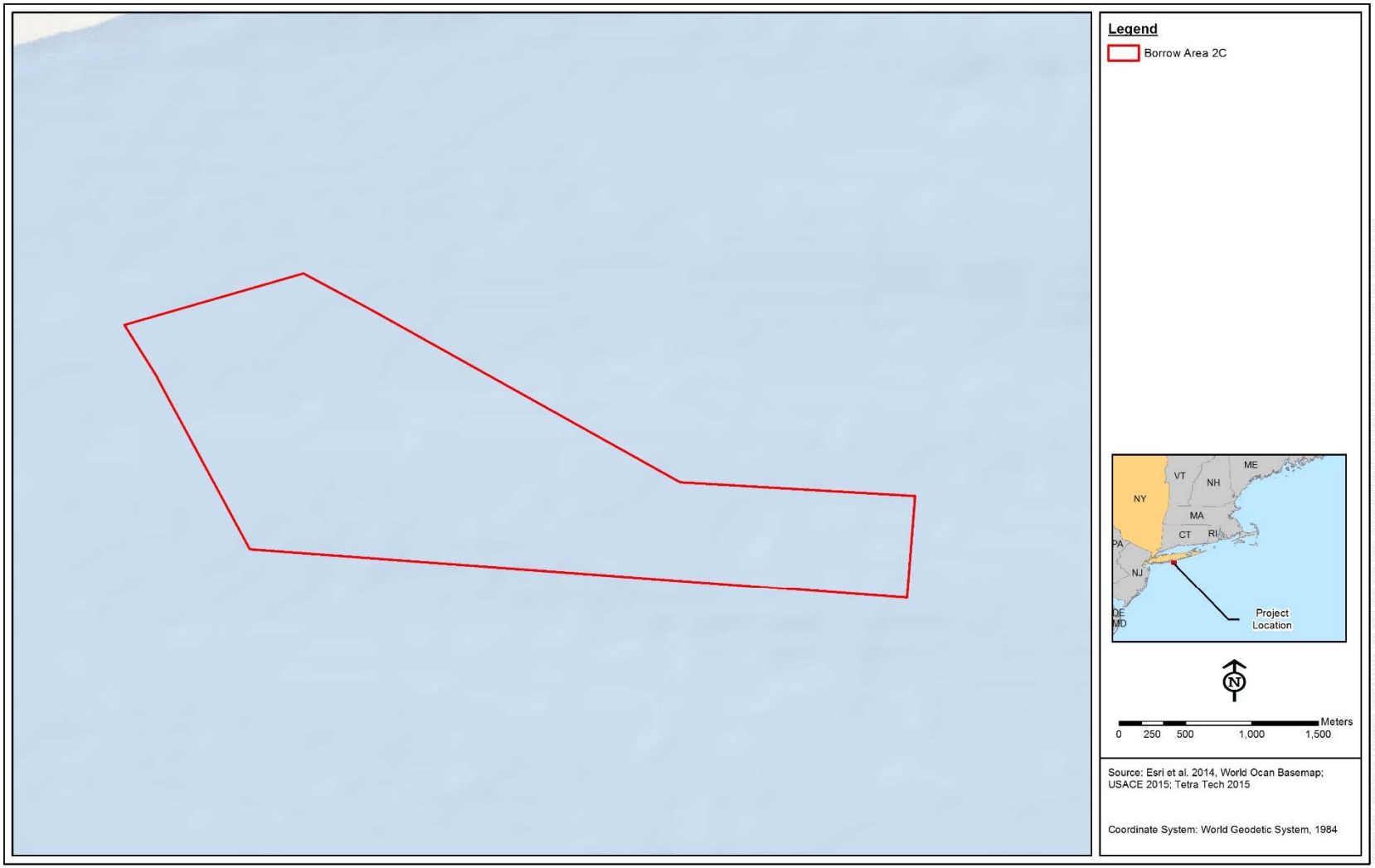


Figure 2: FIMI Borrow Area 2C

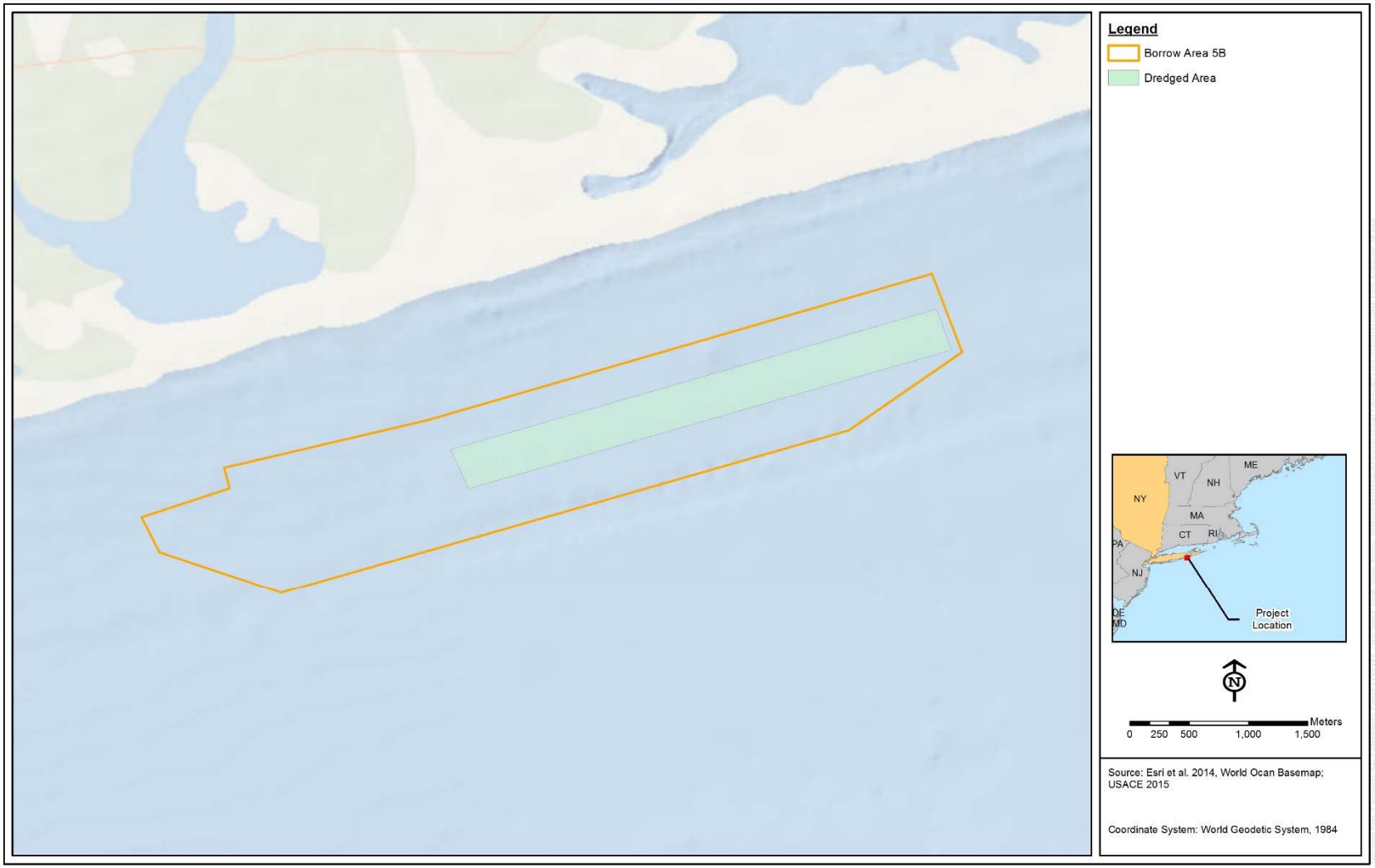


Figure 3: FIMI Borrow Area 5B

1.2 OBJECTIVES

The objectives of this study were to characterize and compare seasonal demersal fishes and benthic community structures, and to assess Project impacts on these communities and their related marine habitats, based on the Project Scope of Work. This report describes field and laboratory methods that were used for the collection of benthic grab samples and offshore fishing trawls. Results are presented in graphs and tables, and are discussed in the context of other relevant studies. The benthic sample collection and bottom trawl methods are described in Section 2.0. Benthic grabs were collected in the summer and fall of 2015. From these, infauna identification, biomass, and sediment size were determined. Monthly trawl data was analyzed for species composition, abundance, and size data to characterize the finfish community of the FIMI Borrow Areas.

1.3 SUMMARY OF FINDINGS

1.3.1 BORROW AREA 2C

Based on the benthic grabs collected in Borrow Areas 2C in the summer and fall, the average dominant sediment type was coarse sand for whole and top samples in both seasons. The most abundant benthic infauna phylum in Borrow Area 2C was Arthropoda in the summer and Annelida in the fall. At the species level, an amphipod (phylum Arthropoda) was the most abundant species in the summer and Nematoda spp. were the most abundant in the fall in Borrow Area 2C. Species richness and individuals per grab were both significantly greater in the summer relative to the fall. During monthly fish sampling both within the borrow area (on-site) and at reference sites, 36 distinct species were captured. Of these, 28 support a commercial industry and 10 have Essential Fish Habitat (EFH) in the study area. Overall, the most abundant species was longfin squid; winter skate (*Leucoraja ocellata*) had the greatest biomass. Based on catch per unit effort (CPUE), which is a standardized unit of abundance, there was greater variation month-to-month than between on-site and reference trawls within a given month.

1.3.2 BORROW AREA 5B

Based on the benthic grabs collected in Borrow Areas 5B, the dominant sediment type was medium sand in the summer for whole and top samples, and coarse sand in the fall for whole and top samples. The most abundant benthic infauna phylum in Borrow Area 5B was Arthropoda in the summer and Nematoda in the fall. At the species level, an amphipod (phylum Arthropoda) was the most abundant in the summer and Nematoda spp. were the most abundant in the fall in Borrow Area 5B. Species richness, individuals per grab, and the dominance index were all significantly greater in the summer relative to the fall; and the diversity index and evenness index were significantly greater in the fall. During monthly fish sampling both within the borrow area (on-site) and at reference sites, 47 distinct species were captured. Of these, 28 support a commercial industry and 10 have Essential Fish Habitat (EFH) in the study area. Overall, the most abundant species was longfin squid; winter skate had the greatest biomass. Based on catch per unit effort (CPUE), which is a standardized unit of abundance, there was greater variation month-to-month than between on-site and reference trawls within a given month.

2.0 METHODS

Sample collection in the field is summarized in Table 3. The benthic surveys and finfish trawls were conducted aboard the fishing vessel *(F/V) Sea Scout.* Sampling details are provided in each subsection below. Blank data sheets used in the field are provided in Appendix A.

Table 3: Summary of Sample Collection Methods in the FIMI Borrow Areas

Summary of Sample Collection Methods in the FIMI Borrow Areas				
Type of sampling	**Gear**	**Number of sites**	**Frequency of sampling**	**Samples collected**
***In situ* water quality**	YSI 6920 sonde	Surface, middle, and bottom readings at each site	Every site	Readings of pH, water temperature, turbidity, dissolved oxygen, and salinity
Benthic grab	0.1 m^2 Smith-McIntyre grab	90 randomly selected sites (45 sites per borrow area)	Seasonally, summer and fall	Assessment of subsamples: macroinvertebrates, and sediment size. Two samples from each grab: a) from top 1 in. of sample, 2) vertical sample of the whole grab
Finfish trawl	30-ft. headrope bottom otter trawl with 1-in. mesh and ¼-in. codend liner	Average of 17 trawl transects per month	Monthly (or bi-monthly), July through October	Species identification, length, and weight; all animals released

Notes: m^2 = square meters; ft. = foot; in. = inch

2.1 PHYSICAL DATA AND WATER QUALITY

Physical data and water parameters were taken at all sampling sites. In the field, date and time of collection, and latitude/longitude coordinates (by dual-range global positioning system) for all samples were recorded. Weather was also recorded for each sampling day.

Water quality data were collected at each of the benthic and finfish sample sites, at the end of each grab or tow. The following parameters were measured at the surface, middle, and bottom: pH, water temperature (degrees Celsius [°C]), turbidity (nephelometric turbidity units [NTU]), dissolved oxygen (DO) (milligrams per liter [mg/L] and percent [%]), and salinity (parts per thousand [ppt]), using a YSI 6920. Depth was also reported relative to tide state. The time of the latest high and low tide at the nearest tide station is included in Appendix B.

2.2 BENTHIC GRABS

To characterize the benthic environment, a total of 90 benthic grabs were completed. Benthic grabs were collected from pre-selected sites in the FIMI Borrow Areas in the summer and fall of 2015 aboard the *F/V Sea Scout*, which are summarized in Table 4. Benthic grabs for the Borrow Area 2C summer and fall surveys are depicted in Figure 4 and Figure 5, and the Borrow Area 5B summer and fall benthic grabs

are depicted in Figure 6 and Figure 7. Coordinates of each grab location are provided in Appendix C. Sites within the borrow areas were labeled as “2C” and “5B” with the site number following each borrow area name, while reference sites were labeled “R” at the end the site name. At each site, the 0.1 m^2 stainless steel Smith-McIntyre grab sampler was thoroughly rinsed with ambient sea water prior to each grab. Each grab was at least 50% full and showed no evidence of surface washout. A 2-liter subsample of each grab was collected and sieved through a clean 0.5 millimeter sieve bucket. The filtered samples were placed in a sediment bag and preserved in 10% buffered Formalin with rose bengal stain. Every sample was analyzed in a laboratory for macroinvertebrate composition and grain size.

Table 4: Benthic Sampling Effort within the FIMI Borrow Areas

Benthic Sampling Effort within the FIMI Borrow Areas							
Borrow area	**Collection date (2015)**	**Weather conditions**	**Number of samples in borrow area**	**Number of reference samples**	**Benthic infauna samples**	**Grain size: top samples**	**Grain size: vertical samples**
Summer 2015							
2C	30 July	Cloudy, 75-85°F, 6 knot winds	26	2	28	28	28
2C	31 July	Sunny, 73-82°F, 2.6 knot winds	14	3	17	17	17
5B	5 August	Sunny, 80°F, 10-15 knot winds	40	5	45	45	45
Fall 2015							
2C	07 Oct	Sunny, high of 70°F, 5-10 knot winds	26	4	30	30	30
2C	08 Oct	Partly cloudy, 55-68°F, 5-10 knot winds	14	1	15	15	15
5B	09 Oct	Cloudy, 65°F, strong winds	9	1	10	10	10
5B	10 Oct	Sunny, 52-57°F, 5-20 knot winds	31	4	35	35	35

Note: Summer benthic grabs for 5B were conducted in one day due to weather delays.

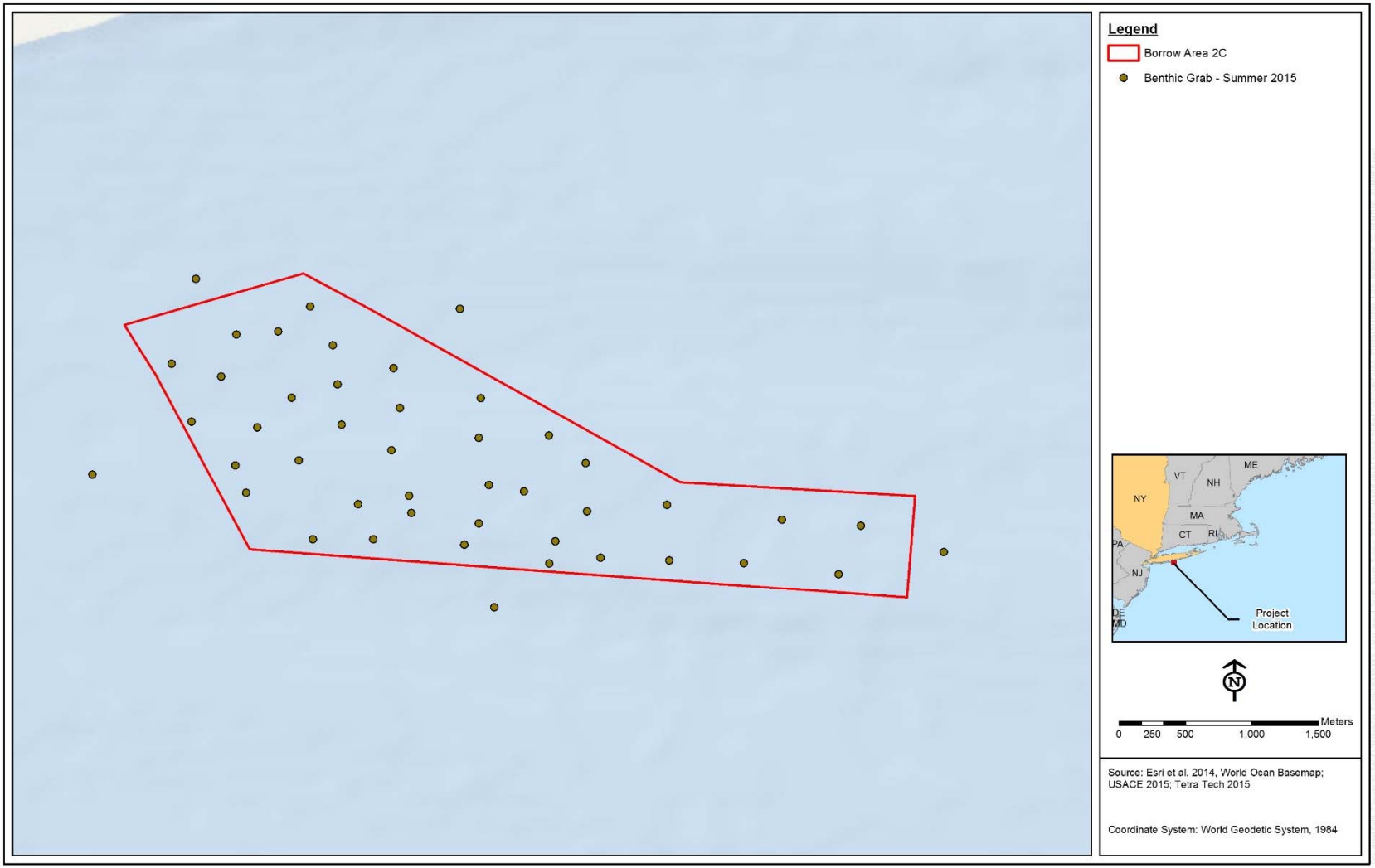


Figure 4: Benthic Grab Sampling Sites in FIMI Borrow Area 2C Collected in the Summer

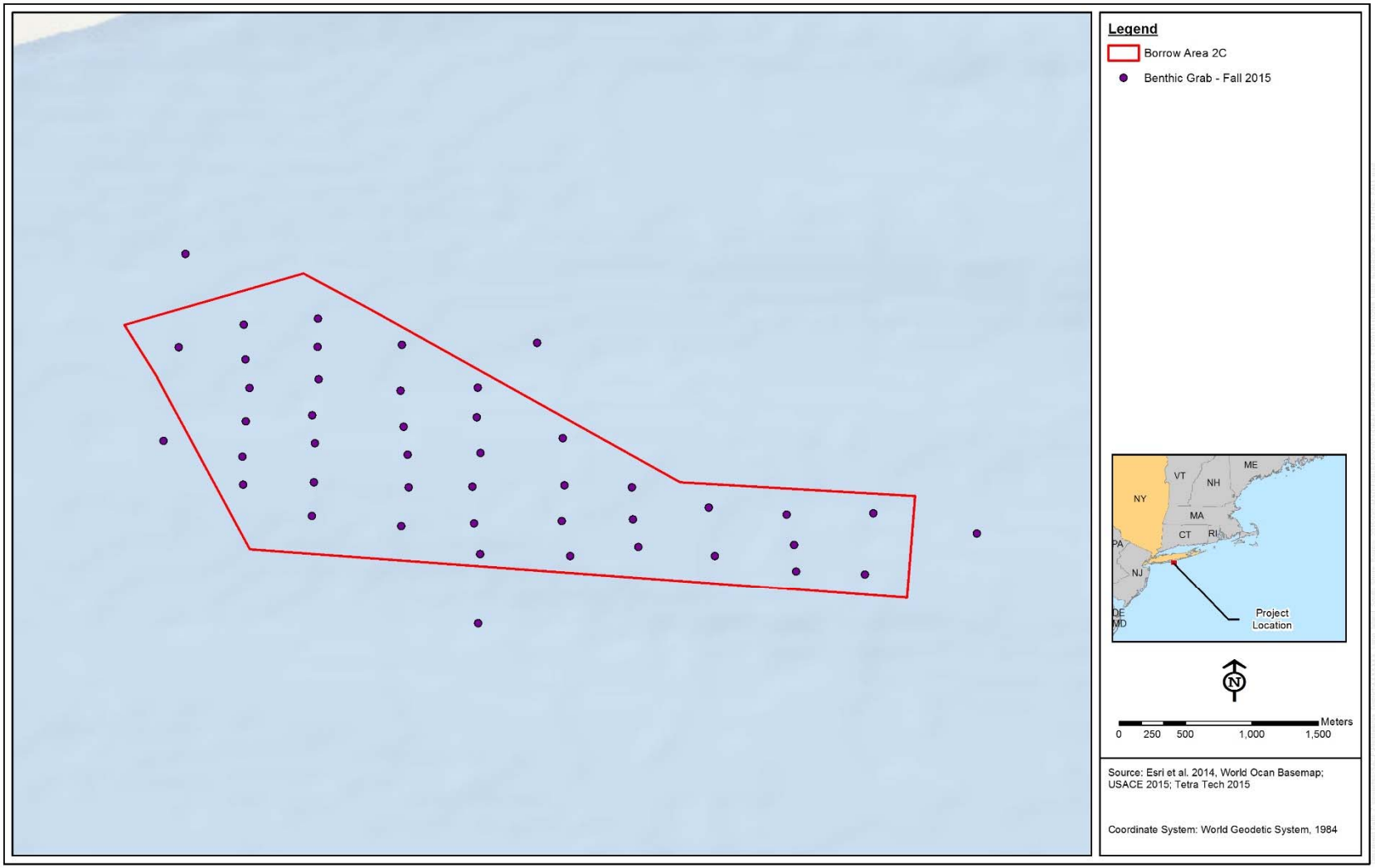


Figure 5: Benthic Grab Sampling Sites in FIMI Borrow Area 2C Collected in the Fall

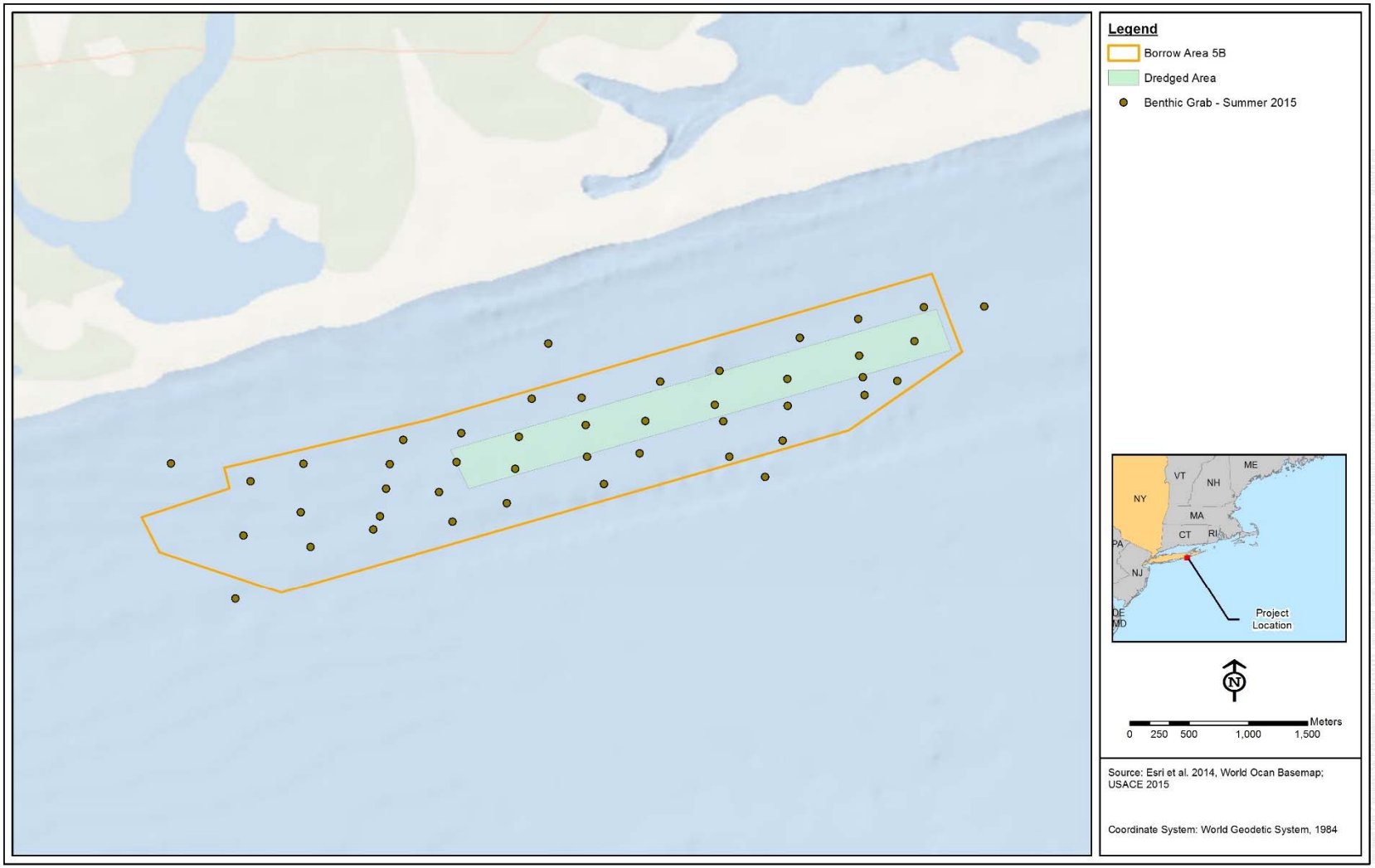


Figure 6: Benthic Grab Sampling Sites in FIMI Borrow Area 5B Collected in the Summer

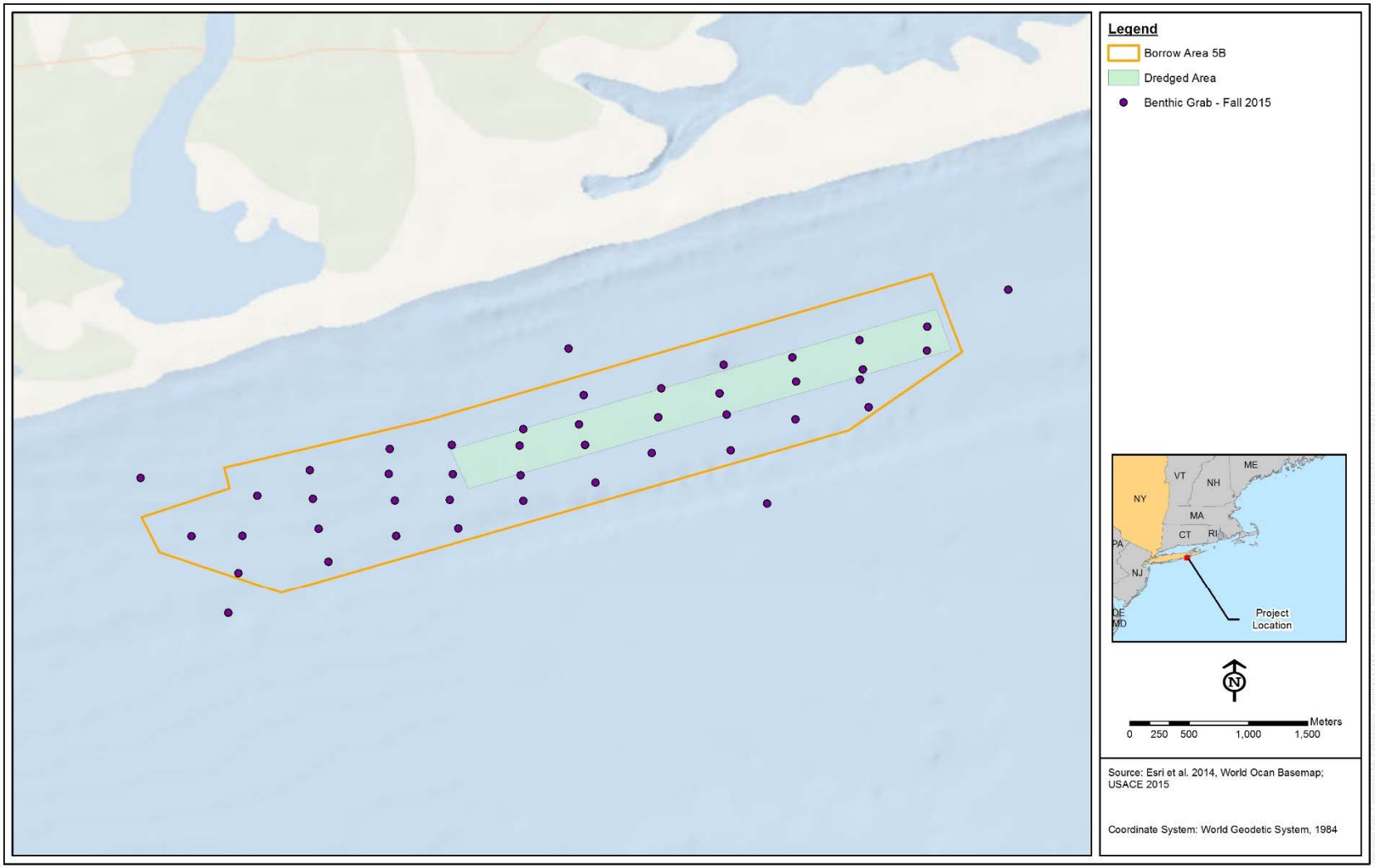


Figure 7: Benthic Grab Sampling Sites in FIMI Borrow Area 5B Collected in the Fall

All sampling containers were pre-labeled for sieved benthic organisms and grain size. No samples were composited; all samples were handled individually. For the grain size sample, two types of samples were collected, a whole sample and a top sample. Whole samples were collected to represent the composition of the whole sample by taking a vertical portion of the material from the sediment grab. For the top samples, surface sediments were removed from the top 1 in. (2.54 cm) of each sediment grab. Both types of samples were placed in quart-sized bags, double bagged, and kept in a cooler until transfer for laboratory processing (Appendix D). Within 1-2 days of collection, the samples were picked up by or delivered to the lab for analysis. In the field, grab samples were then processed for laboratory analysis of benthic infauna identification (Figure 8; see Appendix E for details). After sieving and preserving, the benthic organism samples were packed securely in sealed 5-gallon buckets and shrink-wrapped.

Figure 8: Benthic Sample Processing

2.3 Laboratory Analysis

2.3.1 Grain Size

Grain size analysis was performed in a laboratory using the ASTM Standard D422-63, Particle-Size Analysis of Soils (ASTM International 2007). In this method, sediment was sifted through progressively smaller, nested sieves. After the sample was dried, the weight retained in each sieve was then divided by the total sample weight. Cobble gravel was sediment greater than 2.5000 inches (in.). Pebble gravel was retained in US sieve Number (No.) 5 (0.1570-in.). Granule gravel was retained in the No. 10 sieve (0.0787-in.). Very coarse and coarse sand passed through the No. 10 sieve and was retained in the No. 35 sieve (0.0197-in.). Medium sand was retained in the No. 60 sieve (0.0098-in.). Very fine and fine sand passed through the No. 60 sieve and was retained in the No. 230 sieve (0.0025-in.). Silt and clay passed through all sieves and were collected in the bottom tray, with no further differentiation.

2.3.2 Invertebrate Analysis

Benthic invertebrates, preserved in the field, remained in 10% buffered formalin and rose bengal stain until laboratory sorting by taxonomists. To remove preservative and any sediment, samples were gently rinsed with water over a 0.020-in. (0.5 mm) mesh sieve. If not processed immediately, samples were

kept in alcohol for longer-term storage. All species were identified on a sorting tray using a stereoscope. Each individual was identified to the lowest practical taxonomic level and counted.

2.4 Fish Trawls

Fish trawls were conducted within the FIMI Borrow Area and at nearby reference sites between July and October of 2015 (Figure 9 and Figure 9: Trawls Conducted for Monthly Fish Sampling in FIMI Borrow Area 2C, Appendix C). The weather conditions and effort of each sampling event are summarized in Table 5. The first fishing trawls for Borrow Area 5B were conducted during the first week in August, since it was not possible to complete them in July. There were two trawl surveys conducted in Borrow Area 5B in August, 6-7 August and 19-20 August. The trawls conducted on 6-7 August were treated as July trawls for data analysis purposes. All fish sampling was conducted aboard the *F/V Sea Scout*. Each tow was processed for the identification, enumeration, length, and weight of each species collected. All common and scientific names of fishes are based on Page et al. 2013.

Table 5: Fish Sampling Effort within the FIMI Borrow Areas

Fish Sampling Effort within the FIMI Borrow Areas				
Borrow area	**Collection date (2015)**	**Weather conditions**	**Number of borrow area trawls**	**Number of reference trawls**
July 2015				
2C	28 July	Clear, 75-82°F, 5 knot winds	6	1
2C	29 July	Sunny, 80-88°F, 2 knot winds	6	1
August 2015				
5B*	6 August	Sunny, 85°F, 5-10 knot winds	6	1
5B*	7 August	Sunny, 75-85°F, 10-15 knot winds	9	1
2C	17 August	Clear, 90-95°F, 5-10 knot winds	6	2
2C	18 August	Partly cloudy, 75-88°F, 5-10 knot winds	6	2
5B	19 August	Fog in AM, sunny, 70-80°F, 5-10 knot winds	8	1
5B	20 August	Sunny, 75-80°F, 5-10 knot winds	8	1
September 2015				
5B	08 Sept	Sunny, 85°F, 5-10 knot winds	7	1
5B	09 Sept	Foggy, cloudy, 80-85°F, 10-15 knot winds	8	1
2C	10 Sept	Isolated thunderstorms, 72-79°F, 5 knot winds	7	1
2C	11 Sept	Cloudy, 70-75°F, 5-15 knot winds	7	1
5B	21 Sept	Sunny, 20-30 knot winds	1	1
2C	29 Sept	Foggy, light rain, 70-75°F, 5-15 knot winds	7	1
October 2015				
5B	11 Oct	Sunny, 43-66°F, 5-10 knot winds	7	1
5B	12 Oct	Sunny, 50-70°F, 5-10 knot winds	7	1
2C	13 Oct	Rain and fog clearing in PM, 60-70°F, 10-20 knot winds	7	1
2C	14 Oct	Partly cloudy, 54-66°F, west winds 5-10 knot winds	7	1

*Note: The 6-7 August, 5B trawls are treated as July trawls for purposes of data analysis.

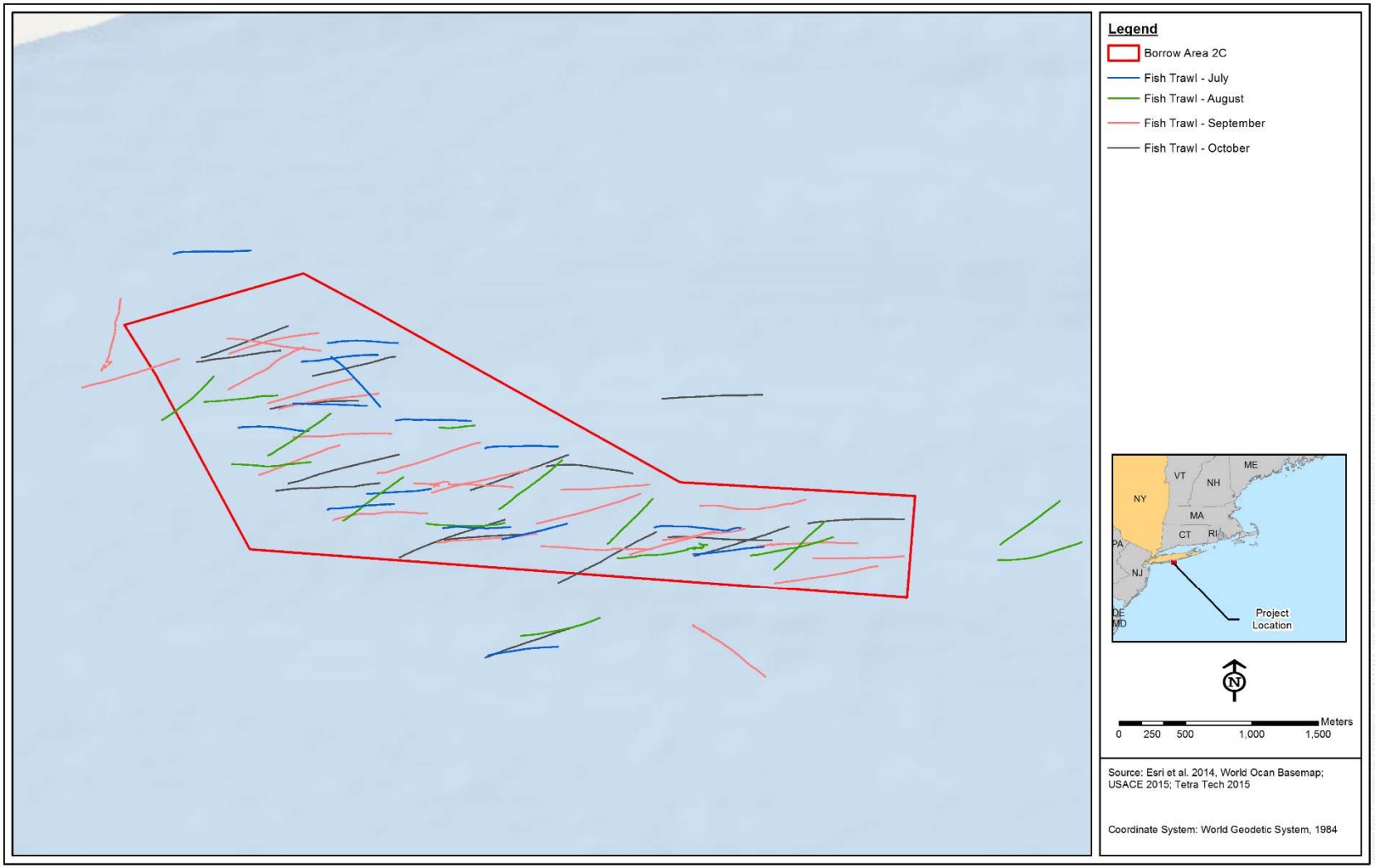


Figure 9: Trawls Conducted for Monthly Fish Sampling in FIMI Borrow Area 2C

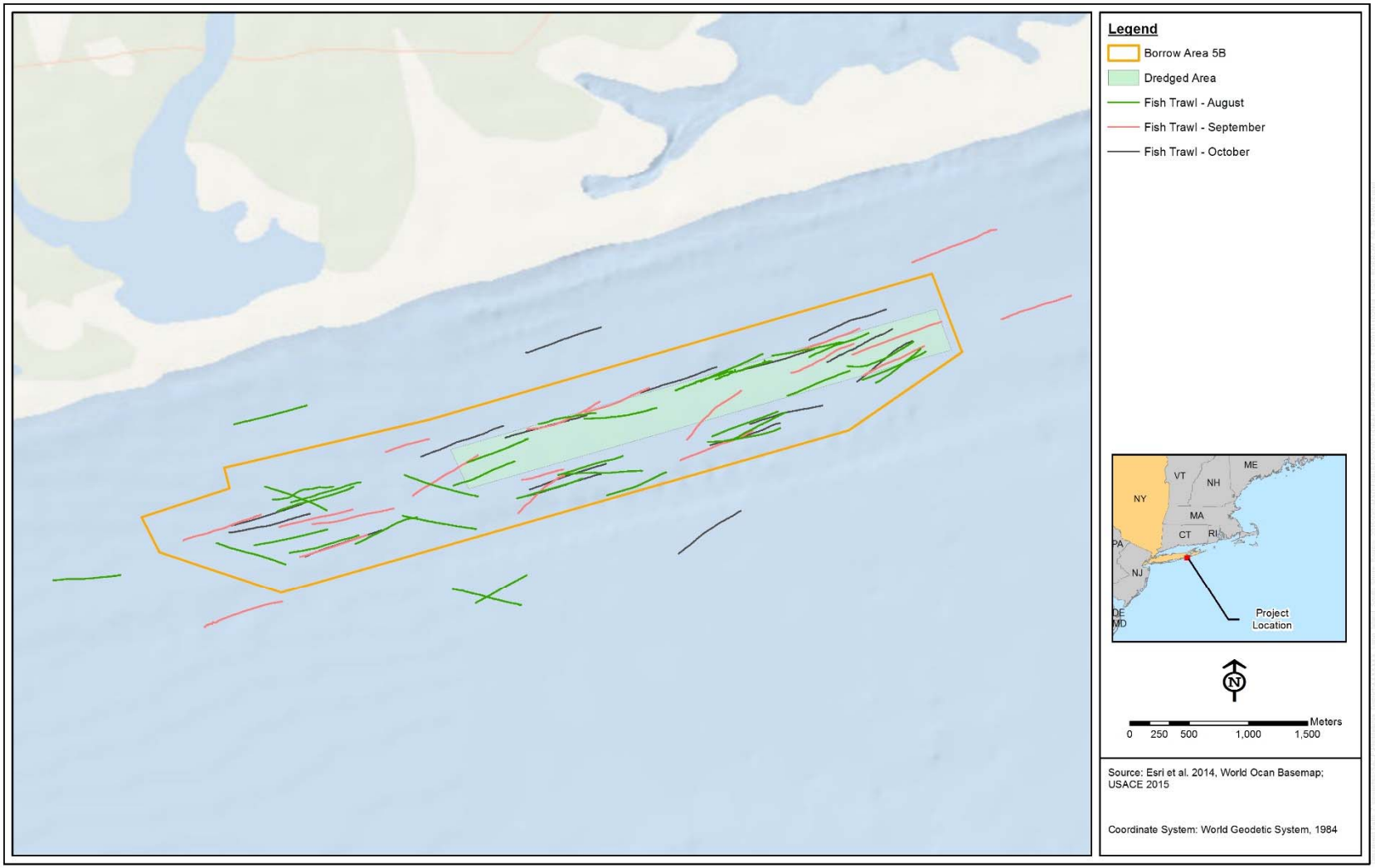


Figure 10: Trawls Conducted for Monthly Fish Sampling in FIMI Borrow Area 5B

A 30-ft. headrope bottom otter trawl with a ¼-in. codend liner was towed for approximately 0.25 nautical miles at a speed of 2 to 3 knots, which equates to 8 to 10 minutes. Contents of the trawl net were processed on board the vessel (Figure 11). Each species of teleost, elasmobranch, and squid was identified to the lowest taxonomic level. The standard length (SL), the distance from the snout to the hypural bone, was measured to the nearest millimeter (mm) for each individual. For elasmobranchs, the total length (TL) from the nose to the tail was measured. Weight was collected to the nearest gram (g). For species with high abundance (i.e., >30 individuals), a bulk composite weight was measured for the additional individuals. With the exception of squid (due to their commercial importance), all mollusks were noted for presence but were otherwise not enumerated, weighed, or measured. Mantle length and weight were collected for squid.

Although abundance, length, and weight was collected for all fish species, in this report, attention is given to species of interest, which are identified as organisms that support a fishery valued at over $1 million.

Figure 11: Fish Sample Processing

2.5 Data Analysis

To analyze characteristics and patterns within the benthic data, several different parameters were investigated. Species richness (R) is the overall number of species. To measure diversity, the Shannon Diversity Index (H') was calculated as:

$$H' = -\sum_{i=1}^{R} p_i \ \ln \ p_i$$

For taxon *i*, p_i is the proportion of individuals from the particular taxon relative to the total number of individuals. Greater values of H' correspond to higher diversity. This diversity index can then be used to look at relative abundances of different species, or evenness. Pielou's evenness index, calculated as:

$$J' = \frac{H'}{H'_{max}}$$

estimates the evenness of different species. H'_{max} is the maximum value of H', equivalent to the natural log (ln) of R (where R = total number of species). J' ranges from 0 to 1, with low values representing greater variation between species and high values indicative of more even abundances.

Species dominance was measured using Simpson's Dominance Index calculated as:

$$\lambda = \sum_{i=1}^{R} p_i^2$$

λ ranges from 0 to 1; a community not dominated by just a few species would have a value below 0.5 while a community dominated by one or a few species would have a value greater than 0.5. A comparison of these infauna community measures between spring and fall was conducted using a two-tailed student's t-test. To focus on spatial changes in the benthic community, these statistics were run separately for grabs conducted on-site and reference site grabs. However, the disproportionate number of grabs collected within the Borrow Area and at reference sites are not suitable for comparing the two types of areas using student's t-tests.

Finfish abundance is reported as percent composition, as well as catch per unit effort (CPUE). CPUE is a way to standardize abundance and is calculated as number of fishes captured per tow. During quality control (QC) of trawl data, the length-weight relationship of each individual organism, if available, was used to identify possible outliers. An assumption was made that if an inconsistency in the length-weight relationship was apparent, the error was in the weight measurement, rather than the length measurement. The movement of a vessel, an inescapable and common challenge working at sea, may impact a weight measurement, especially for smaller individuals. Therefore, based on the fish's length, an expected weight was calculated (Lange and Johnson 1978, NOAA 2003, Robinette 1983). All statistical tests were conducted in Microsoft Excel 2013 and used an error-rate of P = 0.05 to determine statistical significance.

3.0 RESULTS

3.1 WATER QUALITY

Water quality measurements were taken at the surface, middle, and bottom of the water column at each benthic grab and trawl site from July to October 2015 (Table 6). For the purposes of data analysis, the first survey in Borrow Area 5B on 5-7 August were treated as July data and the survey conducted a few weeks later in August were treated as the August data. Though more parameters were measured (Appendix B), temperature, salinity, and dissolved oxygen (DO) are highlighted here due to the biological relevance of these measurements, as well as the seasonal patterns evidenced. When the turbidity and DO meters did not function properly, the data was omitted from the analysis and the meters were repaired or replaced as soon as possible.

Seasonal changes in water quality were evident. Since the solubility of oxygen is greater in colder water, this could partially account for the high DO observed in Borrow Area 2C bottom waters in August. In addition to this, wave action and photosynthetic organisms may have contributed to increased oxygen in surface waters in July, September, and October (Millero 2006). As is common at temperate latitudes, a pycnocline was evident during the summer months. Although the densest water (which is also the coldest and saltiest) is in the bottom layer for all months, it is only during July, August, and September that the surface temperature is warm enough to become less dense, thus creating a pycnocline (i.e., density gradient). In July and September, oxygen levels in bottom water were depleted due to respiration of organisms and lack of mixing with oxygen-rich surface waters (Millero 2006). In October, however, surface waters began to cool, breaking down the pycnocline. Increased wind and storms facilitated the mixing of the water column, maintaining high levels of DO, which would be expected to remain as winter storms replenished atmospheric oxygen into the water.

Table 6: Average Water Quality Parameters by Month at FIMI Borrow Areas 2C and 5B

Average Water Quality Parameters by Month at FIMI Borrow Areas 2C and 5B							
Sampling month	**Borrow Area**	**Average depth (ft.)**	**Reading depth**	**Temperature (°C)**	**Salinity (ppt)**	**DO (mg/L)**	**DO (%)**
July	**2C**	58.39	Surface	22.13	31.18	8.29	115.45
			Middle	19.62	31.30	8.24	111.99
			Bottom	17.50	31.50	7.91	103.96
	5B	45.16	Surface	19.55	31.28	6.62	87.61
			Middle	18.25	31.34	6.44	84.87
			Bottom	17.19	31.48	6.29	79.96
August	**2C**	61.75	Surface	21.88	31.50	7.20	98.62
			Middle	20.15	31.59	7.30	97.53
			Bottom	17.63	31.80	7.66	96.40
	5B	45.44	Surface	22.22	31.25	5.51	76.19
			Middle	20.59	31.31	5.58	75.89
			Bottom	19.29	31.38	5.52	76.57
September	**2C**	58.58	Surface	22.45	32.13	6.02	81.84
			Middle	21.85	32.25	5.70	78.06
			Bottom	18.85	32.57	5.66	74.60

Average Water Quality Parameters by Month at FIMI Borrow Areas 2C and 5B							
Sampling month	**Borrow Area**	**Average depth (ft.)**	**Reading depth**	**Temperature (°C)**	**Salinity (ppt)**	**DO (mg/L)**	**DO (%)**
	5B	45.88	Surface	20.98	32.15	6.11	82.85
			Middle	19.23	32.20	6.03	79.69
			Bottom	18.10	32.31	5.90	75.47
October	**2C**	59.1	Surface	17.74	32.83	7.80	99.95
			Middle	17.77	32.91	7.53	96.42
			Bottom	17.98	33.18	7.41	94.66
	5B	45.97	Surface	17.40	32.96	7.85	100.18
			Middle	17.25	33.06	7.56	96.41
			Bottom	17.10	33.37	7.51	95.01

3.2 BENTHIC GRABS

Benthic sample collection occurred in August and October 2015. Physical attributes, such as sediment type, are presented separately for the summer and fall seasons for each borrow area. Collectively, they provide a characterization of the FIMI Borrow Area benthic habitat. Benthic organisms and communities displayed temporal differences, which are explored in the following section based on the month of collection.

3.2.1 BENTHIC HABITAT AND SEDIMENT TYPES

Each benthic sample collected in the summer and fall of 2015 was described quantitatively through laboratory analysis of grain size. Field data sheets of benthic sample collection are included in Appendix A; detailed laboratory results are provided in Appendix D. In this section, reference sites are distinguished with an “R” after the site number.

Samples collected for grain size analysis were taken in replicate from each sampling site, one to represent the whole grab sample and one to represent the top layer of the sediment. Refer to Section 2.2 for an explanation of how the samples were procured. Whole and top samples were taken to see if finer sediment sizes were filling in depressed areas of the borrow areas that had already been dredged. At the time that this survey was conducted only Borrow Area 5B had been previously dredged.

3.2.1.1 Borrow Area 2C

Overall, samples collected in both the summer and fall were dominated by coarse-sized sand.

Summer

On average, whole grab samples (herein after identified as “W”) contained 55.07% of coarse particles and top grab samples (herein after identified as “T”) contained 56.28% of coarse particles (Table 7). A closer look at this data revealed that for both the whole and top samples, the on-site samples had higher percentages of coarse sand particles compared to the reference sites. Medium-sized sand (0.0098-0.0197 in.) made up 33.18% W and 31.75% T of the samples. Fine to very fine-sized sand (0.0025-0.0098 in.) made up 9.14% W and 8.63% T; silt and clay (<0.0025 in.) made up 2.25% W and 2.93% T, and granule gravel (0.1570-0.0787 in.) made up 0.33% W and 0.41% T of the samples. Cobble and pebble-sized particles were not identified in the summer 2C samples.

Table 7: Average Particle-size Distribution of Summer Benthic Grabs for Borrow Area 2C

Average Particle-size Distribution of Summer Benthic Grabs for Borrow Area 2C								
Benthic sample type	Location	Gravel-size (%)			Sand-size (%)			Silt-size & clay-size (%)
		Cobble	Pebble	Granule	Coarse	Medium	Fine	
Whole	On-site	0.00	0.00	0.37	58.07	33.53	6.22 ǂ	1.80
	Reference	0.00	0.00	0.00	31.09	30.38	32.48	6.05
	Combined	0.00	0.00	0.33	55.07	33.18	9.14	2.28
Top	On-site	0.00	0.00	0.46	60.15	31.51	5.01 ǂ	2.87
	Reference	0.00	0.00	0.00	25.34	33.67	37.61	3.38
	Combined	0.00	0.00	0.41	56.28	31.75	8.63	2.93

Note: Significantly different values are distinguished with a ǂ. "On-site" is the data for the entire borrow area; "Reference" is the data from areas outside of the borrow area; "Combined" is the On-site and Reference location data together.

Comparisons of whole to top grain size samples were conducted using two-tailed student's t-tests for paired samples. These tests were run separately for grabs conducted on-site and reference site grabs. The disproportionate number of on-site and reference site grabs did not allow for comparisons using parametric statistics. For on-site samples in 2C the only significant difference between whole and top samples was for fine sand (P=0.003) (Table 7). None of the reference site samples were significantly different between the whole and top samples.

In the field, the most common descriptor of samples collected in the summer for Borrow Area 2C was "brown sand." Traces of organic matter, invertebrates, and pieces of shell were apparent in several samples. Only one sample was not described as sand; 2C32 R was described as "black brown silt." Other than this one site, reference site descriptions were similar overall. Table 8 shows the dominant sediment type for each benthic grab separated by whole and top samples as quantified through lab analysis. For sediment collected at 2C in the summer, 33 of 45 whole grab samples and 36 of 45 top grab samples were dominated by coarse-sized sand (0.0197-0.0787 in.). Medium sand was the dominant size in 11 W and 7 T; and fine sand was the dominant size in 1 W and 2 T samples. None of the gravel sizes or silt and clay size sediment types were dominant in any samples. The quantitative analysis of sediment size is depicted in Figure 12 and Figure 13. The figures show the percentage composition for each sediment type in the benthic samples; each sediment type is signified by a particular color.

Table 8: Dominant Sediment Type Based on Lab Analysis of Summer Benthic Grabs for Borrow Area 2C

Dominant Sediment Type Based on Lab Analysis of Summer Benthic Grabs for Borrow Area 2C			
Site	Depth (ft.)	Whole sample	Top sample
2C1	57	Medium sand	Coarse sand
2C2	56	Coarse sand	Coarse sand
2C3	56	Coarse sand	Coarse sand
2C4	58	Coarse sand	Coarse sand
2C5	55	Coarse sand	Coarse sand
2C6	57	Coarse sand	Coarse sand
2C7	59	Coarse sand	Coarse sand

Dominant Sediment Type Based on Lab Analysis of Summer Benthic Grabs for Borrow Area 2C			
Site	**Depth (ft.)**	**Whole sample**	**Top sample**
2C8	61	Coarse sand	Coarse sand
2C9	58	Coarse sand	Coarse sand
2C10	55	Medium sand	Medium sand
2C11	59	Coarse sand	Medium sand
2C12	58	Medium sand	Coarse sand
2C13	55	Medium sand	Medium sand
2C14	53	Coarse sand	Coarse sand
2C15	55	Coarse sand	Coarse sand
2C16	57	Coarse sand	Coarse sand
2C17	62	Medium sand	Coarse sand
2C18 R	60	Fine sand	Fine sand
2C19	60	Coarse sand	Coarse sand
2C20	55	Coarse sand	Coarse sand
2C21	54	Coarse sand	Coarse sand
2C22	52	Medium sand	Coarse sand
2C23	56	Medium sand	Coarse sand
2C24 R	73	Medium sand	Medium sand
2C25	57	Coarse sand	Coarse sand
2C26	55	Medium sand	Coarse sand
2C27	54	Medium sand	Coarse sand
2C28	54	Coarse sand	Coarse sand
2C29 R	58	Coarse sand	Coarse sand
2C30	59	Coarse sand	Coarse sand
2C31	56	Coarse sand	Coarse sand
2C32 R	56	Coarse sand	Fine sand
2C33	54	Coarse sand	Coarse sand
2C34	62	Coarse sand	Coarse sand
2C35	56	Coarse sand	Coarse sand
2C36	58	Coarse sand	Coarse sand
2C37	58	Coarse sand	Coarse sand
2C38	60	Coarse sand	Medium sand
2C39	67	Medium sand	Medium sand
2C40	62	Coarse sand	Coarse sand
2C41	62	Coarse sand	Coarse sand
2C42 R	66	Coarse sand	Medium sand
2C43	67	Coarse sand	Coarse sand
2C44	65	Coarse sand	Coarse sand
2C45	59	Coarse sand	Coarse sand

Another way to look at the possible differences between whole and top samples is to see if the dominant sediment type differs between them. The majority of dominant sediment types did not change from the whole to top parts of each sediment grab. Within Borrow Area 2C, 31 samples had the same dominant sediment type for whole and top samples, 7 whole samples had dominant grain sizes that were smaller than the top sample, and 2 whole samples were bigger than the top sample. In reference samples, 3 were the same, and 2 whole samples were bigger than the top sample.

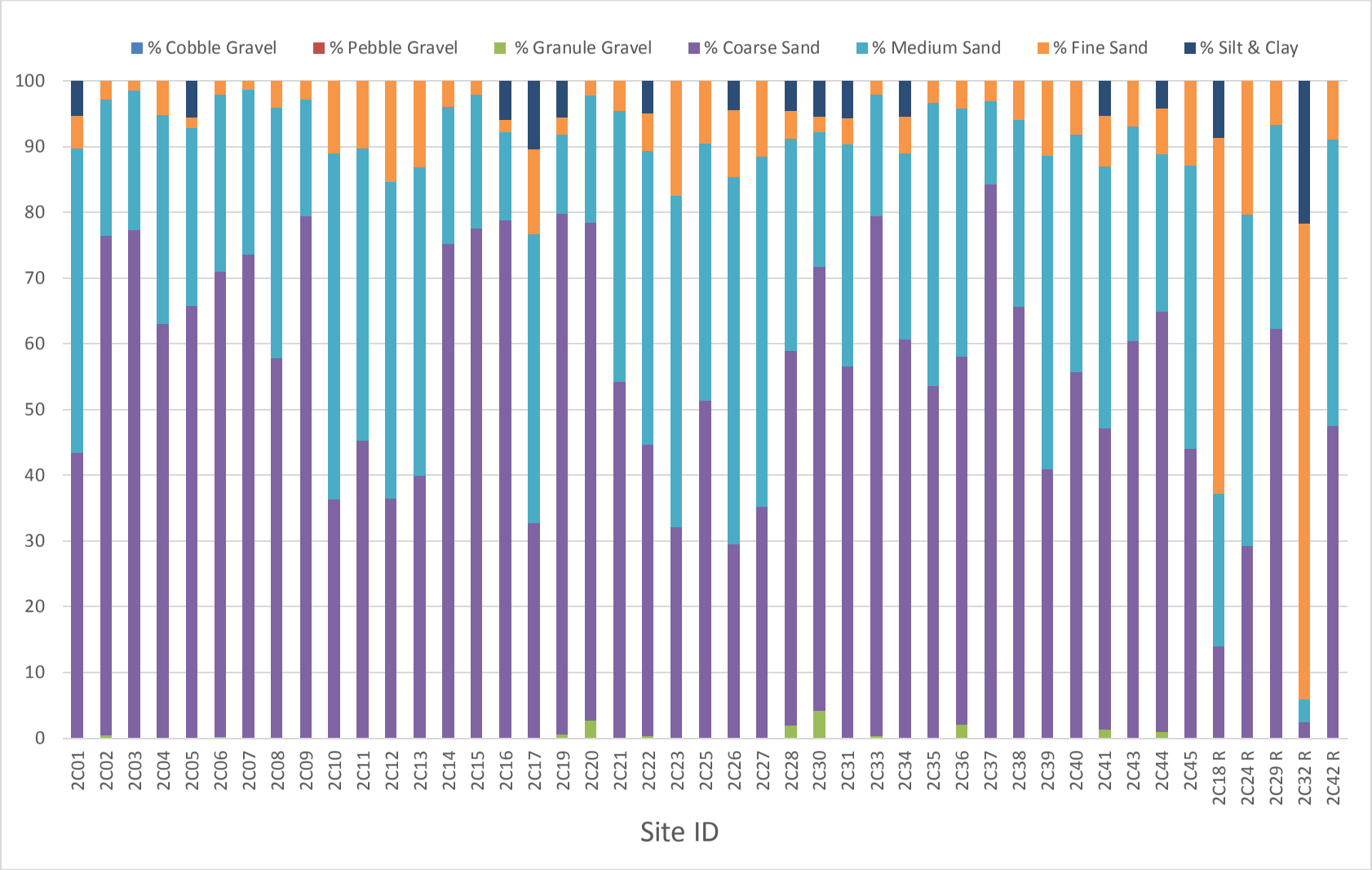


Figure 12: Sediment Composition of Whole Summer Benthic Grabs by Site for Borrow Area 2C (R=reference site)

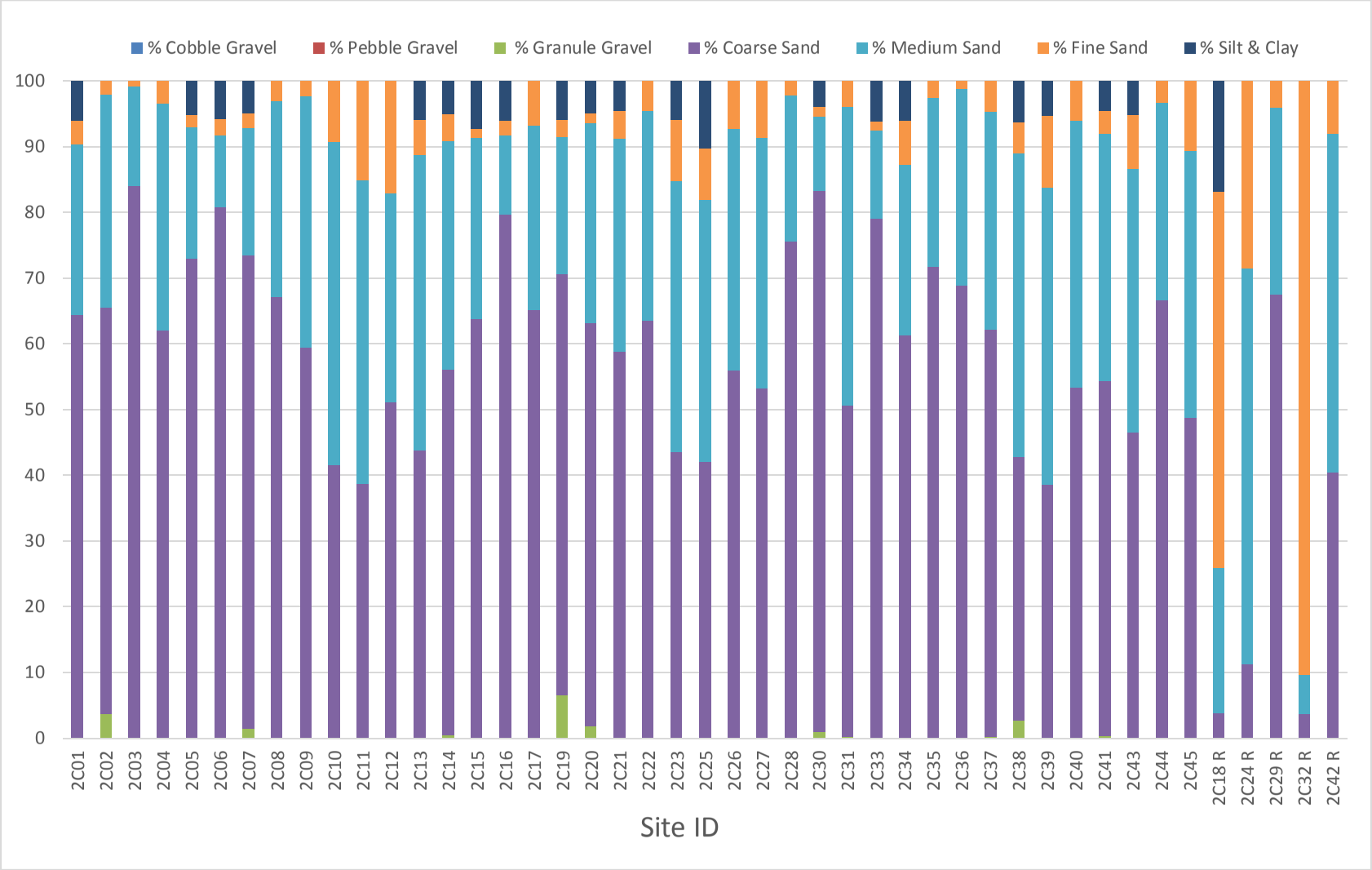


Figure 13: Sediment Composition of Top Summer Benthic Grabs by Site for Borrow Area 2C (R=reference site)

Fall

On average, samples contained 51.41% W and 50.46% T of coarse particles (Table 9). A closer look at this data reveals that for both the whole and top samples, the on-site samples had higher percentages of coarse sand particles compared to the reference sites. Medium-sized sand made up 37.31% W and 37.16% T of the samples. Fine to very fine-sized sand made up 7.62% W and 8.41% T, silt and clay made up 2.07% W and 2.97% T, granule gravel made up 1.42% W and 0.88% T of the samples, and pebble-sized granules made up 0.17% W and 0.12% T of the samples. Cobble-sized particles were not identified in the fall 2C samples.

Table 9: Average Particle-size Distribution of Fall Benthic Grabs for Borrow Area 2C

Average Particle-size Distribution of Fall Benthic Grabs for Borrow Area 2C								
Benthic sediment type	Location	Gravel-size (%)			Sand-size (%)			Silt-size & clay-size (%)
		Cobble	Pebble	Granule	Coarse	Medium	Fine	
Whole	On-site	0.00	0.12	1.52 ŧ	53.62	38.07	5.21	1.46
	Reference	0.00	0.57	0.63	33.72	31.23	26.85	6.99
	Combined	0.00	0.17	1.42	51.41	37.31	7.62	2.07
Top	On-site	0.00	0.14	0.97ŧ	52.79	38.49	5.59	2.02
	Reference	0.00	0.00	0.13	31.84	26.55	30.93	10.55
	Combined	0.00	0.12	0.88	50.46	37.16	8.41	2.97

Note: Significantly different values are distinguished with a ŧ. "Combined" is the On-site and Reference location data together.

Comparisons of whole to top grain size samples were conducted using two-tailed student's t-tests for paired samples. The only significant differences between the whole and top samples was for on-site granule-sized gravel; the percentage of granule-sized gravel was significantly greater in whole samples versus top samples (P=0.013). Most of the fall samples were described as "brown or light brown sand." Pieces of shell were again present, as well as sand dollars and bits of organic matter. For sediment collected at 2C in the fall and analyzed in the lab, 32 of 45 whole grab samples and 30 of 45 top grab samples were dominated by coarse-sized sand. Medium sand was the dominant size in 11 W and 13 T; and fine sand was the dominant size in 2 W and 2 T samples. None of the gravel sizes or silt and clay size sediment types were dominant in any samples.

Table 10: Dominant Sediment Type Based on Lab Analysis of Fall Benthic Grabs for Borrow Area 2C

Dominant Sediment Type Based on Lab Analysis of Fall Benthic Grabs for Borrow Area 2C			
Site	Depth (ft.)	Whole sample	Top sample
2C1 R	54	Coarse sand	Coarse sand
2C2	54	Coarse sand	Coarse sand
2C3 R	54	Fine sand	Fine sand
2C4	53	Coarse sand	Coarse sand
2C5	58	Coarse sand	Coarse sand
2C6	59	Coarse sand	Coarse sand
2C7	56	Coarse sand	Coarse sand
2C8	54	Coarse sand	Coarse sand

Dominant Sediment Type Based on Lab Analysis of Fall Benthic Grabs for Borrow Area 2C			
Site	**Depth (ft.)**	**Whole sample**	**Top sample**
2C9	54	Coarse sand	Coarse sand
2C10	57	Medium sand	Medium sand
2C11	56	Medium sand	Medium sand
2C12	55	Coarse sand	Coarse sand
2C13	56	Coarse sand	Coarse sand
2C14	60	Coarse sand	Coarse sand
2C15	60	Coarse sand	Coarse sand
2C16	56	Coarse sand	Coarse sand
2C17	60	Coarse sand	Coarse sand
2C18	61	Coarse sand	Coarse sand
2C19	58	Coarse sand	Coarse sand
2C20	54	Coarse sand	Coarse sand
2C21	55	Coarse sand	Medium sand
2C22	59	Medium sand	Medium sand
2C23 R	75	Coarse sand	Coarse sand
2C24	60	Medium sand	Medium sand
2C25	56	Medium sand	Medium sand
2C26	56	Coarse sand	Medium sand
2C27	56	Coarse sand	Coarse sand
2C28	58	Coarse sand	Coarse sand
2C29	60	Coarse sand	Coarse sand
2C30 R	67	Fine sand	Fine sand
2C31	56	Coarse sand	Coarse sand
2C32	55	Coarse sand	Coarse sand
2C33	57	Coarse sand	Medium sand
2C34	58	Medium sand	Coarse sand
2C35	57	Coarse sand	Coarse sand
2C36	57	Medium sand	Coarse sand
2C37	55	Coarse sand	Medium sand
2C38	59	Coarse sand	Coarse sand
2C39	60	Medium sand	Medium sand
2C40	60	Medium sand	Medium sand
2C41	60	Medium sand	Coarse sand
2C42	62	Coarse sand	Coarse sand
2C43	65	Coarse sand	Coarse sand
2C44	60	Medium sand	Medium sand
2C45 R	65	Coarse sand	Medium sand

Comparisons of dominant sediment sizes between whole and top samples for each site show that the majority of them, 33 samples, were the same for on-site samples. Three of the whole on-site samples

had bigger dominant grain sizes that were bigger than the top samples, four whole samples that were bigger than the top samples. The reference sites had four sites that were the same and one whole sample that had a bigger dominant grain size than the top sample. The quantitative analysis of sediment size is depicted in Figure 14 and Figure 15.

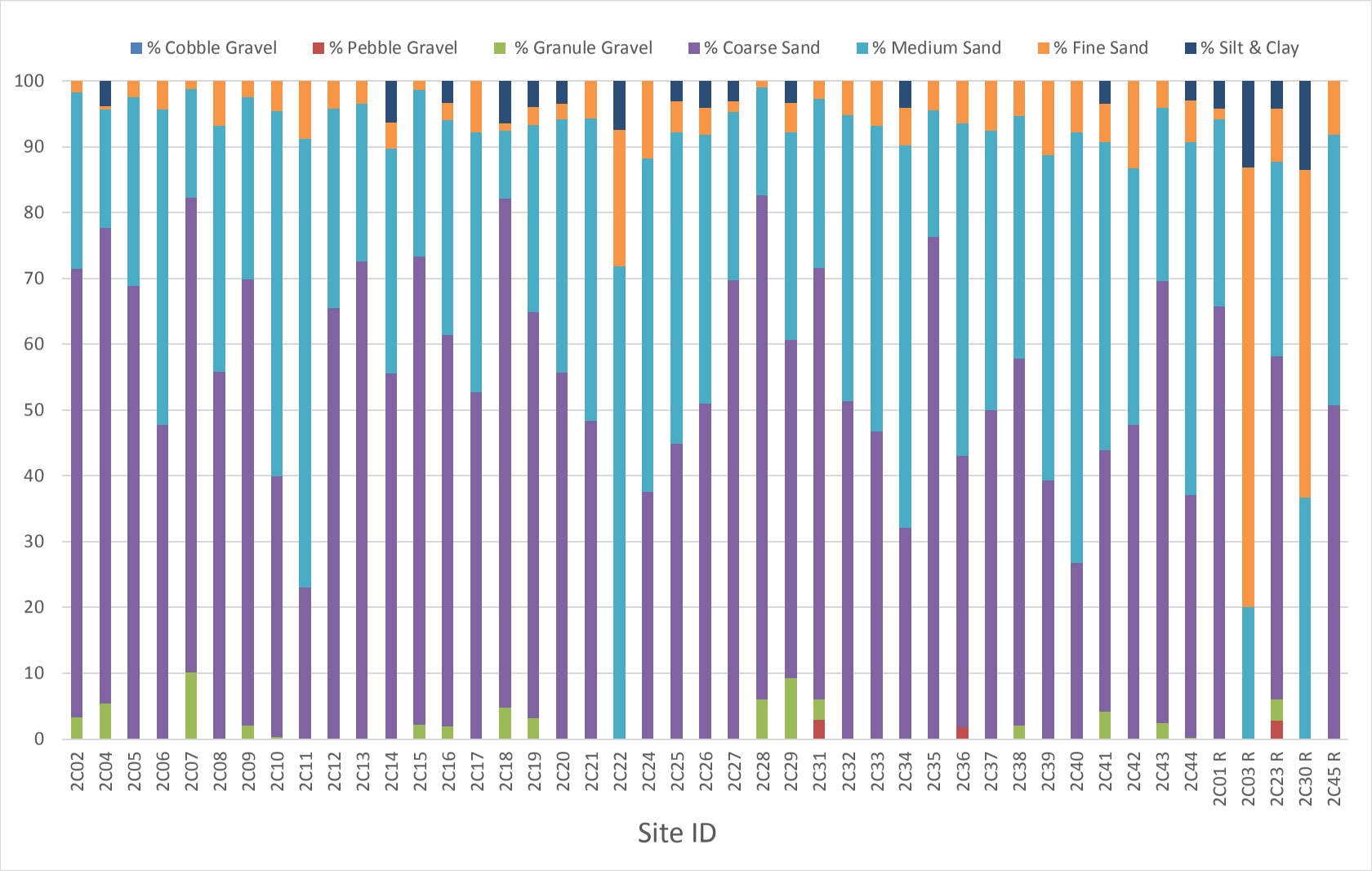


Figure 14: Sediment Composition of Whole Fall Benthic Grabs by Site for Borrow Area 2C (R=reference site)

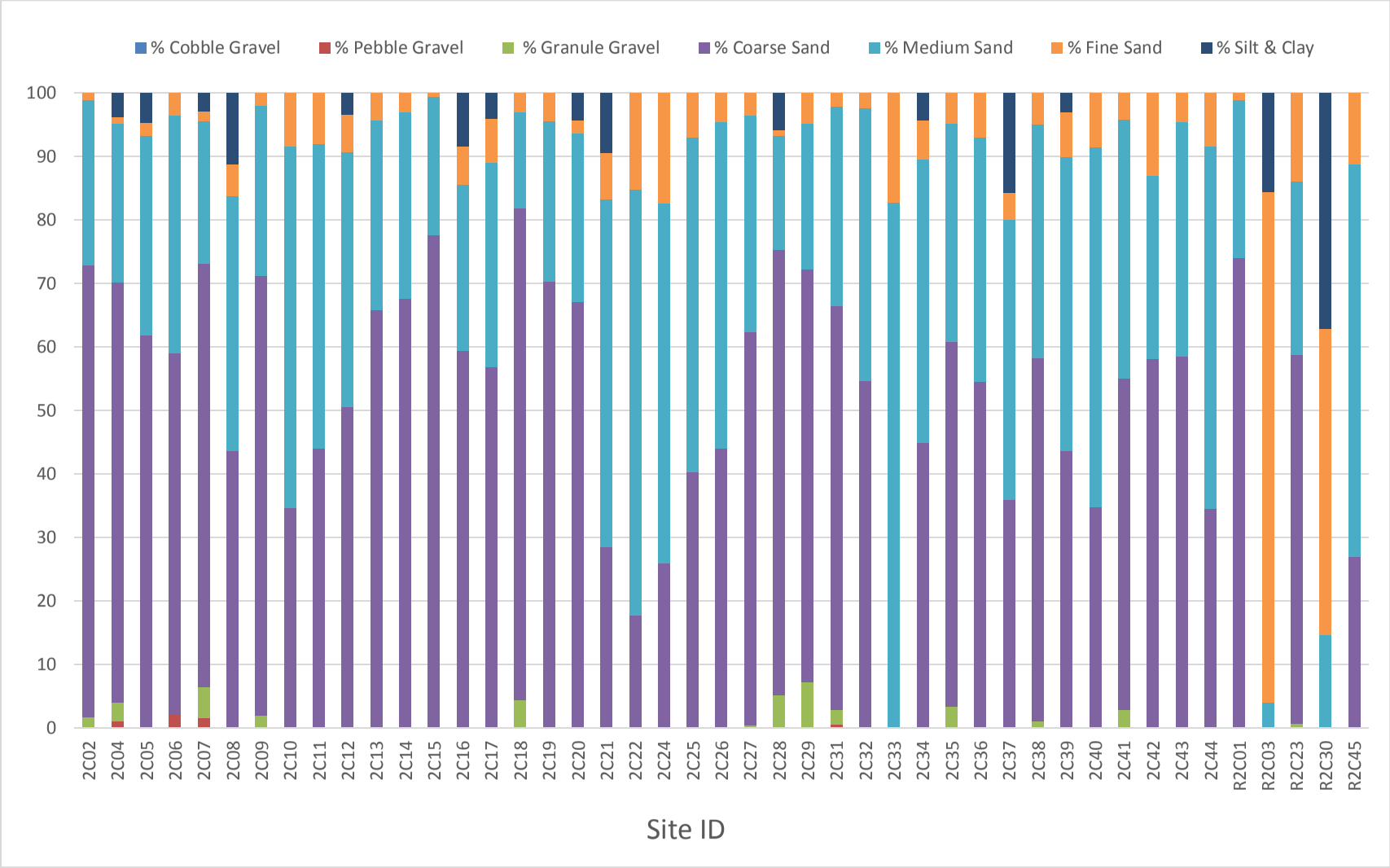


Figure 15: Sediment Composition of Top Fall Benthic Grabs by Site for Borrow Area 2C (R=reference site)

3.2.1.2 Borrow Area 5B

Overall, samples collected in both the summer and fall were predominantly medium-sized sand, with some coarse sand. Samples were analyzed as On-site or Reference, with the On-site samples further split into categories of On-site not including the dredged box, and the Dredged box. The On-site samples were divided into On-site not including the dredged box and the Dredged box to determine if the previously dredged area was filling in with fine sediment. Previous work that occurred in Borrow Area 5B include the West Hampton Bay and FIMI Smith Point projects.

Summer

On average, medium-sized particles made up 37.17% W samples and 41.41% T samples (Table 11). A closer look at this data reveals that for both the whole and top samples, the on-site samples had higher percentages of medium sand particles compared to the reference sites. Coarse-sized sand made up 31.94% W and 31.99% T of the samples. Fine to very fine-sized sand made up 26.46% W and 23.24% T, and silt and clay made up 2.11% W and 1.24% T. Cobble, pebble, and granule-sized gravel made up 2.32% W and 2.12% T combined. Cobble gravel was found in only one sample, 5B10, which is located on-site in the dredged box. The dredged box had less fine sand-sized sediment in whole and top summer samples compared to all other sample locations.

Table 11: Average Particle-size Distribution of Summer Benthic Grabs for Borrow Area 5B

Average Particle-size Distribution of Summer Benthic Grabs for Borrow Area 5B									
Benthic sample type	**Location**		**Particle-size distribution**						
			Gravel-size (%)			**Sand-size (%)**			**Silt-size & clay-size (%)**
			Cobble	**Pebble**	**Granule**	**Coarse**	**Medium**	**Fine**	
Whole	**On-site**	Entire borrow area	0.90	0.36	1.34	34.03	37.88ŧ	23.39	2.09
		Dredged box only	3.61	1.11	3.87	44.28	30.97	14.32	1.84
		Not including dredged box	0.00	0.12	0.49	30.62	40.19	26.42	2.17
	Reference		0.00	0.00	0.06	15.16	31.50	50.98	2.31
	Combined		0.80	0.32	1.20	31.94	37.17	26.46	2.11
Top	**On-site**	Entire borrow area	1.18	0.47	0.74	33.90	43.26ŧ	19.19	1.26
		Dredged box only	4.70	1.88	2.11	40.39	35.91	14.61	0.40
		Not including dredged box	0.00	0.00	0.29	31.74	45.71	20.72	1.54
	Reference		0.00	0.00	0.00	16.67	26.65	55.59	1.10
	Combined		1.04	0.42	0.66	31.99	41.41	23.24	1.24

Note: Significantly different values between benthic sample types are distinguished with a ŧ. "On-site Entire borrow area" is data for the entire borrow area including the dredged box; "On-site Dredged box only" is only the data for the previously dredged area; "On-site Not incld. dredged box" is the borrow area data without the dredged box data; "Reference" is the data from areas outside of the borrow area; "Combined" is the On-site and Reference location data together.

For Borrow Area 5B, student's t-tests for paired comparisons were run separately for grabs conducted on-site, in reference sites, and in the dredged box. The comparisons between whole and top samples

were significantly different only for on-site entire borrow area: medium sized sand (P=0.03); the samples in the reference sites or dredged box were not significantly different. In the field, the most common descriptor of samples collected in the summer for Borrow Area 5B was "brown sand." Traces of organic matter, invertebrates, and pieces of shell were apparent in several samples. For sediment collected at 5B in the summer, cobble was the dominant sediment type of one W and one T sample, coarse sand was the dominant type for 16 W and 16 T, medium sand was the dominant size in 19 W and 20 T; and fine sand was the dominant size in 9 W and 8 T samples. None of the pebble and granule gravel sizes or silt and clay size sediment types were dominant in any samples.

Table 12: Dominant Sediment Type Based on Lab Analysis of Summer Benthic Grabs for Borrow Area 5B

Dominant Sediment Type Based on Lab Analysis of Summer Benthic Grabs for Borrow Area 5B			
Site	**Depth (ft.)**	**Whole sample**	**Top sample**
5B1 R	41	Fine sand	Fine sand
5B2	36	Fine sand	Fine sand
5B3*	44	Medium sand	Medium sand
5B4	48	Fine sand	Medium sand
5B5	48	Medium sand	Coarse sand
5B6	46	Coarse sand	Coarse sand
5B7*	43	Coarse sand	Coarse sand
5B8	36	Fine sand	Fine sand
5B9	37	Medium sand	Coarse sand
5B10*	47	Cobble gravel	Cobble gravel
5B11	56	Medium sand	Coarse sand
5B12	52	Fine sand	Medium sand
5B13 R	57	Medium sand	Fine sand
5B14	53	Coarse sand	Coarse sand
5B15	57	Medium sand	Medium sand
5B16*	45	Coarse sand	Coarse sand
5B17*	42	Coarse sand	Coarse sand
5B18	39	Coarse sand	Coarse sand
5B19*	48	Medium sand	Medium sand
5B20	50	Medium sand	Coarse sand
5B21	53	Medium sand	Medium sand
5B22	48	Coarse sand	Coarse sand
5B23*	46	Coarse sand	Coarse sand
5B24	41	Coarse sand	Coarse sand
5B25 R	29	Medium sand	Medium sand
5B26	37	Fine sand	Fine sand
5B27*	44	Coarse sand	Coarse sand
5B28*	49	Coarse sand	Fine sand
5B29	54	Medium sand	Medium sand
5B30	54	Medium sand	Medium sand

Dominant Sediment Type Based on Lab Analysis of Summer Benthic Grabs for Borrow Area 5B			
Site	**Depth (ft.)**	**Whole sample**	**Top sample**
5B31	48	Medium sand	Medium sand
5B32*	45	Coarse sand	Medium sand
5B33	42	Fine sand	Fine sand
5B34	38	Medium sand	Medium sand
5B35	45	Medium sand	Coarse sand
5B36	46	Coarse sand	Medium sand
5B37	51	Medium sand	Medium sand
5B38	54	Coarse sand	Medium sand
5B39	52	Fine sand	Medium sand
5B40	46	Medium sand	Medium sand
5B41	37	Coarse sand	Coarse sand
5B42	37	Medium sand	Medium sand
5B43	47	Medium sand	Medium sand
5B44 R	29	Fine sand	Fine sand
5B45 R	58	Coarse sand	Medium sand

Note: * = site inside the dredged box and R = reference

Comparisons of dominant sediment sizes between whole and top samples for each site show that 20 of them were the same for on-site samples. Eight of the whole on-site samples had a smaller dominant grain sizes than the top sample, and two whole samples that were bigger than the top sample. The reference sites had three sites that were the same and two whole samples that had bigger dominant grain size than the top sample. Whole and top samples were the same for eight of the sites in the dredged box while two whole samples had bigger grain size compared to the top sample. The quantitative analysis of sediment size is depicted in Figure 16 and Figure 17.

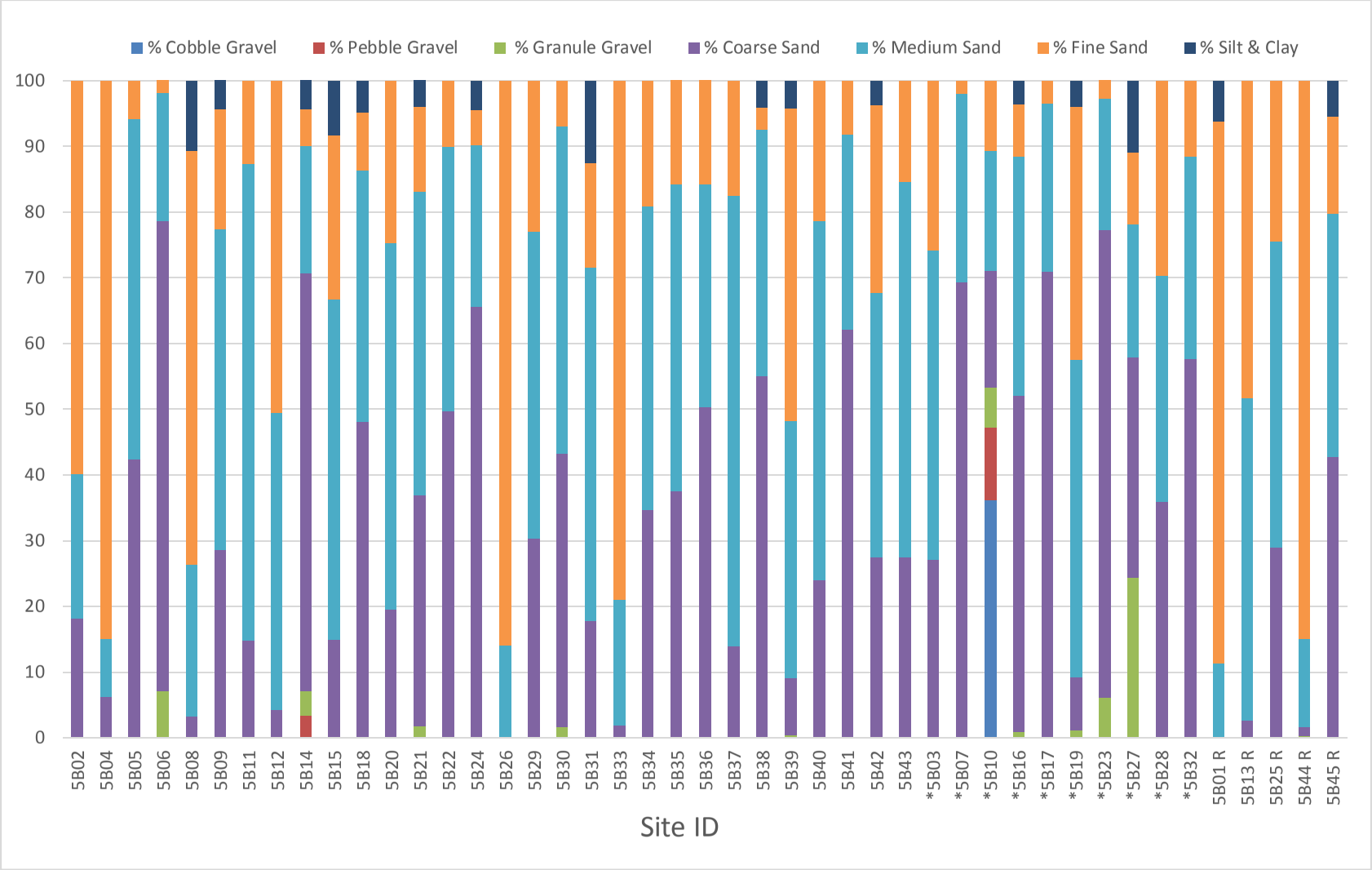


Figure 16: Sediment Composition of Whole Summer Benthic Grabs by Site for Borrow Area 5B (*in Dredged Box, R=reference site)

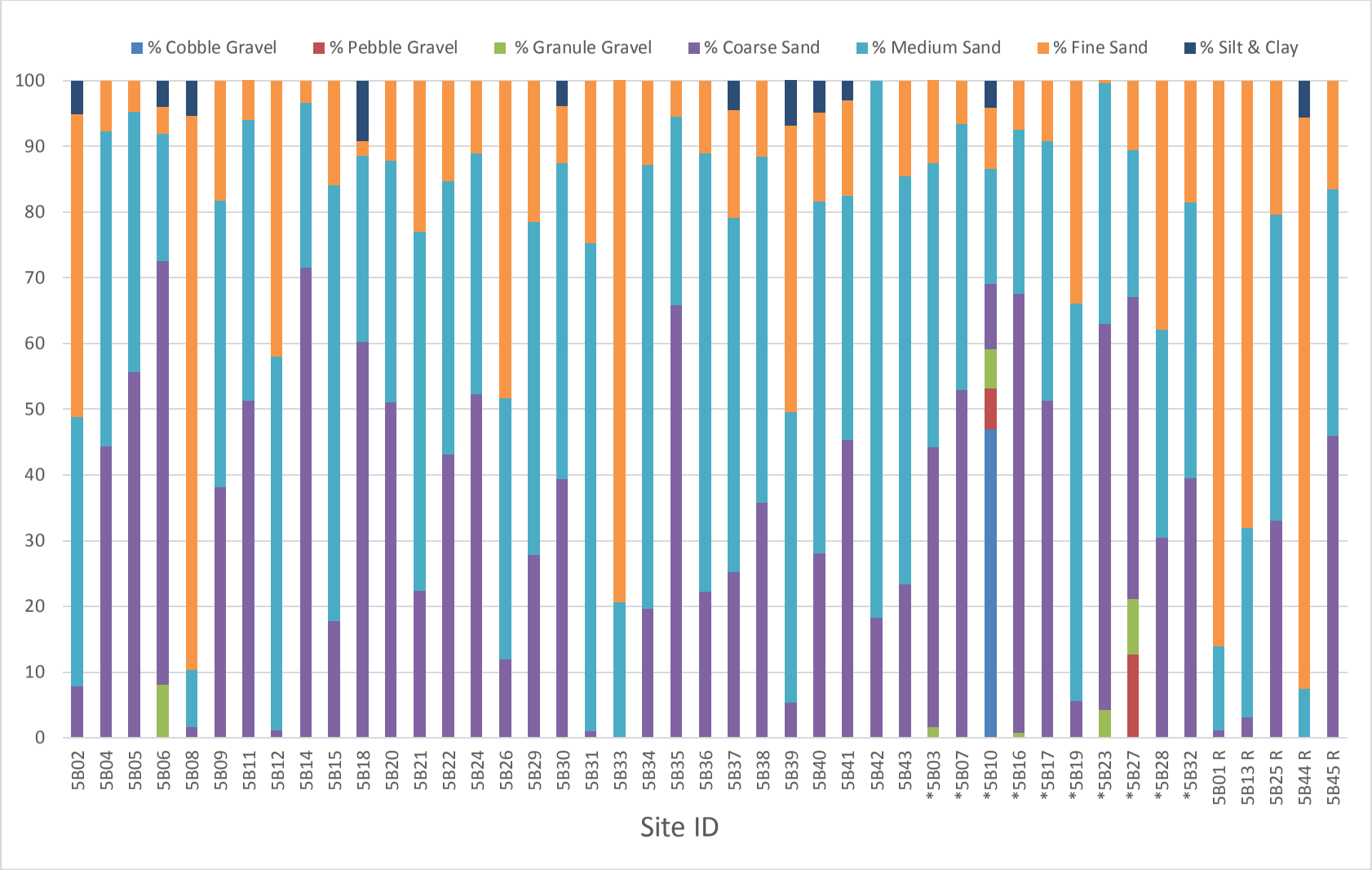


Figure 17: Sediment Composition of Top Summer Benthic Grabs by Site for Borrow Area 5B (*in Dredged Box, R=reference site)

Fall

Overall on average, samples contained 37.65% W and 38.70% T of coarse particles (Table 13). A closer look at this data reveals that for both the whole and top samples, the on-site and dredged box samples had higher percentages of coarse and medium sand particles compared to the reference sites. Medium-sized sand made up 31.68% W and 34.86% T of the samples. Fine to very fine-sized sand made up 25.34% W and 22.82% T, silt and clay made up 1.67% W and 1.33% T, pebble sized gravel made up 2.67% W and 1.51% T, and granule-sized gravel made up 0.99% W and 0.79% T. Cobble gravel was not found in any samples. The dredged box had less fine sand-sized sediment in whole and top fall samples compared to all other sample locations.

Table 13: Average Particle-size Distribution of Fall Benthic Grabs for Borrow Area 5B

Average Particle-size Distribution of Fall Benthic Grabs for Borrow Area 5B									
Benthic sample type	Location		Particle-size distribution						
			Gravel-size (%)			Sand-size (%)			Silt-size & clay-size (%)
			Cobble	Pebble	Granule	Coarse	Medium	Fine	
Whole	On-site	Entire borrow area	0.00	3.00	1.06	38.83	32.05ŧ	23.52ŧ	1.55
		Dredged box only	0.00	7.56	1.54	39.81	28.19	22.52	0.39
		Not including dredged box	0.00	0.00	0.74	36.67	33.26	26.62	2.25
	Reference		0.00	0.00	0.44	28.21	28.77	39.94	2.63
	Combined		0.00	2.67	0.99	37.65	31.68	25.34	1.67
Top	On-site	Entire borrow area	0.00	1.70	0.86	39.81	35.73ŧ	20.41ŧ	1.49
		Dredged box only	0.00	4.64	1.75	41.96	30.78	19.24	1.64
		Not including dredged box	0.00	0.00	0.36	37.22	36.70	24.44	1.19
	Reference		0.00	0.00	0.22	29.81	27.85	42.12	0.00
	Combined		0.00	1.51	0.79	38.70	34.86	22.82	1.33

Note: Significantly different values are distinguished with a ŧ. "On-site Entire borrow area" is data for the entire borrow area including the dredged box; "On-site Dredged box only" is only the data for the previously dredged area; "On-site Not incld. dredged box" is the borrow area data without the dredged box data; "Reference" is the data from areas outside of the borrow area; "Combined" is the On-site and Reference location data together.

Student t-tests between whole and top samples were significantly different only for on-site: medium sand (P=0.01) and fine sand (P=0.04); none of the samples in the reference sites or dredged box were significantly different (Table 13). In the field, the most common descriptor of samples collected in the fall for Borrow Area 5B was "brown sand." Traces of organic matter, invertebrates, and pieces of shell were apparent in several samples. For sediment collected at 5B, one W and one T samples were dominated by pebble, 23 W grab samples and 24 T grab samples were dominated by coarse-sized sand, 12 W and 12 T samples were dominated by medium sand and 9 W and 8 T samples were dominated by fine sand (Table 14). Cobble gravel, and silt and clay-size particles were not dominant sediment types in the fall samples.

Table 14: Dominant Sediment Type Based on Lab Analysis of Fall Benthic Grabs for Borrow Area 5B

Dominant Sediment Type Based on Lab Analysis of Fall Benthic Grabs for Borrow Area 5B			
Site	**Depth (ft.)**	**Whole sample**	**Top sample**
5B1 R	40	Fine sand	Fine sand
5B2*	41	Coarse sand	Coarse sand
5B3*	45	Medium sand	Coarse sand
5B4	52	Coarse sand	Coarse sand
5B5	47	Coarse sand	Coarse sand
5B6*	47	Coarse sand	Coarse sand
5B7*	42	Coarse sand	Coarse sand
5B8*	38	Coarse sand	Coarse sand
5B9*	45	Coarse sand	Coarse sand
5B10	49	Medium sand	Medium sand
5B11 R	61	Coarse sand	Coarse sand
5B12	55	Coarse sand	Coarse sand
5B13*	47	Medium sand	Medium sand
5B14*	46	Coarse sand	Medium sand
5B15	40	Coarse sand	Coarse sand
5B16*	41	Coarse sand	Coarse sand
5B17*	47	Fine sand	Fine sand
5B18	50	Coarse sand	Coarse sand
5B19	49	Coarse sand	Coarse sand
5B20*	45	Medium sand	Medium sand
5B21*	43	Coarse sand	Coarse sand
5B22	37	Fine sand	Fine sand
5B23 R	30	Coarse sand	Coarse sand
5B24*	41	Fine sand	Fine sand
5B25*	44	Pebble gravel	Pebble gravel
5B26	47	Fine sand	Medium sand
5B27	51	Fine sand	Fine sand
5B28	54	Medium sand	Medium sand
5B29	47	Medium sand	Medium sand
5B30	43	Fine sand	Fine sand
5B31	40	Coarse sand	Coarse sand
5B32	37	Coarse sand	Coarse sand
5B33	42	Coarse sand	Medium sand
5B34	46	Coarse sand	Coarse sand
5B35	50	Medium sand	Coarse sand
5B36	52	Medium sand	Medium sand

Dominant Sediment Type Based on Lab Analysis of Fall Benthic Grabs for Borrow Area 5B			
Site	**Depth (ft.)**	**Whole sample**	**Top sample**
5B37	46	Coarse sand	Coarse sand
5B38	40	Medium sand	Medium sand
5B39	35	Coarse sand	Coarse sand
5B40	39	Medium sand	Medium sand
5B41	42	Coarse sand	Coarse sand
5B42	50	Medium sand	Coarse sand
5B43 R	56	Medium sand	Medium sand
5B44	43	Fine sand	Fine sand
5B45 R	28	Fine sand	Fine sand

Note: * = site inside the dredged box and R = reference

Comparisons of dominant sediment sizes between whole and top samples for each site show that 22 of them were the same for on-site samples not including the dredged box. Three of the on-site samples had top samples that had bigger dominant grain sizes than the whole sample and one top sample that was smaller than the whole sample. All five reference sites were the same. The dredged box had 12 samples that were the same, one that had a bigger grain size on top and one with a smaller grain size on top. The quantitative analysis of sediment size is depicted in Figure 18 and Figure 19.

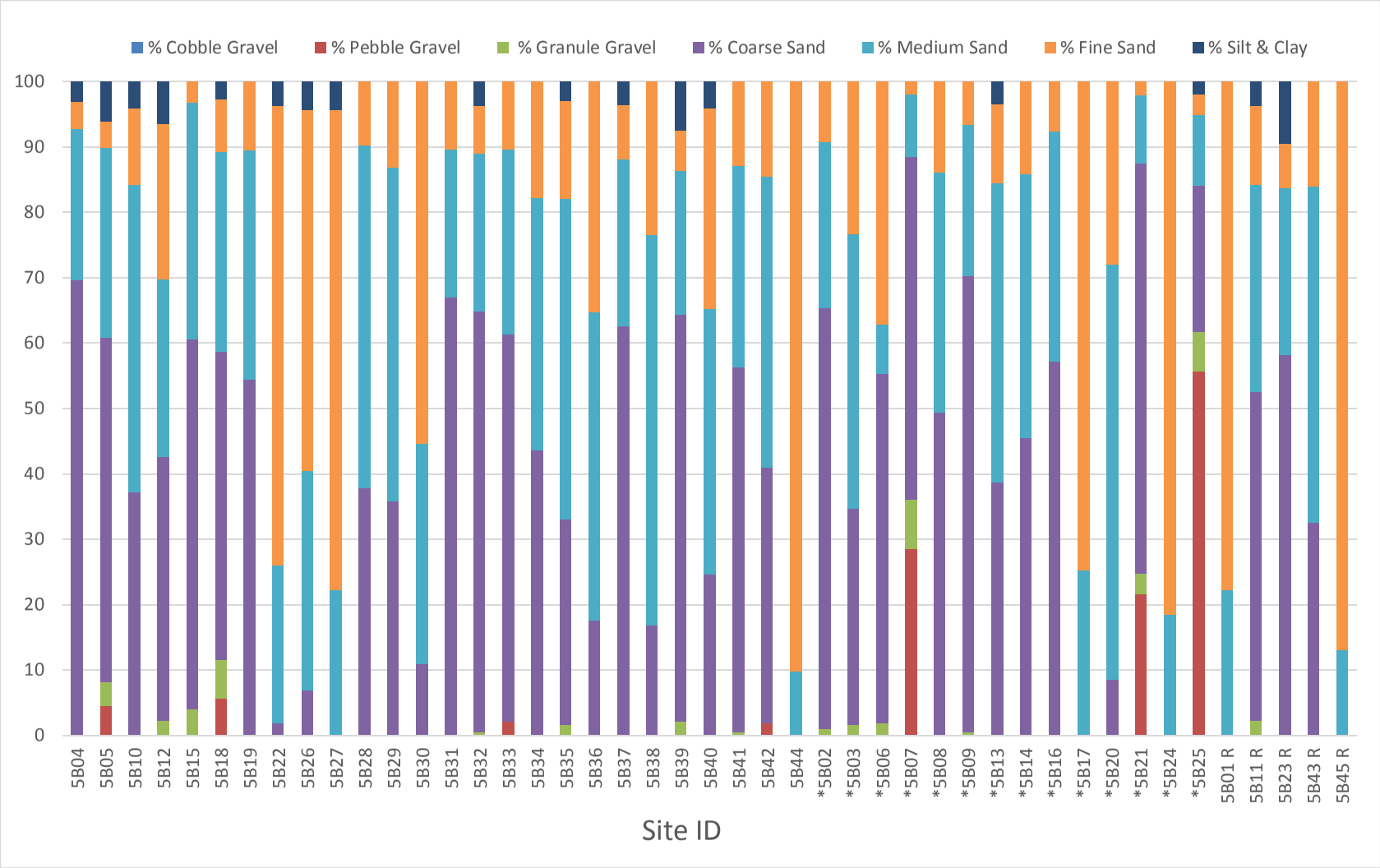


Figure 18: Sediment Composition of Whole Fall Benthic Grabs by Site for Borrow Area 5B (*in Dredged Box, R=reference site)

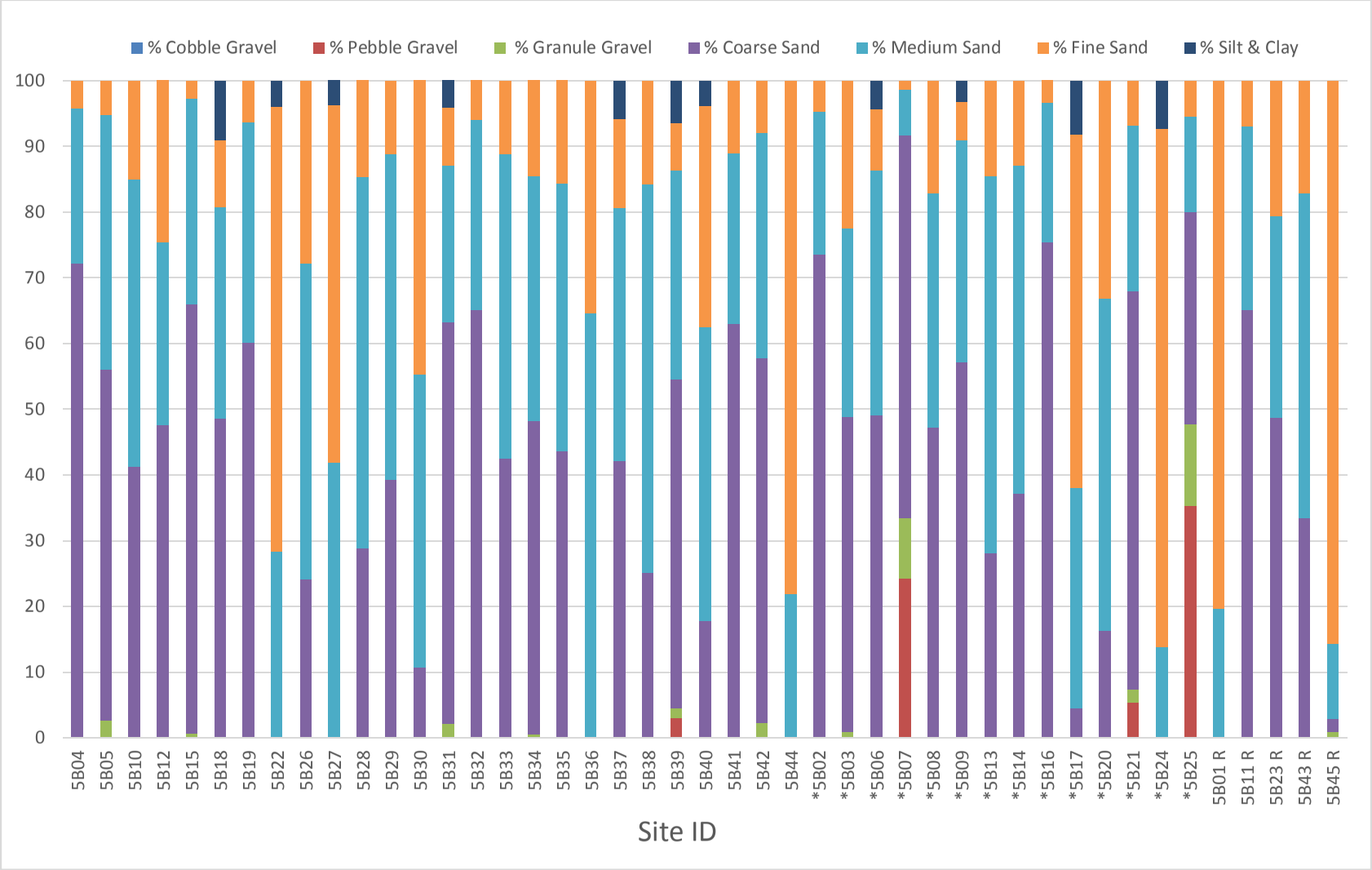


Figure 19: Sediment Composition of Top Fall Benthic Grabs by Site for Borrow Area 5B (*in Dredged Box, R=reference site)

3.2.2 BENTHIC INFAUNA

Although the benthic community in the FIMI Borrow Areas showed species overlap in the summer and fall, there were significant differences in many of the calculated community parameters. In order to focus on the benthic environment of the borrow areas, the following comparisons separate grabs conducted within the borrow areas (on-site), those conducted at nearby reference sites, and for grabs from the dredged box in Borrow Area 5B. Detailed laboratory results are provided in Appendix E. In Table 15 , a "ŧ" indicates a significant difference between seasons at the P = 0.05 level.

3.2.2.1 Borrow Area 2C

For Borrow Area 2C on-site samples, species richness, or the number of species, and the number of individuals per grab were significantly greater in samples collected in the summer relative to those collected in the fall (P < 0.0001 and P < 0.002) (Table 15). Species diversity, the dominance index, nor evenness were different between summer and fall. Reference areas for Borrow Area 2C did not differ between summer and fall sampling events for any of the calculated community parameters. One whole benthic grab that was not subsampled, identified as 2C34A in Appendix E, was sieved down for analysis to compare to samples that were subsampled. The presence of pollution sensitive species (*Acanthohaustorius intermedius*, *Acanthohaustorius millsi*, *Parahaustorius attenuates*, *Protohaustorius wigleyi*, *Chiridotea tuftsi*, *Tanaissus psammophilus*, *Lumbrinereis acuta*, and *Nephtys incisa*) indicate that the benthic environment in Borrow Area 2C is not impacted by pollution (Pelletier et al. 2010).

Table 15: Comparison of Average Benthic Parameters for Borrow Area 2C

Comparison of Average Benthic Parameters for Borrow Area 2C					
Season/ P-value	**Average species richness (R)**	**Individuals per grab**	**Shannon diversity index (H')**	**Simpson's dominance index (λ)**	**Pielou's evenness index (J')**
On-site (n = 40 summer, n = 40 fall)					
Summer	18.50ŧ	176.08ŧ	1.81	0.31	0.63
Fall	14.00ŧ	94.20ŧ	1.79	0.28	0.68
P-value	< 0.0001	0.003	0.83	0.35	0.12
Reference (n = 5 summer, n = 5 fall)					
Summer	17.80	224.00	1.56	0.40	0.55
Fall	15.00	92.20	1.88	0.24	0.71
P-value	0.31	0.14	0.37	0.24	0.26

Note: ŧ indicates significantly different values.

In Borrow Area 2C, a total of 12,534 individual organisms representing 117 different species from eight phyla were collected for the summer and fall benthic grabs (Table 17).

Table 16: Benthic Community Composition in Borrow Area 2C

Benthic Community Composition in Borrow Area 2C				
Summer 2015				
Phylum	**On-site**		**Reference**	
	Individ	**%**	**Individ**	**%**
Arthropoda	4,277	61.17	725	64.85
Nematoda	1,417	20.27	122	10.91
Annelida - Polychaeta	959	13.72	184	16.46
Molluska	194	2.77	56	5.01
Echinodermata	80	1.14	9	0.81
Annelida - Oligochaeta	44	0.63	19	1.70
Nemetinea	19	0.27	3	0.27
Actiniaria	2	0.03	0	0.00
Platyhelminthes	0	0.00		
Total	6,992	100	1,118	100
Fall 2015				
Phylum	**On-site**		**Reference**	
	Individ	**%**	**Individ**	**%**
Annelida - Polychaeta	1,421	35.86	231	50.11
Arthropoda	1,161	29.30	47	10.20
Nematoda	1,144	28.87	122	26.46
Molluska	117	2.95	51	11.06
Echinodermata	79	1.99	4	0.87
Annelida - Oligochaeta	30	0.76	6	1.30
Platyhelminthes	5	0.12	0	0.00
Nemetinea	4	0.10	0	0.00
Actiniaria	2	0.05	0	0.00
Total	3,963	100	461	100

Note: Individ = number of individuals

Fall and summer samples shared 55.56% of the same species. Of the overall total, 8,110 (64.70%) were collected in the summer, and 4,424 (35.30%) were collected in the fall. As was indicated by the community parameters, the summer had greater species richness, with 94 distinct taxa identified, while the fall had 90 taxa. The most abundant phylum in the summer for on-site samples was Arthropoda (61.17%) followed by Nematoda (20.27%) and Annelida-Polychaeta (13.72%). These phyla also dominated the reference site benthic community but in different proportions (Arthropoda [64.85%], Annelida-Polychaeta [16.46%], Nematoda [10.91%]. In the fall the top three phyla didn't change but for on-site samples there was not a strongly dominant phyla among them (Annelida-Polychaeta [35.86%], Arthropoda [29.30%], Nematoda [28.87%]. In fall reference sites Annelida-Polychaeta dominated (50.11%) along with Nematoda (26.46%), Molluska (11.06%), and Arthropoda (10.20%). Molluska makes up a higher proportion of the fall reference benthic community compared to summer samples. The species richness for the benthic grab that was not subsampled, 2C34A, was 27. Sample 2C34A did not have any species that were not also collected in the subsampled samples.

At the species level, the dominant species were similar between on-site and reference samples within a particular season, but summer and fall samples were dominated by different organisms. *Pseudunciola obliquua*, an amphipod, was the most dominant species in both on-site and reference summer samples (Table 17). This species made up 52.55% of on-site samples with Nematoda species making up another 20.27%. All other on-site species made up less than 4% each. *Pseudunciola obliquua* made up 60.38% of the reference site species with Nematoda species making up another 10.91%. All other summer reference species made up less than 5% each. In the fall, Nematoda species dominated abundance in on-site samples at 28.87% (Table 18). The polychaete *Polygordius jouinae* and amphipod *Pseudunciola obliquua* were also abundant at 25.41% and 16.70%, respectively. All other on-site species made up less than 4% each. The fall reference samples were dominated by *Polygordius jouinae* at 30.63% and Nematoda species at 26.70%. *Nucula proxima* made up 8.97% and *Capitellidae* juveniles made up 7.44%; all other species made up less than 3% each.

Table 17: Twenty Most Abundant Benthic Infauna Present in Borrow Area 2C in Summer

Twenty Most Abundant Benthic Infauna Present in Borrow Area 2C in Summer							
On-site				Reference			
Taxon	Species	Total	%	Taxon	Species	Total	%
Arthropoda - Amphipoda	*Pseudunciola obliquua*	3674	52.55	Arthropoda - Amphipoda	*Pseudunciola obliquua*	675	60.38
Nematoda	Nematoda spp.	1417	20.27	Nematoda	Nematoda spp.	122	10.91
Annelida - Polychaeta	*Tharyx* spp.	232	3.32	Annelida - Polychaeta	*Polygordius jouinae*	52	4.65
Annelida - Polychaeta	*Aricidea catherinae*	186	2.66	Annelida - Polychaeta	*Capitellidae juveniles*	50	4.47
Annelida - Polychaeta	*Polygordius jouinae*	182	2.60	Molluska - Bivalvia	*Tellina agilis*	39	3.49
Arthropoda - Amphipoda	*Rhepoxynuis epistomus*	181	2.59	Annelida - Oligochaeta	Oligochaeta spp.	19	1.70
Arthropoda - Amphipoda	*Protohaustorius wigleyi*	143	2.05	Arthropoda - Amphipoda	*Rhepoxynuis epistomus*	16	1.43
Molluska - Bivalvia	*Tellina agilis*	116	1.66	Arthropoda - Amphipoda	*Ampelisca verrilli*	10	0.89
Annelida - Polychaeta	*Goniadella gracilis*	68	0.97	Molluska - Bivalvia	*Yoldia limatula*	10	0.89
Arthropoda - Maxillopoda	Harpacticoid copepod spp.	59	0.84	Annelida - Polychaeta	*Leitoscoloplos robustus*	9	0.81
Annelida - Polychaeta	*Brania wellfleetensis*	53	0.76	Annelida - Polychaeta	*Nepthys picta*	8	0.72
Arthropoda - Tanaidacea	*Tanaissus psammophilus*	51	0.73	Annelida - Polychaeta	*Nephtys bucera*	8	0.72
Annelida - Oligochaeta	Oligochaeta spp.	44	0.63	Annelida - Polychaeta	*Tharyx* spp.	7	0.63
Arthropoda - Amphipoda	*Acanthohaustorius millsi*	41	0.59	Arthropoda - Amphipoda	*Protohaustorius wigleyi*	7	0.63
Molluska - Bivalvia	*Spisula solidissima*	34	0.49	Annelida - Polychaeta	*Drilonereis longa*	6	0.54
Arthropoda - Cumacea	*Pseudoleptocuma minor*	33	0.47	Arthropoda - Tanaidacea	*Tanaissus psammophilus*	5	0.45
Annelida - Polychaeta	*Parougia caeca*	20	0.29	Annelida - Polychaeta	*Parougia caeca*	4	0.36
Annelida - Polychaeta	*Sigalion arenicola*	20	0.29	Annelida - Polychaeta	*Clymenella zonalis*	4	0.36
Nemertinea	Nemertinea spp.	19	0.27	Annelida - Polychaeta	*Sigalion arenicola*	3	0.27
Arthropoda - Isopoda	*Politolana polita*	18	0.26	Nemertinea	Nemertinea spp.	3	0.27

Note: “On-site” is the data for samples within the borrow area; “Reference” is the data for the area sampled outside of the borrow area.

Table 18: Twenty Most Abundant Benthic Infauna Present in Borrow Area 2C in Fall

Twenty Most Abundant Benthic Infauna Present in Borrow Area 2C in Fall							
On-site				Reference			
Taxon	Species	Total	%	Taxon	Species	Total	%
Nematoda	Nematoda spp.	1144	28.87	Annelida - Polychaeta	*Polygordius jouinae*	140	30.63
Annelida - Polychaeta	*Polygordius jouinae*	1007	25.41	Nematoda	Nematoda spp.	122	26.70
Arthropoda - Amphipoda	*Pseudunciola obliquua*	662	16.70	Molluska - Bivalvia	*Nucula proxima*	41	8.97
Arthropoda - Tanaidacea	*Tanaissus psammophilus*	143	3.61	Annelida - Polychaeta	*Capitellidae juveniles*	34	7.44
Arthropoda - Amphipoda	*Rhepoxynuis epistomus*	137	3.46	Arthropoda - Amphipoda	*Pseudunciola obliquua*	17	3.72
Annelida - Polychaeta	*Tharyx* spp.	118	2.98	Annelida - Polychaeta	*Goniadella gracilis*	10	2.19
Arthropoda - Amphipoda	*Protohaustorius wigleyi*	109	2.75	Arthropoda - Tanaidacea	*Tanaissus psammophilus*	6	1.31
Molluska - Bivalvia	*Tellina agilis*	89	2.25	Annelida - Oligochaeta	Oligochaeta spp.	6	1.31
Annelida - Polychaeta	*Syllides setosa*	65	1.64	Annelida - Polychaeta	*Spiochaetopterus oculatus*	6	1.31
Annelida - Polychaeta	*Goniadella gracilis*	36	0.91	Arthropoda - Amphipoda	*Corophium* spp.	5	1.09
Annelida - Polychaeta	*Aricidea catherinae*	34	0.86	Annelida - Polychaeta	*Leitoscoloplos* spp. juveniles	5	1.09
Arthropoda - Amphipoda	*Acanthohaustorius millsi*	32	0.81	Annelida - Polychaeta	*Asabellides oculata*	5	1.09
Arthropoda - Maxillopoda	Harpacticoid copepod spp.	31	0.78	Molluska - Bivalvia	*Tellina agilis*	4	0.88
Annelida - Oligochaeta	Oligochaeta spp.	30	0.76	Annelida - Polychaeta	*Aricidea catherinae*	4	0.88
Annelida - Polychaeta	*Paraonis fulgens*	24	0.61	Annelida - Polychaeta	*Paraonis fulgens*	4	0.88
Annelida - Polychaeta	*Parapionosyllis longicirrata*	24	0.61	Annelida - Polychaeta	*Tharyx* spp.	3	0.66
Annelida - Polychaeta	*Aricidea wassi*	10	0.25	Annelida - Polychaeta	*Exogone* sp.	3	0.66
Annelida - Polychaeta	*Sigalion arenicola*	10	0.25	Arthropoda - Amphipoda	*Unciola irrorata*	3	0.66
Annelida - Polychaeta	*Spiophanes bombyx*	10	0.25	Arthropoda - Cumacea	*Diastylis sculpta*	3	0.66
Annelida - Polychaeta	*Exogone* sp.	9	0.23	Annelida - Polychaeta	*Nepthys picta*	3	0.66

Note: “On-site” is the data for samples within the borrow area; “Reference” is the data for the area sampled outside of the borrow area.

3.2.2.2 Borrow Area 5B

To focus on the benthic environment of the borrow areas, the following comparisons separate grabs conducted within the borrow areas (on-site), those conducted at nearby reference sites, and for grabs from the dredged box. In Table 19, a "ɨ" indicates a significant difference between seasons at the P = 0.05 level. For Borrow Area 5B on-site samples, all of the calculated parameters were significantly different between seasons; species richness, individuals per grab, and dominance index were greater in the summer. The greater dominance index indicateds that fewer taxa make up most of the individuals in the fall. The diversity index and evenness index were greater in the fall. For reference samples the number of individuals per grab was significantly greater in the summer (P = 0.025) and for the dredged area, species richness and the number of individuals were significantly greater in the summer. The other calculated parameters were not significantly different. The presence of pollution sensitive species (*Acanthohaustorius intermedius*, *Acanthohaustorius millsi*, *Parahaustorius attenuates*, *Protohaustorius wigleyi*, *Chiridotea tuftsi*, and *Tanaissus psammophilus*) indicate that the benthic environment in Borrow Area 5B is not impacted by pollution (Pelletier et al. 2010).

Table 19: Comparison of Average Benthic Parameters for Borrow Area 5B

Comparison of Average Benthic Parameters for Borrow Area 5B					
Season/ P=value	**Average species richness (R)**	**Individuals per grab**	**Shannon diversity index (H')**	**Simpson's dominance index (λ)**	**Pielou's evenness index (J')**
On-site (not including dredged box) (n = 30 summer, n = 26 fall)					
Summer	17.03ɨ	602.83ɨ	1.17	0.52ɨ	0.41
Fall	12.31	97.96	1.52ɨ	0.36	0.61ɨ
P-value	< 0.0001	< 0.0002	0.02	0.005	0.0001
Reference (n = 5 summer, n = 5 fall)					
Summer	17.60	244.8ɨ	1.54	0.40	0.54
Fall	12.20	72.80	1.43	0.40	0.62
P-value	0.15	0.025	0.74	0.99	0.53
Dredged box (n = 10 summer, n = 14 fall)					
Summer	16.30ɨ	220.20ɨ	1.46	0.39	0.53
Fall	10.57	85.00	1.37	0.42	0.59
P-value	0.0009	0.012	0.59	0.60	0.24

Note: ɨ indicates a significantly greater value between seasons.

In Borrow Area 5B, a total of 25,612 individual organisms representing 99 different species from seven phyla were collected for the summer and fall benthic grabs (Table 20; Appendix E). Of these, 21,511 (83.99%) were collected in the summer, and 4,101 (16.01%) were collected in the fall. As was indicated by the community parameters, the summer had greater species richness, with 90 distinct taxa identified, while the fall had 67 taxa. The most abundant phylum in the summer for on-site samples was Arthropoda (63.36%) followed by Nematoda (23.84%) and Annelida-Polychaeta (10.71%). These phyla also dominated the reference site benthic community but in different proportions (Nematoda [37.25%], Annelida-Polychaeta [31.62%], Arthropoda [24.67%]). The sites in the dredged box exhibited a similar pattern (Nematoda [37.60%], Arthropoda [35.88%], Annelida-Polychaeta [22.30%]). In the fall the top three phyla didn't change but for on-site samples there wasn't a strongly dominant phyla among them (Nematoda [39.62%], Arthropoda [29.41%], Annelida-Polychaeta [26.82%]). Fall reference sites were

dominated by Nematoda (57.69%) and Annelida-Polychaeta (28.85%). The fall dredged area samples were dominated by Nematoda (38.40%), Arthropoda (31.26%), and Annelida-Polychaeta (26.55%) in proportions similar to the summer samples.

Table 20: Benthic Community Composition in Borrow Area 5B

Benthic Community Composition in Borrow Area 5B						
Summer 2015						
Phylum	**On-site**		**Reference**		**Box**	
	Individ	**%**	**Individ**	**%**	**Individ**	**%**
Arthropoda	11,477	63.46	302	24.67	790	35.88
Nematoda	4,312	23.84	456	37.25	828	37.60
Annelida - Polychaeta	1,936	10.71	387	31.62	491	22.30
Molluska	252	1.39	66	5.39	79	3.59
Echinodermata	66	0.36	8	0.65	7	0.32
Annelida - Oligochaeta	20	0.11	1	0.08	4	0.18
Nemetinea	18	0.10	4	0.33	3	0.14
Platyhelminthes	4	0.02	0	0.00	0	0.00
Total	18,085	100.00	1,224	100.00	2,202	100.00
Fall 2015						
Phylum	**On-site**		**Reference**		**Box**	
	Individ	**%**	**Individ**	**%**	**Individ**	**%**
Nematoda	1,009	39.62	210	57.69	457	38.40
Arthropoda	749	29.41	29	7.97	372	31.26
Annelida - Polychaeta	683	26.82	105	28.85	316	26.55
Echinodermata	77	3.02	4	1.10	25	2.10
Molluska	23	0.90	13	3.57	16	1.34
Annelida - Oligochaeta	4	0.16	2	0.55	1	0.08
Nemetinea	2	0.08	0	0.00	3	0.25
Platyhelminthes	0	0.00	1	0.27	0	0.00
Total	2,547	100.00	364	100.00	1,190	100.00

At the species level, Borrow Area 5B summer and fall samples were dominated by a handful of taxa and had 59.60% of species in common. In summer samples, *Pseudunciola obliquua,* an amphipod, was the most dominant species in on-site samples making up 60.56% of the sample (Table 21). Nematoda species made up 23.84% and Capitellidae juveniles made up another 6.10%; the remaining species made up less than 2% each. For reference samples, Nematoda species were the most abundant taxa at 37.25%. The other dominant reference sample species were Capitillidae juveniles at 23.04% and *Protohaustorius wigleyi* at 14.79%; all other species made up less than 6% each. In the dredged area samples, Nematoda species were the most abundant taxa at 37.60%. Similar to the other sample types, *Pseudunciola obliquua* and Capitellidae juveniles were also dominant at 33.51% and 11.26%, respectively. All other species made up less than 3% each.

The most abundant species for fall in on-site samples did not change from the summer; Nematoda species were the most abundant at 39.62%, *Pseudunciola obliquua* made up 23.95%, and Capitellidae

juveniles made up 9.78%; all other species made up less than 5% each (Table 22). Fall reference samples were very similar to the on-site samples. Reference samples were dominated by Nematoda at 38.40% just like the summer samples. *Pseudunciola obliquua* made up 28.24%, and Capitellidae juveniles made up 5.57%; all other species made up less than 5% each. The dredged box samples were more strongly dominated by Nematoda species in the fall compared to spring at 57.69%. Capitillidae juveniles and *Apoprionospio pygmaea* were also present in larger numbers than other species at 6.87% and 6.04%, respectively. All other species were present at less than 6% each.

Table 21: Twenty Most Abundant Benthic Infauna Present in Borrow Area 5B in Summer

Twenty Most Abundant Benthic Infauna Present in Borrow Area 5B in Summer											
On-site				Reference				Dredged box			
Taxon	Species	Total	%	Taxon	Species	Total	%	Taxon	Species	Total	%
Arthropoda - Amphipoda	*Pseudunciola obliquua*	10,952	60.56	Nematoda	*Nematoda* spp.	456	37.25	Nematoda	*Nematoda* spp.	828	37.60
Nematoda	Nematoda spp.	4,312	23.84	Annelida - Polychaeta	Capitellidae juveniles	282	23.04	Arthropoda - Amphipoda	*Pseudunciola obliquua*	738	33.51
Annelida - Polychaeta	Capitellidae juveniles	1,104	6.10	Arthropoda - Amphipoda	*Protohaustorius wigleyi*	181	14.79	Annelida - Polychaeta	*Capitellidae juveniles*	248	11.26
Arthropoda - Amphipoda	*Protohaustorius wigleyi*	337	1.86	Arthropoda - Amphipoda	*Pseudunciola obliquua*	62	5.07	Annelida - Polychaeta	*Polygordius jouinae*	60	2.72
Annelida - Polychaeta	*Tharyx* spp.	262	1.45	Molluska - Bivalvia	*Spisula solidissima*	37	3.02	Annelida - Polychaeta	*Tharyx* spp.	59	2.68
Annelida - Polychaeta	*Polygordius jouinae*	216	1.19	Molluska - Bivalvia	*Tellina agilis*	28	2.29	Molluska - Bivalvia	*Tellina agilis*	43	1.95
Molluska - Bivalvia	*Tellina agilis*	174	0.96	Arthropoda - Amphipoda	*Acanthohaustorius millsi*	20	1.63	Molluska - Bivalvia	*Spisula solidissima*	28	1.27
Molluska - Bivalvia	*Spisula solidissima*	72	0.40	Annelida - Polychaeta	*Megalona* sp.	18	1.47	Annelida - Polychaeta	*Goniadella gracilis*	27	1.23
Echinodermata - Echinodea	*Echinarachnius parma*	66	0.36	Annelida - Polychaeta	*Spiophanes bombyx*	17	1.39	Annelida - Polychaeta	*Spiophanes bombyx*	19	0.86
Annelida - Polychaeta	*Megalona* sp.	51	0.28	Arthropoda - Amphipoda	*Rhepoxynuis epistomus*	14	1.14	Arthropoda - Amphipoda	*Protohaustorius wigleyi*	13	0.59
Arthropoda - Tanaidacea	*Tanaissus psammophilus*	48	0.27	Annelida - Polychaeta	*Tharyx* spp.	14	1.14	Annelida - Polychaeta	*Paraonis fulgens*	11	0.50
Arthropoda - Amphipoda	*Acanthohaustorius millsi*	37	0.20	Arthropoda - Amphipoda	*Psammonyx nobilis*	11	0.90	Annelida - Polychaeta	*Spio setosa*	9	0.41
Arthropoda - Amphipoda	*Rhepoxynuis epistomus*	32	0.18	Annelida - Polychaeta	*Aricidea wassi*	11	0.90	Arthropoda - Tanaidacea	*Tanaissus psammophilus*	8	0.36
Annelida - Polychaeta	*Spiophanes bombyx*	32	0.18	Annelida - Polychaeta	*Polygordius jouinae*	8	0.65	Annelida - Polychaeta	*Orbinia swani*	8	0.36
Annelida - Polychaeta	*Aricidea wassi*	30	0.17	Echinodermata - Echinodea	*Echinarachnius parma*	8	0.65	Annelida - Polychaeta	*Nepthys picta*	7	0.32
Annelida - Polychaeta	*Orbinia swani*	28	0.15	Annelida - Polychaeta	*Apoprionospio pygmaea*	6	0.49	Echinodermata - Echinodea	*Echinarachnius parma*	7	0.32
Annelida - Polychaeta	*Asabellides oculata*	25	0.14	Annelida - Polychaeta	*Asabellides oculata*	5	0.41	Arthropoda - Isopoda	*Politolana polita*	6	0.27

Twenty Most Abundant Benthic Infauna Present in Borrow Area 5B in Summer											
On-site				Reference				Dredged box			
Taxon	Species	Total	%	Taxon	Species	Total	%	Taxon	Species	Total	%
Annelida - Polychaeta	*Goniadella gracilis*	25	0.14	Annelida - Polychaeta	*Paraonis fulgens*	5	0.41	Annelida - Polychaeta	*Megalona* sp.	5	0.23
Annelida - Polychaeta	*Paraonis fulgens*	25	0.14	Arthropoda - Tanaidacea	*Tanaissus psammophilus*	4	0.33	Annelida - Polychaeta	*Polydora socialis*	5	0.23
Annelida - Oligochaeta	*Oligochaeta* spp.	20	0.11	Annelida - Polychaeta	*Nephtys bucera*	4	0.33	Arthropoda - Maxillopoda	Harpacticoid copepod spp.	5	0.23

Note: "On-site" is the data for samples within the borrow area but not the dredged box; "Reference" is the data for the area sampled outside of the borrow area; "Dredged box" is the data for the dredged area.

Table 22: Twenty Most Abundant Benthic Infauna Present in Borrow Area 5B in Fall

Twenty Most Abundant Benthic Infauna Present in Borrow Area 5B in Fall											
On-site				Reference				Box			
Taxon	Species	Total	%	Taxon	Species	Total	%	Taxon	Species	Total	%
Nematoda	Nematoda spp	1,009	39.62	Nematoda	Nematoda spp	457	38.40	Nematoda	*Nematoda spp*	210	57.69
Arthropoda - Amphipoda	*Pseudunciola obliquua*	610	23.95	Arthropoda - Amphipoda	*Pseudunciola obliquua*	336	28.24	Annelida - Polychaeta	Capitellidae juveniles	25	6.87
Annelida - Polychaeta	Capitellidae *juveniles*	249	9.78	Annelida - Polychaeta	Capitellidae juveniles	102	8.57	Annelida - Polychaeta	*Apoprionospio pygmaea*	22	6.04
Annelida - Polychaeta	*Tharyx spp*	109	4.28	Annelida - Polychaeta	*Tharyx* spp	70	5.88	Annelida - Polychaeta	*Polygordius jouinae*	21	5.77
Annelida - Polychaeta	*Polygordius jouinae*	93	3.65	Annelida - Polychaeta	*Polygordius jouinae*	61	5.13	Arthropoda - Amphipoda	*Protohaustorius wigleyi*	9	2.47
Echinodermata - Echinodea	*Echinarachnius parma*	70	2.75	Echinodermata - Echinodea	*Echinarachnius parma*	20	1.68	Annelida - Polychaeta	*Tharyx* spp	8	2.20
Annelida - Polychaeta	*Apoprionospio pygmaea*	68	2.67	Arthropoda - Tanaidacea	*Tanaissus psammophilus*	13	1.09	Molluska - Bivalvia	*Tellina agilis*	7	1.92
Arthropoda - Amphipoda	*Protohaustorius wigleyi*	45	1.77	Annelida - Polychaeta	*Megalona* sp.	12	1.01	Arthropoda - Amphipoda	*Pseudunciola obliquua*	5	1.37
Arthropoda - Tanaidacea	*Tanaissus psammophilus*	30	1.18	Arthropoda - Amphipoda	*Protohaustorius wigleyi*	11	0.92	Annelida - Polychaeta	*Megalona* sp.	5	1.37
Annelida - Polychaeta	*Megalona* sp.	26	1.02	Molluska - Bivalvia	*Tellina agilis*	11	0.92	Annelida - Polychaeta	*Goniadella gracilis*	5	1.37

Twenty Most Abundant Benthic Infauna Present in Borrow Area 5B in Fall											
On-site				Reference				Box			
Taxon	Species	Total	%	Taxon	Species	Total	%	Taxon	Species	Total	%
Annelida - Polychaeta	*Polydora* spp.(juvenile)	23	0.90	Annelida - Polychaeta	*Goniadella gracilis*	11	0.92	Molluska - Bivalvia	*Spisula solidissima*	5	1.37
Annelida - Polychaeta	*Spiophanes bombyx*	20	0.79	Annelida - Polychaeta	*Paraonis fulgens*	10	0.84	Echinodermata - Echinodea	*Echinarachnius parma*	4	1.10
Annelida - Polychaeta	*Paraonis fulgens*	18	0.71	Annelida - Polychaeta	*Parougia caeca*	8	0.67	Annelida - Polychaeta	*Paraonis fulgens*	4	1.10
Annelida - Polychaeta	*Parougia caeca*	15	0.59	Annelida - Polychaeta	*Spiophanes bombyx*	7	0.59	Annelida - Polychaeta	*Spiophanes bombyx*	4	1.10
Arthropoda - Amphipoda	*Rhepoxynuis epistomus*	14	0.55	Annelida - Polychaeta	*Sigalion arenicola*	6	0.50	Annelida - Polychaeta	*Aricidea catherinae*	3	0.82
Molluska - Bivalvia	*Tellina agilis*	11	0.43	Echinodermata - Holothuroidea	*Leptosynapta* spp.	5	0.42	Arthropoda - Amphipoda	*Ampelisca verrilli*	3	0.82
Annelida - Polychaeta	*Aricidea wassi*	10	0.39	Annelida - Polychaeta	*Aricidea wassi*	4	0.34	Arthropoda - Amphipoda	*Psammonyx nobilis*	3	0.82
Arthropoda - Amphipoda	*Unciola irrorata*	9	0.35	Annelida - Polychaeta	*Apoprionospio pygmaea*	3	0.25	Annelida - Polychaeta	*Aricidea wassi*	2	0.55
Molluska - Bivalvia	*Lyonsia hyalina*	7	0.27	Molluska - Bivalvia	*Lyonsia hyalina*	3	0.25	Arthropoda - Amphipoda	*Rhepoxynuis epistomus*	2	0.55
Annelida - Polychaeta	*Sigalion arenicola*	7	0.27	Annelida - Polychaeta	*Aricidea catherinae*	3	0.25	Annelida - Oligochaeta	Oligochaeta spp.	2	0.55

Note: “On-site” is the data for samples within the borrow area but not the dredged box; “Reference” is the data for the area sampled outside of the borrow area; “Dredged box” is the data for the dredged area.

3.3 FISH TRAWLS

Between July and October 2015, 140 trawls were conducted within and adjacent to the FIMI Borrow Areas, with 70 trawls in Borrow Area 2C and 70 trawls in Borrow Area 5B. In total, 52 fish species and 19 macroinvertebrate species were identified. A total of 13,966 individual fish were captured.

3.3.1 BORROW AREA 2C TRAWLS

Overall, 36 species were collected in the project trawls. The total biomass of the trawls in Borrow Area 2C was 832,927 g (Table 23). Throughout all months the most numerically abundant species was the longfin squid, followed by northern searobin (*Prionotus carolinus*) and scup (*Stenotomus chrysops*). Winter skate had the greatest biomass, followed by clearnose skate (*Raja eglanteria*) and northern searobin. The fish trawl results are presented in more detail in the following sections, first by temporal trends, then by spatial patterns.

3.3.1.1 MONTHLY COMPARISONS

In July and August, northern searobin had the greatest biomass (Table 23). In July, clearnose skate had the second greatest biomass followed by summer flounder. Clearnose and winter skate had the second and third highest biomass in August. Clearnose skate had the highest biomass in September followed by winter skate and northern searobin. By month, winter skate had the greatest biomass only in October even though it had the greatest overall biomass. Longfin squid and spiny dogfish had the second and third highest biomasses in October, respectively. October was the only month that spiny dogfish were recorded in this borrow area.

Although many species showed overlap from month to month, the overall catch composition showed variation depending on the time of year (Table 24). Northern searobin and longfin squid were the most abundant species by number in Borrow Area 2C during the monthly trawls. In July and September northern searobin was the most abundant and in August and October, longfin squid was the most abundant. Of the 36 species collected, 12 species (33.33% of total species) were collected during all four months: winter skate, clearnose skate, northern searobin, longfin squid, summer flounder (*Paralichthys dentatus*), windowpane (*Scophthalmus aquosus*), spotted hake (*Urophycis regia*), little skate (*Leucoraja erinacea*), scup, northern puffer (*Sphoeroides maculatus*), smallmouth flounder (*Etropus microstomus*), and lined seahorse (*Hippocampus erectus*). Five species (13.89%) occurred in three of the four months of trawls and eight species (22.22%) were captured in two of the four months of trawls. There were 11 species (30.56%) that were captured in only one month.

Catch per unit effort (CPUE) is a standardization of abundance based on the number of trawls (i.e., effort). In this case the number of individuals of each species is divided by the number of trawls. Although the level of effort was not similar among months, with between 14 and 24 total trawls, CPUE did display the same patterns as abundance. For example, the same species that dominated each month numerically also had the highest CPUE (Figure 20). Of the 36 species collected, five are among the commercially landed species that generated over $1 million in New York (Table 1): longfin squid, summer flounder, scup, silver hake (*Merluccius bilinearis*), and goosefish (*Lophius americanus*). Three of these species (longfin squid, summer flounder and scup) had relatively low abundance and CPUE in July; goosefish and silver hake were not caught in July trawls. In August, abundance and CPUE increased for longfin squid, scup and silver hake. In September, abundance and CPUE increased for summer flounder and silver hake but decreased for longfin squid and scup. Longfin squid was the dominant species in October, but northern searobin and scup were also present in high numbers, with summer flounder decreasing in abundance. Summer flounder abundance and CPUE was relatively stable compared to the

other commercial species throughout all survey months. The single goosefish that was collected in the study was caught in October.

Table 23: Monthly Biomass (g) of Each Species for Borrow Area 2C

Monthly Biomass (g) of Each Species for Borrow Area 2C							
Species	Scientific name	July	August	September	October	Total	
		Total weight	Total weight	Total weight	Total weight	Total weight	Average length (mm)
Winter skate	*Leucoraja ocellata*	14,465	8,105	35,630	331,800	390,000	472
Clearnose skate	*Raja eglanteria*	25,964	8,520	129,770	11,875	176,129	596
Northern searobin	*Prionotus carolinus*	27,630	9,895	34,485	2,550	74,560	155
Longfin squid	*Doryteuthis pealeii*	1,429	3,820	9,420	35,830	50,499	74
Summer flounder	*Paralichthys dentatus*	17,660	6,991	16,750	7,110	48,511	321
Weakfish	*Cynoscion regalis*	--	--	17,700	60	17,760	203
Spiny dogfish	*Squalus acanthias*	--	--	--	15,850	15,850	721
Windowpane	*Scophthalmus aquosus*	2,340	730	2,675	8,265	14,010	229
Spotted hake	*Urophycis regia*	326	2,880	4,565	2,685	10,456	218
Little skate	*Leucoraja erinacea*	2,120	890	630	4,870	8,510	391
Striped anchovy	*Anchoa hepsetus*	--	--	5,200	2,100	7,300	60
Scup	*Stenotomus chrysops*	153	701	587	4,440	5,881	57
Striped searobin	*Prionotus evolans*	--	--	1,630	2,265	3,895	190
Northern puffer	*Sphoeroides maculatus*	56	46	550	2,619	3,271	71
Smallmouth flounder	*Etropus microstomus*	853	366	596	125	1,940	68
Northern stargazer	*Astroscopus guttatus*	--	--	1,330	--	1,330	310
Northern kingfish	*Menticirrhus saxatilis*	--	--	370	705	1,075	215
Atlantic croaker	*Micropogonias undulatus*	--	--	450		450	204
Butterfish	*Peprilus triacanthus*	--	--	130	125	255	124
Striped cusk-eel	*Ophidion marginatum*	--	--	237		237	162
Black sea bass	*Centropristis striata*	--	--	192	11	203	53
Smooth dogfish	*Mustelus canis*	170	--	--	--	170	352
Bluefish	*Pomatomus saltatrix*	--	--	145	--	145	156
Silver hake	*Merluccius bilinearis*	--	4	31	83	118	72
Bluespotted cornetfish	*Fistularia tabacaria*	6	13	94	--	113	315

Monthly Biomass (g) of Each Species for Borrow Area 2C							
Species	Scientific name	July	August	September	October	Total	
		Total weight	Total weight	Total weight	Total weight	Total weight	Average length (mm)
Goosefish	*Lophius americanus*	--	--	--	110	110	175
Planehead filefish	*Stephanolepis hispidus*	18	--	50	--	68	101
Lined seahorse	*Hippocampus erectus*	4	4	19	4	31	68
Naked goby	*Gobiosoma bosc*	2	5	17	--	24	44
Northern pipefish	*Syngnathus fuscus*	3	1	8	--	12	136
Fourspot flounder	*Paralichthys oblongus*	1	4	--	2	7	50
Atlantic moonfish	*Selene setapinnis*	--	--	3		3	48
Round scad	*Decapterus punctatus*	--	--	--	2	2	43
American sand lance	*Ammodytes americanus*	1	--	--	--	1	70
Snowy grouper	*Hyporthodus niveatus*	1	--	--	--	1	19
Atlantic stingray	*Dasyatis sabina*	--	--	--	--	--	1000▫
Grand Total		**93,202**	**42,975**	**263,264**	**433,486**	**832,927**	**7,541**

Note: weight is total weight of each species in grams; length is average standard length of measured individuals in mm; ▫ = estimated weight.

Table 24: Abundance and Composition of Monthly Trawls for Borrow Area 2C

Abundance and Composition of Monthly Trawls for Borrow Area 2C										
Species	July		August		September		October		Total	
	Individ	%	Individ	%	Individ	%	Individ	%	Individ	%
Longfin squid	73	10.04	239	30.92	330	18.71	662	36.47	1,304	25.67
Northern searobin	359	49.38	161	20.83	391	22.17	28	1.54	939	18.49
Scup	4	0.55	213	27.55	160	9.07	275	15.15	652	12.84
Winter skate	28	3.85	16	2.07	65	3.68	504	27.77	613	12.07
Striped anchovy	--	--	--	--	317	17.97	92	5.07	409	8.05
Smallmouth flounder	152	20.91	76	9.83	65	3.68	20	1.10	313	6.16
Clearnose skate	16	2.20	10	1.29	121	6.86	10	0.55	157	3.09
Weakfish	--	--	--	--	143	8.11	1	0.06	144	2.84
Northern puffer	21	2.89	7	0.91	18	1.02	68	3.75	114	2.24
Summer flounder	37	5.09	14	1.81	33	1.87	22	1.21	106	2.09
Spotted hake	4	0.55	18	2.33	31	1.76	23	1.27	76	1.50
Windowpane	13	1.79	3	0.39	11	0.62	42	2.31	69	1.36
Striped searobin	--	--	--	--	14	0.79	15	0.83	29	0.57
Silver hake	--	--	1	0.13	8	0.45	16	0.88	25	0.49
Little skate	5	0.69	3	0.39	2	0.11	13	0.72	23	0.45
Lined seahorse	2	0.28	2	0.26	8	0.45	1	0.06	13	0.26
Naked goby	3	0.41	5	0.65	5	0.28	--	--	13	0.26
Black sea bass	--	--	--	--	10	0.57	2	0.11	12	0.24
Striped cusk-eel	--	--	--	--	10	0.57	--	--	10	0.20
Northern kingfish	--	--	--	--	4	0.23	5	0.28	9	0.18
Spiny dogfish	--	--	--	--	--	--	9	0.50	9	0.18
Bluespotted cornetfish	1	0.14	2	0.26	4	0.23	--	--	7	0.14
Butterfish	--	--	--	--	3	0.17	4	0.22	7	0.14

Abundance and Composition of Monthly Trawls for Borrow Area 2C										
Species	July		August		September		October		Total	
	Individ	%	Individ	%	Individ	%	Individ	%	Individ	%
Northern pipefish	3	0.41	1	0.13	2	0.11	--	--	6	0.12
Fourspot flounder	1	0.14	2	0.26	--	--	1	0.06	4	0.08
Bluefish	--	--	--	--	3	0.17	--	--	3	0.06
Atlantic croaker	--	--	--	--	2	0.11	--	--	2	0.04
Atlantic moonfish	--	--	--	--	2	0.11	--	--	2	0.04
Planehead filefish	1	0.14	--	--	1	0.06	--	--	2	0.04
American sand lance	1	0.14	--	--	--	--	--	--	1	0.02
Atlantic stingray	1	0.14	--	--	--	--	--	--	1	0.02
Goosefish	--	--	--	--	--	--	1	0.06	1	0.02
Northern stargazer	--	--	--	--	1	0.06	--	--	1	0.02
Round scad	--	--	--	--	--	--	1	0.06	1	0.02
Smooth dogfish	1	0.14	--	--	--	--	--	--	1	0.02
Snowy grouper	1	0.14	--	--	--	--	--	--	1	0.02
Grand Total	**727**	**100.00**	**773**	**100.00**	**1764**	**100.00**	**1815**	**100.00**	**5079**	**100.00**

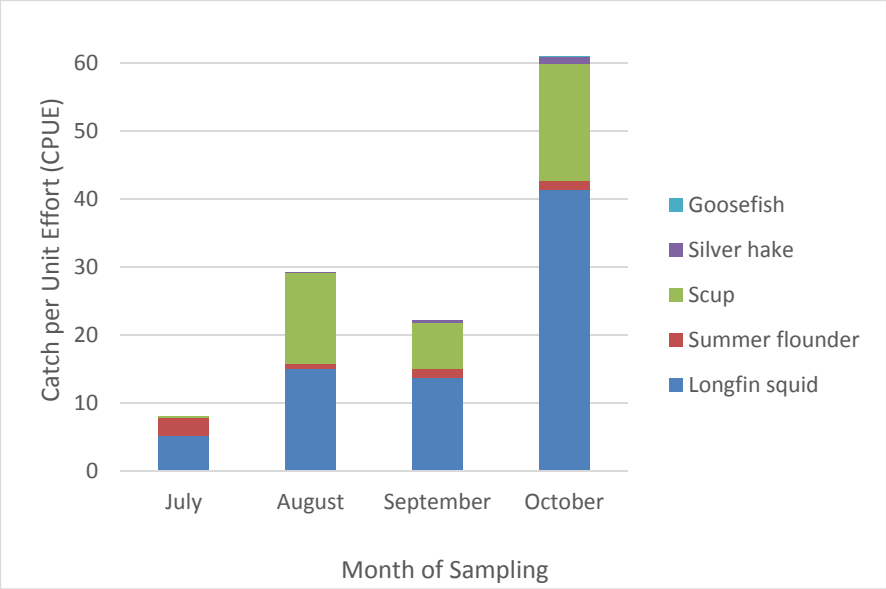


Figure 20: Monthly Catch Per Unit Effort (CPUE) of the Most Commercially Important Species for Borrow Area 2C

With the exception of squid species, invertebrates were not enumerated, measured, or weighed. However, the presence of other organisms in the catch was noted (Table 25). A total of 19 species were observed: nine arthropods, four mollusks, three echinoderms, one cephalopod egg mass, one fish egg case, and one cnidarian. Six of these species were encountered during all four months of the survey: hermit crab, quahog, sand dollar, skate egg cases, spider crab, and sea star. Jellyfish, Jonah crab, and moon snail were present in three of the months; and mahogany clam, rock crab, and whelk were present in only two of the months. The remaining seven species were present in only one of the four months.

Table 25: Presence of Macroinvertebrates Collected in Monthly Fish Trawls in Borrow Area 2C

Presence of Macroinvertebrates Collected in Monthly Fish Trawls in Borrow Area 2C				
Species	**July**	**August**	**September**	**October**
Blue crab			x	
Blue mussel			x	
Calico crab		x		
Hermit crab	x	x	x	x
Horseshoe crab			x	
Jellyfish		x	x	x
Jonah crab		x	x	x
Lady crab			x	
Mahogany clam			x	x
Moon snail	x	x	x	
Quahog	x	x	x	x
Rock crab	x		x	

Presence of Macroinvertebrates Collected in Monthly Fish Trawls in Borrow Area 2C				
Species	**July**	**August**	**September**	**October**
Sand dollar	x	x	x	x
Sea urchin			x	
Skate egg case	x	x	x	x
Spider crab	x	x	x	x
Squid egg mass			x	
Sea star	x	x	x	x
Whelk		x	x	

3.3.1.2 REFERENCE SITE COMPARISONS

To provide a local comparison, as well as a baseline for future projects, reference tows were conducted adjacent to Borrow Area 2C during each monthly sampling event from July to October (Table 26). Since more tows were conducted within Borrow Area 2C, it was expected that greater species would be observed on-site when compared to reference sites. This section presents the overlap of species and presence/absence of species in the reference tows relative to the on-site tows for all months combined and then by month.

As expected, for all months combined there were a greater number of species (33 species) collected in on-site trawls compared to the number of species collected in the reference trawls (26 species) which was likely due to the larger number of on-site trawls. There were 10 species that were collected in on-site trawls that were not also collected in reference trawls; and there were three species that were collected in reference trawls that were not also collected in on-site trawls. It is important to note that none of these species individually accounted for more than 1% of the catch composition of monthly trawls. The great overlap of species between on-site and reference trawls indicates that the same fish assemblages populate on-site and reference areas.

In July, northern searobin were the most abundant species by a large margin in on-site and reference trawls; smallmouth flounder were the second most abundant. Only two of the 14 species collected in reference tows were unique to the catch and not also collected in the Borrow Area; seven species of 19 species were unique to on-site trawls. The August trawls in on-site and reference sites were dominated by three species: longfin squid, scup, and northern searobin with percent composition greater for on-site trawls. One of the 13 species collected in reference tows was unique to the catch. Four of 16 species were caught in on-site trawls and not in reference trawls. September on-site trawls were dominated by northern searobin, longfin squid, and striped anchovy (*Anchoa hepsetus*); reference trawls were dominated by northern searobin, weakfish (*Cynoscion regalis*), striped anchovy, and scup. Striped anchovy were not collected in trawls in previous months. One of the 19 species collected in reference tows was unique to the September catch, while nine of 27 species were only caught in on-site trawls. In October, the longfin squid returned as the dominant species in on-site and reference tows with winter skate and scup following in abundance. There were no unique species caught in October reference trawls but seven of 23 species were only captured in on-site trawls.

Except for July, the CPUE of the total catch from month to month followed the same pattern both within the borrow area and at the reference sites with a gradual increase in CPUE over time (Figure 21).

Reference site trawls had a much greater CPUE than on-site trawls in July. The high number of northern searobin in July reference trawls drove this pattern. The lowest CPUE within the borrow area occurred in July and in August in the reference sites. In September CPUE increased in both areas. October had the highest CPUE of all months in both areas. Catches of large numbers of longfin squid and winter skate within borrow areas and longfin squid, winter skate and scup in reference areas contributed to the higher CPUE.

Table 26: Monthly Comparisons of Catch Composition of On-site and Reference Trawls at Borrow Area 2C

Monthly Comparisons of Catch Composition of On-site and Reference Trawls at Borrow Area 2C								
Species	July		August		September		October	
	On-site	Ref.	On-site	Ref.	On-site	Ref.	On-site	Ref.
Longfin squid	11.05%	7.43%	31.69%	28.05%	21.30%	4.71%	36.23%	38.25%
Northern searobin	45.33%	59.90%	20.85%	20.73%	22.38%	21.01%	1.44%	2.30%
Scup	0.38%	0.99%	29.39%	20.73%	8.27%	13.41%	14.14%	22.58%
Winter skate	3.24%	5.45%	1.15%	5.49%	3.63%	3.99%	28.54%	22.12%
Striped anchovy	--	--	--	--	18.08%	17.39%	5.76%	--
Smallmouth flounder	24.00%	12.87%	9.03%	12.80%	3.90%	2.54%	1.00%	1.84%
Clearnose skate	1.71%	3.47%	1.48%	0.61%	6.85%	6.88%	0.56%	0.46%
Weakfish	--	--	--	--	6.18%	18.48%	0.06%	--
Northern puffer	3.81%	0.50%	0.99%	0.61%	1.14%	0.36%	3.69%	4.15%
Summer flounder	5.33%	4.46%	1.48%	3.05%	1.41%	4.35%	0.94%	3.23%
Spotted hake	0.38%	0.99%	1.97%	3.66%	1.68%	2.17%	1.25%	1.38%
Windowpane	1.90%	1.49%	0.16%	1.22%	0.54%	1.09%	2.44%	1.38%
Striped searobin	--	--	--	--	0.94%	--	0.94%	--
Silver hake	--	--	0.16%	--	0.54%	--	0.94%	0.46%
Little skate	0.57%	0.99%	0.16%	1.22%	0.07%	0.36%	0.75%	0.46%
Lined seahorse	0.19%	0.50%	0.33%	--	0.47%	0.36%	0.06%	--
Naked goby	0.57%	0.00%	0.66%	0.61%	0.34%	--	--	--
Black sea bass	--	--	--	--	0.47%	1.09%	0.13%	--
Striped cusk-eel	--	--	--	--	0.60%	0.36%	--	--
Northern kingfish	--	--	--	--	0.27%	--	0.31%	--
Spiny dogfish	--	--	--	--	--	--	0.44%	0.92%
Bluespotted cornetfish	0.19%	--	--	1.22%	0.27%	--	--	--
Butterfish	--	--	--	--	0.20%	--	0.19%	0.46%
Northern pipefish	0.57%	--	0.16%	--	0.07%	0.36%	--	--
Fourspot flounder	0.19%	--	0.33%	--	--	--	0.06%	--
Bluefish	--	--	--	--	0.13%	0.36%	--	--
Atlantic croaker	--	--	--	--	--	0.72%	--	--
Atlantic moonfish	--	--	--	--	0.13%	--	--	--
Planehead filefish	0.19%	--	--	--	0.07%	--	--	--
American sand lance	0.19%	--	--	--	--	--	--	--
Atlantic stingray	--	0.50%	--	--	--	--	--	--

Monthly Comparisons of Catch Composition of On-site and Reference Trawls at Borrow Area 2C								
Species	July		August		September		October	
	On-site	Ref.	On-site	Ref.	On-site	Ref.	On-site	Ref.
Goosefish	--	--	--	--	--	--	--	--
Northern stargazer	--	--	--	--	0.07%	--	--	--
Round scad	--	--	--	--	--	--	0.06%	--
Smooth dogfish	--	0.50%	--	--	--	--	--	--
Snowy grouper	0.19%	--	--	--	--	--	--	--

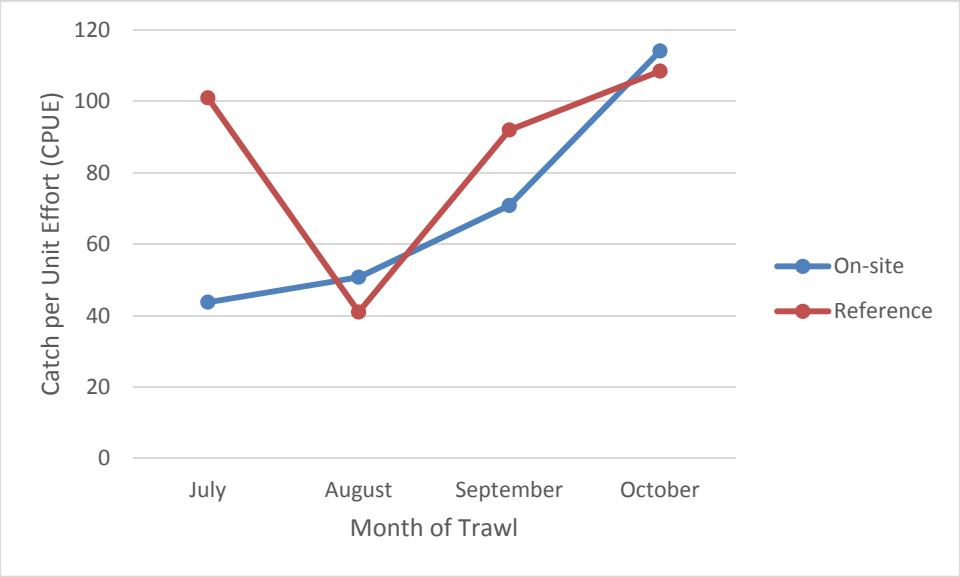


Figure 21: Average Catch per Unit Effort (CPUE) of Monthly Fish Trawls for FIMI Borrow Area 2C

3.3.1.3 LENGTH-FREQUENCY DISTRIBUTIONS

Lengths of all fish species were collected (Appendix A), but the length-frequency distribution data focus on the most important New York commercial species (longfin squid, summer flounder, scup, silver hake and goosefish) which generated over $1 million of revenue individually in 2014. Figure 22 represents the length-frequency distributions for longfin squid, summer flounder, scup, and silver hake; there was only one goosefish collected so it was not included in the figure. Longfin squid ranged in mantle length from a minimum of 13 mm to a maximum of 250 mm. The average length was 97 mm. The majority of longfin squid fell between 26-100 mm. Summer flounder ranged from 198 to 648 mm in standard length, with an average of 327 mm. Most fish fell between 201-400 mm standard length. The standard length of scup ranged from 19 to 194 mm and averaged 81 mm. The most common lengths were between 26 and 50 mm. Silver hake standard lengths were between 54 and 104 mm, averaging 90 mm. The most common lengths were around 61 mm, with only one measurements above 89 mm. Only one goosefish was collected and it was 175 mm.

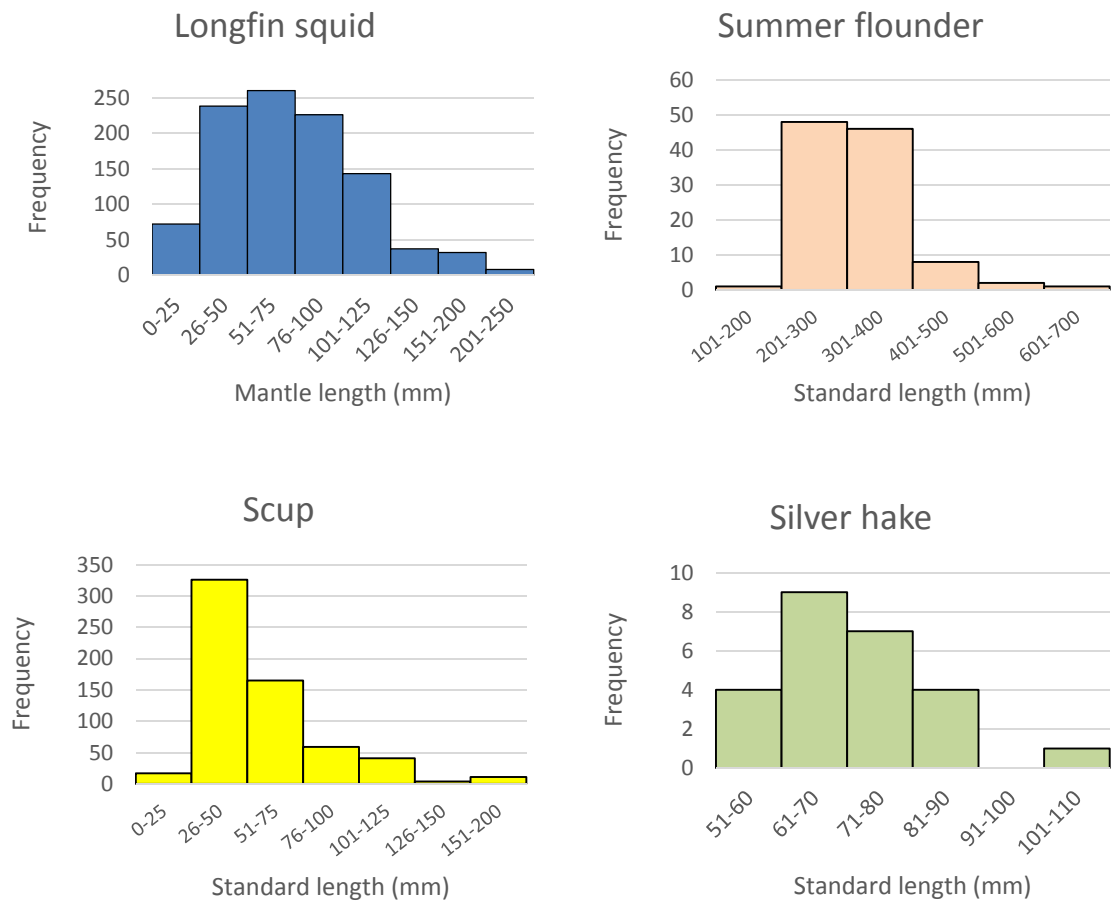


Figure 22: Length Frequency Distribution of Commercially Important New York Fish Species Collected in Borrow Area 2C Which Generated Over $1 Million in Revenue in 2014

3.3.2 Borrow Area 5B Trawls

Overall, 47 species were collected in the trawls. The total biomass of the trawls in Borrow Area 5B was 1,155,369 g (Table 27). Winter skate had the greatest biomass, followed by clearnose skate and scup. Overall, the most numerically abundant species was scup, followed by striped anchovy, and longfin squid. The fish trawl results are presented in more detail in the following sections, first by temporal trends, then by spatial patterns.

3.3.2.1 Monthly Comparisons

In July, August, and September, clearnose skate had the greatest biomass (Table 27). In July, winter skate had the second greatest biomass followed by northern searobin. Scup and winter skate had the second and third highest biomass in August. In September, the species with the second highest biomass was winter skate followed by summer flounder. By month, winter skate had the greatest biomass only in October even though it had the greatest overall biomass. Striped anchovy and spotted hake had the second and third highest biomasses in October. October was the only month that striped anchovy were recorded in this borrow area.

Although many species showed overlap from month to month, the overall catch composition showed variation depending on the time of year (Table 28). Scup, striped anchovy, and longfin squid were the most abundant species in Borrow Area 5B during the monthly trawls. In July, northern searobin was the most abundant and in August and September, scup was the most abundant species. Of the 47 species collected, 12 species (26.09% of total species) were collected during all four months (Table 27). Thirteen species (28.26%) occurred in three of the four months of trawls, and three species (6.52%) were captured in two of the four months of trawls. There were 18 species (39.13%) that were capture in only one month.

Although the level of effort was not similar among months, with between 16 and 24 total trawls, CPUE did display the same patterns as abundance (i.e., the same species that dominated each month numerically also had the highest CPUE). Of the 47 species collected, four are among the commercially important species (Table 1): longfin squid, summer flounder, scup and silver hake. Two species, scup and longfin squid, had relatively high abundance and CPUE in July (Figure 23). In August, there was a sharp peak in scup abundance. September abundance decreased greatly for longfin squid but their numbers peaked in October. Summer flounder were present in all months and abundances remained relatively consistent throughout the study period. Silver hake was not present until October.

Table 27: Monthly Biomass of Each Fish Species for Borrow Area 5B

Monthly Biomass of Each Fish Species for Borrow Area 5B							
Species	Scientific name	July	August	September	October	Total	
		Total weight (g)	Total weight (g)	Total weight (g)	Total weight (g)	Total weight (g)	Average length (mm)
Winter skate	*Leucoraja ocellata*	48,230	17,960	16,580	472,750	555,520	466
Clearnose skate	*Raja eglanteria*	82,320	71,600	30,550	9,100	193,570	611
Scup	*Stenotomus chrysops*	18,564	40,110	8,019	9,000	75,693	71
Striped anchovy	*Anchoa hepsetus*	--	--	--	67,345	67,345	56
Spotted hake	*Urophycis regia*	1,490	--	1,285	57,430	60,205	229
Northern searobin	*Prionotus carolinus*	22,607	14,110	10,630	1,704	49,051	149
Summer flounder	*Paralichthys dentatus*	1,725	5,715	18,835	18,135	44,410	296
Longfin squid	*Doryteuthis pealeii*	2,661	3,748	2,758	31,526	40,693	68
Windowpane	*Scophthalmus aquosus*	2,572	550	1,880	15,065	20,067	225
Northern kingfish	*Menticirrhus saxatilis*	--	180	100	8,720	9,000	185
Atlantic stingray	*Dasyatis sabina*	--	6,804	--	--	6,804	1,219
Striped searobin	*Prionotus evolans*	1,153	--	1,450	3,746	6,349	175
Little skate	*Leucoraja erinacea*	1,090	--	250	4,331	5,671	279
Black sea bass	*Centropristis striata*	1,701	525	2,617	754	5,597	134
Northern puffer	*Sphoeroides maculatus*	--	8	358	4,237	4,603	73
Tautog	*Tautoga onitis*	80	220	1,103	1,325	2,728	203
Butterfish	*Peprilus triacanthus*	596	1	--	817	1,414	72
Silver hake	*Merluccius bilinearis*	4	--	--	1,319	1,323	75
Weakfish	*Cynoscion regalis*	--	--	--	900	900	163
Striped cusk-eel	*Ophidion marginatum*	--	--	--	650	650	126
Smallmouth flounder	*Etropus microstomus*	184	148	58	241	631	70
Bluefish	*Pomatomus saltatrix*	--	--	--	461	461	133
Oyster toadfish	*Opsanus tau*	--	--	--	450	450	262

Monthly Biomass of Each Fish Species for Borrow Area 5B							
Species	Scientific name	July	August	September	October	Total	
		Total weight (g)	Total weight (g)	Total weight (g)	Total weight (g)	Total weight (g)	Average length (mm)
Grey triggerfish	*Balistes capriscus*	--	--	--	410	410	223
Planehead filefish	*Stephanolepis hispidus*	102	183	90	--	375	88
Northern pipefish	*Syngnathus fuscus*	38	32	228	74	371	162
Round scad	*Decapterus punctatus*	12	218	1	--	231	70
Dwarf goatfish	*Upeneus parvus*	38	110	--	--	148	64
Glasseye snapper	*Heteropriacanthus cruentatus*	42	17	--	70	129	66
Bluespotted cornetfish	*Fistularia tabacaria*	40	5	60	3	108	279
Cunner	*Tautogolabrus adspersus*	--	9	69	15	93	37
Winter flounder	*Pseudopleuronectes americanus*	--	--	--	90	90	172
Naked goby	*Gobiosoma bosc*	20	7	39	--	66	48
Striped burrfish	*Chilomycterus schoepfi*	--	--	60	--	60	82
Fourspot flounder	*Paralichthys oblongus*	20	--	22	15	57	61
Atlantic moonfish	*Selene setapinnis*	18	2	--	14	34	41
Spotfin butterflyfish	*Chaetodon ocellatus*	--	--	--	15	15	50
Atlantic herring	*Clupea harengus*	--	--	14	--	14	111
Scrawled filefish	*Aluterus scriptus*	12	--	--	--	12	99
Lined seahorse	*Hippocampus erectus*	--	3	--	3	6	64
Rock gunnel	*Pholis gunnellus*	--	--	6	--	6	116
Atlantic menhaden	*Brevoortia tyrannus*	--	--	--	3	3	59
Atlantic silverside	*Menidia menidia*	2	--	--	--	2	35
Snowy grouper	*Hyporthodus niveatus*	--	--	2	--	2	30
Twospot cardinalfish	*Apogon pseudomaculatus*	--	--	2	--	2	37
Red hake	*Urophycis chuss*	--	--	1	--	1	57

Monthly Biomass of Each Fish Species for Borrow Area 5B							
Species	Scientific name	July	August	September	October	Total	
		Total weight (g)	Total weight (g)	Total weight (g)	Total weight (g)	Total weight (g)	Average length (mm)
Short bigeye	*Pristigenys alta*		1			1	20
	Grand Total	**185,319**	**162,266**	**97,067**	**710,718**	**1,155,369**	**--**

Table 28: Abundance and Composition of Monthly Trawls for Borrow Area 5B

Abundance and Composition of Monthly Trawls for Borrow Area 5B										
Species	July		August		September		October		Total	
	Individ	%	Individ	%	Individ	%	Individ	%	Individ	%
Scup	447	28.24	1,130	61.65	477	42.97	230	5.27	2,284	25.70
Striped anchovy	--	--	--	--	--	--	1,537	35.24	1,537	17.29
Longfin squid	304	19.20	228	12.44	83	7.48	588	13.48	1,203	13.54
Winter skate	88	5.56	30	1.64	30	2.70	803	18.41	951	10.70
Northern searobin	451	28.49	237	12.93	164	14.77	56	1.28	908	10.22
Spotted hake	9	0.57	--	--	6	0.54	352	8.07	367	4.13
Silver hake	1	0.06	--	--	--	--	217	4.98	218	2.45
Northern pipefish	16	1.01	45	2.45	88	7.93	21	0.48	170	1.91
Clearnose skate	75	4.74	59	3.22	23	2.07	6	0.14	163	1.83
Northern puffer	0	0.00	4	0.22	15	1.35	124	2.84	143	1.61
Summer flounder	6	0.38	16	0.87	47	4.23	55	1.26	124	1.40
Northern kingfish	--	--	1	0.05	2	0.18	102	2.34	105	1.18
Windowpane	15	0.95	3	0.16	12	1.08	71	1.63	101	1.14
Butterfish	40	2.53	1	0.05	--	--	54	1.24	95	1.07
Smallmouth flounder	22	1.39	19	1.04	35	3.15	15	0.34	91	1.02
Black sea bass	21	1.33	5	0.27	21	1.89	18	0.41	65	0.73

Abundance and Composition of Monthly Trawls for Borrow Area 5B										
Species	July		August		September		October		Total	
	Individ	%	Individ	%	Individ	%	Individ	%	Individ	%
Cunner	--	--	5	0.27	51	4.59	1	0.02	57	0.64
Striped searobin	7	0.44	--	--	19	1.71	22	0.50	48	0.54
Naked goby	27	1.71	7	0.38	12	1.08	--	--	46	0.52
Little skate	3	0.19	--	--	1	0.09	25	0.57	29	0.33
Dwarf goatfish	11	0.69	13	0.71	--	--	--	--	24	0.27
Striped cusk-eel	--	--	--	--	--	--	18	0.41	18	0.20
Round scad	1	0.06	15	0.82	1	0.09	--	--	17	0.19
Atlantic moonfish	9	0.57	2	0.11	--	--	5	0.11	16	0.18
Planehead filefish	6	0.38	6	0.33	4	0.36	--	--	16	0.18
Fourspot flounder	7	0.44	--	--	3	0.27	3	0.07	13	0.15
Tautog	1	0.06	1	0.05	6	0.54	5	0.11	13	0.15
Weakfish	--	--	--	--	--	--	13	0.30	13	0.15
Bluefish	--	--	--	--	--	--	12	0.28	12	0.14
Bluespotted cornetfish	7	0.44	1	0.05	3	0.27	1	0.02	12	0.14
Glasseye snapper	5	0.32	1	0.05	--	--	1	0.02	7	0.08
Atlantic silverside	3	0.19	--	--	--	--	--	--	3	0.03
Lined seahorse	--	--	2	0.11	--	--	1	0.02	3	0.03
Snowy grouper	--	--	--	--	2	0.18	--	--	2	0.02
Atlantic herring	--	--	--	--	1	0.09	--	--	1	0.01
Atlantic menhaden	--	--	--	--	--	--	1	0.02	1	0.01
Atlantic stingray	--	--	1	0.05	--	--	--	--	1	0.01
Gray triggerfish	--	--	--	--	--	--	1	0.02	1	0.01
Oyster toadfish	--	--	--	--	--	--	1	0.02	1	0.01
Red hake	--	--	--	--	1	0.09	--	--	1	0.01
Rock gunnel	--	--	--	--	1	0.09	--	--	1	0.01

Abundance and Composition of Monthly Trawls for Borrow Area 5B										
Species	July		August		September		October		Total	
	Individ	%	Individ	%	Individ	%	Individ	%	Individ	%
Scrawled filefish	1	0.06	--	--	--	--	--	--	1	0.01
Short bigeye	--	--	1	0.05	--	--	--	--	1	0.01
Spotfin butterflyfish	--	--	--	--	--	--	1	0.02	1	0.01
Striped burrfish	--	--	--	--	1	0.09	--	--	1	0.01
Twospot cardinalfish	--	--	--	--	1	0.09	--	--	1	0.01
Winter flounder	--	--	--	--	--	--	1	0.02	1	0.01
Grand Total	**1,583**		**1,833**		**1,110**		**4,361**		**8,887**	

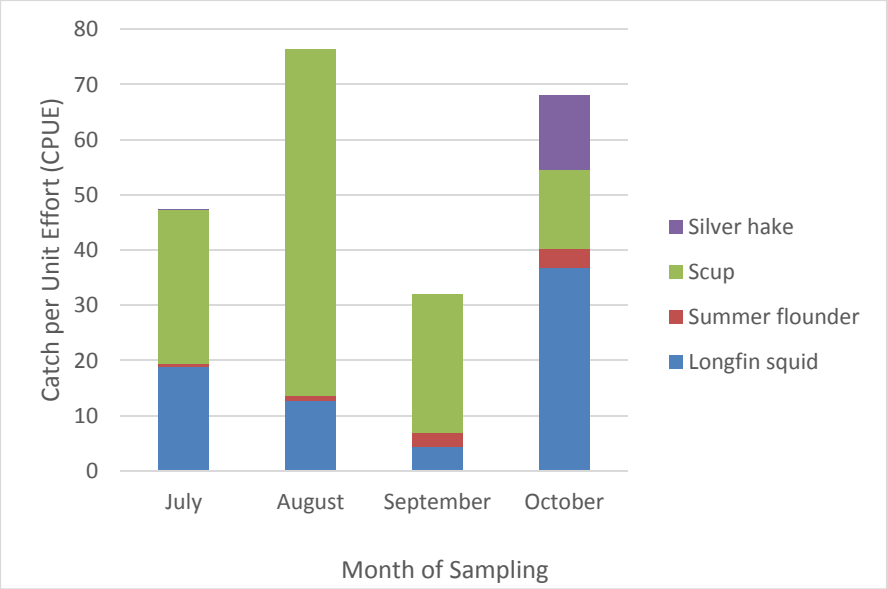


Figure 23: Monthly Catch Per Unit Effort (CPUE) of the Most Commercially Important Species for Borrow Area 5B

With the exception of squid species, invertebrates were not enumerated, measured, or weighed. However, the presence of other organisms in the catch was noted (Table 29). A total of 22 species were observed: 12 arthropods, 4 mollusks, 2 echinoderms, 2 egg cases/masses, and 2 cnidarian. Six of these species were encountered during all 4 months of the survey: hermit crab, Jonah crab, moon snail, rock crab, sand dollar, and spider crab. Brown shrimp, horseshoe crab, lady crab, and squid egg were present in three of the months; and American lobster, calico crab, isopod, jellyfish, and octopus were present in only 2 of the months. The remaining 7 species were present in only 1 of the 4 months.

Table 29: Presence of Macroinvertebrates Collected in Monthly Fish Trawls in Borrow Area 5B

Presence of Macroinvertebrates Collected in Monthly Fish Trawls in Borrow Area 5B				
Species	**July**	**August**	**September**	**October**
American lobster			x	x
Blue crab			x	
Blue mussel			x	
Brown shrimp	x	x		x
Calico crab		x		
Hermit crab	x	x	x	x
Horseshoe crab		x	x	x
Isopod		x	x	
Jellyfish			x	x
Jonah crab	x	x	x	x
Lady crab		x	x	x
Moon snail	x	x	x	x
Mud crab			x	
Octopus	x		x	

Presence of Macroinvertebrates Collected in Monthly Fish Trawls in Borrow Area 5B				
Species	**July**	**August**	**September**	**October**
Quahog	x			
Rock crab	x	x	x	x
Sand dollar	x	x	x	x
Skate egg case		x		
Spider crab	x	x	x	x
Squid egg	x	x	x	
Sea star	x			
Whelk	x			

3.3.2.2 REFERENCE SITE COMPARISONS

To provide a local comparison, as well as a baseline for future projects, reference tows were conducted adjacent to the Borrow Area 5B during each monthly sampling event from July to October (Table 30). Since more tows were conducted within Borrow Area 5B, it was expected that greater diversity (i.e., more species) would be observed on-site when compared to reference sites. This section presents the overlap of species and presence/absence of species in the reference tows relative to the on-site tows for all months combined and then by month.

As expected, for all months combined there were a greater number of species (40 species) collected in on-site trawls compared to the number of species collected in reference trawls (29 species) which was likely due to the larger number of on-site trawls. There were 34 species collected in on-site trawls that were conducted in the previously dredged area (dredged box). For comparison, the number of species that were collected in each area but absent in others is presented here. For on-site trawls there were 14 species that were not also collected in reference trawls and 10 species that were not also collected in dredged box trawls. Nine species were collected in dredged box trawls that were not also collected in reference trawls and four species that were not also collected in on-site trawls. In reference trawls there were three species that were not also collected in dredged box trawls and four species that were not also collected in on-site trawls. It is important to note that none of these species individually accounted for more than 4% of the catch composition of monthly trawls. The great overlap of species between on-site outside the dredged box, the dredged box (which is also onsite) and reference trawls indicates that the same fish assemblages populate on-site and reference areas. It is also significant that the dredged box area had more species than the reference area.

In July reference site trawls, northern searobin were the most abundant species with longfin squid as the second most abundant (Table 30). Within the borrow area, on-site, scup was the most abundant species northern searobin as the second most abundant. Only 1 of the 19 species collected in reference tows were not collected within the borrow area (Table 30). For on-site trawls, 6 of the 25 species that were caught were not also caught in reference tows. The August trawls in on-site and reference sites were dominated by three species: longfin squid, scup, and northern searobin with percent composition greater for only scup during on-site trawls. In reference tows, 1 of the 11 species collected was unique to the catch, while 15 of 25 species were unique for on-site trawls. September on-site and reference trawls were dominated by scup, and northern searobin. In October, striped anchovy and winter skate were the most abundant species in the reference sites. On-site the most abundant species was also striped anchovy with longfin squid and winter skate following in abundance. Striped anchovy were not

collected in trawls in previous months. In reference tows, 3 of the 23 species collected were unique to the October catch, while 11 of 32 species were unique for on-site trawls.

Table 30: Monthly Comparisons of Catch Composition of On-site and Reference Trawls at Borrow Area 5B

Monthly Comparisons of Catch Composition of On-site and Reference Trawls at Borrow Area 5B								
Species	July		August		September		October	
	On-site	Ref.	On-site	Ref.	On-site	Ref.	On-site	Ref.
Scup	30.19%	11.11%	63.58%	40.00%	44.73%	30.99%	4.64%	12.91%
Striped anchovy	--	--	--	--	--	--	36.97%	14.41%
Longfin squid	18.86%	22.22%	11.29%	25.33%	6.40%	14.79%	13.85%	9.01%
Winter skate	5.21%	8.64%	1.43%	4.00%	3.00%	0.70%	18.74%	14.41%
Northern searobin	27.52%	37.04%	12.24%	20.67%	14.05%	19.72%	1.29%	1.20%
Spotted hake	0.56%	0.62%	--	--	0.31%	2.11%	7.94%	9.61%
Silver hake	0.07%	--	--	--	--	--	4.59%	9.61%
Northern pipefish	1.06%	0.62%	2.61%	0.67%	8.78%	2.11%	0.35%	2.10%
Clearnose skate	4.93%	3.09%	3.27%	2.67%	1.24%	7.75%	0.15%	--
Northern puffer	--	--	0.12%	1.33%	1.24%	2.11%	2.46%	7.51%
Summer flounder	0.35%	0.62%	0.89%	0.67%	3.72%	7.75%	1.27%	1.20%
Northern kingfish	--	--	0.06%	--	--	1.41%	2.23%	3.60%
Windowpane	0.77%	2.47%	0.18%	--	0.83%	2.82%	1.46%	3.60%
Butterfish	2.67%	1.23%	0.06%	--	--	--	1.22%	1.50%
Smallmouth flounder	1.34%	1.85%	0.77%	4.00%	3.10%	3.52%	0.30%	0.90%
Black sea bass	1.48%	--	0.30%	--	2.17%	--	0.40%	0.60%
Cunner	--	--	0.30%	--	5.27%	--	0.02%	--
Striped searobin	0.35%	1.23%	--	--	1.76%	1.41%	0.52%	0.30%
Naked goby	1.90%	--	0.42%	--	1.03%	1.41%	--	--
Little skate	0.14%	0.62%	--	--	0.10%	--	0.45%	2.10%
Dwarf goatfish	0.70%	0.62%	0.77%	--	--	--	0.00%	0.00%
Striped cusk-eel	--	--	--	--	--	--	0.42%	0.30%
Round scad	0.07%	--	0.89%	--	0.10%	--	--	--
Atlantic moonfish	0.21%	3.70%	0.12%	--	--	--	0.07%	0.60%
Planehead filefish	0.42%	--	0.36%	--	0.41%	--	--	--
Fourspot flounder	0.28%	1.85%	--	--	0.31%	--	0.07%	--
Tautog	0.07%	--	0.06%	--	0.62%	--	0.12%	--
Weakfish	--	--	--	--	--	--	--	3.90%
Bluefish	--	--	--	--	--	--	0.27%	0.30%
Bluespotted cornetfish	0.49%	--	--	0.67%	0.10%	1.41%	0.02%	--
Glasseye snapper	0.28%	0.62%	0.06%	--	--	--	0.02%	--
Atlantic silverside	--	1.85%	--	--	--	--	--	--

Monthly Comparisons of Catch Composition of On-site and Reference Trawls at Borrow Area 5B								
Species	July		August		September		October	
	On-site	Ref.	On-site	Ref.	On-site	Ref.	On-site	Ref.
Lined seahorse	--	--	0.12%	--	--	--	0.02%	--
Snowy grouper	--	--	--	--	0.21%	--	--	--
Atlantic herring	--	--	--	--	0.10%	--	--	--
Atlantic menhaden	--	--	--	--	--	--	0.02%	--
Atlantic stingray	--	--	0.06%	--	--	--	--	--
Gray triggerfish	--	--	--	--	--	--	0.02%	--
Oyster toadfish	--	--	--	--	--	--	0.02%	--
Red hake	--	--	--	--	0.10%	--	--	--
Rock gunnel	--	--	--	--	0.10%	--	--	--
Scrawled filefish	0.07%	--	--	--	--	--	--	--
Short bigeye	--	--	0.06%	--	--	--	--	--
Spotfin butterflyfish	--	--	--	--	--	--	0.02%	--
Striped burrfish	--	--	--	--	0.10%	--	--	--
Twospot cardinalfish	--	--	--	--	0.10%	--	--	--
Winter flounder	--	--	--	--	--	--	--	0.30%

The CPUE of the total catch from month to month followed the same pattern both on-site and at the reference sites with a decrease in September and an increase in CPUE over time (Figure 24). On-site trawls had a much greater CPUE than reference trawls for all months. The lowest CPUE for on-site and reference trawls occurred in September. October had the highest CPUE of all months in both areas. Catches of large numbers of striped anchovy, longfin squid, and winter skate on-site; and longfin squid, winter skate, and scup in reference areas contributed to the higher CPUE.

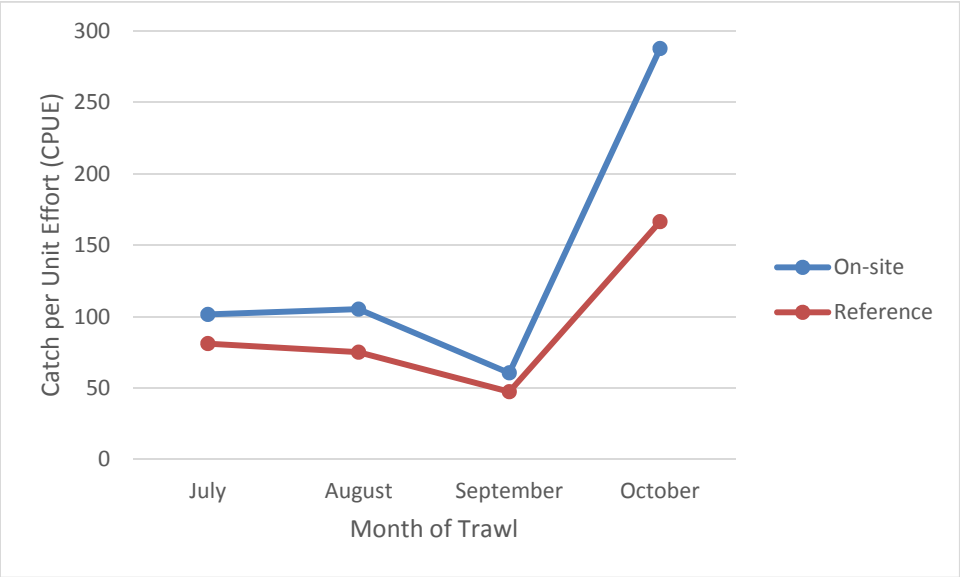


Figure 24: Average Catch per Unit Effort (CPUE) of Monthly Fish Trawls for FIMI Borrow Area 5B

3.3.2.3 LENGTH-FREQUENCY DISTRIBUTIONS

Lengths of all fish species were collected (Appendix A), but the length-frequency distribution data focus on the most important New York commercial species (longfin squid, summer flounder, scup and silver hake) which generated over $1 million of revenue individually in 2014 (Figure 25). Longfin squid ranged in mantle length from a minimum of 18 mm to a maximum of 260 mm. The average length was 68 mm. The most common length was around 50 mm. Summer flounder ranged from 98 to 547 mm in standard length, with an average of 296 mm. A peak in length frequency was apparent at lengths less than 300 mm. The standard length of scup ranged from 18 to 212 mm and averaged 71 mm. The most common length was around 50 mm. Silver hake standard lengths were between 43 and 163 mm, averaging 75 mm. The most common lengths were around 89 mm, with only one measurements above 135 mm.

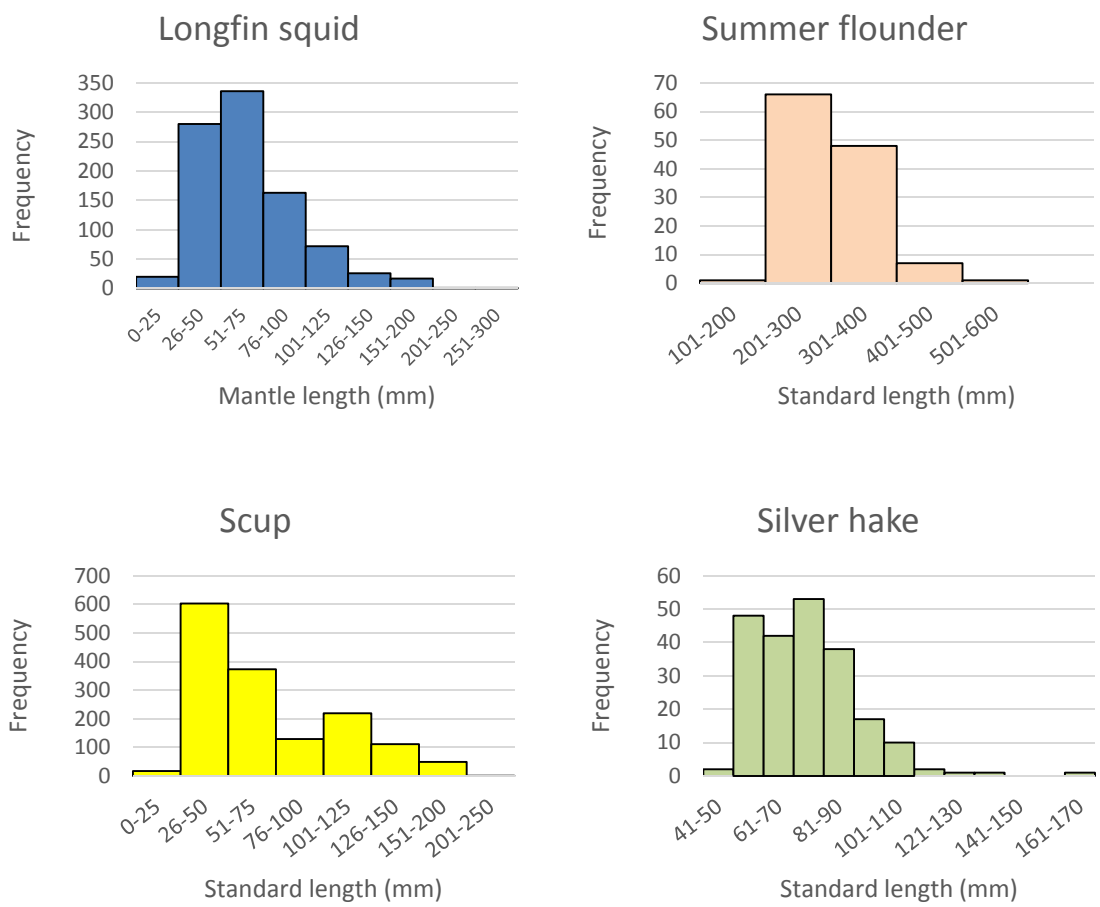


Figure 25: Length Frequency Distributions of Commercially Important Fish New York Fish Species Collected in Borrow Area 5B Which Generated Over $1 Million in Revenue in 2014

4.0 DISCUSSION

The structure and mixing of the water column impacts both benthic invertebrates and fish species. For biological organisms, summer is usually a time of increased growth, due to abundant food and prey resources (e.g., Malloy and Targett 1994). Abiotic factors affect habitat utilization, though. A behavioral response to temperature changes varies greatly by species; however, most fishes strive to remain in their thermal niche (i.e., ±2 or 5°C of the preferred temperature; Magnuson and Destasio 1997). Bottom-dwelling species, such as flatfish, often experience less temperature variation and therefore, move less, while more mobile fishes, like bluefish (*Pomatomus saltatrix*), must seek out their thermal niche, which results in a broader distribution and greater movement (Cranshaw and O'Connor 1997). The greatest temperature-induced movement, however, occurs in species like Atlantic herring (*Clupea harengus*), which may migrate over 100 km in response to a 1°C temperature change (Cranshaw and O'Connor 1997). Locally, thermal refuge may be found in bottom waters; however, if oxygen levels drop below 5 mg/L, non-demersal animals may not remain in the bottom layer for long periods of time. Eventually, these animals would need to move farther offshore until temperatures dropped and oxygen increased in the fall. Warm-water fish species would likely benefit from the competitive advantage of being capable of utilizing the entire water column in the summer months, but may need to migrate southward during the winter. Benthic organisms are more vulnerable to stress due to temperature extremes or oxygen levels since they are less mobile. The existing conditions, as well as the potential impacts of dredge activities, are discussed for both benthos and fishes in the following sections.

4.1 BENTHIC COMMUNITY COMPARISONS

The findings of this study are consistent with previous studies and reports conducted in the FIMI Borrow Areas. Borrow Area 2C and parts of Borrow Area 5 were surveyed in two previous USACE projects. The Draft Benthic Invertebrate Survey: East of Shinnecock Inlet to east of Fire Island Inlet surveyed Borrow Area 2C and Borrow Area 5 (USACE 2004a). USACE's Benthic Invertebrate Survey: Napeague to East of Fire Island Inlet surveyed Borrow Area 2C and Borrow Area 5A and 5B were surveyed and reported together (USACE 2001). The East of Shinnecock Inlet to east of Fire Island Inlet survey characterized the dominant sediment type as sand but did not indicate the breakdown of coarse, medium, or fine sand and the Napeague to East of Fire Island Inlet survey did not provide the dominant sediment type. Although comparisons of the sediment type to these previous studies will not offer much detail, comparisons of benthic infauna data provided insight into trends in species richness, dominant species, species richness, and abundance.

4.1.1 BORROW AREA 2C

This study compared on-site samples to reference samples and benthic samples taken from the top inch of the benthic sample to a vertical "core" of the benthic grab. Bottom sediment in the Borrow Area 2C showed some variation between on-site and reference samples. Notably, for both seasons, only reference sites had fine-sized sand particles as the dominant grain size, while none of the on-site samples had fine-sized grains as the dominant sediment type. At this level of characterization, most of the whole grab samples and the top samples had the same characterization during the summer in Borrow Area 2C. Looking further, on-site whole samples had a significantly greater percentage of fine sand particles compared to on-site top samples during the summer, a pattern that was not evident in the fall. This indicates a possible shift from fine sand particles from summer to fall, and the potential that the fine sand particles were not confined to the top inch of the seafloor in this borrow area. Overall, for Borrow Area 2C, the sediment characterization was very similar between the summer and fall samples. For both seasons, the dominant sediment size was coarse sand for whole and top samples. The

increase in the number of top samples with medium-sized sand as the dominant sediment type and decrease in the number of top samples with coarse sand as the dominant type from summer to fall may be an indication that between the seasons, medium sand replaced or covered some of the coarse sand in the top layer of sediment in the borrow area. This change was only evident in the top sediment samples and not in the whole samples.

Offshore, continental shelf benthic communities are often diverse, especially along the eastern United States. A review by Allen Brooks et al. (2006) revealed that diversity was greater on the East Coast relative to the Gulf of Mexico. This paper also found a lack of strong correlation between species and sediment or depth. In this survey of Borrow Area 2C, Arthropoda were the most abundant in the summer, but the most abundant phylum in the fall was Annelida. This difference appeared to be driven by a shift in the dominant species found in the Borrow Area during the summer. Species richness (R) and abundance were significantly greater in summer samples compared to fall samples, but only on-site. At reference sites, however, there was no significant difference between seasons, although species richness and abundance did decrease slightly. This pattern of greater species richness and abundance is evident in the data provided in the Draft Benthic Invertebrate Survey: East of Shinnecock Inlet to east of Fire Island Inlet for Borrow Area 5 (2004a) and the data in the Benthic Invertebrate Survey: Napeague to East of Fire Island Inlet for Borrow Area 5A and 5B (USACE 2001) (Table 31) and is likely due to lower productivity which is typical in cooler months. Productivity starts to decrease in the fall in temperate climates when sunlight is limited and thermoclines develop which prevents the mixing of nutrients.

Table 31: Summary of Parameters and Comparison with Past Studies in New York Borrow Areas for 2C

Summary of Parameters and Comparison with Past Studies in New York Borrow Areas for 2C						
Parameters	**Current study**		**USACE (2004a)**		**USACE (2001)**	
	Jul 2015	**Oct 2015**	**Jun 2001**	**Nov 2000**	**Aug 1999**	**Dec 1999**
Borrow Area	2C		2C		2C	
Number of grabs	45	45	20	20	33	33
Dominant sediment	Coarse sand	Coarse sand	Sand◊	Sand◊	Not calculated	Not calculated
Avg H' diversity index	1.8	1.8	2.08	2.06	2.53	1.49
Dominant infauna	*Pseudunciola obliquua* (Arthropoda)	Nematode spp. (Nematoda)	Nematode spp. (Nematoda)	Polygoriidae spp. (Annelida)	*Polygordius triestinus* (Annelida)	*Polygordius triestinus* (Annelida)
Avg species richness	18	14	Not calculated	Not calculated	Not calculated	Not calculated
Avg individuals per grab	176.1	94	106.6	66.15	169.09	154.7

Note: Sand◊ = not described further. Current study used a 0.1-m^2 grab sampler; USACE 2001 and 2004a used 0.025-m^2 grab sampler.

4.1.2 BORROW AREA 5B

Bottom sediment in the Borrow Area 5B showed some variation between on-site, dredged box, and reference samples from summer to fall. An interesting point when comparing the different sites is that for both seasons, only one site had cobble or pebble as the dominant grain size and they were located in the dredged box. The presence of cobble and pebble only in the dredged box could indicate that these layers only occur in deeper layers of the sediment and previous dredging removed enough of the top layer of the seafloor to expose it. None of the whole dredged box samples had fine-sized grains as the dominant sediment type although one top dredged box sample did. Lower percentage composition of fine sand-sized sediment in the dredged box compared to on-site samples taken outside of the dredged box, and reference samples indicate that the previously dredged box is not currently filled in with fine sediment. Changes in the dominant sediment type indicate that there was a shift from medium sand to coarse sand from the summer to fall.

Looking further at percentage composition of sediment of whole and top samples reveals that whole, on-site samples (including the dredged box) had a significantly greater percentage of fine sand particles compared to top samples during the fall but not the summer. The difference is reflected in the decrease in fine sand in the top samples from the dredged box. This indicates the possibility that the top layer of the sediment in the dredged box containing fine sand was removed by the dredging process. The lower amount of fine sand in the dredged box compared to on-site samples is also evident in the summer. An alternative is that there was a shift from fine sand particles from summer to fall and the fine sand particles were not confined to the top inch of the seafloor in this borrow area. In addition, for both seasons on-site (including dredged box samples), top samples had a significantly greater percentage of medium sand particles compared to whole samples. Overall, for Borrow Area 5B the sediment characterization shifted between the summer and fall. For whole and top on-site samples the dominant sediment size was medium sand for on-site for summer and coarse for fall; coarse sand was dominant in the dredged box samples. For whole and top reference samples fine and medium sand were dominant in the summer and coarse sand was dominant in the fall.

Arthropoda was the most abundant phylum in the summer while Nematoda was most abundant in the fall. Species richness (R) and organism abundance were all greater in summer samples for all sample types. Species richness and abundance was significantly greater for on-site and dredged box summer values compared to fall. Abundance was significantly greater in the summer for reference sites. Diversity (H') was greater in the fall for on-site samples compared to summer samples. Using these batches of data as a proxy for overall comparisons to Borrow Area 5B shows that they are in general agreement (**Error! Reference source not found.**). This pattern of greater species richness and abundance is evident in the data provided in the Draft Benthic Invertebrate Survey: East of Shinnecock Inlet to east of Fire Island Inlet for Borrow Area 5 (2004a) and the data in the Benthic Invertebrate Survey: Napeague to East of Fire Island Inlet for Borrow Area 5A and 5B (USACE 2001). A decrease in species richness and abundance was observed in these surveys as well and is likely due to lower productivity which is typical in cooler months.

Table 32: Summary of Parameters and Comparison with Past Studies in New York Borrow Areas for 5B

Summary of Parameters and Comparison with Past Studies in New York Borrow Areas for 5B						
Parameters	**Current study**		**USACE (2004a)**		**USACE (2001)**	
	Aug 15	Oct 15	Nov 2000	Jun 2001	Jul 1999	Nov 1999
Borrow Area	5B		5		5A & 5B	
Number of grabs	45	45	20	20	31	31
Dominant sediment	Medium sand	Coarse sand	Sand◊	Sand◊	Not calculated	Not calculated
Avg H' diversity index	1.17	1.52	2.39	2.04	2.60	2.70
Dominant infauna	*Pseudunciola obliquua* (Arthropoda)	Nematode spp. (Nematoda)	*Gammarus oceanicus* (Arthropoda)	*Protohaustorius wigleyi* (Arthropoda)	*Protohaustorius wigleyi* (Arthropoda)	*Protohaustorius wigleyi* (Arthropoda)
Avg species richness	17	12	Not calculated	Not calculated	Not calculated	Not calculated
Avg individuals per grab	602.83	97.96	61.30	58.55	129.13	35.54

Note: Sand◊ = not described further. Current study used a 0.1-m^2 grab sampler; USACE 2001 and 2004a used 0.025-m^2 grab sampler.

4.2 Fisheries Considerations

The fishes collected in this study have both commercial and biological importance. This study revealed a high diversity of fishes, with 52 distinct species identified over four months of trawl sampling. Of these, 28 species have some commercial significance, based on the most recent information on landings in New York from 2014 (NOAA 2015a; Table 33). Additionally, four of the species collected in this study generated over $1 million in revenue last year: longfin squid, summer flounder, scup, and goosefish (Table 1). Since only one goosefish was captured, however, it will not be discussed further. Maintaining these populations ensures an economic resource for the local fishing fleet. Within the study area, various types of gear are used to target species. Landings data indicate that commercial dredge, gillnet, and pot have low landings from the study areas; commercial otter trawls land relatively higher catches (NYS DOS 2013). No landings are evident from longline or seine. Recreational charter and party boats have high use around the borrow areas (NYS DOS 2013).

Previous studies report that near both Borrow Areas, juvenile squid show medium abundance in both the spring and fall; adult squid, however, have moderate abundance near the study areas in the spring and medium abundance in the fall (NYS DOS 2013). Longfin squid spawn year round, with peaks in summer and winter. They have a short life span (around 6 to 8 months), and can grow up to 488 mm, but usually reach a maximum of 305 mm (NOAA 2015c). Most of the individuals captured were juveniles, with peak abundances in October in Borrow Area 2C and in July and October in Borrow Area 5B. This seasonal pattern of squid abundance was also observed in New York waters near the study area (USACE 2004b). In the New York Bight, summer flounder are typically found offshore in the spring and closer to shore in the fall (NYS DOS 2013), which was reflected in Borrow Area 5B, since the highest

catch of the species occurred in October. In Borrow Area 2C, summer flounder was most abundant in July. They spawn over open areas on the continental shelf during fall and winter. With sexes combined, half of the summer flounder population is sexually mature at 276 mm (MAFMC 2013a). Based on the lengths of the summer flounder in this study, it can be inferred that both juveniles and adults were collected. Scup move seasonally, from offshore in the winter to inshore in the summer. The greatest abundances of scup in Borrow Area 5B occurred in August; in Borrow Area 2C, the species was most abundant in the fall. Scup spawn once a year in the summer over weedy or sandy areas; 50% are sexually mature at 2 years, or about 170 mm total length (MAFMC 2013b). Both juveniles and adults are likely present in the study areas, since, accounting for the use of standard length as measurement, some of the larger fishes would probably be sexually mature.

Essential Fish Habitat (EFH) is designated by lifestage and is broadly defined in the 1996 Magnuson-Stevens Act as "water and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The Mid-Atlantic Fishery Management Council aims to designate EFH for each managed species in the study area. Ten of the captured fish species have EFH designated in the same area as the FIMI Borrow Areas (NOAA 2015b; Table 33). The Fire Island Stabilization Project EFH Assessment concluded that dredging and placement of dredged materials on beaches would not cause adverse effects to EFH-designated species of EFH in Borrow Areas 2C and 5B (USACE 2014a).

Table 33: Commercial Use and Essential Fish Habitat Overlap of Each Captured Fish Species

Commercial Use and Essential Fish Habitat Overlap of Each Captured Fish Species		
Species	**Commercial fishery**	**Essential Fish Habitat (EFH) in 2C and 5B**
American sand lance		
Atlantic croaker	x	
Atlantic menhaden	x	
Atlantic moonfish		
Atlantic silverside	x	
Atlantic stingray		
Black sea bass	x	x
Bluefish	x	x
Bluespotted cornetfish		
Butterfish	x	
Clearnose skate	x (skates)	
Cunner	x	
Dwarf goatfish		
Fourspot flounder	x	
Glasseye snapper		
Goosefish	x	
Gray triggerfish		
Lined seahorse		
Little skate	x (skates)	
Longfin squid	x	x
Naked goby		

Commercial Use and Essential Fish Habitat Overlap of Each Captured Fish Species		
Species	**Commercial fishery**	**Essential Fish Habitat (EFH) in 2C and 5B**
Northern kingfish	x	
Northern pipefish		
Northern puffer	x	
Northern searobin	x (searobins)	
Northern stargazer		
Oyster toadfish	x	
Planehead filefish		
Red hake	x	x
Rock gunnel		
Round scad		
Scrawled filefish		
Scup	x	x
Short bigeye		
Silver hake	x	x
Smallmouth flounder		
Smooth dogfish	x	
Snowy grouper		
Spiny dogfish	x	x
Spotfin butterfly fish		
Spotted hake		
Striped anchovy		
Striped burrfish		
Striped cusk-eel		
Striped searobin	x (searobins)	
Summer flounder	x	x
Tautog	x	
Twospot cardinal fish		
Weakfish	x	
Windowpane	x	x
Winter flounder	x	x
Winter skate	x (skates)	

Note: species in bold support a >$1 million fishery

The USACE Fire Island to Montauk Point Reformulation Study summarized finfish data from surveys conducted from 1999 to 2002 (2004b). The CPUE in the current study (CPUE based on the number of monthly trawls) and the USACE report CPUE (based on trawl hours) are not equivalent metrics but illustrate some interesting trends for some key species. This study reflected the same trends in catches as those reported in past trawl surveys discussed in the USACE report (USACE 2004b). This study and the USACE Fire Island to Montauk Point Reformulation Study caught summer flounder in greatest

abundance in the summer, and squid in greatest abundance in the fall. Anchovy catches were not reported USACE Fire Island to Montauk Point Reformulation Study, but they are important to coastal food webs. They feed on plankton and are then consumed by larger predators that often have commercial or recreational significance (e.g., striped bass, bluefish, and spotted seatrout) (Murdy et al. 1997). In the current study, striped anchovy was most abundant in Borrow Area 2C in September and in Borrow Area 5B in October.

There was considerable temporal variation in the species that were present every month. The number of species ranged from 17-28 species in Borrow Area 2C and 25-33 species in Borrow Area 5B, and quite a few were seen only once. This is also reflected in the fluctuation of the dominant species each month in both Borrow Areas. Similarly, abundance, indexed by CPUE, indicated that temporal changes were stronger than spatial variation since CPUE varied more from month to month rather than among areas (i.e., on-site and reference sites) within any given month.

4.3 Potential Impacts and Recovery in FIMI Borrow Areas

The marine offshore environment, particularly the sea floor, would be impacted by dredging activities due to an acute disturbance, followed by a period of recovery. Dredging removes the surface sediments, creating a shallow depression. Typically, following this type of disturbance, a diverse benthic infaunal community would recolonize from adjacent undisturbed areas within a matter of 3 months to 3 years (Allen Brooks et al. 2006; Byrnes et al. 2004; Lundquist et al. 2010).

Physically, bottom sediment is suspended during dredge activities, resulting in increased turbidity and decreased water quality. Suspended particles usually remain within 49 to 131 ft (15 to 40 m) of activity, so adjacent areas would be minimally impacted (Spencer 1997); however, local oceanographic features would 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 finer 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). The Borrow Areas 2C and 5B, which may be used for beach nourishment, are dominated by coarse- and medium-sized sand, so turbidity would be expected to be moderate. Therefore, dredge activities in this expansion site should not result in long-lasting sediment plumes. Excavation depths of borrow sites are similar to natural bathymetry and topography of New York's offshore environment, so the recovery of the physical system is expected to follow natural patterns (Byrnes et al. 2004).

Mobile macroinvertebrates, such as crab, jellyfish, and squid species, are likely to avoid and evade dredge equipment. Any organism that cannot escape the dredge, however, would experience immediate mortality. A few months of 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 usually occurs by an opportunistic species (either adult or larvae) from the surrounding area, if the sediment is similar (Boyd et al. 2005). The type of benthic organisms that are first to recruit may be affected by the timing of dredge activities; for example, ending dredge activities by spring would encourage the settlement of crustaceans, while ending in fall would benefit annelids (Diaz et al. 2004). A change in sediment size following sediment extraction may result in a restructuring of the marine benthic community (Desprez 2000). Although in Borrow Areas 2C and 5B it is expected that sediment of similar grain size will replenish the extracted sediment. The current environment of the Borrow Areas is primarily coarse- and medium-sized sand, and a change in the dominant sediment type may alter the

benthic community composition. Alternatively, if post-dredging sediment does not achieve physical stability, recovery of organisms may be stalled in an early successional stage (Boyd et al. 2005).

Although dredging usually impacts benthos more than fish populations due to differences in mobility, fish species may also be affected. A recent USACE borrow area assessment off the New Jersey coast found that the habitats of ocean pout, black sea bass, and the early life history stages of winter flounder may be directly impacted by dredging (USACE 2014b). Black sea bass and winter flounder were collected in this study, though in relatively small numbers. In addition to direct impacts, indirect trophic effects may also impact fishes, since benthic organisms are an important prey resource (Diaz et al. 2004). Following benthic invertebrate recolonization after dredging activity, though, most fishes would be expected to return to the area in similar numbers as nearby reference areas, with natural seasonal variation in community composition (USACE 2008). Since fish community composition in the Borrow Areas displayed variation among months, the timing of dredge activities will likely affect demersal species differently.

5.0 CONCLUSIONS

The recovery of this bottom habitat is contingent upon the homogeneity of the underlying sediment. Similar-sized sand particles are needed to provide habitat for invertebrates that make up the offshore benthic environment. Recolonization and the accumulation of biomass usually occurs quickly, but the complete recovery of species diversity usually takes longer, and depends on many factors, such as available sediment, hydrodynamics, nearby resources, and the intensity of dredging activity. This study found that the FIMI Borrow Areas have coarse- and medium-sized sand, so similar suitable habitat should be available and stable for the re-settlement of benthic infauna. This study revealed that overall, nearby sites have similar habitat and populations of benthic organisms, which could provide a source of recruits. The samples in the dredged box that contained pebble and cobble sediment in Borrow Area 5B were the outliers; 80% and of the dredged box samples did not contain pebble or cobble. If dredge activity occurs at a high intensity, the Borrow Areas would likely require a longer recovery period. Since the sediment type in part of the Borrow Areas changed from summer to fall, it is possible that the ability of organisms to recolonize may be affected. Greater impacts such as trophic effects are unlikely given the expected rapid recovery of benthos which provides an important prey resource for organisms such as crustaceans and fishes.

6.0 REFERENCES

Allen Brooks, R., C. N. Purdy, S. S. Bell, and K. J. Sulak. 2006. The benthic community of the eastern US continental shelf: A literature synopsis of benthic faunal resources. Continental Shelf Research 26:804-818.

ASTM International. 2007. Standard D422-63. Standard Test Method for Particle-Size Analysis of Soils. ASTM International, West Conshohocken, PA. www.astm.org.

Boyd, S. E., D. S. Limpenny, H. L. Rees, K. M. Cooper. 2005. The effects of marine sand and gravel extraction on the macrobenthos at a commercial dredging site (results 6 years post-dredging). ICES Journal of Marine Science 62:145-162.

Byrnes, M.R., R. M. Hammer, T. D. Thibaut, D. B. Snyder. 2004. Effects of Sand Mining on Physical Processes and Biological Communities Offshore New Jersey, U.S.A. Journal of Coastal Research 20: 25-43.

Cranshaw, Larry I., and Candace S. O'Connor. 1997. Behavioural compensation for long-term thermal change. *In* Global Warming: Implications for Freshwater and Marine Fish. Eds C. M. Wood and D. G. McDonald. Seminar Series-Society for Experimental Biology. Vol. 61. Cambridge University Press.

Desprez M. 2000. Physical and biological impact of marine aggregate extraction along the French coast of the eastern English Channel: short- and long-term post-dredging restoration. ICES Journal of marine Science 57:1428-1438.

Diaz, R. J., G. R. Cutter, C. H. Hobbs. 2004. Potential impacts of sand mining offshore of Maryland and Delaware: Part 2 – Biological Considerations. Journal of Coastal Research 20:61-69.

Lambert, J. and P. Goudreau. 1996. Performance of the New England hydraulic dredge for the harvest of Stimpson's surf clams (*Mactromeris polynyma*). Canadian Industry Report of Fisheries and Aquatic Sciences 235:28.

Lange, A. M. T. and K. L. Johnson. 1978. Dorsal Mantle Length – Total Weight Relationships of Squid (*Loligo pealei* and *Illex illecebrosus*) from the Northwest Atlantic, off the Coast of the United States. US Department of Commerce, National Oceanic and Atmospheric Administration. 60 pp.

Lundquist, C. J., S. F. Thrush, G. Coco, J. E. Hewitt. 2010. Interactions between disturbance and dispersal reduce persistence thresholds in a benthic community. Marine Ecology Progress Series 413: 217-228.

Magnuson, J. J. and B. T. Destasio. 1997. Thermal niche of fishes and global warming. *In* Global Warming: Implications for Freshwater and Marine Fish. Eds C. M. Wood and D. G. McDonald. Seminar Series-Society for Experimental Biology. Vol. 61. Cambridge University Press.

Malloy, Kirk D., and Timothy E. Targett. 1994. Effects of ration limitation and low temperature on growth, biochemical condition, and survival of juvenile summer flounder from two Atlantic coast nurseries. Transactions of the American Fisheries Society 123.2: 182-193.

Mid-Atlantic Fishery Management Commission (MAFMC). 2013a. Scup Advisory Panel Information Document. August 2013.

Mid-Atlantic Fishery Management Commission (MAFMC). 2013b. Summer Flounder Advisory Panel Information Document. August 2013.

Millero, Frank J. 2006. *Chemical Oceanography*. Third Edition. CRC Press. Boca Raton, FL.

Murdy, E. O., R. S. Birdsong, and J. A. Musick. 1997. Fishes of the Chesapeake Bay. Smithsonian Institution Press, Washington, DC.

Naqvi, S. M. and E. J. Pullen. 1982. Effects of beach nourishment and borrowing on marine organisms. US Army Corps of Engineers, Coastal Engineering Research Center, Fort Belvoir, VA.

National Oceanic and Atmospheric Administration (NOAA). 2003. Length-Weight Relationships for 74 Fish Species Collected during NEFSC Research Vessel Bottom Trawl Surveys, 1992-99. NOAA Technical Memorandum NMFS-NE-171. March 2003.

NOAA. 2015a. Commercial Fisheries Statistics. Accessed http://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/annual-landings/index on 11 November 2015.

NOAA. 2015b. Guide to Essential Fish Habitat Designations in the Northeastern United States. Accessed http://www.greateratlantic.fisheries.noaa.gov/hcd/index2a.htm on 11 November 2015.

NOAA. 2015c. Longfin Squid. FishWatch, U.S. Seafood Facts. Accessed http://www.fishwatch.gov/profiles/longfin-squid on November 2015. Last updated 22 July 2014.

New York State Department of State (NYS DOS). 2013. New York Department of State Offshore Atlantic Ocean Study. July 2013.

Page, L. M., H. Espinosa-Pérez, L. T. Findley, C. R. Gilbert, R. N. Lea, N. E. Mandrak, R. L. Mayden, and J. S. Nelson. 2013. Common and Scientific Names of Fishes from the United States, Canada, and Mexico. 7th Edition. American Fisheries Society Special Publication 34. 243 p.

Pelletier, M., A. J. Gold, J. F. Heltshe, H. W. Buffum. 2010. A method to identify estuarine macroinvertebrate pollution indicator species in the Virginian Biogeographic Province. Ecological Idicators 10:1037-1048.

Robinette, H. R. 1983. Species Profiles: Life Histories and Enfironmental Requirements of Coastal Fishes and Invertebrates (Gulf of Mexico), Bay Anchovy and Striped Anchovy. Department of Wildlife and Fisheries, Mississippi State University. Study performed for the US Fish and Wildlife Service and US Army Corps of Engineers. October 1983.

Ruffin, K. K. 1995. The effects of hydraulic clam dredging on nearshore turbidity and light attenuation in Chesapeake, MD. University of Maryland.

Spencer, B. E. 1997. Clam cultivation: Localized environmental effects: Results of an experiment in the river Exe, Devon (1991-1995). Ministry of Agriculture, Fisheries and Food, Directorate of Fisheries Research, Fisheries Laboratory, Conwy.

Tarnowski, M. 2006. A literature review of the ecological effects of hydraulic escalator dredging. Fisheries Technical Report Series Number 48. 30 pp.

USACE. 2001. Benthic Invertebrate Survey: Napeague to East of Fire Island Inlet. US Army Corps of Engineers, New York District. New York, NY. August 2002. Prepared by EEA, Inc.

USACE. 2004a. Draft Benthic Invertebrate Survey: East of Shinnecock Inlet to East of Fire Island Inlet. US Army Corps of Engineers, New York District. New York, NY. July 2004.

USACE. 2004b. Fire Island Inlet to Montauk Point Reformulation Study: Compilation and Comparative Analysis of Physical and Biological Characteristics of Available Sand Sources. US Army Corps of Engineers, New York District. New York, NY. October 2004.

USACE. 2008. West of Shinnecock Inlet and "Bypass Area" Shore Protection Projects: Post-Construction Monitoring – Final Finfish/Epibenthic Invertebrate Data Report (2004-2008). US Army Corps of Engineers, New York District. New York, NY. September 2008.

USACE. 2014a. Fire Island Inlet to Moriches Inlet Fire Island Stabilization Project, Essential Fish Habitat Assessment, Attachment B to the Final Environmental Assessment. US Army Corps of Engineers, New York District. New York, NY. May 2014.

USACE. 2014b. Manasquan Inlet to Barnegat Inlet Storm Damage Reduction Project, Ocean County, NJ, Final Environmental Assessment. US Army Corps of Engineers, Philadelphia District. Philadelphia, PA. May 2014.

This Page Intentionally Left Blank

Appendix A – Field Data Sheets

Placeholder for Appendix A

Appendix B – Water Quality Data

Placeholder for Appendix B

Appendix C – Benthic and Trawl Site Coordinates

Placeholder for Appendix C

Appendix D – Raw Laboratory Data; Grain Size

Placeholder for Appendix D

Appendix E – Raw Laboratory Data; Benthic Infauna

Placeholder for Appendix E

Appendix F – Subcontractor Information

SUBCONTRACTOR INFORMATION

Tootser Seafood – Vessel, Captain & Mate
1674 Harvard Ave.
Brick, NJ 08724

APPENDIX M

DRAFT FISH AND WILDLIFE COORDINATION ACT REPORT

PRELIMINARY DRAFT FISH AND WILDLIFE COORDINATION ACT 2 (b) REPORT
FIRE ISLAND INLET TO MONTAUK POINT
REFORMULATION STUDY PROJECT

Prepared for:
U.S. Army Corps of Engineers
New York District
New York, New York

Prepared by:
Department of the Interior
U.S. Fish and Wildlife Service
Long Island Field Office
Shirley, New York

Preparer: Steve Sinkevich
New York Field Office Supervisor: David A. Stilwell

June 2016

EXECUTIVE SUMMARY

This preliminary 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. This DFWCAR provides the Service 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.

The Corps provided a project description in their August 10, 2015, correspondence, and in their Draft Environmental Impact Statement (DEIS) (U.S. Army Corps of Engineers 2016a) and Draft General Re-Evaluation Report (DGRR) of April, 2016 (U.S. Army Corps of Engineers 2016b). The Corps had indicated that the Tentatively Selected Plan (TSP) design in their August 10, 2015, correspondence was at a 15 percent design level of completion. It is not clear what the design level is in the current DEIS and DGRR. The Service continues to review these documents at this time, requesting additional detail as needed and providing recommendations. As a result, this draft does not, at this time, constitute the final report of the Secretary of the Interior as required by section 2(b) of the FWCA.

The TSP, as proposed, would have both short and long-term impacts to fish and wildlife resources which, as proposed, are not adequately mitigated, thus would result in a net loss for natural/fish and wildlife resources. In addition, we encourage the Corps to fully incorporate ecosystem services analyses into the decision making process as per the Presidential Memorandum M-16-01.

Among the impacts, the Corps' preferred project will have both direct and indirect adverse impacts on fish and wildlife resources and their supporting ecosystems. Initial beach fill will directly impact subaerial, nearshore intertidal, and subtidal marine habitats and subaqueous borrow areas. These impacts include burial of benthic organisms, turbidity, and modification of habitats.

In the long-term, the beach fill/dune construction plan will have cumulative impacts extending after the end of the nourishment project, causing adverse impacts on fish and wildlife habitat and the overall condition of the barrier island through reduction in the frequency and magnitude of coastal sediment processes which maintain the barrier islands as natural protective features. These coastal processes contribute to barrier island resiliency which contributes to the protection of Long Island's south shore from direct influences of ocean waves and also create and maintain a natural balance among various terrestrial and estuarine habitat types, vegetation cover types, and fish and wildlife species.

The best available science does not support the concept that closing or preventing all breaches and overwashing of the barrier island will provide benefits to shorebird populations. The DEIS indicates that overwash habitats are optimal habitats for the federally-listed species in the study area, which is well known from research spanning back to the late 1980s (Patterson 1988; Loergering and Fraser 1995; Elias-Gerken *et al.* 2000; Cohen *et al.* 2009); however the TSP does not evaluate or propose alternatives that would allow for the formation of these habitats except for within a limited area within the Fire Island National Seashore (FIIS).

Apart from the small-scale restoration of wetlands targeted for the mainland, proposed as coastal process features, there does not appear to be any substantial, landscape level evaluation of wetland restoration opportunities for mainland marshes. Accordingly, additional coordination during subsequent planning, engineering, design, and construction phases of the project will be required.

Breaching and overwashing are critical to the long-term resiliency of the barrier islands and wetland growth and sustainability and yet cross island sediment transport is not proposed as a key element of the project. We continue to recommend that the Corps develop a comprehensive breach management plan which includes alternatives that address the importance and benefits of barrier island breaching and overwashing (cross island sediment transport), and evaluate plans that achieve these benefits.

The FIMP should be consistent with the recent Presidential directive entitled, "Mitigating Impacts on Natural Resources From Development and Encouraging Related Private Investment" (Federal Register Vol. 80, No. 215; Friday, November 6, 2015). Accordingly, "Agencies' mitigation policies should establish a net benefit goal or, at a minimum, a no net loss goal for natural resources the agency manages that are important, scarce, or sensitive, or wherever doing so is consistent with agency mission and established natural resource objectives. Additionally, the proposed coastal process features do little to mitigate for the impacts of the TSP and the Service recommends additional features be designed to address these impacts. Due to the above referenced issues, the Service has concerns regarding the TSP as described in this DFWCAR. We will continue to work with the Corps to resolve them.

Finally, this report does not constitute a Biological Opinion under Section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq*.). A detailed discussion of the impacts of the proposed project on the federally-listed threatened piping plover (*Charadrius melodus*; threatened), red knot (*Calidris canutus rufa*; threatened), roseate tern (*Sterna dougallii dougallii*; endangered), and seabeach amaranth (*Amaranthus pumilus*; threatened) will be addressed in the Service's forthcoming Biological Opinion. The Service will also be providing additional comments within the Department of the Interior's consolidated comments on broader issues pertaining to the GRR and DEIS.

I. PROJECT PURPOSE, SCOPE, AND AUTHORITY

The Fire Island Inlet to Montauk Point (FIMP), NY, Combined Beach Erosion Control and Hurricane Protection Project (Location depicted in Figure 1) was originally authorized by the River and Harbor Act of 14 July 1960 in accordance with House Document (HD) 425, 86th Congress, 2nd Session, dated 21 June 1960, which established the authorized overall FIMP project. The authorized project 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 by widening the beaches along the developed areas to a minimum width of 100 feet (ft), with an elevation of 14 ft above mean sea level, and by raising dunes to an elevation of 20 ft above mean sea level, from Fire Island Inlet to Hither Hills State Park, at Montauk and opposite Lake Montauk Harbor. This construction would be supplemented by grass planting on the dunes, by interior drainage structures at Mecox Bay, Sagaponack Lake, and Georgica Pond and the construction of up to 50 groins, and by providing for subsequent beach nourishment for a period of ten years, as amended.

This authorization has been modified by section 31 of the Water Resources Development Act (WRDA) of 1974 (Public Law [PL] 93-251), and sections 103, 502, and 934 of the WRDA of 1986 (PL 99-662), which principally impact cost-sharing percentages and the period of renourishment. The project is also presented in this report considering the cost-sharing provisions within PL 113-2 of January 29, 2013, Disaster Relief Appropriations. The initial construction cost in accordance with the provisions of PL 113-2 is 100 percent federal. PL 113-2 states that "the completion of ongoing construction projects receiving funds provided by this division shall be at full Federal expense with respect to such funds.

The authorized project was developed and implemented along five reaches. These reaches are used in the description of the implementation of the project, and are as follows:

Reach 1 – Fire Island Inlet to Moriches Inlet (FIMI)
Reach 2 – Moriches Inlet to Shinnecock Inlet
Reach 3 – Shinnecock Inlet to Southampton
Reach 4 – Southampton to Beach Hampton
Reach 5 – Beach Hampton to Montauk Point"

A portion of the FIMP project was built between 1965 and 1970 when 15 groins plus beach fill were constructed in Westhampton Beach and two groins were constructed in the vicinity of Georgica Pond in Southampton.

<u>Reformulation of Authorized Plan: 1977 EIS Council on Environmental Quality Referral</u>

As stated in the introduction, the FIMP is being reformulated both in response to earlier recommendations from the President's Council on Environmental Quality (CEQ) and in fulfillment of the Corps' Engineering Regulation 1105-200-2. An Environmental Impact Statement (EIS) for the FIMP project was previously released by the Corps in 1977 that

proposed work in the area west of Shinnecock Inlet as depicted in Figure 3. Subsequently, the DOI, in conjunction with the U.S. Environmental Protection Agency (USEPA) and the National Oceanic and Atmospheric Administration/Fisheries (NOAA/F), referred the final EIS to the President's CEQ based on their findings that the document inadequately addressed systemic environmental impacts, including impacts to the future condition of the barrier islands, and failed to evaluate all reasonable alternatives. The CEQ informed the Corps that the EIS was "environmentally unacceptable and that the Corps has not demonstrated that there are no practicable alternatives available." The CEQ also stated, "Because the entire project area is a system, it would be disingenuous to treat these issues solely in connection with a particular segment of the shore." The CEQ concluded with the recommendation that "the Corps revise its overall project plan to create an adequate framework within which subsequent detailed planning for specific parts--or reaches--might occur." That is, reach by reach planning was to follow an overall understanding of the environmental consequences of the proposed project, not to precede them.

In response to the CEQ decision, the Corps proposed a plan of study for project reformulation in 1980. However, that effort was suspended until the early 1990s due to cost sharing issues between the state of New York (State) and the Corps.

II. RELEVANT PRIOR AND ON-GOING STUDIES/REPORTS/FEDERAL PROJECTS

A. Federal Projects

Additional proposed or constructed federal projects within the FIMP project area are described below. As per the National Environmental Policy Act (NEPA), these actions should be considered in the Corps' cumulative effects analysis for the proposed project.

1. Fire Island Inlet to Moriches Inlet Fire Island Stabilization Project (FIMI)

The Corps' FIMI project is an engineered dune and beach system which is planned for 19 miles (mi.) of Fire Island's beaches (U.S. Army Corps of Engineers 2014a). The proposed project includes dredge material placement in existing overwash habitat in the project area (Figure 2). It will also prevent the formation of new overwash habitats. The project will occur in many breeding and growing areas for endangered species, and will result in significant short and long term changes to their nesting, foraging, and chick rearing habitats. The volume of sand in the proposed project, approximately 7,000,000 cubic yards (cy), would represent the largest single project ever construction on Fire Island and would be accomplished at a full federal cost of about $185,000,000 (U.S. Army Corps of Engineers 2013 [LRR Report]). Sand for dune and beach construction would be obtained from designated offshore sand mining areas. The construction schedule would entail continuous dredging, sand placement, dune building, and beach construction over 2 consecutive years.

Refer to the Corps' Limited Re-Evaluation Report (U.S. Army Corps of Engineers 2013) for a more detailed description of the FIMI project.

A detailed discussion of the impacts of the FIMI on the federally-listed piping plover (*Charadrius melodus*; threatened), roseate tern (*Sterna dougallii dougallii*; endangered), and the seabeach amaranth (*Amaranthus pumilus*; threatened) were transmitted to the Corps as a Biological Opinion on May 23, 2014. A detailed discussion of the impacts of the FIMI on other fish and wildlife resources were transmitted to the Corps as a FWCA Report on June 18, 2014 (U.S. Fish and Wildlife Service 2014).

2. National Park Service Fire Island National Seashore New York's Wilderness Breach Management Plan/EIS

The National Park Service (NPS) Fire Island National Seashore (FIIS) is in the process of determining if the breach in the Otis Pike Fire Island High Dune Wilderness Area, opened during Superstorm Sandy, should be closed. FIIS is preparing an EIS to assist in the decision making process. The EIS will evaluate the following initially identified alternatives: leave the breach open and managed under natural conditions; close the breach; leave the breach open and establish procedures for closing the breach if certain conditions occur; stabilize the breach to provide a permanent inlet. The decision making process is currently in the scoping phase. FIIS is reviewing the public comments and plans on completing the draft EIS and having it available for public review in the summer of 2016 (National Park Service 2015).

3. 30-year Westhampton Interim Storm Damage Protection Project

Initial construction of the Westhampton Interim Project was initiated and completed in the Summer of 1996 and the Fall of 1997, respectively. This project followed a breach during the Winter of 1992 and 1993. Initial construction entailed beach fill/dune construction over 21,460 ft of beach and the realignment of the two western most groins of the 15 groins that were constructed between 1965 and 1970. Over 4,480,000 cy of sand were dredged from offshore borrow areas to complete the initial phase. Renourishment of the design profile will occur on an average of every 3 years, initially requiring 981,000 cy and approximately 1,179,000 cy for each renourishment thereafter. Refer to the Corps' website (http://www.nan.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/11241/Article/487483/fact-sheet-fire-island-to-montauk-point.aspx) for a detailed description of the project.

4. Breach Contingency Plan (BCP)

In addition to the larger scale, longer term, interim proposals and projects, the Corps and other interested Federal, State, and local governments developed the BCP for the 50 mi. of barrier beach (Fire Island Inlet to Southampton Barrier Spit) within the FIMP Reformulation Study area for the purpose of closing breaches in an expedited manner. The Biological Opinion for the BCP has expired and the Corps is required to reinitiate Section 7 of the Endangered Species Act (ESA) consultation in order to lawfully continue to implement this plan.Breach response is a component of the FIMP and will be reassessed in the biological opinion for the currently proposed project.

In October of 2012, Superstorm Sandy created three breaches and extensive overwash areas on the eastern end of Fire Island. Three breaches formed on Fire Island at Smith Point (40.750156N, -72.811806W), Old Inlet (40.723509N, -72.894704W), and eastern Fire Island Pines (40.667489N, -73.055264W). Based upon Service personnel observations, the breach at Smith Point was a relatively small breach that did not appear to exhibit exchange of ocean and bay waters at low tide, but was closed by the Corps under the provisions of the Corps' BCP in December of 2012. The breach at Old Inlet remains open and options concerning its management are being explored by the NPS in accordance with the Fire Island Wilderness Act of 1983 (Public Law 95-585) and NEPA. The breach at eastern Fire Island Pines did not require any action under the Corps' BCP as no exchange of bay and ocean water was observed after the storm passed and tidal levels subsided.

5. Fire Island Inlet Federal Navigation Project authorized in 1948 and Shore Westerly Project (Corps; Active)

DESCRIPTION: This is a multi-purpose project that provides navigation and shore protection benefits through the periodic maintenance dredging of Fire Island Inlet with placement of dredged sand along the shoreline several miles west of the inlet at designated barrier island's critical erosion area [Gilgo Beach]. The sand placed at Gilgo is intended to nourish the westerly beaches and provide storm damage protection.

Refer to the Corps' web site: (http://www.nan.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/11241/Article/10863/fact-sheet-fire-island-inlet-and-shores-westerly-to-jones-inlet-new-york.aspx) for a more detailed description of the project..

6. Long Island Intracoastal Waterway, New York-Federal Navigation Channel

Authorization/Project Description: The Rivers and Harbors Act of August 26, 1937 authorized the Long Island Intracoastal Waterway Federal Navigation Project. The existing project provides for a navigation channel 6 ft deep, 100 ft wide from the Federally-improved channel in Great South Bay, opposite Patchogue, to the south end of Shinnecock Canal. The lengthy 33.6-mi. project traverses the inland waters through the Great South Bay, the Bellport Bay, the Narrow Bay, the Moriches Bay, the Quantuck Bay and the Shinnecock Bay.

Refer to the Corps' web site: (http://www.nan.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/11241/Article/9192/fact-sheet-long-island-intracoastal-waterway-new-york-federal-navigation-channel.aspx) for a detailed description of the project.

7. Moriches Inlet Navigation Project

Authorization/Project Description: The Moriches Inlet Project was authorized by the Rivers and Harbors Act of 1960 and the 1985 Supplemental Appropriation Act. The existing Moriches Inlet Federal Navigation Project provides for a channel, 10 ft deep, 200 ft wide, extending from that depth in the Atlantic Ocean to Moriches Bay, at a length of approximately 0.8 mi., and a channel,

6 ft deep, 100 ft wide, to the Long Island Intracoastal Waterway, length approximately 1.1 mi.. In addition, the project includes a deposition area at the entrance of the channel, 14 ft deep plus 2 ft overdepth, 350 ft wide, and 3,000 ft in length.

Refer to the Corp's Corps web site: (http://www.nan.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/11241/Article/8248/fact-sheet-moriches-inlet-new-york-maintenance-and-stewardship.aspx) for a detailed description of this project.

8. West of Shinnecock Inlet Interim Storm Damage Protection Project

The West of Shinnecock Inlet Storm Damage Protection Project was developed as an interim plan by the Corps to provide protection of the eastern end of Westhampton Island until the FIMP Study was completed. The project includes beach nourishment along the 4,000 ft long shoreline immediately west of Shinnecock Inlet, as a means to mitigate for the loss of beach resulting from the construction of the Federal Shinnecock Inlet Jetty Project. The project initially included periodic renourishment every 2 years for a period of 6 years. The Corps constructed the West of Shinnecock Inlet Interim project in 2005, placing approximately 610,000 cy of sand. The project consisted of dunes with a crest of 15 ft above National Geodectic Vertical Datum (NGVD) and a 90-ft-wide beach berm.

Refer to the Corps' website: (http://www.nan.usace.army.mil/Portals/37/docs/civilworks/SandyFiles/Army%20Corps%20West%20of%20Shinnecock%20Inlet_FCCE_FactSheet.pdf) for a detailed description of the project.

9. Great South Bay Federal Navigation Channel Maintenance Dredging Project

This project, authorized by the Rivers and Harbors Act of 13 June 1902 and modified in 1970, involves the Corps-implemented dredging of approximately 100,000 cy of beach-compatible sand from the Great South Bay Federal Navigation Channel. The placement site for the sand dredged material is located on the ocean-side beachfront of RMSP, specifically fronting the water tower between fields 3 and 4. This maintenance dredging project was last completed in 2014, when ere approximately 60,000 cy of sand dredged material was placed below the Spring High Water line (and the remaining 40,000 cy placed above the Spring High Water Line) across approximately 900,000 square ft of beach. Prior to the 2014 effort, this project was last completed in 1992 and will continue in the future as needed,

Refer to the Corps' website: (http://www.nan.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/11241/Article/487353/fact-sheet-great-south-bay-new-york-maintenance-of-infrastructure-stewardship.aspx) for a detailed description of the project.

B. Federally-Authorized Local Actions

The Corps Regulatory Division: Issuance of permits under section 404 of the Clean Water Act (CWA) and section 10 of the Rivers and Harbor Act (RHA), including Suffolk County

Department of Public Works (SCDPW) Channel Maintenance Dredging and beach disposal projects (21 sites/projects in the Town of Islip and 33 in the Town of Brookhaven, as per Ethan C. Eldon Associates, Inc. 1995). Specific volumes of dredged and placed material were not available during the time of this report preparation but an estimated 6. 5 million cy of dredge material from back bay navigational channels/creeks were placed on Fire Island from 1949-1980 (Suffolk County Planning Department 1985).

Additionally, the Corps' regulatory district authorizes dredging projects within the FIMP project area. The following are recent examples of (but are not limited to) such projects:

1. 2011-2016: Captree Boat Basin Dredging

The Corps Regulatory Division authorized the on-going Captree Boat Basin Project which involves the dredging of navigable waters in the Captree Boat Basin located in western Great South Bay, with dredge material placement on the ocean shoreline of Fire Island in Robert Moses State Park (RMSP). Specifically, a Corps permit was issued to the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP) in 2011 for 10-year maintenance dredging, via hydraulic dredge, of approximately 169,000 cy of material from the irregularly shaped East Captree Channel, with dredge material placement on ocean beaches in RMSP or placed in state-approved upland designated surplus material areas. The Corps issued a modification to expand the authorized dredging area and prism for an additional 320,000 cy of material for emergency shoreline repair work needed in response to Superstorm Sandy and completed section 7 of the ESA consultation (Service correspondence dated March 6, 2013). Dredging for this portion of the project (the east channel) was completed in April-May of 2013 with dredge material placement in Fields 4 and 5 of RMSP.

The NYSOPRHP requested a second modification for 10-year maintenance dredging of an additional 400,000 cy from the Captree State Channel west of the Robert Moses Bridge (NY District Corps Public Notice No. [PN] NAN-2010-00491-M2, published July 17, 2013). The irregularly-shaped West Captree Channel is approximately 400 ft by 3,550 ft in length and will be dredged, via hydraulic dredge, to a depth of approximately 14-ft below mean low water. The dredged materials will be pumped directly on approximately 12,000 linear ft of ocean beaches in RMSP (figure included in the PN depicts an area between Fields 2 and 3, eastward to 5), or the dredged material will be placed in state-approved upland designated surplus material areas (figure included in the PN depicts an area just west of Field 4 of RMSP). Approximately 108,000 cy of material would be deposited below the Spring High Water (SHW) line. This work was completed by the spring of 2014.

The total volume of sand authorized to be dredged from the Captree Boat Basin is, therefore, 889,000 cubic yards.

The stated purpose of the proposed action is to maintain safe navigable water depths for the vessels that use the waterway by removing sand shoaling resulting from Superstorm Sandy and provide beach nourishment for adjacent beaches damaged by Superstorm Sandy.

NYSOPRHP also applied for a Corps' permit in July of 2015 to dredge approximately 122,600 cy of beach compatible sand from another section of the Captree State Park Boat Channel, west of the above described dredging between Seganus Thatch and Oak Islands in Great South Bay north of Democrat Point. The proposed dredge area is approximately 5,100 ft in length, ranges in width from approximately 200 ft to 300 ft and extends to a maximum depth of 14 ft below the plane of Mean Low Water (MLW). The proposed placement sites for the sand dredged material are located in an existing stockpile area just north of the primary dune and at Fields 4 and 5 of RMSP for future beach nourishment (NY District Corps PN NAN-2015-00768-EBO, published July 16, 2015).

NYSOPRHP plans on conducting the dredge operation in the winter/early spring of 2015-2016.

2. 2015: Incorporated Village of Quogue Beach Nourishment Project

The applicant, the Incorporated Village of Quogue, requested authorization from the Department of the Army in July of 2015 for a one-time proposed borrow area dredging and sand beach placement event in the Atlantic Ocean, Village of Quogue, Town of Southampton, Suffolk County, New York.

Specifically, the proposed work, as described in the PN, would involve:

Dredging, via hydraulic cutterhead or hopper dredge, approximately 1,100,000 cy of beach compatible sand fill from an offshore sand borrow area located approximately 2 mi. offshore of the beach. Dredged material to be placed on the Atlantic Ocean shoreline along an approximately 14, 325 linear ft area in the Village of Quogue. Approximately 1,007,160 cy of dredged material would be placed waterward of the SHW Line over approximately 125 acres.

If used, a hydraulic cutterhead dredge would be connected by submerged pipe line to the shoreline. If used, a hopper dredge would collect sand in a hold and discharge the sand via submerged pipeline connected to the shoreline.

The proposed sand borrow area is located in the Atlantic Ocean, in waters approximately 40-60 ft deep. The applicant proposes to dredge approximately 7 ft below grade in the borrow area.

The applicant has stated that they have avoided, minimized, and mitigated for proposed impacts to the maximum extent practicable by matching the physical substrate with existing native material and proposing a no-work window from March 16 to September 30 of any calendar year.

The stated purpose of this project is to stabilize the shoreline, improve the beach-dune system and off-set chronic erosion.

This project is still being reviewed by the Corps, who is coordinating with the New York State Department of Environmental Conservation (NYSDEC) in their authorization process (NY District Corps PN NAN-2012-00011-EHA, published July 6, 2015).

3. 2015: Shinnecock Inlet Cut East Navigation Channel Dredging Project

The applicant, SCDPW, has requested authorization from the Department of the Army for the proposed dredging of approximately 107,000 cy of beach compatible sand from the Shinnecock Inlet Cut East Navigation Channel (in Shinnecock Bay adjacently northeast of the inlet). The dredge material will be placed on beaches located west of Shinnecock Inlet (on the Westhampton barrier island) and on the Shinnecock Nation Beach (within Shinnecock Indian Reservation). The applicant proposes to place 25,000 cy of sand dredged material will be placed as beach nourishment on the Shinnecock Nation Beach, of which approximately 10,000 cy are expected to fall below the plane of MHW line due to uncontrolled hydraulic slope. It is proposed that approximately 82,000 cy of dredged material be placed as beach nourishment on the beach west of Shinnecock Inlet, of which approximately 21,600 cy are expected to fall below the plane of MHW line due to uncontrolled hydraulic slope (NY District Corps PN NAN-2015-01093-EYR, published September 10, 2015).

4. 2013-2014: Bridgehampton-Water Mill Erosion Control District Beach Nourishment Project

The applicant, Bridgehampton-Water Mill Erosion Control District, Town of Southampton, requested Department of the Army authorization (NY District Corps PN NAN-2012-01095-EBO, published November 29, 2012) for the dredging of approximately 950,000 cy of sand from an offshore borrow area and placed along 15, 626 linear ft of eroded dunes and beach in the Hamlets of Bridgehampton and water Mill, Town of Southampton, Suffolk County, New York.

The work, as described in the PN, involved:

Dredging approximately 950,000 cy of clean compatible sand fill from an offshore sand borrow source and place the material on the shoreline and shape it into a design beach and dune fill along approximately 15,626 linear ft of Atlantic Ocean shoreline.

The sand was shaped with bulldozers into the final design template. Thereafter, the beach was shaped by natural wind, wave and tidal forces.

There are 4 offshore sites totaling 380 ac. proposed. The sites are collectively located in the same area identified by the Corps as Borrow Area in the FIMP and also identified in the Sagaponack Erosion Control District Beach Nourishment Project described below. The sand volume needed for this project was achieved by dredging 7-ft deep in an approximate area of 100 ac. defined within the 380-ac. borrow site.

Construction occurred from October 1 of 2013 to March 15 of 2014.

5. 2013-2014: Sagaponack Erosion Control District Beach Nourishment Project

The applicant, Sagaponack Erosion Control District, Town of Southampton, requested Department of the Army authorization (NY District Corps PN NAN-2012-01092, published on November 20, 2012) for the dredging of approximately 1,035,000 cy of sand from an offshore

borrow area and placed along 14,125 linear ft of eroded dunes and beach in the Hamlet of Sagaponack, Town of Southampton, Suffolk County, New York.

The proposed work, as described in the PN, involved:

Dredging approximately 1,035,000 cy of clean compatible sand fill from an offshore sand borrow source and place the material on the shoreline and shape it into a design beach and dune fill along approximately 14,125 linear ft of Atlantic Ocean shoreline.

The sand was shaped with bulldozers into the final design template. Thereafter, the beach was shaped by natural wind, wave, and tidal forces.

There are 4 offshore sites totaling 380 ac. proposed. The sites are collectively located in the same area identified by the Corps as Borrow Area in the FIMP. The sand volume needed for this project will be achieved by dredging 7-ft deep in an approximate area of 100 ac. defined within the 380-ac. borrow site.

Construction occurred from October 1 of 2013 to March 15 of 2014.

6. 2013: New York State Department of Transportation (NYSDOT) Emergency Repair of Ocean Parkway

Under authority of the Corps Regional General Permit Number 15, Authorizing Remedial Activities Undertaken in Response to Major Storms: The NYSDOT hydraulically dredged approximately 790,000 cy of sand from Fire Island Inlet Federal Navigation Channel for the expedited repair/replacement to pre-storm conditions of Ocean Parkway, RMSP Traffic Circle, and adjacent Atlantic Ocean shorelines damaged by Hurricane Sandy, including dune systems and the Atlantic Ocean beaches seaward of dunes. Approximately 566,000 cy of dredged material were placed along Ocean Parkway and 224,000 cy in the vicinity of the Robert Moses Causeway Traffic Circle and Field 5 of RMSP in the Spring of 2013.

7. 2008: Fire Island Short-term Protection Project

This project addressed short-term storm surge protection for 5 mi. of ocean beach fronting the Fire Island National Seashore (FIIS) Communities by using beach scraping and beach nourishment for the period between 2008 and 2013. Over 1.8 million cy of dredged material was obtained from offshore borrow areas to construct the project. The intention was to: (1) provide protection for residential, commercial, and municipal structures, as well as public infrastructure within the communities from storm waves, tidal and wave surges, and flooding; (2) provide or improve beach width adequate for safe vehicular passage during all tidal cycles; and (3) enhance recreational use of the beaches (National Park Service 2008).

C. Completed and On-Going Studies/Reports

Refer to the following NY District Corps website for a complete list of studies/reports that the Corps has completed for the FIMP study:

http://www.nan.usace.army.mil/Missions/CivilWorks/ProjectsinNewYork/FireIslandtoMontaukPointReformulationStudy/FIMPReports.aspx

Additional studies currently being conducted within the FIMP study area are listed as follows:

1. Virginia Tech Shorebird Project

Response of Piping Plovers and their Invertebrate Prey to Habitats Created By Hurricane Sandy (On-going, initiated in 2013): The goal of this project is to provide a broader ecological understanding of the ways in which breaches and Corps breach-fill projects affect piping plover populations and their invertebrate prey communities by comparing the dynamics of bird use and invertebrate densities in a breach area, two filled breach areas, overwash areas, and other areas. Ultimately the results will help refine the understanding of the time frame and manner in which piping plover habitat develops and persists.

In addition to monitoring breeding piping plovers, a key goal in the first year of the study was to band piping plover adults and chicks to allow comparison of the relative contribution of local recruitment versus immigration to population growth in storm-created habitat and artificially closed breaches in subsequent years of the study.

2. The Great South Bay Project

The Great South Bay Project sponsored by Stony Brook University and the NYSDOS, has been collecting water quality data in Great South Bay prior to and after Hurricane Sandy. The goal of this program is to gain a thorough understanding of the biogeochemistry of the Bay and its effect on pelagic and benthic communities. Currently this effort is supported by the NYSDOS in which observations and models are combined in support of the development of an ecosystem based management approach to address the ecological problems besetting the Bay.

3. Horseshoe Crab Monitoring

The NYSDEC and Cornell University Cooperative Extension are conducting on-going surveys of horseshoe crab spawning and migratory shorebirds in Jamaica Bay, south shore of Long Island sites (Moriches Bay), Peconic Estuary, and North Shore of Long Island sites to address the need in assessing and managing these resources in coastal New York State (http://www.nyhorseshoecrab.org/).

III. DESCRIPTION OF THE STUDY AREA

A. Study Area

The FIMP study area extends from Fire Island Inlet easterly to Montauk Point along the south shore of Long Island and Atlantic Coast of Suffolk County and is approximately 83 mi. long (U.S. Army Corps of Engineers 1997). The western and central portion of the study area are part of a barrier island system, composed of narrow, sandy beaches and peninsulas separated from the

mainland by shallow bays (Tanski 2007). This barrier island system includes three estuarine bays: Great South Bay, Moriches Bay, and Shinnecock Bay, and three associated inlets, including Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet, respectively. The Corps' Inlet Modifications Report (U.S. Army Corps of Engineers 2007) provides a detailed history of these inlets. The bays are estuaries in that they are semi-enclosed by land with open access to the open ocean, and the ocean's waters are at least occasionally diluted by freshwater runoff from the land by way of numerous freshwater rivers and tributaries (Jones and Schubel 1980). Three barrier islands are present within the FIMP study area, referred to as Fire Island, the Westhampton barrier island, and the Southampton barrier island.

East of Southampton, in the eastern portion of the study area, the barrier island system gives way to the headland region, where the mainland directly abuts the ocean all the way to Montauk Point (approximately 30 mi. in length). In the western portion of this region, sandy beaches separate the ocean from a low-lying plain made of material deposited by waters melting from glaciers tens of thousands of years ago (Tanski 2007). To the east, the flat plains are replaced by 40-60 ft high bluffs formed when glaciers stopped their advance southward and dropped the material being transported, ranging from large boulders to fine clays (Tanski 2007). Three coastal ponds are also present within the headland region of the study area including Mecox Bay, Sagaponack Lake, and Georgica Pond.

Land use within the FIMP includes recreational beaches, residential communities, summer resort communities, open space/parkland/refuges, commercial fishing, and commercial/industrial development.

Federal, state, and county lands are depicted in Figures 2a, 2b, and 2c.

Hurricane Sandy

On October 29, 2012, Hurricane Sandy made landfall on Long Island and affected fish and wildlife resources on both a short- (within a year) and long-term (to present time) timescale and illustrated what the TSP is proposed to minimize/prevent. According to the National Hurricane Center, Hurricane Sandy, at nearly 2,000 kilometers (km) in diameter, was the largest storm on historical record in the Atlantic basin (Hapke *et al.* 2013). It affected extensive areas of the east coast of the United States (U.S), including and on Long Island. In some areas, dunes were extensively overwashed and several breaches formed as the storm made landfall during astronomical high tides (Hapke *et al.* 2013). While strong coastal storms such as Hurricane Sandy can often result in severe damages to physical structures, particularly on the barrier islands, they are an important natural process of barrier islands that allow these systems to evolve in response to sea-level rise (Hapke *et al.* 2013).

Both developed and undeveloped beaches on Fire Island experienced profound changes as a result of the storm (Hapke *et al.* 2013). The storm created three breaches and extensive overwash areas on the eastern end of Fire Island. The U.S. Geological Survey (USGS) undertook a rapid assessment of the areal extent and depth of overwash deposits shortly after the storm (Hapke *et al.* 2013). In the western portion of the island, 147 ac. of overwash areas were identified. However, these deposits were limited in many locations by residential development

and other infrastructure. Much of the material was deposited on private property, concrete walkways, etc., and was mechanically redistributed back on the beach during post-storm clean up and dune construction activities. In the central areas of Fire Island, the occurrence of overwash was relatively low (31 ac.) and primarily confined to existing dune cuts that served as vehicle access points or other lows spots between the dunes. The greatest areal extent of overwash deposits, or 220 ac, occurred on eastern Fire Island, and were concentrated in the vicinity of Old Inlet in the federal wilderness area and east of the TWA Flight 800 Memorial at Smith Point County Park (Hapke *et al.* 2013).

Three breaches formed on Fire Island at Smith Point (40.750156N, -72.811806W), Old Inlet (40.723509N, -72.894704W), and eastern Fire Island Pines (40.667489N, -73.055264W). The breach at Smith Point was a relatively small breach that did not appear to exhibit exchange of ocean and bay waters at low tide (Papa, U.S. Fish and Wildlife Service, personal observation), but was closed by the Corps under the provisions of the Corps' BCP in December 2012. The breach at Old Inlet remains open and options concerning its management are being explored by the NPS in accordance with the Fire Island Wilderness Act of 1983 (PL 95-585) and the NEPA. The breach at eastern Fire Island Pines did not require any action under the Corps' BCP as no exchange of bay and ocean water was observed after the storm passed and tidal levels subsided.

Refer to sections 3.0 of the Corps' EIS for a description of the Affected Environment; 3.7 for Land Use Development, Policy, and Zoning; and 3.8 for Recreational Activities within the FIMP study area.

B. Audubon Important Bird Areas (IBA)

The Audubon Society has designated 10 areas within the FIMP as IBA's (see Figure 4). The IBA program is a bird conservation initiative whose goal is to identify the most important places for birds and conserve them (Burger and Liner 2005). The IBA's and descriptions (excerpted from Audubon website: http://iba.audubon.org/iba/stateIndex.do?state=US-NY) are listed as follows:

<u>Captree Island Vicinity</u>

Site Description: This site includes the barrier islands on the south shore of Long Island, and the islands and marshes on the bayside. Sandy beach and dune systems, natural saltmarshes, and spoil islands are included. According to the NY-GAP land cover data, approximately 20 percent of the site is saltmarsh habitat. The site extends from the Nassau/Suffolk county line east to and including Captree Island and Robert Moses State Park. It includes the eastern end of Jones Beach Island and the western tip of Fire Island. The interior of the barrier island is bisected by a four-lane highway with associated heavily developed recreational areas and large parking areas. Ownership is a mix of public (Captree Island State Park, Gilgo State Park, and RMSP, administered by NYSOPRHP), municipal, and private.

Ornithological Summary: This site supports high numbers of wading birds during the breeding season: 125 pairs in 1993, 140 in 1992, 54 in 1991, 206 in 1990, 365 in 1989, 194 in 1988, 305 in 1987, 375 in 1986, 171 in 1985, and 120 in 1984. Wading birds include great egrets

(*Casmerodius albus*; 6 pairs in 1995, representing 1 percent of the State's coastal population), snowy egrets (*Egretta thula*; 10 pairs in 1995; 2 percent of the State population), little blue herons (*E. caerulea*; 5 pairs in 1995; 19 percent of State population), tricolored herons (*E. tricolor*; 10 pairs in 1995; 38 percent of the State population), black-crowned night-herons (*Nycticorax nycticorax*; 75 pairs in 1995; 4 percent of the State coastal population), and glossy ibis (*Plegadis falcinellus*; 80 pairs in 1995; 11 percent of the State population). In recent years, the total number of wading birds has dropped to under 100 individuals. The site supports at-risk species, including northern harriers (*Circus cyaneus*; breeds and migrant), black rails (*Laterallus jamaicensis*; one pair in 1997, the only known breeding location in the State), piping plovers (8 pairs in 1994; 4 percent of the State breeding population), American oystercatchers (*Haematopus palliatus*; 31 pairs in 1995; 17 percent of the State population), herring gulls (*Larus argentatus*; 893 pairs in 1995; 8 percent of the State population), great black-backed gulls (L. marinus) (68 pairs in 1995; 1 percent of the State population), roseate terns (75 pairs in 1994; 5 percent of the State population), common terns (*S. hirundo*; 2,000 pairs in 1994; 12 percent of the State coastal population), least terns (*S. antillarum*; 200 pairs in 1994; 8 percent of the State population), black skimmers (*Rynchops niger*; 33 pairs in 1994; 6 percent of the State population), short-eared owls (*Asio flammeus*; breeds), horned lark (*Eremophila alpestris*; breeds and migrant), saltmarsh sharp-tailed sparrow (*Ammodramus caudacutus*), and seaside sparrow (A. maritimus). Other saltmarsh breeders include clapper rails (*Rallus longirostris*) and willets (*Catoptrophorus semipalmatus*). The area is also important for passerine migrants and raptors, particularly in the fall. The tidal area at Democrat Point at the western tip of Fire Island hosts a great diversity and abundance of shorebirds. This is one of the few sites in the State with regularly breeding Chuck-will's-widow (*Caprimulgus carolinensis*).

Great South Bay

Site Description: This site is a protected, open water bay behind Fire Island and Jones Beach Islands, extending roughly from the Nassau/Suffolk County line in the west to Bellport Bay in the east, including eastern Jones Beach (Gilgo and Cedar Beaches). It is the largest shallow saltwater bay in the State, with sandy shoals and extensive eelgrass beds. Great South Bay is a highly productive ecosystem and supports a regionally important commercial and recreational fishery. Sea turtles, including the Kemp's ridley turtle (*Lepidochelys kempi*), loggerhead turtle (*Caretta caretta*), and green sea turtle (*Chelonia mydas*), regularly forage in the area.

Ornithological Summary: This is an important waterfowl wintering area. It supports an estimated 25 percent of the State's wintering American black ducks (*Anas rubripes*) and 22 percent of the State's wintering scaup, according to an analysis done by the NYSDEC using aerial waterfowl surveys from 1973-1994. The Captree Christmas Bird Count (CBC), which covers a portion of the site, has documented averages from 1980-1989 of 1,842 (maximum 3,379) brants (*Branta bernicla*); 1,501 (maximum 2,383) American black ducks; and 8,262 (maximum 18,028) greater scaup (*Aythya marila*). Mixed Species - 5,681 individuals in 2004; 8,296 in 2003; 8,707 in 2002; 1,652 in 2001; 9,019 in 2000; 3,685 in 1999, Winter. Congregations: Shorebirds/Mixed Species - 196 individuals on May 18, 1995; 528 on August 18, 1994; 408 on July 24, 1993; 617 on August 10, 1992; 1,416 on August 11, 1991, Migration.

Connetquot Estuary

Site Description: This site is located within the Connetquot River watershed and includes Connetquot River State Park, Benton Bay, Heckscher State Park, and surrounding lands. Uplands include relatively large areas of pine barrens, oak-pine woodlands, and oak brush plains. Saltmarsh/tidal creek wetlands are found near the mouth of river. According to the NY-GAP land cover data, approximately 50 percent of this site is shrub habitat, which includes old/field pasture and pitch pine oak. The Connetquot is one of only four major rivers on Long Island, supporting one of the few wild brook trout (*Salvelinus fontinalis*) populations on Long Island. A number of rare plants occur in the area, as well.

Ornithological Summary: This is one of the largest areas of undeveloped pitch pine/scrub oak and general scrub habitat on eastern Long Island. It harbors significant populations of characteristic shrub/scrub species, including the northern bobwhite (*Colinus virginianus*), American woodcock (*Scolopax minor*), whip-poor-will (Caprimulgus vociferus), eastern kingbird (*Tyrannus tyrannus*), gray catbird (*Dumetella carolinensis*), brown thrasher (*Toxostoma rufum*), blue-winged warbler (*Vermivora pinus*), prairie warbler (*Dendroica discolor*), eastern towhee (*Pipilo erythrophthalmus*), and field sparrow (*Spizella pusilla*). Small numbers of breeding common terns (35 pairs in 1997) and least terns (9 pairs in 1997) are present at Timber Point. Tidal wetland habitats also support breeding willets, marsh wrens (*Cistothorus palustris*), and saltmarsh sharp-tailed sparrows, and provide important foraging habitat for snowy egrets and least terns.

Fire Island

Site Description: This site includes all but the westernmost few miles of Fire Island, a 32-mi. long, quarter-mile wide barrier beach island off the southern shore of Long Island. According to the NY-GAP land cover data, over 15 percent of this site is beach/dune habitat. A site almost 8 mi. long – the Otis G. Pike Wilderness Area - is the only federal wilderness area in the State. A number of small communities are scattered along the island. The Fire Island Lighthouse, located 5 mi. from the western tip, is located near a bird banding station and hawk watch site.

Ornithological Summary: This site supports colonial nesting species, including piping plovers, common terns, and least terns. The site serves as a raptor migration corridor, with an average of 5,000 hawks and a maximum of 6,654 between 1980 and 1995. Especially high numbers of American kestrels (*Falco sparverius*; average 2,400; maximum 3,523), merlins (*F. columbarius*; average 1,230; maximum 1,638), and peregrine falcons (*Falco peregrinus*; average 146; maximum 249) have been documented. The area is a stopover for diverse passerine migrants, with thousands of birds visiting in the fall. A full-scale banding operation that had been discontinued for several years has been resumed.

Carmans River Estuary

Site Description: Situated on the south shore of Long Island, this site includes the Carmans River, a New York State-designated Wild and Scenic River, and its estuary, as well as uplands composed of oak and pine barren vegetation (part of the Long Island Pine Barrens). The core

protected portion of the area is the 2,550-ac Wertheim National Wildlife Refuge (NWR). According to the NY-GAP land cover data, this site includes approximately 675 ac. of saltmarsh habitat. The estuary provides an important spawning and nursery area for an abundance of fish and other aquatic life and is one of only four known breeding sites in the state for the eastern mud turtle (*Kinosternon subrubrum*). The site is primarily owned by the Service and Suffolk County Parks, and the rest is privately owned.

Ornithological Summary: This site is important for breeding and wintering waterfowl (3,000-4,000 on average), including large numbers of American black ducks (60 percent of all waterfowl at the site) and greater scaup at the mouth of the river. Hooded and common mergansers (*Lophodytes cucullatus* and *Mergus merganser*, respectively) winter further upriver, where the site provides open water in the winter when the bay freezes. The area also supports the largest breeding population of wood ducks (*Aix sponsa*) on Long Island. Carmans River's marshes support breeding at-risk birds, including the American black duck, American bittern (*Botaurus lentiginosus*), least bittern (*Ixobrychus exilis*), osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*; winters), saltmarsh sharp-tailed sparrow (probably exceeds IBA threshold, but further data is needed), and seaside sparrow. Clapper rails and willets are also found here. During fall migration, the marshes support 5-10 shorebirds per acre, including the semipalmated plover (*Charadrius semipalmatus*), greater and lesser yellowlegs (*Tringa melanoleuca* and *T. flavipes*, respectively), semipalmated sandpiper (*Calidris pusilla*), least sandpiper (*C. minutilla*), and pectoral sandpiper (*C. melanotos*). Also, wading birds can be seen along the river and refuge marshes, including the great blue heron (*Ardea herodias*), great egret, snowy egret, little blue heron, and glossy ibis. Migrating tree swallows (Tachycineta bicolor) come to the marshes along the Carmans River in the last weeks of September to roost. The swallows primarily congregate in the marshes that are part of the Wertheim NWR. The estimated flock size is many thousands, numbering in the tens of thousands on some nights. These marshes also provide important habitat for thousands of red-winged blackbirds (*Agelaius phoeniceus*). The banks are bordered mostly with common reed (*Phragmites australis*), with some common cattail (*Typha latifolia*) and other brackish tolerant species.

<u>Moriches Bay</u>

Site Description: This site consists of a bay, marsh, and barrier beach complex (with adjoining uplands) on the south shore of Long Island, extending from the Floyd Estate in Mastic (mainland portion of the FIIS) in the west to Westhampton Beach in the east. The site includes Haven's Estate and Cupsogue County Park, both owned by Suffolk County. It is a productive area for marine finfish, shellfish, and other wildlife.

Ornithological Summary: This site is important for nesting wading birds. West Inlet Island alone supports large numbers of great egrets (108 pairs in 2004), snowy egrets (59 pairs in 2004), little blue heron (2 pairs in 2004), tricolored heron (1 pair in 2004), black-crowned night-heron (155 pairs in 2004), and glossy ibis (44 pairs in 2004). The site also supports at risk species such as osprey (breeds), piping plovers (48 pairs in 1998), roseate terns (four pairs in 1998), common terns (631 pairs in 1999), least terns (6 pairs in 1999), black skimmers (23 pairs in 1998), and seaside sparrow (breeds). Herring gulls (368 pairs in 1995; 3 percent of the State population.) and great black-backed gulls (168 pairs in 1995; 3 percent of the State population) nest here, as

well. The saltmarshes support breeding clapper rails, American oystercatchers, willets, and saltmarsh sharp-tailed sparrows. The site is also an important waterfowl wintering area. NYSDEC mid-winter aerial waterfowl surveys from 1975-1984 documented over 5,000 individuals on average (8,382 in peak year). These included an average of 350 brant (580 maximum), 400 Canada geese (*Branta canadensis*; 870 maximum), 1,100 American black ducks (1,580 maximum), 225 mallards (*Anas platyrhynchos*; 430 maximum), 2,150 scaup (4,470 maximum), and 400 red-breasted mergansers (*Mergus serrator*; 920 maximum). Congregations: Waterfowl/Mixed Species - Over 5,000 individual waterfowl on average, with 8,382 individuals during the peak year. Congregations: Waterbirds/Terns - Estimated 637 pairs in 1999; 1,129 in 1998; 920 in 1997; 1,504 in 1996; 586 in 1995; 216 in 1994; and 948 in 1993. Congregations: Wading Birds/Mixed Species - Islands in the bay easily support more than 100 pairs of nesting herons.

Shinnecock Bay

Site Description: This site includes a diverse region of barrier island beaches, saltmarshes, dredge spoil islands, and surrounding bays and estuaries. It includes 5 mi. of mostly undeveloped shoreline along the southernmost part of Shinnecock Bay, and large undeveloped tidal wetlands that are relatively rare in the State.

Ornithological Summary: This was not provided by Audubon Society. See the Bay Intertidal Section (page 58) for the Service's Ornithological Summary.

Mecox Sagaponack Coastal Dunes

Site Description: This site includes the coastal beaches and wetlands extending from Watermill Beach in the west to Georgica Pond in the east. The site includes undeveloped flats, sand bars, and an ocean inlet.

Ornithological Summary: The area is important to breeding piping plovers and least terns, migrating shorebirds, and wintering waterfowl.

Napeague Harbor and Beach

Site Description: This site includes the Napeague State Park, administered by NYSOPRHP, and surrounding wetlands and beaches, including Napeague Harbor.

Ornithological Summary: This site provides important habitat for the northern harrier (male and female have been observed), piping plover (six pairs in 1999), common tern (two pairs in 1997), and least tern (five pairs in 1999).

Montauk Point

Site Description: This site includes the easternmost point of land on Long Island, extending from Lake Montauk in the west to Montauk Point State Park and including the offshore waters. A large portion of the area is under public ownership, including Montauk Point State Park and

Camp Hero State Park. The site contains an impressive diversity of maritime upland, wetland, and shoreline habitats. According to the NY-GAP land cover data, over 35 percent of this site is shrub habitat, which includes pitch pine oak, shrub swamp, and successional hardwoods. The waters off of the point contain extensive blue mussel (*Mytilus edulis*) and kelp (*Laminaria agardhii*) beds and are an important feeding area for juvenile Kemp's ridley turtles, loggerhead turtles, and leatherback turtles (*Dermochelys coriacea*). Marine mammals including gray seals (*Halichoerus grypus*), harbor seals (*Phoca vitulina*), northern right whales (*Eubalaena glacialis*), finback whales (*Balaenoptera physalus*), humpback whales (*Megaptera novaeangliae*), and minke whales (*Balaenoptera acutorostrata*) regularly forage in or migrate through the near-shore waters.

Ornithological Summary: The point is a very important waterfowl wintering area, with the largest winter concentration of sea ducks in the State. A waterfowl count in January 1997 documented 17,514 common eiders (*Somateria spectabilis*), 120 long-tailed ducks (*Clangula hyemalis*), 1,900 surf scoters (*Melanitta perspicillata*), 2,402 white-winged scoters (*M. fusca*), 1,000 black scoters (*M. nigra*), and 320 red-breasted mergansers. The 1996 NYSDEC mid-winter aerial waterfowl survey documented 4,300 scoters and 250 long-tailed ducks. The December 1995 CBC tallied 1,500 greater scaup, over 5,000 common eiders, over 500 white-winged scoters, over 600 common golden-eyes (*Bucephala clangula*), and over 600 red-breasted mergansers. King eiders (*Somateria spectabilis*) and harlequin ducks (*Histrionicus histrionicus*) occur here regularly in winter. Montauk is the southernmost wintering area for common eiders and harlequin ducks on the East Coast. Sizable concentrations of pelagic seabirds occur in the waters off the point. For example, 250 northern gannets (*Morus bassanus*) were counted in the December 1995 CBC. Wetland areas around Big and Little Reed Ponds support confirmed or probable breeding at-risk species, including the American black duck, least bittern, northern harrier, and red-shouldered hawk (*Buteo lineatus*). Upland areas host characteristic shrub breeding species including the northern bobwhite, American woodcock, eastern kingbird, gray catbird, brown thrasher, blue-winged warbler, prairie warbler, eastern towhee, and field sparrow.

New York State Bird Conservation Areas (BCA)

The New York State BCA Program was established in 1997 to safeguard and enhance bird populations and their habitats on State lands and waters. The goal of the BCA Program is to integrate bird conservation interests into agency planning, management and research projects, within the context of agency missions. The BCA Program is modeled after the National Audubon Society's IBA program, which began in New York in 1996. The BCA Program applies criteria developed under the IBA program to State-owned properties (New York State Department of Environmental Conservation website http://www.dec.ny.gov/animals/30935.html).

The only New York State BCA located within the FIMP is the South Shore Tidal Wetlands area, which includes 20 State-owned properties, further described above in the State lands section. The following description is excerpted from the NYSDEC's website (http://www.dec.ny.gov/animals/27026.html):

This BCA is comprised of tidal saltmarshes with areas of associated upland habitat as well as open water in the form of creeks, channels, and ditches, located on the bays of the south shore of Long Island. The habitat ranges from open water and tidal mud flats to Spartina (*Spartina alterniflora*) marsh and dense upland forest. The marshes support a diverse mix of uncommon bird species such as seaside sparrow, saltmarsh sharp-tailed sparrow, clapper rail, and northern harrier, while the uplands provide critical migration habitat for birds crossing the ocean and bays. The wetland habitats are threatened by erosion, invasive plant species, and loss of tidal flow. Birds of interest include northern harrier (Threatened), common tern (Threatened), osprey (Special Concern), seaside sparrow (Special Concern), clapper rail, and, possibly, short-eared owl (Endangered).

C. Habitat and Ecosystem Designations

The study area consists of numerous communities, ecosystems, and habitats that have been designated and identified in several publications and efforts. These efforts/publications include the FIMP Habitat Evaluation Team, the Service's Restoration PAL, the Corps' Conceptual model publications, and the Corps' cover type designations. The following is a listing of the effort or publication and the corresponding cover type/community/habitat designations:

For the purposes of this report and for consistency with the Corps' efforts, the Service shall use the habitat designations developed by the Corps in their conceptual model Phase III publication (U.S. Army Corps of Engineers 2006a). (The Service also designates two additional habitats – Bay Islands within the Bay Ecosystem and Mainland Uplands/Wetlands within the Terrestrial Upland portion of the Barrier Island Ecosystem.) The publication identifies four ecosystems within the project area as follows (Figure 3):

- Coastal Marine Ecosystem;
- Ocean Beach and Dune Ecosystem;
- Bay Ecosystem; and
- Barrier Island Ecosystem.

<u>Coastal Marine Ecosystem</u>

This ecosystem consists of the following habitats:

Offshore – Subtidal marine habitat ranging in depth from 10 to 30 meters (m.); includes pelagic and benthic zones.

Nearshore – MLW to depth of 10 m.; includes pelagic and benthic components.

Marine Intertidal – Extends from the boundary of the marine nearshore at MLW, to mean high water (MHW); sandy substrate.

Ocean Beach and Dune Ecosystem

This ecosystem consists of the following habitats:

Marine Beach – Extends from the MHW line on the oceanside to the boundary of the primary dune and swale habitat with the terrestrial upland; sandy substrate.

Dunes and Swales – Primary dune through most landward primary swale system.

Bay Ecosystem

This ecosystem consists of the following habitats:

Bay Intertidal – Extends from the terrestrial upland boundary with MHW, or landward limit of high marsh vegetation of the barrier island terrestrial upland habitat, to MLW; includes other habitats such as tidal marsh, shoals, and/or mud flat.

Bay Subtidal – Bayside aquatic areas below the MLW, includes submerged aquatic vegetation (SAV) beds (bayside vegetation communities found within the subtidal zone).

Inlets – Areas of water interchange between backbay and ocean zones (*e.g*., Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet).

Bay Islands – An important habitat present within the FIMP study area that the Corps does not account for in their habitat designations is bay islands, which, for the purposes of this document, are defined as upland islands in one of the bays, landward of the bay intertidal areas but not connected to the mainland of Long Island.

Barrier Island Ecosystem

This ecosystem consists of the following habitat:

Terrestrial Upland – Extends from the landward boundary of the primary dunes and swales on the oceanside, to the MHW boundary of the bay intertidal habitat on the bay side of the island; contains all upland and wetland habitats, including the maritime forest; scrub/shrub are also included in this habitat, along with bayside beach areas.

D. Physical Processes and Habitat Formation

The Service recognizes that the project area contains land development, and hence the proposal for the project. However, the review of the project includes an analysis of the barrier island system as a whole; therefore, discussions include descriptions of the processes which occur over the entire system.

A constantly evolving and changing habitat complex, unusual in other landforms, is typical of barrier islands. Changes in the islands' shape and position occur from season to season, and even day-to-day. The sandy ocean beachfront constantly adjusts to the balance between two factors: (1) the erosive forces of storm winds and waves, and (2) the restorative powers of prevailing geological, oceanic, and meteorological actions. In response to the interplay of these forces, the whole system of beaches, barrier islands, and dunes shift more or less continuously (Tanski 2007). Over a longer time span, the mass/energy interaction has resulted in a relatively continuous, though intermittent, landward migration (Panageotou *et al.* 1985, Hapke *et al.* 2013) of Long Island's barrier island system.

Sea Level Rise

The force driving the islands landward is rising sea level. The relative sea level rise in the New York area has averaged about 2 millimeters (mm) (0.1 inch [in.]) per year during the past 50+ years (Leatherman and Allen 1985a, Tanski 2007). Since 1993, sea level rise has increased to 3.2 mm/year (Church and White 2011). By 2100, scientists project sea levels 18 to 50 in. higher than today along New York's coastlines and estuaries, though a rise as high as 75 inches could occur (New York State Department of Environmental Conservation 2015a).

The GRR states that coastal flooding is likely to increase in magnitude due to future elevated rates of sea-level rise. However, throughout most of the document, analyses of damages and benefits are based on the assumption of an historical sea level rise rate. Although the Future Without Project and TSP plans are evaluated using the more realistic "intermediate" and "high" rates of sea level rise in the short discussion of Table 51, the reader should be reminded up front that there is debate regarding the sea-level rise rates used in the majority of the document that require further coordination between the Corps and the DOI. The combined Table discussed above could easily be reproduced for the different sea level rise rates and also presented in the main body of the GRR with a clear description of why these model's costs (and benefits) increase, including the assumptions made.

The documents do not clearly state how this project, designed with historic sea-level rise numbers, perform into the future. How this project is modified or not in the future needs to be explained now so we can understand the potential benefits or impacts (to DOI resources) of the project with increased sea level.

In addition, the DEIS/GRR should present how the damages change with sea-level rise and how this affects the cost/benefit ratio, how it would be addressed in an adaptive management plan, local land use planning, the effects on habitat or how the project may change and affect habitat/species in the future. This is poorly described in Table 51 of the GRR. It appears that the assumption is made that although breach closure costs increase (TSP), the benefit of "total breach closure' go up even higher. Has the assumption been made that the TSP will close all breaches in the Wilderness area? The table also indicates that the backbay inundation benefits go up somewhat, which suggests that the non-structural component has a larger influence at higher rates of SLR. This information and assumptions should be clarified in the revised GRR.

Barrier Island Migration

The phenomenon of migration is often termed erosion by some, but this is not accurately descriptive for barrier beaches. What happens to the whole barrier landform is not erosion in the sense that the barrier is being chopped away and is gradually disappearing; barriers retreat or migrate and they do so as entire ecological units. In marked contrast to the sea cliffs which erode from fixed positions, coastal barriers move themselves backwards onto marsh and lagoonal deposits as they climb the slope of the continental shelf (Department of the Interior 1983; Hapke *et al.* 2013).

As the barrier landform retreats, its transported sand buries parts of its system, such as saltmarshes, while new marshes develop further landward on the leading edge of the new sediment. Although a barrier's movement is at least partly in response to the steadily rising sea level (Tanski 2007), as well as the amount of off-shore sediment present seaward of the shore, the pace of its migration is not steady. Its migration depends in large part upon crucial events which occur during storms: inlet formation and overwash. These are the primary mechanisms by which sand is transported landward from the oceanfront, along with a third process which occurs on some coastal barriers: wind-blown dune migration (Department of the Interior 1983; U.S. Army Corps of Engineers 2016a).

All three of the processes described below can be affected by stabilized dune systems. Formation and stabilization of well-developed dunes can significantly moderate a barrier's dynamic of change. Inlets contribute to barrier island retreat. Enormous quantities of sand can be swept through a new inlet. Marshes form on the new flood tidal delta. The net result of these dynamics forces is the further retreat of the barrier system with all ecological units retained (Department of the Interior 1983; Tanski 2007; Hapke 2013).

1. Overwash

Barrier beaches in active retreat actually roll over themselves into the lagoon or back-bay. The most common mechanism for accomplishing this is overwash, the breaching of dunes by a severe storm surge which carries beach and dune sand onto the backdune region (Figures 18 and 19). Depending on the storm's magnitude and the island's width, the overwash area of newly transported sand may go no further than the dunes, or it may spread onto the marshes or into the lagoon. In general, major overwashes only occur during exceptionally severe storms (Department of the Interior 1983; Tanski 2007).

Overwash processes can provide a source of sediments to the barrier island and contribute to elevational changes. In locations where the dunes are not breached during a major storm, washover deposits are negligible, and the dominant sediment transport direction is seaward. In locations where the dune is absent or breached, overwash processes are uni-directional, delivering sand to the island surface, but not removing sand from the littoral system as an inlet would (Leatherman 1985). These rare but potentially large overwashes generally result in localized accretion on the bay side (New York Sea Grant Institute 1993; Walter & Kirwan 2016). Hurricane/Superstorm Sandy caused extensive overwash on Fire Island, although inland deposits

accounted for only 14 percent of the volume lost from beaches and dunes, indicating that the majority of this material was moved offshore (Hapke *et al.* 2013).

2. Inlet Dynamics

Barrier ecosystems seem to rely mainly upon inlet dynamics for landward displacement. Migrating and temporary inlets/breaches provide flood tidal deltas upon which the barrier island environments are established. A flood tidal delta exhibits a deltaic pattern upon full development, and when an inlet closes or migrates it becomes prime substrate for saltmarsh development. These actually become the substrates for marsh growth and thereby extend the bay shoreline landward. Wind-carried and overwash sediments then are deposited on top of this accretionary base. These two types of sediment movement (via wind and overwash) are also what makes it possible for a barrier to grow vertically (Department of the Interior 1983; Walters and Kirwan 2016). While inlet formation is an infrequent process in this barrier island system, it is within the range of natural variability of that system.

Significant storm conditions are required in order to induce the formation of an inlet. This fact is emphasized by the number of washovers that occur during large storms. Few of these washovers cross the island completely, much less produce new inlets. Of the 4 inlets that opened into Shinnecock Bay in 1938, only Shinnecock Inlet persisted, eventually being stabilized by the Corps in 1954. The hurricane of 1938 washed over the entire beach between Democrat Point and Ocean Beach and many other places as well (Bokuniewicz and Schubel 1991; Tanski 2007). After that, 63 washovers occurred after a hurricane in 1944. Thirteen washovers were found after a storm in 1949. A storm in 1953 caused seven or more washovers, while nine washovers were reported after a storm in 1960. Fifty more occurred after another storm in 1962. A storm in 1963 produced 4 washovers on eastern Fire Island. None of these washovers resulted in a permanent inlet. For inlet formation to occur, certain geophysical and meteorological conditions must be met. Leatherman (1982) states that overwash is a relatively common event, happening during most major storms, but that inlets are relatively rare, occurring only once in 50 to 75 years along some shorelines. This implies that the opportunity for inlet-based habitat formation is an equally rare occurrence.

Inlets of varying size and number have developed at various times in Fire Island's history, particularly in eastern Fire Island. By examining the barrier island chain from Fire Island to Montauk Point, it can be demonstrated that 59 percent of the system has been subject to inlet activity (Leatherman and Allen 1985b). Other parts of Fire Island, particularly the central portion, have been stable for hundreds of years. For example, Fire Island's Sunken Forest, a true maritime forest, could only have developed under conditions of prolonged limitation of environmental stresses, particularly salt spray and saltwater flooding (Leatherman *et al.* 1985). The development of the Sunken Forest is due to the fact that it is protected behind a high secondary dune. In this location, washovers do not penetrate the secondary dune, which is also effective at screening back-barrier vegetation from salt spray. The western part of Fire Island has not migrated landward but has narrowed while following the migration of Fire Island Inlet to the west.

As stated above, three breaches formed on Fire Island at Smith, Old Inlet, and eastern Fire Island Pines. The breach at Smith Point was a relatively small breach that did not appear to exhibit exchange of ocean and bay waters at low tide (Papa, personal observation), but was closed by the Corps under the provisions of the Corps' BCP in December 2012. The breach at Old Inlet remains open and options concerning its management are being explored by the NPS in accordance with the Fire Island Wilderness Act of 1983 (PL 95-585) and the NEPA. The breach at eastern Fire Island Pines did not require any action under the Corps' BCP as no exchange of bay and ocean water was observed after the storm passed and tidal levels subsided.

3. Habitat Formation

Along the south shore of Long Island, the normal evolution for an inlet results in sediments and geomorphic features moving both northward (landward) and westward (downdrift) (Leatherman 1985; Tanski 2007). This inlet migration in two directions over time gives rise to complex sedimentary patterns involving a variety of different inlet-related environments: bay bottom, deep to shallow inlet channel, active and relict flood and ebb tidal deltas (Figure 20), spit platform, and spit (Figure 21) (Leatherman 1985; Rice 2009). Each of these sedimentary forms has specific niche functions in the ecology of Great South (New York Sea Grant Institute 1993) Moriches and Shinnecock Bays. The outstanding biological diversity and abundance of Long Island's south shore estuary is, in part, a consequence of the variety of habitat types within the system.

Through time, an unstabilized inlet achieves a net downdrift migration and in most caseseventually becomes choked with sand and closes. Marsh islands develop in the bay if the flood tidal delta achieves sufficient elevation and the bay hydrodynamic environment supports its development. Eelgrass beds may develop below the MLW line of the flood tidal delta at a depth controlled by turbidity and bay wave turbulence. The presence of saltmarsh islands and the wide bayside marshy plains on the northern shore of Long Island's barrier islands can be an impediment to inlet development because of the resistance of the marshy substrate to erosion. Inlet migration and closure depend upon the longshore current and the tidal jet flushing capacity (Leatherman 1985). The subsequent formation of flood tidal deltas varies in time depending on the forces at the inlet.

Comparison of wetland areas and historical inlet locations illustrate that barrier islands have widened and strengthened at historical inlet sites. Creation of these wetland areas has also led to habitat formation. Inlet processes are mainly responsible for providing sediment to the barrier bayshore, causing a widening of the island at inlet locations and, therefore, promoting landward migration (Leatherman *et al.* 1985). When the inlet closes, this large sedimentary deposit becomes an excellent substrate for potential saltmarsh colonization (Gregg 1982; Leatherman 1982; National Park Service 1995). The marsh islands in the bay and most, if not all, of the bayshore marshes formed atop flood-tidal delta sediments (Leatherman *et al.* 1985; New York Sea Grant Institute 1993) in locations where bay wave energies are sufficiently small.

Overwash contributes in several important ways to maintaining barrier islands and their ecosystem functions, especially as habitat for many plant and animal species. In the process of the barrier island's growth through overwash, several important unique landforms are produced,

including overwash channels, overwash fans, vegetated and non-vegetated subtidal flats, and backdunal swales. Overwash that crosses the entire barrier island leaves behind distinct corridors known as washovers (Kana and Krishnamohan 1994). These areas are important biological corridors, linking ocean and bay habitat. Several species, especially the piping plover, are known to take advantage of the increased access to bayside forage areas afforded by overwash corridors (Cohen *et al.* 2009).

Overwash maintains unvegetated intertidal sand flats by providing a vital clearing function, similar to naturally occurring forest fires and river bank floods. Bayside sand spits are especially productive for shorebirds and wading birds. A new spit and shoal complex formed following the 1992 breach at Westhampton and has become a highly productive nesting and forage area for shorebirds, including black skimmer (*Rhynchops niger*), American oystercatcher (*Haematopus palliatus*), willet (*Catoptrophorous semipalmatus*), least tern, common tern, and piping plover. This area produced one of the highest nesting densities of piping plover in the state of New York from 1995 to 1996 (New York State Department of Environmental Conservation 2002).

Both overwash fans and flood tidal deltas are prime spawning grounds for the horseshoe crab (*Limulus polyphemus*) (New York Sea Grant Institute 1993). Intertidal beaches are used by several fish species as a spawning site. The Atlantic silverside deposits its eggs in filamentous algae (*Enteromorpha* spp.) or other vegetative material in the upper intertidal zone of saltmarshes and open beaches (Conover and Kynard 1984). The mummichog (*Fundulus heteroclitus*) also deposits eggs in the upper intertidal zone either on stems of Spartina, within empty mussel shells, or amongst filamentous algae (Able and Castagna 1975; Taylor *et al.* 1977). The un-vegetated stretch of sand between MHW and the upper tidal limit is also prime feeding habitat for numerous species of shorebirds, especially during spring and fall migrations, and prime nesting habitat for several beach nesting birds, including piping plover, common and least terns, black skimmer, and American oystercatcher (Bull and Farrand 1977).

IV. FISH AND WILDLIFE RESOURCE CONCERNS AND PLANNING OBJECTIVES

The purpose of consultation under the FWCA is to ensure equal consideration of fish and wildlife resources in the planning of water resource development projects. The Service's emphasis in this regard is to identify means and measures to mitigate the potential adverse impacts of the proposed project and to make positive contributions to fish and wildlife resource problems and opportunities.

This report was prepared concurrently with other Corps' environmental review requirements. From the Service's perspective, a desired output of the proposed project is to ensure the protection of healthy marine, estuarine, and terrestrial ecological communities. Specifically, the Service recommends that conservation of fish and wildlife resources be accomplished by: (1) ensuring that the proposed project evaluate alternatives which achieve and maintain high biological diversity; (2) ensuring natural areas are protected and monitored throughout the life of the project; (3) ensuring construction designs promote high value habitats for Service trust species; (4) establishing conservation easements over the life of the project; and (5) incorporating education and outreach activities to the project to inform the public about the uniqueness and fragility of the coastal ecosystem.

Ultimately, the Service's Mitigation Policy (January 23, 1981, Federal Register v. 46 n. 15 pp. 7644-7663) establishes a number of criteria which, if met, would allow the Service to support a water resource development project. These criteria are:

1) The projects are ecologically sound.
2) The least environmentally damaging alternative is selected.
3) Every reasonable effort has been made to avoid or minimize damage or loss of fish and wildlife resources and uses.
4) All mitigation recommendations have been adopted with guaranteed implementation to satisfactorily compensate for unavoidable damage or loss consistent with the appropriate mitigation goal.
5) For wetlands and shallow water habitats, the proposed activity is clearly water dependent and there is a demonstrated public need.

Presidential Memorandum M-16-01 to federal agencies entitled, "Incorporating Ecosystem Services into Federal Decision Making" dated October 7, 2015, will be a necessary consideration in the recommendations we make concerning this federal planning effort. M-16-01 establishes, "Ecosystem services provide vital contributions to economic and social well-being. These include, but are not limited to, provisioning food and materials, improving the quality and moderating the quantity of water, providing wildlife habitat and spawning and nursery habitats for fisheries, enhancing climate resilience, mitigating storms and floods, buffering pollutants, providing greater resilience for communities and ecosystems, and supporting a wide array of cultural benefits, recreational opportunities, and aesthetic values." Consequently, the President has directed federal agencies to make due consideration of the full range of benefits and tradeoffs among ecosystem services associated with potential federal actions, including benefits and costs that may not be recognized in private markets because of the public-good nature of some ecosystem services. As stated in the M-16-01, an ecosystem-services approach can: (1) more completely inform planning and decisions, (2) preserve and enhance the benefits provided by ecosystems to society, (3) reduce the likelihood of unintended consequences, and, (4) where monetization is appropriate and feasible, promote cost efficiencies and increase returns on investment.

Bear (2014) stated as it relates to the Corps of Engineers' Civil Works Program, "In the Water Resources Development Act of 2007, Congress directed that the 1983 Principles and Guidelines utilized by the U.S. Army Corps of Engineers...be updated to reflect national priorities, including not only economic development but protection of the environment by maximizing sustainable economic development, avoiding the unwise use of floodplains, minimizing adverse impacts when a floodplain or flood-prone area is used, and protection and restoration of natural system functions."

The President's memorandum entitled, "Mitigating Impacts on Natural Resources From Development and Encouraging Related Private Investment" (Federal Register Vol. 80, No. 215 Friday, November 6, 2015) was very recently issued to federal agencies and sets forth a series of directives that will factor into our FWCA and ESA consultations including, but not limited to:

- “Agencies’ mitigation policies should establish a net benefit goal or, at a minimum, a no net loss goal for natural resources the agency manages that are important, scarce, or sensitive, or wherever doing so is consistent with agency mission and established natural resource objectives. When a resource's value is determined to be irreplaceable, the preferred means of achieving either of these goals is through avoidance, consistent with applicable legal authorities. Agencies should explicitly consider the extent to which the beneficial environmental outcomes that will be achieved are demonstrably new and would not have occurred in the absence of mitigation (*i.e.* additionality) when determining whether those measures adequately address impacts to natural resources;

- Agencies should set measurable performance standards at the project and program level to assess whether mitigation is effective and should clearly identify the party responsible for all aspects of required mitigation measures. Agencies should develop and use appropriate tools to measure, monitor, and evaluate effectiveness of avoidance, minimization, and compensation policies to better understand and explain to the public how they can be improved over time; and

- When evaluating proposed mitigation measures, agencies should consider the extent to which those measures will address anticipated harm over the long term. To that end, agencies should address the durability of compensation measures, financial assurances, and the resilience of the measures' benefits to potential future environmental change, as well as ecological relevance to adversely affected resources.”

The Service also notes that the President’s Climate Action Plan seeks to implement “...climate-adaptation strategies that promote resilience in fish and wildlife populations, forests and other plant communities, freshwater resources, and the ocean” (Executive Office of the President 2013).

V. EVALUATION METHODS

Descriptions of natural resources are based on studies for similar projects, relevant grey and peer-reviewed literature, local, state, and federal fish and wildlife reports and plans, and personal communications with knowledgeable biologists, planners, coastal geologists, and engineers.

In this report, the Service provides a discussion of federal trust resources (i.e., migratory birds, wetlands, endangered species, and anadromous fish), as well as shellfish, for the project area. However, our analysis focuses on migratory birds and wetlands due to the fact that the Corps will likely have to complete an Essential Fish Habitat (EFH) assessment for a number of marine shellfish and finfish species during consultation with NOAA/F, and consultation under the ESA will be required for federally-listed species in the proposed project area.

In developing mitigation recommendations, the Service relied on experience, literature searches, and local, state, and federal conservation plans (e.g., bird conservation plans and local, state, and federal land and water conservation plans), and special designations (*e.g.*, federally- and state-identified Significant Fish and Wildlife Habitat Complexes) to derive appropriate recommendations for mitigation and fish and wildlife enhancement opportunities.

Fish and wildlife enhancement opportunities are presented which represent actions that are recommended as part of existing conservation plans, which would benefit migratory birds and the habitats in the study area that support them.

As discussed in more detail in the following section, this report discusses fish and wildlife resources which use the three major ecological systems (marine, estuarine, and terrestrial) found in the significant land and water complexes of the proposed project area.

VI. DESCRIPTION OF FISH AND WILDLIFE RESOURCES

A. Coastal Marine Ecosystem

1. Offshore

The offshore marine community consists of benthic organisms such as worms (*Polygordius triestinus*), sand dollar (*Echinarachnius parma*), small clam (*Tellina agilis*), surf clam, and finfish such as summer flounder (*Paralichthys dentatus*) and little skate (*Raja erinacea*) (U.S. Army Corps of Engineers 1999). Marine mammals such as the harbor seal and sea turtles, such as the leatherback sea turtle, have been reported to utilize the open marine community as well (U.S. Army Corps of Engineers 1999).

As part of the FIMI, Corps' contractors conducted water quality surveys in borrow areas 2C and 5B (portions of which are now proposed to be used for the FIMP) from July through October of 2015 (U.S. Army Corps of Engineers 2016a). Refer to the Corps' DEIS Appendix L for more detailed information regarding these surveys.

Water quality surveys conducted as part of the FIMI provided the following results:

- Salinity ranged from 31.18 parts per thousand (ppt) at the surface in borrow area 2C in July to 33.37 ppt at the ocean bottom in borrow area 5B in October;

- Temperature ranged from 17.10° Celsius (C) at the ocean bottom in borrow area 5B in October to 22.45° C at the surface in borrow area 2C in September;

- Dissolved oxygen (DO) ranged from 5.51 mg/l at the surface in borrow area 5B in August to 8.29 mg/l at the surface of borrow area 2C in July.

Surf clams are a dominant species of inshore benthic infauna and also an important commercial fishery resource. Most surf clam beds off of Long Island occur from the beach zone to a depth of approximately 150 ft (Fay *et al.* 1983). Adult surf clams rarely voluntarily vacate their burrows, usually only being displaced by oceanic storms (Fay *et al.* 1983). The Corps surveys, conducted in August and September of 2001, of 9 sampling areas distributed along the FIMP study area shoreline, indicated that many survey areas had very small or no localized surf clam populations with the exception of areas off of Fire Island Pines and areas east of Shinnecock Inlet (U.S. Army Corps of Engineers 2002). Surf clams were found in the borrow areas 2c (maximum of 2

bushels of clams in one of the survey stations) and in the vicinity of area 4c (FIMP borrow area 4A - maximum of 11 bushels) during these 2001 surveys, but the abundance was relatively low when compared to the borrow 2AD area that had a maximum of 67 bushels. Although these results indicate general trends in surf clam distribution within the FIMP area, these surveys occurred in potential borrow areas and sampling points were not necessarily distributed to quantify surf clam populations for the entire FIMP study area.

More recent surf clam surveys are conducted annually by the NYSDEC, albeit a more regional effort along the south shore of Long Island. Sampling stations occurring within the FIMP study area are present within each of the following ocean stratum/sub areas: 1) Fire Island to Moriches Inlet (FM) 1 - 0-1 mi. from shore; 2) FM2 - 2 mi. from shore; 3) FM3 - 3 mi. from shore; 4) Moriches Inlet to Montauk Point (MM) 1 - 0-1 mi. from shore. The mean catch per unit effort (bushels taken in a three-minute tow) for each stratum in 2012 (the most recent data available) is listed as follows (New York State Department of Environmental Conservation 2013):

FM1: 2.66 bushels
FM2: 0.95 bushels
FM3: 1.01 bushels
MM1: 0.59 bushels

The area along the ocean shoreline between Fire Island and Moriches Inlet had the greatest abundance. For comparison, the stratum with the greatest abundance along the south shore of Long Island was the Jones Inlet to Fire Island Inlet, 0-1 mi. from shore (3.46 bushels). The MM1 stratum had the least abundance of the areas surveyed (New York State Department of Environmental Conservation 2013).

Many benthic macro-invertebrate species within the offshore marine substrate are important prey/forage for commercially and ecologically important finfish species. The Corps conducted benthic invertebrate surveys of potential borrow areas in the fall of 2000 and spring of 2001 (U.S. Army Corps of Engineers 2004a). Dominant species observed in the fall of 2000 included amphipods (*Gammarus oceanicus* and Protohaustorius wigleyi), polychaete worms (*Magelona rosea* and *Tharyx acutus*), archiannelid worms (*Polygordius triestinus*), tanaid/crustaceans (*Leptochelia savignyi*), sand dollars, and bivalves (*Tellina agilis*). Dominant benthic invertebrate species observed during the Spring of 2001 surveys included amphipods (*G. oceanicus*, *P. wigleyi*, and *Amphiporeia gigantean*), Nematoda, archiannelid worms (*P. triestinus*), bivalves (*T. agilis*), and polychaete worms (*Spiophanes bombyx* and *Syllidae* spp.). The Corps concluded that abundances and diversity of benthic invertebrates were generally consistent among borrow areas and between seasons (U.S. Army Corps of Engineers 2004a).

These benthic surveys were supplemented by Corps contractor FIMI surveys of borrow areas 2C and 5B (portions of which are now proposed to be used for the FIMP) from July through October of 2015 (U.S. Army Corps of Engineers 2016a) and comparable to the 2000 and 2001 surveys. During summer surveys, the most abundant benthic species in each borrow area were amphipods, Nematoda and archiannelid worms while in the fall, the most abundant species were archiannelid worms, amphipods and Nematoda in borrow area 2C and Nematoda, amphipods,

and archiannelid worms in borrow area 5B. Refer to the Corps' DEIS - Appendix L for more detailed information regarding these surveys (U.S. Army Corps of Engineers 2016a).

Dominant fish species observed during Corps' surveys of 4 potential borrow areas in 1999-2002 included Atlantic silverside (*Menidia menidia*), striped anchovy (*Anchoa hepsetus*), bay anchovy (*A. mitchilli*), spotted hake (*Urophycis regia*), butterfish (*Peprilus triacanthus*), scup (*Stenotomus chrysops*), Atlantic herring (*Clupea harengus*), silver hake (*Merluccius bilinearis*), winter flounder (*Pseudopleuronectes americanus*), winter skate (*Raja ocellata*), and little skate (U.S. Army Corps of Engineers 2004b). The Corps found that the greatest abundance of finfish occurred in the fall months at depths greater than 30 ft and that the off-shore bottom predominantly consisted uniformly of sand. A review of the Corps' finfish database indicate that the areas within the vicinity of Shinnecock Inlet and borrow area 2b (offshore of Fire Island Pines) had the highest diversity of finfish species (U.S. Army Corps of Engineers 2004b).

The Corps also surveyed the same four borrow areas for squid (*Teuthida* spp.), a carnivore that feeds upon small fish, crustaceans, benthic worms, and shrimp, that is an important commercial fishery resource and prey species for many finfish species, including bluefish and silver hake. Squid were observed at each of the borrow areas with the greatest numbers occurring in the fall months (U.S. Army Corps of Engineers 2004b). Squid abundance appears to be evenly distributed, except for a slightly higher abundance at the Shinnecock borrow area in the summer and borrow area 2c (offshore of Sailors Haven) in the winter and spring.

These fish/squid surveys were supplemented by Corps contractor FIMI surveys of borrow areas 2C and 5B from July through October of 2015 (U.S. Army Corps of Engineers 2016a). The most abundant species in each borrow area throughout all the months sampled included squid, northern sea robin (*Prionotus carolinus*) and scup while the species with the greatest biomass included the winter skate, clearnose skate (*Raja eglanteria*) and northern searobin. Refer to the Corps' DEIS Appendix L for more detailed information regarding these surveys (U.S. Army Corps of Engineers 2016a).

Artificial Reefs

The NYSDEC Division of Marine Resources develops and manages artificial reefs to provide fishing opportunities for fish species that frequent hard bottom habitat. These species include tautog, black sea bass (*Centropristis striata*), and scup (New York State Department of Environmental Conservation 2006). Artificial reefs present within the FIMP study area include:

Fisherman (Great South Bay, 1.0 nautical mi. northeast of the Robert Moses water tower);

Kismet (Great South Bay, north of Kismet);

Fire Island (Atlantic Ocean, 1.8 nautical mi. south of Fire Island Lighthouse);

Moriches (Atlantic Ocean, 2.1 nautical mi. south of Moriches Inlet), proposed to be significantly expanded from 14 to over 400 ac.; and

Shinnecock (Atlantic Ocean, 2.0 nautical mi. south of Shinnecock Inlet) proposed to be significantly expanded from 35 to over 400 ac.

These reefs consist of red shale, jetty stone, barges, ship hulls, and buoy anchors.

Essential Fish Habitat (EFH)

The EFH provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) authorize the National Oceanic and Atmospheric Administration (NOAA) to evaluate development projects proposed or licensed by federal agencies, including the Corps. If coastal development projects have the potential to adversely affect marine, estuarine, or anadromous species or their habitat, the NOAA makes recommendations on how to avoid, minimize, or compensate these impacts (NOAA website http://www.nero.noaa.gov/hcd/webintro.html).

The MSFCMA also establishes measures to protect EFH. The NOAA must coordinate with other Federal agencies to conserve and enhance EFH, and federal agencies must consult with NOAA on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH. In turn, NOAA must provide recommendations to federal and state agencies on such activities to conserve EFH. These recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from actions or proposed actions authorized, funded, or undertaken by that agency.

The EFH areas are depicted in NOAA's website http://www.nero.noaa.gov/hcd/webintro.html). Several of the dominant species discussed above are designated as EFH species by the NOAA, including the Atlantic butterfish, scup, and winter flounder. The Corps will need to complete EFH consultation with the NOAA for this project.

2. Nearshore

The Service (U.S. Fish and Wildlife Service 1996) defines the nearshore zone as the aquatic area between the offshore 20-m depth contour and the MLW line. The nearshore bottom is a gently sloping terrace composed of a uniform sand sediment surface (U.S. Fish and Wildlife Service 1996b). The NYSDEC's New York Natural Heritage Program (NYNHP) defines the community within this area as the Marine Deepwater Community (New York Natural Heritage Program 2002).

The nearshore community within the project area is also a sandy, sparsely vegetated aquatic community dominated by benthic organisms such as the polychaete worm (*Mageloma papillicornis*) and dwarf tellin (Tellina agilisa), and sea turtles, such as the Kemp's ridley sea turtle (U.S. Army Corps of Engineers 1999). Finfish observed in the nearshore zone include bluefish, striped bass (*Morone saxitilis*), alewife, Atlantic menhaden (*Brevoortia tyrannus*), northern kingfish (*Menticirrhus saxatilis*), and striped sea robin (*Prionotus evolans*) (U.S. Fish and Wildlife Service 1981a).

The Service's Significant Habitats and Habitat Complexes of the New York Bight Watershed Report (SHCR) identifies the Montauk Peninsula as a significant habitat, specifically the nearshore open waters which provide regionally significant and critical wintering waterfowl habitat and extensive beds of blue mussel and kelp.

The NYSDOS has designated Montauk Point shoals as a Significant Coastal Fish and Wildlife Habitat (New York State Department of State website: http://www.nyswaterfronts.com/downloads/pdfs/sig_hab/LongIsland/Montauk_Point_Shoals.pdf (see Figure 6).

3. Marine Intertidal

The marine intertidal gravel/sand beach community is characterized by tidal or wave inundation and has sand or gravel substrates (New York Natural Heritage Program 2002; U.S. Army Corps of Engineers 2016). This community is present along the majority of the Atlantic shoreline within the FIMP study area. The marine rocky intertidal community is also influenced by tidal and wave inundation, but its substrate consists of boulders/rocks. This community is present in the eastern portion of the FIMP study area, specifically along the south shore of the Montauk Peninsula (New York Natural Heritage Program 2002). The marine riprap/artificial shore community is present at the groins and jetties located along the FIMP area, Atlantic Ocean shoreline, including the jetties at Fire Island, Moriches, and Shinnecock Inlets, and groins at Westhampton Beach.

Corps Surveys

<u>East of Shinnecock Inlet</u>

The Corps contracted EEA, Inc. to survey benthic invertebrates from Shinnecock Inlet east to Montauk Point (a total of 24 transects), within the marine intertidal community, from the wrack line, mid-tide zone and surf zone. The survey was segmented into four reaches: the Montauk Headlands (described as shorelines with large boulders and rocks on short beaches below heavily eroded bluffs), Ditch Plains (described as areas with sandy beaches and areas with rocks and boulders), Coastal Ponds (in front of Mecox Bay, Sagaponack Pond, and Georgica Pond, described as being influenced by washout events and materials from the ponds), and east of Shinnecock Inlet (described as sandy beach). Surveys were conducted in May and November/December of 2000 (EEA, Inc. 2003a).

May 2000

East of Shinnecock Inlet – Polychaete worms (*Scolelpis squamata*), and amphipods (*Gammarus oceanicus* and *Amphipoda* spp.) were the dominant species, both found more in the mid-tide zone.

Coastal Ponds – Nematoda (*Nematoda* spp.) found in the wrack line and mid-tide zones, polychaete worms (*Scolelpis squamata*), found more in the surf and mid-tide zones, and bivalves/blue mussel found in the mid-tide zones, were the dominant species.

Ditch Plains – Blue mussel, found primarily in the mid-tide and surf zones, was most dominant, followed by polychaete worms (*Scolelpis squamata*), found more in the surf and mid-tide zones and amphipods, found in the wrack line and surf zone.

Montauk Headlands – Blue mussel, found primarily in the mid-tide and surf zones, was most dominant, followed by amphipod species, found primarily in the surf zone, and Gastropoda (*Littorina littorea*), found in the mid-tide zone.

November/December 2000

East of Shinnecock Inlet – Amphipods (*Gammarus oceanicus*), found primarily in the mid-tide and surf zones, were most dominant, followed by polychaete worms (*Scolelpis squamata*), found in the surf zone.

Coastal Ponds – Polychaete worms (*Scolelpis squamata*), found in the mid-tide and surf zones, were most dominant, followed by Nematoda (*Nematoda* spp.), found in the mid-tide zone.

Ditch Plains – Polychaete worms (*Scolelpis squamata*, *Ophelia bicornis*), found primarily in the mid-tide and surf zones, were most dominant, followed by Nematoda (*Nematoda* spp.), found in the wrack line.

Montauk Headlands – Polychaete worms (*Ophelia bicornis*, *Glycera* spp.), found primarily in the surf zone, were most dominant, followed by Nematoda (*Nematoda* spp.), found in the wrack line.

EEA, Inc. concluded that: a) abundance and diversity of infauna generally increased from west to east; b) most biomass was attributable to polychaete worms, with the exception of the Montauk Headlands Reach, where mollusks and periwinkle *(Littorina littorea*) were dominant; c) surf and mid-tide zones had higher abundances than the wrack line; and d) organisms in the eastern reaches (Ditch Plains and Montauk Point) were dissimilar to those in the western reaches (Shinnecock Inlet east and the Coastal Ponds) (EEA, Inc. 2003a).

EEA, Inc. also compared their results with previous studies of ocean shoreline benthic infauna conducted on Fire Island (Kluft 1999), Westhampton Beach (EEA, Inc. 1999), and along the New Jersey shoreline (Vittor 1999). EEA, Inc. concluded that their study findings were similar to those on the Long Island barrier beaches but differed from those on New Jersey beaches, where Rhyncocoela (nemertean worms – *Nemertean* spp.) was dominant and overall abundances were higher, as were the number of sampling stations (twice as many). The nemertean worms, which live under rocks or burrow in soft substrates, were rarely collected in EEA, Inc.'s efforts and none were collected in the Fire Island study. It was not clear to EEA, Inc. why this species was found in large numbers in some areas and not in others (EEA, Inc. 2003a).

EEA, Inc. observed extensive tire ruts across the western beaches of the study area (just east of Shinnecock Inlet). These areas were open to vehicular traffic, which may have accounted for the low numbers of organisms observed in the wrackline zone (EEA, Inc. 2003a).

Refer to EEA, Inc. 2003a for a complete listing of species observed and a more comprehensive discussion of study findings.

West of Shinnecock Inlet

The Corps beach invertebrate surveys were conducted at twelve locations from Fire Island to Shinnecock Inlets in the Spring and Fall of 2003, using benthic cores, wrackline observations and pitfall traps (discussed in the Marine Beach community section). Overall, dominant species observed in benthic cores included oligochaeta, nematoda, and blue mussel. In the spring, oliochaeta and nematoda were dominant in the low, mid, and high tide zones and the wrack line, while blue mussel and turbellaria flatworms were dominant only in the low tide zone. In the fall, oliochaeta and nematoda were dominant in each portion of the intertidal area, with oliochaeta being more dominant in the upper zones (high tide and wrack line) and Nematoda being more dominant in the lower zones (low, mid, and high tide zones). Dominant wrack line organisms observed included springtail (*Anurida maritima*), bivalves, amphipod beach fleas, and common sea star (*Asterias forbesii*). The total number of benthic organisms appeared to fluctuate randomly along a west-to-east gradient, while the stations fronting Shinnecock Bay had the highest mean abundance (U.S. Army Corps of Engineers 2005a). There was a greater abundance of benthic organisms observed in the fall. In the spring, benthic organism abundance was highest at the mid-tide zone while abundance was more evenly distributed in the fall.

A comparison of the findings of this study and the study of the eastern portion of the FIMP study area described above, indicated seasonal similarities in abundances and taxa, but differences along the transects. In this study of the western portion of the study area, there were a higher number of benthic invertebrates found in the high tide line and wrack locations, while the study of the eastern portion of the study area showed higher organism abundances in the mid and surf zones than the wrack (U.S. Army Corps of Engineers 2005a). This phenomenon may be due to the fact that the shoreline of the eastern portion of the study area, primarily Montauk Point and Ditch Plains, is armored with stones, boulders, and coarse sand, while the western portions consist of sand. Additionally, off-road vehicle (ORV) traffic affects wrackline abundances.

Refer to U.S. Army Corps of Engineers 2005a for a complete listing of species observed and a more comprehensive discussion of study findings.

B. Ocean Beach and Dune Ecosystem

1. Marine Beach

Vegetation

Landward of the sandy intertidal zone is the maritime beach community that is typically dominated by American beachgrass (*Ammophila breviligulata*), sea-rocket (*Cakile edentula*), seaside goldenrod, seaside spurge (*Chamaesyce polygonifolia*), and the federally-listed (threatened) seabeach amaranth (New York Natural Heritage Program 2002).

The NPS-FIIS, USGS, NYNHP, The Nature Conservancy (TNC), and Conservation Management Institute completed the mapping of vegetation within the FIIS in 2002 (Conservation Management Institute 2002). These maps (too large to be incorporated into this document) are available at http://biology.usgs.gov/npsveg/fiis/index.html. Dominant species observed in this effort within the Marine Beach habitat (classified as North Atlantic Upper Ocean Beach in their report) included American beachgrass, seaside goldenrod, and beach pea (*Lathyrus japonicus*).

Benthic Species

Dominant species/taxa observed in pitfall traps (in the wrackline, supratidal, and grass zones) from above-described surveys conducted in the spring and fall of 2003, included brine fly (*Ephydridae* spp.) and ground beetle (Clivinia spp.), beach flea amphipods (*Talorchestia longicornis* and *T. megalopthalma*), and incidental collections of blue mussel (U.S. Army Corps of Engineers 2005a). In the spring, *T. longicornis* was more dominant while *T. megalopthalma* was more dominant in the fall. Generally, *T. longicornis* was more dominant in the wrack line and supratidal zone while *T. megalopthalma* was more dominant in the grass zone. There was a greater abundance of invertebrates captured/observed in the spring than the fall, with the greatest abundance along the beaches fronting the Great South Bay (Old Inlet).

Significant Habitats

The Service's Significant Habitat and Habitat Complexes of the New York Bight Watershed Report identifies sandy beach areas within the following significant habitat complexes:

<u>Montauk Peninsula</u>

Napeague Beach – One of the largest undeveloped beach and back dune ecosystems. This complex also a NYSDOS-designated significant habitat.

<u>South Fork Atlantic Beaches</u>

Gin Lane Beach – Federally-listed seabeach amaranth present.

Atlantic Double Dunes – Undeveloped beach and dune ecosystem with extensive dunes and maritime interdunal swale communities. This complex also a NYSDOS-designated significant habitat.

<u>Shinnecock Bay</u>

Tiana Beach and Southampton Beach – Support significant nesting habitat for the State-listed least tern and federally-listed piping plover.

<u>Moriches Bay</u>

Smith Point County Park, Pikes Beach, Westhampton Beach, and Cupsogue County Park – Piping plovers and least terns nest on these sandy beaches and harbor seals haul-out at Cupsogue County Park in the winter.

Great South Bay

Democrat Point, FIIS Wilderness Area – Piping plovers and least terns nest and seabeach amaranth grows on these sandy beaches.

The following New York State Department of State- (NYSDOS) designated Significant Coastal Habitats (SCH) are present within this zone (excerpts from NYSDOS web-site):

Atlantic Double Dunes

The fish and wildlife habitat extends approximately 2.5 mi. along the coast, from Old Beach Lane in the Village of East Hampton to Beach Avenue in Amagansett, and includes the Amagansett NWR. This approximate 280 ac area consists of open sandy beach (the Maidstone Club Beach and Amagansett Beach) and a relatively undisturbed interdunal area situated between the primary dune and residential development along the south side of Further Lane and Bluff Road. Atlantic Double Dunes is one of the largest remaining areas of undeveloped barrier beach and back dune ecosystem on Long Island, representing a rare ecosystem type in New York State.

Mecox Beach

The beach occurs in the dynamic area between the coastal pond and ocean and is an important nesting area for least terns and piping plovers.

Smith Point County Park

Smith Point County Park is one of the largest segments of undeveloped barrier beach on Long Island, comprising a rare ecosystem type in New York State. This area contains the largest extent of saltmarsh in Moriches Bay, and is an important habitat for many fish and wildlife species throughout the year. Piping plovers nest on the upper beach. The dunelands at Smith Point County Park comprise a significant segment of the fall migration corridor for raptors moving south along the Atlantic Coast. Undeveloped dune areas such as this provide critical feeding and resting areas for thousands of migrating raptors each year.

As stated above, Hurricane Sandy created overwash deposits, east of the TWA Flight 800 Memorial at Smith Point County Park (Hapke *et al.* 2013). However, the FIMI project stabilized/altered much of the habitat created there, although mitigation/restoration sites have been constructed to mimic natural features and are being assessed by the Corps and the Service to assess their success.

Three breaches formed on Fire Island at Smith Point (40.750156N, -72.811806W), Old Inlet (40.723509N, -72.894704W), and eastern Fire Island Pines (40.667489N, -73.055264W). The

breach at Smith Point was a relatively small breach that did not appear to exhibit exchange of ocean and bay waters at low tide (Papa, U.S. Fish and Wildlife Service, personal observation), but was closed by the Corps under the provisions of the Corps' BCP in December 2012.

Cupsogue County Park

Cupsogue County Park is an important segment of undeveloped barrier beach on Long Island. This area is a valuable habitat for a variety of wildlife species, including foraging and breeding habitat for least terns and piping plovers. Barrier beach dunelands, such as that found on Cupsogue County Park, are also essential resting and feeding areas for migrating raptors, especially falcons and accipiters, which move south through a very narrow corridor along the south shore. These birds forage extensively among the undeveloped barrier beaches, where concentrations of small mammals, migrant shorebirds, and passerine birds provide an important prey base. The wetland areas in Cupsogue County Park are valuable feeding areas for a variety of shorebirds and waterfowl throughout the year, and contribute significantly to the biological productivity of Moriches Bay.

Corps Avian Surveys

The Corps conducted a 1-year survey of avian species within the FIMP study, specifically along the barrier islands from Fire Island Inlet to just east of Shinnecock Inlet, along 20 transects from May 2002-May 2003 (U.S. Army Corps of Engineers 2003). Beach habitat, including intertidal and supratidal areas, consisted of the largest percentage of habitat surveyed. Dominant species observed during these surveys include:

Black-bellied plover (*Pluvialis squatarola*; forages in beach habitat during winter and migration);
Dunlin (*Calidris alpine*; forages in beach habitat during winter and migration);
Great black-backed gull (year-round foraging);
Herring gull (year-round foraging);
Least tern (forages and breeds in spring/summer);
Piping plover (forages and breeds in spring/summer);
Sanderling (forages during winter and migration).

Other species regularly observed in the beach habitat include the American oystercatcher, which forages and breeds in the spring/summer, and semi-palmated plover, which forages during migration.

The Service conducted avian surveys for the FIMP project from May-July of 1982, from Moriches Inlet to Montauk Point. These surveys identified many of the above listed species as dominant in the marine beach habitat, as well as the American kestrel and horned lark, both year-round residents (U.S. Fish and Wildlife Service 1983).

Federally- and State-listed Species

Beach habitat also provides essential foraging and nesting habitats for nesting waterbirds, including the federally-listed threatened piping plover, endangered roseate tern, and State-listed threatened least tern, common tern, and species of special concern black skimmer. The federally-listed red knot (*Calidris canutus rufa*; threatened) utilizes sandy beaches within the FIMP study area as stopover/foraging habitat during spring and fall migrations. However, this species is more concentrated in areas where horseshoe crab eggs and bivalves are available for forage, which is in the bay intertidal habitat discussed more below. Seabeach amaranth is a federally-listed (threatened) plant that grows in this habitat.

Within the FIMP area, the piping plover and least tern nest in Marine Beach and Dune and Swale, Terrestrial Upland, bayside beach and bay island habitats along the ocean shoreline, and back-bay areas as well. Plovers forage on invertebrates primarily along the ocean and bay shorelines, while the least tern forages for fish in ocean and bay open waters. The roseate and common terns breed on bay islands and forage for fish in ocean and bay open waters. Common terns nest within the FIMP study while roseate terns had historically, but not within the last 5 years. Black skimmers also had historically nested within the FIMP study area on bay islands in tern colonies although they have not nested recently within the FIMP project area in the last 5 years. Black skimmers forage in ocean and bay waters for fish.

Seabeach amaranth only grows on sparsely vegetated ocean beaches (U.S. Fish and Wildlife Service 1996a). This annual plant usually grows on the ocean beaches within the FIMP study area with greater concentrations in the western and central portions.

A summary of population trends for these species (NYSDEC Long Island Colonial Waterbird and Piping Plover data) that breed within New York State (Long Island) are listed as follows (2015 data not yet available at the time of the preparation of this document):

Table 1. Federally- and New York State-listed Species on Long Island/NY

Species (1 = No. of Pairs; 2 = No. of Breeding Individuals)						
Year	**Piping Plover1**	**Roseate Tern1**	**Common Tern2**	**Least Tern2**	**Black Skimmer2**	**Seabeach Amaranth ***
2000	289	2104	19,664	2,103	331	138,600
2001	309	1815	17,499	2,737	512	179,300
2002	369	1853	15,790	3,267	491	190,500
2003	386	1938	18,405	2,678	378	112,128
2004	384	1804	19,116	2,069	265	30,831
2005	374	1380	19,330	3,382	418	16,813
2006	422	1835	20,097	2,798	390	32,473
2007	456	1,832	17,548	2,792	483	3,914
2008	472	1324	21,441	3,669	622	4,416
2009	475	1328	17463	2817	690	5,402
2010	428	1315	18,177	2832	589	534

2011	334	1505	8,161	2311	538	2,662
2012	391	1501	15,616	1720	508	1,213
2013	344	1,544	17,453	2,281	557	729
2014	309	1,610	6,559	1,804	768	902
* Number of plants						

Plover populations on Long Island steadily increased from the year 2000, peaking in 2009, then dropped significantly in 2011 and 2014. Populations numbers in 2015 (still preliminary) indicate a slight increase from 2014 (New York State Department of Environmental Conservation 2015b). Roseate tern populations on Long Island were relatively stable from 2000-2004, but dropped in 2005 and 2008-2010, but have been on the rebound since 2011. Seabeach amaranth numbers plummeted in 2004, and have remained low, with modest fluctuations since then.

A more detailed assessment of the piping plover, seabeach amaranth, roseate tern and red knot will be completed during the ESA section 7 consultation.

There is a fourteen year downward trend in common tern and least tern populations across Long Island. While the trend for black skimmers in this time period is an increase in the total population, the number of colonies has sharply decreased Long Island-wide, but specifically within the FIMP area from 12 in 1980 to none in 2015 (New York State Department of Environmental Conservation 2015b).

Although not a federally or state-listed species, the American oystercatcher (Haematopus palliates) is a ground-nesting shorebird which breeds within the ocean beach, dunes and swales, terrestrial upland, bayside beach, and bay island habitats that many federally and State-listed ground-nesting shorebird species breed in within the FIMP.

Limiting factors in shorebird productivity include disturbances from recreational activities, flooding/inundation of nests, predation, beach stabilization practices, and loss of habitat from development. Limiting factors in seabeach amaranth growth include trampling from off-road vehicles and/or pedestrians, loss of habitat from development, beach stabilization practices which promote dense beach grass growth, burial of seed banks, and competition with perennial plants as beach habitat is stabilized (U.S. Fish and Wildlife Service 1996a).

2. Dunes and Swales

Vegetation

The vegetated beach community consists of the vegetated dune and back-dune areas which are dominated by American beachgrass, bayberry (*Myrica pennsylvanica*), dusty miller, beach plum (*Prunus maritima*), beach heath (*Hudsonia tomentosa*), beach pea (*Lathyrus japonicus*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Rhus radicans*), and common saltwort (*Salsola kali*).

The NPS-FIIS vegetation mapping efforts (Conservation Management Institute 2002) designated several vegetation classes/communities present within dunes and swales, listed in Table 2.

Table 2. NPS-FIIS Dunes and Swales Vegetative Communities of Fire Island

Vegetation Class/Community	Description	Dominant Species
Northern Beach Grass Dune	Perhaps the most prevalent on Fire Island. It is found on the ocean side of the interdunal area from the crest through the high saltmarsh	American beachgrass, seaside goldenrod
Overwash Dune Grassland	Occurs on recent overwash areas near the foredune	American beachgrass
Brackish Interdunal Swale	Found behind primary and secondary dunes where saline surface water is found	Three square bulrush (*Scirpus pungens*), saltmeadow cordgrass (*Spartina patens*)
Northern Sandplain Grassland	Rare and limited to the wider parts of the Otis Pike Wilderness Area	Bayberry
Beach Heather Dune	Widespread on Fire Island and is found from Fire Island Inlet to the Moriches Inlet predominantly in the interdunal zone	Beach heather (*Hudsonia tomentosa*), American beachgrass
Northern Interdunal Cranberry Swale	Found in the interdunal zone as small, pond-like bodies of shallow water	Cranberry (*Vaccinium macrocarpon*), highbush blueberry (*V. corymbosum*), Canadian rush (*Juncus canadensis*)
Northern Dune Shrubland	Dominates the interdunal areas on Fire Island	Beach plum, American beachgrass, bayberry
Maritime Vine Dune	Located on dunes	Poison Ivy, greenbrier (*Smilax rotundifolia*)
Highbush Blueberry Shrub Forest	Located in noticeable depressions or swales throughout the interdunal area	Juneberry (*Amelanchier canadensis*), Swamp azalea (*Rhododendron viscosum*), Highbush blueberry

Many of these communities are present along the Westhampton and Southampton barrier islands within the FIMP study area as well.

Significant Habitats

The Service's SHCR identifies dune grassland areas within the following significant habitat complexes:

<u>Montauk Peninsula</u>

Easthampton Heathland – One of the largest remaining maritime heathlands in New York.
Shadmoor Ditch Plains – Maritime grassland which provides habitat for the federally-listed sandplain gerardia (*Agalinus acuta*).

The sandy beach designated by the SHCR and NYSDOS also have dune grasslands present.

Migrating Hawks

Hawks migrate along the south shore of Long Island above the dunes and swales each fall. Since 1982, the Fire Island Raptor Enumerators (FIRE) organization has conducted annual surveys of these migrating hawks, at a station located at the eastern portion of RMSP, and provides annual data on their website (http://www.battaly.com/fire/). Dominant species observed by FIRE include: the osprey (*Pandion haliaetus*), northern harrier (*Circus cyaneus*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*A. cooperii*), American kestrel (*Falco sparverius*), and merlin (*F. columbarius*). The FIRE's annual data indicates significant variations from year to year, perhaps due to inclement weather, changes in migration patterns, and/or hawk movements when surveyors were not present.

Corps Avian Surveys

Dominant species observed within the dune/swale habitats during Corps surveys (U.S. Army Corps of Engineers 2003) from May 2002-May 2003 included:

Brown-headed cowbird (*Molothrus ater*; year-round resident);
Common yellowthroat (*Geothlypis trichas*; summer resident; spring and fall migrant);
Mourning dove (*Zenaida macroura*; year-round resident);
Dark-eyed junco (*Junco hyemalis*; winter resident; spring and fall migrant);
Northern mockingbird (*Mimus polyglottos*; year-round resident);
Rufous-sided towhee (*Pipilo erythrophthalmus*; year-round resident);
Red-winged blackbird (year-round resident);
Sharp-tailed sparrow (year-round resident);
Song sparrow (*Milospiza melodia*; year-round resident); and
Yellow-rumped warbler (*Dendroica coronata*; winter resident; spring and fall migrant).

Piping plovers, common terns, black skimmers, and least terns will potentially also nest in blow-out or overwashed areas within dune/swale areas.

The Service conducted avian surveys for the FIMP project from May-July of 1982, from Moriches Inlet to Montauk Point. These surveys identified many of the above listed species as dominant in the dune and swale habitats, as well as the grasshopper sparrow (*Ammodramus savannarum*) (U.S. Fish and Wildlife Service 1983).

Corps Small Mammal and Herpetile Surveys

The Corps conducted small mammal and herpetile (reptiles and amphibians) surveys in May through August of 2002. The white-footed mouse (*Peromyscus leucopus*) and meadow vole (*Pennsylvaniana maniculatus*) were the most dominant small mammals observed in the dune and swale habitats. Other mammals observed within this habitat include the house mouse (*Mus musculus*), white-tailed deer (*Odocoileus virginianus*), eastern cottontail (*Sylvilagus floridanus*), and red fox (*Vulpes vulpes*). The eastern garter snake (*Thamnophis sirtalis*) and Fowler's toad

(*Bufo woodhousei*) were the only herpetiles observed within this habitat (U.S. Army Corps of Engineers 2004c).

The Corps' herpetile surveys echo the findings of the Service in herpetile surveys conducted in April-July 1982 for the FIMP study (from Moriches Inlet to Montauk Point), in which the Fowler's toad and eastern garter snake were dominant (U.S. Fish and Wildlife Service 1983). An additional species observed during Service surveys within dune and swale habitats was the eastern spadefoot toad (*Scaphiopus holbrookii*).

C. Barrier Island Ecosystem

1. Terrestrial Upland

Vegetation

The NPS-FIIS vegetation mapping efforts (Conservation Management Institute 2002) designated several vegetation classes/communities present within the terrestrial uplands, listed in Table 3.

Table 3. NPS-FIIS Terrestrial Vegetative Communities of Fire Island

Vegetation Class/Community	Description	Dominant Species
Maritime Holly Forest	Occurs just behind (landward of) the backdune	American holly (*Ilex opaca*), shadblow serviceberry (*Amelanchier canadensis*), sassafras, black gum (*Nyssa sylvatica*), black cherry, and pitch pine (*Pinus rigida*)
Old Field Red-Cedar Forest	Found on William Floyd Estate. Individual trees are smaller-crowned and scattered in with hardwoods	Red cedar (*Juniperus virginiana*), autumn olive (*Eleagnus umbellate*), and winged sumac (*Rhus copallina*)
Maritime Post Oak Forest	Limited to the edge of waterways on the William Floyd Estate	Black oak (*Quercus velutina*), post oak (*Q. stellata*), and northern bayberry
Coastal Oak-Heath Forest	Covers a large portion of the William Floyd Estate	Black oak, white oak (*Quercus alba*), mockernut hickory (*Carya tomentosa*), and lowbush blueberry (*Vaccinium pallidum*)
Acidic Red Maple Basin Swamp Forest	Found on both the Floyd Estate and Fire Island	Black gum, red maple (*Acer rubrum*), highbush blueberry, and swamp azalea
Japanese Black Pine Forest	Found in many isolated patches on Fire Island. It is often used to stabilize the fore dune – especially on the eastern end of the island and around human communities.	Japanese black pine (*Pinus thunbergii*), pitch pine (*Pinus rigida*), and switchgrass (*Panicum virgatum*)
Pitch Pine Woodland	Found throughout Fire Island behind the primary dune	Pitch pine, northern bayberry, switchgrass
Maritime Deciduous Scrub Forest	Found on the bay side, often behind a large primary dune on wider parts of the island	Mockernut hickory, black oak, sassafras, northern bayberry, Pennsylvania sedge (*Carex pennsylvanica*)

Bayside Beach

Bayside shorelines within the FIMP vary, with many areas transitioning from terrestrial upland habitat to tidal marsh, while some bay shoreline transitions from dune habitat to open sand shoreline (bayside beach). This habitat is sparsely-vegetated, with beach grass dune habitat present landward of the shoreline. The bayside beach habitat is an important habitat for many wading birds and is breeding habitat for the diamondback terrapin.

White-tailed Deer Status

The white-tailed deer population on Fire Island has grown dramatically since 1983. Deer density in the eastern half of the island appears to have stabilized at 25-35 deer/square kilometers (km^2) while densities are 3-4 times higher in the western half within residential communities (Underwood 2005). Deer can have a significant impact on vegetation that they browse upon, most evident in Sunken Forest, where the herbaceous layer is sparse (Underwood 2005). Deer populations on the mainland of Long Island and at FIIS has increased dramatically since the early 1980s and is impacting local flora, including the globally rare maritime holly forest at Sunken Forest (National Park Service 2009). NYSDEC hunting season forecasts indicate that deer populations in Suffolk County are above desired levels (website-http://www.dec.ny.gov/outdoor/37304.html). In East Hampton, the uncontrolled explosion in the deer population has reached an emergency level according to the Deer Management Working Group (Town of Easthampton 2013).

Mainland Upland/Wetlands

Long Island occurs within the Atlantic coastal plains (U.S. Fish and Wildlife Service 1996). The Mainland Upland is variable in land use, with many areas consisting of disturbed uplands consisting of commercial and recreational development. Representative "natural/undisturbed" areas occur in federal, state, and local parks/refuges. Communities present in the FIMP study area mainland include successional Old Field/Shrubland (William Floyd Estate); Coastal Oak/Heath Forest (Seatuck and Wertheim NWRs), Red Maple/Black Gum Swamp, Freshwater Tidal Marsh (Wertheim NWR), Tidal Marsh (low saltmarsh/brackish meadow/salt shrub/high saltmarsh, Suffolk County Islip Meadows, Wertheim NWR).

Successional Old Field/Shrubland is dominated by red cedar, with other canopy associates including black cherry and black oak in the overstory. The shrub layer is dominated by autumn olive, shadblow serviceberry, winged sumac, red cedar, and post oak, prickly dewberry (*Rubus flagellaris*), highbush blueberry, and greenbrier also occurs in the vine layer. The herbaceous layer is dominated by red fescue grass (*Festuca rubra*), common mullein (*Verbascum thapsus*), wild rye (*Elymus virginicus*), and panic grass (*Panicum acuminatum*) (Conservation Management Institute 2002). Characteristic wildlife includes the brown thrasher, warblers (*Dendroica* spp.), eastern towhee, field sparrow, red-tailed hawk, red fox, and white-tailed deer (New York Natural Heritage Program 2002).

The Coastal Oak/Heath Forest community is dominated by black oak, white oak, and pitch pine in the overstory, lowbush blueberry and black huckleberry (*Gaylussacia baccata*) in the understory, and greenbrier, wintergreen (*Gaultheria procumbens*), and Pennsylvania sedge in the herbaceous layer (New York State Department of Conservation 2002). Characteristic wildlife includes the redback salamander (*Plethodon cinereus*), eastern towhee, black-capped chickadee (*Parus atricapillus*), sharp-shinned hawk, and white-tailed deer (Hofstra University website: http://people.hofstra.edu/Russell_L_Burke/HerpKey/index.htm).

The Red Maple Swamp-Black Gum Swamp is dominated by red maple, black gum, and pitch pine in the overstory, sweet pepperbush (*Clethra alnifolia*), highbush blueberry, swamp azalea,

and spicebush (*Lindera benzoin*) in the shrub layer, and greenbrier, poison ivy, skunk cabbage (*Symplocarpus foetidus*), and cinnamon fern (*Osmunda cinnamomea*) in the herbaceous layer (New York State Department of Conservation 2002). Characteristic wildlife include the yellow warbler (*Dendroica petechia*), hairy woodpecker (*Picoides villosus*), red-shouldered hawk, eastern painted turtle (*Chrysemys picta picta*), and spotted salamander (*Ambystoma maculatum*) (Hofstra University website: http://people.hofstra.edu/Russell_L_Burke/HerpKey/index.htm).

The Tidal Marsh is variable in dominant species, depending upon the intrusion of invasive species and hydrology. Low saltmarsh is dominated by smooth cordgrass (*Spartina alterniflora*) and glasswort, the brackish meadow is dominated by saltmeadow cordgrass (*S. patens*), switchgrass, and sedge (*Carex silicea*). The salt shrub community is dominated by groundsel-tree (*Baccharis halimifolia*), marsh elder (*Iva frutescens*), saltmeadow cordgrass, and switchgrass. The high saltmarsh is dominated by saltmeadow cordgrass, spikegrass (*Distichlis spicata*), glasswort, and sea lavender (*Agalinus maritima*) (New York Natural Heritage Program 2002). With the exception of the low marsh, many of these communities have been invaded by common reed. Characteristic wildlife in lower areas include willet, seaside sparrow, fiddler crab (*Uca pugilator*), ribbed mussel (*Geukensia dimissa*), and mummichog. Characteristic wildlife in higher areas include coffeabean snail (*Melampus bidentatus*), sharp-tailed sparrow, marsh wren, eastern meadowlark (*Sturnella magna*), clapper rail, American black duck, and northern harrier (New York Natural Heritage Program 2002).

Corps Avian Surveys

Dominant species observed within forest habitats during Corps surveys (U.S. Army Corps of Engineers 2003) from May 2002-May 2003 include:

American crow (*Corvus brachyrhynchos*; year-round resident);
American goldfinch (*Carduelis tristis*; year-round resident);
American robin (*Turdus migratorius*; year-round resident);
Black-capped chickadee (year-round resident);
Common grackle (*Quiscalus quiscula*; year-round resident);
Golden-crowned kinglet (*Regulus satrapa*; winter resident; spring and fall migrant);
Dark-eyed junco (winter resident; spring and fall migrant);
Rufous-sided towhee (year-round resident);
Red-winged blackbird (year-round resident);
Yellow-rumped warbler (winter resident; spring and fall migrant).

The Service conducted avian surveys for the FIMP project from May-July of 1982, from Moriches Inlet to Montauk Point (U.S. Fish and Wildlife Service 1983). These surveys identified many of the above listed species as dominant in the terrestrial/mid-barrier island habitats, as well as the following additional species:

Brown thrasher (year-round resident);
Bobwhite (year-round resident);
Ring-necked pheasant (*Phasianus colchicus*; year-round resident);
Field sparrow (year-round resident);

Prairie warbler (summer resident);
Chipping sparrow (*Spizella passerine*; year-round resident);
Marsh wren (*Cistothrus palustris*; summer resident).

Corps Small Mammal and Herpetile Surveys

The Corps surveys in May through August of 2002 (U.S. Army Corps of Engineers 2004c) indicated that the white-footed mouse, meadow vole (*Microtus pennsylvanicus*), and masked shrew (*Sorex cinereus*) were the most dominant small mammals within terrestrial upland habitats, while the woodland vole (*M. pinetorum*), norway rat (*Rattus norvegicus*), white-tailed deer, red fox, eastern cottontail, and gray squirrels (*Sciurus carolinensis*) were also observed. Box turtles (*Terrapene carolina*) and Fowler's toad were the only herpetiles observed in this habitat. Although not observed during these surveys, other herpetile species expected to occur in terrestrial habitats include the eastern spadefoot toad and northern black racer (*Coluber constrictor constrictor*). The snapping turtle (*Chelydra serpentine*) was observed in freshwater wetlands within terrestrial habitats, spring peepers (*Hyla crucifer*), and bullfrog (*Rana catesbeiana*) are expected to occur in these habitats, as well. The spring peeper, Fowler's toad, eastern painted turtle, snapping turtle, green frog (*R. clamitans melanota*), and eastern garter snake were observed in terrestrial freshwater wetlands and ponds during Service surveys in 1982 (U.S. Fish and Wildlife Service 1983).

D. Bay Ecosystem

1. Bay Intertidal

Vegetation

The dominant vegetation in the bay intertidal community includes saltmarsh cordgrass, saltmeadow grass, glasswort (*Salicornia* spp.), and groundselbush (*Baccharis halimifolia*). Wildlife found in this community includes the muskrat (*Ondatra zibethica*), great egret, northern harrier, and seaside sparrow. Fish found in the tidal pools and ditches within this community include the mummichog, silverside, and fish which use marshes as nurseries, including striped bass and winter flounder.

Saltmarshes are tidal marshes of brackish or saltwater, along estuaries and behind barrier beaches. Tidal marsh generally consists of dense stands of herbaceous wetland vegetation dominated by Spartina alterniflora and S. patens and subject to variation in water depth during each tidal cycle (McCormick and Associates 1975). Saltmarshes are among the most productive communities known. Most of the tremendous production of saltmarshes is used in the form of organic detritus (Odum 1961). This organic detritus, mostly Spartina wrack (New York Sea Grant Institute 1993), is then distributed throughout the system (Odum 1961). Coastal marshes are also important in stabilizing shorelines and as wildlife habitat (New York Sea Grant Institute 1993).

The NPS-FIIS vegetation mapping efforts (Conservation Management Institute 2002) designated several vegetation classes/communities present within bay intertidal areas, listed in Table 4.

Table 4. NPS-FIIS Bay Intertidal Vegetative Communities of Fire Island

Vegetation Class/ Community	Description	Dominant Species
Reedgrass Marsh	Widespread, found in and around most wetland areas on both the Floyd Estate and Fire Island	Common reed, groundselbush, poison ivy
Low Saltmarsh	More regularly flooded parts of the saltmarsh	Saltmarsh cordgrass, spikegrass, glasswort (*Salicornia* spp.)
High Saltmarsh	Found in close proximity to *Spartina alterniflora* on the less-frequently flooded portions of the saltmarsh	Salt meadow grass, spikegrass, black grass (*Juncus geradii*), glasswort
Brackish Marsh	Found uncommonly near the highest portions of the saltmarsh on the bay side of Fire Island	Saltmeadow grass, switchgrass, Canadian rush, blackgrass

It should be noted that bulkheads are common on the bay shoreline in developed communities and areas. Bulkheads prevent sand from entering the littoral drift system, causing sediment starvation in unprotected areas downdrift (Nordstrom *et al.* 2005). Bulkheaded areas are generally void of tidal marsh vegetation and are of minimal habitat quality. Also, nearly all the back-barrier fringe marshes on Fire Island have been grid ditched for mosquito control (National Park Service 2009).

Sand shoals and mud flats provide important forage habitat for wading birds such as the black-bellied and piping plover, greater yellow-legs, sanderling, American oystercatcher, and dunlin (U.S. Fish and Wildlife Service 1983). These areas also provide important loafing/resting/ stopover habitat for many shorebirds, such as the roseate tern, common tern, least tern, and black skimmer. Sand shoals and mudflats also provide breeding habitat for the horseshoe crab, discussed further below.

NPS-FIIS Evaluation of Marsh Development

The NPS-FIIS conducted a monitoring program to quantify marsh elevation change in relation to sea-level rise and to identify factors and/or processes that influence the development and maintenance of Fire Island saltmarshes. Monitoring was conducted in three marsh areas, Great Gun Meadows, Hospital Point, and Watch Hill from August 2002 to May 2007. The NPS determined that the development of the three marshes coincided with the establishment of the Hallets (1788) and Smiths (1773) inlets. Storm-induced inlets and barrier island overwash transport sediment from the ocean and barrier island to the bay. As such, inlets and associated flood tidal deltas support the establishment of back-barrier saltmarsh habitat (Roman et al.2007).

See Section V-B for a discussion of NPS-FIIS's findings regarding marsh elevation and sea-level rise.

Wetland Trends

Having an understanding of the trends of wetland accretion/gains or losses in the bays will assist decision-makers and biologists in assessing the status of this important resource within the FIMP study area. This assessment will assist in determining and gauging/weighing the significance in impacts of the proposed action, should the proposed action alter the natural processes that form these habitats (cross-island sediment transport, bayside shoreline processes).

The NYSDEC conducted a trend analysis of New York State's tidal wetlands in Moriches and Shinnecock Bays using GIS analysis in 1996 which was updated in 2015. Within the FIMP study area since 1974, there has been: a net loss of 308 ac. of tidal wetlands from Fire Island Inlet to Moriches Inlet (Great South Bay); a net gain of 60.9 ac. in Moriches and Shinnecock Bays; and a net loss of 55.4 ac. in Mecox Bay, Sagaponack Pond, and Georgica Ponds. The gains in Moriches and Shinnecock Bays are likely a result of landward movement of the tidal wetlands boundary (Fallon and Mushacke 1996; Cameron Engineering & Associates, LLP 2015).

Despite a net gain of tidal wetlands in Shinnecock Bay, there were thirteen separate islands, but by 1995, six of the islands had completely disappeared and the remaining islands had a loss of wetland areas (Fallon and Mushacke 1996). Service personnel have observed the loss of Warner's South Island (Little Warner's) in Shinnecock Bay, which was historically an important colony site for the federally endangered roseate tern. The island supported the colony until 2001-2002, when the island was flooded over.

The primary causes of wetland loss are listed as follows (Cameron Engineering & Associates, LLP 2015):

- Conversion of high marsh to intertidal marsh;
- Formation of pannes and ponds within marshes;
- Conversion of interior marsh to mudflats;
- Alteration/widening of tidal creeks and man-made ditches;
- Erosion and retreat of seaward wetland edge;
- Phragmites australis encroachment;
- Sea-level rise
- Low sediment supply.

Erosion may be caused by: a) the apparent deficit of sediment in the bays due to maintenance dredging activities (Intracoastal Waterways) and boat wake reflection (Cameron Engineering & Associates, LLP 2015).

Significant Habitats

Significant bay intertidal habitats within the FIMP are present in Great South Bay, Moriches Bay, Shinnecock Bay and coastal ponds including Mecox Bay, Sagaponack Lake, and Georgica Pond. A general description of each of these waterbodies (excerpted from the Service's SHCR) is provided below.

Great South Bay

The Great South Bay complex as defined here includes 47 km (29 mi.) of this system from South Oyster Bay east to Moriches Bay. This part of the Long Island back barrier system is characterized by shallow open water habitat with extensive saltmarshes along the backside of the barrier beach and along tidal creeks and rivers feeding into the bay from the mainland. Great South Bay occupies an area of 243 km2 (151 square miles [mi2]) and has an estuarine drainage of 1,360 km2 (845 mi2), with a daily average freshwater inflow of 19.8 cubic meters (m3) per second (700 cubic ft [ft3] per second). The majority of this flow originates from six groundwater-fed bodies: Orowoc Creek, Champlin Creek, Connetquot River, Swan River, Beaverdam Creek, and Carmans River. Great South Bay is the only one of the Long Island south shore bays that has major riverine input (from the Carmans and Connetquot Rivers) (U.S. Fish and Wildlife Service 1996).

Moriches Bay

The Moriches Bay habitat complex includes the entire 3,836-hectare (ha) (9,480-ac) aquatic environment of Moriches Bay, Moneybogue Bay, and Quantuck Bay; this includes open water, saltmarshes, dredged material islands, and intertidal flats, as well as the eastern end of the Fire Island barrier island, the western end of the Westhampton Beach barrier island (the barrier island between Moriches and Shinnecock Inlets), Moriches Inlet, and the nearshore waters of the New York Bight. The western boundary of this complex is the Smith Point Bridge; the eastern boundary is the eastern edge of Quantuck Bay. This habitat complex also includes the tidal creeks and marshes feeding into Moriches Bay from the Long Island mainland and the adjacent uplands of the William Floyd Estate. This boundary encloses regionally significant habitat for fish and shellfish, migrating and wintering waterfowl, colonial nesting waterbirds, beach-nesting birds, migratory shorebirds, raptors, and rare plants (U.S. Fish and Wildlife Service 1996). Moriches Bay is a regionally-significant habitat for fish and shellfish, migrating and wintering waterfowl, colonial nesting waterbirds, beach-nesting birds, migratory shorebirds, raptors, and rare plants. There are 105 species of special emphasis in the Moriches Bay complex, incorporating 42 species of fish and 41 species of birds (U.S. Fish and Wildlife Service 1996).

Shinnecock Bay

The Shinnecock Bay habitat complex comprises the entire 3,642-ha (9,000-ac) aquatic environment of Shinnecock Bay, including open water, saltmarshes, dredged material islands, and intertidal flats, in addition to the eastern end of the Westhampton Beach barrier island (refers to island between Moriches Inlet and Shinnecock Inlet), the western end of the Southampton Beach barrier spit, Shinnecock Inlet, and the nearshore waters of the New York Bight. The

western boundary of this complex is the Quogue Canal in Quogue; the eastern boundary is the eastern edge of Taylor Creek in Southampton Village. This habitat complex also includes the tidal creeks and marshes entering into Shinnecock Bay from the Long Island mainland. This boundary encloses regionally significant habitat for fish and shellfish, migrating and wintering waterfowl, colonial nesting waterbirds, beach-nesting birds, migratory shorebirds, raptors, and rare plants (U.S. Fish and Wildlife Service 1996). Shinnecock Bay is a regionally significant habitat for fish and shellfish, migrating and wintering waterfowl, colonial nesting waterbirds, beach-nesting birds, migratory shorebirds, raptors, and rare plants. There are 97 species of special emphasis in the Shinnecock Bay complex, incorporating 42 species of fish and 37 species of birds (U.S. Fish and Wildlife Service 1996).

Mecox Bay, Sagaponack Lake, and Georgica Pond (Part of South Fork Atlantic Beaches Complex)

The South Fork Atlantic beaches habitat complex boundary encloses the entire 27-km (17-mi.) stretch of sand beach, dunes, and associated bays from Halsey Neck Pond at the eastern end of Shinnecock Bay in Southampton east to the eastern edge of the Amagansett NWR in East Hampton. The habitat boundary encloses the entire beach strand habitat from the ocean inland to the mainland or back barrier ponds; this includes the foreshore, backshore, dunes, and interdunal areas as well as the nearshore waters extending offshore about 1/4 mile. The habitat complex also includes the aquatic habitats in Mecox Bay and other bays and ponds. This boundary encompasses nesting and feeding habitat for beach-nesting birds, rare beach and interdunal swale communities and plants, and wintering waterfowl habitat. The beaches on the South Fork front directly on the mainland or are only minimally separated from the mainland by small ponds and bays. Mecox Bay, Sagaponack Pond, and Georgica Pond are brackish ponds that are breached intermittently to alleviate flooding and improve water quality (U.S. Fish and Wildlife Service 1996).

In addition to the tidal marshes present throughout each of the identified bays, the Service's SHCR identifies specific bay intertidal areas within the following significant habitat complexes:

Moriches Bay

William Floyd Estate – One of the few remaining sites where tidal wetlands are contiguous to an undeveloped upland buffer.

Shinnecock Bay

Dune Road Marsh (adjacent to Tiana Beach) – Important waterfowl, wading bird, and songbird nesting habitat, and the marshes, shallows, and flats are important foraging areas for these birds, as well.

Great South Bay

Connetquot River Estuary – A unique 4,500-ac undeveloped coastal watershed that is an important wintering area for waterfowl.

Champlin Creek – A brackish coastal stream which provides rich spawning and nursery habitats for commercially valuable marine species.

Orowoc Creek – A freshwater coastal stream that harbors a locally rare population of naturally-reproducing brook trout.

Swan River – Supports both native brook trout and sea-run brown trout (Salmo trutta).

Beaverdam Creek – Supports sea-run brown trout.

Carmans River Estuary – Extensive and undeveloped tidal wetlands on both sides of the river provide outstanding habitat for a great diversity of fish and wildlife species, specifically being one of the most significant nursery areas for yearling striped bass in Great South Bay.

With the exception of the William Floyd Estate, each of the above designated significant habitat complexes are also designated as SCH's by the NYSDOS. Additional NYSDOS-designated SCH's within this zone are described in the following excerpts from the NYSDOS's website (http://www.nyswaterfronts.com/waterfront_natural_narratives.asp#LongIsland):

<u>Far Pond and Middle Pond Inlets in Shinnecock Bay</u>

Far Pond and Middle Pond Inlets are adjoining undeveloped barrier peninsulas and tidal inlets, which are a relatively uncommon ecosystem type in Suffolk County. Piping plovers and least terns nest on the peninsulas, and the inlets are important feeding areas for least terns and other shorebird species because of the concentrations of fish which occur in those locations. Both ponds serve as nursery areas for winter flounder.

<u>Sagaponack Inlet that flows into the Atlantic Ocean</u>

The Sagaponack Inlet fish and wildlife habitat consists of a relatively small, undeveloped, inlet through the ocean side barrier beach. This represents an ecosystem type that is generally rare in Suffolk County, being found at only a limited number of locations along the south shore and in the eastern forks of Long Island. Sagaponack Inlet serves as a nesting and foraging site for least terns and piping plovers.

<u>Long Pond Greenbelt in Sagaponack Lake</u>

The Long Pond Greenbelt is an interconnected pond/wetland ecosystem with undeveloped border areas. This ecosystem type is rare in Suffolk County and provides important habitat for a wide variety of fish and wildlife species. The Long Pond Greenbelt site is included in the "Southampton Green Belt" IBA (one of 127 such areas), which extends from Tuckahoe in the west to the Sag Harbor area in the east. Sagaponack Pond has been designated and mapped as an undeveloped beach unit pursuant to the Federal Coastal Barrier Resources Act, prohibiting federal financial assistance or flood insurance within the unit. The NYNHP, in conjunction with TNC, recognizes the greater Long Pond Greenbelt complex, including Long Pond Greenbelt,

Slate Pond, Black Pond Bridgehampton, and Little Poxabogue Pond, as a Priority Site for Biodiversity. The larger Long Pond/Southampton Greenbelt is an undeveloped corridor across the South Fork between the Atlantic Ocean and the Peconic Bays, serving as an important migratory stopover for birds and insects.

Finfish/Invertebrates

2001-2002 Surveys

The Corps conducted a finfish/invertebrate survey of back-bay intertidal areas in 2001 and 2002. Beach seining was conducted along the shoreline and in tidal ponds, while throw traps were used in marsh areas. A total of 15 stations were sampled from June 2001 to May 2002, along the backbay side of the barrier island intertidal zone from Fire Island Inlet to Shinnecock Inlet. Seven stations were sampled along Great South Bay: Kismet, Clam Pond, Sailor's Haven, Barrett Beach, Watch Hill, Old Inlet, and Pattersquash. Five stations were sampled along Moriches Bay: Cupsogue, Dune Lane, Pikes Beach, Picket Point, and Jessup Lane. Three stations were sampled along Shinnecock Bay: Tiana Beach, Ponquogue West, and Ponquogue East. Sampling was conducted bimonthly (twice per month, typically every other week) during the course of the study. There was a four-month hiatus in sampling from December 2001 through March 2002 - a winter period when productivity was minimal (U.S. Army Corps of Engineers 2005b). Samples were collected along the shoreline and in tidal ponds.

The surveys found that the dominant finfish species in the intertidal shoreline areas were Atlantic silverside, striped killifish (*Fundulus majalis*), and bay anchovy. Total numbers of finfish collected at each station ranged from the lowest catch at Barrett Beach (372) to highest catch at Clam Pond (14,533). Finfish species diversity appears to fluctuate randomly throughout all stations and bays. Dominant invertebrate species included sand shrimp (*Crangon septemspinosa*), marsh grass shrimp (*Palaemonetes vulgaris*), and blue crab (*Callinectes sapidus*). Total abundances were highest in October (8,705) and lowest in July (1,123). Spatially, the number of species and diversity appears to fluctuate randomly (U.S. Army Corps of Engineers 2005b).

In tidal ponds, sheepshead minnow (*Cyprinodon variegates*) was the most abundant species, comprising 42 percent of the total catch. Striped killifish were also collected in large numbers, representing 26 percent of the total catch. Spatially, pond abundances were highest at Ponquogue East (519) and Cupsogue (420). Lowest abundances were at Picket Point (149) and Old Inlet (202). On a monthly basis, finfish abundances were highest in July (495) and lowest in April (6) and May (21). Marsh grass shrimp was the dominant invertebrate species collected representing 69 percent of the total catch. Monthly abundances were highest in May (27), April (25), and October (24). Months with the lowest catches occurred in September (3), July (4), and August (5) (U.S. Army Corps of Engineers 2005b).

Stony Brook University conducted trawl surveys in Great South Bay as part of their assessment of the impacts of the breach at Old Inlet on the bay ecosystem from 2013-2015 during spring, summer and fall months at randomly selected stations (Frisk *et al.* 2015). As in 2001-2002, the bay anchovy was found to be a dominant species found in these surveys for each of the three

years sampled. Other dominant species in each of the three years included the blue crab, lady crab (*Ovalipes ocellatus*), spider crab and summer flounder. Species dominant in 2013 and 2015 include weakfish (*Cynoscion regalis*) and bluefish (*Pomatomus saltatrix*). Additional dominant species in 2013 included spot (*Leiostomus xanthurus*), Atlantic silverside, tautog and sand lance (*Ammodytes* sp.). Other dominant species in 2014 included the Northern puffer (*Sphoeroides maculatus*), squid, cunner, northern pipefish, and butterfish and other dominant species in 2015 included sea robin, winter flounder, mantis shrimp (*Stomatopoda* spp.) and menhaden.

To complement other FIMP studies, sediment was analyzed for sediment type as well for benthic organisms from six stations along West Hampton Island: Cupsogue, Dune, Picket Point, Jessup, Ponquogue West, and Ponquogue East. Samples were collected at seven tidal locations from each site (U.S. Army Corps of Engineers 2005b). This study found that all samples were composed primarily of sand, with several stations (dispersed throughout the study area) consisting of sand with gravel, and several with sand and silt (U.S. Army Corps of Engineers 2005b). Annelids, arthropods, and mollusks dominated the collections during both seasons (spring and fall). During Year 2, annelids, arthropods, and mollusks were still dominant, as were aschelminths (spring and summer). Aschelminths, during Year 2, were much more abundant at all stations than during Year 1. In addition, at Ponquogue East, summer collections showed that over half of the benthos sampled were platyhelminths (U.S. Army Corps of Engineers 2005b).

Corps Avian Surveys

Dominant species observed within Spartina-dominated saltmarsh/tidal wetland habitats during Corps surveys from May 2002-May 2003 (U.S. Army Corps of Engineers 2003) include:

Canada goose (year-round resident);
Least sandpiper (foraging during migration);
Mallard (year-round resident);
Greater yellowlegs (foraging during winter and migration);
Red-winged blackbird (year-round resident);
Seaside sparrow (year-round resident);
Sharp-tailed sparrow (year-round resident); and
Willet (foraging in summer).

Although not a numerically dominant species, an important predator within this habitat is the northern harrier, a fall migrant/year-round resident, which preys upon small mammals, birds, and reptiles.

Dominant species observed within Phragmites-dominated bay intertidal habitats during Corps surveys from May 2002-May 2003 (U.S. Army Corps of Engineers 2003) include:

Song sparrow (year-round resident);
Yellow warbler (summer resident; spring and fall migrant);
Yellow-rumped warbler (winter resident; spring and fall migrant);
Red-winged blackbird (year-round resident);
Dark-eyed junco (winter resident; spring and fall migrant); and
Common grackle (year-round resident).

Dominant species observed within bay intertidal flat habitats during Corps surveys from May 2002-May 2003 (U.S. Army Corps of Engineers 2003) include:

American oystercatcher (summer breeder; spring and fall migrant);
Black-bellied Plover (*Pluvialis squatarola*; forages in beach habitat during winter and migration);
Common tern (summer breeder; spring and fall migrant);
Dunlin (*Calidris alpine*; forages in beach habitat during winter and migration);
Greater yellowlegs (foraging during winter and migration);
Herring gull (year-round foraging);
Ruddy turnstone (*Arenaria interpres*; spring and fall migrant);
Sanderling (*Calidris alba*; forages during winter and migration); and
Willet (foraging in summer).

The NYSDEC and Cornell Cooperative Extension conducted migratory shorebird surveys of the Moriches Bay shoreline at 16 sampling stations (4 along the south shore of the Long Island mainland; 4 on Fire Island and 8 on the Westhampton Barrier Island) during the spring of 2012 and 2013 to capture the spring migration (Sclafani *et al.* 2014). Important foraging/loafing areas that had the highest shorebird densities included Pikes Beach in Westhampton (maximum of 3,009 birds observed on May 24, 2012) and Cupsogue County Park in Westhampton (maximum of 2,536 birds observed on May 31, 2012). Other important shorebird foraging/loafing areas include East Inlet Island near Moriches Inlet, the Great Gunn area of Smith Point County Park and the Moriches Bay shoreline of Terrell River County Nature Preserve. Dominant species observed included the red knot, dunlin, sanderling, semi-palmated sand spiper, and ruddy turnstone (Sclafani *et al.* 2014).

Virginia Polytechnic Institute also surveyed shorebird habitat use on Fire Island and Westhampton barrier islands in 2014 (Derose-Wilson *et al.* 2015). Important forage areas identified included the backbay sandbar at Cupsogue County Park (21,576 individual birds), the ocean beach at Smith Point County Park (10,110 birds) and the breach at Otis Pike Wilderness Area (3,463 birds). Dominant species included black-bellied plover, dunlin, ruddy turnstone, sanderling, short-billed dowitcher (*Limnodromus griseus*), semipalmated plover and semipalmated sandpiper (Derose-Wilson *et al.* 2015). Refer to Virginia Polytechnic Institute's 2015 report for more details on their findings.

Federally-listed Species – Red Knot

The red knot, a federally threatened species, does utilize low-energy bay intertidal areas (tidal flats and tidal marshes) within the FIMP study area as stopover/foraging habitat during spring

and fall migrations (New Jersey Department of Environmental Protection 2007). While this species is known to be more concentrated in areas where horseshoe crab eggs are available for forage, research does document coquina clams (*Donax variabilis*) and blue mussels as being important prey species as well (Watts and Truitt 2015). Horseshoe crab eggs are also an essential food source for many other migrating shorebirds (NYSDEC website: http://www.dec.ny.gov/animals/36195.html).

Although the Service is not aware of comprehensive horseshoe crab and/or red knot surveys being conducted within the FIMP area, the NYSDEC and Cornell University Cooperative Extension are monitoring horseshoe crab spawning activity at select sites on Long Island, including two sites within the FIMP study area, Captree Island, and Pikes Beach Westhampton (Cornell University Cooperative Extension website: http://counties.cce.cornell.edu/suffolk/Vanderbilt/Horseshoe-research.htm). The Cornell Cooperative Extension of Suffolk County has indicated that Pikes Beach is a heavily utilized area for horseshoe crab spawning, including a peak of 6 crabs/meter in May of 2013 (Sclafani *et al.* 2014), and has identified the majority of the bay shoreline of Fire Island as potential spawning habitat (Sclafani, et.al 2009). One hundred and thirteen horseshoe crabs were observed spawning at Captree Island in 2007, where peak spawning generally occurs in the months of May and June and specifically occurred on June 3 (Sclafani *et al.* 2009). Horseshoe crab spawning was also confirmed at Captree Island, as well as Davis Park on Fire Island more recently during the years of 2011-2013 (Sclafani *et al.* 2014). Similar habitats along bay intertidal flats and/or marshes within the FIMP are expected to have horseshoe crab spawning activity and associated red knot foraging.

A more detailed assessment of the red knot will be completed during the ESA section 7 consultation.

Corps Small Mammal and Herpetile Surveys

The Corps surveys in May through August of 2002 (U.S. Army Corps of Engineers 2004c) indicated that the white-footed mouse, meadow vole, and masked shrew were the most dominant small mammals within bay intertidal habitats, while the white-tailed deer, raccoon (*Procyon lotor*), muskrat, and red fox were also observed. Although not observed during these surveys, the diamond-back terrapin is a common species found in bay intertidal habitats and was observed during Service surveys in 1982 (U.S. Fish and Wildlife Service 1983).

2. Back-Bay Subtidal

Seagrass beds represent a critical habitat for at least one species, the bay scallop (*Argopecten irradians*) (New York Sea Grant Institute 1993). The rock crab (*Cancer irroratus*) was found to be restricted to thick eelgrass areas (WAPORA 1982). The blue mussel and hard clam are species found in moderate to dense vegetation (O'Connor 1972). Seagrass beds provide hard clams with protection from whelks (*Buscyon* spp.), and possibly other predators as well (Peterson 1982). The venus clam (Gemma gemma) is an extremely abundant, suspension feeding bivalve found in especially high abundance in eelgrass regions (WAPORA 1982). It is an important forage species for shorebirds.

Seagrass beds are also noted for high densities of fish, in part because of the abundant food supply (Heck *et al.* 1989). The importance of eelgrass as a habitat for the juvenile and adult stages of numerous marine fishes has been frequently documented (New York Sea Grant Institute 1993). Many studies have shown that eelgrass beds support significantly higher faunal densities than other habitats (Orth *et al.* 1984). Eelgrass is the predominant submerged vascular plant, while widgeon grass (Ruppia maritima) is also an important seagrass species present within the FIMP bays, although distributed in small patches (Bokuniewicz *et al.* 1993). Abundances of sand shrimp were found to be approximately 70 percent greater in widgeon grass beds than in eelgrass beds (New York Sea Grant Extension Program 2001).

New York Sea Grant Institute (1993) reported that juvenile tautog and cunner (*Tautogolabrus adspersus*) depend strongly on eelgrass habitat as a shelter and/or nursery. Winter flounder also appear to use eelgrass beds as nursery areas (Heck *et al.* 1989). Again, forage fish species critical to the bay food web, particularly stickleback species (Apeltes quadracus and Gasterosteus aculeatus), also depend upon this habitat.

Eelgrass is an important foraging resource for avian species, especially brant. The distribution of major waterfowl feeding and nesting areas in the adjacent Great South Bay (New York Sea Grant Institute 1993) closely corresponds to the distribution of eelgrass meadows.

Open Water/Non-Vegetated Bay Bottom: The substrate in this community consists of sand and silts in the low energy areas. Benthic organisms found in this habitat include the hard clam and clam worm (*Platynereis dumerilii*). Finfish found in this community include the striped bass and summer flounder, while wading birds and shorebirds, such as the great blue heron and piping plover, respectively, forage in the shallow/exposed bay bottom. Additionally, harbor seals have been documented using the bay and exposed sand shoals (U.S. Army Corps of Engineers 1999).

In addition to the actual bays identified below, the Service's SHCR identifies specific bay subtidal areas within the following significant habitat complexes:

<u>Long Pond Greenbelt</u>

Sagaponack Pond – Identified as an undeveloped beach unit of the Coastal Barrier Resources System.

<u>South Fork Atlantic Beaches</u>

Mecox and Georgica Ponds – Support colonies of least terns and consistent use by piping plovers near the inlets; important for both breeding and foraging; further description of Mecox Bay provided below.

The following NYSDOS-designated SCH's are present within this zone (excerpts from NYSDOS website:
http://www.nyswaterfronts.com/waterfront_natural_narratives.asp#LongIsland):

Great South Bay (East)

Great South Bay-East comprises approximately one-half of the largest protected, shallow, coastal bay area in New York State. This broad expanse of open water is highly productive, and supports a tremendous diversity of fish and wildlife species. Many species of migratory birds which typically occur in coastal habitats are found nesting or feeding in the remaining natural areas along the north and south shores of Great South Bay-East. These include green-backed heron, black-crowned night heron, snowy egret, American bittern, Canada goose, mallard, black duck, gadwall, northern harrier, osprey, least tern, herring gull, willet, horned lark, fish crow, marsh wren, red-winged blackbird, sharp-tailed sparrow, and seaside sparrow. Great South Bay-East is also one of the most important waterfowl wintering areas (November - March) on Long Island, especially for diving ducks, which feed on eelgrass, invertebrates, and small fish. Mid-winter aerial surveys of waterfowl abundance for the 10-year period 1975-1984 indicate average concentrations of over 10,700 birds in the bay each year (25,409 in peak year), including approximately 6,600 scaup (21,155 in peak year), 1,000 red-breasted mergansers (2,470 in peak year), 750 black ducks (2,710 in peak year), 700 brant (2,121 in peak year), 600 common goldeneye (1,750 in peak year), and 430 Canada geese (750 in peak year), along with lesser numbers of oldsquaw, bufflehead, mallard, mute swan, and canvasback. Based on these surveys, it appears that Great South Bay-East supports the largest wintering waterfowl concentrations in New York State, and is probably one of the most important areas for diving ducks in the northeastern United States.

Concentrations of waterfowl also occur in the area during spring and fall migrations (March-April and October-November, respectively). In addition to having significant bird concentrations, Great South Bay-East is an extremely productive area for marine finfish, shellfish, and other wildlife. Great South Bay-East serves as a major spawning, nursery, and foraging area (April - November, generally) for winter flounder, kingfish, bluefish, blue crab, and forage fish species, such as Atlantic silverside, striped killifish, mummichog, northern pipefish, and sticklebacks. The entire Great South Bay-East area is inhabited by local concentrations of hard clams along with local concentrations of American oyster.

Moriches Bay

Moriches Bay is one of three major protected, shallow, coastal bay areas on the south shore of Long Island, which constitutes one of the largest estuarine ecosystems in New York State. This highly productive bay supports a variety of fish and wildlife species throughout the year. Many species of migratory birds nest among the saltmarshes and spoil islands in Moriches Bay, including roseate terns (historically), common terns, and black skimmers. Other species nesting in the area include black duck, mallard, gadwall, American oystercatcher, great black-backed gull, herring gull, willet, clapper rail, fish crow, sharp-tailed sparrow, and seaside sparrow. The saltmarshes are used extensively as feeding areas by birds nesting in the area, and by a variety of herons, egrets, and other shorebirds. Moriches Bay is one of the most important waterfowl wintering areas (November - March) on Long Island. Mid-winter aerial surveys of waterfowl abundance for the 10 year period 1975-1984 indicate average concentrations of over 5,000 birds in the bay each year (8,382 in peak year), including approximately 2,150 scaup (4,470 in peak year), 350 brant (580 in peak year), 1,100 black ducks (1,580 in peak year), 400 red-breasted

mergansers (920 in peak year), 400 Canada geese (870 in peak year), and 225 mallards (430 in peak year), along with lesser numbers of common golden-eye, bufflehead, oldsquaw, American widgeon, and canvasback. Based on these surveys, Moriches Bay supports wintering waterfowl concentrations of State-wide significance.

Concentrations of waterfowl also occur in the area during spring and fall migrations (March-April and October-November, respectively). In addition to having significant waterfowl concentrations, Moriches Bay is a productive area for marine finfish, shellfish, and other wildlife. Moriches Bay serves as a nursery and feeding area (April-November, generally) for bluefish, winter flounder, summer flounder, tomcod, American eel, blue crab, and forage fish species, such as Atlantic silverside, striped killifish, pipefish, and sticklebacks. Moriches Inlet is an especially significant component of the bay, as a corridor for fish migrations, as a source for the exchange and circulation of bay waters, and as an area where feeding by many fish and wildlife species is concentrated. As a result of the abundant fisheries resources in the bay, especially winter flounder, fluke, and baitfish species, Moriches Bay receives heavy recreational and commercial fishing pressure, of regional significance. Moriches Bay is inhabited by hard clams, bay scallops, and blue mussels, and most of the bay waters are certified for commercial shellfishing.

Shinnecock Bay

Shinnecock Bay is part of one of the largest estuarine ecosystems in New York State. This highly productive bay is important to a variety of fish and wildlife species throughout the year. Shinnecock Bay is one of the most important waterfowl wintering areas (November-March) on Long Island. Mid-winter aerial surveys of waterfowl abundance for the 10-year period 1975-1984 indicate average concentrations of over 3,500 birds in the bay each year (7,284 in peak year), including approximately 1,650 scaup (4,100 in peak year), 470 brant (1,060 in peak year), 380 black ducks (867 in peak year), 400 red-breasted mergansers (1,455 in peak year), 300 buffleheads (1,265 in peak year), and 100 common goldeneye (305 in peak year), along with lesser numbers of mallard, Canada goose, oldsquaw, and canvasback. Based on these surveys, Shinnecock Bay supports wintering waterfowl concentrations of statewide significance.

Concentrations of waterfowl also occur in Shinnecock Bay during spring and fall migrations (March-April and October-November, respectively). In addition to having significant waterfowl concentrations, Shinnecock Bay is a productive area for marine finfish, shellfish, and other wildlife. Much of this productivity is directly attributable to the saltmarshes and tidal flats which border the bay. Shinnecock Bay serves as a nursery and feeding area (April-November, generally) for bluefish, winter flounder, summer flounder, scup, weakfish, tomcod, blue crab, and forage fish species, such as Atlantic silverside, menhaden, striped killifish, pipefish, and sticklebacks. A total of 51 fish species were collected during an intensive survey of the bay in 1981. Shinnecock Inlet is an especially significant component of Shinnecock Bay, as a corridor for fish migrations, as a source for the exchange and circulation of bay waters, and as an area where foraging by many fish and wildlife species is concentrated. Wildlife species which feed extensively on fisheries resources near the inlet include the New York State-listed least tern (endangered) and common tern (threatened), and harbor seal. From December through early May, concentrations of harbor seals (approximately 30-40 individuals) occur in Shinnecock Bay.

Exposed sand shoals near the inlet provide an important "haulout" area, which seals use for resting and sunning. This location is one of about five major haulouts around Long Island, serving as a focal point for seals feeding in the bay. The bay is also inhabited by hard clams, soft clams, bay scallops, and bank mussels.

Mecox Bay

Mecox Bay and Beach is the largest of the coastal pond and wetland ecosystems east of Shinnecock Bay on the south shore of Long Island. The inlet which connects Mecox Bay to the ocean, through the barrier beach, is a relatively uncommon element of the coastal zone in eastern Long Island. This entire area is important to a variety of fish and wildlife species throughout the year. Mecox Beach serves as an important nesting site for least terns and piping plovers. Mecox Bay is especially significant as a waterfowl wintering area (November-March), with concentrations of Canada goose of statewide significance. Mid-winter aerial surveys of waterfowl abundance for the ten year period 1975-1984 indicate average concentrations of over 1,500 birds in the bay each year (3,079 in peak year), including approximately 1,200 Canada geese (2,978 in peak year), 100 black ducks (825 in peak year), and 100 scaup (600 in peak year), along with lesser numbers of mallard, common goldeneye, American widgeon, canvasback, and mute swan. Concentrations of waterfowl also occur in the area during spring and fall migrations (March-April and October- November, respectively).

In addition to being an important habitat for migratory birds, Mecox Bay is a productive area for marine finfish and shellfish. The creeks and wetlands which drain into the bay contribute to the biological productivity of this area. The bay contains populations of many estuarine species, including soft clam, American oyster, blue crab, and white perch.

Corps Surveys

SAV Surveys

The Corps funded ecological inventory surveys of six SAV beds, two in each of the three bays within the FIMP study area. The East Fire Island and Bellport beds are located in the Great South Bay, Great Gunn, and Cupsogue beds are in Moriches Bay, and Tiana and Ponquogue East beds are in Shinnecock Bay. Surveys were conducted from June through October of 2003, in 2004 (time of year not provided), and from May through November of 2005 (U.S. Army Corps of Engineers 2006b). Major components of the field survey included the collection of finfish and invertebrates in the eelgrass beds using a seine net, eelgrass quadrate analysis (eelgrass height and density), collection of water quality data, and sediment grain size.

Finfish

2004 Survey

Atlantic silverside was the most commonly distributed species found at all 6 SAV sites. Blackfish (Tautoga onitis), winter flounder, and cunner were the most abundant finfish,

representing 23.8 percent, 16.7 percent, and 15.1 percent, respectively, of the total catch (U.S. Army Corps of Engineers 2004d, 2006b).

Easternmost sites were most productive, with Tiana and Ponquogue East stations having the highest abundances and biodiversity. The lowest levels of abundance and diversity were recorded at Bellport in Great South Bay.

2005 Survey

The Atlantic silverside was the most common species, representing 26.0 percent of the total catch. The next most commonly occurring species include bay anchovy and Atlantic tomcod (*Microgadus tomcod*), representing 16.5 percent and 13.9 percent of the total catch, respectively.

From a temporal perspective, the greatest diversity occurred during the months of July through September and the lowest in November (U.S. Army Corps of Engineers 2006b). A breakdown of dominant species and percent of total catch by month is listed as follows:

May: Atlantic tomcod (46.8 percent), fourspine stickleback (*Apelte quadracus*), and pollock (*Pollachius virens*), 46.8 percent, 13.5 percent, and 12.3 percent, respectively;

June: Atlantic silverside, Atlantic tomcod, and pollock, 46.0 percent, 16.9 percent, and 9.7 percent, respectively;

July: Bay anchovy, fourspine stickleback, and Atlantic tomcod, 59.6 percent, 7.7 percent, and 7.2 percent, respectively;

August: Atlantic silverside and northern sennet (*Sphyraena borealis*), 61.0 percent, and 8.8 percent, each respectively;

September: Cunner, Atlantic silverside, and blackfish, 41.0 percent, 35.0 percent, and 5.9 percent, respectively;

November: Northern pipefish (*Sygnathus fuscus*) and Atlantic silverside, 43.5 percent and 39.1 percent, respectively.

From a spatial perspective, the lowest catch was at Bellport in Great South Bay while the highest catch was at Cupsogue in Moriches Bay. Diversity was greatest at Ponquogue East (easternmost site), where 27 species were observed, while the lowest diversity occurred at East Fire Island (westernmost site), where 12 species were observed (U.S. Army Corps of Engineers 2006b).

Invertebrates

2004 Survey

Marsh grass shrimp was the most abundant and common species, representing 38.8 percent of the total catch and was found at all six locations. Comb jelly (*Mnemiopsis leidyi*) and green crabs (*Carcinus maenas*) were the second and third most commonly occurring invertebrate species, accounting for 25.1 percent and 11.0 percent of the total catch, respectively.

In regards to a spatial perspective, there were no discernible geographical trends, with the Cupsogue station in Moriches Bay having the greatest abundance and diversity of invertebrates and Ponquogue East in Shinnecock Bay had the lowest abundance and diversity (U.S. Army Corps of Engineers 2006b). There was a relative consistency of abundance and diversity between five of the six stations (the exception being Ponquogue East), indicating a uniformed distribution of invertebrates and habitat.

2005 Survey

The blue mussel was the most dominant species, although it was associated with a post-larval settlement on algae at the time of the sampling. Besides the blue mussel, the green crab consisted of 44.2 percent of the total counted catch, mud crab (*Panopeus herbstii*) with 15.0 percent, spider crab (*Libinia emarginata*) with 7.2 percent, and blue crab with 6.7 percent of the total counted catch (U.S. Army Corps of Engineers 2006b).

From a temporal perspective, invertebrate biodiversity was the lowest in May and the highest in June. The greatest invertebrate abundance was documented during the June sampling event, with August being the least productive. However, no obvious temporal trends could be established.

From a spatial perspective, the lowest diversity occurred at the Cupsogue station and the highest diversity at the East Fire Island station. The greatest abundance occurred at Ponquogue East Station while the least productive station was Cupsogue.

This study did determine a significantly negative correlation between finfish abundance and invertebrate biodiversity.

Landings Data

Landings of soft shell clams, oysters (*Crassostrea virginicus*), mussels, and conch (*Busycotypus canaliculatum*) in the Great South Bay were modest in the 1990's (most recent available data). Soft shell clam landings peaked in 1967 (over 3,000 bushels) and in 1985 (over 2, 500 bushels), and less than 100 bushels in 1999. Oyster landings peaked in 1961 (over 8,000 bushels) and have not gone above 100 bushels since 1981. Mussel landings peaked in 1965 (over 7,000 bushels) and less than 200 bushels since 1995. Conch landings peaked in 1985 (over 2,000 bushels) and have been less than 200 bushels since 1992. Blue crab landings increased in the

early 1990's, peaking at over 450 pounds in 1990 (New York Sea Grant Extension Program 2001).

Shellfish

Shellfish present within the subtidal habitat of the backbays include the hard clam, blue mussel, soft shell clam (*Mya arenaria*), oyster, and bay scallop (*Aequipecten irradians concentricus*). Hard clams and other shellfish such as bay scallop and soft clam play a critical role in the bays, filtering water and serving as an important link in the food web. During the 1970s, there were enough hard clams to filter 40 percent of Great South Bay every day. Today, only 1 percent of the Great South Bay is filtered daily (The Nature Conservancy website: http://www.nature.org/wherewework/northamerica/states/newyork/press/press1616.html). Since 1976, the hard clam harvest has declined 100 fold (Hinga 2005). The shellfish stocks have been declining steadily since the 1960s. The causes of the decline are still not proven, but poor natural recruitment, over-harvesting, increased predation, long-term climatic changes in temperature and salinity, and toxic algal blooms, such as brown tide, have been identified as possible factors (Town of Southampton 2001).

High abundances of hard clams are found in sediments with a larger fraction of course-grained materials, especially shell fragments, which appear to provide a more diverse habitat community of suspension feeders and carnivores (Hinga 2005). The South Shore Estuary Council (2001) recommended in their Comprehensive Management Plan that hard clam populations in Great South Bay, Moriches Bay, and Shinnecock Bay be enhanced through shell augmentation projects, using shell materials from appropriate sources (South Shore Estuary Reserve Council 2001).

Optimal temperature and salinity for adult hard clam growth has been estimated to be 20-30° C and 26-27 ppt (New York Seagrant Extension Program 2001).

Since 2004, TNC has been involved in restocking its 13,000-ac underwater holdings in the Great South Bay with adult hard clams (over 2.2 million as of 2013) in the hopes that they will reproduce, and ultimately restore, the bay (The Nature Conservancy 2013). The TNC has also planted over 10,000 bay scallops. Shellfish pump large volumes of water to feed on plankton and other organic particles. This, in turn, influences the entire food web and enhances ecosystem stability (The Nature Conservancy website: http://www.nature.org/wherewework/northamerica/states/newyork/press/press1616.html). The Service recommended shellfish bed restoration in its Planning Aid Report in 2005 for the FIMP, which identified potential restoration projects within the FIMP Study Area (U.S. Fish and Wildlife Service 2005).

Several municipalities also have clam restocking programs. The Town of Islip operates a shellfish culture facility to provide a sustainable source of seed clams to assist the recovery of stocks and to rebuild the public resource in the bay (Great South Bay). The facility is designed to produce up to forty million seed clams for planting annually (Town of Islip website: http://www.isliptown.org/details.cfm?did=110).

The Town of Babylon operates a spawning sanctuary – an area stocked with clams at high densities with the hope of enhancing reproduction. To date, over 6, 200 bushels of clams have been stocked. The Town of Babylon also operates a seed clam growout program in which one million 3-5 mm seed clams grow-out in rafts. Approximately 20 mm clams are broadcast into the bay. Over 25,000,000 clams have been introduced since the program's inception (Town of Babylon website: http://www.townofbabylon.com/departments/details.cfm?did=9).

The Town of Brookhaven's Division of Environmental Protection actively manages a Shellfish program, involving placement of approximately 100,000 spawner clams into Great South Bay annually and 1,000,000 12 mm seed clams in 2005. The Town of Brookhaven is planning to open a grow-out facility whose clams will be planted on the south shore in Great South Bay.

The Town of Southampton Trustees currently are undertaking trials of oyster seed introduction within Mecox Bay in an effort to increase the current population. The predominant shellfish taken from Mecox Bay include oysters and soft-shell clams (Town of Southampton 2001). The Southampton Trustees, in conjunction with the Cornell Cooperative Extension, undertake a seeding program yearly. Two million clams, approximately 12 mm in size, are planted on the bay bottoms, and 500,000 at 5 mm in size are placed in the Trustees owned rafts. Cornell Cooperative also rears oysters and scallops as space permits. The Southampton Trustees also transplant shellfish from uncertified areas (areas where shellfish harvest is not allowed) into seasonal areas in an effort to not only increase the current stock, but also to aid in optimal spawning (Town of Southampton 2001).

The Town of Easthampton program involves the restocking of hard clams, oysters, and bay scallops. In 2006, more than 2 million oysters were grown to planting size and seeded into East Hampton Town waters. A total of over 12 million hard clams were seeded throughout the 2006 growing season while approximately 200,000 scallops, were either over-wintered in Napeague Harbor or seeded into town harbors (Town of Easthampton website: http://www.town.east-hampton.ny.us/aquaculture.cfm)

Scientists hope that rebuilding the populations of these filter feeders will help control development of nuisance algae blooms like brown tide. Brown tide blooms periodically in each of the bays. This species appears to mechanically interfere with shellfish ingestion of other types of phytoplankton, essentially starving these herbivores. Hard clams can experience significant mortalities (67 percent) during brown tide blooms, and these blooms also prevent light penetration to the bottom, thereby affecting SAV as well (Hinga 2005). The primary cause of these blooms appears to be related to the relatively high levels of dissolved organic matter and dissolved organic carbon (Hinga 2005).

Eelgrass Height and Density

Eelgrass provides critical habitat for finfish, invertebrates, and waterfowl. The health of an eelgrass bed is better measured by density rather than height, because plant stability is gained through the expansion of rhizomes (U.S. Army Corps of Engineers 2006b).

2004 Survey

Eelgrass density (mean percent coverage within 1 m [3.3 ft] squared quadrants) ranged from 25 to 80 percent, with the least dense bed occurring at the Cupsogue station in Moriches Bay in August, and the densest at East Fire Island in Great South Bay and Tiana in Shinnecock Bay during July and August, respectively (U.S. Army Corps of Engineers 2006b). Average density was highest for Shinnecock Bay and lowest for Moriches Bay.

2005 Survey

Eelgrass bed density was greatest at East Fire Island in Great South Bay in June and least at Cupsogue in Moriches Bay in June, as well. Average density was highest in Shinnecock Bay and lowest in Moriches Bay.

From a temporal perspective, the month when each station had its maximum eelgrass bed density is listed as follows:

Great South Bay	East Fire Island	June (95 percent)
	Bellport	September (90 percent)
Moriches Bay	Great Gunn	August (80 percent)
	Cupsogue	September (60 percent)
Shinnecock Bay	Tiana	November (90 percent)
	Ponquogue East	August and September (65 percent)

An analysis of the relationship between eelgrass bed height and density and abundance and diversity of finfish and invertebrates indicated that there was no correlation. This conclusion suggests that faunal abundance and density are not dependent on eelgrass height or density.

The Corps' general conclusions of the study are listed as follows:

Eelgrass density and height were greatest when temperatures were highest;
Eelgrass density and height were greatest in Shinnecock and Moriches Bays;
Finfish abundance and diversity increased from west to east (greater in the eastern portions of the study area), and diversity increased with temperature.

Some efforts are being undertaken to restore eelgrass/submerged aquatic vegetation beds in the bays present within the FIMP. For example, the Shinnecock Bay Restoration Program, working with Stony Brook University as part of an on-going effort to restore eelgrass beds in Shinnecock Bay, planted 8,200 reproductive shoots of eelgrass in the Bay in June of 2014 (http://sb.cc.stonybrook.edu/news/general/140618seedsofhope.php). This partnership is also planning to install clam sanctuaries in the Bay as well.

Grain Size

Samples primarily consisted of medium (size class of 0.25 mm to 0.50 mm) sand. Tiana in Shinnecock Bay had the highest percentage (65.45 percent) of medium sand while site with the

lowest percentage of medium sand was found at East Fire Island in Great South Bay (which had the highest percentage of fine sand). However, the Corps determined that grain size between stations did not vary significantly and were statistically indistinguishable from each other, and that no significant correlations between grain size and effects of eelgrass density could be made. The Corps noted that sediment sampling of back-bay stations only entailed a grain size analysis. An analysis of organic material content was not conducted as part of the Corps' sampling effort (U.S. Army Corps of Engineers 2006b).

Hurricane Sandy Effect on Shellfish, Benthic Organisms, and Eelgrass Beds

Hurricane Sandy, while likely having long-term beneficial effects further described below, did bury sessile benthic organisms and submerged aquatic vegetation in Great South Bay in concentrated areas where overwash reached the bay side of the barrier island, in the vicinity of existing inlets where sediment was transported and where the breaches occurred. The largest areas of eelgrass and benthic organism burial occurred in the vicinity of Fire Island Inlet and the breach area at Old Inlet (Flagg 2013; Peterson pers. comm. 2014).

Pre-Hurricane Sandy Water Quality (FIMP Area - Corps Surveys)

Water quality parameters measured during the 2005 survey at each station included temperature, salinity, DO, and turbidity. Temperature values ranged from 9.79° C at Cupsogue in Moriches Bay to 26.15° C at Bellport in Great South Bay. However, study participants found no significant differences in temperature existed either spatially or temporally, and no general geographic patterns of increase or decrease were evident. The highest average DO concentrations were observed at the Ponquogue East station (10.66 milligrams [mg]/liter [L]). All station values, except for Tiana in September, were above 4.8 mg/L (USEPA minimum criteria for chronic and acute effects on biota). However, study participants indicated that that this reading may have been due to temporary equipment malfunction. Study participants found no differences in DO concentrations either spatially or temporally, and no general geographic patterns (U.S. Army Corps of Engineers 2006b).

Salinity ranged from 17.30 ppt at East Inlet Island in Great South Bay in June to 29.80 ppt at Ponquogue East in Shinnecock Bay in September. Salinity generally decreased by bay from east to west; however, study participants determined that it was unlikely that these decreases would have a negative impact on local biota (U.S. Army Corps of Engineers 2006b).

Turbidity values ranged from 0.00 Nephelometric Turbidity Units (NTU) at both Ponquogue East and Bellport stations during the August sampling event to 10.80 NTU at the Bellport station in Great South Bay in November. According to Singleton (2001), the management guideline for supporting marine life is < 8 NTU. Although two turbidity values were greater than the maximum standard, average values did not exceed this guideline and study participants state that these two values may have been due to equipment malfunction. Participants found no significant differences in turbidity either spatially, temporally, or from a geographic pattern perspective (U.S. Army Corps of Engineers 2006b).

When determining if environmental factors contributed to faunal and floral abundances and diversity, study participants found a positive correlation between temperature and finfish biodiversity (U.S. Army Corps of Engineers 2006b).

Water Quality (Great South Bay – NPS-FIIS)

A review of water quality data in Great South Bay, an effort sponsored by the NPS-FIIS, indicates that the salinity of the bay ranges from 25 to 30 ppt, surface water temperatures range from 25 to 29° C in the summer, and usually 0 to 2° C in the winter (Hinga 2005). Fecal coliform concentrations, although approaching levels of concern in some bayside beaches and marinas (see further below in South Shore Estuary discussion), are acceptable while there is an encouraging trend of decreasing dissolved inorganic nitrogen over the past quarter century, perhaps due to implementation of sewage management practices where sewage is discharged in the Atlantic Ocean instead of from individual septic systems (Hinga 2005). Sediment contamination levels are far below the levels that one would expect to have a major impact on the majority of organisms in the system (Hinga 2005). The DO concentrations in Great South Bay did not approach hypoxic (reduction of oxygen supply below physiological levels) or anoxic (without oxygen) concentrations that would be of concern to organisms, and oscillated between 6 mg/L and 12 mg/L with peaks in the winter and lower DO in the summer (Hinga 2005).

<u>Post-Hurricane Sandy Water Quality Conditions</u>

The Great South Bay Project sponsored by Stony Brook University and the NYSDOS, has been collecting water quality data in Great South Bay prior to and after Hurricane Sandy (refer to http://po.msrc.sunysb.edu/GSB/). Results from this monitoring indicates that the Fire Island breaches caused an initial increase in sea-level in Bellport Bay, but over the next 4 days after the breaches (October 30, 2012), the sea-level gradually returned to its normal level, as did the tidal range and phase (Flagg 2014). Water Quality data collected in 2013 from the Great South Bay Project buoy in Great South Bay, located in the middle of Great South Bay south of Sayville, lists the salinity range from 30.851 practical salinity units (psu) in November to 23.904 psu in February; a temperature range of -1.50° C in January to 29.40° C in July. Temperature and salinity measurements are similar to those reported by Hinga in 2005 (Hinga 2005). However, Flagg and Gobler (Flagg 2014; Gobler 2014) report that while the overall salinity for much of Great South Bay is similar to pre-Hurricane Sandy conditions, there is a net increase (3 to 6 units higher) in salinity in the eastern half of Great South Bay.

The net effect of the existing breach at Old Inlet on the water quality of eastern Great South/ Bellport and western Moriches Bays is an increase in bay salinity and an associated increase in water quality, and no significant change in the tidal dynamics and no increased risk from storm surges (Flagg 2014). Nitrogen can have potential negative side effects since they are quickly utilized by phytoplankton, leading to elevated chlorophyll levels (National Park Service 2009). Nitrogen concentrations in eastern Great South Bay are significantly lower than before the Old Inlet Breach (Gobler 2014). Water clarity has also improved, where secchi disc depths observed in 2013 (an indicator of water clarity) increased 35 percent in eastern Great South Bay (Gobler 2014). Increased ocean flushing and lowered nitrogen levels caused by the breach seem to have also lead to a decrease in phytoplankton levels in eastern Great South Bay. Although a large

(1,000,000 cells per mL) brown tide occurred across most of Great South Bay during the summer and fall of 2013, the ocean inlets and the breach at Old Inlet were spared of this tide (Gobler 2014).

Backbay Benthic Invertebrate Survey

The Corps contracted EEA, Inc., to conduct a benthic invertebrate survey at three locations: Sailor's Haven in Great South Bay, Pike's Beach in Moriches Bay, and Tiana Beach in Shinnecock Bay in August of 2000 (EEA, Inc. 2003). The purpose of the survey was to define the benthic invertebrate communities behind the Pike's Inlet Breach (breached in 1992) area and compare these findings to two areas (control sites) where breaches had not recently, or ever, occurred. The percent of abundance of dominant species at each location are listed as follows:

Sailors Haven – 47 percent polychaete worms (*Prionospio* spp.), 12 percent sipunculan worms (Oligochaeta spp.), 12 percent nematodes (*Nematoda* spp.), 12 percent tanaids (*Leptochelia savignyi*), and 10 percent amphipods (*Ampelisca abdita*). Biomass was dominated by annelid worms, arthropods, and mollusks (EEA, Inc. 2003);

Pikes Beach – 65 percent bivalves (*Gemma gemma*), 25 percent amphipods (*Paraphoxus epistomus*), 6 percent polychaete worms (*Capitellidae* spp.), and 5 percent tanaids. Biomass was evenly distributed between annelids, mollusks, and arthropods (EEA, Inc. 2003).

Tiana Beach – 67 percent polychaete worms (*Streblospio benedicti*, *Capitellidae* spp.), 11 percent nematodes, and 10 percent bivalve mollusks. Biomass was dominated by annelid worms, arthropods, and mollusks (EEA, Inc. 2003).

There was a greater abundance of benthic species at Pikes Beach, but a greater diversity of species at Sailors Haven. The data at Pikes Beach (higher abundances and lower diversity) is indicative of an area that is in recovery from a "disturbance" (albeit a natural "disturbance"). Surveyors also noted that SAV beds at the Pikes Beach station were more patchy and sparse than at the control sites (EEA, Inc. 2003).

Anadromous Fish

Numerous small creeks and rivers drain into the three bays and coastal ponds. Historically, these tributaries have supported fish migration from the sea to freshwater. Many of the significant habitats designated in the Service's SHCR were given this designation due to the presence of anadromous fish (fish that spend most of their lives in saltwater but migrate to freshwater to spawn), including the alewife, white perch (*Morone americana*), American smelt (*Osmerus mordax*), and diadromous (migrate between fresh and saltwater) fish, including sea-run brown trout. Dams constructed in these tributaries have blocked access and extirpated many of these migrations/runs.

The South Shore Estuary Reserve (SSER) and the Oceans Program of Environmental Defense have formed and chaired a diadromous fish conservation workgroup to address conservation within the Reserve Area (including the FIMP area) and evaluate the present status, threats, and

potential actions (including fish passageways) to conserve and improve these fish populations. The workgroup has had several meetings (since December of 2004) and is currently identifying potential actions, survey needs, and funding sources.

Further information on the SSER can be found at their web site at:
http://www.estuary.cog.ny.us/.
The Service's Southern New England/New York Bight Office, in partnership with the NYSDEC's Fisheries Division, has proposed fish passageways for Mud Creek and Swan River (Halavik, pers. comm. 2004). These fishways would allow access for anadromous fish, primarily alewife.

Corps Avian Surveys

Dominant species observed within bay subtidal/open water habitats during Corps surveys from May 2002-May 2003 include:

Red-breasted merganser (winter resident);
Mallard (year-round resident);
Greater black-backed gull (year-round resident);
Herring gull (year-round foraging);
Gadwall (*Anas strepera*; year-round resident);
American black duck (year-round resident);
Bufflehead (*Bucephala albeola*; winter resident);
Common loon (*Gavia immer*; winter resident); and
Common merganser (winter visitor).

The Corps found this habitat to have the highest species richness and abundance during their avian surveys in 2002 and 2003 (U.S. Army Corps of Engineers 2003).

South Shore Estuary Reserve (SSER)

The SSER Council, a multi-agency/stakeholder organization, was established to protect and manage the South Shore Estuary Reserve system as a single integrated estuary (from Nassau County line to the Town of Southampton, including the Great South, Moriches, and Shinnecock Bays). The council identified numerous goals/outcomes to halt further degradation of the Reserve's natural resources and to improve them. Some of these goals, deemed to be applicable to the FIMP study, are listed as follows (South Shore Estuary Reserve 2001):

<u>Reduction of Nonpoint Pollution</u> – Elevated levels of coliform bacteria are responsible for the year-round closure of 12, 886 ac. of shellfish beds in Great South Bay and 6,170 ac. of shellfish beds in Moriches and Shinnecock Bays. Due to impervious surfaces within the watersheds, polluted stormwater runoff is the primary issue, as well as waterfowl and vessel discharges.

<u>Reduction of Point Source Pollution</u> – Although point source pollution is not as widespread as and less significant than non-point pollution, it can still cause water quality degradation in immediate areas. Such sources include wastewater treatment plants and other discharges

regulated by the State Pollution Discharge Elimination System permits, and solid waste disposal sites.

Increase in the Harvest Levels of Hard Clams and Other Estuarine Shellfish Species:

- Seeding of hard clams;
- Expansion of Islip Hatchery;
- Increase in grow-out (size of) shellfish;
- Enhancement of hard clam habitat through shell augmentation;
- Evaluation of spawner sanctuaries; and
- Creation of a reserve shellfish management forum.

Coastal Habitats Protected and Restored to Support Shellfish, Finfish, and Coastal Bird Populations:

- Restoration of tidal wetlands;
- Coordination of restoration efforts;
- Restoration of anadromous fish;
- Habitat restoration of tributaries;
- Evaluation and restoration of eelgrass beds;
- Vegetation management for coastal birds;
- Recognition of shorebird reserves;
- Increased protection of marine turtle populations;
- Management of upland ponds; and
- Augmentation of stream flow.

3. Bay Islands

The bay islands have many of the above described communities present, typically including low marsh, high marsh, and terrestrial uplands. Although many of the islands are man-made from dredge material placement, they provide important breeding habitat for shorebirds (tern colonies) and wading birds (heron rookeries).

As stated in Section VI subsection D, there has been a net loss of the number and size of bay islands (both manmade and natural) within the FIMP area due to storm events, rising sea levels, and erosion.

Significant Habitats

Service-designated significant bay island habitats include:

Moriches Bay

Carter's, New Made, and West Inlet Islands – New York State-listed common terns historically nested in large numbers.

East Inlet Island – Federally-listed roseate tern and state-listed common terns nested on the island until 1998.

Shinnecock Bay

Lanes Island and Warner's Island – Historically supported roseate and common tern colonies.

Sedge Island, Greater Greenbacks Island, and Lesser Greenbacks Island – Historically supported common tern colonies.

Service Bay Island Investigations

The Service's Long Island Field Office (LIFO) has conducted numerous site investigations of bay islands to identify restoration sites in Great South, Moriches, and Shinnecock Bays. Appendix A lists each of the backbay islands visited, the type of vegetation observed, history of wading bird and shorebird nesting (as of 2003), and restoration potential (U.S. Fish and Wildlife Service 2005).

4. Inlets

In addition to the actual bays identified below, the Service's SHCR identifies specific bay subtidal areas within the following significant habitat complexes:

Moriches Bay

Moriches Inlet – Provides a corridor for fish migration into the bay and a foraging area for harbor seals in the winter.

Shinnecock Bay

Shinnecock Inlet – Important haul-out area for harbor seals in the winter, as well as a corridor for juvenile loggerhead and green sea turtles that feed in the bay.

Great South Bay

Fire Island Inlet – Important in daily flushing of Great South Bay, corridor and habitat for finfish, and foraging habitat for the federally-listed roseate tern. Piping plover and least terns nest at Democrat Point on the east side of the inlet and Cedar Beach on the west side of the inlet.

VII. DESCRIPTION OF SELECTED PLAN AND EVALUATED ALTERNATIVE

A. General Description of the Proposed Project

The specific features, as described in the Corps' GRR (U.S. Army Corps of Engineers 2016b), of the TSP are listed below:

Inlet Modifications

- Continuation of authorized navigation projects, and scheduled O&M dredging with beneficial reuse of sediment at Fire Island, Moriches and Shinnecock Inlets;
- Additional dredging of 73,000 to 379,000 cy from the ebb shoals of each inlet, outside of navigation channel, with downdrift placement undertaken in conjunction with scheduled Corps Operations and Maintenance (O&M) dredging of the inlets;
- Placement of the bypassed material consisting of a +13 ft. dune and berm, as needed in identified placement areas; and
- Monitoring to facilitate adaptive management changes in the future.

Mainland and Non-Structural

- Addresses approximately 4,400 structures within 10 year floodplain using non-structural measures, primarily through building retrofits, with limited relocations and buy-outs, based upon structure type and condition; and
- Includes road raising in four locations, totaling 5.91 mi. in length, that 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. dune and 90 ft. berm). This plan is included on Fire Island in vicinity of Lighthouse, Smith Point County Park East (to supplement the sand bypassing when needed), and Smith Point County Park West (after short-term beachfill to allow relocation of infrastructure) and also on the Westhampton 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 FIIS, 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. only.

- Beach and Dune Fill

  - Provides for a continuous 90 ft. width berm and +15 ft. 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.
  - Renourishment – Up to 30 years approximately every 4 years.

Sediment Management at Downtown Montauk 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 and 100 ft., to increase sediment transport (0.5M to 2M cy) to the west and reduce renourishment requirements.
- Shorten existing Ocean Beach groins.

Coastal Process Features

- Project Features that contribute to coastal storm risk management through the reestablishment of the coastal processes are included at seven 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 saltmarsh features by reestablishing hydrologic connections and disturbances.

  - *Tiana* – Reestablishes the bay shoreline natural protective features by reestablishing the dune, saltmarsh, and enhancing the SAV beds.

  - *West of Shinnecock Inlet Interim (WOSI)* – Reestablishes the bay shoreline natural protective features by reestablishing the existing saltmarsh.

  - *Islip Meadows* – Reestablishing saltmarsh habitat in conjunction with nonstructural measures by restoring hydrologic connections.

  - *Seatuck Refuge* – reestablishing saltmarsh habitat in conjunction with nonstructural measures by restoring hydrologic connection and plantings.

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.

Refer to the Corps' GRR for a more detailed description of the TSP (U.S. Army Corps of Engineers 2016b).

B. Clarification of Fill Volumes

The Corps' GRR provides the beach fill volumes expected to be placed on project area beaches from borrow areas and from inlet/ebb shoal dredging. However, some of the numbers provided in the Executive Summary (initial fill volumes from borrow areas and inlets) don't match with numbers provided in the body of the document (Table 35 initial fill volumes and Table 39 borrow area initial construction, especially inlet volumes), which also don't match with the numbers provided in the Appendices of the document (Appendix J Table 1 initial fill volumes). The Service requests clarification on the initial, renourishment, and total beach fill volumes proposed to be dredged from the inlets and borrow areas so that the Service is clear on the scope of this project and the associated impacts (removal/burial of benthic invertebrates, stabilization of dynamic habitats, reduction in the amount of sediment entering the bay and associated reduction in formation of SAV and saltmarsh habitats and additional impacts further discussed in Section VIII below).

The Service's tentative total numbers of beach fill (cy) are presented as follows (from GRR):

Initial Construction (from Table 39, includes inlets):		6,440,000
Total Renourishment Volumes (Appendix J Table 3 w/o inlets):		+ 29,895,155
Renourishment and Initial Construction	Subtotal:	36,335,155

Subsequent total dredged from inlets & ebb shoals (from Executive Summary, bi-annually except Moriches every year)

Fire Island Inlet:	1,360,000 x 14 cycles =	19,040,000
Shinnecock Inlet:	275,000 x 14 cycles =	3,850,000
Moriches Inlet:	171,000 x 29 cycles =	4,959,000
	Inlet Dredge Placement Subtotal:	+ 27,849,000

Totals	Renourishment and Initial Construction	Subtotal:	36,335,155
	Inlet Dredge Placement Subtotal:		+ 27,849,000
		Total:	64,184,155

The Service requests confirmation of these numbers.

Additionally, the Corps identifies the borrow areas to be used for initial construction. The Service requests identification of the borrow areas to be used for the subsequent renourishment efforts. This information will assist the Service in assessing the impacts of dredging operations in the borrow areas (loss of surf clam and benthic invertebrate populations).

The Service notes that the non-structural aspect is the largest part of the project and the project description provided in the Corps' GRR and EIS provide only a general description of the mainland non-structural components proposed for this project (no information on how the roads will be raised, the amount of wetlands filled, if any, specific areas to be acquired, etc.). The DEIS and GRR do not contain any impact analysis for the non-structural measures and does not identify mitigation or environmental monitoring plan for the major components of the TSP, including beach construction, breach filling, road raising, or house raising that discuss outcomes of their analyses in terms of net conservation benefit or no net loss. The Corps has indicated informally (e-mail) that the plan is to conduct separate environmental assessments in each town as non-structural components are developed. Given this scenario the Service is unable to evaluate potential impacts from this aspect of the project. Accordingly, the Corps will need to prepare supplemental NEPA document(s) once each part of the project is defined , which appears to be in contradiction of the CEQ findings and recommendations that "reach by reach planning was to follow an overall understanding of the environmental consequences of the proposed project, not to precede them."

Summary of Service requests for more information/detail

The Service requests more information/detail on the following elements of the TSP:

- Adaptive management;
- Proposed beach-fill volumes;
- Non-structural measures and associated impact analysis;
- Proposed borrow areas after initial construction;
- Clarification on what conservation/mitigative measures are proposed; and
- The design level of the TSP as presently proposed in the GRR/EIS.

As stated above, the Service requests this information so that we are clear on the scope of this project and the associated impacts (removal/burial of benthic invertebrates, stabilization of dynamic habitats, reduction in the amount of sediment entering the bay and associated reduction in formation of SAV and saltmarsh habitats, and additional impacts further discussed in Section VIII below), as well as the Service's involvement in future assessments as more information is provided.

C. No-Action Alternative/Future Without Project Conditions

Assumptions

For the purposes of this analysis, it is assumed, in the Future Without Project condition, that the following projects shall continue to be implemented within the FIMP Study Area:

Corps: BCP;

Corps: Westhampton Interim Project (until 2027);

Corps: Fire Island Inlet Federal Navigation Project authorized in 1948 and Shore Westerly Project;

Corps: Moriches Inlet Federal Navigation Channel, Jetty Rehabilitation Project, authorized in 1959;

Corps: Shinnecock Inlet Federal Navigation Channel and Jetty Rehabilitation Project;

Corps: Long Island Intracoastal Waterway Federal Navigation Channel Project;

State: Shinnecock Inlet dune and beach fortification; and

SCDPW: Channel Maintenance Dredging and Beach Disposal.

Non-federal storm damage protection projects are likely to be designed and implemented within the FIMI/FIMP, such as the FIIS Short-term Community Storm Surge Protection Plan and Erosion Control District beach nourishment projects in Southampton. Please note that with sea level rise there may be an economic tipping point at which it will not be feasible for communities to raise the funds for such projects. It is also important to note that due to the high expense of these types of projects, such projects are only going to be done in certain communities.

Ocean Beach/Barrier Islands

On Fire Island, there is an insufficient amount of sediment coming to the island from all potential sources (Psuty *et al.* 2005). Sediment deficits are greatest along the eastern portion of the island, while the central and western areas are buffered due to contributions from an offshore source. In fact, there is no evidence of historic inlets within the central portion (between Ocean Beach and Watch Hill) of Fire Island over the last several centuries (Tanski 2007), suggesting that this portion of Fire Island is relatively stable with regards to the potential for breaching. The recent acceleration of sea-level rise, coupled with the negative sediment budget, will result in continued beach erosion and dune displacement, with greater effects occurring in the eastern portion of the island (Psuty *et al.* 2005). Future sea levels are expected to rise at a greater rate, causing increased frequency of overwash and creation of new inlets/breaches (Hinga 2005) in the FIMI study area (more so in the eastern portion of Fire Island). Small-scale storm damage protection projects and sand by-passing associated with maintenance dredging of the inlets would stabilize

the ocean shoreline to some extent, which may minimize/limit the occurrence of overwash and new inlet formation, but presumably at a smaller scale than a FIMP project would due to the smaller volumes of sand.

Increased frequency of overwash and/or breach events could result in the creation of early successional habitat/sparsely vegetated habitat preferred by many shorebirds (piping plovers, least tern, etc.) and annual coastal plants, such as seabeach amaranth, which, if left undisturbed, will likely result in an increase in abundance and productivity of these species (provided areas are properly managed, an issue to be addressed during the ESA section 7 consultation). However, storm damage protection measures (beach nourishment, beach scraping, beach grass planting, and/or sand fencing installation) are likely to occur. The impact of these measures would be dependent upon the scale and frequency of these efforts. If it is a limited area and not at a high frequency there is the potential for an increase in the formation of early successional habitat which would be important for shorebirds.

Barrier islands, such as those within the FIMP study area, move in a continuous process whereby sand is transported across the island from the ocean to the bay, allowing the islands to migrate landward (Tanski 2007) and maintain an elevation that prevents submergence due to rising sea levels (Leatherman 1988).

Bay Intertidal Areas

Increased frequency of overwash and/or breach events could result in the creation of additional tidal wetlands and/or tidal flats in the bays. Additionally, bulkheads, which are common on the bayshore in developed communities, replace natural formations landward of them and prevent sand from entering the littoral drift system, causing sediment starvation/accelerated erosion in unprotected areas downdrift (Nordstrom and Jackson 2005). The accelerated erosion will continue to narrow the width of the barrier island in these areas and potentially cause breaching from the bayside of the barrier island.

Sea Level Rise and Tidal Marsh Elevation Change

The NPS-FIIS conducted a monitoring program to quantify marsh elevation change in relation to sea-level rise and to identify factors and/or processes that influence the development and maintenance of Fire Island saltmarshes. Monitoring was conducted in three marsh areas, Great Gun Meadows, Hospital Point, and Watch Hill from August 2002 to May 2007. The NPS-FIIS concluded that all three sites revealed an elevation deficit when compared to sea level rise and that the marshes do not appear to be keeping pace with rates of sea level rise (Roman *et al.* 2007). Sea level rise over the past 60 to 100 years from NOAA water level stations in the vicinity of Great South Bay ranged from 2.52 mm/year to 3.79 mm/year (Roman *et al.* 2007), all greater than measured marsh elevation. These numbers are comparable to Church and White's (2011) 3.2 mm/year global average in 1993. If the observed elevation deficit continues, it is likely that these marshes will become wetter and high marsh vegetation may convert to *Spartina alterniflora* and areas of open water and marsh submergence may increase (Roman *et al.* 2007), which could negate the trend of increased tidal marsh areas found by the NYSDEC. With marsh submergence, soils become waterlogged and anaerobic soil conditions persist, causing plant

death, collapse of peat, and ultimate increased flooding (Roman *et al.* 2007). Additionally, there would likely be a landward encroachment of marshes to upland areas, provided that man-made structures (bulkheads) do not impede this migration. This trend may exacerbate if predictions of an accelerated rate of sea-level rise in response to global warming occurs (Roman *et al.* 2007). By 2100, scientists project sea levels 18 to 50 in. higher than today along New York's coastlines and estuaries, though a rise as high as 75 in. could occur (Pendleton *et al.* 2004; New York State Department of Environmental Conservation 2015a)

Overwash is important in allowing marshes to keep pace with sea level rise. The NPS determined that the development of the three marshes in FIIS coincided with the establishment of the Hallets (1788) and Smiths (1773) inlets. Storm-induced inlets and barrier island overwash transport sediment from the ocean and barrier island to the bay. As such, inlets and associated flood tidal deltas support the establishment of back-barrier saltmarsh habitat (Roman *et al.* 2007). The build-up of sediments in breach/overwash 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 (U.S. Army Corps of Engineers 2016a).

Great South and Bellport Bay

Suffolk County monitoring data indicates an improvement in water quality in the Great South Bay due to the implementation of sewage management practices (Hinga 2005) and this trend is likely occurring in Moriches and Shinnecock Bays, as well. Improvements in water quality (fecal coliform, concentrations of nutrients, etc.) may improve the chances of successful shellfish stocking and increase the diversity of biota (finfish, benthic organisms, etc.) in the bays (by increasing flushing and dilution of fecal coliform and nutrients, increasing light penetration, and reducing the potential for brown tide (New York Sea Grant Extension Program 2001). An increase in the occurrence of breaching may also improve water quality in the bays, but would also increase salinity of the bays, which could allow for more predators of shellfish (finfish) to frequent the bays (Tanski 2007).

It is expected that the number and size of bay islands within the FIMP study area will continue to decrease due to storm events, rising sea levels, and erosion.

Inlets/Mainland

As previously stated, the inlets will likely be maintained through maintenance dredging and maintenance of the jetties. On the mainland, rising sea levels could cause the migration of marshes landward, if there is room (possible in undeveloped areas/open space), or cause some submergence of marshes and create more open water areas along the bayshore line.

VIII. DESCRIPTION OF PROPOSED ACTION IMPACTS ON FISH AND WILDLIFE RESOURCES

A. Direct and Indirect Impacts

The proposed action has the potential to directly and indirectly adversely impact fish and wildlife resources within the project area and the overall condition of the barrier island due to the reduced likelihood of natural processes occurring unhindered resulting from the Corps' beach nourishment and dune construction project.

Direct impacts include:

- Loss and habitat modification of offshore borrow area and ebb shoal habitats, benthic/fisheries resources, and overwash/early successional habitat as well as accreting spit habitat;
- Burial of marine intertidal and marine beach invertebrate species and temporal modification of intertidal and marine habitats; and
- Temporary increase in turbidity of offshore and intertidal habitats.

Indirect impacts include:

- Decrease in habitat values for federally and state-listed plant and animal species;
- Reduced potential to form and create early successional barrier island habitats;
- Reduced opportunities for water quality improvement in backbay;
- Reduced potential to form new inlet channel habitat;
- Reduced potential to recruit finfish and crustaceans to backbay;
- Reduced sediment transport to the bay;
- Reduced rates of formation of SAV and saltmarsh habitats;
- Accelerated vegetative succession on barrier island and backbay;
- Decreased biodiversity at the community level;
- Development of habitat preferred by mammalian and avian predators; and
- Reduced habitat values for waterfowl and migratory shorebirds.

1. Offshore/Nearshore Communities

A description of the potential physical and biological changes resulting from dredging of borrow areas and their associated direct impacts is given in Minerals and Management Service (2001). Some notable potential biological effects to fish and invertebrates include, but are not limited to, (1) removal or loss of infauna and epifauna at the borrow site for one to five years to a community with comparable pre-disturbance abundance and diversity and biomass but different species composition and structure (Greene 2002); (2) altered energy transfer on the food chain and altered composition of fish prey base; (3) loss of spawning habitat; (4) loss of overwintering habitat; and (5) changes in community structure (species present, diversity, abundance, and biomass in surrounding areas) (Minerals Management Service 2001).

The primary adverse direct impact on the environment due to dredging operations at a borrow area involves the disturbance and destruction of benthic resources and their habitats, which would result in a loss of benthic organisms from the immediate area. Woodward-Clyde Consultants (1975) concluded that dredging may lower the productivity of a borrow area, and thus, the usefulness of the site for the production of fish and shellfish may decrease until a typical community is re-established in the borrow area. Many studies concluded that the benthic community within the borrow area of a dredge operation is fully recovered within one-year, while other studies had found that recovery took more than one year and that species composition was still changing because sediment composition had not returned to pre-dredging conditions (Greene 2002; U.S. Army Corps of Engineers 2016a).

The Corps stated the following in page 4-33 of the DEIS regarding benthic recovery in borrow areas:

> "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 (U.S. Army Corps of Engineers 2008)."

The loss of the third-most abundant macroinvertebrate is a significant impact to this community.

While borrow area benthic community recovery within borrow area is dependent upon many factors, the sediment composition of the site and the characteristics of the new sediment interface are two important factors that the Corps could consider when selecting borrow sites (Greene 2002).

As previously stated, surf clam surveys conducted in 2001 indicate that this species was present in the project borrow areas . More recent surveys in 2012 confirm surf clam presence within the borrow areas (New York State Department of Environmental Conservation 2013). The greatest concentration of surf clams observed during these surveys were from 0-1 mi. from the ocean shoreline from Fire Island Inlet to Moriches Inlet. Although no borrow areas (at least those identified for initial construction) are present in this portion of the study area, the dredging of the ebb shoal could potentially impact an area with a relatively high concentration of surf clams. Two of the borrow areas (2C and 2H) occur in areas with moderate surf clam concentrations (as of 2012) while the remaining borrow areas occur in areas with lower clam concentrations. Nonetheless, direct disturbance and loss of surf clam populations are likely to occur.

Dredging also directly affects fish by displacing fish populations from the dredging operation site (Woodhead 1992, Minerals Management Service 2000). Fish utilizing borrow pits may potentially be exposed to elevated contaminant levels due to the siltation of contaminated fine material into the borrow pit. Small deep pits are the poorest habitat due to reduced water

circulation and high sedimentation rates which could lead to anoxic conditions lethal to species using the pits. However, as indicated in studies by Woodhead and McCafferty (1986), borrow areas and channels often contain higher levels of fish than adjacent shoals, indicating that borrow areas do not demonstrate adverse impacts to resources once the construction period is over.

Decreased water quality and increased turbidity in the marine nearshore subtidal zone could result from the actual beach nourishment activity (Mineral Management Service 2001). Sand particles suspended by dredging are dense and fall quickly back to the bottom while the fine sediments stay in suspension longer than sand, only sinking slowly (Woodhead 1992). Fish tolerance to suspended solids varies by species and by age. Beach nourishment can affect fish populations by delaying hatching time of fish eggs, by killing the fish by coating their gills, and by reducing dissolved oxygen concentrations to stressful levels (Naqvi and Pullen 1982).

Localized turbidity plumes can have lethal and sublethal effects on benthos and fish, including hematological compensation for reduced gas exchange across gill surfaces, abrasion of epithelial tissue, packing of the gut with large quantities of ingested solids which may have little nutritive value, disruption of gill tissues (abrasion, clogging, increased activity of mucosa), and increased activity with a reduction of stored metabolic reserves (Profiles Research and Consulting Groups, Inc., 1980). Other effects of increases in turbidity include a decrease in light penetration, mechanical abrasion of the filter feeding and respiratory structures of animals, possible resuspension of contaminants and nutrients, burial of non-motile eggs, larvae, and adults, and absorption of essential nutrients from the water column (Stern and Stickle 1978).

The potential for oxygen deprivation problems in borrow areas is a very real concern. Reduced water circulation and high siltation/sedimentation of fine material can lead to anoxic conditions lethal to organisms which may be utilizing a borrow pit. These adverse direct/indirect impacts have been found to be minimal in areas with strong currents where oxygen can be quickly replenished (Tuberville and Marsh 1982). Elimination of small deep pit designs can alleviate potential oxygen deprivation problems.

In addition, dredging activities may also directly impact migratory or overwintering seabirds (Minerals Management Service 2001). Seabirds also use these habitats and can experience loss of foraging resources due to dredging, which can result in shifts in foraging patterns. The Minerals Management Service, which oversees exploration of offshore areas for mining, and oil and gas reserves, has recognized the potential impacts of their programs to seabirds and has undertaken, in certain areas of the country, surveys to understand seabird distribution and abundance in their project areas.

2. Marine Intertidal and Marine Beach

Sandy beaches and associated intertidal areas are important habitat for nesting and foraging shorebirds, feeding and nursery grounds for demersal and pelagic surf fish and the prey species they depend on. Effects from beach nourishment may disturb these species causing them to depart or avoid the area; result in the burial of vegetation and benthic invertebrates; increase vegetation succession; or result in physical changes to the habitat such as increased turbidity that may have numerous effects on species.

The FIMP entails the placement of 64,184,155 cy of material over the 50-year project in the primary beach fill/dune construction area.

Recent studies present varied evidence as to both short- and long-term impacts of beach nourishment along the western coast of the Atlantic Coast, and focus principally on beach and benthic/pelagic invertebrate and finfish communities of the western Atlantic Coast (*e.g.*, Mineral and Management Service 2001). On the other hand, relatively little information on the effects of beach nourishment on shorebirds and waterbirds is present in the literature (CZR, Inc. 2003).

Based on the review of the literature, the proposed project has the potential to result in a number of direct and indirect physical and biological impacts in terms of scale and duration in the marine intertidal, maritime beach, and maritime dune communities in the proposed project area. Direct adverse impacts to these communities include, but are not limited to, impacts to breeding and non-breeding avian species through habitat modification, burial of prey resources at the disposal sites, removal of prey resources in the offshore dredging areas, and disturbance of breeding, loafing, roosting, and foraging activities of avifauna.

Potentially beneficial impacts of beach nourishment have been observed at other Corps sites existing on Long Island (wider beaches provide more shorebird breeding areas/growing areas for coastal plants); however, these are not well studied and remain anecdotal as to their long-term contribution to resource conservation.

In addition to the above, direct impacts also include burial of benthic resources due to the covering of these existing habitats with sand (U.S. Army Corps of Engineers 2014b). Peterson and Manning (2001) stated that long-term adverse impacts to benthic fauna at North Topsail Beach, North Carolina, occurred following beach nourishment. Lindquist and Manning (2001) reported that periodic nourishment of these beaches appeared to prevent the full recovery of benthic species.

The timing of dredging and placement of sand during the nourishment activities will also be a major factor regarding short- and long-term impacts for non-endangered shorebird and waterbird species. These effects include disruption of breeding, foraging, and roosting activities (Gill 2007). Beach construction activities are usually very intensive environmentally disruptive operations, which involve the mobilization and use of heavy equipment and vehicles on the ocean beaches. The operation of dredging equipment immediately adjacent to a shoreline that is used as a courtship, nesting, and brood rearing area has the potential to disturb shorebirds to the point where they may not successfully nest and fledge young. Dredging equipment that is operated immediately adjacent to shorebird breeding habitat may preclude shorebirds from using the habitat entirely, forcing them to seek appropriate habitat elsewhere. Operation of machinery used to move dredge pipeline and to grade the nourished beach can greatly disturb shorebirds, their nests, and can endanger the lives of chicks (U.S. Fish and Wildlife Service 1995). However, even low levels of human activity have been shown to result in disturbance and displacement of shorebirds at migration staging and roosting areas (Pfister et al... 1992) and may negatively affect shorebirds and waterbirds by increasing energetic costs, limiting access to important foraging areas and enhancing predation risk which could result in local population

declines, lowered body condition, regional habitat shifts and local avoidance behavior (Peters and Otis 2007). Migratory shorebirds are particularly vulnerable to disturbance at roosting sites at high tides where the habitat available for roosting is diminished (U.S. Fish and Wildlife Service 1998). Species that exhibit strong roost fidelity are likely to be most affected by loss of roosting habitat (Peters and Otis 2007). Long-term indirect impacts are likely, as recreational activities would increase as a result of the proposed project. Human activities may adversely affect productivity of shorebirds (Ruhlen *et al.* 2002) and influence foraging activity of some shorebird species (Burger and Gochfeld 1991). Combine this with nourishment cycles for the Fire Island, Moriches and Shinnecock Inlets, the Intracoastal Waterway and Captree Boat Basin dredging, and the remaining projects listed in Section II-A. above, the effect of the FIMP beach placement becomes compounded. The Service is concerned that birds migrating or wintering along newly created beaches would be at risk of not meeting their nutritional needs, which are particularly high during these periods.

The proposed project will also result in changes to the existing dune structure, burial of dune vegetation, and vegetation succession. The proposed project will create a monotypic stand of American beach grass through artificial planting. Cohen *et al.* (2008) reported that mean vegetative cover around piping plover nests on a recently re-nourished Long Island beach was 7.5 percent, and all plovers nested in <47 percent vegetation cover. Although almost 60 percent of nests were on bare ground, nests occurred in sparse vegetation more often than expected based on availability of this habitat type (Cohen *et al.* 2009). Maslo *et al.* (2011) found that most piping plover nests were located in areas with less than 10 percent vegetative cover in the backshore and less than 13 percent in the primary dune. If vegetation succession and increased human disturbance is encouraged, shorebirds will most likely be discouraged from occupying these habitats.

Peterson *et al.* (2014) describes beach nourishment as a "pulse perturbation because it involves the deposition of sediments onto the beach at rates that exceed the capacity of benthic invertebrates to burrow upwards and escape suffocation, starvation and crushing by burial." As such beach nourishment results in both short term and long term effects to the benthic assemblage within the intertidal and upper beach habitat. Recovery of the benthic infauna is largely dependent on 4 factors: the quality and quantity of the sediment; the nourishment technique and strategy applied; the place and size of nourishment; and the physical environment prior to nourishment (Speybroeck *et al.* 2006), as well as the tidal range, wave energy beach slope, and the sediment grain size (Peterson *et al.* 2014).

Studies completed since the 1970s indicate that recovery time of macrofauna (those animals 0.5 mm or larger in size) is varied and have reported recovery times ranging from 2 months to 2 years (Reilly and Bellis 1983; Bacca and Lankford 1988; Lynch 1994; National Resource Council 1995; Peterson *et al.* 2000; U.S. Army Corps of Engineers 2001; Land Use Ecological Services, Inc., 2005). However, many of these studies have been short in duration and may not provide a comprehensive understanding of the recovery of benthic infauna and little is known about the cumulative effects of repeated renourishments (Speybroeck *et al.* 2006; Peterson *et al.* 2014).

Reilly and Bellis (1978) and Parr *et al.* (1978) noted that when nourishment ceases, the recovery of the community is rapid and complete recovery may occur within one or two seasons. Gorzelany and Nelson (1987) found no significant long-term negative effects of beach nourishment on nearshore benthic fauna during monitoring of a beach replenishment project on a central Florida east coast sand beach community. Peterson and Manning (2001) stated that long-term adverse impacts to benthic fauna at North Topsail Beach, North Carolina, resulted following beach nourishment.

The Corps reported intertidal benthos communities recovered from beachfill impacts within 6 months, and impacts to the intertidal benthic community were more significant when sand particle size of nourished material did not match that of the existing beach, based upon monitoring of beach nourishment impacts on the New Jersey shoreline of the Atlantic Ocean (U.S. Army Corps of Engineers 2001). The Corps' DEIS states that borrow area sediment will be compatible with the FIMP area ocean beach sand (U.S. Army Corps of Engineers 2016a).

The recovery of marine invertebrate prey resources will vary depending on the timing of the fill activity relative to the periods of highest biological activity in these zones of the beach, as well as compatibility of the dredged material with the existing beach substrate. The Corps (1999) examined the effects of beach nourishment on oceanside intertidal benthos in Monmouth County, NJ. They found that the recovery time of the intertidal infaunal community was as short as two months following renourishment carried out between early August and early October. However, studies conducted in Florida, North Carolina, and South Carolina show that re-colonization rates by benthic invertebrates are variable and dependent on the time of year in which the nourishment occurs, beginning within days and taking up to one year for full recovery of some species (Reilly and Bellis 1983; Bacca and Lankford 1988; Lynch 1994; Peterson *et al.* 2000). Areas receiving sand in autumn will likely have a longer prey resource recovery period than areas receiving fill in the winter and early spring. Manning *et al.* (2014) observed seasonal effects of beach nourishment on the mole crab (*Emerita talpoida*), amphipod (*Parahaustorius longimerus*), bean clam (*Donax variabilis*), 3 species of haustoriid amphipods and a polychaete (*Scolelepis squamata*). Recruitment of the mole crab and P. longimerus was negatively influenced when placement occurred before spring recruitment and the recruitment of the bean clam, and 3 species of haustoriid amphipods were negatively affected after placement occurred after spring recruitment. A *S. squamata* responded positively when nourishment occurred after recruitment (Manning *et al.* 2014). Substantial effects of beach replenishment were documented by Woolridge *et al.* (2016) who observed only 48 percent as many invertebrates in the nourishment area compared to the control after 15 months and major impacts to the community composition were observed through the end of the study.

Furthermore, the macrofaunal community after re-colonization may differ considerably from the original community. Once established, it may be difficult for species of the original community to displace the new colonizers (Hurme and Pullen 1988).

Meiofauna (animals smaller than 0.5 mm [0.02 in.] and equal to or larger than 0.062 mm [0.002 in.]) tend to recover very slowly from a major disturbance, perhaps due to their slow reproduction, limited ability to migrate, and their highly specialized adaptations to a restricted environment (Naqvi and Pullen 1982). However, meiofaunal recovery can be rapid following

minor disturbances (Naqvi and Pullen 1982). Few studies have focused on the impacts to primary producers (Cahoon *et al.* 2012).

Abundance, species richness and diversity of macrobenthos were significantly lower on beaches impacted by off road vehicles (ORV) (Schlacher and Thompson 2008). ORV use results in reduced abundances of prey resources in wrack habitat as a result of mortality, displacement or lowered total amount of wrack, (Kluft and Ginsburg 2009). Within the project site, ORV use occurs in Smith Point County Park, throughout the FIIS, and along beaches within the Towns of Southampton and East Hampton. The continuation and possible increase of ORV use within the project site following implementation of the proposed project may affect the recolonization rates of macrobenthos. As such additional research is needed to evaluate recolonization rates under varying driving conditions.

The proposed action will bury the benthic organisms present within this community and it could take up to 2 years for this community to recover, however, Woolridge *et al.* (2016) cautions against making broad generalizations about the magnitude and duration of replenishment effects and recovery time based on the variations between beaches. The loss of these organisms will impact finfish and shorebirds which feed on these organisms, many of which depend on this seasonally dense prey source during migration and breeding. Peterson *et al.* (2006) documented lower abundance of ghost crabs and foraging shorebirds with ghost crabs half as abundant and foraging shorebirds 60-95 percent lower on nourished beaches than control beaches.

These impacts from the proposed project are compounded by nourishment associated with the maintenance dredging projects described above. The project could also directly impact fish communities by increasing turbidity in the placement area.

Sandy beaches are important habitat for nesting and foraging shorebirds, feeding grounds for demersal and pelagic surf fish and the prey species they depend on. Manning *et al.* (2014) found elevated turbidity within the surf-zone during and occasionally after the deposition of sediment during beach nourishment activities. Suspended solids in water can affect the fish population by delaying the hatching time of fish eggs (Schubel and Wang, 1973), killing the fish by coating their gills, and by anoxia (O'Connor *et al.* 1976). Sherk *et al.* (1974) found that demersal fish are more tolerant to suspended solids and filter-feeding fish are least tolerant, giving an advantage to demersal fish and a disadvantage to filter feeders.

Mobile organisms, such as fish, appear to be the least affected by beach nourishment activities as they are able to move to avoid disturbances (Hurme and Pullen 1988). Such motile species are able to return to the area when conditions are suitable again. However, visually orienting predatory fishes and diving seabirds may avoid turbid waters more than species that are ambush predators (Manning *et al.* 2014). Wilber *et al.* (2003) documented localized attraction by northern kingfish and avoidance by bluefish to beach nourishment areas. Avoidance of these areas may increase energetic costs, enhance predation risk which may result in lowered body condition and decreased fitness.

The Service emphasizes the need to quantify the long term effects of projects similar to the FIMP. Pre-project, during construction, and post-construction studies need to be completed to

assess benthic invertebrate recovery, and impacts to migratory and wintering shorebirds as well as finfish.

Recreational Impacts to Fish and Wildlife Resources

The ORV access is authorized by: the NYSOPRHP in RMSP; the NPS in FIIS; by Suffolk County in Smith Point County Park, Tiana Beach, Shinnecock West and East; Southampton Trustees in Southampton and Easthampton Town Board and Trustees in the Town of Easthampton. Each of these entities allow for ORV access while also managing their beaches for federally and state-listed ground nesting shorebirds during the plover breeding season, including the restriction of vehicle access when unfledged piping plover chicks are present. Due to Hurricane Sandy, the expanse of ocean-to-bay overwash areas in Smith Point County Park are some of the highest for ecological value, providing habitat for the federally-listed threatened piping plover and seabeach amaranth, as well as the state-listed least tern (threatened), common tern (threatened), and black skimmer (state species of special concern), and the American oystercatcher, a ground-nesting shorebird which breeds in this habitat as well (U.S. Fish and Wildlife Service 1996b). The federally-listed seabeach amaranth (threatened), as well as other coastal plants, grows in this habitat as well (U.S. Fish and Wildlife Service 1996a). Although recreational activities are beyond the jurisdiction of the Corps, these activities and associated management may affect the success of the Corps conservation measures in this area. The Service notes that all overwash areas within the FIMI/FIMP study area will be/has been altered by dune construction).

3. Dunes and Swales

The Corps' recommended beach fill/dune construction plan could have significant direct and indirect impacts on barrier island vegetation present within the project area. The deposition of material and stabilization of the shoreline would alter, and could limit the creation of, sparsely-vegetated overwash areas and inter-dunal swales. Proposed dune alignments would occur in extensive sparsely vegetated overwash areas created by Hurricane Sandy. The Corps has incorporated some project features to diversify the shoreline; however, the simplified shoreline proposed in the remainder of the project area would not provide the range of habitat features critical to species diversity on the barrier islands that are created and maintained through natural coastal processes, including cross island sediment transport.

This simplified shoreline would represent a loss of biodiversity at the community level, if not at the species level. Denser grassy vegetation, an attractive habitat for many mammals, could make the project area less suitable for nesting shorebirds, including the federally-listed piping plover and state-listed common and least terns, black skimmer, and American oystercatcher. In addition, several species of reptiles that use seashores during their egg laying life stages, including the Eastern mud turtle and the diamondback terrapin, could be adversely affected by this predicted habitat change.

The seashore habitat includes open sandy beaches, sand flats, mudflats, and dunes, the latter covered with beach grass (Bull and Farrand 1977). Nesting shorebird populations have declined severely and several shorebird species are either in danger of or threatened with extinction. A

number of birds that are known to use this habitat are either federally-listed (roseate tern and piping plover) or state-listed (least tern and common tern). Other breeding birds, such as the American oystercatcher (Melvin *et al.* 1991) and black skimmer (Safina and Burger 1983), are also affected by human activity on Atlantic Coast beaches. Though not currently state- or federally-listed, the reliance of these species on this habitat puts them at risk for population decline which could warrant future listing. The current trend on Long Island south shore beaches to foster stabilization activities is adversely affecting those species (plovers, terns, seabeach amaranth, etc.) that are dependent on dynamic changes to the barrier beach.

The FIMP shoreline design profile is an uninterrupted, unconsolidated, trapezoidal feature. Interdunal habitat and its diversity of microhabitats and microclimates that would normally be found in the sheltered low areas between dune crests, are not proposed for this project. The loss of niche habitats represented by the replacement of the existing beach surface with a more uniform system represents a significant change in habitat quality and diversity.

The amount and type of vegetation on the surface of the barrier islands is largely controlled by the amount of sea spray and overwash. The amount of saltwater exposure defines the type of vegetation that can survive in a given location, contributing to habitat patchiness and diversity. Several shorebirds, including the piping plover, the least tern, and the black skimmer, and reptiles such as the northern diamondback terrapin, must nest in areas where overwash regularly thins or clears away the vegetation. By reducing the frequency and extent of overwash, the FIMP would also limit/eliminate this ecologically critical beach clearing function, especially if land managers install sand fencing and supplemental vegetation plantings occur during post-construction phases of the project. The Corps recognized the importance of cross island sediment transport in their DEIS, stating that each of the coastal processes “are critical to the development and sustainability of the various coastal features which form the natural system” (U.S. Army Corps of Engineers 2016a). The Corps also recognized that the TSP will limit/prevent overwash/cross island sediment transport and cause the “dune-swale complex to be built-up”(U.S. Army Corps of Engineers 2016a). While the DEIS indicates that overwash habitats are optimal habitats for listed species in the study area which is well known from research spanning back to the late 1980s (Patterson 1988; Loergering and Fraser 1995; Elias *et al.* 2000; Cohen *et al.* 2009), the TSP does not evaluate alternatives that would allow for the formation of these habitats beyond federal properties on Fire Island.

The project area contains a federally-listed threatened plant, seabeach amaranth, which colonizes areas created by overwash and breaching. The Recovery Plan for this species (U.S. Fish and Wildlife Service, 1996b) states that “any stabilization of shoreline is detrimental for a pioneer, upper beach annual whose niche or ‘life strategy’ is the colonization of unstable, unvegetated, or new land, and which is unable to compete with perennial grasses.” On North Carolina's barrier islands, the zone where seabeach amaranth is absent corresponds almost exactly with the presence of an artificial barrier dune built and maintained by various federal agencies from the 1930s to 1950s (U.S. Fish and Wildlife Service 1996b). Because seabeach amaranth survives by colonizing new patches of suitable habitat, these new patches must be extensive enough and close enough to each other for the plant to propagate. Fortifying a lengthy portion of the barrier island shoreline may preclude the survival of seabeach amaranth and similar plants, such as

seabeach knotweed (*Polygonum glaucum*), throughout the barrier island system. Refer to the Service's biological opinion for this project for more detailed information and analysis.

The most likely change in vegetation patterns in the dune and swale communities would be from sparsely vegetated beach to vegetated beach and grassland. This would alter the competition among species for this area, favoring bird species which have adapted to more heavily vegetated beach areas elsewhere, particularly black-backed gull, herring gull, and ring-billed gull (*Larus delawarensis*). Each of these species are common on today's beaches and prey upon unfledged plover, skimmer, and tern chicks. Densely vegetated areas also serve as habitat for the red fox and raccoon, two highly effective mammalian predators that have flourished on beaches associated with human recreation and development. The presence of both the gull and mammalian predators has contributed to the decline of plover and tern populations. Common species able to tolerate denser stands of beach grass would tend to displace and prey upon rarer species requiring bare or sparsely vegetated sand, which represents a potential loss of species diversity for the barrier beach/backbay community.

4. Terrestrial Upland

Increasing thicket vegetation at the expense of sparsely vegetated beach would change the species distribution on the barrier islands. The net result would favor mammals, which have already adapted relatively well to the human presence on the barrier islands, and the species of birds and reptiles found on the Long Island mainland, over the remaining examples of seaside species. The Corps' preferred alternative would result in the reduced probability of overwash and inlet formation, resulting in an increase in vegetation density, leading to thicket formation, favoring bird species such as the American robin, song sparrow, mourning dove, and gray catbird. McCormick & Associates (1975) identified the following reptiles as using thickets on Fire Island as probable breeding habitat: box turtle, Eastern hognose snake, and black racer. They tend to favor moist, shaded environments. The black racer is the most indiscriminate predator, eating rodents, small birds, lizards, snakes, frogs, and insects (Conant and Collins 1991).

The mammals of the barrier islands would be afforded a great increase in nesting and forage habitat by any increase in dense, woody vegetation. The following mammals have been identified as breeding in thicket or woodland habitat (McCormick & Associates 1975): Opossum (*Didelphis marsupialis*), short tailed shrew (*Blarina brevicauda*), Norway rat, red fox, and long tailed weasel (*Mustela frenata*). Several of these animals are omnivorous, and all will eat birds if they can catch them (Godin 1977). Unfledged birds are particularly vulnerable to this predation. Herbivorous mammals in the area include Eastern cottontail, grey squirrel, and white-tailed deer. Small mammals are an important component of the prey base of migrating birds during the spring and fall.

A potential positive impact of the proposed action is the protection of the Maritime Holly Forest at Sunken Forest within FIIS. Sunken Forest is the northernmost holly-dominated maritime forest on the Atlantic barrier island chain. This community is considered globally rare by TNC (National Park Service 2009). Although no beachfill is proposed in front of this community, the

addition of sand updrift (east) of this community could result in a wider beach and more storm damage protection over time.

5. Bay Intertidal

The Corps' recommended beach fill/dune construction plan has the potential to indirectly impact fish and wildlife resources by potentially altering the balance between marsh creation and marsh loss in the adjacent backbay habitats. The impact from the FIMP depends upon the extent to which the plan achieves the stated goal of reducing overwash and inlet/breach formation within the project area. If the project is effective, the potential to form saltmarsh would be reduced. The NPS determined that the development of the three marshes in FIIS coincided with the establishment of the Hallets (1788) and Smiths (1773) inlets. Storm-induced inlets and barrier island overwash transport sediment from the ocean and barrier island to the bay. As such, inlets and associated flood tidal deltas support the establishment of back-barrier saltmarsh habitat (Roman *et al.* 2007). The loss of plant detritus producing regions of the estuary such as Spartina marshes will greatly lower the productivity of the estuary and directly limit its potential to produce commercially important species of fish and crustaceans (Odum 1970).

Cashin Associates (1993) points out that tidal marsh areas near active, migrating inlets will stay in the early stages of vegetative succession, maintaining their highest rate of organic production and export to the estuary. In comparison, long-term stability will result in decreased productivity. Beach nourishment reduces the potential for the creation of new wetlands by reducing the frequency and extent of natural barrier island processes (Cashin Associates 1993). Without new inlet formation to compensate for wetland loss, tidal wetlands will eventually decline in the area. The TSP places priority of dunes and beach building over saltmarsh and wetland habitats in general. Saltmarsh habitat will be impaired by lack of sediment being moved onto it from overwash and thus will be unable to keep up with sea level rise and subsidence. Conservation of marsh birds, such as the sharp-tailed saltmarsh sparrow, a species of highest conservation concern in the northeast and mid-Atlantic States need to be integrated into this plan in order to ensure there is a net conservation benefit, or at a minimum, no net loss of their habitats.

If the FIMP reduces the frequency and extent of inlet/breach formation and overwash, the ground elevation rises from aeolian transport above the tidal range and barrier-flat grasses and shrubs colonize the washover surface (Leatherman and Allen 1985a). 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" (U.S. Army Corps of Engineers 2016a). The Corps' DEIS states that the TSP would result in "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" (U.S. Army Corps of Engineers 2016a). As discussed above in the Dunes and Swales section, if the recommended plan reduces the probability of an overwash, there is likely to be a major change in both the plant and animal communities. If both overwash and inlet formation processes are impacted, marsh will still be lost to rising sea level and bayside erosion, again without compensating marsh formation. The Corps also states in their DEIS

(Appendix I - U.S. Army Corps of Engineers 2016a) the following regarding importance of cross island sediment transport:

"From a geologic perspective breaches are episodic events that help form the coastal barriers by depositing sediment in shoals that widen the barrier and form a platform where aquatic plants help accumulate sand. Washovers, or sand driven up onto the barriers during storms, also help build sand volume. Management efforts that prevent breaches and washovers may destabilize the barriers by preventing retreat in response to sea level rise. The shore face will continue to erode and steepen, while the bayshore will shrink with encroaching sea level and lack of sediment input. This combination of factors could lead to thinning the barriers, loss of volume and possible catastrophic breaches in a major storm."

The Corps provided an estimate of the bayside deposition above mean sea level (MSL) that would occur as a result of breaching at 10 Corps-identified areas of concentrated risk for storm damages (U.S. Army Corps of Engineers 2009a) in acres and volume of material (two of which are within the Old Inlet breach area). The Corps' GRR (U.S. Army Corps of Engineers 2016b) only provided volumes of bay deposition which are identical to the volumes provided in their 2009 report. As such, the aerial extent of deposition provided in the 2009 report is deemed valid for this analysis. These deposition areas above MSL and presumably within the intertidal zone, created if a breach was left open for 12 months, are listed as follows:

Site	**Acres of Bayside Deposition Above MSL after 12 Months**
Fire Island Lighthouse Tract	51 ac.
Town Beach to Corneille Estates	68 ac.
Talisman to Water Island	68 ac.
Davis Park	125 ac.
Smith Point County Park	17 ac.
Sedge Island (Westhampton)	25 ac.
Tiana Beach	12 ac.
West of Shinnecock Inlet	11 ac.
Total	**377 ac.**

6. Bay Subtidal

Barrier island and coastal processes, including breaches and inlet formation, may positively affect water quality in the backbay area within the project area by reducing the number of waterborne pathogens from tidal exchange, reducing turbidity, and moderating bay temperatures. All of these could prove favorable to the production of shellfish, especially the hard clam. However, the Corps' recommended plan is designed to reduce the frequency and extent of such processes, a potential indirect impact of the proposed action.

The Corps (1995) has expressed concern that a breach within the project area may cause changes in bay salinity that would be damaging to shellfish, and New York Sea Grant concluded that breaches would have both negative and positive impacts on the hard clam (New York Sea Grant Extension Program 2001). The salinity and temperature changes (as described in Section VI)

could slow the development of fertilized eggs and larvae as well as increase mortality and the abundance of shellfish predators (channel whelks and moon snails) (New York Sea Grant Extension 2001). However, larger oceanic plankton species may improve food quality and more moderate winter water temperatures may decrease over-winter mortality (New York Sea Grant Extension 2001). There was a significant increase in shellfish populations in Moriches Bay after the two breaches occurred in 1992 (S. Kiernan, pers. comm. 2000). Increased salinity allows for an accelerated rate of shellfish growth and improved larval development (Cashin Associates 1993). Higher salinity appears to be more favorable to hard clam growth at non-optimal temperatures (>30 or <20°C) (Malouf 1991). Growth rings on hard clams in Bellport Bay were reported to be larger in 2013 than in pre-breach conditions (Gobler, pers. comm. 2014).

Increased tidal flushing in the bay resulting from a breach within the project area could reduce the number of waterborne pathogens in shellfish growing areas present within each of the bays, leading to a possible reduction in the number of areas now closed to commercial and recreational clamming (Cashin Associates 1993). Cashin Associates (1993) also notes that increased flushing reduces turbidity, which may have positive effects on both shellfish and eelgrass. Turbidity also affects the feeding efficiency of filter feeders such as the hard clam (Schubel 1991). Many bivalves, including hard clams, have the ability to sort the food particles (phytoplankton) from the nonfood particles (silt) that they filter out of suspension (Bricelj and Malouf 1984), but hard clams tend to respond to increasing silt loads by reducing their filtration rates (Bricelj and Malouf 1984). Therefore, it appears that hard clams are less well adapted for survival in a turbid environment than many other bivalve species and are more dependent on less turbid waters, conditions that would occur with a breach.

As light penetration is a major limiting factor affecting the primary productivity of submerged aquatic vegetation in the bays (U.S. Fish and Wildlife Service 1996), reduced turbidity associated with increased tidal flushing could increase light penetration and with it, primary productivity and the habitat structure that submerged aquatic vegetation provides. Although the breach at Old Inlet did result in the burial of eelgrass beds in the immediate vicinity, increases in water quality due to increased flushing of Great South Bay may lead to an increase in vegetated bottoms elsewhere in the bay. Sediment passing through a new inlet/breach would create sand flats elevated above the bay bottom, potentially compensating for some of the eelgrass area that will be lost to increased water depth. In this manner, a new inlet could be beneficial to the eelgrass population of the bays by providing new substrate for growth. For example, the densest eelgrass beds in Great South Bay are near the existing inlets (Cashin Associates 1993). This has been attributed to the clearer water and sediment input which is suitable for eelgrass development available in these locations. It is possible that a new inlet could more than compensate for short-term physical damage with a long term improvement in conditions.

The introduction of additional ocean water through a breach in the project area might also moderate bay temperature (Cashin Associates 1993), as the annual temperature range for ocean water is from 4 to 21°C (U.S. Fish and Wildlife Service 1981a), narrower than the bay water temperature range of 0 to 30°C. Hard clam growth is disrupted outside of the optimal temperature range, approximately 20 to 23°C (Malouf 1991). Moderation of bay temperature would tend to reduce these disruptions (Cashin Associates 1993).

Finfish would be largely unaffected by a breach within the project area, although the new channel might provide attractive habitat for certain species (New York Sea Grant 2001). Unvegetated bay bottom is the preferred habitat of several benthic fishes. Sogard (1992) found that juvenile winter flounder were more abundant in unvegetated habitats than in eelgrass habitats; there was also some suggestion that winter flounder may grow faster in unvegetated habitats with coarse sediments. However, flounder populations are not limited by any shortage of non-vegetated bottom habitat (New York Sea Grant Institute 1993), and the flounder population would not be increased by the creation of more non-vegetated bottom area.

The Corps provided an estimate of the bayside deposition below mean sea level (MSL) that would occur as a result of breaching at 8 Corps-identified areas of concentrated risk for storm damages (U.S. Army Corps of Engineers 2009a) in acres and volume of material. The Corps' GRR (U.S. Army Corps of Engineers 2016b) only provided volumes of bay deposition which are identical to the volumes provided in their 2009 report. As such, the aerial extent of deposition provided in the 2009 report is deemed valid for this analysis. These deposition areas below MSL created if a breach was left open for 12 months, are listed as follows:

Site	**Acres of Bayside Deposition Above MSL after 12 Months**
Fire Island Lighthouse Tract	338 ac.
Town Beach to Corneille Estates	274 ac.
Talisman to Water Island	171 ac.
Davis Park	314 ac.
Smith Point County Park	117 ac.
Sedge Island (Westhampton)	165 ac.
Tiana Beach	83 ac.
West of Shinnecock Inlet	74 ac.
Total	**1,536 ac.**

The FIMP is, therefore, designed to prevent the formation of a total of approximately 1,536 ac. of bayside habitat, including the above described 377 ac. of intertidal/supra-tidal habitats described above. This is total amount of habitat that could potentially form if breaches were to occur at each of the areas of concentrated risk and left open over a period of 12 months. The Service recognizes that this estimate could be less since there is also the potential that: 1) a breach would not form in each of these locations over the 50-year life of this project and; 2) should breaches occur, they could close naturally at any time prior to 12 months. Conversely, this total could be conservative in that it would not include ocean-to-bay overwash habitat that could also be created across the existing barrier island in the event of severe storms and the potential for breaches to provide additional sediment beyond 12 months if it hasn't reached equilibrium. The Corps determined that there is a combined total of 7.4 breaches expected to occur over the 50 year time frame of the FIMP (U.S. Army Corps of Engineers 2016b).

It appears that the existing breach at Old Inlet is present in the area the Corps refers to as Old Inlet (West). Based upon delineations of Google Earth 2015 aerial photographs, the Service estimates that a total of 525 ac. of back-bay tidal shoal habitat has been created thus far at the Old Inlet Breach (three years after its formation). Due to its dynamic nature, it's difficult to

know if this amount could increase as the breach migrates or the breach could close naturally in the near future (or be closed by the Corps pending NPS's EIS). In their 2009 Formulation Report, the Corps had forecasted that a breach at Old Inlet would create 622 ac. if left open for 12 months. Although the forecasted value was greater than what was actually created, this comparison does validate the premise of using these Corps' forecasted values in assessing the impacts of this project.

7. Bay Islands

As stated above, the NYSDEC analysis did find a substantial loss of bay island tidal wetlands (both man-made dredge deposition islands and natural islands) within the FIMP area. The loss of these islands appears to be caused by storm events, rising sea levels, and erosion. Erosion may be caused by: a) the apparent deficit of sediment in the bays due to maintenance dredging activities (Intracoastal Waterways and each of the inlets), b) the maintenance of relatively deep channel depths for navigation which increase tidal flow velocities, and c) boat wake reflection. Although some back-bay islands were created from dredge placement activities (New Made Island), these back-bay islands are important habitat for colonial waterbirds, piping plovers, American oystercatchers, and heron rookeries.

Dune building projects restrict the delivery of sediment to the bay by inlets/breaches, wave overwash, and Aeolian transport, thereby increasing bay sediment budget deficiencies and potentially increasing bay island erosion and/or loss (Nordstrom *et al.* 2005).

8. Inlets

The FIMP does not reduce the amount of presently available channel habitat, but is intended to reduce the likelihood of formation of any new inlet channel habitat associated with a breach within the project area. Inlet channels, and their attendant physical features, appear to be preferred habitat for bluefish and may provide essential foraging habitat for black skimmers, common terns, and roseate terns. The roseate tern is a federally-listed endangered species. Safina (1990a and b) found that common terns were able to take advantage of prey that had been driven to the surface by bluefish, which tend to congregate near inlets, while roseate terns relied on physical features associated with inlet channels, such as shoals, which cause prey to move up into their diving range.

Although the interim BCP was intended to close any new inlet quickly, short-term impacts of a breach may be ecologically important, including the habitat provided by the temporary existence of the new channel itself and the changes in bottom topography due to delivery of new sediment to the back bays.

The Corps proposes to incorporate the maintenance dredging of Fire Island, Moriches, and Shinnecock Inlets, normally conducted under separate authorities through the Operations Division of the Corps, into the FIMP project (Planning Division). These maintenance dredging projects are proposed to be expanded/increased in the following manner (U.S. Army Corps of Engineers 2016b):

- These dredging efforts will now include the dredging of the ebb shoals of each inlet, outside navigation channel, with downdrift placement (presumably in the same placement areas used in the Operations Division maintenance dredging projects);

- These dredging efforts will now include the construction of a +13 ft dune and berm, as needed in identified placement areas;

- These inlets will be dredged on a 2-year cycle (the Operations dredging would occur irregularly, averaging approximately once every 5-6 years).

The expansion of these maintenance dredging projects will further stabilize the placement areas, thereby exasperating FIMP projects impacts. Additionally, the removal of the ebb shoals could remove potential sources of sediment downdrift of the inlets as well as the flood shoals and result in accelerated erosion in these areas. Any modification of the inlet systems has the potential to alter the flooding hazard. The TSP proposes to include the dredging of 73,000 to 379,000 cy from the ebb shoal in addition to deepening the navigation channels of each inlet as part of the scheduled Operations and Maintenance dredging at a two year interval. The Corps should address the potential for this proposed practice to exacerbate the flooding hazard associated with the management of the federal inlets.

Ebb and flood shoals are spawning areas for crab and shrimp species, roosting and foraging habitat for shorebirds, shelter for SAV (Rice 2009) and ebb shoals support benthic invertebrates which are important prey species for commercially important demersal fish and crustaceans (Bishop *et al.* 2006)

One impact to the Fire Island Inlet area in particular, is the bi-annual removal of the accreting spit located west of the Fire Island Inlet Jetty along part of what is referred to as Democrat Point. As the Service had documented in our August 24, 2006, correspondence (U.S. Fish and Wildlife Service 2006 *in litt*.) to the Corps (Operations Division), the dredging of the accreting spit removes important foraging and breeding habitat for federally and state-listed shorebirds such as the piping plover (U.S. Fish and Wildlife Service 1996) and least tern, while the areas inland of the spit stabilize and dense vegetation encroaches, thereby limited habitat suitability for these species.

The expansion in the depths of the inlets and the dredging of the ebb shoal could result in the increase of tidal flushing and potentially an improvement in local water quality, but could also increase the flooding potential along the mainland.

It is not clear if the Operation Division-sponsored maintenance dredging of these inlets will continue or if this dredging will solely be conducted through the FIMP project.

9. Disruption of Physical Processes and Habitat Formation

As described in Section III-C-3, the physical process of overwash is important in maintaining/creating fish and wildlife habitat (SAV beds, tidal wetlands, sparsely-vegetated

ocean-to-bay overwash fans, etc.) and the very goal of the FIMP is to prevent/limit this very coastal process.

B. Cumulative Impacts

As a preface to the discussion below, Berg (1977) and Hobbs *et al.* (1981) noted that the FIMP Reformulation Study, as initiated in 1980, was intended to address the entire barrier system as a unit, because action under a comprehensive plan that considers the erosion processes over the full length of the receding shore segment is both more effective and more economical, and because, as the CEQ noted, actions in one part of the system tend to affect other parts of the system.

The Corps' cumulative impact analysis for the FIMP (U.S. Army Corps of Engineers 2016a) included the following summarized conclusions:

- The cumulative impact assessment of federal nourishment projects on the south shore of Long Island indicate that federal project actions would occur in a dynamic environment whose inhabitants have adapted to these conditions.

- Studies indicate that borrow area and sand placement areas re-colonize shortly after construction activities are completed.

- Best Management Practices/conservation measures (Time-of-year restrictions, place only suitable material on beaches, properly graded, etc.) will lessen temporary impacts;

- The proposed borrow areas in the TSP Alternative represent a very small percentage of the total available habitat.

<u>Agency Planning/Environmental Analysis</u>

As described in the Service's Mitigation Policy, the Service must consider project impacts as part of its review, including: (1) the total long-term biological impact of the project, including any secondary or indirect impacts regardless of location, and (2) any cumulative effects when viewed in the context of existing or anticipated projects. Direct impacts occur in the same place and location. Indirect impacts can occur later in time or farther removed in distance, but are still reasonably foreseeable. The CEQ-defined cumulative impacts (40 CFR 1508.7) as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions...." Also, "...cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time."

Shoreline stabilization projects in the form of beach nourishment have been undertaken on Long Island since the 1920s. For example, since the 1930s, the beaches on Fire Island have been stabilized via sand fence placement, dune construction, jetty construction, and beach nourishment. The first large-scale dune and beach construction was undertaken in the developed

FIIS communities in the late 1940s (Gravens 1999). It is estimated that a total of 6.9 m cy of beachfill was placed along Fire Island from 1933-1989 (Gravens 1999).

If the WOSI, the FIMI, the BCP, the Westhampton Interim Project, and the Westhampton groin field are considered together, the Corps' interim projects would encompass nearly 50 mi. of the original 83-mi. FIMP study area. Recent (since 2008) federal projects or federally-authorized projects within or adjacent (Long Shore current updrift) to the FIMP are listed as follows:

Year	Project Name	Cubic Yards (cy)	Project Distance (ft)
2015	Village of Quogue Beach Nourishment Project	1,100,000 cy	14,325 ft
	Captree Boat Basin Great South Bay Initial	122,600 cy	12,000 ft
	Captree Boat Channel Great South Bay Second	75,000 cy	
	Tiana Beach Levee	100,000 cy	3,500 ft
2014	Downtown Montauk Stabilization Project	65,000 cy	3,100 ft
	Great South Bay Federal Navigation Channel Dredging	100,000 cy	3,000 ft
	FIMI	7,000,000 cy	100,320 ft
2013	East Captree State Channel Modification 1	489,000 cy	12,000 ft
	East Captree State Channel Modification 2	400,000 cy	
	New York State Department of Transportation Fire Island Inlet Dredging	800,000 cy	50,000 ft
	Corps Emergency Fire Island Inlet Dredging	1,500,000 cy	40,000 ft
2008	FIIS Community Project	1,800,000 cy	22,000 ft
	Smith Point and Cupsogue County Parks	460,000 cy	15,000 ft
2003	FIIS Community Project	1,000,000 cy	15,000 ft
2002	Fire Island Pines Marina Dredging	6,000 cy	6,000 ft
2001	West of Shinnecock Inlet Interim	810,000 cy	4,000 ft
1999	West of Shinnecock Inlet Interim	810,000 cy	4,000 ft
1994	Westhampton Interim Project	3,500,000 cy	21,500 ft
	Total	**20,137,600 cy**	**325,745 ft**

Therefore, over 20 million cy of material have been dredged and placed along over 60 mi. of ocean beaches within and adjacent to the FIMP project area since 1994. The FIMP project would contribute an additional 64,184,155 cy of material over the 50-year project life. Additionally, the continued implementation of the above projects that are authorized for future dredging/nourishment that will not be super-ceded by the FIMP (at a minimum- bay dredging projects) will contribute additional material as well. This amount of material resulted in direct and indirect impacts summarized as follows:

Direct impacts include:

- Loss and habitat modification of offshore borrow area habitats, benthic/fisheries resources, and overwash/early successional habitat;
- Burial of marine intertidal and marine beach invertebrate species and temporal modification of intertidal and marine habitats; and

- Increased turbidity of offshore and intertidal habitats.

Indirect impacts include:

- Decreases habitat values for federally and state-listed plant and animal species;
- Reduces potential to form and create early successional barrier island habitats;
- Reduces opportunities for water quality improvement in backbay;
- Reduces the potential to form new inlet channel habitat;
- Reduces the potential to recruit finfish and crustaceans to backbay;
- Reduces sediment transport to the bay;
- Reduces rates of formation of SAV and saltmarsh habitats;
- Accelerates vegetative succession on barrier island and backbay;
- Decreases biodiversity at the community level;
- Develops habitat preferred by mammalian and avian predators;
- Reduces habitat values for waterfowl and migratory shorebirds;
- Potential for snow fencing, planting of vegetation, and beach raking;
- Increase in recreational activity.

It is not clear if the FIMP will supercede and prohibit other beach nourishment projects from occurring within the study area. Additional beach nourishment/dredge material placement projects will compound the above listed impacts, especially the recovery of benthic invertebrate species in borrow/dredge and placement areas. It will be more difficult for the benthic communities to recover in these areas if more frequent beach nourishment and maintenance dredging operations are occurring. As stated above, recovery of this community could take up to 2 years, which, for example, is the dredging cycle for the Fire Island and Shinneocock Inlets (every year for Moriches Inlet). So just as benthic communities (important for fish, shorebirds, sea turtles, etc.) are recovering, another dredging and beach placement operation is occurring. If additional beach nourishment projects occur, the benthic communities could potentially not have time to recover.

The FIMI, Westhampton Interim Project, Village of Quogue, Sagaponack/Bridgehampton Erosion Control District and Fire Island Community projects involve the dredging of an offshore borrow area with placement on the ocean shoreline. The remaining projects involve the dredging of backbay/flood shoal and/or inlet and ebb shoal areas with dredge material placement on the ocean shoreline or stockpiled within the vicinity of the ocean shoreline. This removal of sediment from the backbay and inlet habitats is further exasperated by the limiting/prevention of cross-island sediment transport (overwash and breaching) that occurs from the cyclical nourishment of these ocean beaches.

As such, the Service concludes that the beach fill/dune construction plan will have cumulative impacts causing adverse impacts on fish and wildlife habitat and the overall condition of the FIMP project area through reduction in the frequency of coastal processes which maintain the barrier islands as natural protective features. Coastal processes keep the barrier island above water and protect Long Island's south shore from direct influences of ocean waves and also create and maintain a natural balance among various terrestrial and estuarine habitat types, vegetation cover types, and fish and wildlife species (U.S. Army Corps of Engineers 2016b).

Other than beach nourishment projects, local/state actions that are reasonably certain to occur in the project area that could potentially affect fish and wildlife resources include beach cleaning, the installation of sand fencing, and increase in the amount of recreational activity. The Service requests clarification from the Corps whether easements will be established within the FIMP project area that would preclude local or state entities from conducting such operations to address this cumulative impact.

The installation of snow fencing or the planting of beach grass are common practices in attempting to stabilize nourished beaches and have occurred on other sites on Long Island without federal (Service, Corps) or NYSDEC coordination/authorization. Vegetation planting and snow fence placement, in association with beach nourishment, will artificially accelerate growth of dense vegetation that precludes use of habitat by species which prefer open or sparsely-vegetated beach habitats, including ground-nesting shorebirds and coastal plants. This effect will limit the amount of available suitable habitat for these species and will create suboptimal habitat conditions. Artificially-planted areas that rapidly grow into dense areas of perennial vegetation precludes use by this species. For example, Weakley and Bucher (1992) report that stabilization of seabeach amaranth habitat allows for succession to a densely-vegetated perennial community, rendering the beaches only marginally suitable for seabeach amaranth, which is rarely encountered in areas that have been snow fenced.

Another beach management practice not mentioned in the project description which could occur over the life of the project is beach raking. Beach raking/cleaning does occur throughout the FIMP project area, primarily on bathing beaches. Mechanized beach cleaning adversely affects seabeach amaranth and other coastal plants through the direct crushing of plants and removes the wrack line, an important forage micro-habitat for shorebirds.

Off-road vehicle traffic on ocean beaches severely limit ground-nesting shorebirds and coastal plant habitat suitability through the disturbance of foraging and breeding behaviors, as well as crushing of unfledged chicks and plants. The ORVs can also affect shorebird foraging habitat. Kluft and Ginsberg (2009, p. vi) found that ORVs killed and displaced invertebrates and crushed/decimated wrack, in turn lowering the overall abundance of wrack dwellers. In the intertidal zone, invertebrate abundance is greatest in the top 12 in. (30 cm) of sediment (Carley *et al.*2010, p. 9). Intertidal fauna are burrowing organisms, typically 2 to 4 inches (5 to 10 cm) deep; burrowing may ameliorate direct crushing. However, shear stress of ORVs can penetrate up to 12 inches (30 cm) into the sand (Schlacher and Thompson 2008, p. 580).

<u>Increase in Recreational Activities</u>

Indirect effects of disturbance to ground-nesting shorebirds also occurs by limiting breeding habitat to oceanside habitats that are simultaneously made more attractive for recreational activities by beach stabilization projects. Recreational activities that may potentially adversely affect these species include an increase in beach patrons and associated activities (ORV use, sunbathing, sports, playing loud music, etc.), unleashed pets, fireworks, kite-flying, and increase in garbage and refuse concomitant with increased recreational activities. Unleashed pets, such as

dogs and cats, can prey on shorebirds. Kite-flying may disturb these species as it is believed that the ground-nesting shorebirds perceive kites as avian predators.

The level of recreational impacts within potential ground-nesting shorebird areas is expected to increase in the near term. Wide beaches with little human disturbance at the time these species initiate nesting (March to May) often experience heavy recreational pressure later in the nesting season (June through August), potentially creating sufficient disturbance to cause abandonment of nests, interfere with foraging, cause broods to be separated from adults, or attract predators. The degree to which increases in recreational activity and predator habitat result in mortality or disturbances to ground-nesting shorebirds and their chicks depends on the degree to which the protection measures are implemented.

Seabeach amaranth and other coastal plant colonization is unlikely to occur on intensively used recreational beaches, but would be more likely in areas fenced for the protection of piping plovers and other beach nesting birds (U.S. Fish and Wildlife Service 2002).

IX. MITIGATION/FISH AND WILDLIFE ENHANCEMENT RECOMMENDATIONS

Service Mitigation Policy

The Service's Mitigation Policy (Policy) (U.S. Fish and Wildlife Service 1981b) was developed to guide our preparation of recommendations on mitigating the adverse impacts of land and water developments on fish, wildlife, their habitats, and uses thereof. It helps both the Service and the federal action agency, in this case, the Corps, by assuring consistent and effective recommendations, by outlining policy for the levels of habitat mitigation needed, and the various methods for accomplishing mitigation for habitat losses associated with such projects. It allows federal action agencies to anticipate Service recommendations and to assist in the preparation of mitigation measures early, thus avoiding delays and assuring equal consideration of fish and wildlife resources with other project features and purposes (FWCA: 16 USC 661-667[e]).

The term "mitigation" is defined in the Service's Policy (U.S. Fish and Wildlife Service 1981b) as: (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating impacts over time; and (e) compensating for impacts by replacing or providing substitute resources or habitats.

As previously stated, the President's memorandum entitled, "Mitigating Impacts on Natural Resources From Development and Encouraging Related Private Investment" (Federal Register Vol. 80, No. 215 Friday, November 6, 2015) was very recently issued to federal agencies and sets forth a series of directives that will factor into our FWCA and ESA consultations including, but not limited to:

- "Agencies' mitigation policies should establish a net benefit goal or, at a minimum, a no net loss goal for natural resources the agency manages that are important, scarce, or sensitive, or wherever doing so is consistent with agency mission and established natural

resource objectives. When a resource's value is determined to be irreplaceable, the preferred means of achieving either of these goals is through avoidance, consistent with applicable legal authorities. Agencies should explicitly consider the extent to which the beneficial environmental outcomes that will be achieved are demonstrably new and would not have occurred in the absence of mitigation (*i.e.* additionality) when determining whether those measures adequately address impacts to natural resources;

- Agencies should set measurable performance standards at the project and program level to assess whether mitigation is effective and should clearly identify the party responsible for all aspects of required mitigation measures. Agencies should develop and use appropriate tools to measure, monitor, and evaluate effectiveness of avoidance, minimization, and compensation policies to better understand and explain to the public how they can be improved over time; and

- When evaluating proposed mitigation measures, agencies should consider the extent to which those measures will address anticipated harm over the long term. To that end, agencies should address the durability of compensation measures, financial assurances, and the resilience of the measures' benefits to potential future environmental change, as well as ecological relevance to adversely affected resources."

Corps Proposed Mitigation Measures/Best Management Practices

Refer to the Corps' DEIS for a detailed description of the proposed mitigation measures and best management practices (U.S. Army Corps of Engineers 2016a). A summary of these measures are listed as follows:

- The borrow areas are sloped in a manner to prevent anoxic conditions.

- Federal or state-listed wildlife species surveys - all findings will be reported to the Service for potential consultation to modify any procedures to reflect actual observed impacts and associated responses.

- Plant endemic vegetation at low densities (18 in. on center).

- Time-of-Year Restrictions, which will provide for no activities between April 1 and September 1 to protect piping plovers and May 1 to November 1 to protect seabeach amaranth.

- Provisions for the project to only undertake low impact construction activities, such as beach surveying or the installation of sand fencing, during the piping plover breeding season, utilizing a 300-ft protective buffer zone.

- 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., ORVs, and recreational activities) and predator management will be undertaken following the conditions outlined below.

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

- All pedestrian and ORV access into, or through, the breeding or growing areas shall be prohibited.

- 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).

- 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 ft from the tidal wetland boundary (intertidal zone).

- 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.

The Service requests clarification on whether the Corps will enforce landowners/land managers' abidance with these measures.

<u>Service Planning Aid Letter 2005</u>

With Corps funding, the Service prepared a PAL entitled "Identification of Restoration Opportunities within the Fire Island to Montauk Point Reformulation Study Area" published in April of 2005 (Service 2005). Although the site investigations occurred in 2005 and 2004, much of the information and observations are still relevant. This document listed numerous potential restoration projects for fish and wildlife resources/habitats ranging from wetlands, federal and state-listed ground-nesting shorebirds, shellfish, and anadromous fish. The following table summarizes the PAL findings. The Corps could implement projects identified here to rectify/compensate for project impacts.

Table 5. Potential Restoration Projects within the FIMP Study Area

Site	Location	Approximate Size	Type of Restoration	Ownership	Benefit to T&E Species	Site
COTE = Common Tern; LETE = Least Tern; PPL = Piping Plvoer; ROTE = Roseate Tern; T&E = Threatened and Endangered Listed Species						
Cupsogue County Park	Moriches Inlet	5 ac.	Clearing of vegetation for plovers and terns	Suffolk County	Yes	Past restoration prior to 2005 was successful
Democrat Point	Fire Island Inlet	25 ac.	Clearing of vegetation for plovers and terns	New York State	Yes	Heavy recreational use
Pikes Beach	Moriches Bay, Westhampton	10 ac.	Clearing of vegetation for plovers and terns	Town of Southampton	Yes	History of PPL nesting
Warner's South Island	Shinnecock Bay	2 ac.	Dredge material placement for terns	Suffolk County	Yes	History of ROTE nesting
Shirley Marina	Bellport Bay	10 ac.	Clearing of vegetation for terns	Suffolk County	Yes	History of LETE nesting
John Boyle Island	Bellport Bay	5 ac.	Clearing of vegetation for terns	Town of Brookhaven	Yes	History of LETE nesting
New Made Island	Moriches Bay, West of Moriches Inlet	3 ac.	Clearing of vegetation for terns	Town of Brookhaven	Yes	History of COTE nesting
East Inlet Island	Moriches Inlet	5 ac.	Removal of dredge spoil for terns	Town of Brookhaven	Yes	History of ROTE nesting
Wertheim Refuge	Carmans River	100 ac.	Removal of Common Reed	Service	No	Also propose to restore hydrology
Brown's Creek	Great South Bay, Sayville	2 ac.	Shoreline stabilization, Spartina plantings	Suffolk County	No	Corps Operations Division project
Roosevelt Estate County Park	Sayville	5 ac.	Common reed control	Suffolk County	No	Local support for view-shed restoration
Islip Meadows County Nature Preserve	Great South Bay, East Islip	25 ac.	Common reed control	Suffolk County	No	Adjacent to Islip Nature Preserve
Green's Creek	Great South Bay, West Sayville	2 ac.	Common reed control	Suffolk County	No	Public support for restoration

Beaver Dam Creek	Bellport Bay	5 ac.	Common Reed control, removal of dredge spoil	New York State	No	Portion of work complete; Multi-partnerships
Seatuck Refuge	Champlin Creek Great South Bay	5 ac.	Remove dredge spoil and restore hydrology	Service	No	Service/ Refuge
Blue-points Bottom-lands	Great South Bay	11,500 ac.	Shellfish and SAV beds	TNC	No	Multi-partnerships
Mud Creek	Moriches Bay	10 ac.	Alewife fishway	Suffolk County	No	Common reed removal also proposed
Swan River	Patchogue Bay	1 ac.	Alewife fishway	Privately owned	No	Fishway for brook trout, as well
Kismet	Great South Bay	2 ac.	Restore littoral drift	Privately owned/ FIIS	No	Re-alignment of marina
Sailor's Haven	Great South Bay	10 ac.	Restore littoral drift	Privately owned/ FIIS	Possibly, plover foraging habitat	Re-alignment of marina
Saltaire	Great South Bay	5 ac.	Restore littoral drift	Privately owned/FIIS	No	Re-alignment of marina
Great Gun	Moriches Bay	5 ac.	Restore littoral drift	Privately owned/ FIIS	Possibly, plover foraging habitat	Re-alignment of marina
Robbins Rest	Great South Bay	5 ac.	Restore littoral drift	Privately owned/FIIS	Possibly, plover foraging habitat	Re-alignment of hardened shoreline
Point of Woods	Great South Bay	10 ac.	Restore littoral drift	Privately owned/ FIIS	Possibly, plover foraging habitat	Re-alignment of hardened shoreline
Cherry Grove	Great South Bay	5 ac.	Restore littoral drift	Privately owned/ FIIS	Possibly, plover foraging habitat	Re-alignment of hardened shoreline

Fire Island Pines	Great South Bay	10 ac.	Restore littoral drift	Privately owned/ FIIS	Possibly, plover foraging habitat	Re-alignment of hardened shoreline
Abbetts Creek	Patchogue Bay	5 ac.	Remove dredge spoil and restore hydrology	Town of Brookhaven	No	Adjacent tidal wetlands
Moriches Avenue Site	Moriches Bay	5 ac.	Remove dredge spoil and restore hydrology	Town of Brookhaven	No	Adjacent tidal wetlands

Service February 13, 2008, Correspondence

The Service provided a list of potential habitat creation, restoration, and/or enhancement in a February 13, 2008, correspondence to the Corps. A summary of each project identified on Fire Island are listed as follows:

- Democrat Point/RMSP: Clear dense vegetation to restore early successional habitat (308 ac.);
- Lighthouse Beach: Create bayside overwash habitat (58 ac.);
- Robin's Rest: Create bayside overwash habitat (27 ac.);
- Sailor's Haven: Create bayside overwash habitat (24 ac.);
- Carrington Tract: Create bayside overwash habitat (12 ac.);
- John Boyle Island: Restore tern habitat (5 ac., also identified in the PAL);
- Talisman: Create bayside overwash habitat (acreage not provided);
- Blue Point Beach Tract: Create bayside overwash habitat (acreage not provided);
- FIIS Wilderness Area: Create bayside overwash habitat (20 ac.);
- West and East Inlet Islands: Restore plover and tern habitat (32 ac.).

These above-described projects are examples or options of potential compensatory measures designed to mitigate for the FIMP impacts to fish and wildlife resources. As further described below, the Service notes that the total amount of mitigation required for this project is yet to be determined, subject to a better understanding of the project impacts.

All of the Service-recommended restoration/enhancement/creation projects combine for a total of 12, 436 ac., 11,500 of which consists of the Blue Points Bottom shellfish area. All remaining projects add up to 936 ac., of which 600 involve creating/restoring bayside overwash habitat.

Recommended Compensatory Mitigative Measures

The Corps has determined that the FIMP TSP would prevent the creation of 1,536 ac. of back bay habitat (which would presumably include 377 ac. above MSL). As stated above, the Service recognizes that this estimate could be less since there is also the potential that: 1) a breach would not form in each of these locations over the 50-year life of this project and; 2) should breaches occur, they could close naturally or reach equilibrium at any time prior to 12 months. Conversely, this total could be conservative in that: it would not include overwash habitat that could also be created across the existing barrier island in the event of severe storms; the potential for breaches to provide additional sediment beyond 12 months if it hasn't reached equilibrium or closed; and the potential for higher sea level rise which could result in more breaching and more sediment deposition in the backbay. When looking only at the amount of back bay habitat that the FIMP would prevent from forming from breaches, the creation/restoration/enhancement of a minimum of 1,536 ac. of early successional/overwash habitat would be appropriate to compensate for the impacts of the FIMP TSP. However, as stated above, the amount of overwash that the FIMP will prevent from forming also needs to be accounted for. Additionally, sea level rise needs to be accounted for in assessing the amount habitat that would be available over the 50-year life of the project as well as the salt marshes' ability to keep pace with seas level rise. The creation of sand flats that provide platforms for new salt marsh growth would

provide protection to wetland and upland areas from sea level rise (U.S. Army Corps of Engineers 2016a). As stated in Section III-D above, further coordination/assessment with DOI is needed regarding the sea-level rise rates used in the majority of the Corps' documents.

As such, the Service requests additional information on the amount of overwash habitat that the FIMP would prevent from forming over the life of the project. Additionally, information on how the compensatory measures will perform in the future with the latest/scientifically correct and agreed-upon sea-level rise rates are needed before we can recommend a total amount of compensatory mitigation.

The Service recognizes the challenge in securing suitable areas for restoration/enhancement/creation and receiving approvals/buy in from landowners and land managers and is available to assist and coordinate with the Corps in this regard.

The below described additional measures could also be implemented which may reduce the amount of mitigation required.

Additional Measures

<u>Best Management Practices During Construction and Post-Construction Between Nourishment Cycles</u>

- Preconstruction surveys of the borrow areas to ensure that impacts to highly diverse areas containing substantial surf clam populations are avoided or minimized;

- Benthic infauna in borrow areas are likely to recolonize more rapidly if small "islands" are left in the borrow areas (Minerals Management Service 2000, Rice 2009). Recommend leaving as many untouched "islands" in the borrow area as possible.

- As described above in the impacts section and the revised project design discussion below, vegetation planting and sand fencing limits habitat suitability for beach strand-dependent species (piping plover, seabeach amaranth, least tern, etc.). As such, the location and scale of these practices should be minimized to the greatest extent practicable. When stabilization is required, vegetation alone should be used on dunes to trap windblown sediment so that resulting dunes are more natural in size, shape and location (Nordstrom *et al*. 2012). The use of snow/sand fencing should be minimized as much as possible (Rice 2009).

- To facilitate benthic invertebrate recovery (Rice 2009):

  - Beach fill material must be compatible, being similar in color and grain size distribution, with the native sediment on the existing beach;
  - Be placed to the thinnest depth possible;
  - Fill should not be placed in contiguous sections of beach but should be divided into shorter sections;

- Beaches should not be raked or mechanically cleaned, wrack materials should be preserved.

Revise Project Design

- Lower proposed dune heights to promote overwash and early successional habitat in appropriate areas. Maslo *et al.* (2011) conclude that recovery and persistence of piping plovers and other early successional habitat-dependent species will depend on conservation and restoration of breeding habitats with very low slopes, dune heights, vegetative cover, and wide, flat beaches in order to ensure that plovers and their chicks are able to move freely from their nesting sites/dry areas to foraging areas within the intertidal area as well providing suitable nesting habitat. Specifically, Maslo *et al.* (2011) recommended dune thresholds for suitable plover breeding habitat of 1.6 m. (5.25 ft) dune height (from apex to the seaward toe), dune slope of 17 percent, shell/pebble cover of 17-18 percent and 22 percent vegetative cover. The more-gradual slope of the dune will likely allow for plover brood movements between the dune/back dune and intertidal areas. Additionally, the use of compatible sand and maintaining sparsely-vegetated dunes/upper beach will promote plover/tern/black skimmer/American oystercatcher breeding. Specifications on dune heights, locations, etc. can be agreed upon during the ESA consultation.

Supplement Shinnecock Bay SAV/Shellfish Restoration Efforts

The above described Shinnecock Bay Restoration Program is conducting an on-going effort to restore eelgrass beds in Shinnecock Bay and is planning to install clam sanctuaries in the Bay, as well. The Corps could assist in this endeavor through providing funds or labor/resources.

Colonial Shorebird Breeding Habitat Restoration

There are numerous sites within the FIMP that have a history of colonial shorebird breeding, including the black skimmer, which no longer nest in these historic nesting sites within the study area. The Service is in the process of refining and further developing more specific information/recommendations and invites the Corps to coordinate with the Service in this regard.

Stormwater Treatment

The Corps should explore opportunities to partner with local municipalities and state agencies to improve bay water quality through improved storm-water treatment. The Service is in the process of refining and further developing more specific information/recommendations and invites the Corps to coordinate with the Service in this regard.

Corps-Proposed Mitigation/Coastal Process Features

In regards to the coastal process features that are proposed for restoration, the GRR lists coastal process features at seven locations (GRR at page xii) while the DEIS lists eleven (DEIS page 2-27) (only 10 of which are viable since restoration at the Seatuck National Wildlife Refuge has already been completed). Coastal Processes restoration at John Boyle, New Made, and Warners Islands, and the Atlantique to Corneille portion of Fire Island, listed in the DEIS are not included in the GRR.

The GRR identifies coastal process features at seven locations which are described as follows:

- *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 saltmarsh features by reestablishing hydrologic connections and disturbances.

- *Tiana* – Reestablishes the bay shoreline natural protective features by reestablishing the dune, saltmarsh, and enhancing the SAV beds.

- *WOSI* – Reestablishes the bay shoreline natural protective features by reestablishing the existing saltmarsh.

- *Islip Meadows* – Reestablishing saltmarsh habitat in conjunction with nonstructural measures by restoring hydrologic connections.

- *Seatuck Refuge* – Reestablishing saltmarsh habitat in conjunction with nonstructural measures by restoring hydrologic connection and plantings.

The additional four CPF's proposed in the DEIS are described as follows:

- *John Boyle Island* – Create shorebird nesting habitat by regrading/removing vegetation on existing dunegrass areas to promote use of the areas by breeding/nesting shorebirds, and using herbicide to control Phragmites. Use bio-engineering measures to stabilize approximately 1,500 ft of eroding island shoreline.

- *New Made Island* – Convert existing Phragmites-dominated intertidal areas to habitat suitable for shorebird breeding and nesting.

- *Atlantique to Corneille* – Create new saltmarsh by excavating and regrading upland areas and bay shoreline, and planting native saltmarsh species.

- Warner Island East – Create additional dunegrass habitat.

The Service has supported the development of alternatives that restore natural processes and provide crucial sources of habitat for species which require early-successional habitats within the coastal beach ecosystem (see U.S DOI correspondence dated June 3, 2008). We have also expressed support for restoration of bay islands for colonial waterbird species, submerged aquatic vegetation, and saltmarsh wetlands, which support birds of conservation concern and we highlighted the importance and our support of research into methods for habitat restoration in this type of coastal setting, and urged the Corps to build pilot projects as soon as possible in the U.S DOI June 3, 2008, correspondence.

The Corps-proposed features were developed, generated and assessed using a Habitat Evaluation Procedures (HEP) analysis. In 2004, the Corps formed the interagency FIMP Habitat Evaluation Procedures (HEP) Interagency Team, consisting of the Corps, Service, NPS, NYSDEC, and Rutgers University (consultant to the NPS). This team, which met on numerous occasions from 2004-2007, developed a number of goals and alternatives for habitat restoration, including the following:

"1. Maximize the benefits, functions, and biodiversity of natural and native habitats on FIMP;

2. Advance the status of populations of rare, threatened, and endangered biota on FIMP;

3. Re-establish natural rates of longshore sediment transport along the ocean and the bay;

4. Improve circulation into and within the back bay; and

5. Re-establish natural rates of cross-island sediment transport" (U.S. Army Corps of Engineers 2006a.)

The Service continues to support these goals, however, we continue to express our concern (See U.S. Fish and Wildlife Service's HEP letter of July 7, 2006, and the November 17-19, 2004, HEP team meeting minutes [U.S. Army Corps of Engineers 2009b]), that the Corps' HEP/CPF features have failed to address, goals 2 and 5, above. The following is a summary of the Service's concerns with the FIMP HEP analysis:

- None of the Corps proposed HEP restoration/CPF's are designed to facilitate cross-island sediment transport.

- The HEP analysis was only used to quantify benefits of the CPF's and was not used to quantify project impacts.

- The HEP analysis assumes that restoration projects will be maintained without any landowner buy-in.

- The HEP model was designed to increase Habitat Suitability Index (HSI) values when: beach nourishment prevents natural processes (overwash/breaching) from occurring; stabilizes dynamic habitats created by overwash; and larger dunes are constructed when compared to smaller dunes.

- The HEP model was designed to decrease HSI values when natural processes occur.

Concerns with the HEP analysis aside, the Service supports many of the CPF alternatives proposed, in fact, three of these alternatives (Islip Meadows, John Boyle Island, and New Made Island) were recommended by the Service in our 2005 PAL and/or February 13, 2008, correspondence. Specifically, the Service supports alternatives which are designed to:

- Restore tidal marsh through the removal of non-native invasive vegetation and restoring/improving hydrological connections and tidal pools;

- Stabilize eroding bay shoreline through the use of bio-engineering techniques (provided it does not adversely affect shorebird/federally-listed species foraging) and the removal of bulkheads;

- Enhance SAV habitat;

- Create/restore shorebird breeding habitat by allowing or mimicking natural processes;

- Remove manmade structures such as boardwalks, walkways, sand fencing, and parking lots.

However, while the Service supports many of the proposed CPF and these alternatives partially address some of the FIMP project impacts (limiting SAV bed development and stabilization/dense vegetation growth limiting colonial shorebird breeding habitat) on a small scale, these alternatives do not address/ameliorate/mitigate for the majority of the above-described FIMP project impacts. As the Service expressed during HEP team meeting minutes and in our July 7, 2006, correspondence, there are no alternatives designed to facilitate cross island sediment transport. Additionally, the Service does not support the CPF's designed to further stabilize or enhance dunes, which would further stabilize the upper beach/dunes and swale habitats, promote dense vegetation growth and exacerbate the FIMP project impacts. Apart from the small-scale restoration of wetlands targeted for the mainland, there does not appear to be any substantial, landscape-level evaluation of wetland restoration opportunities for mainland marshes to address shoreline protection and flood abatement.

While the Corps identifies Cross Island Sediment Transport as a vital coastal process (EIS - pp 2-26) and "fundamental to the long-term geologic resiliency of barrier islands" (GRR - page 12), it also identifies a project impact of less sediment input in the bays and decreasing long-term formation of saltmarsh and submerged aquatic vegetation (EIS page ES-4). And though these

impacts have been identified, the GRR/EIS provide no mitigation/coastal process features to address this significant impact in a scale commensurate with the impacts of beach construction over 19 mi. and breach filling over 40 mi. of barrier island habitat.

In terms of coastal processes, it is not clear which coastal processes the Corps is restoring in the habitat restoration of man-made dredge spoil islands. Restoration of these islands for purposes of waterbird breeding habitat may be warranted with other goals in mind. Consequently, the U.S. Fish and Wildlife Service does not support these projects as materially offsetting impacts of this project or significantly restoring coastal processes. To that end, the Service re-iterates the need for a comprehensive analysis of the with and without project habitat changes/impacts so we can determine the right portfolio of mitigation in terms of type, quantity, quality, and position on the landscape.

Whether or not mitigation for breaches will be implemented is still unclear in the GRR/DEIS. For example, the GRR (Appendix K, page 17, third paragraph) states (emphasis added), "Placement of additional sand material in the bay during the hydraulic construction closure of the breach could be included in the condition breach closure, to emulate flood shoal volumes of breaches allowed to remain open." However, the DEIS, on pp 261 and 396, states, "To minimize impacts to the species [piping plover] 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." Under the red knot section (pp 261 and 397), the DEIS states, "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."

Further, Appendix K of the GRR indicates that there is some speculation about how these CPF's would be maintained into the future (for the life of the project), suggesting it would require funding by separate Corps authorization or by the local cost-share sponsor. Per the above-described Presidential memorandum on mitigation, prospective funding and responsibility for project impact mitigation is not appropriate, but should instead be captured in the DEIS/GRR. The CPF's are not linked by form, function, quality, or quantity to project impacts. There is no indication that any of the projects are viable from the standpoint of landowner agreement or that necessary permits would be granted for such actions. Further, there is no information as to performance criteria and who would be responsible for maintaining the mitigation or funding any maintenance activities for the life of the project. It is therefore, unclear if the regulatory agencies, such as the NYSDEC, agree with these restoration projects and whether or not they remain viable. As noted above, this concurrence would not relieve the Corps of addressing the concerns of the Service on the overall approach and methodologies which were employed in the selection of these projects.

Adaptive Management

The Corps described their proposed adaptive management program in their GRR as follows:

- 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.

The Service requests more information on what parameters will be specifically measured, what thresholds will be established to assess project success and what potential corrective measures will be implemented to attain this success.

Open Marsh Water/Integrated Management

The NPS determined that nearly all backbarrier marshes on Fire Island have been ditched for mosquito control (National Park Service 2009). A potential measure to improve habitat diversity could be to practice open-marsh water/integrated management which includes the filling in ditches and creating new tidal creeks and ponds, which allow small fish and other mosquito predators back into the marsh (U.S. Fish and Wildlife Service's website: http://www.fws.gov/refuge/Wertheim/wildlife_and_habitat/index.html).

Bayside Shoreline Processes

The NPS's FIIS has identified areas within the National Seashore's jurisdiction, where the littoral drift is being interrupted by hard structures (bulkheads, revetments, marinas, etc.) and adjacent non-hardened areas are being eroded. Through coordination with the Service during our efforts in identifying restoration projects for the PAL in 2005 (U.S. Fish and Wildlife Service 2005), eight specific areas having the potential for restoration of bayside shoreline processes. Four areas are eroded due to adjacent marinas, including Sailor's Haven, Great Gun, Kismet, and Saltaire. Additionally, four areas are eroded due to adjacent hardened shorelines, including east of Fire Island Pines, east of Point of Woods, east and west of Cherry Grove, and east and west of Robbins Rest. For each of these sites, restoration would involve the redesigning/realignment of these hard structures to restore littoral drift. These sites are listed in the PAL and in the above summary table.

Study/Survey Needs

The NPS identified data/study needs for the FIIS in their Assessment of Natural Resource Conditions Report (National Park Service 2009). The studies relevant to the FIMP and it's impact on fish and wildlife resources (with Service emphasis in parenthesis) are listed as follows:

- The retreat of bayside shoreline should be monitored closely, and management actions to mitigate the effects of existing and proposed bulkheads (and the limiting of sediment transport to the bay) should be considered.

- A detailed analysis of recent nutrient monitoring data is warranted to determine if ambient nutrient concentrations are increasing. Seasonal monitoring of nutrients and DO in coastal embayments surrounding Great South Bay would identify problem areas requiring remediation, hopefully before nutrient loading in these areas has a negative impact on Great South Bay and FIIS. Similarly, only limited monitoring of groundwater nutrient levels has been conducted recently. It is recommended that a more extensive monitoring effort be implemented to determine the spatial extent and depth of nitrogen contamination, both within the groundwater system and within shallow bay habitats. These measurements should be continued with particular emphasis on monitoring during time periods of maximal drawdown during the summer. Monitoring of fecal and total coliforms or other suitable markers of sewage bacterial contamination should be expanded in Great South Bay and Moriches Bay, particularly in the waters near FIIS, to ensure that this potential risk to human health is adequately assessed and support management plans enacted to reduce impacts. (To address impacts to water quality from limiting breaching)

- There are almost no data on levels of non-nutrient contaminants in Great South Bay and Moriches Bay in general and FIIS in particular. Analysis of contaminants in indigenous filter feeding organisms, such as that underway in NOAA's Mussel Watch program, at several year intervals at some sites within or near FIIS waters, would be a way to address this issue. Such a program would provide a measure of bioavailable contaminants within the waters of the park. (To address impacts to water quality from limiting breaching)

- Conduct an assessment of shellfish populations within its bayside boundary to better assess this resource. Determining the sustainable harvest rate of these populations might help regenerate shellfish populations baywide and provide a form of biological control on brown tide. Efforts to restore shellfish and eelgrass communities in Great South Bay being conducted by TNC and the NYDOS should be closely followed. Data generated from these efforts should be considered in future management plans. (To address impacts to water quality from limiting breaching and associated impacts to shellfish populations)

- Continue to monitor the introduction and spread of invasive plants into the various habitats on Fire Island. In particular, the spread of phragmites into the upper fringes of saltmarshes and brackish habitats should be closely monitored. Management plans should include actions that would help eradicate or prevent the spread of this species. (To address potential of FIMP stabilizing upland habitats and associated increase in invasive species)

- Monitor visitor recreational use of the natural habitats, especially beaches, dunes, and maritime forests. Off-trail trampling of vegetation may increase erosion, spread invasive species, and disturb ground-nesting birds. This threat can be minimized via adequate trail signage and appropriately placed string fencing. (To address potential of FIMP increasing recreational activities)

The Service also suggests the funding and implementing of studies to assess the impacts of Hurricane Sandy on fish and wildlife resources within Great South Bay and Bellport Bay through

surveys of benthic organisms, SAV beds, bay water quality, and finfish and tidal marshes, for comparison to pre-storm conditions.

Cornell Cooperative Extension of Suffolk County Marine Program Recommended Studies

1) Help support the migratory shorebird foraging and horseshoe crab spawning surveys monitoring network so that it can include some monitoring at Fire Island (backbays). This should include Indices of spawning activities and conventional tagging

2) Use radio telemetry tagging study on Fire Island to help identify key spawning areas for horseshoe crab.

3) Since FINS also extends jurisdiction into the bay, consider using acoustic tagging to assess sub-tidal habitat use during spawning and outside of spawning season. (Some of this work was done by NPS with URI, but spatial coverage can probably be bolstered to identify subtidal habitat use).

4) Replicate the migratory shorebird monitoring survey completed for Moriches Bay in Shinnecock and Great South Bay. This is particularly important given the relationship between horseshoe crab and red knot (threatened species).

X. SERVICE POSITION

Section 2(b) of the FWCA requires that the final report of the Secretary of the Interior: 1) determine the magnitude of the 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. The Service has reviewed the current literature on the biological and physical processes affecting the barrier island and coastal ecosystems. Although system specific data are limited, it is clear that when the project is considered within the context of the existing and foreseeable coastal projects, this project has the potential to have significant adverse ecological impacts to fish and wildlife resources of national significance.

In the short-term, the Corps' recommended plan will have direct and indirect adverse impacts on fish and wildlife resources and their supporting ecosystems. Initial beach fill will directly impact subaerial, nearshore intertidal, and subtidal marine habitats, and subaqueous borrow areas. These impacts include burial of benthic organisms, turbidity, and modification of habitats.

In the long-term, the beach fill/dune construction plan will have cumulative impacts extending after the nourishment project, causing adverse impacts on fish and wildlife habitat and the overall condition of the barrier island through reduction in the frequency of coastal processes which maintain the barrier islands as natural protective features. Coastal processes keep the barrier island above water and protect Long Island's south shore from direct influences of ocean waves and also create and maintain a natural balance among various terrestrial and estuarine habitat types, vegetation cover types, and fish and wildlife species.

In the course of its review, the Service has determined that this beach fill/dune construction project could have significant ecological impacts upon the barrier islands, backbays, and their fish and wildlife communities. While the Corps identifies Cross Island Sediment Transport as a vital coastal process and "fundamental to the long-term geologic resiliency of barrier islands" (GRR page 12 - U.S. Army Corps of Engineers 2016b), it also identifies a project impact of less sediment input in the bays and decreasing long-term formation of salt marsh and submerged aquatic vegetation (EIS page ES-4 - U.S. Army Corps of Engineers 2016a). And though these impacts have been identified, the GRR/EIS provide no mitigation/coastal process features to address this significant impact in a scale commensurate with the impacts of beach construction over 19 mi. and breach filling over 40 mi. of barrier island habitat. As such, the Service does not support the TSP as currently proposed.

The Service has identified the impacts that the FIMP could potentially have on fish and wildlife resources and provided recommended measures to avoid, minimize, rectify, reduce and compensate for these impacts. However, the Service requires additional information regarding the project design and expected project impacts before we can recommend a total amount of compensatory mitigation that would result in a no net loss to fish and wildlife resources. A summary of the additional information requested is listed as follows:

- Adaptive management;
- Proposed beach-fill volumes;
- Non-structural measures and associated impact analysis;
- Proposed borrow areas after initial construction;
- Clarification on what conservation/mitigative measures are proposed;
- The design level of the TSP as presently proposed in the GRR/EIS.
- the amount of overwash habitat that the FIMP would prevent from forming over the life of the project;
- Use mid and high sea level rise rates in the impact analysis and assess how the compensatory measures will perform in the future with these latest/scientifically correct and agreed-upon sea-level rise rates;
- Clarification on whether the Corps will enforce landowners/land managers' abidance with Corps-proposed BMP's/mitigative measures
- Clarification from the Corps whether easements will be established within the FIMP project area that would preclude local or state entities from conducting beach cleaning, sand fence installation and recreational activities to address their cumulative impacts.

The Service looks forward to working with the Corps in gathering this information and completing our analysis of this project.

XI. LITERATURE CITED

Able, K.W., and M. Castagna. 1975. Aspects of an Undescribed Reproductive Behavior in *Fundulus heteroclitus* (Pisces: Cyprinodontidae) from Virginia. Chesapeake Science 16:282-284.

Bacca, B.J., and T.E. Lankford. 1988. Myrtle Beach Renourishment Project. Biological Monitoring Report, Years 1, 2, 3. Coastal Science and Engineering, Inc. Columbia, SC. 46 pp.

Bear, D. 2014. "Integration of Ecosystem Services Valuation Analysis into National Environmental Policy Act Compliance: Legal and Policy Perspectives." In Federal Resource Management and Ecosystem Services Guidebook. Durham: National Ecosystem Services Partnership, Duke University, www.nespguidebook.com.

Bishop, M.J., C. H. Peterson, H.C. Summerson, H.S. Lenihan, and J.H. Grabowski. 2006. Deposition and Long-Shore Transport of Dredge Spoils to Nourish Beaches: Impacts on Benthic Infuana of an Ebb-Tidal Delta. Journal of Coastal Research 22 (3):530-546.

Bokuniewicz, H.J., and J.R. Schubel. 1991. The Origin and Development of the Great South Bay: A Geological Perspective. *In* Schubel, J.R., T.M. Bell, and H.H. Carter, *eds*. The Great South Bay. State University of New York Press, Albany, NY. 107 pp.

Bokuniewicz, H.J., A. McElroy, C. Schlenk, and J. Tanski. 1993. Estuarine Resources of Fire Island National Seashore and Vicinity. New York Sea Grant Institute (NYSGI-T-93-001). 79 pp. plus Appendices.

Bull, J., and J. Farrand, Jr. 1977. The Audubon Society Field Guide to North American Birds. Alfred A. Knopf, New York, NY. 778 pp.

Burger, J., and M. Gochfeld. 1991. Human Activity Influence and Diurnal and Nocturnal Foraging of Sanderlings (*Calidris alba*). The Condor 93: 259-265.

Burger, M.F., and J. M. Liner. 2005. Important Bird Areas of New York. Audubon New York. 352 pp.

Cahoon, L., Carey, E.S., and IE. Blum. 2012. Benthic Microalgal Biomass on Ocean Beaches: Effects of Sediment Grain Size and Beach Renourishment. Journal of Coastal Research 28 (4):853-859.

Cameron Engineering & Associates, LLP. 2015. Long Island Tidal Wetlands Trends Analysis. Prepared for the New England Interstate Water Pollution Commission.

Carley, J.T., I.R. Coghlan, M.J. Blacka, and R.J. Cox. 2010. Development of a Proposal and Environmental Assessment of Beach Scraping – New Brighton and South Golden Beach WRL Technical Report 2008/19. Water Research Laboratory, University of New South Wales, Manly Vale, New South Wales, Australia.

Cashin Associates, P.C. 1993. The Environmental Impacts of Barrier Island Breaching with Particular Focus on the South Shore of Long Island, New York. Unpublished Report prepared for State of New York, Department of State, Albany, NY. 44 pp.

Church, J.A., and N.J White. 2011. Sea-Level Rise from the Late 19th to the Early 21st Century. Surv Geophys (2011) 32:585-602. DOI 10.1007/s10712-011-9119-1.

Cohen, J.B., E.H. Wunker, and J.D. Fraser. 2008. Substrate and Vegetation Selection by Nesting Piping Plovers. The Wilson Journal of Ornithology. Vol. 120 (2): 404-407.[GTW1]

Cohen, J.B., L.M. Houghton, and J.D. Fraser. 2009. Nesting Density and Reproductive Success of Piping Plovers in Response to Storm- and Human-Created Habitat Changes. Wildlife Monographs 173:1-24. DOI: 10.2193/2007-553.

Conant, R., and J.T. Collins. 1991. The Peterson Field Guide Series: Reptiles and Amphibians of North America (Eastern/Central North America). Houghton Mifflin Company. Boston, New York. 450 pp.

Conover, D.O., and B.E. Kynard. 1984. Field and Laboratory Observations of Spawning Periodicity and Behavior of a Northern Population of the Atlantic Silverside, *Menidia menidia* (Pisces: Atherinidae). Environmental Biology of Fishes 11:161-171.

Conservation Management Institute. 2002. Final Report of the NPS Vegetation Mapping Project at Fire Island National Seashore. GIS & Remote Sensing Division, College of Natural Resources, Virginia Tech, VA. 205 pp.

CZR, Inc. 2003. Waterbird and Shorebird Use at Ocean Island Beach in Brunswick County, North Carolina – December 2001-November 2002. Prepared for U.S. Army Corps of Engineers, Wilmington District, Wilmington, NC. Contract Number DACW 54-97-D-0028.

Department of the Interior. 1983. Undeveloped Coastal Barriers, Final Environmental Statement. DOI, Coastal Barriers Task Force, Washington, D.C.

Derose-Wilson, A., J.D. Fraser, D. H. Catlin and S. M. Karpanty. 2015. 2014 Shorebird Survey Report. Virginia Tech, Department of Fish and Wildlife Conservation, Shorebird Program, Blacksburg, VA. 11 pp.

EEA, Inc. 2003. Final - Backbay Benthic Invertebrate Habitat Survey. Prepared for the U.S. Army Corps of Engineers, New York District, Work Order 15.

Elias, S.P., J.D. Fraser, and P.A. Buckley. 2000. Piping Plover Brood Foraging Ecology on New York Barrier Islands. Journal Wildlife Management. 64(2): 346-354.

Ethan Eldon Associates, Inc. 1995. Suffolk County Department of Public Works Maintenance Dredging Projects. Draft Generic Environmental Impact Statement. Uniondale, NY.

Executive Office of the President. 2013. Climate Action Plan. Washington, D.C.

Fallon, D., and F. Mushacke. 1996. Tidal Wetlands Trends in Shinnecock Bay, New York 1974 to 1995. New York State Department of Environmental Conservation. 14 pp plus attachments.

Flagg, Charles. 2013. Bellport SeaCat Results. Great South Bay Project: http://po.msrc.sunysb.edu/GSB/.

Flagg, Charles. 2014. The Opening of the Breach in Fire Island and its Impact on the Great South Bay. Abstract from 9th Biennial Fire Island National Seashore Planning, Science and Research Center, March 28, 2014. Stony Brook University School of Marine and Atmospheric Sciences.

Gill, J.A. 2007. Approaches to Measuring the Effects of Human Disturbance on Birds. Ibis 149 (Suppl. 1): 9-14

Gobler, Christopher J. 2014. Assessing the Response of the Great South Bay Water Quality and Plankton Community to Hurricane Sandy. Abstract from 9th Biennial Fire Island National Seashore Planning, Science and Research Center, March 28, 2014. Stony Brook University School of Marine and Atmospheric Sciences.

Godin, A.J. 1977. Wild Mammals of New England. The Johns Hopkins University Press. Baltimore, MD. 304 pp.

Gorzelany, IF., and W. Nelson. 1987. The Effects of Beach Replenishment on the Benthos of a Sub- Tropical Florida Beach. Department of Oceanography and Ocean Engineering, Florida Institute of Technology, Melbourne, FL.

Gravens, M.B. 1999. Periodic Shoreline Morphology, Fire Island, New York. Proceedings of Coastal Sediments. American Society of Civil Engineers, NY. Vol. 2, pp 1613-1626.

Greene, K. 2002. Beach Nourishment: A Review of the Biological and Physical Impacts. Atlantic States Marine Fisheries Commission. ASMFC Habitat Management Series No. 7. Washington, D.C.

Gregg, W.P. 1982. Development Alternatives: New Directions. *In* Mayo, B., and L. Smith, *eds*. Proceedings of Barrier Island Forum and Workshop, Provincetown, MA, May 1980. Boston, U.S. National Park Service, 207 pp.

Halavik, Thomas. 2004. Personal Communication. U.S. Fish and Wildlife Service Southern New England - New York Bight Coastal Ecosystems Program. Charlestown, RI.

Hapke, C.J., O. Brenner, Rachel Hehre, and B.J. Reynolds. 2013. Coastal Change from Hurricane Sandy and the 2012-2013 Winter Storm Season: Fire Island, New York. U.S. Department of the Interior, U.S. Geological Survey. Open-File Report 2013-1231.

Heck, Jr., K.L., K.W. Able, M.P. Fahay, and C.T. Roman. 1989. Fishes and Decapod Crustaceans of Cape Cod Eelgrass Meadows: Species Composition, Seasonal Abundance Patterns and Comparison with Unvegetated Substrates. Estuaries 12:59-65.

Hinga, K.R. September 2005. Water Quality and Ecology of Great South Bay (Fire Island National Seashore Science Synthesis Paper). Technical Report NPS/NER/NRTR-2005/019. National Park Service. Boston, MA.

Hobbs, III, C.H., R.J. Byrne, W.R. Kerns, N.J. Barber. 1981. Shoreline Erosion: A Problem in Environmental Management. Coastal Zone Management Journal 9: 89-105.

Hurme, A.K., and E.J. Pullen. 1988. Biological Effects of Marine Sand Mining and Fill Placement for Beach Replenishment. Marine Mining (7): 123-136.

Jones, C.R., and J.R. Schubel. 1980. Distributions of Surficial Sediment and Eelgrass in Great South Bay, New York. Marine Sciences Research Center State University of New York, Stony Brook, NY. Special Report 39, reference 80-6.

Kana, T.W., and R. Krishnamohan. 1994. Assessment of the Vulnerability of the Great South Bay Shoreline to Tidal Flooding. Unpublished Report prepared by Coastal Science and Engineering, Inc., Columbia, SC, for New York Coastal Partnership, Babylon, NY. 127 pp.

Kiernan, S. 2000. Town of Southampton. Personal communication.

Kluft, J.M., and H.S. Ginsberg. 2009. The Effect of Off-road Vehicles on Barrier Beach Invertebrates at Cape Cod and Fire Island National Seashores. National Park Service, Technical Report NPS/NER/NRTR—2009/138, Boston, MA. Available at: <http://www.nps.gov/nero/science/FINAL/CACO-FIIS_vehicles/NRTR-2009-138 percent20CACO percent20FIIS.pdf>.

Land Use Ecological Services, Inc. 2005. Western Fire Island and Fire Island Pines Beach Nourishment Report – 2005 Environmental Monitoring Report. 14 pp., plus Appendices.

Leatherman, S.P. 1982. Non-structural Approach to Coastal Problems. in Mayo, B., and L. Smith, eds. Proceedings of Barrier Island Forum and Workshop, Provincetown, MA, May 1980. National Park Service, Boston, MA. 207 pp.

Leatherman, S.P. 1985. Stratigraphic Correlations. *In* Leatherman, S.P. and J.R. Allen, *eds*. Geomorphologic Analysis of South Shore of Long Island Barriers, New York. National Park Service, Boston, MA.

Leatherman, S.P. 1988. Barrier Island Handbook. Coastal Publications Series Laboratory for Coastal Research University of Maryland.

Leatherman, S.P., C.E. Johnson, and D.C. Joneja. 1985. Morphological analysis. *In* Leatherman, S.P. and J.R. Allen, *eds*. Geomorphologic Analysis of South Shore of Long Island Barriers, New York. National Park Service, Boston, MA.

Leatherman, S.P., and J.R. Allen. 1985a. Discussion and Synthesis. *In* Leatherman, S.P. and J.R. Allen, *eds*. Geomorphologic Analysis of South Shore of Long Island Barriers, New York. National Park Service, Boston, MA.

Leatherman, S.P., and J.R. Allen, *eds*. 1985b. Geomorphologic Analysis of South Shore of Long Island Barriers, New York. National Park Service, Boston, MA.

Lindquist, N., and L. Manning. 2001. Impacts of Beach Nourishment and Beach Scraping on Critical Habitat and Productivity of Surf Fishes. Final Report to the North Carolina Fisheries Resource Grant Program. 41 pp. plus Appendices.

Lynch, A.E. 1994. Macroinfaunal Re-colonization of Folly Beach, South Carolina, after Beach Nourishment. Masters Thesis. University of Charleston, Charleston, SC. 45 pp.

Malouf, R.E. 1991. The Hard Clam: Its Biology and the Natural Processes that Affect its Success. *In* Schubel, J.R., T.M. Bell, and H.H. Carter, *eds*. The Great South Bay. State University of New York Press, Albany, NY. 107 pp.

Manning, L.M., C.H. Peterson, and M.J. Bishop. 2014. Dominant Macrobenthic Populations Experience Sustained Impacts from Annual Disposal of Fine Sediments on Sandy Beaches. Marine Ecology Progress Series 508:1-15.

Maslo, B., J. Burger, S. Handel. 2011. Modeling Foraging Behavior of Piping Plovers to Evaluate Habitat Restoration Success. Journal of Wildlife Mangement 9999:1-8;2011; DOI:10.1002/jwmg.210.

McCormick & Associates. 1975. Environmental Inventory of the Fire Island National Seashore and the William Floyd Estate. Contract No. 2000-4-0010. Submitted to National Park Service, Denver, CO.

Melvin, S.M., C.R. Griffin, and L.H. MacIvor. 1991. Recovery Strategies for Piping Plovers in Managed Coastal Landscapes. Coastal Management 19:21-34.

Minerals Management Service. 2000. Final Report. Environmental Survey of Potential Sand Resource Sites Offshore Delaware and Maryland. OCS Study 2000-055. International Activities and Marine Minerals Division. Contract 1435-01-97-CT-30853.

Minerals Management Service. 2001. Final Report Development and Design of Biological and Physical Monitoring Protocols to Evaluate the Long-Term Impacts of Offshore Dredging Operations on the Marine Environment. Prepared for the U.S. Department of the Interior, Minerals Management Service, International Activities and Marine Minerals Division Under Contract No. 14-35-0001-31051. 166 pp. plus Appendix.

Naqvi, S.M., and E.J. Pullen. 1982. Effect of Beach Nourishment and Borrowing on Marine Organisms. Miscellaneous Report No. 82-14. U.S. Army Corps of Engineers Coastal Engineering Research Center. 43 pp.

National Park Service. 1995. Fire Island Official Map and Guide. Government Printing Office: 387-038/00166 Reprint. Multi-fold pamphlet.

National Park Service. 2008. Draft Environmental Assessment for Fire Island Short-term Protection Projects, Fire Island, Suffolk County, NY. Fire Island National Seashore, Patchogue, NY. 213 pp.

National Park Service. 2009. Assessment of Natural Resource Conditions. Fire Island National Seashore. Natural Resource Report NPS/NRPC/NRR-2009/139

National Park Service. 2015. Wilderness Breach Management Plan/Environmental Impact Statement Scoping Newsletter #1. Fire Island National Seashore, New York.

New Jersey Department of Environmental Protection. 2007. Status of Red Knot (*Calidris canutus rufa*) in the Western Hemisphere. Division of Fish and Wildlife, Endangered and Nongame Species Program, Trenton, NJ. 235 pp plus figures.

New York Natural Heritage Program. 2002. Ecological Communities of New York State - Second Edition. New York State Department of Environmental Conservation, Albany, NY.

New York Sea Grant Institute. 1993. Estuarine Resources of the Fire Island National Seashore and Vicinity. Report No. NYSGI-T-93-001. New York Sea Grant. Stony Brook, NY.

New York Seagrant Extension Program. 2001. Impacts of Barrier Island Breaches on Selected Biological Resources of Great South Bay, New York. Final Report. State University of New York, Stony Brook, NY. 103 pp.

New York State Department of Environmental Conservation. 2002. 2000 Long Island Colonial Waterbird Survey Data. Stony Brook, NY.

New York State Department of Environmental Conservation. 2006. Construction of Artificial Reefs in the Marine Waters of New York and in the Nearby Atlantic Ocean. NYSDEC Artificial Reef Program, Reef Construction Summary Report, Appendices 1-12.

New York State Department of Environmental Conservation. 2013. 2012 Atlantic Ocean Surfclam Population Assessment. Division of Fish, Wildlife and Marine Resources Bureau of Marine Resources, East Setauket, NY.

New York State Department of Environmental Conservation. 2015a. 6 NYCRR Part 490, Projected Sea-level Rise Rulemaking - http://www.dec.ny.gov/energy/45202.html. December, 2015.

New York State Department of Environmental Conservation. 2015b. Colonial Waterbird and Piping Plover Survey Data. Stony Brook, NY

Nordstrom, K.F., and N.L. Jackson. 2005. Bay Shoreline Physical Processes (Fire Island National Seashore Science Synthesis Paper). Technical Report NPS/NER/NRTR-2005/020. National Park Service. Boston, MA.

Nordstrom, K.F., N.L. Jackson, A.L. Freestone, K.H. Korotky, and J.A. Puleo. 2012. Effects of Beach Raking and Sand Fences on Dune Dimensions and Morphology. Geomorphology: 179:106-115.

O'Connor, J.S. 1972. The Benthic Macrofauna of Moriches Bay, NY. Biological Bulletin 142:84-102.

O'Connor, J.M., D.A. Neumann, and J.A. Sherk, Jr. 1976. Lethal Effects of Suspended Sediments on Estuarine Fish. TP 76-20, U.S. Army Corps of Engineers, Coastal Engineering Research Center, Fort Belvoir, VA.

Odum, E.P. 1961. The Role of Tidal Marshes in Estuarine Production. Contribution No. 29 from the University of Georgia Marine Institute. Information leaflet. New York State Conservation Department. 4 pp.

Odum, W.E. 1970. Insidious Alteration of the Estuarine Environment. Transactions of the American Fisheries Society 90: 836-847.

Orth, R.J., K.L. Heck, Jr., and J. van Montfrans. 1984. Faunal Communities in Seagrass Beds: A Review of the Influence of Plant Structure and Prey Characteristics on Predator-Prey Relationships. Estuaries 7:339-350.

Panageotou, W., S.P Leatherman, and C. Dill. 1985. Geophysical Interpretation. *In* Leatherman, S.P. and J.R. Allen, *eds*. Geomorphologic Analysis of South Shore of Long Island Barriers, New York. National Park Service, Boston, MA.

Parr, T., E. Diener, and S. Lacy. 1978. Effects of Beach Replenishment on Nearshore Sand Fauna at Imperial Beach, California. Fort Belvior: U.S. Army Corps of Engineers, Coastal Engineering Research Center. MR-74.

Patterson, M.E. 1988. Piping Plover Breeding Biology and Reproductive Success in Assateague Island. M.S. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, VA. 131 pp.

Pendleton, E.A., S.J. Williams, and E.R. Thieler. 2004. Coastal Vulnerability and Assessment of Fire Island National Seashore to Sea-Level Rise, U.S. Geological Survey Open-File Report 03-439 http://pubs.usgs.gov/of/2003/of03-439

Peters, K.A., and D.L. Otis. 2007. Shorebird Roost-site Selection at Two Temporal Scales: Is Human Disturbance a Factor? Journal of Applied Ecology 44:196-209.

Peterson, Bradley. 2014. Personal Communication. Stony Brook University School of Marine and Atmospheric Sciences.

Peterson, C.H., M.J. Bishop, L.M. D'Anna, and G.A. Johnson. 2014. Multi-year Persistence of Beach Habitat Degradation from Nourishment Using Coarse Shelly Sediments. Science of the Total Environment 487:481-492.

Peterson, C.H, D.H.M. Hickerson, and G.G. Johnson. 2000. Short-term Consequences of Nourishment and Bulldozing on the Dominant Large Invertebrates of a Sandy Beach. Journal of Coastal Research Vol. 16(2): 368-378.

Peterson, C.H., M.J. Bishop, G.A. Johnson, L.M. D'Anna, and L.M. Manning. 2006. Exploiting beach filling as an unaffordable experiment: Benthic intertidal impacts propagating upwards to shorebirds. Journal of Experimental Marine Biology and Ecology 338:205-221.

Peterson, C.H. 1982. Clam predation by whelks (Busycon spp.): experimental tests of the importance of prey size, prey density, and seagrass cover. Marine Biology 66: 159-170.

Peterson, C.H., and L. Manning. 2001. How Beach Nourishment Affect the Habitat Value of Intertidal Beach Prey for Surf Fish and Shorebirds and Why Uncertainty Still Exists. Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium, August 20-22, 2001. 2 pp.

Pfister, C., B.A. Harrington, and M. Lavine. 1992. The Impact of Human Disturbance on Shorebirds at a Migration Staging Area. Biological Conservation (60): 115-126.

Profiles and Research Consulting Groups, Inc. 1980. Seasonal Restrictions on Dredging Projects by NMFS in the Northeast. Volume 1. Prepared for the National Marine Fisheries Service under Contract SB 1408(a) -79-C-169.

Psuty, N.P., M. Grace, and J.P. Pace. 2005. The Coastal Geomorphology of Fire Island: A Portrait of Continuity and Change (Fire Island National Seashore Science Synthesis Paper). Technical Report NPS/NER/NRTR-2005/021, National Park Service, Boston, MA.

Reilley, Jr., F.J., and V.J. Bellis. 1978. A Study of the Ecological Impact of Beach Nourishment with Dredged Materials on the Intertidal Zone. Institute for Coastal and Marine

Resources, East Carolina Univ. Tech Rpt. No. 4. East Carolina University, Greenville, NC.

Reilly, F.J. ,and V.J. Bellis. 1983. The Ecological Impact of Beach Nourishment with Dredged Materials on the Intertidal Zone at Bogue Banks, North Carolina. Miscellaneous Report 83-3. U.S. Army Engineer Coastal Engineering Research Center, Fort Belvoir, VA.

Rice, T.M. 2009. Best Management Practices for Shoreline Stabilization to Avoid and Minimize Adverse Environmental Impacts. Prepared for U.S. Fish and Wildlife Service, Panama City Ecological Services Field Office by Terwilliger Consulting, Inc., Locustville, VA. 21 pp.

Roman, C.T., J.W. King, D.R. Cahoon, J.C. Lynch, and P.G. Appleby. 2007. Evaluation of Marsh Development Processes at Fire Island National Seashore (New York): Recent and Historic Perspectives. Technical Report NPS/NER/NRTR-2007/089. National Park Service.

Ruhlen, T.D., S. Abbott, L.E. Stenzel, and G.W. Page. 2002. Evidence that Human Disturbance Reduces Snowy Plover Chick Survival. Journal of Field Ornithology 74(3): 300-304.

Safina, C. 1990a. Foraging Habitat Partitioning in Roseate and Common Terns. The Auk 107:351-358.

Safina, C. 1990b. Bluefish Mediation of Foraging Competition between Roseate and Common Terns. Ecology 71:1804-1809.

Safina, C. and J. Burger. 1983. Effects of Human Disturbance on Reproductive Success in the Black Skimmer. Condor 85:164-171.

Schlacher, T.A., and L.M.C. Thompson. 2008. Physical Impacts Caused by Off-road Vehicles (ORVs) to Sandy Beaches: Spatial Quantification of Car Tracks on an Australian Barrier Island. Journal of Coastal Research 24:234-242.

Schubel and Wang. 1973. The Effects of Suspended Sediment in Northern Chesapeake Bay. Powder Technology 6:9-16.

Schubel, J.R. 1991. Introduction. *In* Schubel, J.R., T.M. Bell, and H.H. Carter, *eds*. The Great South Bay. State University of New York Press, Albany, NY. 107 pp.

Sclafani, M., M.L. Brousseau, K. McKown, J. Maniscalco, and D.R. Smith. 2009. T-3-1 Study 5: Horseshoe Crab Spawning Activity Survey - Final Report. Cornell Cooperative Extension of Suffolk County.

Sclafani, M., M.L. Brousseau, K. McKown, C. Sukowski, M. Sautkulis, R. Sysak and C. Humphrey. 2014. Migratory Shorebird Foraging and Horseshoe Crab Spawning Surveys for the New York State Marine District: A look at Species Interactions. Cornell

Cooperative Extension of Suffolk County, Marine Program, New York State Department of Environmental Conservation.

Sherk, J.A., J.M. O'Connor, and D.A. Neumann. 1974. Effects of Suspended and Deposited Sediments on Estuarine Organisms, Phase II. Reference No. 74-02, National Research Institute, Solomons, MD.

Singleton, H. 2001. Ambient Water Quality Guidelines (Criteria) for Turbidity, Suspended and Benthic Sediments: Overview Report. Ministry of Water, Land, and Air Protection. British Columbia, Canada.

Sogard, S.M. 1992. Variability in Growth Rates of Juvenile Fishes in Different Estuarine Habitats. Marine Ecological Progress Series 85:35-53.

South Shore Estuary Reserve Council. 2001. Long Island South Shore Estuary Reserve Comprehensive Management Plan. Freeport, NY.

Speybroeck, J.; Bontje, D.; Courtens, W.; Gheskiere, T.; Grootaert, P.; Maelfait, J.P.; Mathys, M.; Provoost, S.; Sabbe, K.; Stienen, E.W.M.; Van Lancker, V.; Vincx, M.; Degraer, S. (2006). Beach Nourishment: An ecologically sound coastal defense alternative? A review. Aquatic Conservation: Marine and Freshwater Ecosystems 16:4119-435.

Stern, E.M., and W.B. Stickle. 1978. Effects of Turbidity and Suspended Material in Aquatic Environments. Vicksburg: U.S. Army Corps of Engineers, Waterways Experiment Station. Technical Report D-78-21.

Suffolk County Planning Department. 1985. Analysis of Dredging and Spoil Disposal Activity Conducted by Suffolk County, County of New York, Historical Perspective and a Look to the Future. Hauppauge, NY.

Tanski, J. 2007. Long Island's Dynamic South Shore - A Primer on the Forces and Trends Shaping Our Coast. New York Sea Grant. 27 pages.

Taylor, M.H., L. Di Michele, and G.J. Leach. 1977. Egg stranding in the life cycle of the mummichog, Fundulus heteroclitus. Copeia 1977:397-399.

The Nature Conservancy. 2013. Restoring Hard Clams to Great South Bay. The Nature Conservancy on Long Island. Final Report, Authors C. LoBue and A. Starke.

Town of Easthampton. 2013. Management of the White-tailed Deer Population in East Hampton Town. East Hampton, NY

Town of Southampton. 2001. Marine Resources Protection and Management Plan. Board of Trustees of the Town of Southampton, Southampton, NY. 84 pp.

Tuberville, D.B. and G.A. Marsh. 1982. Benthic Fauna of an Offshore Borrow Area in Broward County, Florida. MR 82-1, U.S. Army Corps of Engineers, Coastal Engineering Research Center, Fort Belvior, VA. 26 pp.

Underwood, H.B. 2005. White-tailed Deer Ecology and Management on Fire Island National Seashore (Fire Island National Seashore Science Synthesis Paper). Technical Report NPS/NER/NRTR—2005/022. National Park Service. Boston, MA.

U.S. Army Corps of Engineers. . 1999. Fire Island Inlet to Montauk Point, Long Island, New York: Reach 2, West of Shinnecock Inlet Draft Decision Document, An Evaluation of an Interim Plan for Storm Damage Protection, Volume I - Main Report and Environmental Assessment. U.S. Army Corps of Engineers, New York District, North Atlantic Division. 98 pp. and 63 pp., respectively.

_____. 2001. The New York District's Biological Monitoring Program for the Atlantic Coast of New Jersey, Asbury Park to Manasquan Section Beach Erosion Control Project Final Report. Engineer Research and Development Center, Waterways Experiment Station, Vicksburg, MS.

_____. 2002. Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York Storm Damage Reduction Reformulation Study - Surf Clam Stock Assessment. URS/Moffat and Nichol Joint Venture.

_____. 2003. Reformulation of the Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York - Fire Island Inlet to Montauk Point, Final Avian Survey Summary Report May 2002-May 2003. Planning Division New York District. 49 pp. plus figures and tables.

_____. 2004a. Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York Reformulation Study - Benthic Invertebrate Survey: East of Shinnecock Inlet to East of Fire Island Inlet. New York District. 56 pp. plus appendices.

_____. 2004b. Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York Reformulation Study. Compilation and Comparative Analysis of Physical and Biological Characteristics of Available Sand Sources. New York District. 45 pp.

_____. 2004c. Reformulation of the Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York - Fire Island Inlet to Montauk Point, Final Small Mammal and Herpetile Survey Summary Report May - August 2002. Planning Division New York District. 38 pp. plus figures and tables.

_____. 2004d. Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York Reformulation Study. Submerged Aquatic Vegetation (SAV) Bed Characterization. New York District. 83 pp. plus appendices.

_____. 2005a. Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York Reformulation Study, Beach and Intertidal Invertebrate Survey. New York District. 40 pp. plus figures and tables.

_____. 2005b. Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York Reformulation Study, Intertidal Wetland and Estuarine Finfish Survey of the Backbays (Year 2). New York District. 114 pp.

_____. 2006a. Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York Reformulation Study, Work Order 38, Phase 3 Development of the Conceptual Ecosystem Model for the Fire Island Inlet to Montauk Point Study Area. Final Report.

_____. 2006b. Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York Storm Damage Reduction Project, Submergent Aquatic Vegetation Evaluation Report. New York District. 21 pp. plus figures.

_____. 2007. Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York Storm Damage Reformulation Study Work Order 28 Inlet Modifications. Draft Final Report, URS Consultants, Inc./Moffat and Nichols. 361 pp. plus figures.

_____. 2009a. Fire Island Inlet to Montauk Point New York Reformulation Study Draft Formulation Report. New York District.

_____. 2009b. Atlantic Coast of Long Island Fire Island Inlet to Montauk Point (FIMP), New York Storm Damage Reduction Project, Reformulation Study, Evaluation of Restoration Opportunities Using the Habitat Evaluation Procedures (HEP) Method. Final Phase II Report. New York District Planning Division, NY.

_____. 2014a. Fire Island Inlet to Moriches Inlet to Fire Island Stabilization Project Hurricane Sandy Limited Reevaluation Report Draft. Evaluation of a Stabilization Plan for Coastal Storm Risk Management In Response to Hurricane Sandy & Public Law 113-2. Main Report. NY District.

_____. 2014b. Fire Island Inlet to Moriches Inlet to Fire Island Stabilization Project Hurricane Sandy Limited Reevaluation Report Draft. Evaluation of a Stabilization Plan for Coastal Storm Risk Management In Response to Hurricane Sandy & Public Law 113-2. Draft Environmental Assessment. NY District.

_____. 2016a. Fire Island Inlet to Montauk Point Reformulation Study Draft Environmental Impact Statement. New York District.

_____. 2016b. Fire Island Inlet to Montauk Point Reformulation Study Draft General Re-evaluation Report. New York District.

U.S. Fish and Wildlife Service. 1981a. Environmental Inventory for the Fire Island Inlet to Montauk Point, New York, Beach Erosion Control and Hurricane Protection Project Reformulation Study. U.S. Fish and Wildlife Service, Cortland, New York. 64 pp. plus appendices.

_____. 1981b. U.S. Fish and Wildlife Service Mitigation Policy. Federal Register, Friday, January 23, 1981. 46:7644-7663.

_____. 1983. Fish and Wildlife Resource Studies for the Fire Island Inlet to Montauk Point, New York, Beach Erosion Control and Hurricane Protection Project Reformulation Study - Terrestrial Resource Component. Region 5, New York Field Office, Cortland, NY. 140 pp.

_____. 1995. Fish and Wildlife Coordination Act Report, Section 2(b): Atlantic Coast of Long Island, Jones Inlet to East Rockaway Inlet, Long Beach Island, New York. Storm Damage Reduction Project. Islip, NY. 31 pp.

_____. 1996 a. Recovery Plan for Seabeach Amaranth (*Amaranthus pumilus*) Rafineaque. Southeast Region, Atlanta, GA.

_____. 1996b. Significant Habitats and Habitat Complexes of the New York Bight Watershed. Southern New England - New York Bight Coastal Ecosystems Program. Charlestown, RI.

_____. 1998. Fire Island Inlet to Montauk Point Beach Erosion Control and Hurricane Protection Project Reach I Fire Island Inlet to Moriches Inlet Interim Storm Damage Protection Plan Draft Fish and Wildlife Coordination Act Section 2(b) Report. U.S. Fish and Wildlife Service, Long Island Field Office, Islip, NY. 59 pp.

_____. 2002. Biological Opinion on the Effects of Beach Nourishment and Restoration Activities, Townsend Inlet to Hereford Inlet, Cape May County, New Jersey on the Piping Plover (Charadrius melodus) and Seabeach Amaranth (*Amaranthus pumilus*). Prepared for the U.S. Army Corps of Engineers' Philadelphia District. 106 pp.

_____. 2005. Identification of Restoration Opportunities within the Fire Island to Montauk Point Reformulation Study Area. Region 5, Long Island Field Office, Islip, NY. 31 pp. plus figures.

_____. 2014. Fire Island Inlet to Moriches Inlet to Fire Island Stabilization Project Fish and Wildlife Coordination Act 2 (b) Report. Department of the Interior, Long Island Field Office.

Walters D.C., and M.L. Kirwan. 2016. Optimal Hurricane Overwash Thickness for Maximizing Marsh Resilience to Sea Level Rise. Ecology and Evolution 2016; 6(9):2948-2956.

WAPORA, Inc. 1982. Impact Assessment on Shellfish Resources of Great South Bay, South Oyster Bay, and Hempstead Bay, NY. Draft Report submitted to U.S. Environmental Protection Agency, Region II, New York, NY, by WAPORA, Inc. 115 pp.

Watts, B., and B.R. Truitt. 2015. Spring Migration of Red Knots along the Virginia Barrier Islands. Journal of Wildlife Management. 79 (2):288-295;2015;DOI:10.1002/jwmg.828.

Weakley, A.S., and M. Bucher. 1992. Status Survey of Seabeach Amaranth (Amaranthus pumilus Rafinesque) in North and South Carolina, Second Edition (After Hurricane Hugo). Report to North Carolina Plant Conservation Program, North Carolina Department of Agriculture, Raleigh, NC, and Endangered Species Field Office, U.S. Fish and Wildlife Service, Asheville, NC. 178 pp.

Wilber, D.H., D.G. Clarke, G.L. Ray, and M. Burlas. 2003. Response of Surf Zone Fish to Beach Nourishment Operations on the Northern Coast of New Jersey, USA. Marine Ecology Progress Series 250:231-246.

Woodhead, P.M.J. 1992. Assessments of the Fish Community and Fishery Resources of the Lower New York Bay Area in relation to a Program of Sand Mining Proposed by New York State. Stony Brook: Marine Sciences Research Center, SUNY at Stony Brook.

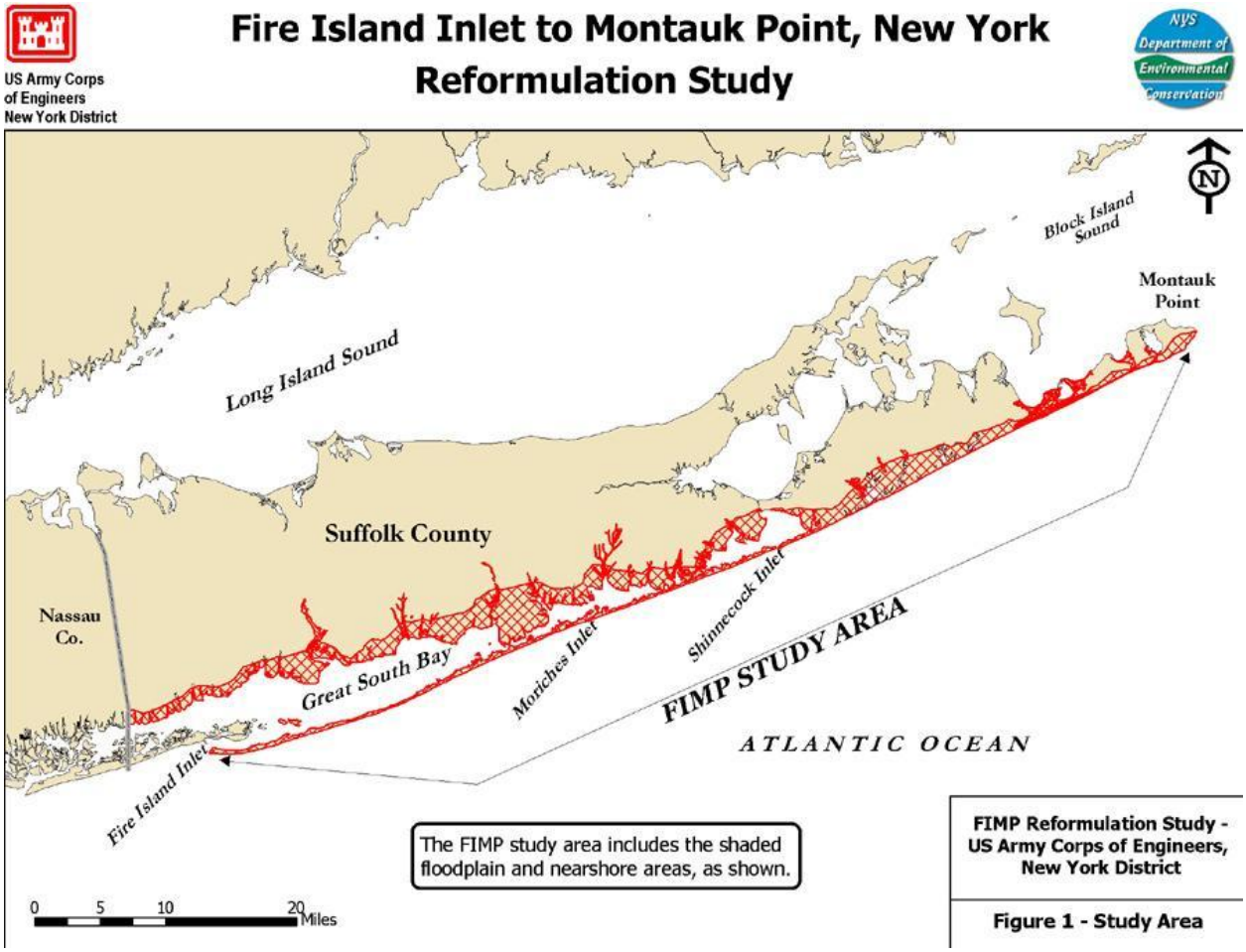
Woodhead, P.M.J. and S.S. McCafferty. 1986. Report of the Fish Community of Lower New York Harbor in Relation to Borrow Pit Sites. In "Draft Supplemental Environmental Impact Statement: Use of Subaqueous Borrow Pits in the Disposal of Dredged Material from the Port of New York – New Jersey," 1988, by U.S. Army Corps of Engineers, New York District, New York, NY. 1988.

Woodward-Clyde Consultants. 1975. Rockaway Beach Erosion Control Project Dredge Material Research Program Offshore Borrow Area. San Francisco: Woodward-Clyde Consulting Engineers, Geologists, and Environmental Scientists.

Woolridge, T., H.J. Henter, and J.R. Kohn. 2016. Effects of Beach Replenishment on Intertidal Invertebrates: A 15 Month, Eight Beach Study. Estuarine, Coastal and Shelf Science. doi:10.1016/j.ecss.2016.03.018

FIGURE 1

FIMP STUDY AREA



From U.S. Army Corps of Engineers' Website:
http://www.nan.usace.army.mil/Missions/CivilWorks/ProjectsinNewYork/FireIslandtoMontaukPointReformulationStudy/FIMPStudyArea.aspx

FIGURE 2

FIMI Study Area

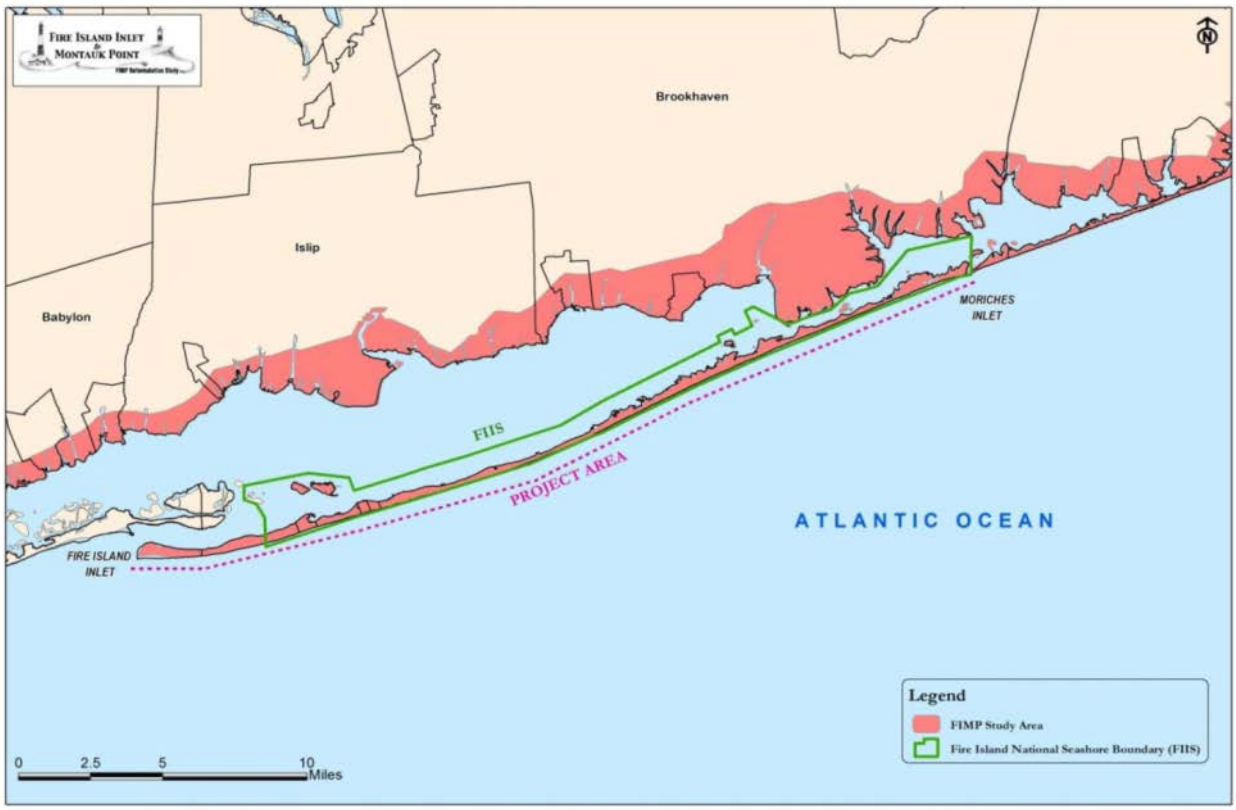


Figure 2. Map of FIMI Project Area. From U.S. Army Corps of Engineers (2014b).

FIGURE 3

Idealized Transect of Barrier Island Ecosytems

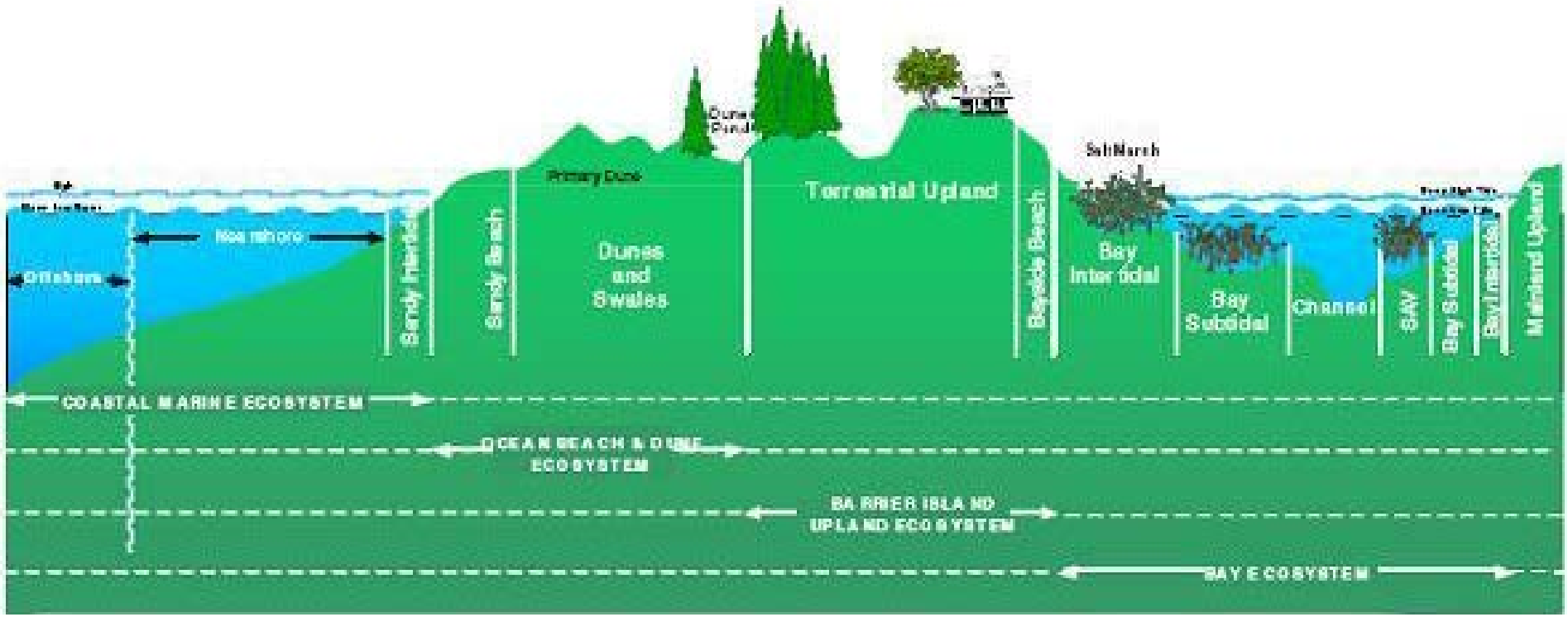


Figure 3. - Idealized Transect of Barrier Island Ecosystems.

(Illustration from: U.S. Army Corps of Engineers. Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York Reformulation Study, Work Order 38, Phase 3 Development of the Conceptual Ecosystem Model for the Fire Island Inlet to Montauk Point Study Area. Final Report.)

APPENDIX A

Fire Island to Montauk Point Service Back-Bay Island Investigations

Island	History of Dredge Placement	Cover-type	Location	Wildlife Use	Ownership	Prior Designations	Notes	Restoration Potential
Sexton Isl.	No	Spartina marsh	Great South Bay	2003* - COTE, ROTE	NPS		Site visited 7/14/03	None
Islip Spoil Isl.	Yes	Scrub shrub & grassland	Great South Bay	2003* - GREG, SNEG, TRHE, GLIB, BLHE	Town of Islip		Heron Rookery; visited on 7/14/03	Minimal
John Boyle Isl.	Yes	Phragmites/ beachgrass/ spartina	Bellport Bay	Historic – AMOY, BLSK, LETE	Town of Brookhaven	SSLIEI & NYSDOS	NPS jurisdiction, may need NEPA document prep.; visited on 9/01/04	In phragmites areas at southern portion
Hospital Isl.	No	Spartina marsh	Bellport Bay	No records of shorebird breeding	Town of Brookhaven		Visited on 10/07/03	None
Pelican Isl.	No	Spartina marsh	Bellport Bay	No records of shorebird breeding	Town of Brookhaven	Identified by SSLIEI	Visited on 10/7/03	None
Ridge Isl.	No	Spartina marsh	Bellport Bay	Historic - COTE	Town of Brookhaven	Identified by SSLIEI	Visited on 10/07/03	None
Goose Point Isl.	No	Spartina marsh	Bellport Bay	No records of shorebird breeding	Town of Brookhaven		Visited on 10/07/03	None
Pattersquash Isl.	No	Spartina marsh	Moriches Bay	2003 - COTE	Town of Brookhaven	Identified by SSLIEI	Visited on 9/01/04	None
Carter's Island	No	Spartina marsh	Moriches Bay	2003 – COTE; Historic – LETE, BLSK	Town of Brookhaven		Visited on 2/26/02	None
New Made Isl.	Yes	Phragmites	Moriches Bay	Historic – COTE, BLSK	Town of Brookhaven		Within NPS jurisdiction; visited on 9/1/04	High
West Inlet Isl.	Yes	Phragmites, beachgrass, spartina marsh	Moriches Bay	2003 - COTE and AMOY; Historic - BLSK, GLIB, SNEG, GREG	Town of Brookhaven	Identified by SSLIEI	Phragmites only along shoreline; visited on 9/01/04	Limited
East Inlet Isl.	Yes	Open sand, beachgrass, spartina marsh	Moriches Inlet	Historic - ROTE, COTE, BLSK	Town of Brookhaven	Identified by SSLIEI	Beneficial use of dredge material project completed in 2004; visited on 9/1/04	Moderate
		Spartina marsh	Moriches	2003 – COTE, AMOY	Town of		Visited on 9/1/04	

Swan Isl.	No		Bay		Brookhaven			None
Sedge Spoil Isl.	Yes	Spartina marsh	Shinnecock Bay	Information not available	Town of Southampton		Visited on 3/12/03	Limited
Sedge Isl.	No	Spartina marsh	Shinnecock Bay	2003 - COTE	Town of Southampton		Visited on 3/12/03	None
Tiana Marsh	No	Spartina marsh	Shinnecock Bay	Information not available	Town of Southampton		Visited on 3/12/03	None
Lesser Greenbacks Isl.	No	Spartina marsh	Shinnecock Bay	Historic – COTE, AMOY	Town of Southampton		Visited on 3/12/03	None
Lanes Isl.	No	Spartina marsh	Shinnecock Bay	2003 - COTE, FOTE, ROTE, BLSK, AMOY	Town of Southampton		Visited on 3/12/03	None
Ponquogue Spoil Isl.	Yes	Shrubs, beachgrass, phragmites	Shinnecock Bay	Historic - AMOY, GLIB, LIHE, RHE, BLHE, SNEG, GREG	Town of Southampton		Visited on 3/12/03	Limited, existing heron rookery

2003* – Observed by the Service during the 2003 breeding season.
2003 – NYSDEC/Long Island Colonial Waterbird and Piping Plover (LICWPPS) data for the 2003 season.

Historic – NYSDEC/LICWPPS data, 1994-2002 breeding seasons.

Shorebird Abbreviations:

COTE–Common tern (*Sterna hirundo*)
LETE–Least tern (*Sterna antillarum*)
BLHE–Black-crowned night-heron (*Nycticorax nycticorax*)
GRHE–Green heron (*Butorides striatus*)
GREG–Great egret (*Casmerodius albus*)
AMOY–American oystercatcher (*Haematopus palliates*)
ROTE–Roseate tern (*Sterns dougallii*)
GLIB–Glossy ibis (*Plegadis falcinellus*)
LIHE–Little blue heron (*Florida caerulea*)
TRHE–Tri-colored heron (*Hydranassa tricolor*)
SNEG–Snowy egret (*Egretta thula*)
BLSK–Black skimmer (*Rynchops niger*)

Other Abbreviations:

Isl. – Island
NYSDOS - New York State Department of State
SSLIEI - South Shore Long Island Embayments Initiative.

APPENDIX N

CLEAN AIR ACT COMPLIANCE DOCUMENTS

United States Army Corps of Engineers, New York District
DRAFT General Conformity Determination Notice

On October 30, 2012, New York State (DR-4085) and New Jersey State (DR-4086) declared Super Storm Sandy a Major Disaster. In response to the unprecedented breadth and scope of the damages sustained along the New York and New Jersey coastlines, the U.S. Congress passed Public Law (PL) 113-2 "Disaster Relief Appropriations Act 2013", also known as House Resolution (H.R.) 152-2 Title II which was signed into law on January 29, 2013. PL 113-2, which states "That the amounts... are designated by the Congress as being for an emergency requirement pursuant to section 251(b)(2)(A)(i) of the Balanced Budget and Emergency Deficit Control Act of 1985", provides funding for numerous projects to repair, restore and fortify the coastline in both states as a result of the continuing emergency as people and property along the coast remain in a vulnerable condition until the coastline is restored and fortified. To protect the investments by the Federal, State, local governments and individuals to rebuild damaged sites, it is imperative that these emergency disaster relief projects proceed as expeditiously as possible.

There are two coastal projects that are concurrently going through the Reformulation Study process at the New York District. The Fire Island Inlet to Montauk Point, New York Combined Beach Erosion Control and Hurricane Protection Project (FIMP) 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 (CEQ) in response to a 1978 Environmental Impact Statement (EIS) that was prepared for the project subsequent to passage of NEPA in 1969. FIMP-related activities are located in Suffolk County, New York and was originally authorized under 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.

FIMP is a Reformulation Study project that is anticipated to start construction during or after October 2018 and this document represents the General Conformity Determination required under 40CFR§93.154 by the United States Army Corps of Engineers (USACE). USACE is the lead Federal agency that will contract, oversee, approve, and fund the project's work, and thus is responsible for making the General Conformity determination for this project.

USACE has coordinated this determination with the New York State Department of Environmental Conservation (NYSDEC) and United States Environmental Protection Agency (EPA) Region 2. Based on the National Ambient Air Quality Standards (NAAQS), Suffolk County

is currently classified as 'marginal' 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 $PM_{2.5}$.

The equipment associated with this project that is evaluated under General Conformity (40CFR§93.153) includes direct and indirect nonroad diesel sources, such as dredging equipment and land based earth-moving equipment. The primary pollutant of concern with this type of equipment is NO_x, as VOCs, $PM_{2.5}$, and SO_2 are generated at significantly lower rates. The NO_x emissions associated with the project are estimated to range from nearly 15 to 242 tons per calendar year for 2018 through 2025, (see emissions estimates provided as Attachment A). The project exceeds the NO_x trigger level of 100 tons in any calendar year and as a result, the USACE is required to fully offset the NO_x emissions of this project. The project does not exceed the ozone related VOC trigger level of 50 tons (for areas in an ozone transport region) in any calendar year, nor the $PM_{2.5}$ and SO_2 maintenance areas' related triggers level of 100 tons in any calendar year, per pollutant.

The USACE is committed to fully offsetting the emissions generated as a result of the disaster relief and coastal protection work associated with this project. USACE recognizes that the feasibility and cost-effectiveness of each offset option is influenced by whether the emission reductions can be achieved without introducing delay to the construction schedule that would prevent timely implementation of the project to protect the coastline from future storm events.

USACE will demonstrate conformity with the New York State Implementation Plan by utilizing the emission offset options listed below. The demonstration can consist of any combination of options, and is not required to include all or any single options to meet conformity. The options for meeting general conformity requirements include the following:

a. Emission reductions from project and/or non-project related sources in an appropriately close vicinity to the project location. In assessing the potential impact of this offset option on the construction schedule, USACE recognizes the possibility of lengthening the time period in which offsets can be generated as appropriate and allowable under the general conformity rule (40CFR§93.163 and §93.165).
b. Use of Surplus NOx Emission Offsets (SNEOs) generated under the Harbor Deepening Project (HDP). As part of the mitigation of the HDP, USACE and the Port Authority of New York & New Jersey developed emission reduction programs coordinated through the Regional Air Team (RAT). The RAT is comprised of the USACE, New York State Department of Environmental Conservation, NJDEP, United States Environmental Protection Agency (EPA), and other stakeholders. SNEOs will be applied in concurrence with the agreed upon SNEO Protocols to ensure the offsets are real, surplus, and not double counted.
c. Use of Cross-State Air Pollution Rule (CSAPR) ozone season NO_x Allowances with a distance ratio applied to allowances, similar to the one used by stationary sources.

Due to unpredictable nature of dredge-related construction and the preliminary estimates of sand required to restore the integrity of the coastlines, the project emissions will be monitored as

appropriate and regularly reported to the RAT to assist the USACE in ensuring that the project is fully offset.

In summary, USACE will achieve conformity for NO_x using the options outlined above, as coordinated with the NYSDEC and coordinated through the RAT.

Attachment A

Bob Martin, Commissioner, NJDEP Letter to Colonel Paul E. Owen, P.E., Commander New York District, USACE and Lieutenant Colonel John C. Becking, PE., Commander Philadelphia District, USACE

November 4, 2013

Attachment B

General Conformity Related Emission Estimates

DRAFT

MARINE VESSEL ENGINE REPLACEMENT PLAN

July 2016

NEW YORK DISTRICT
UNITED STATES ARMY CORPS OF ENGINEERS

Table of Contents

Section 1 – Introduction 1
1.2 – Background 2
1.3 – General Conformity 2
1.4 – Regional Air Team 3
Section 2 – MVERP Methods and Protocols 5
2.1 – Evaluation of MVERP as a Viable Mitigation Strategy 5
2.1.1 – Survey of Interest 6
2.2 – Elements of MVERP Implementation Process 10
2.2.1 – Methodology for Quantifying Emissions Offsets 10
2.2.2 – Agreement and Contracting Elements 11
2.2.2.1 – USACE and Non-Federal Sponsor 11
2.2.2.2 –Implementing Agency & Vessel Owner 11
2.2.2.3 –Project Bid Package Elements 12
2.2.2.4 –Project Contracting Elements 12
2.2.3 – MVERP Implementation 13
2.2.3.1 – Terms and Conditions 13
2.2.3.2 – Request for Proposals and Evaluation 16
2.2.3.3 – Selecting and Awarding 18
2.2.3.4 – Contracting 19
2.2.3.5 – Engine Ordering 19
2.2.3.6 – Engine Delivery 20
2.2.3.7 – Dry dock 20
2.2.3.8 – Verification of Destruction of Existing Engine 20
2.2.3.9 – Recordkeeping and Reporting 20
2.2.3.10 – Coordination with NAN and RAT 21
2.2.3.11 – Vessels that are Repositioned 21
2.2.4 – SNEO Integration 21
Section 3 – Costing 24
3.1 – Administrative Costs 24
3.2 – Reimbursement for Capital Purchases 25
3.3 – Planning Cost Estimate 25
Section 4 – MVERP Timeline 26

Attachment 1 – SNEO Protocol
Attachment 2 – MVERP Survey of Interest Fact Sheet
Attachment 3 – Survey of Interest Data Template
Attachment 4 – Sample PANYNJ MVERP Contract with Vessel Owner
Attachment 5 – Bid Package & Contract Language Examples

Section 1 – Introduction

The Marine Vessel Emissions Reduction Plan (MVERP) was one of the primary emission reduction strategies implemented by the United States Army Corps of Engineers (USACE) New York District (NAN) and the Port Authority of New York & New Jersey (PANYNJ) as part of the Harbor Deepening Project[1] (HDP) in order to meet the requirements of General Conformity.[2] The HDP MVERP was led by the non-federal sponsor, PANYNJ, and paid for engine replacements for domestic commercial vessels operating in the New York-Northern New Jersey-Long Island-Connecticut ozone nonattainment area (NYNJLICTNA). The MVERPs undertaken for the HDP were conducted under the larger Harbor Air Management Plan (HAMP) and coordinated with the Regional Air Team (RAT).

The basic concept of the strategy is to replace older, "dirtier" engines with newer, "cleaner" engines meeting higher regulatory standards established by the U.S. Environmental Protection Agency (EPA). The PANYNJ developed, awarded, and managed the MVERPs for the HDP. The evaluation and award of the vessels to be repowered was conducted through a request for proposal (RFP) process and utilized the same basic methods used by the California Air Resources Board (CARB) Carl Moyer Program[3]. The difference between the MVERP and Carl Moyer Program is the funding levels, as the Carl Moyer Program provides financial assistance while MVERP is specifically designed to undertake action to generate emissions offsets by funding 100% of the new engine costs, with the vessel owner typically paying for the destruction of the existing engine, dry dock costs (both removal and installation), and any gearing or equipment changes needed with the new engines. In return the vessel owner provides operational data and confirmation that the vessel has remained in operation in the applicable or adjacent nonattainment area on a quarter-annual basis. MVERP has been demonstrated to be one of the most cost effective strategies to reduce emissions and generate long-term emissions offsets.

The purpose of this document is to move beyond the HDP and provide the approach for evaluating the feasibility of integrating similar mitigation requirements to reduce NOx for NAN projects that trigger General Conformity, and for implementing, tracking, and coordinating with the RAT to ensure that the mitigation requirements are met for the specific project. Specifically, this report has been prepared for the Fire Island to Montauk Point (FIMP) project, which is currently conducting analyses within the General Re-evaluation Report (GRR) authorized study process.

This section provides background on the project and overviews relating to General Conformity and the Regional Air Team.

[1] See: *www.nan.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/11241/Article/487407/fact-sheet-new-york-new-jersey-harbor-50-ft-deepening.aspx*
[2] 40 CFR §93 Subpart B
[3] See: *www.arb.ca.gov/msprog/moyer/source_categories/moyer_sc_marine.htm*

1.2 – Background

This section needs to recount how we got here: the NAN-EPA agreement that permitted SANDY projects to proceed to construction using reallocation of HDP offsets, with the commitment by USACE to seek authorization for two new MVERPs, etc.

1.3 – General Conformity

The General Conformity rule of the CAA applies to Federal actions, such as beach-related construction projects that occur within an EPA designated nonattainment area. A nonattainment area is a region that fails to meet one or more national standards for designated air pollutants. A State Implementation Plan (SIP) is a state-prepared, EPA-approved plan whereby the state (in this case, New York) presents their specific plans and schedules for bringing the nonattainment area into compliance with the national standards. The General Conformity rule requires that a Federal action not interfere with or hinder progress of a SIP in reaching attainment with the national standards. This is ensured by requiring mitigation of the Federal action's emissions if the action's emissions are anticipated to exceed General Conformity trigger levels,[4] unless at least one of the following conditions is met:

- The action is exempt (meets an exemption listed in 40 CFR §93.153(c)),
- The action is incorporated as a "line item" in the applicable SIP,
- The emissions from the action can be accommodated in the applicable SIP without jeopardizing the attainment of the standard.

The mitigation requirements are to fully and contemporaneously reduce emissions from the project or to offset the emissions using other strategies, such that there will be no net increase in emissions on a calendar year basis. General Conformity provides provisions for reductions in calendar years other than the year of the action provided appropriate ratios are used based on the nonattainment area's severity level and approval by the applicable State.[5]

The FIMP project, which is in the GRR study phase, will be undertaken in the NYNJLICTNA. The NYNJLICTNA is adjacent to the Philadelphia-Wilmington-Atlantic City ozone nonattainment area (PANJMDDENA). Due to the potential scale of the project, NAN anticipates that the project will trigger General Conformity requirements and that the applicable project emissions are not included in, nor can be accommodated by, the applicable SIP, and the project is not otherwise exempt. Therefore, the project's applicable emissions will need to be fully offset. During the implementation of the HDP, the RAT developed a number of applicable and precedent-setting policies and protocols that have been successfully utilized to ensure that a Federal action's emissions are fully offset, which is further discussed in Section 1.4. FIMP will utilize these policies and protocols to ensure compliance with General Conformity.

[4] 40 CFR §93.153(b)
[5] 40 CFR §93.163

1.4 – Regional Air Team

The RAT was formed in October 2001 to provide a forum for open communication and coordination between NAN, PANYNJ, and the resource agencies regarding air quality issues. Initially the RAT focused directly on General Conformity relating to the HDP, but the RAT has continued to meet regularly and has developed detailed policy protocols associated with emissions offsets and mitigation strategies. The members of the RAT include the following entities:

- EPA Region 2
- NAN (Chair)
- New Jersey Department of Environmental Protection (NJDEP), New Jersey Department Office of Marine Resources
- New York City Department of Transportation (NYCDOT)
- New York State Department of Environmental Conservation (NYSDEC)
- PANYNJ
- Philadelphia District Corps of Engineers (NAP)

The RAT is hosted and administered by NAN and other agencies, such as the New Jersey Department Office of Marine Resources, have joined and left the group as their projects have ended over time. The RAT has been the focal point for the development, review, and implementation of unique policy approaches related to General Conformity relating to the and beyond the HDP including: the Harbor Air Management Plan (HAMP), development, implementation, and reporting of various emissions reduction strategies, the development and implementation of the Surplus Nitrogen Oxides (NOx) Offset (SNEO) Protocol (see Attachment 1), and the quantification, tracking, and reporting of emissions and offsets for applicable projects in New York and New Jersey. RAT meetings are scheduled on an as-needed basis and historically occurred from monthly to quarterly. The RAT's primary responsibilities are:

- Provide technical and policy support to clarify and agree upon General Conformity requirements specific to projects by member agencies
- Provide review and comment on emission mitigation strategies and implementation
- Provide oversight to the SNEO Protocol
- Provide oversight and review to project emissions and offsets
- Support the development of implementable mitigation strategies to ensure each project meet General Conformity requirements
- Provide a forum for member agencies and other related agencies to discuss air quality issues, mitigation strategies, and related topics with the resource agencies

With the advent of the large Hurricane Sandy authorized but unconstructed (ABU) projects along the New Jersey and New York coasts, covering both NAN and NAP Districts, the sponsors of these projects jointly developed mitigation strategies and coordinated these strategies with the RAT. The projects are currently being implemented and mitigation is being reported and tracked through the RAT. One of the major policy efforts that the RAT produced was the Surplus NOx Emission Offsets (SNEO) Protocol, which was completed in May 2014 and which details a continuing emissions reduction offset program for activities that fall under General Conformity requirements and that are overseen/managed by the USACE, as allowed under 40 CFR §93.160-165. The offsets created under the SNEO protocols and their use will be coordinated through the RAT and be consistent with the applicable General Conformity requirements. The SNEO Protocol details the generation of NOx offsets, their use and limitations, their geographical extent, and the life of offset strategies.

The development and implementation of FIMP mitigation strategies will be coordinated with the RAT and be developed under the SNEO Protocol.

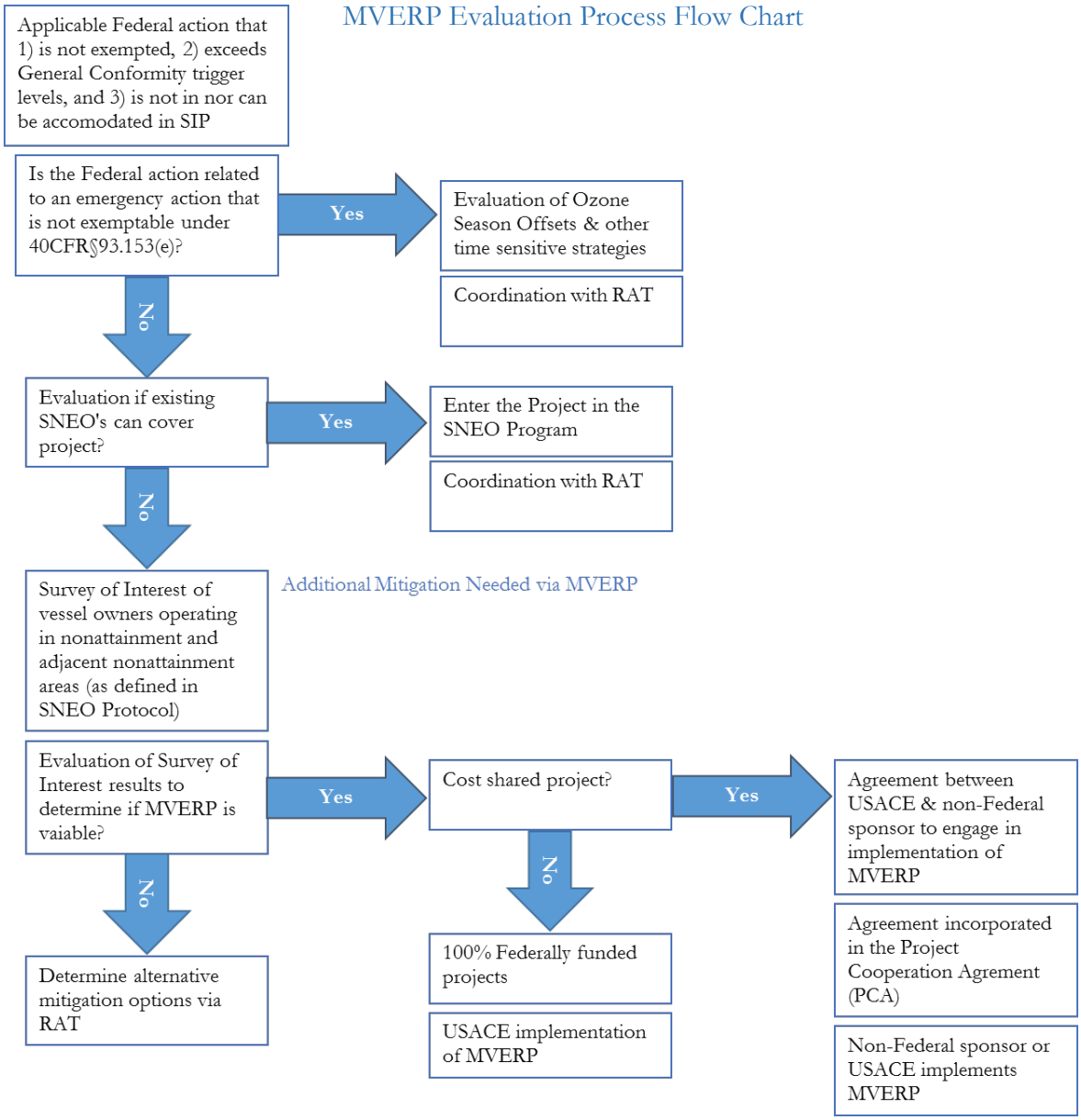
Section 2 – MVERP Methods and Protocols

This section provides an overview of the greater evaluation process to determine the viability of MVERP for a specific project, details the implementation process, identifies costing elements, and identifies overall timeline ranges for key elements.

2.1 – Evaluation of MVERP as a Viable Mitigation Strategy

The overall MVERP process builds on the experience, methods, protocols, and tools developed to track and report on the various projects that have been coordinated through the RAT. The first steps are to evaluate whether the project needs mitigation, evaluate the options, determine whether an MVERP is viable (in that a significant amount of offsets can be generated), and then implement the MVERP (Figure 1).

Figure 1 –
MVERP Evaluation Process Flow Chart



In general, applicable Federal actions[6] undertaken by the USACE that exceed the General Conformity trigger levels, and are not included in nor can be accommodated in the applicable SIP, will require mitigation. If the applicable Federal action is taken in response to a continuing emergency but does not meet the definition of "Emergency Action[7]," similar to the extended Hurricane Sandy ABUs, then the project's sponsors can evaluate the utilization of ozone season offsets and other time sensitive emissions offset strategies through coordination and agreement with the RAT. For non-emergency/longer term projects, the applicable Federal action is evaluated to determine what, if any, of its anticipated emissions can be covered under the SNEO Protocols or other emissions offset strategies. This determination would be coordinated with the RAT.

For any excess of applicable emissions beyond what can be covered by SNEOs, the USACE would need to first determine the feasibility of an MVERP by conducting a "Survey of Interest" of vessel owners in the applicable nonattainment area(s). The next step would be to evaluate the responses to determine the potential magnitude of offsets that could be generated. If the magnitude of potential offsets is significant, then an MVERP is viable. For projects that are cost shared, the USACE and the non-Federal sponsor would develop Terms and Conditions that would be entered into the Project Partnership Agreement (PPA) and either the non-Federal sponsor or USACE would implement the MVERP, as agreed in the PPA. For 100% Federally funded projects, the USACE would implement the MVERP. For projects for which an MVERP is not viable, other mitigation options would need to be discussed and evaluated through the RAT.

2.1.1 – Survey of Interest

The objective of a Survey of Interest is to determine whether an MVERP is a viable emission offset strategy for a specific project. Viable in this sense is that there are a sufficient number of applicable vessels and owners interested in repowering, such that implementing an MVERP would produce enough emission reductions to make sense as a mitigation strategy.

The steps in conducting the survey include:

1. Identify vessel owners in the applicable nonattainment area(s)
2. Develop a fact sheet outlining key points of the potential MVERP
3. Conduct the survey
4. Aggregate the responses and determine the potential number of applicable vessels

The primary data elements that need to be collected for the survey include:

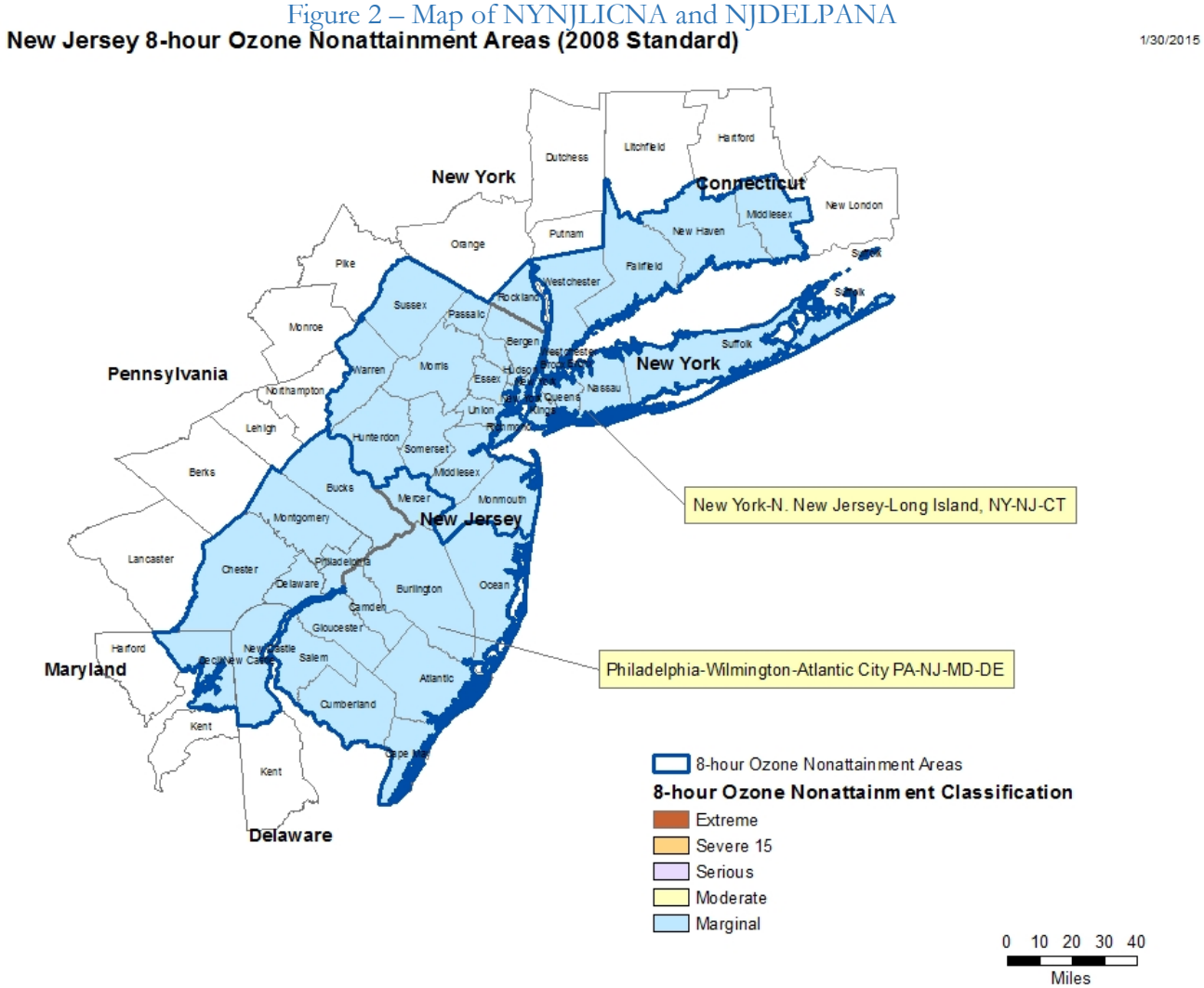
1. Company name and contact information (contact name, address, phone number, email address, etc.)
2. Company vessel type(s) (tugboat, excursion, dredge, pilot boat, etc.)
3. Number of total company vessels
4. Interest in the program (yes/no/maybe)
5. Percent time operated in applicable nonattainment area(s)
6. Specific vessel information for vessels the owner is interested in repowering (name, vessel type, number of propulsion engines, number of auxiliary engines, model years,

[6] As defined in 40 CFR §93.152-153
[7] As defined in 40 CFR §93.153(e)

power ratings, makes and models, and average operating hours in nonattainment area(s))

For FIMP, a Survey of Interest was conducted in July and August 2015. The first step to the survey was to list the names and contact phone number for vessel owners and operators in the geographic area. The Waterborne Transportation Lines of the United States, Volume 2 (Vessel Company Summary)[8] was used to identify potential vessel owners. Approximately 105 vessel owners and operators in the NYNJLICTNA and PANJMDDENA areas[9] (Figure 2) were contacted to determine interest in future repower projects.

Figure 2 – Map of NYNJLICNA and NJDELPANA



Once the contact list was completed, a fact sheet was developed (provided as Attachment 2) to introduce the program and help answer initial questions the vessel owners/operators may have. A template for collecting data was also developed to enable engine information to be collected in a uniform manner for proposed vessels and engines. The completed data template is included as Attachment 3.

[8] See: *www.navigationdatacenter.us/veslchar/veslchar.htm*
[9] See: *www.epa.gov/airquality/greenbook/nj8_2008.html*

The vessel owners/operators were contacted initially by phone and in most cases, followed up by an email and second phone call. The names of the 104 vessel owners/operators that were identified and contacted for the survey are listed below:

A&S Transportation
All Pro Marine Contracting
American RoRo Carrier
Arthur H Sulzer Associates
Atlantic Gulf Towing
Atlantic Subsea
Atlas Holding One
Bay Tours
Block Island Ferry
BMS Riverside
Boston Marine Transport
Bouchard Transportation
Breakwater Marine Construction
Bren Transp Corp
Bridgeport-Port Jeff. Steamboat
Brooklyn Marlyn Boats
Brown Thomas J & Sons
Buchanan Marine
Buck's County Riverboat
Caddel Dry Dock and Repair
Circle Line
Coastline Marine Towing
Construction & Marine
Costello Marine Contracting
Cross Sound Ferry Service
D'Onofrio General Contractors
Delaware Bay Launch Service
Delaware River & Bay Authority
Delaware River Port Authority
Disch Construction
Donjon Marine
Eastern Barge Services
Eshendfelder, Peter
Fire Island Ferries
Fischer, Frederic
Fishers Island Ferry District
Fox Marine
Gateway Towing
Gellatly & Criscione Services
Gladsky Marine
Governors Island Corp
Greater Marine Transportation
Greenwich CT, Dept Park & Rect
Harley Marine
Hays Tug & Launch Service
Henry Marine Service
Hudson Cruises
Hudson Highlands Cruises
Hueber Launch Services
Hughes Bros
Hunt Marine
Island Princess
JJC Boats
Kearny Barge Co
Ken's Booming and Boat
Kirby Offshore Marine
Lafarge Building Materials
Lehigh Maritime Corp
Liberty Fleet
Lomma Construction
Marine Environmental
Marine Oils Service of NY
Marine Steel Transport
Maritime Transport
McAllister Towing & Transportation
Metropolitan Marine Transp
Miller's Launch
Mohawk Northeast
Moran Towing
Morning Cheer
Mothers Towing
New York City
Northstar Marine
NYWT Shark and NWT Zephyr
Oceanside Marine
Pappy's Lady
Pleasure Boat Cruises
Poling & Cutler Marine
Port Imperial Ferry (NY Waterway)
Premier Yachts (Spirit Cruises)
R.B. Conway & Sons
Reinauer Transportation Co.
Reynolds Shipyard Co.
Riverboat Tours
Sea Streak
Sea Wolf Marine Transp
Seaboard Barge Corp
Skyline Cruise Lines
Specialist
Statue of Liberty
T&C Towing
Tappan Zee Constructors
Tioga Construction
Tony's Barge Service
Tucker - Roy Marine Towing
Tyler's Cruises
USS Chartering
Vane Line Bunkering
Viking Fleet
Vinik Marine
Weeks Marine
White Near Coastal Towing Co
Willis, C.G.
Willoughby Spit
Wilmington Tug
World Yacht Cruises

The response rate of the survey was 61% and the following table summarizes the general survey responses.

Table 1 - Responses

Reponses	Count	Percent
Yes, interested in repowering	49	47%
No, not interested in the program	11	11%
Not eligible	3	3%
Did not provide a response	41	39%
Owners/operators contacted	104	100%

Out of the interested vessel owners/operators that provided specific engine data, a total of 170 engines were identified. Table 2 provides summary data regarding type, count, average model year, engine rating, and operating hours in the nonattainment areas of interest. It should be noted that this is not a complete total engine count because not all of those interested provided engine data.

Table 2 – Summary of Identified Engines

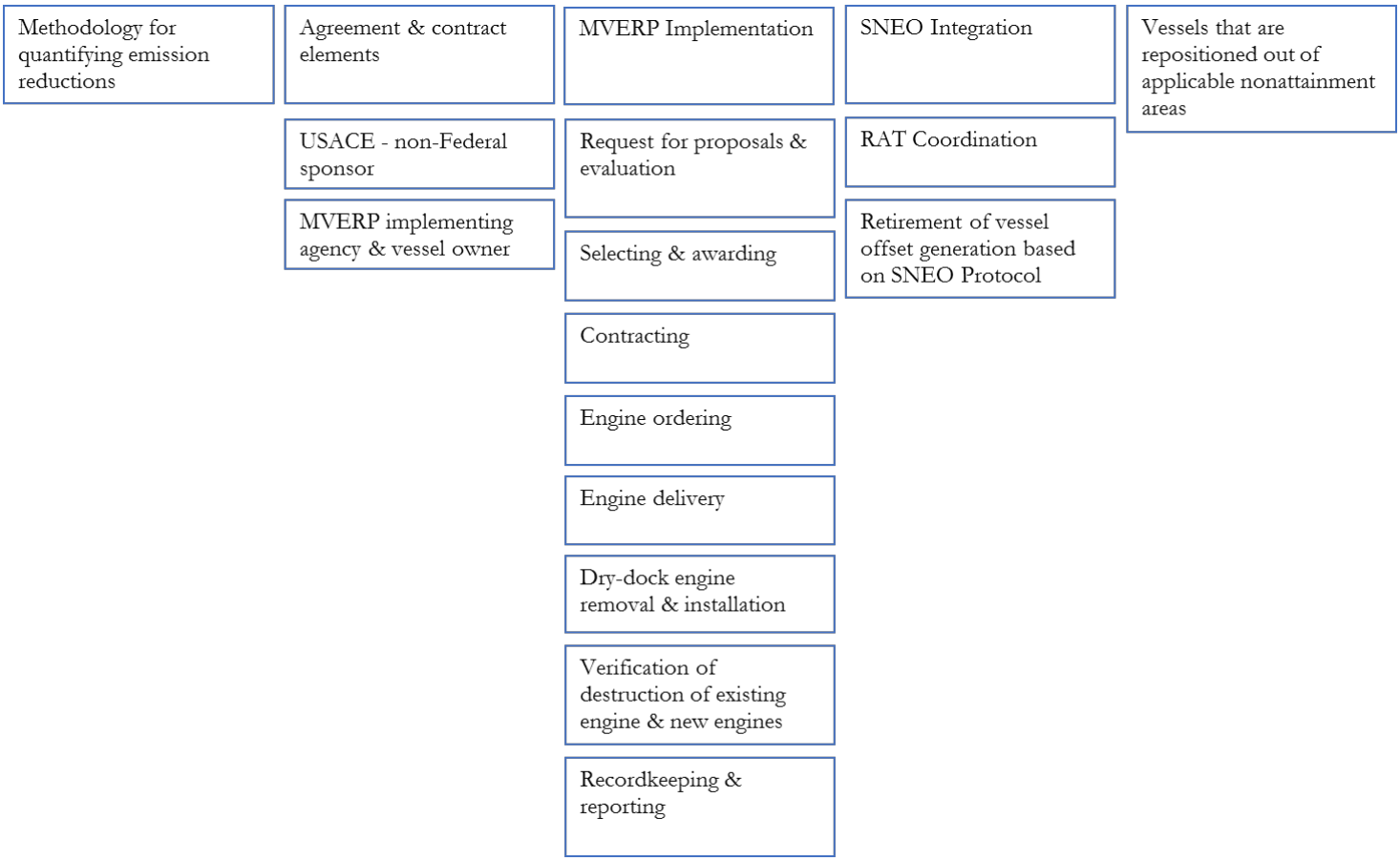
Engine Type	Count	Average Model Year	Average Engine Rating hp	Average Operating Hours
Auxiliary	71	1990	547	4,004
Propulsion	99	1985	1,447	2,989

The results from the FIMP-related Survey of Interest indicate that there is a substantial number of potential engine replacements that could be effectively utilized to create emissions offsets, making MVERP a viable strategy from the opportunity perspective. . An uncertainty is that the project timeline is not fully known; however, it is favorable that the project is still undergoing the GRR and the draft environmental impact statement (DEIS) processes, as the implementation of an MVERP takes time to fully implement (see Section 4).

2.2 – Elements of MVERP Implementation Process

Several major elements need to be considered and undertaken to successfully implement an MVERP. These elements are identified in Figure 3 and detailed further in the following subsections.

Figure 3 – Major Elements of MVERP



2.2.1 – Methodology for Quantifying Emission Offsets

Emission offsets are the difference between what the new engine emits while in service within the overwater boundary and what the old (replaced) engine would have emitted if it were still in service. It will be necessary to have detailed information on the old (existing) engine and on the proposed replacement engine in order to characterize their emissions on an hourly and annual basis. This information will be needed to assist in ranking the MVERP participation proposals. Details are provided in later sections.

The steps in determining potential and actual emission offset production are as follows:

1. Establish baseline emissions of the existing engine – based on tier level (or build year), horsepower, duty cycle (i.e., propulsion or auxiliary, etc.). Characterize emissions on an hourly basis (pounds per hour) and on an annual basis (tons per year) according to the average number of hours worked per year over the past five

years. This will be done during MVERP proposal evaluation based on submitted information.

2. Determine potential offset production by estimating emissions from the replacement engine operating the same number of hours per year as the existing engine, and subtracting these emissions from the baseline emissions. The difference is the potential annual offset production and will be calculated during MVERP proposal evaluation as part of the ranking process.

3. Once the replacement engine is in service, the operator will track usage (hours) within the overwater boundary each month, and report quarterly on the previous three months of activity. Actual offset production will be determined by:

    a. calculating emissions from the replacement engine over the reporting period,
    b. calculating emissions that would have occurred from the original (replaced) engine, and
    c. subtracting the replacement engine's emissions from the emissions the original engine would have produced over the same period.

The calculated offsets will be available on an annual basis, with the mid-year review used as a monitoring tool to assess whether the offsets actually produced are on track to correspond with the potential offsets calculated during the proposal evaluation phase.

2.2.2 – Agreement and Contracting Elements

Several agreement and contract elements need to be completed in conjunction with implementing an MVERP. These elements include the USACE and non-Federal sponsor agreements, the contracts between the Implementing Agency and the vessel owner, the project bid package, and the project contract. This section provides details while examples, where available, are provided as attachments.

2.2.2.1 – USACE and Non-Federal Sponsor

The agreements between the USACE and the non-federal sponsor that need to reflect the implementation of an MVERP is the Project Cooperation Agreement (PCA).

2.2.2.2 –Implementing Agency & Vessel Owner

The Implementing Agency, either the non-Federal sponsor or USACE, will need to have a contract with the selected and awarded vessel owners. The contract should reference the Terms and Conditions that are required by the MVERP (Section 2.2.3.1) and provide all necessary language needed by the Implementing Agency in order to execute the transfer of funds for the purchase of new engines. An example contract from the PANYNJ MVERP is provided as Attachment 4.

2.2.2.3 –Project Bid Package Elements

The bid package for a Federal action-related project, typically a construction project, for which an MVERP is planned as a mitigation strategy to meet General Conformity requirements should contain conditions to require bidders to provide information such that emissions from performance of the project can be estimated. The information is typically provided using project-specific calculators such as have been used on HDP and Hurricane Sandy ABUs. The bidder is required, as part of a complete bid package, to submit a completed bid calculator that estimates the project emissions by calendar year. The data required includes:

1. Anticipated equipment type (e.g., backhoe, excavator, etc.) or vessel name and type (dredge, crew boat, survey boat, etc.)
2. Anticipated engine specific information (for each associated engine) such as
    a. Horsepower rating
    b. Model year
    c. EPA Tier (anticipated for the project)
    d. Number of hours, by calendar year

Language in the bid packages should require the bidder to provide a completed emissions calculator and the language should make clear that proposals that do not include a completed emissions calculator will be deemed incomplete and rejected.

Example emissions calculator bid package requirements are provided in Attachment 5.

2.2.2.4 –Project Contracting Elements

The contract for the awarded project should require the prime contractor to submit the USACE provided monthly contract emissions calculator by the 10th of each month once the project has started until the project is completed. The contract emissions calculator submittal should be certified by the contractor as accurate and auditable. The prime contractor is responsible for including all vessel and equipment engines used on the project, including equipment used by subcontractors, and submitting the calculator to the USACE Construction Division Contracting Officer Representative COR). The submitted calculator should include a list of all construction related equipment and associated vessels that worked on the project site for the preceding month, as well as the following parameters for each piece of equipment and engine:

1. Equipment identification number or vessel name
2. Equipment/vessel type (excavator, backhoe, dredge, crew boat, etc.)
3. Power rating of engine (horsepower)
4. Engine model year
5. EPA Tier, if known
6. Hours of operation for the preceding month
7. Hours of operation for the year, up to the preceding moth
8. Estimate for remaining calendar year

This data is used to track the project-related emissions and determines the actual amount of emissions offsets needed each year. The contract language should clearly require the prime contractor to submit the completed and certified calculator in a timely manner each month.

Example project emissions calculator contract requirements are provided in Attachment 5.

2.2.3 – MVERP Implementation

Implementation of a successful MVERP requires several elements to be prepared and coordinated. These elements include the Terms and Conditions; a request for proposal process; an evaluation and selection process; contracting, engine ordering, delivery, and dry dock; verification of existing engine destruction; various record keeping and reporting requirements; and coordination with the RAT. These elements are further detailed below.

2.2.3.1 – Terms and Conditions

Prior to issuing a public RFP, the USACE and non-Federal sponsor (as applicable) should agree on the Terms and Conditions of the MVERP, which should include the following, at a minimum:

1. Delineate the operational requirements. Two key elements to the effectiveness of an MVERP are the number of hours the awarded vessel operates in the nonattainment area (overwater boundary), as a percentage of the vessel's total annual operational time, and the size of the engines. Therefore, the goal is to find vessels with the largest engines that have a high percentage of their operational hours within the applicable overwater boundary.

   The operational requirements typically establish the targeted percentage of operational time within the overwater boundary. The higher the percentage of operational time in the applicable overwater boundary the higher the potential offset generation. The original PANYNJ MVERP program, set this criteria at 90% of operational time within the applicable overwater boundary and in later rounds this was reduced ultimately to 70%. Analysis can be conducted with the data provided in the Survey of Interest to develop ranges that are likely to produce the most effective candidate vessels during the RFP process. It should be noted that setting the operational limitation too high will filter out viable vessels with lower operational times in the applicable overwater boundary. Therefore, it is suggested not setting the requirement significantly higher than 70% as this allows for a broader set of vessels to apply and be evaluated, from which the ultimate selection and awards can be made.

The other key element relating to operational requirements is the term during which the vessel is required to operate within the overwater boundary, which is typically 10 years. To maximize mitigation funding, the MVERP targets vessels that work within the overwater boundary continuously, because when the vessels are outside the overwater boundary, no offsets are being generated for the funding project. Therefore, the Terms and Conditions should set a requirement of 10 years within the overwater boundary and the contract should have the same term.

2. Delineate the applicable nonattainment area(s) in which the operational requirements apply, including the overwater boundary and the seaward distance from shore. This distance is typically three nautical miles (nm), but this should be discussed and confirmed with the RAT. National Oceanic and Atmospheric Agency (NOAA) navigational charts[10] should be used and incorporated into the Terms and Conditions.

3. Specify the disposition of the existing engines once removed from the awarded vessel. Typically, certified engine destruction is required, where the engine block is cut and rendered nonfunctional/not repairable. The vessel owner should be required to provide the certificate and photographs to confirm the engines are no longer operational; this condition should be tied to the payment schedule.

   In some cases, EPA Tier 2 or Tier 3 engines may be replaced, which may provide benefits in other applications within or outside of the applicable nonattainment area(s). In anticipation of these cases, the Terms and Conditions should leave open the possibility of discussing with the RAT whether these engines can provide emissions benefits by replacing lower-tiered engines within the nonattainment area or in another area (and not be allowed to return), or whether they should be destroyed as discussed above. This case would not be known prior to issuing an RFP so the Terms and Conditions should not be written so restrictively that engine destruction is the only option.

4. Require winning bidders to provide sales invoices for the engines specified in the proposal for the vessel. This will document for the Implementing Agency that the engines in the proposal, which were the basis of the award, are actually ordered and delivered. For the latter, the vessel owner should provide proof that the invoiced engines were delivered to the shipyard performing the engine replacement. Photographs of the engines and the nameplates should be provided.

5. Require winning bidders to identify the shipyard that the vessel owner has contracted with to complete the engine replacements and provide the anticipated dates of the replacement. The vessel owner should also grant the

[10] See: *www.charts.noaa.gov/InteractiveCatalog/nrnc.shtml*

Implementing Agency the right to visit the shipyard during the engine replacement to observe and verify that the engine replacements are consistent with the proposal.

6. Delineate recordkeeping and reporting requirements for the pre-engine replacement process, the engine replacement process, and during the operational phase to the end of the contract term. The pre-engine replacement process includes ordering the proposed engines, providing the final invoice and proof of payment, providing engine details, notification of the anticipated delivery date, dry dock schedule, and other associated elements prior to the actual engine replacement phase at the dry dock. During the engine replacement phase, information such as the dry dock schedules, start of work, date of removal of existing engines, date and certification of engine destruction, dry dock completion date, sea trial dates, results of sea trials, and when the vessel is cleared by the United States Coast Guard for full operation. The owner should be compelled to inform the Implementing Agency of any changes to these dates.

   The vessel owner must document the hours of engine operation and percent of operating time in the overwater boundary in order to quantify the generation of emission offsets. This data needs to be submitted every quarter of each year of the contracted term. The owner also must agree that the data underlying the operating hours and percent time in the overwater boundary is auditable. To confirm the time in the overwater boundary, the vessel must have an Automated Identification System (AIS) and the data from that system must be made available, as needed, to confirm the vessels time in the overwater boundary. AIS equipment is required on all commercial vessels.

7. Delineate a repayment schedule to apply if the awarded vessel is moved out of the overwater boundary prior to the completion of the term of the operational requirements. This condition is to avoid the situation of paying for new engines and then having the awarded vessel's operating area moved outside the overwater boundary. The Implementing Agency can develop this schedule keeping in mind that the goal is to keep the vessel operating within the overwater boundary for a significant portion of the term of the agreement.

8. Delineate conditions/limitations regarding the sale of the repowered vessels to ensure that the vessel either continues to provide offsets or that the company makes repayment based on item 7 above.

9. Delineate insurance requirements or other provisions for the contract term for the vessel and the repowered engines to ensure that the MVERP funding is protected if the vessel and/or repowered engines are destroyed or lost.

The Terms and Conditions, once agreed upon by the Implementing Agency and the USACE, need to be reviewed and agreed upon by the RAT.

2.2.3.2 – Request for Proposals and Evaluation

A public Request for Proposal (RFP) is used to solicit proposals for consideration for the MVERP. The RFP should be drafted by the Implementing Agency, coordinated with the USACE, and provided to the RAT for review. The RFP should include the follow informative elements, at a minimum:

1. Background on the need for and the goals of the MVERP
2. Contact information for the Implementing Agency and websites, as applicable
3. Description of what types of vessels the MVERP is targeting
4. Description of the overwater boundary
5. Provide a copy of the Terms and Conditions
6. Provide RFP related dates (when proposals are due, when awards are anticipated, etc.)
7. Provide how proposals will be ranked, selected, and how notification will be accomplished
8. Provide notification requirements to keep the Implementing Agency aware of the progress of the repowering

In addition to the informative elements above, the RFP should require the following company information to qualitatively evaluate risk, at a minimum:

Company related information:

1. Company name, contact, and contact information
2. When the company was formed and whether it has been in continual operation since its inception
3. Length of time the company has been working in the applicable overwater boundaries
4. Percentage of the company's total operations that take place within the applicable overwater boundary
5. Whether the company has filed for bankruptcy in the last 10 years
6. Certification that the company is financially stable and is not anticipating to declare bankruptcy
7. Number of employees
8. Total number of company owned vessels
9. Number of vessels proposed for MVERP
10. Anticipated dry dock facility

Repowers can be proposed for auxiliary engines, propulsion engines, or both. Typically most vessels will have two auxiliary engines and two propulsion engines. The RFP should state that if the vessel has more than one auxiliary or propulsion engine, then the proposal must be for all the engines in each service (auxiliary or propulsion). This is to avoid a partially repowered vessel being able to operate an existing engine while the repowered engine is on standby or down. For each vessel

proposed to be repowered, the following information should be provided, at a minimum:

1. Vessel name and registration number
2. Date of build
3. How long the owner has had the vessel in their possession
4. Certify that the submitter has authority from the vessel owner to replace the engines, if the proposal submitter is not the vessel owner.
5. Length, width, and deadweight tonnage of the vessel
6. Vessel's U.S. state of registration
7. Type of vessel (tugboat, excursion, ferry, etc.)
8. Type of work engaged in (assist, hauling, security, passenger, etc.)
9. Vessel operating hours per year for each of the last five years (in operation whether engines are on or off)
10. Percent of vessel operational time within the overwater boundary for each of the last five years
11. List of existing engine(s) proposed for replacement and the proposed replacement engine(s)
12. For each existing engine being proposed to be replaced:
    a. Engine service type (propulsion, auxiliary, pump, etc.)
    b. Engine manufacturer
    c. Model
    d. Model year
    e. EPA Tier, if known
    f. Model number
    g. Stroke type (two/four)
    h. Indicate if the engine is turbocharged or not
    i. Engine rating (in horsepower)
    j. Emissions controls (as applicable)
    k. Indicate if the engine has been replaced or original. If replaced, when.
    l. Number of operating hours over the last five years
    m. Percent of engine operational time in the overwater boundary for the past five years
    n. Last time the engine was overhauled
    o. Anticipated next engine overhaul (without MVERP)
    p. Anticipated engine replacement (without MVERP)
13. For each replacement engine being proposed:
    a. Engine service type (propulsion, auxiliary, pump, etc.)
    b. Engine manufacturer
    c. Model
    d. Model year
    e. EPA Tier
    f. Model number
    g. Stroke type (two/four)
    h. Indicate if the engine is turbocharged or not
    i. Engine rating (in horsepower)

j. Emissions controls (as applicable)
k. Engine costs including delivery to the dry dock

14. Estimated costs for repower elements not covered in item 13 j above
15. Timeline for repowering including:
    a. When the engine orders will be placed
    b. Anticipated date of delivery of replacement engines to dry dock
    c. Anticipated dry dock dates
    d. Anticipated completion of dry dock services dates
    e. Anticipated sea trials dates
    f. Anticipated full operations of the repowered vessel

The RFP should be sent to the vessels owners contacted through the Survey of Interest, posted in applicable regional maritime periodicals/newsletters as identified, and notice should be provided to related maritime associations and work groups.

Evaluation of the submitted proposals should confirm that each submittal has provided the requested data, confirm the engines proposed, and then estimate the potential annual offsets by estimating the vessel's existing annual emissions and the vessel's annual emissions with the proposed replacement engines. The potential annual offsets are the annual emissions from the existing engines minus the annual emissions from the proposed engines. The cost effectiveness in cost per ton of emissions offset should be calculated for the proposed vessel over the 10-year term.

In addition, each proposed vessel should have a risk qualification that takes into account the financial health of the proposing company and other information as provided in the proposal. Finally, vessel operations can change year to year based on market conditions, so the selection process should consider a contingency, agreed upon between the Implementing Agency and the USACE, based on the risk that offsets will not be sufficient to cover General Conformity requirements.

2.2.3.3 – Selecting and Awarding

The potential annual emissions offsets and the cost effectiveness developed in 2.2.3.2 should be used to rank the proposals and selection should be based on the most cost effective solution, and the amount of offsets needed (including contingency). The mitigation budget should be allocated to maximize emissions offsets and should consider risk factors such as reposition or company bankruptcy. The selection process will be coordinated with the USACE, as applicable.

The selected owners should be notified of their award, which could be all or a portion of their proposal (in the case of multiple vessels). The vessel owner should be given up to 30 days to confirm agreement to enter into contract. If any vessel owner backs out and does not sign a confirmation letter, then another vessel should be selected from the ranked list. After all the confirmation signatures are collected, then notification should be provided to the non-awarded proposers.

A summary of the RFP process and the final results of selected of vessels to be repowered under the MVERP should be documented and provided as an information item to the RAT.

2.2.3.4 – Contracting

The contracting process should start as the awarded companies provide their signed confirmations. The Terms and Conditions need to be incorporated or appended into the contract. There should be provisions to ensure that the proposed engines are the ones actually purchased, but there should also be consideration given that if the proposed engine has a significant lead time and another engine offers the same or better emissions offset, a change in replacement engine should be allowed as long as the alternative engine is approved by the Implementing Agency before the change is made.

It is important to note that for the duration of the term of the contract, various information submittals will be required and provisions should be made in the contract to ensure that the submittals are provided in a timely and consistent fashion. This is a critical component to the contract because the data is directly linked to the quantification and verification of the generation of emissions offsets. Without the data, there are no emissions offsets. Therefore, the contract and the Terms and Conditions must be aligned and reinforce each other relating to data provisions.

The contracting should be concluded in 30 to 60 days after receipt of the confirmation letters. The RAT should be informed when the contracting process has been completed for each company and the related vessels.

2.2.3.5 – Engine Ordering

The vessel owner will order the proposed engine and provide the Implementing Agency confirmation via invoices and proof of payment. In addition, the vessel owner needs to provide the Implementing Agency the original equipment manufacturer's EPA Tier certificate, engine data sheet, and estimated date for completed engine construction and delivery to the dry dock for each engine covered by the contract. The vessel owner will need to notify the Implementing Agency promptly of any delays in the engine construction and delivery timeline.

As noted in the preceding subsection, in the situation where the proposed engine has a significant and unforeseen delay due to any of many factors, and assuming the contract is structured to allow flexibility, the vessel owner could propose an alternative engine that provides the same or greater emissions offsets or even an insignificant reduction in offsets (in some cases). The change of engine would need to have prior approval from the Implementing Agency, which would coordinate with the USACE and RAT, before the alternative engine is ordered. If this type of flexibility is to be incorporated into the MVERP, it should not be incorporated through the Terms and Conditions and addressed only through the contract.

2.2.3.6 – Engine Delivery

Upon delivery of the new engines to the dry dock, the vessel owner will notify the Implementing Agency and provide proof that the engine is the proposed engine by providing photographs of the engine onsite and pictures of the engine plate showing manufacturer, model number, identification numbers, etc.

2.2.3.7 – Dry dock

The vessel owner will notify the Implementing Agency when the vessel arrives at the dry dock yard and when the vessel is moved to dry dock. While the vessel is in dry dock, the vessel owner shall provide access for inspection during the repower process if requested by the Implementing Agency. The Implementing Agency must comply with all health and safety provision of the ship yard while onsite and not unnecessarily slow down the repower process. The vessel owner must promptly notify the Implementing Agency if there are any changes to the dry dock schedule and the nature of the delay.

2.2.3.8 – Verification of Destruction of Existing Engine

The vessel owner must notify and document the destruction the existing engine(s). The existing engines need to be decommissioned such that they are not repairable and cannot be brought back into use. The ship yard should certify the engine destruction and the owner should provide photographic evidence. The ship owner should make provisions with the ship yard to allow the Implementing Agency access to the destroyed existing engines for confirmation purposes, as necessary.

As discussed above, if the existing engines could be used beneficially in other areas to reduce emissions, then the Implementing Agency can coordinate with the RAT on how to address this issue and determine if the engines can be resold outside the area.

2.2.3.9 – Recordkeeping and Reporting

Recordkeeping and reporting requirements are separated between the three phases of the MVERP process: pre-engine repower, engine repowering at the ship yard, and operational. Several elements related to recordkeeping and reporting are noted above in the various sections and are ultimately tied to the requirements of the Terms and Conditions and the ultimate contract between the Implementing Agency and vessel owner.

As stated earlier, recordkeeping and reporting are critical elements to the MVERP process, both on the construction project (emission producing) side and the offset (emission offsetting) side. The contract and Terms and Conditions must align with each other and make it incumbent on the contractor to meet the recordkeeping and reporting requirements or the emission offsets and compliance with applicable General Conformity requirements are at risk. In addition, the Terms and Conditions and/or the contract should allow the provision that the Implementing Agency can, at the agency's discretion, audit the information and data underlying the recordkeeping requirements. Finally, a balance must be struck such that the reporting and recordkeeping provide the data needed for the MVERP to be successful, but limited

beyond those provisions as not to inhibit participation because the requirements are too onerous. Examples from the PANYNJ MVERP relating to recordkeeping and reporting are provided in Attachment 4.

The Implementing Agency needs to provide MVERP updates to the RAT as detailed in the next subsection.

2.2.3.10 – Coordination with NAN and RAT

The Implementing Agency, if not NAN, needs to coordinate the implementation of the agreed upon MVERP closely with NAN. All emission calculators (bid and project) along with reductions from the repowered vessels will be coordinated with NAN for review and confirmation, prior to coordinating with the RAT. This coordination provides the Implementing Agency the experience developed by NAN over the HDP and Sandy Hurricane ABU projects related to the quantification of the offsets, emissions netting, coordination with the RAT, and ensures that the project partners are in agreement during the implementation of the MVERP, even after the specific project is completed and the MVERP is still active.

Further, the Implementing Agency needs to coordinate with the RAT. Again, if the Implementing Agency is not NAN, then coordination with the RAT is facilitated through NAN. The RAT should be viewed as a resource to the Implementing Agency and provides third-party and regulatory review, can cooperatively develop solutions to issues that arise, and assist through its advisement and support as a RAT member to ensure that the MVERP is successful.

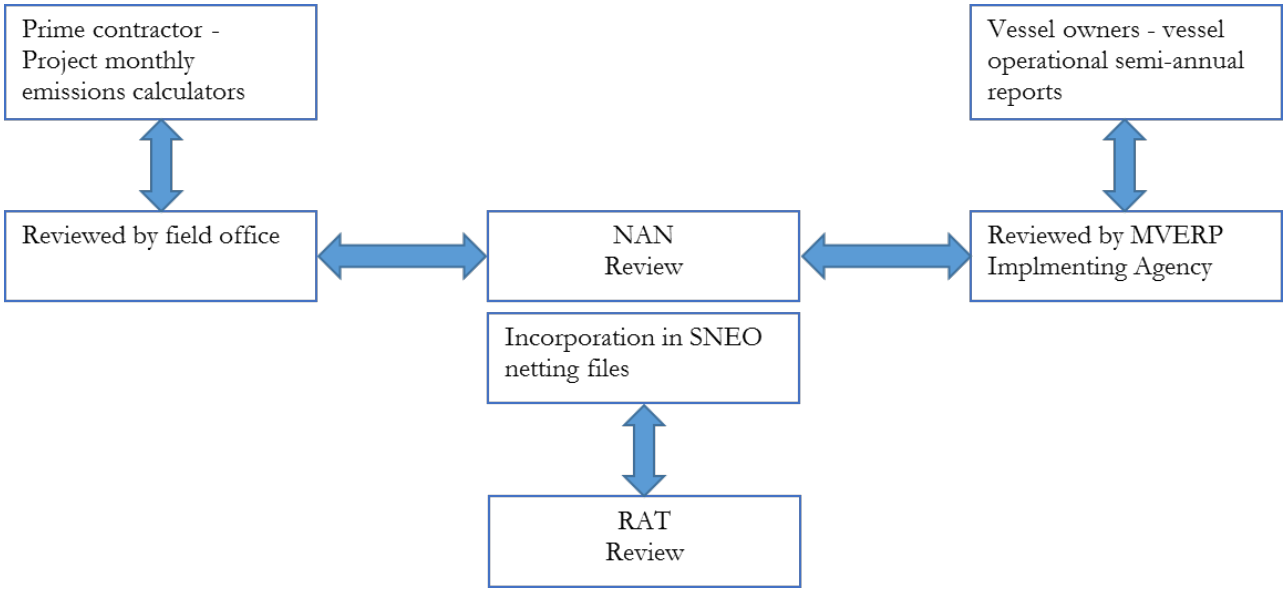
2.2.3.11 – Vessels that are Repositioned

Should a vessel operator notify the Implementing Agency that an MVERP funded vessel is to be repositioned out of the overwater boundary, the Implementing Agency will notify NAN and recover funds based on the contract conditions. As an alternative to recovering funds under the contract, the vessel operator should be provided the opportunity to propose an alternative option, such as another vessel that the operator repowers in trade for taking out the MVERP funded vessel. The proposed alternative scenario needs to be coordinated with the RAT and agreed to prior to acceptance of the alternative by the Implementing Agency. The contract should take this option into consideration when delineating the requirements for vessels that are repositioned.

2.2.4 – SNEO Integration

MVERP generated offsets will be integrated into the SNEO netting consistent with the provisions of the SNEO Protocol. NAN administers the SNEO netting and coordination and review on project-related emissions and MVERP generated offsets is required as part of integrating new MVERPs into the netting. The SNEO emissions netting is reviewed by the RAT and documents a project's compliance with applicable General Conformity mitigation requirements. The information flow for the process is illustrated in Figure 4.

Figure 4 – SNEO Integration Illustration



The project that is using the MVERP generated offsets, as stated above, needs to complete and deliver monthly project emissions calculators to the applicable USACE CO field office, which reviews them for completeness (i.e., making sure that vessels or equipment is not being left out of the calculator, that the operational hours seem reasonable, etc.) and if there are any issues the field office engages the project's prime contract for updates. Once the field office review is completed, the project monthly calculators are sent to the Clean Air Act subject matter expert (SME) technical point of contact in Planning Division, Environmental Analyses Branch (PLE) for compliance review (i.e., making sure that the calculators are complete, identifying any anomalies, confirming the calculator is in proper working order, etc.) and if there are any queries or updates need, and coordinates revisions with the CO field office. Once the project emission calculators are completed, they are incorporated into the SNEO netting tables under USACE and the appropriate District and project. This process repeats every month, with calculators typically due to NAN by the 10th of each month.

From the MVERP offset generation side, the vessel owners will log their engines' operational time and the percentage of that time in the overwater boundary. The operators will report operational parameters, for each applicable vessel and engine, on a quarterly basis, which would need to be provided 4-6 weeks after the end of each quarter to the Implementing Agency for review. The reviews by the Implementing Agency include:

- Review for completeness to ensure that each vessel and engine that was funded under the MVERP are being documented and the submittal meets the contract requirements.
- Review of the operational data to determine if the vessel is performing above or below anticipated operational levels and the factors that are effecting operations.

If there are any anomalies identified during these reviews, the Implementing Agency will coordinate with the vessel owner to make updates as needed. When the operational reports are complete, the Implementing Agency will estimate the emissions offsets for the reporting period by vessel and by engine. A summary is developed for each vessel that is participating in the MVERP that includes, at a minimum:

1. Vessel name
2. Activity indication (active or not active)
3. Repowered engines service (propulsion, auxiliary, pump, etc.)
4. Repowered engine power rating, in horsepower
5. Total operational time, for each repowered engine
6. Operational time in the overwater boundary, for each repowered engine
7. Emissions calculations for prior and repowered engine, by engine (using the methods described in 2.2.1)
8. The generated offsets, by engine (the delta between the emissions of the prior and repowered engines)
9. Any notations that relevant to the operational period (vessel was laid up for maintenance, vessel hours effected by weak demand, etc.)

The summary is provided to NAN for review and comments will be addressed by the Implementing Agency, and a final draft summary provided. NAN will distribute the final draft six month summary reports to the RAT for their review and comment will be incorporated.

Section 3 – Costing

Two costing elements typically need to be taken into account when determining the ultimate cost of implementing an MVERP: administrative costs (throughout the MVERP process) and reimbursement for capital equipment purchases (repowered engines). These cost elements are discussed below.

3.1 – Administrative Costs

Administrative costs are dependent on the scope of the MVERP, the number of vessels, and the Implementing Agency's approach to the administrative elements of the MVERP (fully self-administer, contract out portions or all of the administration, etc.). The anticipated administrative costs can be grouped into the following:

- Costs associated with developing and finalizing the agreements between the Implementing Agency and NAN in order to implement the MVERP.
- Initial cost associated with the development and implementation of the RFP process including development of the RFP package, development of public notices, conducting outreach, review and evaluation of proposals, selection, awarding, contracting, and coordination with NAN and the RAT. For the PANYNJ MVERP 2 the estimate for the initial costs were approximately $75,000; however, that was building off the previous MVERPs. Therefore, for costing purposes the initial costs are anticipated to range from $75,000 to $150,000.
- Operational costs associated with oversight and audit of contractual requirements relating to the purchase of the new engines; delivery, dry dock, and commissioning schedules; reporting to NAN; confirming the existing engines have been destroyed, semi-annual operational reports once the MVERP funded vessel is commissioned, estimates of the emissions offsets, coordination with vessel operator, auditing, and coordination with NAN and the RAT for the duration of the MVERP. For the PANYNJ MVERP 2 the estimate for the annual operational costs were approximately $25,000. Again, these costs were benefited by implementing earlier programs. Therefore for costing purposes the operational costs are anticipated to range from $25,000 to $35,000 per year for the life of the MVERP.
- Costs of NAN's labor related to support, coordination, facilitation, and incorporation of offsets into the SNEO netting tables.

3.2 – Reimbursement for Capital Purchases

The costs associated with the repowered engines should include only the costs of the engines as proposed and the costs of delivering the engine to the ship yard where the dry dock or engine replacement will take place. These costs should be validated through the final invoice from the engine original equipment manufacturer to the vessel owner.

Engine costs range significantly depending on the rated power and EPA engine tier. From the PANYNJ MVERPs, the following engine costs were funded:

- MVERP1
  - Total cost: $2.44 million
  - Number of vessels: 12
  - Average cost per vessel: $271,500
  - Average annual reductions: 90.1 tons NOx
  - Total reduction: 827.5 tons NOx
  - Cost effectiveness: $2,950/ton NOx reduced
- MVERP2
  - Total cost: $1.71 million
  - Number of vessels: 8
  - Average cost per vessel: $189,700
  - Average annual reductions: 250.0 tons NOx
  - Total reduction: 2,035 tons (estimated)
  - Cost effectiveness: $840/ton NOx reduced

It should be noted the future repowers to the higher EPA engine tiers will increase the costs of the engine purchases and the potential emissions reductions.

3.3 – Planning Cost Estimate

To estimate the administrative and repower costs for developing and implementing an MVERP for FIMP, for planning purposes, the following assumptions are made:

1. FIMP MVERP assumed to have a similar cost effectiveness as PANYNJ MVERP1
2. Duration of FIMP MVERP 10 years; operational costs based on PANYNJ information
3. Estimated highest annual offsets of 200 tpy NOx

The estimated cost for the scenario above is:

1. Administrative Costs		
a. Agreements		$25,000
b. Initial Costs		$135,000
c. Operational Costs ($30,000 x 10 years)		$300,000
	Subtotal	$460,000
2. Capital Reimbursement Costs		
a. Engine repowers		$2,500,000
3. Total Planning Costs		$2,960,000

Section 4 – MVERP Timeline

Planning and implementing an MVERP strategy is quite an involved and up-front intensive effort. Getting the proper agreements negotiated, planning, request for proposal, and installation of the new engines is a significant effort. Once all the vessels are repowered and operational, then the administration of an MVERP focuses around data collection and reporting twice a year for ten years.

The draft timeline presented on the next page shows the major elements of planning and implementing an MVERP between USACE and a non-federal sponsor.

USACE - non-Federal sponsor Agreements	4-16 weeks
Development & coordination on Terms and Conditions	4-12 weeks
Development and coordination on contract language	4-12 weeks
RFP development & coordination	4-8 weeks
RFP posting	2 weeks
RFP closing	4-8 weeks
Proposal evaluation	3-6 weeks
Selecting & awarding	2-4 weeks
Vessel owner confirmation	2-4 weeks
Contracting	4-6 weeks
Engine ordering	2-3 weeks
Engine delivery	6-24 months
Dry-dock removal & installation	2-10 weeks
Verification of destruction of existing engine & new engines	1-3 weeks
Recordkeeping & reporting	Ongoing; reporting semiannually
SNEO Integration	Ongoing; integration semiannually
Retirement of vessel offset generation based on SNEO Protocol	Typically 10 years

Can overlap to some extent

Start of emissions offset generation

Attachment 1 – SNEO Protocol

SURPLUS NOx EMISSION OFFSET PROGRAM PROTOCOL

Table of Contents

Introduction 1
Proposed SNEO Program Premise 2
SNEO Distribution Agreement 5
Project Identification & Inclusion 5
Determination of SNEOs and Contingency 6
Quantification of Project Emissions to be Offset 6
Quantification of Available Emission Offsets 7
Netting of Project Emissions and SNEOs 8
Tracking and Reporting Requirements 8
Bid & Contract Requirements 9
PANYNJ Proctor & Gamble Emission Reduction Credits 9

Appendix A: SNEO Netting Example
Appendix B: USACE Contract Language Example

INTRODUCTION

This document proposes a programmatic protocol for the use of oxides of nitrogen (NOx) emission offsets (SNEOs) as a result of the emission reduction strategies implemented as part of the New York and New Jersey Harbor Deepening Project (HDP). These emission offsets are estimated to be in excess of those needed to fully offset the projects' construction emissions in order to comply with the General Conformity requirements. The lead federal agency for the HDP is the United States Army Corps of Engineers (USACE); the lead local sponsor is the Port Authority of New York & New Jersey (PANYNJ); and the lead local sponsor for the Port Jersey channel is the New Jersey Department of Transportation, Office of Marine Resources (NJDOTOMR). In the fall of 2001, the USACE, PANYNJ, New York State Department of Environmental Conservation (NYSDEC), New Jersey Department of Environmental Protection (NJDEP), and the United States Environmental Protection Agency Region 2 (EPA R2) came to an agreement on the development of a Harbor Air Management Plan (HAMP) which allows for the implementation of emission reduction strategies, quantification of applicable HDP emissions, and the reporting of netted SNEOs to ensure that the project complied with General Conformity. The New York City Department of Transportation (NYCDOT) agreed to provide access to the Staten Island Ferry Fleet (SIFF) as one of the primary emission reduction sources to be incorporated into the HAMP. The NYCDOT has provided support, funding, and coordination for emission reduction strategies developed for the SIFF. As a result, the Regional Air Team (RAT) was formed to monitor progress, review netted emissions, and coordinate on how any SNEOs beyond what the HDP required could be utilized by the USACE, PANYNJ, and NYCDOT. This document looks to establish a protocol for utilizing the unused SNEOs that are deemed to be surplus NOx offsets for the HDP.

The proposed protocol consists of the following key elements:

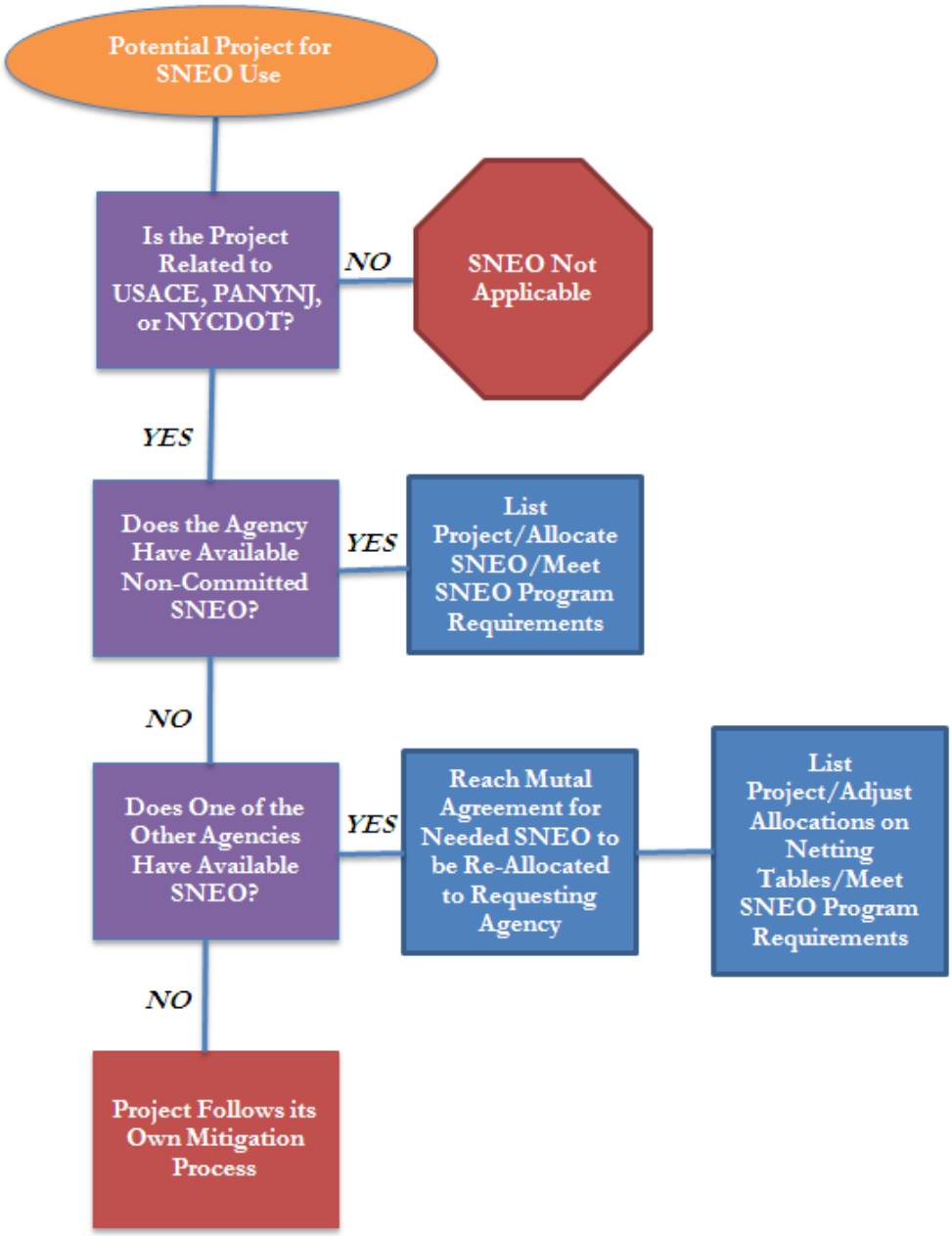
- Proposed program SNEO premise
- SNEO distribution agreement
- Project identification and inclusion
- Determination of SNEOs
- Quantification of project emissions to be offset
- Quantification of available emission offset
- Netting of emissions and offsets to generate SNEOs
- Tracking and reporting requirements
- Contract Requirements

To date, the implementation of the HDP HAMP has produced a regional net NOx benefit of 1,018.8 tons from 2005 through 2012. It is anticipated, that the level of unused offsets will be higher in future years, than the trend that has been established during the HDP.

PROPOSED SNEO PROGRAM PREMISE

The proposed SNEO protocol builds on the methods and tools (i.e. netting) developed to track and report the HDP's construction NOx emissions and available offsets. The SNEO protocol proposes to use the successful quantification, netting, tracking, and reporting of NOx budgets on a year-to-year basis and apply them to a broader range of projects beyond the HDP, subject to certain criteria. The process of project inclusion in the proposed SNEO program is presented in Figure 1. The SNEO program will include projects only under the purview of the USACE, PANYNJ, or the NYCDOT.

Figure 1: Project Inclusion Flow Chart



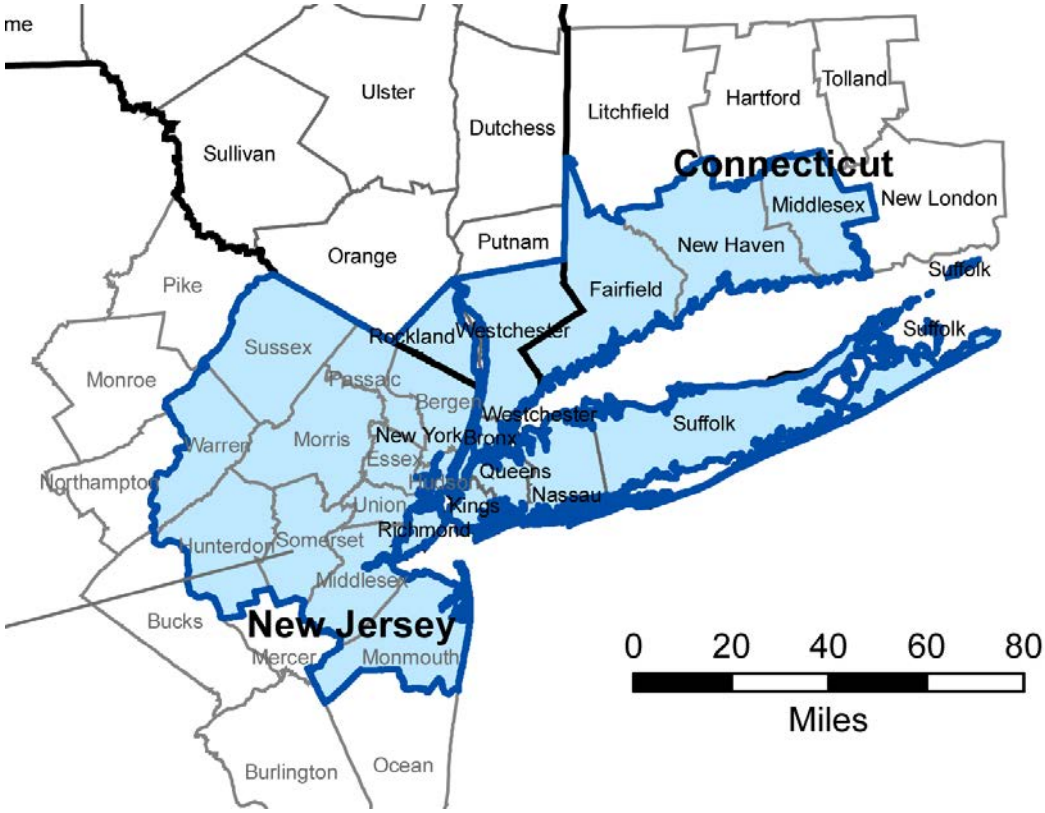
The RAT, chaired by the USACE, will continue to serve as the technical oversight group for the SNEO program by confirming that acceptable methods are employed, double counting is avoided, providing technical and regulatory expertise, and ensuring that transparency is maintained throughout the program.

The criteria for use of SNEOs generated by the HDP are listed below:

- **Only useable** by the three HAMP participating agencies (USACE, PANYNJ, and NYCDOT) that funded the surplus offsets, and therefore are not a marketable commodity;
- **Only used** consistent with the rules associated with applicable General Conformity regulations; and,
- Can be used within the same nonattainment or maintenance area or nearby area of equal or higher classification provided the emissions from that area contribute to the violations, or have contributed to violations in the past, in the area of the federal action. Currently, SNEOs are being generated in the New York, Northern New Jersey-Long Island Connecticut ozone nonattainment area illustrated in the blue shaded are in Figure 2.

The SNEO protocols represent a continuing emission reduction offset program for activities that are overseen/managed by the USACE and fall under General Conformity, as allowed under §93.160-165. The emission offsets created under the SNEO protocols, and their use, will be consistent with the applicable General Conformity requirements.

Figure 2: New York-Northern New Jersey-Long Island Connecticut Ozone Nonattainment Area[1]



[1] EPA Green Book, *http://www.epa.gov/airquality/greenbk/map/ny8_2008.pdf*

SNEO DISTRIBUTION AGREEMENT

The SNEO distribution agreement divides SNEOs annually between the participating agencies (USACE, PANYNJ, and NYCDOT) based on each agencies financial contribution to the emission reduction strategy programs implemented under the HAMP. The initial distribution will be set annually at the following levels:

Table 1. SNEO Distribution by Agency and Program

Emission Reduction Strategy Program	USACE	PANYNJ	NYCDOT
KVK-5 Tugs	50%	50%	0%
Port Jersey Tugs	50%	50%	0%
MVERP	50%	50%	0%
MVERP	50%	50%	0%
Staten Island Ferries	35%	35%	30%

Each agency retains the right to reallocate SNEOs to one of the three participating agencies if their annual allocation is not fully needed by the agency's own projects. In this case, the reallocation must be decremented from the donating agency's SNEO allocation and added to the receiving agency's SNEO allocation on the netting sheets to properly track NOx budgets and ensure that no double counting occurs. All reallocations will be reported to the RAT.

PROJECT IDENTIFICATION & INCLUSION

Each agency will be responsible for identifying projects that they want to apply SNEOs to and have those projects included in the SNEO netting tables. The SNEO netting tables report projects, by entity, and projected emission estimates for the life of the project. Monthly tracking of those projects that utilize SNEOs will be conducted in a similar fashion as currently done for the HDP. The USACE will continue to update and manage SNEO netting tables. The required information includes project name, forecasted annual emission estimates that need to be offset, and project contact. The netting tables will be distributed monthly, like with the HDP netting files, to the RAT. Forecasted annual emission estimating procedures and methods need to be detailed to the RAT for concurrence on methods, factors, and other variables.

A quarterly conference call will be scheduled to discuss potential SNEO projects. If a significant project is identified between the quarterly conference calls, a RAT meeting will be scheduled as needed.

DETERMINATION OF SNEOS AND PLANNING CONTINGENCIES

SNEO quantities are determined and tracked through the HDP netting process (which includes a 10% planning contingency) and are defined as emission offsets beyond the HDP annual requirements. The following planning contingencies help ensure that annual project emissions do not exceed annual emission offsets available through the SNEO program:

- SNEO planning contingency of 10% on emissions from SNEO related projects
- SNEO planning discount contingency of 10% on offset generation to be used by SNEO related projects, if operational uncertainties associated with offset generation warrant further contingency planning.

QUANTIFICATION OF PROJECT EMISSIONS TO BE OFFSET

Quantification of actual project emissions needs to be based on actual equipment specifications such as engine rating, year, rpm, technology hours of operation, and acceptable emission and load factors. Each agency is responsible for quantifying the actual project emissions.

Methods for quantifying emissions from projects seeking to utilize SNEOs, will be agreed upon by the RAT. Tracking of actual activity data, similar to the level required for the HDP monthly calculators, will be provided and made available to the RAT every six months. Monthly summary project data will be utilized to develop monthly project emission estimates, which will be provided to the RAT on the SNEO emissions and offset netting.

Coordination with the RAT on these elements is essential to ensure that the emission estimates are acceptable to the regulatory agencies.

QUANTIFICATION OF AVAILABLE EMISSION OFFSETS

Quantification of actual monthly emission offsets will be conducted in the same manner that is currently used for the HDP. The following table shows the longevity of each of the emission reduction strategies by program:

Table 3. Life of Emission Offset Strategies

Emission Reduction Strategy/Program	Longevity	Last Year of Offsets
Engine Replacement/KVK-5 Tugs	10 years from installation	On vessel-by-vessel basis
Engine Replacement/Port Jersey Tugs	10 years from installation	On vessel-by-vessel basis
Engine Replacement/MVERP	10 years from installation	On vessel-by-vessel basis
Engine Replacement/MVERP2	10 years from installation	On vessel-by-vessel basis
Selective Catalytic Reduction/Staten Island Ferries	While ferries are in operation & SCR is properly operated/matintained	When SCR is no longer maintained
Engine Rebuild Kits/Staten Island Ferries	While ferries are in operation & kit's life (typically 20,000 hours) or maximum 10 years	On vessel-by-vessel basis

Engine replacements (replacing an older/dirtier engine with a newer/cleaner higher EPA tier engine) can generate SNEOs for a maximum of 10 years, unless the applicable SIP regulations (local/state) or federal regulations requires engine replacement or alternative emission reductions from such engines. If regulations (local/state) are in the process of being incorporated into the SIP, then SNEOs can only be generated until they are incorporated in the SIP, as allowed by the regulation. The replaced engine(s) can only generate SNEOs while operating in the nonattainment area, as presented in Figure 2.

Selective catalytic reduction (SCR) systems, if not required by the applicable SIP regulations (local/state), can generate SNEOs, as long as the SCR is operated in accordance with the manufacturer's guidance, urea is purchased and consumed, and catalysts are replaced. The vessel/equipment with the SCR can only generate SNEOs while operating in the nonattainment area, as presented in Figure 2.

Engine rebuild kits, which upgrade an existing engine to a higher EPA Tier, can be used to generate SNEOs for the life of the kit warranted by the manufacturer (typically 20,000 hours) as long as there is no requirement in the applicable SIP regulations (local/state) that requires the use of a rebuild kit. SNEOs can only be generated and use if the rebuild kit exceeds the SIP requirements (e.g., SIP requires a Tier 2 and a Tier 3 kits is installed). Once a rebuild kit expires or the maximum life span of 10 years has been obtained, a new rebuild kit can be purchased and installed to continue the generation of SNEOs, as long as the kit is a higher EPA Tier than the one it's replacing. If there is not higher tier kit available for the engine, then the RAT will determine if a replacement kit will generate SNEOs on a case-by-case basis. In the case of the John F. Kennedy, which is a grandfathered vessel built in 1965, the next kit needs to be cleaner than the current kit, if available. The kitted engines can only generate SNEOs while operating in the nonattainment area, as presented in Figure 2.

Methods for quantifying emission offsets from projects seeking to generate SNEOs, will be agreed upon by the RAT. Tracking of actual activity data, similar to the level required for the HDP monthly calculators, will be provided and made available to the RAT every six months. Bi-annual emission offset data will be utilized to develop SNEO estimates, which will be provided to the RAT on the SNEO emissions and offset netting.

Coordination with the RAT on these elements is essential to ensure that the emission offset estimates are acceptable to the regulatory agencies.

NETTING OF PROJECT EMISSIONS AND SNEOS

Netting of project emissions and emission offsets will be conducted similar to how the netting has been estimated for the HDP for the past several years, as approved by the RAT. The applicable planning contingency factors will be included in the netting. Netting will be provided to the RAT on an agreed upon frequency. It should be noted that if SNEOs net to less than one ton, then no SNEOs for that year could be allocated to other projects. An example of the proposed netting scheme is provided in Appendix A.

TRACKING AND REPORTING REQUIREMENTS

The tracking and reporting requirements for the SNEO Program will be consistent with requirements for the HDP as applicable, with monthly netting with appropriate backup and as described in *Monitoring, Recordkeeping, and Reporting* section, HAMP, 2004. SNEO netting tables will be updated on a monthly basis and annual summaries provided after each calendar year to document the progress of the program.

BID & CONTRACT REQUIREMENTS

At a minimum, the use of applicable bid and contract requirements used for the HDP will be used for all projects entering the SNEO Program. These provisions include:

- Setting annual air emission caps for projects in the bid specs and including those caps as contract conditions
- Use of bid calculators as part of the bid packages to ensure that bidders have an accurate method for determining how to propose the project such that their bid can meet the air emissions caps
- Use of project monthly calculators to feed into the estimation of actual project emissions
- Contract clauses that require the contractor to stop work when the annual air emission cap is reached, assuming there are no additional SNEOs available

USACE contract language is provided in Appendix B as an example. Each agency will to develop their specific contract language in coordination with their internal contracting and legal departments. Once the language is developed for a specific project, it will be shared with the RAT for informational purposes.

PANYNJ PROCTOR & GAMBLE EMISSION REDUCTION CREDITS

The 2004 HAMP outlined strategies and alternatives to address and meet the requirements of the General Conformity rules. Seven mitigation alternatives were proposed in the HAMP, with the final selection of Mitigation Alternative #7 as outlined in the HAMP and committed to in the final GC Determination. Mitigation Alternative #7 consists of selective catalytic reduction (SCR) installation in the Staten Island Ferry fleet, the repowering of tugboats with newer/cleaner engines under the KVK-5 permit and additional project tugboats, and the use of emission credits purchased by the PANYNJ. The RAT reviewed, commented, and agreed on the 2004 HAMP.

In 2000, the PANYNJ's purchased the Proctor & Gamble (P&G) site in New York, in which the PANYNJ was transferred 202.9 tons NOx/year of Emission Reduction Credits (ERCs) by NYSDEC in early 2001 (an asset of the property purchased). The use of the P&G ERCs during the first two years of the HDP (while the Staten Island Ferry SCR system was being installed and tugboats were being repowered) as a primary offset strategy, however after the first two years these ERC became a "last-ditch" contingency strategy against any short falls in emission offsets.

During the discussions of the SNEO program, it was agreed that the P&G ERCs are not considered part of the SNEO program.

APPENDIX A: SNEO NETTING EXAMPLE

SNEO Program Netting

12-Nov-13

Annual Offsets Summary by Year, tons — **DRAFT**

Offset Source	Offset Program	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
KVK-5 Tugs (Repowers)	HDP	38.0	36.6											
Alice Austen (SCR)	HDP													
John Noble (SCR)	HDP	35.8	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5
Andrew Barberi (Tier I)	HDP	109.9	90.7	90.7	90.7									
Samuel Newhouse (Tier I)	HDP	57.4	82.0	82.0										
Guy V. Molinari (Tier II)	HDP	53.4	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0			
John J. Marchi (Tier II)	HDP	52.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0				
Spirit of America (Tier II)	HDP	14.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0			
John F. Kennedy (Tier I)	HDP	77.9	56.5	56.5	56.5	56.5	56.5							
PJ Tugs (Repowers)	HDP	107.1	107.1											
MVERP (Repowers done)	HDP	91.2	91.2	91.2										
MVERP2 (Repowers planned)	HDP	254.7	254.7	254.7	254.7	254.7	230.6							
Offsets subtotal (in place)		891.3	967.4	823.7	650.4	559.7	535.7	248.5	248.5	248.5	178.5	38.5	38.5	38.5
Offsets subtotal (planned)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offsets (w/HDP Contingency; w/o SNEO Contingency)		891.3	967.4	823.7	650.4	559.7	535.7	248.5	248.5	248.5	178.5	38.5	38.5	38.5
Offsets (w/HDP Contingency; w/SNEO Contingency)		802.2	870.6	741.3	585.4	503.8	482.1	223.7	223.7	223.7	160.7	34.7	34.7	34.7
HDP Emis Requirement (w/HDP Contingency)		**502.2**	**209.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
TOTAL AVAILABLE SNEO (w/HDP & SNEO Contingencies)		**300.0**	**660.7**	**741.3**	**585.4**	**503.8**	**482.1**	**223.7**	**223.7**	**223.7**	**160.7**	**34.7**	**34.7**	**34.7**

Key: In Place | Planned

Annual Available SNEO Allocation by Agency (w/Contingency), tons

Agency	Annual Allocation %	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
USACE-NYD	*Tugs*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*
	SIFF	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*
Available SNEO		**129.8**	**281.4**	**306.1**	**239.3**	**210.7**	**199.9**	**78.3**	**78.3**	**78.3**	**56.2**	**12.1**	**12.1**	**12.1**
PANYNJ	*Tugs*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*
	SIFF	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*
Available SNEO		**129.8**	**281.4**	**306.1**	**239.3**	**210.7**	**199.9**	**78.3**	**78.3**	**78.3**	**56.2**	**12.1**	**12.1**	**12.1**
NYCDOT	*Tugs*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
	SIFF	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*
Available SNEO		**40.4**	**97.9**	**129.0**	**106.9**	**82.4**	**82.4**	**67.1**	**67.1**	**67.1**	**48.2**	**10.4**	**10.4**	**10.4**
TOTAL AVAILABLE SNEO by Agency (w/SNEO Contingency)		**300.0**	**660.7**	**741.3**	**585.4**	**503.8**	**482.1**	**223.7**	**223.7**	**223.7**	**160.7**	**34.7**	**34.7**	**34.7**
	Tugs Allocation QA	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*
	SIFF Allocation QA	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*

SNEO Program Netting

12-Nov-13

Annual Project Emissions, tons **DRAFT**

Agency/Project	Status / Notes	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
USACE-NAN														
Fire Is to Montauk Point, NY		45.6	273.6	273.6	273.6	273.6	273.6	273.6	136.8	0.0	0.0	0.0	0.0	0.0
Long Beach, NY		0.0	0.0	0.0	434.6	22.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
East Rockaway to Rockaway Inlet, NY		0.0	0.0	0.0	91.3	273.7	273.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sea Bright to Clean Township (Elberon to Loch Arbour), NJ		0.0	228.0	501.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total USACE-NYD	**45.6**	**501.7**	**775.3**	**799.5**	**570.1**	**547.3**	**273.6**	**136.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
PANYNJ														
Goethals Bridge	Emission estimates based on GCD	0.0	114.0	153.0	130.0	96.0	92.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TBD		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TBD		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TBD		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total PANYNJ	**0.0**	**114.0**	**153.0**	**130.0**	**96.0**	**92.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
NYCDOT														
TBD	**Total NYCDOT**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Project NOx Emissions		45.6	615.7	928.3	929.5	666.1	639.3	273.6	136.8	0.0	0.0	0.0	0.0	0.0
10% Construction Emissions Contingency		4.6	61.6	92.8	92.9	66.6	63.9	27.4	13.7	0.0	0.0	0.0	0.0	0.0
TOTAL PROJECT NOx EMISSIONS (w/Contruction Contingency)		**50.2**	**677.2**	**1,021.1**	**1,022.4**	**732.8**	**703.2**	**301.0**	**150.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Annual Netted Remaining SNEO (SNEO = Project Emissions - Allocated SNEO), tons

Agency/Project	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
USACE-NYD													
Total Project Emissions (w/Contingency)	45.6	501.7	775.3	799.5	570.1	547.3	273.6	136.8	0.0	0.0	0.0	0.0	0.0
Allocated SNEO (w/Contingency)	129.8	281.4	306.1	239.3	210.7	199.9	78.3	78.3	78.3	56.2	12.1	12.1	12.1
Netted Remaining SNEO	**84.2**	**-220.2**	**-469.1**	**-560.2**	**-359.4**	**-347.4**	**-195.3**	**-58.5**	**78.3**	**56.2**	**12.1**	**12.1**	**12.1**
PANYNJ													
Total Project Emissions (w/Contingency)	0.0	114.0	153.0	130.0	96.0	92.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Allocated SNEO (w/Contingency)	129.8	281.4	306.1	239.3	210.7	199.9	78.3	78.3	78.3	56.2	12.1	12.1	12.1
Netted Remaining SNEO	**129.8**	**167.4**	**153.1**	**109.3**	**114.7**	**107.9**	**78.3**	**78.3**	**78.3**	**56.2**	**12.1**	**12.1**	**12.1**
NYCDOT													
Total Project Emissions (w/Contingency)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Allocated SNEO (w/Contingency)	40.4	97.9	129.0	106.9	82.4	82.4	67.1	67.1	67.1	48.2	10.4	10.4	10.4
Netted Remaining SNEO	**40.4**	**97.9**	**129.0**	**106.9**	**82.4**	**82.4**	**67.1**	**67.1**	**67.1**	**48.2**	**10.4**	**10.4**	**10.4**
TOTAL NETTED REMAINING SNEO (w/Contingency)	**254.4**	**45.1**	**-187.0**	**-344.1**	**-162.4**	**-157.2**	**-49.9**	**86.9**	**223.7**	**160.7**	**34.7**	**34.7**	**34.7**
TOTAL Planning Contingency (SNEO + Construction)	93.7	158.3	175.2	158.0	122.6	117.5	52.2	38.5	24.9	17.9	3.9	3.9	3.9
TOTAL NETTED REMAINING SNEO (w/o Contingency)	348.1	203.4	-11.8	-186.1	-39.8	-39.7	2.3	125.4	248.5	178.5	38.5	38.5	38.5

APPENDIX B: USACE CONTRACT LANGUAGE EXAMPLE

SECTION 01 13 55.00 18

AIR EMISSIONS REQUIREMENTS
(nyd 09)

PART 1 GENERAL

1.1 BACKGROUND

The Contractor shall comply with the air emissions requirements of this section which are intended to ensure compliance with the Federal Clean Air Act and limit the emission of Nitrogen Oxides (NOx)produced by the combustion of fossil fuels.

1.2 AIR EMISSIONS CONSULTANT (AEC)

The Contractor shall retain an independent firm having a minimum of 3 years of experience in calculating air emissions for equipment in the utility, process, construction or manufacturing industries to assist the Contractor in fulfilling the requirements of this section.

1.3 NOx EMISSIONS LIMIT

a. The Contractor shall not adversely affect the attainment plans established by the States of New York and New Jersey. The Government has allocated Air Quality Units for this contract; therefore the Contractor is limited to the following allowable NOx emissions per calendar year unless the Contractor is able to obtain additional Air Quality Units at its own expense.

Calendar Year	Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons)
2010	20.2
2011	34.6

b. NOx emissions shall be calculated for all marine based equipment, with a maximum horsepower output of greater than or equal to **25**, operated in the area as shown on the map at the end of this Section. Emissions from the following equipment, including their auxiliary engines, shall be calculated: dredges, tugs, scows, drill boats, survey boats, supply boats, crew boats, tenders and other water based equipment associated with the Contractor's dredging operation. **Emissions shall be calculated for activities directly related to the performance of the contract.**

c. The Contractor is responsible for ensuring that contract emissions do not exceed the calendar year Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons) for NOx in a given calendar year. Once the Contractor reaches Allocated Air Quality Units (NOx Emissions Allowable

Limit - Tons) in a given calendar year, all water based equipment must cease operations for the remainder of the calendar year unless the Contractor is able to obtain additional Air Quality Units at its own expense. The Contractor will not be entitled to additional time or money in the event that the Contractor exhausts the Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons) made available by the Government and must stop work.

d. The Government has developed an Air Emissions Calculator that must be used by the Bidder during the preparation of its bid to ensure that NOx emissions of all equipment associated with the contract are within the calendar year Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons). The calculator may be downloaded from fedteds.gov web site with the plans and specs.

1.4 AIR EMISSIONS SUBMITTAL REQUIREMENTS

1.4.1 The Contractor shall submit ten (10) copies of the following information within **Five (5) calendar days** of being notified of being the apparent low bidder.

A. The qualifications of the Contractor's Air Emissions Consultant (AEC).

B. Air Emissions Calculator

The Contractor **shall** use the air emissions calculator to estimate the emissions of NOx and provide printed versions of all emission calculation tabs.

The following is provided to describe the calculator and the input data required.

List all engines to be used on the contract on a separate line.

The calculator requires knowledge of the equipment to be used on the project, including the engine horsepower, year of manufacture (its model year), and its regulatory "Tier" level (i.e., Tier 1, Tier 2).

The calculator consists of **four** worksheets within a Microsoft® Excel workbook.
The **four** worksheets are:

- Instructions
- **Dredge Inputs and Calcs**
- **Vessel Input and Calcs**
- Emission Summary

The Instruction Worksheet provides for descriptions of the field names and the action required to input data on the Input and Calculations Worksheet.

Input and Calculations Worksheet: **These worksheet are** where the Contractor inputs information about the equipment that is or will be operating for this contract, such as the dredge engine type and name, "Tier" level, horsepower, NOx Control Method and expected number of hours of operation. Operating hours are those hours that the diesel engine is actually running or operating (not the total time spent onsite) and will be entered for each month of work. Each engine shall be entered on a separate line. Data is only entered on this worksheet; no entries are to be made on the Emission

Summary worksheet.

If an emission control technology such as a fuel emulsion or a catalytic converter is used, or will be used, to reduce NOx emissions, there is a column on the worksheet, entitled NOx Control Method, to incorporate the reduction that the technology is recognized to achieve. The NOx emission control systems effectiveness must be approved by the U.S. Environmental Protection Agency (EPA).

This worksheet also calculates the estimated emissions from the equipment information entered.

The Emission Summary worksheet presents the emission estimates by year. This worksheet is provided to help the Contractor adjust the technology or timing of their dredging operations to ensure that the estimated NOx emissions do not exceed the Allocated Air Quality Units in a given calendar year, thereby indicating whether the projected emissions are at an acceptable level.

C. Certification from the independent Air Emissions Consultant stating the following:

1)That the information provided in 1.4.1.A and 1.4.1.B is accurate;

2)That the construction schedule developed by the Contractor with its' associated marine equipment is within the calendar year Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons); and

3)That any technologies, techniques, or methods identified to reduce emissions are approved by the U.S. Environmental Protection Agency (EPA).

D. Information as identified in Section 00 80 00.00 18, paragraph 1.45.**C**, Air Emissions Information to be submitted by the Contractor.

E. Should the Contractor choose to provide additional Air Quality Units at its own expense for this contract, the Contractor must provide evidence that these additional Air Quality Units are available to the Contractor, are appropriate for use on this contract for the calendar year they are to be used and can be obtained by the Contractor within 35 calendar days of being notified of being the apparent low bidder.

1.4.2 The Contractor shall submit the following information within 35 calendar days of being notified of being the apparent low bidder. If there are no changes to Contractor's 5 calendar day submission, the Contractor shall resubmit the information noting on the cover letter that there were no changes to the respective items.

A. Air Emissions Calculator (described in 1.4.1.B above).

B. Certification from an independent Air Emissions Consultant stating the following:

1)That the information provided in 1.4.2.A is accurate;

2)That the construction schedule developed by the Contractor with its' associated equipment is within the calendar year Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons); and

3)That any technologies, techniques, or methods identified to reduce

emissions are approved by the U.S. Environmental Protection Agency (EPA).

C. Should the Contractor choose to provide additional Air Quality Units for this contract at its own expense, the Contractor must provide documentation that the Air Quality Units are appropriate for use on this contract for the calendar year they are to be used and provide evidence in the form of a contract or agreement, that these additional Air Quality Units are available for use by the Contractor by the 35th calendar day after being notified of being the apparent low bidder.

1.4.3 Information to be provided monthly during the execution of the contract.

A.Air Emissions Calculator and Narrative

1)The Air Emissions calculator and Narrative shall be updated monthly and submitted electronically. Updated calculations, narrative and other information associated with this task are due 10 days after the end of the month.

2)The Air Emissions Calculator shall be updated monthly to reflect actual hours worked, equipment actually used, **and daily runtime per reportable engine, and other applicable information, on the data logging sheet provided at the end of this section**; and actual emission control methods used during the previous month; and

3)Revise future emissions to reflect future hours of work remaining, equipment and emission control method adjustments.

4)A narrative explaining the changes from the baseline (Air Emissions Calculator submitted within 30 calendar days after award) to the updated Air Emissions Calculator shall be submitted.

B.Certification from an independent Air Emissions Consultant stating the following:

1)That the information provided in 1.4.3.A is accurate;

2)That the construction schedule developed by the Contractor with its' associated equipment is within the calendar year Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons); and

3)That any technologies, techniques, or methods used to reduce emissions are approved by the U.S. Environmental Protection Agency (EPA).

C. If after the NTP is issued and during the execution of the Contract the Contractor chooses to provide additional Air Quality Units at its own expense, the Contractor must provide, **at least two weeks** prior to the use of the Air Quality Units, documentation that these additional Air Quality Units are appropriate for use on this contract for the calendar year they are to be used.

1.5 OPERATIONAL MONITORING, RECORDKEEPING, AND REPORTING

The Contractor shall be required to install appropriate instrumentation (data loggers) on the dredges to record and measure as a minimum engine hours of operation, , engine speed, engine temperature, and fuel use rates. The Contractor shall download data from the data loggers and

provide the information to the COR on a quarterly basis. The Contractor shall provide access to the Government and its contractors to observe the installation, operation, and download of data from the data loggers. The Contractor shall maintain the data loggers. Should a data logger fail, the Contractor shall notify the COR and maintain records manually on an hourly basis until the data logger is repaired.

The Contractor shall maintain daily records on engines that are not equipped with a data logger (i.e., engines other than dredge engines). These records will be provided to the Government on a regular basis. The records will be maintained as part of the Contractor's daily report and provided to the Government on that basis (i.e., with the same frequency as the daily report). An example of the log sheet for keeping these required records is attached at end of this section.

1.6 IN-USE TESTING OF DREDGING EQUIPMENT

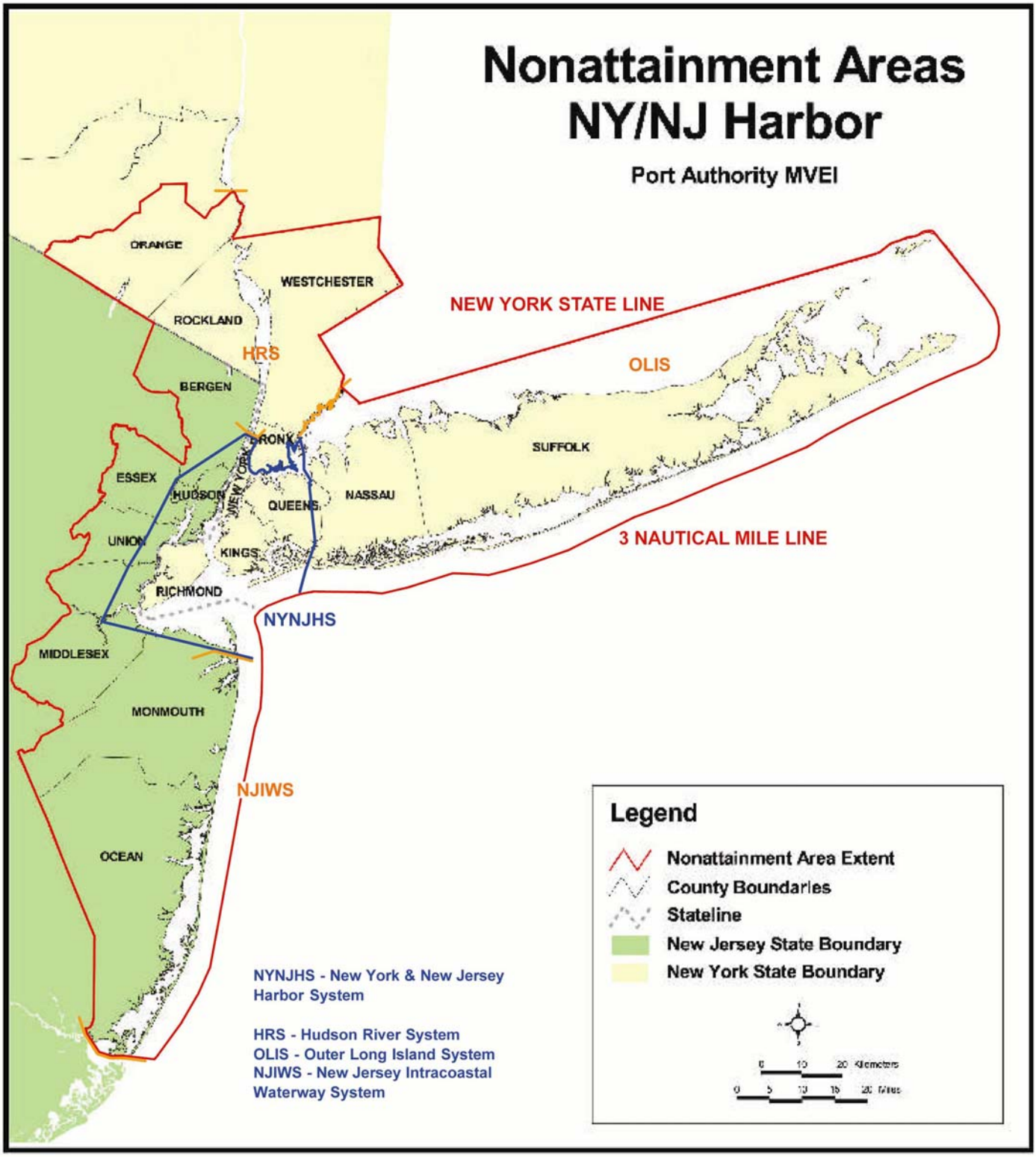
The Contractor shall cooperate with and assist the Government and its contractor(s) in obtaining measurements of emissions from the major engines powering the dredge(s) and associated equipment. The Government will be responsible for the testing program and the required equipment, while the Contractor will be responsible for making such minor physical modifications to the dredging equipment as may be necessary for successful emission testing. (Such modifications may include the installation of sampling ports on exhaust ducts or mounting brackets to support measuring equipment.) The Government and its emission testing contractor(s) will provide specific instructions on any physical modifications the Contractor is required to make after the issuance of the NTP.

The Contractor shall notify the COR of any plans to substitute or add major pieces of equipment to allow the Government to determine whether additional emission testing will be warranted. Engines with test equipment attached shall not be removed from the contract area without written consent from the COR.

1.7 MEASUREMENT AND PAYMENT

No separate payment shall be made for this item.

-- End of Section --


Nonattainment Areas
NY/NJ Harbor
Port Authority MVEI
ORANGE
WESTCHESTER
ROCKLAND
HRS
BERGEN
NEW YORK STATE LINE
OLIS
BRONX
SUFFOLK
ESSEX
HUDSON
NEW YORK
QUEENS
NASSAU
UNION
KINGS
3 NAUTICAL MILE LINE
RICHMOND
NYNJHS
MIDDLESEX
MONMOUTH
NJIWS
OCEAN
Legend
Nonattainment Area Extent
County Boundaries
Stateline
New Jersey State Boundary
New York State Boundary
NYNJHS - New York & New Jersey Harbor System
HRS - Hudson River System
OLIS - Outer Long Island System
NJIWS - New Jersey Intracoastal Waterway System

PAGE 6

U.S. Army Corps of Engineers - New York District PJ4

SAN2 Contract 10 Vessel Data Logging Sheet Page 7

THE PORT AUTHORITY OF NY & NJ

MONTH: _____

YEAR: _____

Page: _____ of _____

Vessel Name:

	Engine Information				Activity Information			
Date	Engine Name	Engine Type (Propulsion, Auxiliary, etc.)	Daily Runtime (hours)	Daily Fuel Consumption (tons or gallons)	# of Daily Trips to HARS or Reef	Average Transit Time Within 3-Nautical Mile Line (hours)	Average Loaded Speed (knots)	Average Unloaded Speed (knots)

U.S. Army Corps of Engineers - New York District

SAN2 Contract 10 Dredge Data Logging Sheet Page 8

THE PORT AUTHORITY OF NY & NJ

MONTH: _____
YEAR: _____
Page: of _____ _____

Dredge/Barge Name:

	Engine Information				Activity Information			
Date	Engine Name	Engine Type (Main, Aux, Pump, etc)	Daily Runtime (hours)	Daily Fuel Consumption (tons or gallons)	Sediment Type	Daily Dredged Volume (cubic yards)	Scow Capacity (cubic yards)	Daily Number of Scows Filled

Attachment 2 – MVERP Survey of Interest Fact Sheet

FACT SHEET

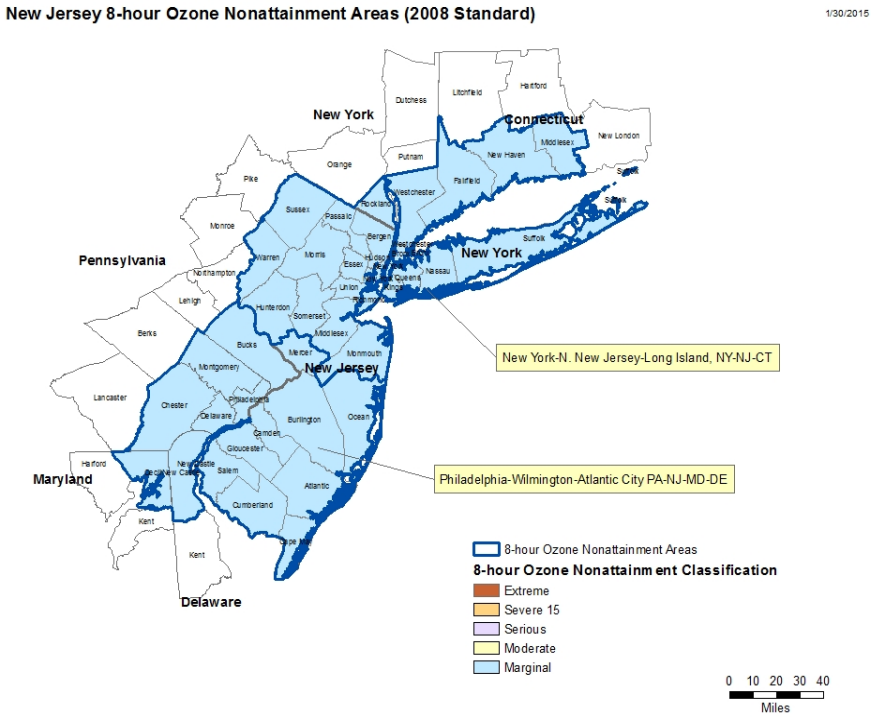
The United States Army Corps of Engineers New York District is conducting a survey to determine interest from vessel owners/operators in a Marine Vessel Engine Replacement Program, similar to the programs conducted by the Port Authority of New York and New Jersey. The Army Corps is interested in conducting engine replacement programs to offset upcoming project emissions.

What will the program pay?

The program would pay for new marine engines that have lower emissions (and typically lower fuel consumption) than existing vessel engines. The vessel owner would be responsible for costs associated with installation and any changes to onboard machinery.

Who is eligible?

The area of operation includes NY/NJ harbor, Long Island Sound, Long Island and New Jersey coast, and Philadelphia/Delaware River areas (see figure) and the Army Corps is looking for vessels that spend a significant percent of their operational time in these areas (75% or greater). Vessel owners in this area can apply for funding for propulsion and auxiliary engines.



What are the requirements?

Repowered vessels will be required to operate in the above areas for 10 years; if the vessel is moved out of the area a decreasing repayment schedule would apply (similar to the Port's program).

What is the timeframe?

The programs would be completed through a Request for Proposals anticipated to come out in

Interested?

If your company is interested in the program, please respond to the following questions:
Name of Company
Contact information for the Request for Proposal (Name, Mail, Phone, email)
What type of vessel? For example: excursion, towboat, tugboat, ferry, workboat, supply boat.
How many vessels and engines would you consider repowering?
Engine Information, if available (model year, horsepower, engine make/model, average hours)

Contact

For further questions, please contact the Starcrest Consulting Group consultant that sent you this fact sheet.

Attachment 3 – Survey of Interest Data Template

Company Name	Vessel Types	Count	Address	Phone Number	Contact Name	Email	Interested?	Percent in Study Area (>75% for eligibility)	Vessel Name	Vessel Type	Engine Type (propulsion or auxiliary)	Engine Count	Model Year	Horsepower	Make and Model	Average Hours
ABC Tow	*Tugboat*	*1*	*Staten Island NY*	*number*	*name*	*email*	*Yes*	*100%*	*Emily*	*Tugboat*	*Propulsion*	*2*	*1989*	*2000*	*CAT 3406*	*900*
ABC Tow	*Tugboat*	*1*	*Staten Island NY*	*number*	*name*	*email*	*Yes*	*100%*	*Emily*	*Tugboat*	*Auxiliary*	*2*	*1989*	*100*	*Perkins*	*1500*

Attachment 4 – Sample PANYNJ MVERP Contract with Vessel Owner

THE PORT AUTHORITY OF NEW YORK & NEW JERSEY

MEMORANDUM

TO: Karen Eastman
FROM: Larry Waxman
DATE: November 24, 2008

RE: **Marine Vessel Engine Replacement Program (MVERP) for Vessels that Operate within the United States Environmental Protection Agency Designated New York-Northern New Jersey-Connecticut-Long Island Ozone Non-Attainment Area, RFP #15091; Purchase Order #4500057399**

COPY TO: SEE BELOW

Transmitted herewith is the original contract as described above with White Near Coastal Towing, in the net estimated amount of $180,700.

Conformed copies of this contract are being distributed as follows:

R. Hsu
C. Tse
J. Huxel (2)
M. Bennett
L. Waxman
J. Hutnick (2)
M. Masters (2)
D. Bailey
J. Grossgold
D. Vrecenak
PSD Files

Larry Waxman
Manager, Technology and Operational
Procurement Services Division

THE PORT AUTHORITY OF NY & NJ

November 3, 2008

Mr. Roy White
President
White Near Coastal Towing
333 Jackson Avenue, ST 9
Syosset, NY 11791

RE: **MARINE VESSEL ENGINE REPLACEMENT PROGRAM (MVERP) FOR VESSELS THAT OPERATE WITHIN THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY DESIGNATED NEW YORK- NORTHERN NEW JERSEY- CONNECTICUT- LONG ISLAND OZONE NON-ATTAINMENT AREA; REQUEST FOR PROPOSAL NUMBER 15091; PURCHASE ORDER NUMBER 4500057399; CAPTAIN ZEKE**

Dear Mr. White:

The Port Authority of New York and New Jersey ("The Port Authority" or "the Authority") hereby offers to enter into an agreement, subject to the provisions of this letter, as hereinafter set forth ("the Agreement") with White Near Costal Towing, ("the Contractor") for the performance of the services under the above-referenced Contract.

The Contract between the parties shall consist of the following items and in case of a conflict between or among the said items; their precedence shall be in the following descending order.

1. This Letter of Acceptance, which shall control over all other documents.
2. The Port Authority's Request for Proposal (RFP) # 15091, Attachment B, Part I- "Contract Specific Terms and Conditions"; Part II-"Standard Contract Terms and Conditions"
3. Addendum #1,Non- Attainment Area (NAA) Map
4. The following sections of your proposal time stamped, 1:21 PM, April 17, 2008

   - Attachment B- Part III -Cost Proposal Form #2,"Captain Zeke"
   - Memo RE: MARINE VESSEL ENGINE REPLACEMENT PROGRAM (MVERP) for Vessels that Operate within the United States Environmental Protection Agency Designated New York-Northern New Jersey-Connecticut-Long Island Ozone Non-Attainment Area, RFP #15091: Clarifications and Concerns time stamped 3:34 PM, June 2, 2008
   - Letter of Transmittal

One Madison Avenue,7th fl
New York, NY 10010
T: 212 435 7000

- Executive Summary
- Proposal
- Technical data
- USCG document Survey
- Attachment A: Agreement on Terms Of Discussion

Please note the Port Authority's sole financial obligation hereunder is to reimburse White Near Coastal Towing for the actual cost of the replacement and auxiliary engines in accordance with the provisions of the RFP, in an amount not to exceed $180,700. No other amounts shall be payable to White Near Coastal Towing hereunder including any other amounts contained in the cost proposal sheet #2 submitted by White Near Coastal Towing.

In addition, the following provisions shall apply:

The re-powered vessel, Captain Zeke", must be operational no later than six months following the date on which the Port Authority executes this letter.

White Near Coastal Towing agrees to allow for site visits by a representative of the Port Authority at the location where the work will be performed to confirm the following events:

Receipt of the new engine
Completion of installation in accordance with manufacturer instructions
Destruction of the existing engine or rendering them inoperable
Witness the launch of the re-powered vessel
Running test with engine manufacturer's representatives

White Near Coastal Towing will provide documentation to demonstrate the "Captain Zeke" operation within the Non-Attainment Area in accordance with Attachment B-Part I, Contract Specific Terms and Conditions. This documentation is to be provided to the Port Authority of New York and New Jersey on a semi-annual basis for a period of ten years, commencing with the successful completion of sea trials. Information must be submitted prior to the 5th day following the six-month anniversary of the successful completion of sea trials. Information should be sent to:

Ms Dorian Bailey
Port Authority of NY & NJ
Materials Engineering Division
241 Erie Street, Room 234
Jersey City NJ. 07310
Telephone: 201-216-2963
dbailey@panynj.gov

or to such other individual as may subsequently be designated in writing.

Except as they have been identified above, no other documents or submission by the contractor are to be considered as part of the Contract.

Prior to the commencement of work, please submit to the Port Authority your insurance certificates as required per the contract, Attachment B-Part I Section 4, entitled "Insurance". Please send your certificate to: General Manager, Risk Financing, 225 Park Avenue South, 12th floor, New York, New York 10003. Please reference CITS #2431N on your certificate.

Your Port Authority Contract Administrator is John Hutnick. He can be reached at 973-792-4663 or jhutnick@panynj.gov. For payment, invoicing and administrative purposes, Purchase Order #4500057399 will be assigned to the Contract and must be referenced on all correspondence, including invoices.

We look forward to working with White Near Coastal Towing to advance this regionally significant air quality improvement initiative.

If you are in agreement with the above, please indicate such agreement by signing the duplicate originals of this Letter of Acceptance below and returning both to the attention of Maryellen Bennett, 7th Floor, at the address provided at the bottom of page 1. A copy is enclosed for your records.

Very truly yours,

APPROVED:	
FORM	TERMS

The Port Authority of New York & New Jersey

By: _____
Title: Director of Procurement Department
Date: 11/21/08

Agreed:
White Near Coastal Towing

By: Roy J White
Title: President
Date: 11/14/08

ATTACHMENT B

CONTRACT TERMS AND CONDITIONS FOR FACILITY SERVICES

TABLE OF CONTENTS

PART I – CONTRACT SPECIFIC TERMS AND CONDITIONS

1. Introduction and Description of Services
2. Billing and Payment
3. Extra Work
4. Insurance Procured By the Contractor

PART I- CONTRACT SPECIFIC TERMS AND CONDTIONS

1. General Agreement

Subject to all of the terms and conditions of this Contract, the undersigned (hereinafter called the "Contractor") hereby offers and agrees to provide all the necessary supervision, personnel, equipment, materials and all other things necessary to perform the Work required by this Contract as specified in Part I, and fully set forth in the Scope of Work, in Attachment D and do all other things necessary or proper therefor or incidental thereto, all in strict accordance with the provisions of the Contract Documents and any future changes therein; and the Contractor further agrees to assume and perform all other duties and obligations imposed upon him/her by this Contract.

In addition, all things not expressly mentioned in the Specifications but involved in the carrying out of their intent and in the complete and proper execution of the matters referred to in and required by this Contract are required by the Specifications, and the Contractor shall perform the same as though they were specifically delineated, described and mentioned therein.

2. Billing and Payment

Subject to the provisions of this Contract, the Port Authority agrees to pay and the Contractor agrees to accept from the Port Authority as full and complete compensation for the performance of the Port Authority's obligations under this Contract an amount computed from the prices as set forth in the Cost Proposal Form, subject, however, to all payments and adjustments as hereinafter specifically provided.

The Contractor's compensation for work will be computed based on the actual work performed. Payments made hereunder are subject to such adjustment as may be necessitated following Port Authority verification of the accuracy of amounts billed.

Standard payment terms are net thirty days after receipt of invoice.
The Port Authority agrees to reimburse each Contractor the amount actually paid by the Contractor for replacement (Make and Model) engines to be placed in the (Vessel Name)as proposed in the Proposer's proposal (Date) provided such amount is no greater than that contained in the proposal. No other costs will be reimbursed.
The Contractor must submit both its actual paid invoices for the new engines and proof that the old engines have been scrapped (as evidenced by a contract, delivery/purchase order for scrappage, witness by Port Authority representative, or by a letter from the scrap yard confirming that the engines were destroyed) to the Port Authority.
Documentation shall also be provided to show that the new engines have been installed and successfully sea tested. The company is to advise the Port Authority of installation,

scrappage and sea trials sufficiently in advance so that Port Authority representatives may have the opportunity to witness these events.

If the Contractor defaults on the requirement regarding hours of operation within the NAA, the Port Authority shall have the right to terminate the contract and upon such event the Contractor shall make partial and proportional repayment of the Port Authority's engine purchase costs in accordance with the following schedule:

Default Year	Amount Reimbursed
Amount paid by Port Authority:_____	
Year 1-	Amount paid by Port Authority x 1.0
Year 2 -	Amount paid by Port Authority x .90
Year 3 -	Amount paid by Port Authority x .80
Year 4	Amount paid by Port Authority x .70
Year 5	Amount paid by Port Authority x .60
Year 6	Amount paid by Port Authority x .50
Year 7	Amount paid by Port Authority x .40
Year 8	Amount paid by Port Authority x .30
Year 9	Amount paid by Port Authority x .20

Should the Contractor claim mitigating factors beyond its control were the cause of such default, the Authority will take those factors into account when deciding whether to terminate the contract and require the default repayment and the operation of the replacement engines.

The Port Authority is only providing funding up to the cost of new replacement engines for vessel propulsion and/or auxiliary power. The Port Authority is not providing technical review or approval of the work, and the Contractor is solely responsible for that work. Therefore, the Contractor assumes the risk of all loss or damage arising out of or in connection with the work and shall indemnify and hold harmless the Authority against all claims, suits, losses or damages arising out of or in connection with the engine replacement work.

"Final Payment," as the term is used throughout this Contract, shall be the final payment made for services rendered in the final month of the Contract term or any extension thereof. However, should this Contract be terminated for any reason prior to the final month of the Contract Term then Final Payment shall be the payment made for services rendered in the month during which such termination becomes effective.

The acceptance by the Contractor, or by anyone claiming by or through him, of Final Payment shall be and shall operate as a release to the Authority of all claims and of all liability to the Contractor for all things done or furnished in connection with the Contract and for every act and neglect of the Authority and others relating to or arising out of the Contract, including claims arising out of breach of Contract and claims based on claims of third persons. No payment, however,

final or otherwise, shall operate to release the Contractor from any obligation in connection with this Contract.

The Contractor's agreement as provided in the immediately preceding paragraph shall be deemed to be based upon the consideration forming part of this Contract as a whole and not to be gratuitous; but in any event even if deemed gratuitous and without consideration, such agreement as provided in the immediately preceding paragraph shall nevertheless be effective. Such release shall include all claims, whether or not in litigation and even though still under consideration by the Authority. Such release shall be effective notwithstanding any purported reservation of right by the Contractor to preserve such claim. The acceptance of any check designated as "Final Payment" or bearing any similar designation shall be conclusively presumed to demonstrate the intent of the Contractor that such payment was intended to be accepted as final, with the consequences provided in this numbered clause, notwithstanding any purported reservation of rights.

The Contractor agrees that he shall not be entitled to, and hereby waives any right he might otherwise have to, and shall not seek any judgment whether under this Contract or otherwise for any such Final Payment for an amount equivalent thereto or based thereon, or for any part thereof, if such judgment would have the effect of varying, setting aside, disregarding or making inapplicable the terms of this numbered clause or have the effect in any way of entitling the Contractor to accept such Final Payment or an amount equivalent thereto or based thereon or any part thereof other than in the same fashion as a voluntary acceptance of a Final Payment subject to all terms of this Contract including this numbered clause, unless and until the Contractor should obtain a judgment on any claim arising out of or in connection with this Contract (including a claim based on breach of Contract) for an amount not included in said Final Payment. In any case in which interest is allowable on the amount of the Final Payment, such interest shall be at the rate of 6% per annum for the period, if any, in which such interest is due.

5. Extra Work

The Contractor is required to provide separate materials, supplies, equipment and personnel for Extra Work when such is deemed necessary by the Manager. "Extra Work" as used herein shall be defined as work which differs from that expressly or impliedly required by the Specifications in their present form. Total Extra Work performed by the Contractor shall not exceed six percent (6%) of the Total Contract Price of this Contract for the entire Term of this Contract including extensions thereof.

An increase in area or frequency does not constitute Extra Work, but shall be compensable based on the prices in the Cost Proposal Form and the paragraph herein titled "Increase or Decrease in Areas or Frequencies".

The Contractor is required to perform Extra Work pursuant to a written order of the Manager expressly recognizing such work as Extra Work. If Lump Sum or Unit Price compensation cannot be agreed upon by the parties in writing

prior to the start of Work, the Contractor shall perform such Extra Work and the Contractor's compensation shall be increased by the sum of the following amounts and such amounts only: (1) the actual net cost, in money, of the labor, and material, required for such Extra Work; (2) ten percent (10%) of the amount under (1) above; (3) such rental as the Manager deems reasonable for plant and equipment (other than small tools) required for such Extra Work; (4) if the Extra Work is performed by a subcontractor, an additional five percent (5%) of the sum of the amounts under (1) through (3) above.

As used in this numbered clause (and in this clause only):

"Labor" means laborers, mechanics, and other employees below the rank of supervisor, directly employed at the Site of the Work subject to the Manager or his/her designee's authority to determine what employees of any category are "required for Extra Work" and as to the portion of their time allotted to Extra Work; and "cost of labor" means the wages actually paid to and received by such employees plus a proper proportion of (a) vacation allowances and union dues and assessments which the employer actually pays pursuant to contractual obligation upon the basis of such wages, and (b) taxes actually paid by the employer pursuant to law upon the basis of such wages and workers' compensation premiums paid pursuant to law. "Employees" as used above means only the employees of one employer.

"Net Cost" shall be the Contractor's actual cost after deducting all permitted cash and trade discounts, rebates, allowances, credits, sales taxes, commissions, and refunds (whether or not any or all of the same shall have been taken by the Contractor) of all parts and materials purchased by the Contractor solely for the use in performing its obligation hereunder provided, such purchase has received the prior written approval of the Manager as required herein. The Contractor shall promptly furnish to the Manager such bills of sale and other instruments as may be required by it, executed, acknowledged and delivered, assuring to it title to such materials, supplies, equipment, parts, and tools free of encumbrances.

"Materials" means temporary and consumable materials as well as permanent materials; and "cost of materials" means the price (including taxes actually paid by the Contractor pursuant to law upon the basis of such materials) for which such materials are sold for cash by the manufacturers or producers thereof, or by regular dealers therein, whether or not such materials are purchased directly from the manufacturer, producer or dealer (or if the Contractor is the manufacturer or producer thereof, the reasonable cost to the Contractor of the manufacture and production), plus the reasonable cost of delivering such materials to the Site of the Work in the event that the price paid to the manufacturer, producer or dealer does not include delivery and in case of temporary materials, less their salvage value, if any.

The Manager shall have the authority to decide all questions in connection with the Extra Work. The exercise by the Manager of the powers and authorities vested in him/her by this section shall be binding and final upon the Port Authority and the Contractor.

The Contractor shall submit all reports, records and receipts as are requested by the Manager so as to enable him/her to ascertain the time expended in the performance of the Extra Work. the quantity of labor and materials used therein and the cost of said labor and materials to the Contractor.

The provisions of this Contract relating generally to Work and its performance shall apply without exception to any Extra Work required and to the performance thereof. Moreover, the provisions of the Specifications relating generally to the Work and its performance shall also apply to any Extra Work required and to the performance thereof, except to the extent that a written order in connection with any particular item of Extra Work may expressly provide otherwise.

If the Contractor deems work to be Extra Work, the Contractor shall give written notice to the Manager within twenty-four (24) hours of performing the work that he so considers as Extra Work, and failure of the Contractor to provide said notice shall be a waiver of any claim to an increase in compensation for such work and a conclusive and binding determination that it is not Extra Work.

The Contractor shall supply the amount of materials, supplies, equipment and personnel required by the Manager within four (4) hours following the receipt of written or verbal notice from the Manager, or in the case of an emergency as determined by the Manager, within four (4) hours following the receipt by the Contractor of the Manager's written or oral notification. Where oral notification is provided hereunder, the Manager shall thereafter confirm the same in writing.

All Extra Work shall be billed to the Port Authority on a separate invoice on a monthly basis.

Section 4. Insurance

The Contractor shall maintain throughout the term of this agreement (including the ten year minimum period of operation requested hereunder) replacement cost hull insurance including, but not limited to the cost of the engines. The Port Authority shall be a named insured on such policy of insurance. Should such insurance not be in force at any time throughout the term of the agreement, the Authority shall have the right to terminate the contract and to be reimbursed for its payment for the engines in accordance with the payment schedule outlined in Attachment B Part I Section 2 above.

The Contractor shall take out, maintain and pay the premiums on the below stated policy or policies of insurance, including but not limited to premises-operations and products-completed operations, broad form property damage and independent contractors coverage, with a contractual liability endorsement covering the obligations assumed by the Contractor under this Contract and, if vehicles are to be used to carry out the performance of this Contract, then the Contractor shall also procure, maintain and pay the premiums on Automobile Liability Insurance covering owned, non-owned and rented vehicles in limits not less than the amounts set forth below:

COMMERCIAL GENERAL LIABILITY INSURANCE

$5 million combined single limit per occurrence for bodily injury and property damage liability.

AUTOMOTIVE LIABILITY INSURANCE

$5 million combined single limit per accident for bodily injury and property damage liability.

PROPERTY DAMAGE INSURANCE – on an all-risk basis with full replacement value for each new tugboat engine, including but not limited to, spare parts, special tools and test equipment, covering all phases of this contract, including the performance-testing phase of this contract. .This said policy shall include The Port Authority of New York and New Jersey as loss payee.

PROTECTION AND INDEMNITY INSURANCE – a policy of Marine Protection and Indemnity Insurance and Chartered Legal Liability Insurance, where applicable, relating to the operation, maintenance, or use of any vessel (whether self-propelled or being towed) in connection with the work to be performed in this contract, in a limit of liability of not less than $5 million for any one occurrence, including masters and members of crews of vessels.

Such liability policy or policies shall contain the following endorsements.

"The insurer shall not, without obtaining express advance permission from the General Counsel of the Authority, raise any defense involving in any way the jurisdiction of the Tribunal over the person of the Authority, the immunity of the Authority, its Commissioners, officers, agents or employees, the governmental nature of the Port Authority, or the provisions of any statutes respecting suits against the Port Authority."

The liability policy or policies carried by the Contractor and Subcontractors must contain **"Cross-Liability/Severability of Interests coverage**, providing that the protection afforded the Contractor thereunder, with respect to any claim or action against the Contractor by a third person, shall pertain and apply with like effect with respect to any claim or action against the contractor by the Port Authority, or against the Port Authority by the Contractor, but said endorsement shall not limit, vary, change or affect the provisions afforded the Port Authority as an additional insured.

The Port Authority of New York and New Jersey shall be named as an additional insured in the policy or policies set forth above.

In addition, the Contractor shall take out, maintain and pay premiums on **Workers' Compensation Insurance** (including other states coverage) in accordance with the requirements of the law.

Certified copies of the policy or policies described above or a certificate or certificates evidencing the existence thereof shall be delivered to the General Manager, Risk Management, The Port Authority of New York and New Jersey, 225 Park Avenue South, 12th Floor, New York, NY 10003, within ten (10) days after the execution of this Contract by both the Authority and the Contractor. Such policy or policies, certificate or certificates shall state the number of this contract and shall contain a valid provision or endorsement that the policy or policies may not be canceled, terminated, changed or modified without giving thirty (30) days written advance notice thereof to the Port Authority. Renewal policies shall be delivered to the Port Authority at least fifteen (15) days prior to the expiration date of each expiring policy. If at any time any of the certificates or policies shall be or become unsatisfactory to the Port Authority as to form or

substance, or if the carrier issuing any such certificate or policy shall be or become unsatisfactory to the Port Authority, the Contractor shall promptly obtain a new and satisfactory certificate and policy. Upon request of the General Manager, Risk Management, the Contractor shall furnish the Port Authority with a certified copy of each policy stated above. **(CITS #2431N)**

ATTACHMENT B- PART II- STANDARD CONTRACT TERMS AND CONDITIONS

PART I GENERAL DEFINITIONS 3

PART II GENERAL PROVISIONS 4

1. Facility Rules and Regulations of The Port Authority 4
2. Contractor Not An Agent 4
3. Contractor's Warranties 5
4. Personal Non-Liability 6
5. Equal Employment Opportunity, Affirmative Action, Non-Discrimination 6
6. Rights and Remedies of the Port Authority 6
7. Rights and Remedies of the Contractor 6
8. Submission To Jurisdiction 6
9. Harmony 7
10. Claims of Third Persons 7
11. No Third Party Rights 8
12. Provisions of Law Deemed Inserted 8
13. Costs Assumed By The Contractor 8
14. Default, Revocation or Suspension of Contract 8
15. Sales or Compensating Use Taxes 11
16. No Estoppel or Waiver 11
17. Records and Reports 11
18. General Obligations 12
19. Assignments and Subcontracting 14
20. Indemnification and Risks Assumed By The Contractor 14
21. Approval of Methods 15
22. Safety and Cleanliness 15
23. Accident Reports 15
24. Trash Removal 15
25. Lost and Found Property 16
26. Property of the Contractor 16
27. Modification of Contract 16
28. Invalid Clauses 16
29. Approval of Materials, Supplies and Equipment 16
30. Intellectual Property 17
31. Contract Records and Documents – Passwords and Codes 17
32. High Security Areas 17
33. Notification of Security Requirements 18
34. Construction In Progress 19
35. Permit-Required Confined Space Work 19
36. Signs 19
37. Vending Machines, Food Preparation 19
38. Non-Publication 19
39. Time is of the Essence 19
40. Holidays 19
41. Personnel Standards 20
42. General Uniform Requirements for Contractor's Personnel 20
43. Labor, Equipment and Materials Supplied by the Contractor 20
44. Contractor's Vehicles – Parking - Licenses 21

45. Manager's Authority 21
46. Price Preference 21
47. M/WBE Good Faith Participation 21

PART III CONTRACTOR'S INTEGRITY PROVISIONS 23
1. Certification of No Investigation (criminal or civil anti-trust), Indictment, Conviction, Debarment, Suspension, Disqualification and Disclosure of Other Information 23
2. Non-Collusive Bidding, and Code of Ethics Certification, Certification of No Solicitation Based On Commission, Percentage, Brokerage, Contingent or Other Fees 23
3. Bidder Eligibility for Award of Contracts - Determination by an Agency of the State of New York or New Jersey Concerning Eligibility to Receive Public Contracts 25
4. No Gifts, Gratuities, Offers of Employment, Etc. 25
5. Conflict of Interest 26
6. Definitions 26

STANDARD CONTRACT TERMS AND CONDITIONS

PART I GENERAL DEFINITIONS

To avoid undue repetition, the following terms, as used in this Agreement, shall be construed as follows:

Authority or Port Authority - shall mean the Port Authority of New York and New Jersey.

Contract, Document or Agreement - shall mean the writings setting forth the scope, terms, conditions and Specifications for the procurement of Goods and/or Services, as defined hereunder and shall include, but not be limited to: Invitation for Bid (IFB), Request for Quotation (RFQ), Request for Proposal (RFP), Purchase Order (PO), Cover Sheet, executed Signature Sheet, AND PRICING SHEETS with Contract prices inserted," "STANDARD CONTRACT TERMS AND CONDITIONS," and, if included, attachments, endorsements, schedules, exhibits, or drawings, the Authority's acceptance and any written addenda issued over the name of the Authority's Manager, Purchasing Services Division.

Days or Calendar Days - shall mean consecutive calendar days, Saturdays, Sundays, and holidays, included.

Week - unless otherwise specified, shall mean seven (7) consecutive calendar days, Saturdays, Sundays, and holidays.

Month - unless otherwise specified, shall mean a calendar month.

Director - shall mean the Director of the Department which operates the facility of the Port Authority at which the services hereunder are to be performed, for the time being, or his/her successor in duties for the purpose of this Contract, acting personally or through one of his/her authorized representatives for the purpose of this Contract.

Manager - shall mean the Manager of the Facility for the time being or his successor in duties for the purpose of this Contract, acting personally or through his duly authorized representative for the purpose of this Contract.

No person shall be deemed a representative of the Director or Manager except to the extent specifically authorized in an express written notice to the Contractor signed by the Director or Manager, as the case may be. Further, no person shall be deemed a successor in duties of the Director unless the Contractor is so notified in writing signed by the Authority's Manager, Purchasing Services Division. No person shall be deemed a successor in duties of the Manager unless the Contractor is so notified in a writing signed by the Director.

Minority Business Enterprise (MBE) - shall mean a business entity which is at least 51% owned and controlled by one or more members of one or more minority groups, or, in the case of a publicly held corporation, at least 51% of the stock of which is owned by one or more minority groups, and whose management and daily business operations are controlled by one or more such individuals who are citizens or permanent resident aliens.

"Minority Group" means any of the following racial or ethnic groups:

(a) Black persons having origins in any of the Black African racial groups not of Hispanic origin;

(b) Hispanic persons of Mexican, Puerto Rican, Dominican, Cuban, Central or South American culture or origin, regardless of race;

(c) Asian and Pacific Islander persons having origins in any of the original peoples of the Far East, Southeast Asia, The Indian Subcontinent, or the Pacific Islands;

(d) Native American or Alaskan native persons having origins in any of the original peoples of North
America and maintaining identifiable tribal affiliations through membership and participation or community identification.

Site of the Work - or words of similar import shall mean the Facility and all buildings and properties associated therewith as described in this Contract.

Small Business Enterprise (SBE) - The criteria for a Small Business Enterprise are:

- o The principal place of business must be located in New York or New Jersey;
- o The firm must have been in business for at least three years with activity;
- o Average gross income limitations by industry as established by the Port Authority.

Subcontractor - shall mean anyone who performs work (other than or in addition to the furnishing of materials, plant or equipment) in connection with the services to be provided hereunder, directly or indirectly for or on behalf of the Contractor (and whether or not in privity of contract with the Contractor), but shall not include any person who furnished merely his own personal labor or his own personal services. "Subcontractor", however, shall exclude the Contractor or any subsidiary or parent of the Contractor or any person, firm or corporation which has a substantial interest in the Contractor or in which the Contractor or the parent or the subsidiary of the Contractor, or an officer or principal of the Contractor or of the parent of the subsidiary of the Contractor has a substantial interest, provided, however, that for the purpose of the clause hereof entitled "Assignments and Subcontracts" the exclusion in this paragraph shall not apply to anyone but the Contractor itself.

Women-Owned Business Enterprise (WBE) - shall mean a business enterprise which is at least 51% owned by one or more women, or, in the case of a publicly held corporation, at least 51% of the stock of which is owned by one or more women and whose management and daily business operations are controlled by one or more women who are citizens or permanent or resident aliens.

Work - shall mean all services, equipment and materials (including materials and equipment, if any, furnished by the Authority) and other facilities and all other things necessary or proper for, or incidental to the services to be performed or goods to be furnished in connection with the service to be provided hereunder.

PART II GENERAL PROVISIONS

1. Facility Rules and Regulations of The Port Authority

a. The Contractor shall observe and obey (and compel its officers, employees, guests, invitees, and those doing business with it, to observe and obey) the facility Rules and Regulations of the Port Authority now in effect, and such further reasonable Rules and Regulations which may from time to time during the term of this Agreement be promulgated by the Port Authority for reasons of safety, health, preservation of property or maintenance of a good and orderly appearance and efficient operation of the Facility. The Port Authority agrees that, except in case of emergency, it shall give notice to the Contractor of every Rule and Regulation hereafter adopted by it at least five days before the Contractor shall be required to comply therewith.

b. A copy of the facility Rules and Regulations of the Port Authority shall be available for review by the Contractor at the Office of the Secretary of the Port Authority.

2. Contractor Not An Agent

This Agreement does not constitute the Contractor the agent or representative of the Port Authority for any

purpose whatsoever except as may be specifically provided in this Agreement. It is hereby specifically acknowledged and understood that the Contractor, in performing its services hereunder, is and shall be at all times an independent Contractor and the officers, agents and employees of the Contractor shall not be or be deemed to be agents, servants or employees of the Port Authority.

3. Contractor's Warranties

The Contractor represents and warrants:

a. That it is financially solvent, that it is experienced in and competent to perform the requirements of this Contract, that the facts stated or shown in any papers submitted or referred to in connection with the solicitation are true, and, if the Contractor be a corporation, that it is authorized to perform this Contract;
b. That it has carefully examined and analyzed the provisions and requirements of this Contract, and that from its own investigations it has satisfied itself as to the nature of all things needed for the performance of this Contract, the general and local conditions and all other matters which in any way affect this Contract or its performance, and that the time available to it for such examination, analysis, inspection and investigation was adequate;
c. That the Contract is feasible of performance in accordance with all its provisions and requirements and that it can and will perform it in strict accordance with such provisions and requirements;
d. That no Commissioner, officer, agent or employee of the Port Authority is personally interested directly or indirectly in this Contract or the compensation to be paid hereunder;
e. That, except only for those representations, statements or promises expressly contained in this Contract, no representation, statement or promise, oral or in writing, of any kind whatsoever by the Port Authority, its Commissioners, officers, agents, employees or consultants has induced the Contractor to enter into this Contract or has been relied upon by the Contractor, including any with reference to: (1) the meaning, correctness, suitability, or completeness of any provisions or requirements of this Contract; (2) the nature, quantity, quality or size of the materials, equipment, labor and other facilities needed for the performance of this Contract; (3) the general or local conditions which may in any way affect this Contract or its performance; (4) the price of the Contract; or (5) any other matters, whether similar to or different from those referred to in (1) through (4) immediately above, affecting or having any connection with this Contract, the bidding thereon, any discussions thereof, the performance thereof or those employed therein or connected or concerned therewith.

Moreover, the Contractor accepts the conditions at the Site of the Work as they may eventually be found to exist and warrants and represents that it can and will perform the Contract under such conditions and that all materials, equipment, labor and other facilities required because of any unforeseen conditions (physical or otherwise) shall be wholly at its own cost and expense, anything in this Contract to the contrary notwithstanding.

Nothing in the Specifications or any other part of the Contract is intended as or shall constitute a representation by the Port Authority as to the feasibility of performance of this Contract or any part thereof.

The Contractor further represents and warrants that it was given ample opportunity and time and by means of this paragraph was requested by the Port Authority to review thoroughly all documents forming this Contract prior to opening of Bids on this Contract in order that it might request inclusion in this Contract of any statement, representation, promise or provision which it desired or on which it wished to place reliance; that it did so review said documents, that either every such statement, representation, promise or provision has been included in this Contract or else, if omitted, that it expressly relinquishes the benefit of any such omitted statement, representation, promise or provision and is willing to perform this Contract without claiming reliance thereon or making any other claim on account of such omission.

The Contractor further recognizes that the provisions of this numbered clause (though not only such provisions) are essential to the Port Authority's consent to enter into this Contract and that without such provisions, the Authority would not have entered into this Contract.

4. Personal Non-Liability

Neither the Commissioners of the Port Authority nor any of them, nor any officer, agent or employee thereof, shall be charged personally by the Contractor with any liability, or held personally liable to the Contractor under any term or provision of this Agreement, or because of its execution or attempted execution, or because of any breach, or attempted or alleged breach, thereof.

5. Equal Employment Opportunity, Affirmative Action, Non-Discrimination

a. The Contractor is advised to ascertain and comply with all applicable federal, State and local statutes, ordinances, rules and regulations and, federal Executive Orders, pertaining to equal employment opportunity, affirmative action, and non-discrimination in employment.

b. Without limiting the generality of any other term or provision of this Contract, in the event of the Contractor's non-compliance with the equal opportunity and non-discrimination clause of this Contract, or with any of such statutes, ordinances, rules, regulations or Orders, this Contract may be cancelled, terminated or suspended in whole or in part.

6. Rights and Remedies of the Port Authority

The Port Authority shall have the following rights in the event the Contractor is deemed guilty of a breach of any term whatsoever of this Contract:

a. The right to take over and complete the Work or any part thereof as agent for and at the expense of the Contractor, either directly or through others.

b. The right to cancel this Contract as to any or all of the Work yet to be performed.

c. The right to specific performance, an injunction or any appropriate equitable remedy.

d. The right to money damages.

For the purpose of this Contract, breach shall include but not be limited to the following, whether or not the time has yet arrived for performance of an obligation under this Contract: a statement by the Contractor to any representative of the Port Authority indicating that the Contractor cannot or will not perform any one or more of its obligations under this Contract; any act or omission of the Contractor or any other occurrence which makes it improbable at the time that it will be able to perform any one or more of its obligations under this Contract; any suspension of or failure to proceed with any part of the Work by the Contractor which makes it improbable at the time that it will be able to perform any one or more of its obligations under this Contract.

The enumeration in this numbered clause or elsewhere in this Contract of specific rights and remedies of the Port Authority shall not be deemed to limit any other rights or remedies which the Authority would have in the absence of such enumeration; and no exercise by the Authority of any right or remedy shall operate as a waiver of any other of its rights or remedies not inconsistent therewith or to stop it from exercising such other rights or remedies.

7. Rights and Remedies of the Contractor

Inasmuch as the Contractor can be adequately compensated by money damages for any breach of this Contract which may be committed by the Port Authority, the Contractor expressly agrees that no default, act or omission of the Port Authority shall constitute a material breach of this Contract, entitling the Contractor to cancel or rescind this Contract or to suspend or abandon performance.

8. Submission To Jurisdiction

The Contractor hereby irrevocably submits itself to the jurisdiction of the Courts of the State of New York and New Jersey, in regard to any controversy arising out of, connected with, or in any way concerning this Contract.

The Contractor agrees that the service of process on the Contractor in relation to such jurisdiction may be

made, at the option of the Port Authority, either by registered or certified mail addressed to it at the address of the Contractor indicated on the signature sheet, or by actual personal delivery to the Contractor, if the Contractor is an individual, to any partner if the Contractor be a partnership or to any officer, director or managing or general agent if the Contractor be a corporation.

Such service shall be deemed to be sufficient when jurisdiction would not lie because of the lack of basis to serve process in the manner otherwise provided by law. In any case, however, process may be served as stated above whether or not it might otherwise have been served in a different manner.

9. Harmony

a. The Contractor shall not employ any persons or use any labor, or use or have any equipment, or permit any condition to exist which shall or may cause or be conducive to any labor complaints, troubles, disputes or controversies at the Facility which interfere or are likely to interfere with the operation of the Port Authority or with the operations of lessees, licensees or other users of the Facility or with the operations of the Contractor under this Contract.

   The Contractor shall immediately give notice to the Port Authority (to be followed by written notices and reports) of any and all impending or existing labor complaints, troubles, disputes or controversies and the progress thereof. The Contractor shall use its best efforts to resolve any such complaint, trouble, dispute or controversy. If any type of strike, boycott, picketing, work stoppage, slowdown or other labor activity is directed against the Contractor at the Facility or against any operations of the Contractor under this Contract, whether or not caused by the employees of the Contractor, and if any of the foregoing, in the opinion of the Port Authority, results or is likely to result in any curtailment or diminution of the services to be performed hereunder or to interfere with or affect the operations of the Port Authority , or to interfere with or affect the operations of lessees, licensees, or other users of the Facility or in the event of any other cessation or stoppage of operations by the Contractor hereunder for any reason whatsoever, the Port Authority shall have the right at any time during the continuance thereof to suspend the operations of the Contractor under this Contract, and during the period of the suspension the Contractor shall not perform its services hereunder and the Port Authority shall have the right during said period to itself or by any third person or persons selected by it to perform said services of the Contractor using the equipment which is used by the Contractor in its operations hereunder as the Port Authority deems necessary and without cost to the Port Authority. During such time of suspension, the Contractor shall not be entitled to any compensation. Any flat fees, including management fees, shall be prorated. Prior to the exercise of such right by the Port Authority, it shall give the Contractor notice thereof, which notice may be oral. No exercise by the Port Authority of the rights granted to it in the above subparagraph shall be or be deemed to be a waiver of any rights of termination or revocation contained in this Contract or a waiver of any rights or remedies which may be available to the Port Authority under this Contract or otherwise.

b. During the time that the Contractor is performing the contract, other persons may be engaged in other operations on or about the worksite including Facility operations, pedestrian, bus and vehicular traffic and other Contractors performing at the worksite, all of which shall remain uninterrupted.

   The Contractor shall so plan and conduct its operations as to work in harmony with others engaged at the site and not to delay, endanger or interfere with the operation of others (whether or not specifically mentioned above), all to the best interests of the Port Authority and the public as may be directed by the Port Authority.

10. Claims of Third Persons

The Contractor undertakes to pay all claims lawfully made against it by subcontractors, suppliers and workers, and all claims lawfully made against it by other third persons arising out of or in connection with

or because of the performance of this Contract and to cause all subcontractors to pay all such claims lawfully made against them.

11. No Third Party Rights

Nothing contained in this Contract is intended for the benefit of third persons, except to the extent that the Contract specifically provides otherwise by use of the words "benefit" or "direct right of action."

12. Provisions of Law Deemed Inserted

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included therein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.

13. Costs Assumed By The Contractor

It is expressly understood and agreed that all costs of the Contractor of whatever kind or nature and whether imposed directly upon the Contractor under the terms and provisions hereof or in any other manner whatsoever because of the requirements of the operation of the service or otherwise under this Agreement shall be borne by the Contractor or without compensation or reimbursement from the Port Authority, except as specifically set forth in this Agreement. The entire and complete cost and expense of the Contractor's services and operations hereunder shall be borne solely by the Contractor and under no circumstances shall the Port Authority be liable to any third party (including the Contractor's employees) for any such costs and expenses incurred by the Contractor and under no circumstances shall the Port Authority be liable to the Contractor for the same, except as specifically set forth in this Section.

14. Default, Revocation or Suspension of Contract

a. If one or more of the following events shall occur:

1. If fire or other cause shall destroy all or a substantial part of the Facility.

2. If any governmental agency shall condemn or take a temporary or permanent interest in all or a substantial part of the Facility, or all of a part of the Port Authority's interest herein;

then upon the occurrence of such event or at any time thereafter during the continuance thereof, the Port Authority shall have the right on twenty-four (24) hours written notice to the Contractor to revoke this Contract, such revocation to be effective upon the date and time specified in such notice. .

In such event this Contract shall cease and expire on the effective date of revocation as if said date were the date of the expiration of this Contract. Such revocation shall not, however, relieve the Contractor of any liabilities or obligations hereunder which shall have accrued on or prior to the effective date of revocation.

b. If one or more of the following events shall occur:

1. The Contractor shall become insolvent, or shall take the benefit of any present or future insolvency statute, or shall make a general assignment for the benefit of creditors, or file a voluntary petition in bankruptcy or a petition or answer seeking an arrangement or its reorganization or the readjustment of its indebtedness under the federal bankruptcy laws or under any other law or statute of the United States or of any State thereof, or consent to the appointment of a receiver, trustee, or liquidator of all or substantially all its property; or
2. By order or decree of a court the Contractor shall be adjudged bankrupt or an order shall be made approving a petition filed by any of the creditors, or, if the Contractor is a corporation,

by any of the stockholders of the Contractor, seeking its reorganization or the readjustment of its indebtedness under the federal bankruptcy laws or under any law or statute of the United States or of any State thereof; or

3. A petition under any part of the federal bankruptcy laws or an action under any present or future insolvency law or statute shall be filed against the Contractor and shall not be dismissed within thirty (30) days after the filing thereof; or
4. The interest of the Contractor under this Contract shall be transferred to, passed to or devolve upon, by operation of law or otherwise, any other person, firm or corporation, or
5. The Contractor, if a corporation, shall, without the prior written approval of the Port Authority, become a surviving or merged corporation in a merger, a constituent corporation in a consolidation, or a corporation in dissolution; or
6. If the Contractor is a partnership, and the said partnership shall be dissolved as the result of any act or omission of its copartners or any of them, or by operation of law or the order or decree of any court having jurisdiction, or for any other reason whatsoever; or
7. By or pursuant to, or under authority of any legislative act, resolution or rule, or any order or decree of any court or governmental board, agency or officer having jurisdiction, a receiver, trustee, or liquidator shall take possession or control of all or substantially all of the property of the Contractor and such possession or control of all or substantially all of the property of the Contractor and shall continue in effect for a period of fifteen (15) days;

then upon the occurrence of any such event or at any time thereafter during the continuance thereof, the Port Authority shall have the right upon five (5) days notice to the Contractor to terminate this Contract and the rights of the Contractor hereunder; termination to be effective upon the date and time specified in such notice as if said date were the date of the expiration of this Contract. Termination shall not relieve the Contractor of any liabilities or obligations hereunder which have accrued on or prior to the effective date of termination.

c. If any of the following shall occur:

1. The Contractor shall cease, abandon any part of the service, desert, stop or discontinue its services in the premises for any reason whatsoever and regardless of the fault of the Contractor; or

2. The Contractor shall fail to keep, perform and observe each and every other promise, covenant and agreement set forth in this Contract on its part to be kept, performed or observed, within five (5) days after receipt of notice of default thereunder from the Port Authority (except where fulfillment of its obligations requires activity over a greater period of time, and the Contractor shall have commenced to perform whatever may be required for fulfillment within five (5) days after receipt of notice and continues such performance without interruption except for causes beyond its control);

then upon the occurrence of any such event or during the continuance thereof, the Port Authority shall have the right on twenty four (24) hours notice to the Contractor to terminate this Contract and the rights of the Contractor hereunder, termination to be effective upon the date and time specified in such notice. Termination shall not relieve the Contractor of any liabilities which shall have accrued on or prior to the effective date of termination.

d. If any of the events enumerated in this Section shall occur prior to commencement date of this Contract the Port Authority upon the occurrence of any such event or any time thereafter during the continuance thereof by twenty-four (24) hours notice may terminate or suspend this Contract and the rights of the Contractor hereunder, such termination or suspension to be effective upon the date specified in such notice.

e. No payment by the Port Authority of any monies to the Contractor for any period or periods after default of any of the terms, covenants or conditions hereof to be performed, kept and observed by the Contractor and no act or thing done or omitted to be done by the Port Authority shall be deemed to be a waiver of the right of the Port Authority to terminate this Contract or of any other right or remedies to which the Port Authority may be entitled because of any breach thereof. No waiver by the Port Authority of any default on the part of the Contractor in the performance of any of the terms, covenants and conditions hereof to be performed, kept or observed by the Contractor shall be or be construed to be a waiver by the Port Authority of any other subsequent default in the performance of any of the said terms, covenants and conditions.

f. In addition to all other rights of revocation or termination hereunder and notwithstanding any other provision of this Contract the Port Authority may terminate this Contract and the rights of the Contractor hereunder without cause at any time upon five (5) days written notice to the Contractor and in such event this Contact shall cease and expire on the date set forth in the notice of termination as fully and completely as though such dates were the original expiration date hereof and if such effective date of termination is other than the last day of the month, the amount of the compensation due to the Contractor from the Port Authority shall be prorated when applicable on a daily basis. Such cancellation shall be without prejudice to the rights and obligations of the parties arising out of portions already performed but no allowance shall be made for anticipated profits.

g. Any right of termination contained in this paragraph, shall be in addition to and not in lieu of any and all rights and remedies that the Port Authority shall have at law or in equity consequent upon the Contractor's breach of this Contract and shall be without prejudice to any and all such other rights and remedies. It is hereby specifically agreed and understood that the exercise by the Port Authority of any right of termination set forth in this paragraph shall not be or be deemed to be an exercise by the Port Authority of an election of remedies so as to preclude the Port Authority from any right to money damages it may have for the period prior to the effective date of termination to the original expiration date of the Contract, and this provision shall be deemed to survive the termination of this Contract as aforesaid.

h. If (1) the Contractor fails to perform any of its obligations under this Contract or any other agreement between the Port Authority and the Contractor (including its obligation to the Port Authority to pay any claim lawfully made against it by any supplier, subcontractor or worker or other person which arises out of or in connection with the performance of this Contract or any other agreement with the Port Authority) or (2) any claim (just or unjust) which arises out of or in connection with this Contract or any other agreement between the Port Authority and the Contractor is made against the Port Authority or (3) any subcontractor under this Contract or any other agreement between the Port Authority and the Contractor fails to pay any claims lawfully made against it by any supplier, subcontractor, worker or other third person which arises out of or in connection with this Contract or any other agreement between the Port Authority and the Contractor or if in the opinion of the Port Authority any of the aforesaid contingencies is likely to arise, then the Port Authority shall have the right, in its discretion, to withhold out of any payment (final or otherwise) such sums as the Port Authority may deem ample to protect it against delay or loss or to assure the payment of just claims of third persons, and to apply such sums in such manner as the Port Authority may deem proper to secure such protection or satisfy such claims. All sums so applied shall be deducted from the Contractor's compensation. Omission by the Port Authority to withhold out of any payment, final or otherwise, a sum for any of the above contingencies, even though such contingency has occurred at the time of such payment, shall not be deemed to indicate that the Port Authority does not intend to exercise its right with respect to such contingency. Neither the above provisions for rights of the Port Authority to withhold and apply monies nor any exercise or attempted exercise of, or omission to exercise, such rights by the Port Authority shall create any obligation of any kind to such supplier, subcontractors, worker or other third persons. If, however, the payment of any amount due the Contractor shall be improperly delayed, the Port

Authority shall pay the Contractor interest thereon at the rate of 6% per annum for the period of the delay, it being agreed that such interest shall be in lieu of and in liquidation of any damages to the Contractor because of such delay.

i. If the Port Authority has paid any sum or has incurred any obligation or expense which the Contractor has agreed to pay or reimburse the Port Authority, or if the Port Authority is required or elects to pay any sum or sums or incurs any obligations or expense by reason of the failure, neglect or refusal of the Contractor to perform or fulfill any one or more of the conditions, covenants, or agreements contained in this Contract, or as a result of an act of omission of the Contractor contrary to the said conditions, covenants and agreements, the Contractor shall pay to the Port Authority the sum or sums so paid or expense so incurred, including all interests, costs and damages, promptly upon the receipt of the Port Authority's statement therefore. The Port Authority may, however, in its discretion, elect to deduct said sum or sums from any payment payable by it to the Contractor.

j. If the Port Authority pays any installment to the Contractor without reducing said installment as provided in this Contract, it may reduce any succeeding installment by the proper amount, or it may bill the Contractor for the amount by which the installment paid should have been reduced and the Contractor shall pay to the Port Authority any such amount promptly upon receipt of the Port Authority's statement therefore.

k. The Port Authority shall also have the rights set forth above in the event the Contractor shall become insolvent or bankrupt or if his affairs are placed in the hands of a receiver, trustee or assignee for the benefit of creditors.

15. Sales or Compensating Use Taxes

Sales to the Port Authority are currently exempt from New York and New Jersey State and local sales and compensating use taxes and generally from federal taxation. The Contractor certifies that there are no such taxes included in the prices for this Contract. The Contractor shall retain a copy of this Contract to substantiate the exempt sale.

The compensation set forth in this Agreement is the complete compensation to the Contractor, and the Port Authority will not separately reimburse the Contractor for any taxes unless specifically set forth in this Agreement.

16. No Estoppel or Waiver

The Port Authority shall not be precluded or estopped by any payment, final or otherwise, issued or made under this Contract, from showing at any time the true amount and character of the services performed, or from showing that any such payment is incorrect or was improperly issued or made; and the Port Authority shall not be precluded or estopped, notwithstanding any such payment, from recovering from the Contractor any damages which it may sustain by reason of any failure on its part to comply strictly with this Contract, and any moneys which may be paid to it or for its account in excess of those to which it is lawfully entitled.

No cancellation, rescission or annulment hereof, in whole or as to any part of the services to be provided hereunder, or because of any breach hereof, shall be deemed a waiver of any money damages to which the Port Authority may be entitled because of such breach. Moreover, no waiver by the Authority of any breach of this Contract shall be deemed to be a waiver of any other or any subsequent breach.

17. Records and Reports

The Contractor shall set up, keep and maintain (and shall cause its subcontractors to set up, keep and maintain) in accordance with generally accepted accounting practice during the term of this Agreement and any extensions thereof and for three years after the expiration, termination or revocation thereof, records, payroll records and books of account (including, but not limited to, records of original entry and daily

forms, payroll runs, cancelled checks, time records, union agreements, contracts with health, pension and other third party benefit providers) recording all transactions of the Contractor(and its subcontractors), at, through or in any way connected with or related to the operations of the Contractor (and its subcontractors) hereunder, including but not limited to all matters relating to the charges payable to the Contractor hereunder, all wages and supplemental benefits paid or provided to or for its employees (and its subcontractors' employees) and such additional information as the Port Authority may from time to time and at any time require, and also including, if appropriate, recording the actual number of hours of service provided under the Contract, and keeping separate records thereof which records and books of account shall be kept at all times within the Port District. The Contractor shall permit (and cause its subcontractors to permit) in ordinary business hours during the term of this Agreement including any extensions thereof and for three years thereafter the examination and audit by the officers, employees and representatives of the Port Authority of such records and books of account and also any records and books of account of any company which is owned or controlled by the Contractor, or which owns or controls the Contractor if said company performs services similar to those performed by the Contractor anywhere in the Port District. However, if within the aforesaid three year period the Port Authority has notified the Contractor in writing of a pending claim by the Port Authority under or in connection with this Contract to which any of the aforesaid records and documents of the Contractor or of its subcontractors relate either directly or indirectly, then the period of such right of access shall be extended to the expiration of six years from the date of final payment with respect to the records and documents involved.

The Contractor (and its subcontractors) shall, at its own expense, install, maintain and use such equipment and devices for recording the labor hours of the service as shall be appropriate to its business and necessary or desirable to keep accurate records of the same and as the general manager or the Facility Manager may from time to time require, and the Contractor (and its subcontractors) shall at all reasonable times allow inspection by the agents and employees of the Port Authority of all such equipment or devices.

a. The Contractor hereby further agrees to furnish to the Port Authority from time to time such written reports in connection with its operations hereunder as the Port Authority may deem necessary or desirable. The format of all forms, schedules and reports furnished by the Contractor to the Port Authority shall be subject to the continuing approval of the Port Authority.
b. No provision in this Contract giving the Port Authority a right of access to records and documents is intended to impair or affect any right of access to records and documents which they would have in the absence of such provision. Additional record keeping may be required under other sections of this Contract.

18. General Obligations

a. Except where expressly required or permitted herein to be oral, all notices, requests, consents and approvals required to be given to or by either party shall be in writing and all such notices, requests, consents and approvals shall be personally delivered to the other party during regular business hours or forwarded to such party by United States certified mail, return receipt requested, addressed to the other party at its address hereinbefore or hereafter provided. Until further notice the Contractor hereby designates the address shown on the bottom of the Contractors Signature Sheet as their address to which such notices, requests, consents, or approvals may be forwarded. All notices, requests, consents, or approvals of the Contractor shall be forwarded to the Manager at the Facility.
b. The Contractor shall comply with the provisions of all present and future federal, state and municipal laws, rules, regulations, requirements, ordinances, orders and directions which pertain to its operations under this Contract and which affect the Contract or the performance thereof and those engaged therein as if the said Contract were being performed for a private corporation, except where stricter requirements are contained in the Contract in which case the Contract shall control. The Contractor shall procure for itself all licenses, certificates, permits or other authorization from all governmental authorities, if any, having jurisdiction over the Contractor's operations hereunder which may be

necessary for the Contractor's operations. The Contractor's obligation to comply with governmental requirements are not to be construed as a submission by the Port Authority to the application to itself of such requirements.

c. The Contractor shall pay all taxes, license, certification, permit and examination fees and excises which may be assessed on its property or operations hereunder or income therefrom, and shall make all applications, reports and returns required in connection therewith.

d. The Contractor shall, in conducting its operations hereunder, take all necessary precautions to protect the general environment and to prevent environmental pollution, contamination, damage to property and personal injury. In the event the Contractor encounters material reasonably believed to be asbestos, polychlorinated biphenyl (PCB) or any other hazardous material, in conducting its operations hereunder, the Contractor shall immediately stop Work in the area affected and report the condition in writing to the Manager. Work in the affected area shall not thereafter be resumed by the Contractor except upon the issuance of a written order to that effect from the Manager.

e. The Contractor shall promptly observe, comply with and execute the provisions of any and all present and future rules and regulations, requirements, standard orders and directions of the American Insurance Association, the Insurance Services Office, National Fire Protection Association, and any other body or organization exercising similar functions which may pertain or apply to the Contractor's operations hereunder.

The Contractor shall not do or permit to be done any act which:

1. will invalidate or be in conflict with any fire insurance policies covering the Facility or any part thereof or upon the contents of any building thereon; or
2. will increase the rate of any fire insurance, extended coverage or rental insurance on the Facility or any part thereof or upon the contents of any building thereon; or
3. in the opinion of the Port Authority will constitute a hazardous condition, so as to increase the risk normally attendant upon the operations contemplated by this Contract; or
4. may cause or produce in the premises, or upon the Facility any unusual, noxious or objectionable smoke, gases, vapors, odors; or
5. may interfere with the effectiveness or accessibility of the drainage and sewerage system, fire protection system, sprinkler system, alarm system, fire hydrants and hoses, if any, installed or located or to be installed or located in or on the Facility; or
6. shall constitute a nuisance in or on the Facility or which may result in the creation, commission or maintenance of a nuisance in or on the Facility.

f. If by reason of the Contractor's failure to comply with the provisions of this Section and provided the Port Authority has given the Contractor five (5) days written notice of its failure and the Contractor shall not have cured said failure within said five (5) days, any fire insurance, extended coverage or rental insurance rate on the Facility or any part thereof or upon the contents of any building thereon shall at any time be higher than it otherwise would be, then the Contractor shall on demand pay the Port Authority that part of all fire insurance, extended coverage or rental insurance premiums paid or payable by the Port Authority which shall have been charged because of such violations by the Contractor.\

g. The Contractor shall conduct its operations hereunder so as not to endanger, unreasonably interfere with, or delay the operations or activities of any tenants or occupants on the premises or the Facility and, moreover, shall use the same degree of care in performance on the premises as would be required by law of the Port Authority and shall conduct operations hereunder in a courteous, efficient and safe manner.

h. The Contractor shall provide such equipment and medical facilities as may be necessary to supply first aid service in case of accidents to its personnel who may be injured in the furnishing of service hereunder. The Contractor shall maintain standing arrangements for the removal and hospital treatment of any of its personnel who may be injured.

19. Assignments and Subcontracting

a. The Contractor shall not sell, transfer, mortgage, pledge, subcontract or assign this Contract or any part thereof or any of the rights granted hereunder or any moneys due or to become due to it hereunder or enter into any contract requiring or permitting the doing of anything hereunder by an independent Contractor, without the prior written approval of the Port Authority, and any such sale, transfer, mortgage, pledge, subcontract, assignment or contract without such prior written approval shall be void as to the Port Authority.

b. All subcontractors who provide permanent personnel to the Contractor for work under this Contract shall be given written notice to comply with all requirements of the Contract. The Contractor shall be responsible and liable for the performance and acts of each subcontractor.

c. All persons to whom the Contractor sublets services shall be deemed to be its agents and no subletting or approval thereof shall be deemed to release this Contractor from its obligations under this Contract or to impose any obligations on the Port Authority to such subcontractor or to give the subcontractor any rights against the Port Authority.

20. Indemnification and Risks Assumed By The Contractor

To the extent permitted by law, the Contractor shall indemnify and hold harmless the Port Authority, its Commissioners, officers, representatives and employees from and against all claims and demands, just or unjust, of third persons (including employees, officers, and agents of the Port Authority) arising out of or in any way connected or alleged to arise out of or alleged to be in any way connected with the Contract and all other services and activities of the Contractor under this Contract and for all expenses incurred by it and by them in the defense, settlement or satisfaction thereof, including without limitation thereto, claims and demands for death, for personal injury or for property damage, direct or consequential, whether they arise from the acts or omissions of the Contractor, of the Port Authority, of third persons, or from the acts of God or the public enemy, or otherwise, including claims and demands of any local jurisdiction against the Port Authority in connection with this Contract.

The Contractor assumes the following risks, whether such risks arise from acts or omissions (negligent or not) of the Contractor, the Port Authority or third persons or from any other cause, excepting only risks occasioned solely by affirmative willful acts of the Port Authority done subsequent to the opening of proposals on this Contract, and shall to the extent permitted by law indemnify the Port Authority for all loss or damage incurred in connection with such risks:

a. The risk of any and all loss or damage to Port Authority property, equipment (including but not limited to automotive and/or mobile equipment), materials and possessions, on or off the premises, the loss or damage of which shall arise out of the Contractor's operations hereunder. The Contractor shall if so directed by the Port Authority, repair, replace or rebuild to the satisfaction of the Port Authority, any and all parts of the premises or the Facility which may be damaged or destroyed by the acts or omissions of the Contractor, its officers, agents, or employees and if the Contractor shall fail so to repair, replace, or rebuild with due diligence the Port Authority may, at its option, perform any of the foregoing work and the Contractor shall pay to the Port Authority the cost thereof.

b. The risk of any and all loss or damage of the Contractor's property, equipment (including but not limited to automotive and/or mobile equipment) materials and possessions on the Facility.

c. The risk of claim, whether made against the Contractor or the Port Authority, for any and all loss or damages occurring to any property, equipment (including but not limited to automotive and/or mobile equipment), materials and possessions of the Contractor's agents, employees, materialmen and others performing work hereunder.

d. The risk of claims for injuries, damage or loss of any kind just or unjust of third persons arising or alleged to arise out of the performance of work hereunder, whether such claims are made against the Contractor or the Port Authority.

If so directed, the Contractor shall at its own expense defend any suit based upon any such claim or demand, even if such suit, claim or demand is groundless, false or fraudulent, and in handling such shall not, without obtaining express advance permission from the General Counsel of the Port Authority, raise any defense involving in any way the jurisdiction of the tribunal over the person of the Port Authority, the immunity of the Port Authority, its Commissioners, officers, agents or employees, the governmental nature of the Port Authority or the provision of any statutes respecting suits against the Port Authority.

Neither the requirements of the Port Authority under this Contract, nor of the Port Authority of the methods of performance hereunder nor the failure of the Port Authority to call attention to improper or inadequate methods or to require a change in the method of performance hereunder nor the failure of the Port Authority to direct the Contractor to take any particular precaution or other action or to refrain from doing any particular thing shall relieve the Contractor of its liability for injuries to persons or damage to property or environmental impairment arising out of its operations.

21. Approval of Methods

Neither the approval of the Port Authority of the methods of furnishing services hereunder nor the failure of the Port Authority to call attention to improper or inadequate methods or to require a change in the method of furnishing services hereunder, nor the failure of the Port Authority to direct the Contractor to take any particular precautions or to refrain from doing any particular thing shall relieve the Contractor of its liability for injuries to persons or damage to property or environmental impairment arising out of its operations.

22. Safety and Cleanliness

a. The Contractor shall, in the furnishing of services hereunder, exercise every precaution to prevent injury to person or damage to property or environmental impairment and avoid inconvenience to the occupants of or any visitors to the Facility. The Contractor shall, without limiting the generality hereof, place such personnel, erect such barricades and railings, give such warnings, display such lights, signals or signs, place such cones and exercise precautions as may be necessary, proper or desirable.

b. The Contractor shall in case of unsafe floor conditions due to construction, wetness, spillage, sickness and all other types of hazardous conditions proceed to rope off the unsafe area and place appropriate warnings signs to prevent accidents from occurring. The Contractor shall clean said area to the satisfaction of the Manager.

c. The Contractor shall at all times maintain in a clean and orderly condition and appearance any and all facilities provided by the Port Authority for the Contractor's operations, and all fixtures, sink closets, equipment, and other personal property of the Port Authority which are located in said facilities.

23. Accident Reports

The Contractor shall promptly report in writing to the Manager of the Facility and to the Deputy Chief, Litigation Management of the Port Authority all accidents whatsoever arising out of or in connection with its operations hereunder and which result in death or injury to persons or damage to property, setting forth such details thereof as the Port Authority may desire. In addition, if death or serious injury or serious damage is caused, such accidents shall be immediately reported by telephone to the aforesaid representatives of the Port Authority.

24. Trash Removal

The Contractor shall remove daily from the Facility by means provided by the Contractor all garbage, debris and other waste material (solid or liquid) arising out of or in connection with its operations hereunder, and any such garbage, debris and other waste material not immediately removed shall be temporarily stored in a clear and sanitary condition, approved by the Facility Manager and shall be kept covered except when filling

or emptying them. The Contractor shall exercise care in removing such garbage, debris and other waste materials from the Facility. The manner of such storage and removal shall always be subject in all respects to the continual approval of the Port Authority. No equipment or facilities of the Port Authority shall be used in such removal unless with its prior consent in writing. No such garbage, debris or other waste materials shall be or be permitted to be thrown, discharged or disposed into or upon the waters at or bounding the Facility.

25. Lost and Found Property

The Contractor shall instruct its personnel that all items of personal property found by the Contractor's employees at the Site must be turned in to the Port Authority and a receipt will be issued therefor.

26. Property of the Contractor

a. All property of the Contractor at the Site by virtue of this Contract shall be removed on or before the expiration or sooner termination or revocation of this Contract.

b. If the Contractor shall fail to remove its property upon the expiration, termination or revocation of this Contract the Port Authority may, at its option, dispose of such property as waste or as agent for the Contractor and at the risk and expense of the Contractor, remove such property to a public warehouse, or may retain the same in its own possession, and in either event after the expiration of thirty (30) days may sell the same in accordance with any method deemed appropriate; the proceeds of any such sale shall be applied first, to the expenses of sale and second, to any sums owed by the Contractor to the Port Authority; any balance remaining shall be paid to the Contractor. Any excess of the total cost of removal, storage and sale and other costs incurred by the Port Authority as a result of such failure of performance by the Contractor over the proceeds of sale shall be paid by the Contractor to the Port Authority upon demand.

27. Modification of Contract

This Contract may not be changed except in writing signed by the Port Authority and the Contractor. The Contractor agrees that no representation or warranties shall be binding upon the Port Authority unless expressed in writing in this Contract.

28. Invalid Clauses

If any provision of this Contract shall be such as to destroy its mutuality or to render it invalid or illegal, then, if it shall not appear to have been so material that without it the Contract would not have been made by the parties, it shall not be deemed to form part thereof but the balance of the Contract shall remain in full force and effect.

29. Approval of Materials, Supplies and Equipment

Only Port Authority approved materials, supplies, and equipment are to be used by the Contractor in performing the Work hereunder. Inclusion of chemical containing materials or supplies on the Port Authority Approved Products List – Environmental Protection Supplies constitutes approval. The list may be revised from time to time and at any time by the Port Authority and it shall be incumbent upon the Contractor to obtain the most current list from the Manager of the Facility.

At anytime during the Solicitation, pre-performance or performance periods, the Contractor may propose the use of an alternate product or products to those on the Approved Products List – Environmental Protection Supplies, which product(s) shall be subject to review and approval by the Port Authority. Any alternate product so approved by the Port Authority may be used by the Contractor in performing the Services hereunder. Until such approval is given, only products on the Approved Products List – Environmental Protection Supplies may be used.

30. Intellectual Property

The right to use all patented materials, appliances, processes of manufacture or types of construction, trade and service marks, copyrights and trade secrets, collectively hereinafter referred to as "Intellectual Property Rights", in the performance of the work, shall be obtained by the Contractor without separate or additional compensation. Where the services under this Agreement require the Contractor to provide materials, equipment or software for the use of the Port Authority or its employees or agents, the Port Authority shall be provided with the Intellectual Property Rights required for such use without further compensation than is provided for under this Agreement.

The Contractor shall indemnify the Port Authority against and save it harmless from all loss and expense incurred as a result of any claims in the nature of Intellectual Property Rights infringement arising out of the Contractor's or Port Authority's use, in accordance with the above immediately preceding paragraph, of any Intellectual Property. The Contractor, if requested, shall conduct all negotiations with respect to and defend such claims. If the Contractor or the Port Authority, its employees or agents be enjoined either temporarily or permanently from the use of any subject matter as to which the Contractor is to indemnify the Port Authority against infringement, then the Port Authority may, without limiting any other rights it may have, require the Contractor to supply temporary or permanent replacement facilities approved by the Manager, and if the Contractor fails to do so the Contractor shall, at its expense, remove all such enjoined facilities and refund the cost thereof to the Port Authority or take such steps as may be necessary to insure compliance by the Contractor and the Port Authority with said injunction, to the satisfaction of the Port Authority.

In addition, the Contractor shall promptly and fully inform the Director in writing of any intellectual property rights disputes, whether existing or potential, of which it has knowledge, relating to any idea, design, method, material, equipment or any other matter related to the subject matter of this Agreement or coming to its attention in connection with this Agreement.

31. Contract Records and Documents – Passwords and Codes

When the performance of the contract services requires the Contractor to produce, compile or maintain records, data, drawings, or documents of any kind, regardless of the media utilized, then all such records, drawings, data and documents which are produced, prepared or compiled in connection with this contract, shall become the property of the Port Authority, and the Port Authority shall have the right to use or permit the use of them and any ideas or methods represented by them for any purpose and at any time without other compensation than that specifically provided herein.

When in the performance of the contract services the Contractor utilizes passwords or codes for any purpose, at any time during or after the performance of such services, upon written request by the Authority, the Contractor shall make available to the designated Authority representative all such passwords and codes.

32. High Security Areas

a. Services under the Contract may be required in high security areas, as the same may be designated by the Manager from time to time. The Port Authority shall require the observance of certain security

procedures with respect to the high security areas, which may include the escort to, at, and/or from said high security areas by security personnel designated by the Contractor or any subcontractor's personnel required to work therein.

b. Twenty-four hours prior to the proposed performance of any work in a high security area, the Contractor shall notify the Manager. The Contractor shall conform to the procedures as may be established by the Manager from time to time and at any time for access to high security areas and the escorting of personnel hereunder. Prior to the start of work, the Contractor shall request a description from the Manager of the high security areas which will be in effect on the commencement date. The description of high security areas may be changed from time to time and at any time by the Manager during the term of the Contract.

33. Notification of Security Requirements

The Port Authority operates facilities and systems, at which terrorism or other criminal acts may have a significant impact on life safety and key infrastructures. The Authority reserves the right to impose multiple layers of security requirements on the performance of the Contract work, including on the Contractor, its staff and subcontractors and their staffs depending upon the level of security required, as determined by the Authority. The Contractor shall and shall instruct its subcontractors to cooperate with Authority staff in adopting security requirements. These security requirements may include but may not be limited to the following:

i. Identity Checks and Background Screening

Contractor/subcontractor identity checks and background screening shall include but shall not be limited to: (1) inspection of not less than two forms of valid/current government issued identification (at least one having an official photograph) to verify staff's name and residence; (2) screening of federal, state, and/or local criminal justice agency information databases and files; (3) screening of any terrorist identification files; (4) multi-year check of personal, employment and /or credit history; (5) access identification to include some form of biometric security methodology such as fingerprint, facial or iris scanning.

The Contractor may be required to have its staff, and any subcontractor's staff, authorize the Authority or its designee to perform background checks. Such authorization shall be in a form acceptable to the Authority. If the Authority directs the Contractor to have identity checks and background screening performed by a particular firm designated by the Authority, the Authority will compensate the Contractor for the cost of such screening pursuant to the Extra Work provisions of the Contract.

ii. Issuance of Photo Identification cards:

If the Authority requires facility-specific identification cards for the Contractor's and subcontractors' staff, the Authority will supply such identification cards at no cost to the Contractor.

iii. Access control, inspection, and monitoring by security guards:

The Authority will provide for facility access control, inspection and monitoring by Authority retained security guards. Should the Authority require the Contractor to hire security guards for the purpose of facility access control and inspection in lieu of or in addition to the Authority retained facility security guards, the Contractor will be reimbursed for the cost of such security guards pursuant to the Extra Work provisions of the Contract. However, this provision shall not relieve the Contractor of its responsibility to secure its equipment and work at the facility at its own expense.

The Authority may impose, increase, and/or upgrade security requirements for the Contractor, subcontractors and their staffs during the term of this Contract to address changing security conditions

and/or new governmental regulations.

34. Construction In Progress

The Contractor recognizes that construction may be in progress at the Facility and may continue throughout the term of this Contract. Notwithstanding, the Contractor shall at all times during the term hereof maintain the same standards of performance and cleanliness as prevails in non-affected areas as required by the standards hereunder.

35. Permit-Required Confined Space Work

Prior to commencement of any work, the Contractor shall request and obtain from the Port Authority a description of all spaces at the facility which are permit-required confined spaces requiring issuance of an OSHA permit.

Prior to the commencement of any work in a permit-required confined space at a Port Authority facility requiring issuance of an OSHA permit, the Contractor shall contact the Manager to obtain an Authority Contractor Permit-Required Confined Space Notification form. The notification form must be filled out and submitted prior to commencing permit-required confined space work. All confined space work shall be performed in accordance with all applicable OSHA requirements. The Contractor shall provide its employees with a copy of its own company permit and shall furnish the Port Authority with a copy of the permit upon completion of the work. The Contractor must supply all equipment required for working in a confined space.

36. Signs

Except with the prior written approval of the Port Authority, the Contractor shall not erect, maintain or display any signs or posters or any advertising on or about the Facility.

37. Vending Machines, Food Preparation

The Contractor shall not install, maintain or operate on the Facility, or on any other Port Authority property, any vending machines without the prior written approval of the Port Authority. No foods or beverages shall be prepared or consumed at the Facility by any of the Contractor's employees except in areas as may be specifically designated by the Port Authority for such purpose.

38. Non-Publication

The Contractor shall not issue nor permit to be issued any press release, advertisement, or literature of any kind, which refers to the Port Authority or to the fact that goods have been, are being or will be provided to it and/or that services have been, are being or will be performed for it in connection with this Agreement, unless the vendor first obtains the written approval of the Port Authority. Such approval may be withheld if for any reason the Port Authority believes that the publication of such information would be harmful to the public interest of is in any way undesirable.

39. Time is of the Essence

Time is of the essence in the Contractor's performance of this Contract inasmuch as the Work to be performed will affect the operation of public facilities.

40. Holidays

The following holidays will be observed at the Site:

New Year's Day	Labor Day
Martin Luther King Jr. Day	Columbus Day

Presidents Day	Veterans Day
Memorial Day	Thanksgiving Day
Independence Day	Day After Thanksgiving
Christmas Day	

This list is subject to periodic revision and the Contractor shall be responsible for obtaining all updated lists from the office of the Manager. If any such holiday falls on a Sunday then the next day shall be considered the holiday and/or if any such holiday falls on a Saturday then the preceding day shall be considered the holiday.

41. Personnel Standards

In addition to any specific personnel requirements that may be required under the clause entitled "Personnel Requirements" in the Specifications, the Contractor (and any Subcontractor) shall furnish competent and adequately trained personnel to perform the Work hereunder. If, in the opinion of the Manager, any employee so assigned is performing their functions unsatisfactorily, they shall be replaced by the Contractor within twenty-four (24) hours following the Contractor's receipt of the Manager's request for such replacement.

All Contractor's employees performing Work hereunder shall have the ability to communicate in the English language to the extent necessary to comprehend directions given by either the Contractor's supervisory staff or by the Manager's staff. Any employee operating a motor vehicle must have a valid driver's license.

42. General Uniform Requirements for Contractor's Personnel

In addition to any specific uniform requirements that may be required by the Specifications, uniforms must be worn at all times during which the Services are being performed hereunder. The Contractor agrees that his/her employees will present a neat, clean and orderly appearance at all times. Uniforms shall include the Contractor's identification badge with picture ID bearing the employee's name. All uniforms, colors, types and styles shall be subject to the prior approval of the Manager. The Contractor will also be responsible for ensuring that its employees are wearing shoes appropriate for the tasks performed. The Manager shall have the right to require removal of any employee who shall fail to wear the proper uniform and shoes, and the exercise of this right shall not limit the obligation of the Contractor to perform the Services or to furnish any required number of employees at a specific location at the Site as specified.

43. Labor, Equipment and Materials Supplied by the Contractor

The Contractor shall, at all times during the performance of this Contract, furnish all necessary labor, supervision, equipment and materials necessary for the prompt and efficient performance of the Work, whether such materials and equipment are actually employed in the furnishing of the Work or whether incidental thereto.

All materials used by the Contractor in furnishing Work hereunder shall be of such quality as to accomplish the purposes of this Contract and the Services to be furnished hereunder in such manner so as not to damage any part of the Site.

The Port Authority by its officers, employees and representatives shall have the right at all times to examine the supplies, materials and equipment used by the Contractor, to observe the operations of the Contractor, its agents, servants and employees and to do any act or thing which the Port Authority may be obligated or have the right to do under this Contract or otherwise.

All equipment, materials and supplies used in the performance of this Contract required hereunder shall be used in accordance with their manufacturer's instructions.

Materials and supplies to be provided by the Contractor hereunder shall comply with OSHA and all

applicable regulations.

44. Contractor's Vehicles – Parking - Licenses

At the discretion of the Manager, the Port Authority may permit the Contractor during the effective period of this Contract to park vehicle(s) used by it in its operations hereunder in such location as may from time to time or at any time be designated by the Manager. The Contractor shall comply with such existing rules, regulations and procedures as are now in force and such reasonable future rules, regulations and procedures as may hereafter be adopted by the Port Authority for the safety and convenience of persons who park automotive vehicles in any parking area at the Site or for the safety and proper persons who park automotive vehicles in any parking area at the Site or for the safety and proper identification of such vehicles, and the Contractor shall also comply with any and all directions pertaining to such parking which may be given from time to time and at any time by the Manager. Any vehicle used by the Contractor hereunder shall be marked or placarded, identifying it as the Contractor's vehicle.

45. Manager's Authority

In the performance of the Work hereunder, the Contractor shall conform to all orders, directions and requirements of the Manager and shall perform the Work hereunder to the satisfaction of the Manager at such times and places, by such methods and in such manner and sequence as he/she may require, and the Contract shall at all stages be subject to his/her inspection. The Manager shall determine the amount, quality, acceptability and fitness of all parts of the Work and shall interpret the Specifications and any orders for Extra Work. The Contractor shall employ no equipment, materials, methods or staff or personnel to which the Manager objects. Upon request, the Manager shall confirm in writing any oral order, direction, requirement or determination.

The Manager shall have the authority to decide all questions in connection with the Services to be performed hereunder. The exercise by the Manager of the powers and authorities vested in him/her by this section shall be binding and final upon the Port Authority and the Contractor.

46. Price Preference

If this solicitation has not been set aside for the purposes of making an award based on bids solicited from Port Authority certified Minority Business, Women Business or Small Business Enterprises as indicated by the bidder pre-requisites in Part II hereof, for awards of contracts, not exceeding $1,000,000, for:

(a) Services, a price preference of 5% is available for New York or New Jersey Small Business Enterprises (SBE); or

(b) Services (excluding Janitorial/Cleaning Services), a price preference of 10% is available for New York or New Jersey Minority or Women Business Enterprises (M/WBE),

certified by the Port Authority by the day before the bid opening.

If the Bidder is a Port Authority certified MBE, WBE or SBE, enter the applicable date(s) certification was obtained in the space provided on the Signature Sheet attached hereto.

47. M/WBE Good Faith Participation

If specified as applicable to this Contract, the Contractor shall use every good-faith effort to provide for participation by certified Minority Business Enterprises (MBEs) and certified Women-owned Business Enterprises (WBEs) as herein defined, in all purchasing and subcontracting opportunities associated with this Contract, including purchase of equipment, supplies and labor services.

Good Faith efforts to include participation by MBEs/WBEs shall include the following:

a. Dividing the services and materials to be procured into small portions, where feasible.

b. Giving reasonable advance notice of specific contracting, subcontracting and purchasing opportunities to such MBEs/WBEs as may be appropriate.

c. Soliciting services and materials, to be procured, from the Directory of MBEs/WBEs, a copy of which can be obtained by contacting the Port Authority's Office of Business and Job Opportunity at (212) 435-7819 or seeking MBEs/WBEs from other sources.

d. Insuring that provision is made to provide progress payments to MBEs/WBEs on a timely basis.

e. Observance of reasonable commercial standards of fair dealing in the respective trade or business.

Either prior or subsequent to Contract award, the Contractor may request a full or partial waiver of the M/WBE participation goals set forth in this Contract by providing documentation demonstrating to the Manager, for approval by the Port Authority's Office of Business and Job Opportunity, that its good faith efforts did not result in compliance with the goals set forth above because participation by eligible M/WBEs could not be obtained at a reasonable price or that such M/WBEs were not available to adequately perform as subcontractors. The Contractor shall provide written documentation in support of its request to the Manager. The documentation shall include, but not be limited to, documentation demonstrating good faith efforts as described above, which may include, proof that the Authority's directory does not contain M/WBEs in this specific field of work, a list of organizations contacted to obtain M/WBEs, and/or a list of M/WBEs contacted and their price quotes. If approved by the Authority's Office of Business and Job Opportunity, the Manager will provide written approval of the modified or waived M/WBE Participation Plan.

Subsequent to Contract award, all changes to the M/WBE Participation Plan must be submitted via a modified M/WBE Participation Plan to the Manager for review and approval by the Authority's Office of Business and Job Opportunity. For submittal of modifications to the M/WBE Plan, Contractors are directed to use form PA3749C, which may be downloaded at http://www.panynj.gov/DoingBusinessWith/contractors/html/other_info.html. The Contractor shall not make changes to its approved M/WBE Participation Plan or substitute M/WBE subcontractors or suppliers for those named in their approved plan without the Manager's prior written approval. Unauthorized changes or substitutions, including performing the work designated for a subcontractor with the Contractor's own forces, shall be a violation of this section. Progress toward attainment of M/WBE participation goals set forth herein will be monitored throughout the duration of this Contract.

The Contractor shall also submit to the Manager, along with invoices, the Statement of Subcontractor Payments as the M/WBE Participation Report, annexed hereto as an attachment. The Statement must include the name and business address of each M/WBE subcontractor and supplier actually involved in the Contract, a description of the work performed and/or product or service supplied by each such subcontractor or supplier, the date and amount of each expenditure, and such other information that may assist the Manager in determining the Contractor's compliance with the foregoing provisions.

If, during the performance of this Contract, the Contractor fails to demonstrate good faith efforts in carrying out its M/WBE Participation Plan and the Contractor has not requested and been granted a full or partial waiver of the M/WBE participation goals set forth in this Contract, the Authority will take into consideration the Contractor's failure to carry out its M/WBE Participation Plan in its evaluation for award of future Authority contracts.

PART III CONTRACTOR'S INTEGRITY PROVISIONS

1. Certification of No Investigation (criminal or civil anti-trust), Indictment, Conviction, Debarment, Suspension, Disqualification and Disclosure of Other Information

By bidding on this Contract, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, that the Bidder and each parent and/or affiliate of the Bidder has not

a. been indicted or convicted in any jurisdiction;
b. been suspended, debarred, found not responsible or otherwise disqualified from entering into any contract with any governmental agency or been denied a government contract for failure to meet standards related to the integrity of the Bidder;
c. had a contract terminated by any governmental agency for breach of contract or for any cause based in whole or in part on an indictment or conviction;
d. ever used a name, trade name or abbreviated name, or an Employer Identification Number different from those inserted in the Bid;
e. had any business or professional license suspended or revoked or, within the five years prior to bid opening, had any sanction imposed in excess of $50,000 as a result of any judicial or administrative proceeding with respect to any license held or with respect to any violation of a federal, state or local environmental law, rule or regulation;
f. had any sanction imposed as a result of a judicial or administrative proceeding related to fraud, extortion, bribery, bid rigging, embezzlement, misrepresentation or anti-trust regardless of the dollar amount of the sanctions or the date of their imposition; and
g. been, and is not currently, the subject of a criminal investigation by any federal, state or local prosecuting or investigative agency and/or a civil anti-trust investigation by any federal, state or local prosecuting or investigative agency.

2. Non-Collusive Bidding, and Code of Ethics Certification, Certification of No Solicitation Based On Commission, Percentage, Brokerage, Contingent or Other Fees

By bidding on this Contract, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, that

a. the prices in its bid have been arrived at independently without collusion, consultation, communication or agreement for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;
b. the prices quoted in its bid have not been and will not be knowingly disclosed directly or indirectly by the Bidder prior to the official opening of such bid to any other bidder or to any competitor;
c. no attempt has been made and none will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition;
d. this organization has not made any offers or agreements or taken any other action with respect to any Authority employee or former employee or immediate family member of either which would constitute a breach of ethical standards under the Code of Ethics dated April 11, 1996 (a copy of which is available upon request to the individual named in the clause hereof entitled "Bidder's Questions"), nor does this organization have any knowledge of any act on the part of an Authority employee or former Authority employee relating either directly or indirectly to this organization which constitutes a breach of the ethical standards set forth in said Code;
e. no person or selling agency other than a bona fide employee or bona fide established commercial or selling agency maintained by the Bidder for the purpose of securing business, has been employed or retained by the Bidder to solicit or secure this Contract on the understanding that a commission, percentage, brokerage, contingent, or other fee would be paid to such person or selling agency; and

f. the bidder has not offered, promised or given, demanded or accepted, any undue advantage, directly or indirectly, to or from a public official or employee, political candidate, party or party official, or any private sector employee (including a person who directs or works for a private sector enterprise in any capacity), in order to obtain, retain, or direct business or to secure any other improper advantage in connection with this Contract.

g. no person or organization has been retained, employed or designated on behalf of the Bidder to impact any Port Authority determination with respect to (i) the solicitation, evaluation or award of this Contract; or (ii) the preparation of specifications or request for submissions in connection with this Contract.

The foregoing certifications shall be deemed to be made by the Bidder as follows:

* if the Bidder is a corporation, such certification shall be deemed to have been made not only with respect to the Bidder itself, but also with respect to each parent, affiliate, director, and officer of the Bidder, as well as, to the best of the certifier's knowledge and belief, each stockholder of the Bidder with an ownership interest in excess of 10%;
* if the Bidder is a partnership, such certification shall be deemed to have been made not only with respect to the Bidder itself, but also with respect to each partner.

Moreover, the foregoing certifications, if made by a corporate Bidder, shall be deemed to have been authorized by the Board of Directors of the Bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of such certification as the act and deed of the corporation.

In any case where the Bidder cannot make the foregoing certifications, the Bidder shall so state and shall furnish with the signed bid a signed statement that sets forth in detail the reasons therefor. If the Bidder is uncertain as to whether it can make the foregoing certifications, it shall so indicate in a signed statement furnished with its bid, setting forth in such statement the reasons for its uncertainty. With respect to the foregoing certification in paragraph "2g", if the Bidder cannot make the certification, it shall provide, in writing, with the signed bid: (i) a list of the name(s), address(es), telephone number(s), and place(s) of principal employment of each such individual or organization; and (ii) a statement as to whether such individual or organization has a "financial interest" in this Contract, as described in the Procurement Disclosure policy of the Authority (a copy of which is available upon request to the Director of the Procurement Department of the Authority). Such disclosure is to be updated, as necessary, up to the time of award of this Contract. As a result of such disclosure, The Port Authority shall take appropriate action up to and including a finding of non-responsibility.

Failure to make the required disclosures shall lead to administrative actions up to and including a finding of non-responsibility.

Notwithstanding that the Bidder may be able to make the foregoing certifications at the time the bid is submitted, the Bidder shall immediately notify the Authority in writing during the period of irrevocability of bids on this Contract of any change of circumstances which might under this clause make it unable to make the foregoing certifications or require disclosure. The foregoing certifications or signed statement shall be deemed to have been made by the Bidder with full knowledge that they would become a part of the records of the Authority and that the Authority will rely on their truth and accuracy in awarding this Contract. In the event that the Authority should determine at any time prior or subsequent to the award of this Contract that the Bidder has falsely certified as to any material item in the foregoing certifications or has willfully or fraudulently furnished a signed statement which is false in any material respect, or has not fully and accurately represented any circumstance with respect to any item in the foregoing certifications required to be disclosed, the Authority may determine that the Bidder is not a responsible Bidder with respect to its bid on the Contract or with respect to future bids on Authority contracts and may exercise such other remedies as are provided to it by the Contract with respect to these matters. In addition, Bidders are advised that knowingly providing a

false certification or statement pursuant hereto may be the basis for prosecution for offering a false instrument for filing (see e.g. New York Penal Law, Section 175.30 et.seq.). Bidders are also advised that the inability to make such certification will not in and of itself disqualify a Bidder, and that in each instance the Authority will evaluate the reasons therefor provided by the Bidder. Under certain circumstances the Bidder may be required as a condition of Contract award to enter into a Monitoring Agreement under which it will be required to take certain specified actions, including compensating an independent Monitor to be selected by the Port Authority, said Monitor to be charged with, among other things, auditing the actions of the Bidder to determine whether its business practices and relationships indicate a level of integrity sufficient to permit it to continue business with the Port Authority.

3. Bidder Eligibility for Award of Contracts - Determination by an Agency of the State of New York or New Jersey Concerning Eligibility to Receive Public Contracts

Bidders are advised that the Authority has adopted a policy to the effect that in awarding its contracts it will honor any determination by an agency of the State of New York or New Jersey that a Bidder is not eligible to bid on or be awarded public contracts because the Bidder has been determined to have engaged in illegal or dishonest conduct or to have violated prevailing rate of wage legislation.

The policy permits a Bidder whose ineligibility has been so determined by an agency of the State of New York or New Jersey to submit a bid on a Port Authority contract and then to establish that it is eligible to be awarded a contract on which it has bid because (i) the state agency determination relied upon does not apply to the Bidder, or (ii) the state agency determination relied upon was made without affording the Bidder the notice and hearing to which the Bidder was entitled by the requirements of due process of law, or (iii) the state agency determination was clearly erroneous or (iv) the state determination relied upon was not based on a finding of conduct demonstrating a lack of integrity or violation of a prevailing rate of wage law.

The full text of the resolution adopting the policy may be found in the Minutes of the Authority's Board of Commissioners meeting of September 9, 1993.

4. No Gifts, Gratuities, Offers of Employment, Etc.

During the term of this Contract, the Contractor shall not offer, give or agree to give anything of value either to a Port Authority employee, agent, job shopper, consultant, construction manager or other person or firm representing the Port Authority, or to a member of the immediate family (i.e., a spouse, child, parent, brother or sister) of any of the foregoing, in connection with the performance by such employee, agent, job shopper, consultant, construction manager or other person or firm representing the Port Authority of duties involving transactions with the Contractor on behalf of the Port Authority, whether or not such duties are related to this Contract or any other Port Authority contract or matter. Any such conduct shall be deemed a material breach of this Contract.

As used herein "anything of value" shall include but not be limited to any (a) favors, such as meals, entertainment, transportation (other than that contemplated by the Contract or any other Port Authority contract), etc. which might tend to obligate the Port Authority employee to the Contractor, and (b) gift, gratuity, money, goods, equipment, services, lodging, discounts not available to the general public, offers or promises of employment, loans or the cancellation thereof, preferential treatment or business opportunity. Such term shall not include compensation contemplated by this Contract or any other Port Authority contract. Where used herein, the term "Port Authority" shall be deemed to include all subsidiaries of the Port Authority.

The Contractor shall insure that no gratuities of any kind or nature whatsoever shall be solicited or accepted by it and by its personnel for any reason whatsoever from the passengers, tenants, customers or other persons using the Facility and shall so instruct its personnel.

In addition, during the term of this Contract, the Contractor shall not make an offer of employment or use confidential information in a manner proscribed by the Code of Ethics and Financial Disclosure dated April 11,

1996 (a copy of which is available upon request to the Office of the Secretary of the Port Authority).

The Contractor shall include the provisions of this clause in each subcontract entered into under this Contract.

5. Conflict of Interest

During the term of this Contract, the Contractor shall not participate in any way in the preparation, negotiation or award of any contract (other than a contract for its own services to the Authority) to which it is contemplated the Port Authority may become a party, or participate in any way in the review or resolution of a claim in connection with such a contract if the Contractor has a substantial financial interest in the contractor or potential contractor of the Port Authority or if the Contractor has an arrangement for future employment or for any other business relationship with said contractor or potential contractor, nor shall the Contractor at any time take any other action which might be viewed as or give the appearance of conflict of interest on its part. If the possibility of such an arrangement for future employment or for another business arrangement has been or is the subject of a previous or current discussion, or if the Contractor has reason to believe such an arrangement may be the subject of future discussion, or if the Contractor has any financial interest, substantial or not, in a contractor or potential contractor of the Authority, and the Contractor's participation in the preparation, negotiation or award of any contract with such a contractor or the review or resolution of a claim in connection with such a contract is contemplated or if the Contractor has reason to believe that any other situation exists which might be viewed as or give the appearance of a conflict of interest, the Contractor shall immediately inform the Director in writing of such situation giving the full details thereof. Unless the Contractor receives the specific written approval of the Director, the Contractor shall not take the contemplated action which might be viewed as or give the appearance of a conflict of interest. In the event the Director shall determine that the performance by the Contractor of a portion of its Services under this Agreement is precluded by the provisions of this numbered paragraph, or a portion of the Contractor's said Services is determined by the Director to be no longer appropriate because of such preclusion, then the Director shall have full authority on behalf of both parties to order that such portion of the Contractor's Services not be performed by the Contractor, reserving the right, however, to have the Services performed by others and any lump sum compensation payable hereunder which is applicable to the deleted work shall be equitably adjusted by the parties. The Contractor's execution of this document shall constitute a representation by the Contractor that at the time of such execution the Contractor knows of no circumstances, present or anticipated, which come within the provisions of this paragraph or which might otherwise be viewed as or give the appearance of a conflict of interest on the Contractor's part. The Contractor acknowledges that the Authority may preclude it from involvement in certain disposition/privatization initiatives or transactions that result from the findings of its evaluations hereunder or from participation in any contract which results, directly or indirectly, from the Services provided by the Contractor hereunder.

6. Definitions

As used in this section, the following terms shall mean:

Affiliate - Two or more firms are affiliates if a parent owns more than fifty percent of the voting stock of each of the firms, or a common shareholder or group of shareholders owns more than fifty percent of the voting stock of each of the firms, or if the firms have a common proprietor or general partner.

Agency or Governmental Agency - Any federal, state, city or other local agency, including departments, offices, public authorities and corporations, boards of education and higher education, public development corporations, local development corporations and others.

Investigation - Any inquiries made by any federal, state or local criminal prosecuting agency and any inquiries concerning civil anti-trust investigations made by any federal, state or local governmental agency. Except for inquiries concerning civil anti-trust investigations, the term does not include inquiries made by any civil government agency concerning compliance with any regulation, the nature of which does not carry criminal penalties, nor does it include any background investigations for

employment, or Federal, State, and local inquiries into tax returns.

Officer - Any individual who serves as chief executive officer, chief financial officer, or chief operating officer of the Bidder by whatever titles known.

Parent - An individual, partnership, joint venture or corporation which owns more than 50% of the voting stock of the Bidder.

If the solicitation is a Request for Proposal:

Bid - shall mean Proposal;
Bidder - shall mean Proposer;
Bidding - shall mean submitting a Proposal.

In a Contract resulting from the taking of bids:

Bid - shall mean bid;
Bidder - shall mean Bidder;
Bidding - shall mean executing this Contract.

In a Contract resulting from the taking of Proposals:

Bid - shall mean Proposal;
Bidder - shall mean Proposer;
Bidding - shall mean executing this Contract.

THE PORT AUTHORITY OF NEW YORK & NEW JERSEY
PURCHASING SERVICES DIVISION
ONE MADISON AVENUE 7TH FL.
NEW YORK, NY 10010

ADDENDUM # 1
March 28, 2008

To prospective Proposers on Request for Proposal Number 15091 for MARINE VESSEL ENGINE REPLACEMENT PROGRAM (MVERP) FOR VESSELS THAT OPERATE WITHIN THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY DESIGNATED NEW YORK-NORTHERN NEW JERSEY-CONNECTICUT-LONG ISLAND OZONE NON-ATTAINMENT AREA which is due back no later than 2:00 PM on April 10, 2008.

The following information is provided to Proposers:

Item 1: Pre-proposal meeting sign-in sheet

Item 2: ATTACHMENT D- Non-Attainment Area Map

Item 3: Those Proposers who want to view the MVERP Emissions Calculation Factors spreadsheet should make the request at email: dbailey@panynj.gov .

THE PORT AUTHORITY OF NY & NJ

JANE CETERKO, MANAGER
PURCHASING SERVICES DIVISION

BIDDERS FIRM NAME: _____

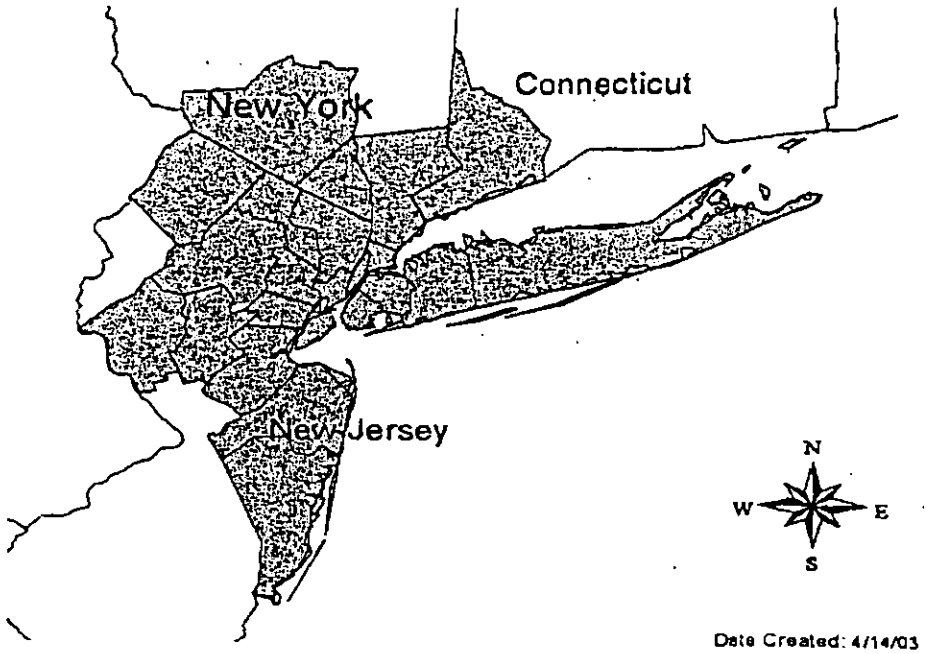
INITIALED: _____

DATE: _____

QUESTIONS CONCERNING THIS ADDENDUM MAY BE ADDRESSED TO MARYELLEN BENNETT WHO CAN BE REACHED AT 212-435-3915.

Attachment D - Non-Attainment Area Map

New York-N. New Jersey-Long Island, NY-NJ-CT Non-Attainment Areas



Attachment B – Part III – Cost Proposal Form

~~4~~ 2

One Form per Vessel

Name of Vessel: Capt Zeke

Number of Propulsion Engines to be replaced: (2)

Number of Auxiliary Engines to be replaced: (2)

Cost of Propulsion Engines: 185,700

Cost of Auxiliary Engines: 31,100

Less amount to be contributed by marine vessel owner: 36,100

Total to be reimbursed by Port Authority: 180,700

Other information: This cost proposal form constitutes an alternate costing for the program to include a monitoring system that would prove beneficial to both operator and donor (port auth).

WHITE NEAR COASTAL TOWING CORP

333 JACKSON AVE, ST 9
SYOSSET NY, 11791
RWHITE4@OPTONLINE.NET

PH: 516-802-7126 F: 516-802-7125

PROCUREMENT
2008 MAY 33 PM 3:32

TO: PORT AUTHORITY OF NEW YORK

FROM: ROY WHITE, CAPTAIN ZEKE PROPOSAL

RE: MARINE VESSEL ENGINE REPLACEMENT PROGROM (MVERP) for vessels that Operate within the United States Environmental Protection Agency Designated New York-Northern New Jersey-Connecticut-Long Island Ozone Non-Attainment Area, RFP #15091: Clarifications and Concerns

---

First let me apologize for this late response, we had some very pressing issues involving our oil barges that required immediate attention.

Responses to numbered items are as follows:

1) Capt Zeke was in operation in 2007, logs for a 364 day period are included. (May 15, 2007 to May 15, 2008) Estimated number of hours in our proposal included the obvious running hours underway (see logs) as well as the hours during which mains are run between consecutive jobs and before and after a job starts and ends (startup and shutdown).
2) Survey report provided quoted a near maximum horsepower for a 1271 main engine bared on an operating RPM that is not utilized in a tug (2100RPM). This constitutes an error on the part of the surveyor which went uncorrected by owner (White Near Coastal Towing). Regarding the quoted difference between the 472 and 483 HP, this is best accounted for in terms of inaccuracies involving old equipment and poor databases. Proposer (White Near Coastal) affirms these figures to be squarely in line

with reality and they should approximate others seen in past proposals for 1271 main operating at 1800 RPM. See Iron Eagle submittal (Bridge Construction Services) and Robert IV (Henry Marine).

(1) The original 371 generator sets have been replaced with the generators specified in the submittal. All have been in a bad state of repair and are being constantly patched up with old parts being kept in stock.

(2) Enclosed are requested pieces of information regarding 4045D John Deere generator sets.

Sorry for delays,

Roy White
President

06-02-08P03:33 RCVD

CURRY MARINE
PO BOX 610
NEWPORT OR 97365
541 265-7955

To: White Near Coastal Towing 04/15/08

Att: Jim

Fax: 631 547-0231

TOTAL

2ea Cummins QSK 19 600 HP @ 1800 RPM Marine Engine **$185,700.00**

Includes: Full authority electronic engine
Continuous Duty rating
Keel cooled configuration
24 Volt electrical, starter & alternator
Engine room & pilot house instrument panels
Extension wiring harnesses for instrument panels
Air cleaner
Front engine mount
Marine gear oil cooler
Spin on fuel, lube oil and water filters
Racor crank vent system
Ethernet connection for remote engine monitoring
Sea Command Elite monitoring system
EPA Tier 2 compliant
Standard Commercial Warranty
F.O.B. Newport OR

2ea Optional Cummins Eliminator lube oil centrifuge **$8,200.00**

Engine mounted
No spin on lube filters required

Note: Start up and sea trial at your location not included.

Thank you,

Scott Graf

White Near Coastal Towing

333 Jackson Ave. Syosset, NY 11791
TEL: (516) 802-7126 FAX: (516) 802-7125

A. Letter of Transmittal

As an operating company with its own assets, White Near Coastal Towing has been in existence for five years. As a company with extensive experience in dealing with agencies, corporations and individuals, it has been able to deal with the myriad of situations involving accountability both on paper and in the field.

In the course of normal business activities, it is necessary to file reports with federal regulatory agencies (Coast Guard, Corps of Engineers) private corporations and lenders. These capabilities are the very same necessary and useful ones needed to comply with the Port Authority contract requirements. The growth of the company to its present multi-million dollar level has been quick but measured.

The capabilities of White Near Coastal Towing are enhanced greatly by its association with several other companies owned wholly or partly by Roy White. These associations have both broadened its range of abilities and helped secure its financial security through diversity. Associated companies include Bridge Construction Services (tugs), Eastern Barge Services (tugs), Greater New York Marine Transportation (oil barges), as well as others.

(1) See above;
(2) Roy L. White, President, (516) 330-4803 is authorized to negotiate and execute the Contract;
(3) Roy L. White, President, (516) 330-4803 is the contact person to which the Port Authority can address questions or issues related to this RFP;
(4) Roy White, President, 12 Dumbarton Drive Huntington, NY 11743 and
John White, Vice President, 236 S Snedecor Ave. Bayport, NY 11705 are the only owners Of White Near Coastal Towing.

Roy L White _____ President

John W White _____ Vice President

White Near Coastal Towing

333 Jackson Ave. Syosset, NY 11791
TEL: (516) 802-7126 FAX: (516) 802-7125

B. Executive Summary

The major feature of this proposal by White Near Coastal Towing, Inc is the very large reduction in tons of NOX per year. Due to the large number of hours this vessel is used annually, and the amount of pollution produced by the existing antiquated equipment, there is a large proposed reduction. The owner's experience and success in the towing industry, the oil barge industry and the construction industry allow for a solid base in terms of security, financially and otherwise. Most employees of this company and others owned wholly or partly by Roy White are lifetime or long time participants in marine related businesses. This goes for those in managerial or on ship operations positions. The structure of management is such that only one individual would be in charge of the actual repower and another in charge of planning, scheduling and payments. The expertise and competencies needed to meet the requirements of this RFP are already in place and in existence and in use daily

White Near Coastal Towing

333 Jackson Ave. Syosset, NY 11791

TEL: (516) 802-7126 FAX: (516) 802-7125

April 10, 2008

Above named proposer does intend to operate any vessel, which is a beneficiary of the Port Authority program to which this application is addressed. Such operation shall take place a minimum of 80% of its total hours in the NAA Zone and for a minimum of 10 continuous years from the inception of the contract.

Ryan White

White Near Coastal Towing

333 Jackson Ave. Syosset, NY 11791
TEL: (516) 802-7126 FAX: (516) 802-7125

F. As a company with years of continuous operation and experience gleamed from owning and maintaining a fleet of vessels and barges, White Near Coastal Towing is fully capable of the work necessary to repower tugs. Technical Supervision shall be provided by the experts at Tottenville Marina in Staten Island, NY where the dry dock would be done. Attached in this package are engine descriptions for main and generator set engines. General timeline information is as follows;

Acquisition of engines:	1 month maximum
Installation:	5 weeks maximum
Sea trial:	1 week after start of replacement engines.
Scrappage dates:	Immediate, after removal

Please be aware that we use our daily logs for our vessels. A sample is included. To get the annual hour totals, the information from these sheets is used. Due to the enormous amount of paperwork involved with 12 copies and 365 logs all are not included. If there is another way to supply you with necessary information please let us know.

White Near Coastal Towing

333 Jackson Ave. Syosset, NY 11791
TEL: (516) 802-7126 FAX: (516) 802-7125

Addendum- 1 Remote Engine Monitoring

In addition to the fuel reduction and subsequent NOX reductions as per the formula calculations, the owners of White Near Coastal Towing intend to capitalize on the QSK-19's computer technology resulting in further actual fuel reductions. The QSK-19 is equipped with a computerized engine monitoring system. This monitoring system has Ethernet capability. We are planning to use this system along with Cummins "Command Elite Plus" to remotely monitor engine RPM and fuel usage from our main office. Due to the increased horsepower of the new engines, we will instruct the Captains to routinely operate the engines at 1500 RPM maximum. With the system installed on the engines, management will be able to ensure that this practice is being adhered to. The load factor associated with continuous usage at 1500 RPM is by itself approximate to the .68 load factor used in the Port Authority calculations. As a fixed reference number the .68 load factor includes idle engine operation time. This practice will result in an actual lower than .68 load factor during normal operation and considerably lower when idle operation time is factored into the equation and drastically reduce fuel consumption and our NOX tonnage figures. We suggest that the real world load factors with the system, (and the ability to truly limit RPM) would be in the range of .52 to .56 lowering the total emissions and to some degree offsetting increased costs. As can be seen from the horsepower curve tables, there will still be a horsepower increase over the old engines when operated at 1500 RPM allowing the vessel to complete its usual work.

White Near Coastal Towing

333 Jackson Ave. Syosset, NY 11791
TEL: (516) 802-7126 FAX: (516) 802-7125

Vessel Name: CAPTAIN ZEKE;

Current Main Engines: Detroit # 6120084/ 16-71 472 HP @1800 RPM (w/60 injectors)
Detroit# 6120085/ 16-71 472 HP @ 1800 RPM (w/60 injectors)

Proposed Engine for Repower: Cummins QSK-19 Tier 2 (600 hp @ 1800 RPM)

Current Generator Engines: Detroit# 4A 249944
4A 249944

Proposed Replacement Generator Engines: John Deere Model 4045 DFM70 Tier 2 (62 hp)

Curry Marine
PO Box 610
Newport OR 97365
541 265-7955

White Near Coastal Towing 04/15/08
Att: Jim
Fax: 631 547-0231

Jim, here is a emissions comparison on the Cummins QSK 19 and John Deere 4045 against the Detroit diesels.

Existing Machinery:
2ea Detroit Diesel 16V71, 6,100 hours per year @ 18.77 g/kwhr = 61.80 Tons per year
1ea Detroit Diesel 471 gen 8,760 hours per year @ 18.77 g/kwhr = 4.92 Tons per year
TOTAL 66.72 Tons per year

Proposed Machinery:
2ea Cummins QSK 19, 6,100 hours per year @ 6.37 g/kwhr = 26.072 Tons per year
1ea John Deere 4045 gen, 8,760 hours per year @ 6.55 g/kwhr = 1.72 Tons per year
TOTAL 27.792 Tons per year

Combined Savings: 66.72 Tons per year
-27.792 Tons per year
TOTAL SAVINGS= 38.928 Tons per year

Formula used:

kw x 0.68 x hours x g/kwhr divide by 907,180

kw = engine hp rating
0.68 = assumed load factor
hours = operating hours per year
g/kwhr = grams of nox produced per kilowatt hour
907,180 = conversion of grams to tons

Detroit Diesel 16V71 rated 360 kw @ 1800
Detroit Diesel 471 rated 40 kw @ 1800

Cummins QSK 19 rated 447 KW @ 1800
John Deere 4045 rated 40 KW @ 1800

Thank you,
Scott Graf

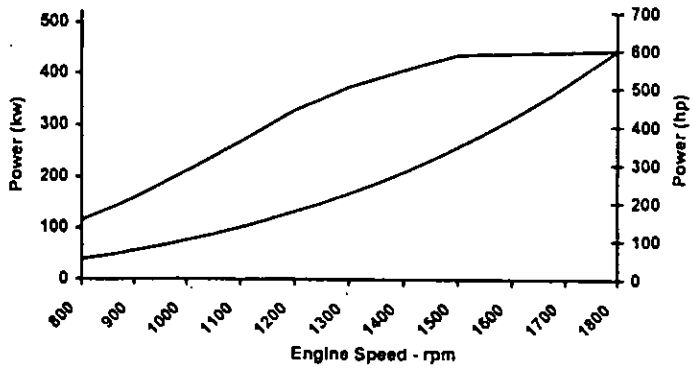
CUMMINS INC. Columbus, IN 47201 Marine Performance Curves	Basic Engine Model QSK19-M	Curve Number: M-4442	
	Engine Configuration D193102MX03	CPL Code: 2768	Date: 4-Jan-08

Displacement: 19 Liter [1150 in³]
Bore: 159 mm [6.25 in]
Stroke: 159 mm [6.25 in]
Fuel System: Modular Common Rail (MCRS)
Cylinders: 6

kW [bhp] @ rpm
Advertised Power: 447 [600] @ 1800

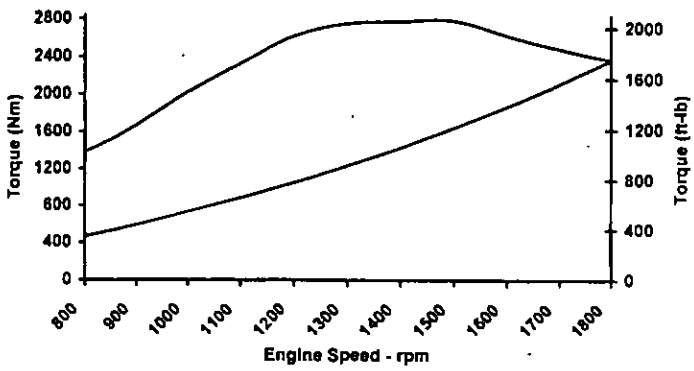
Aspiration: Turbocharged / Low Temperature Aftercooled
Rating Type: Continuous

CERTIFIED: This marine diesel complies with or is certified to the:
IMO - NOx requirements of the International Maritime Organization (IMO), MARPOL 73/78 Annex VI, Regulation 13
EPA Tier 2 - Model year requirements of the EPA marine regulation (40CFR94)
EU Stage IIIa - EC Nonroad Mobile Machinery Directive (2004/26/EC)



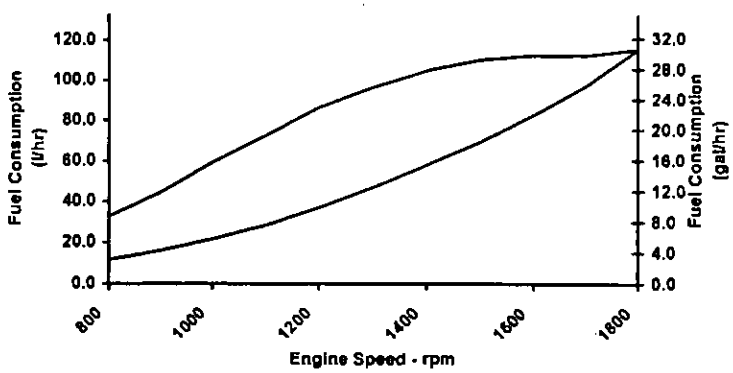
RATED POWER OUTPUT CURVE

rpm	kw	bhp
1800	447	600
1700	444	595
1600	441	591
1500	438	587
1400	408	546
1300	376	504
1200	330	442
1100	269	361
1000	212	285
900	158	212
800	116	156



FULL LOAD TORQUE CURVE

rpm	N-m	ft-lb
1800	2373	1751
1700	2490	1837
1600	2632	1941
1500	2786	2055
1400	2779	2050
1300	2760	2036
1200	2625	1936
1100	2334	1722
1000	2026	1495
900	1675	1235
800	1385	1021



FUEL CONSUMPTION - PROP CURVE

rpm	l/hr	gal/hr
1800	115.9	30.6
1700	97.7	25.8
1600	83.0	21.9
1500	69.6	18.4
1400	58.3	15.4
1300	47.1	12.4
1200	37.2	9.8
1100	28.5	7.5
1000	21.7	5.7
900	16.2	4.3
800	11.8	3.1

Rated Conditions: Ratings are based upon ISO 8665 and SAE J1228 reference conditions; air pressure of 100 kPa [29.612 in Hg], air temperature 25deg. C [77 deg. F] and 30% relative humidy. Power is in accordance with IMCI procedure. Member NMMA.

Rated Curves (upper) represents rated power at the crankshaft for mature gross engine performance capabilities obtained and corrected in accordance with ISO 3046. Propeller Curve (lower) is based on a typical fixed propeller demand curve using a 3.0 exponent. Propeller Shaft Power is approximately 3% less than rated crankshaft power after typical reverse/reduction gear losses and may vary depending on the type of gear or propulsion system used

Fuel Consumption is based on fuel of 35 deg. API gravity at 16 deg C [60 deg. F] having LHV of 42,780 kj/kg [18390 Btu/lb] and weighing 838.9 g/liter [7.001 lb/U.S. gal].

Continuous Rating (CON): Intended for continuous use in applications requiring uninterrupted service at full power. This rating is an ISO 3046 standard power rating.

CHIEF ENGINEER

Propulsion Marine Engine Performance Data

Curve No.	M-4442
DS :	D19-MX-1
CPL :	2768
DATE:	4-Jan-08

General Engine Data

Engine Model		QSK19-M
Rating Type		Continuous
Rated Engine Power	kW [hp]	447 [600]
Rated Engine Speed	rpm	1800
Rated Power Production Tolerance	±%	3
Rated Engine Torque	N·m [lb·ft]	2374 [1751]
Peak Engine Torque @ 1500 rpm	N·m [lb·ft]	2786 [2055]
Brake Mean Effective Pressure	kPa [psi]	1583 [230]
Indicated Mean Effective Pressure	kPa [psi]	3165 [459]
Default Idle Speed Setting	rpm	650
Minimum Idle Speed Setting	rpm	550
Normal Idle Speed Variation	rpm	10
High Idle Speed Range Minimum	rpm	1900
Maximum	rpm	2150
Maximum Allowable Engine Speed	rpm	2450
Maximum Torque Capacity from Front of Crank[2]	N·m [lb·ft]	N.A. [N.A.]
Compression Ratio		15:1
Piston Speed	m/sec [ft/min]	9.5 [1874]
Firing Order		1-5-3-6-2-4
Weight (Dry) - Engine Only - Average	kg [lb]	2200 [4850]
Weight (Dry) - Engine With Heat Exchanger System - Average	kg [lb]	2336 [5150]
Weight Tolerance (Dry) Engine Only	3xStd Dev(±%)	10.0

Noise and Vibration

Average Noise Level - Top	(Idle)	dBA @ 1m	82
	(Rated)	dBA @ 1m	93
Average Noise Level - Right Side	(Idle)	dBA @ 1m	85
	(Rated)	dBA @ 1m	97
Average Noise Level - Left Side	(Idle)	dBA @ 1m	85
	(Rated)	dBA @ 1m	98
Average Noise Level - Front	(Idle)	dBA @ 1m	87
	(Rated)	dBA @ 1m	99

Fuel System[1]

Avg. Fuel Consumption - ISO 8178 E3 Standard Test Cycle	l/hr [gal/hr]	78 [20.7]
Fuel Consumption at Rated Speed	l/hr [gal/hr]	116 [30.6]
Approximate Fuel Flow to Pump	l/hr [gal/hr]	382 [101.0]
Maximum Allowable Fuel Supply to Pump Temperature	°C [°F]	60 [140]
Approximate Fuel Flow Return to Tank	l/hr [gal/hr]	267 [70.4]
Approximate Fuel Return to Tank Temperature	°C [°F]	51 [124]
Maximum Heat Rejection to Drain Fuel	kW [Btu/min]	1.5 [85]

Air System[1]

Intake Manifold Pressure	kPa [in Hg]	189 [56]
Intake Air Flow	l/sec [cfm]	687 [1456]
Heat Rejection to Ambient	kW [Btu/min]	40 [2292]

TBD= To Be Determined N/A = Not Applicable N.A. = Not Available

1 All Data at Rated Conditions.
2 Consult Installation Direction Booklet for Limitations.
3 Heat rejection to coolant values are based on 50% water/50% ethylene glycol mix and do NOT include fouling factors. If sourcing your own cooler, a service fouling factor should be applied according to the cooler manufacturer's recommendation.
4 Consult option notes for flow specifications of optional Cummins seawater pumps, if applicable.

Propulsion Marine Engine Performance Data

Curve No.	M-4442
DS :	D19-MX-1
CPL :	2768
DATE:	4-Jan-08

Exhaust System[1]		
Exhaust Gas Flow	l/sec [cfm]	1602 [3395]
Exhaust Gas Temperature (Turbine Out)	°C [°F]	437 [818]
Exhaust Gas Temperature (Manifold)	°C [°F]	563 [1,045]
Emissions (in accordance with ISO 8178 Cycle E3)		
NOx (Oxides of Nitrogen)	g/kw·hr [g/hp·hr]	6.469 [4.824]
HC (Hydrocarbons)	g/kw·hr [g/hp·hr]	0.139 [0.103]
CO (Carbon Monoxide)	g/kw·hr [g/hp·hr]	1.466 [1.094]
PM (Particulate Matter)	g/kw·hr [g/hp·hr]	0.088 [0.065]
Cooling System[1]		
Sea Water Pump Specifications	MAB 0.08.17-07/16/2001	
Pressure Cap Rating (With Heat Exchanger Option)	kPa [psi]	103 [15]
Engines with Low Temperature Aftercooling (LTA)		
Single Loop LTA		
Coolant Flow to Cooler (with open thermostat)	l/min [gal/min]	238 [63]
LTA Thermostat Operating Range (Start to Open)	°C [°F]	66 [150]
LTA Thermostat Operating Range (Full Open)	°C [°F]	80 [175]
Heat Rejection to Engine Coolant[3]	kW [Btu/min]	359 [20455]
Maximum Coolant Inlet Temperature from LTA Cooler	°C [°F]	49 [120]

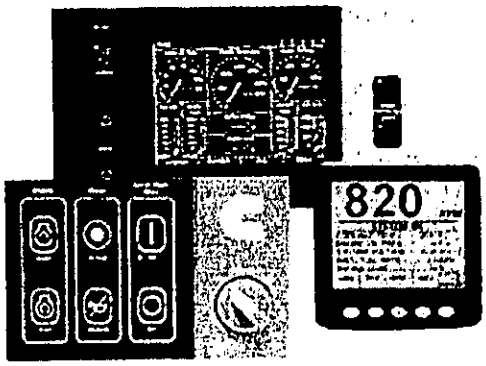
TBD= To Be Determined N/A = Not Applicable N.A. = Not Available

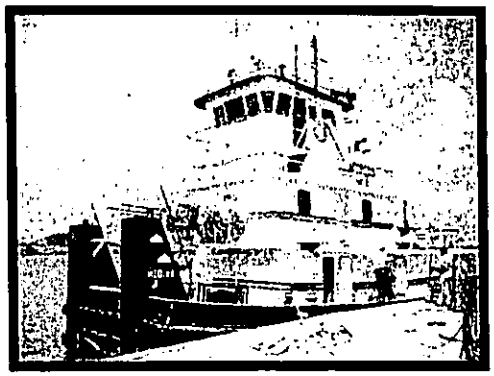
[1] All Data at Rated Conditions.
[2] Consult Installation Direction Booklet for Limitations.
[3] Heat rejection to coolant values are based on 50% water/50% ethylene glycol mix and do NOT include fouling factors. If sourcing your own cooler, a service fouling factor should be applied according to the cooler manufacturer's recommendation.
[4] Consult option notes for flow specifications of optional Cummins seawater pumps, if applicable.

Cummins Inc.
COLUMBUS, INDIANA

All Data is Subject to Change Without Notice - Consult the following Cummins Intranet site for most recent data: http://www.cummins.com

Electronic Information System





Cummins is pleased to introduce C-Command panels, part of our Electronic Information System (EIS) product line, designed specifically for the marine industry. The systems are designed to maximize operation of the Tier 2 engines and include a variety of monitoring and display options.

C-Command - cost-effective, flexible, basic system

C-Command Elite - premium features for advanced monitoring and control

C-Command Elite Plus - type-approved systems for classed applications

Every Situation. C-Command Panels brochure

EVERY™ PORT.

© 2003 Cummins Inc. Box 3005, Columbus, IN 47202-3005 U.S.A.

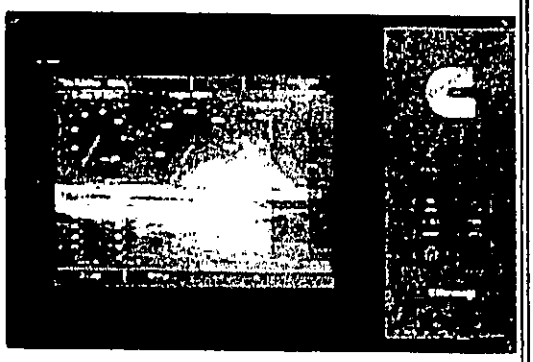
Publish Date-January 04, 2006 :: Expiry Date-January 03, 2009 :: Author Id-bc949 :: Approver Id-bc949
Apps :: Marine
Regions :: Southeast Asia, East Asia, India, Mexico, Korea, Central Area, South Pacific, Latin America, North America, Japan

Distribution is intended for Cummins personnel and distributors

Remote Control Panel

Component Features

Remote digital interface to engine control
Digital microprocessor controlled
Features:
- 8.4" FT color touch-screen display
- Menu-driven user interface
- Ethernet communication
- Self-diagnostic
- Start/Stop control
- Alarm indication
- Station transfer control
- Multiple engine monitoring capability



EVERY™ PORT.

© 2003 Cummins Inc, Box 3005, Columbus, IN 47202-3005 U.S.A.

Publish Date-January 04, 2008 :: Expiry Date-January 03, 2009 :: Author Id-bc949 :: Approver Id-bc949
Apps :: Marine
Regions :: Southeast Asia, East Asia, India, Mexico, Korea, Central Area, South Pacific, Latin America, North America, Japan
Roles :: Engine Dealer, Boat Builder, Naval Architect/Engineer, Cummins Mercruiser Distributor, Certification, Cummins Distributor, OEM, Training, Fleet Customer, MerCruiser Only Distributor, Component Supplier, Service, Boat Dealer, Sales

Distribution is intended for Cummins personnel and distributors

C-Command Elite

System Features

- Modular design
- Simplified installation
- Compatible with C-Command remote options
- Digital access to all ECM engine data
- Connection to six (6) customer inputs (2 temperature, 2 pressure and 2 switch)

Components

- Customer Interface Box (CIB)
- Remote Control Panel (RP) - Optional

Technical Information

- Wiring Diagrams

EVERY™ PORT.

© 2005 Cummins Inc. Box 3005 Columbus, IN 47202-3005 U.S.A.

Publish Date-January 04, 2008 :: Expiry Date-January 03, 2009 :: Author id-bc949 :: Approver id-bc949
Apps :: Marine
Regions :: Southeast Asia, East Asia, India, Mexico, Korea, Central Area, South Pacific, Latin America, North America, Japan
Roles :: Engine Dealer, Boat Builder, Naval Architect/Engineer, Cummins Mercruiser Distributor, Certification, Cummins Distributor, OEM, Training, Fleet Customer, MerCruiser Only Distributor, Component Supplier, Service, Boat Dealer, Sales

Distribution is intended for Cummins personnel and distributors

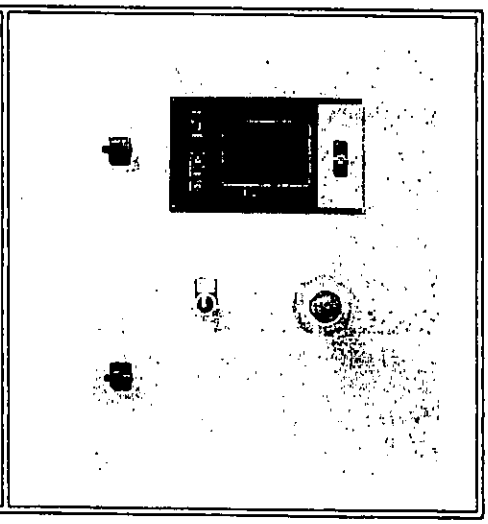
C-Command Elite Plus

System Features

Complies with Marine Classification Society rules
Compatible with the C-Command Elite system
Remote I/O Module (RIO) included for alarm system sensors
Shut-Down Unit (SDU) included for safety system sensors
Alarm and safety system data available at all digital stations

Component Features

Customer Interface Box (CIB)
Central engine to vessel interface point
Same features as C-Command Elite CIB
Plus:
- RIO for alarm system sensors
- SDU for safety system sensors
- Requires two (2) independent power supplies
- Compatible with all remote panel options
- Additional I/O available for Marine Societies not covered by the default system



Technical Information

Wiring Diagrams

EVERY™ PORT.

© 2003 Cummins Inc, Box 3005, Columbus, IN 47202-3005 U.S.A.

Publish Date-January 04, 2008 :: Expiry Date-January 03, 2009 :: Author Id-bc949 :: Approver Id-bc949
Apps :: Marine
Regions :: Southeast Asia, East Asia, India, Mexico, Korea, Central Area, South Pacific, Latin America, North America, Japan
Roles :: Engine Dealer, Boat Builder, Naval Architect/Engineer, Cummins Mercruiser Distributor, Certification, Cummins Distributor, OEM, Training, Fleet Customer, MerCruiser Only Distributor, Component Supplier, Service, Boat Dealer, Sales

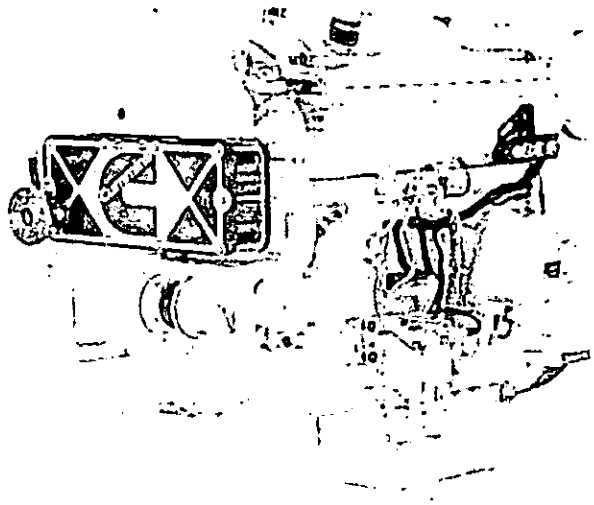
Distribution is intended for Cummins personnel and distributors

QSK19 Tier 2

MARINE PROPULSION AND AUXILIARY ENGINES

SPECIFICATIONS

ENGINE TYPE	IN-LINE, 6 CYLINDER, 4 STROKE DIESEL
BORE & STROKE	159 mm x 159 mm (6.25 in x 6.25 in)
DISPLACEMENT	19 L (1150 in³)
ROTATION	COUNTERCLOCKWISE FACING FLYWHEEL
ASPIRATION	TURBOCHARGED/AFTERCOOLED
EMISSIONS	U.S. EPA TIER 2, EU STAGE IIIA, IMO



RATINGS

ENGINE MODEL	OUTPUT POWER kW	HP	kWe*	ENGINE SPEED RPM	RATING DEFINITION	FUEL CONSUMPTION** L/hr (gal/hr)
VARIABLE SPEED						
QSK19-M TIER 2	373	500	-	1800	CONTINUOUS	68.9 (18)
QSK19-M TIER 2	448	600	-	1800	CONTINUOUS	78 (21)
QSK19-M TIER 2	492	660	-	1800	CONTINUOUS	94.9 (25)
QSK19-M TIER 2	560	750	-	1800	HEAVY DUTY	98.7 (26)
QSK19-M TIER 2	567	760	-	2100	HEAVY DUTY	N/A
QSK19-M TIER 2	597	800	-	2100	MCD	N/A
FIXED SPEED						
QSK19-DM TIER 2	563	755	541	1800 (60 Hz)	PRIME	33 (9)

* kWe reflects the approximate amount of power available when used in a keel cooled genset configuration
** Average fuel consumption based on ISO 8178 E3 Standard Test Cycle (variable speed models) and ISO 8178 D2 Standard Test Cycle (fixed speed models)

FEATURES AND BENEFITS

Engine Design - Reliable base engine uses common components from the proven K19, K38 and K50 engines. A new cast-iron, ductile single-piece piston with nitride-coated rings and hardened cylinder liner provides excellent durability and long life

Fuel System - Modular Common-Rail Fuel System features a simplified design which provides constant high injection pressure regardless of engine speed or load conditions. Benefits include low noise and vibration for quiet operation, idle stability and low-end torque

Cooling System - Single-loop cooling eliminates the need for two keel coolers for reduced installation expense. Engine-mounted titanium plate heat exchanger provides superior durability with minimal maintenance requirements

Exhaust System - Water-cooled exhaust manifold cools engine surface temperatures. Design is a cast single piece construction that eliminates potential exhaust leakage

Air System - Mounted or remote marine grade air cleaner with replaceable element reduces maintenance cost. Water-cooled turbocharger optimized for vessel operating conditions and safety

Lubrication System - Standard capacity 60.6 L (16 U.S. gal) oil pan with shallow, rear or front sump for installation flexibility. Cummins spin-on oil filters available on engine service side

EVERY™ PORT.

QSK19 Tier 2

MARINE PROPULSION AND AUXILIARY ENGINES

FEATURES AND BENEFITS

Electronics - 24-volt Quantum System electronics feature a proven CM850 ECM to monitor operating parameters such as fuel consumption, duty cycle, engine load and speed, while providing diagnostics, prognostics and complete engine protection. Simplified electrical customer interface box for all vessel connections reduces installation complexity

Certifications.- Complies with MARPOL 73/78 Annex VI (IMO), U.S. EPA Tier 2 and EU Stage IIIA emissions regulations. Designed to meet the International Association of Classification Societies (IACS) and SOLAS requirements. Consult your local Cummins professional for a complete listing of available class approvals

Optional Equipment

- Integrated C Command panels with a selection of display options are available to monitor and maximize operation and performance
- Optional Cummins ELIMINATOR™ filter replaces disposable lube filters with a self-cleaning centrifuge that reduces maintenance expense and improves engine life
- Premium coolant hose connections
- Duplex lube oil and fuel filtration
- Integral marine gear oil cooler
- SAE A or B auxiliary drive
- Front PTO adaptor
- Fully integrated, type-approved alarm and safety system

DIMENSIONS

LENGTH	2007 mm	79 in	KC
WIDTH	963 mm	38 in	
HEIGHT	1880 mm	74 in	
WEIGHT	2189 kg	4825 lb	

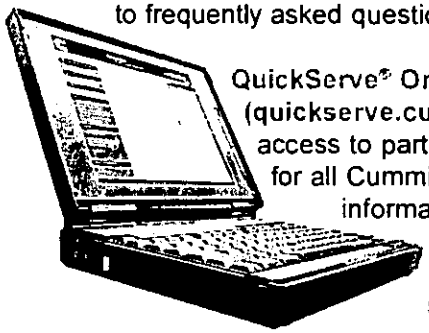
Dimensions and weight may vary based on selected engine configuration

THE CUMMINS ADVANTAGE

- 24 Hour Customer Support
- Reliable & Durable Products
- Best in Class Life Cycle Cost
- Comprehensive Global Warranty

EVERY QUESTION. ANSWERED.

Marine Website (marine.cummins.com) - Offers the most up-to-date product specifications, installation drawings and technical information as well as answers to frequently asked questions



QuickServe® Online (quickserve.cummins.com) - Gives easy access to parts and service information for all Cummins engines. Find the information you need with our high-speed search function and your engine's serial number

Cummins Online Product Registration - Register your Cummins engine quickly and easily on the Marine website to ensure quality parts and service

Distributor Expertise - The best source for service, parts and application assistance. To find your nearest Cummins distributor, go to the Worldwide Service Locator at wsl.cummins.com. If you need assistance beyond what your local Cummins professional has offered, contact the Regional Office for your area or email wave.master@cummins.com

Global Support Network - Backed by the strength of Cummins distribution network with marine service locations in 160 countries, Cummins engines include a comprehensive, worldwide warranty

Cummins Inc.
4500 Leeds Avenue - Suite 301
Charleston, South Carolina 29405
U.S.A.

Email: wave.master@cummins.com
Internet: http://marine.cummins.com

Cummins is a pioneer in product improvement. Thus specifications may change without notice. Illustrations may include optional equipment.

Bulletin M10050 Printed in U.S.A. REV 1/08
©2008 Cummins Inc.

MEMPHIS DIESEL POWER, INC.

P.O. BOX 1452
MEMPHIS, TENNESSEE 38101-1452
TEL: 901-774-6800

1488 CHANNEL AVE.
MEMPHIS, TENNESSEE 38113
FAX: 901-948-5247

JOHN DEERE

April 15, 2008

To: White Near Coastal
Attn: Jim

From: Sean Farrell

Ref: John Deere 45 kW Marine Genset Quotation

Memphis Diesel Power is pleased to offer the following marine generator set:

45 kW GenTech MODEL 45MKCTII
MARINE KEEL COOLED DIESEL GENERATOR

ENGINE DATA:

- ***JOHN DEERE*** MARINE DIESEL ENGINE MODEL 4045DFM70 ***TIER II***
- 62 HP @ 1800 RPM
- HEAVY DUTY 6 INCH CHANNEL STEEL SKID
- VIBRATION ISOLATORS
- COOLANT EXPANSION TANK
- WATER COOLED EXHAUST MANIFOLD
- WATER COOLED TURBOCHARGER HOUSING
- DRY EXHAUST ELBOW
- CRANKCASE BREATHER
- OIL DRAIN VALVE & HOSE
- FUEL WATER SEPARATOR SYSTEM
- 12 VOLT DC STARTING SYSTEM
- 12 VOLT DC BATTERY CHARGING ALTERNATOR
- BELT GUARD
- FUEL PRIMING PUMP
- ECU GOVERNOR SYSTEM

- ENGINE INSTRUMENT PANEL
  - *ENGINE OIL PRESSURE*
  - *RPM*
  - *ENGINE TEMPERATURE*
  - *HOURS*
  - *BATTERY DC VOLTAGE*
- SAFETY SHUT DOWN SYSTEM
  - *LOW OIL PRESSURE*
  - *HIGH COOLANT TEMPERATURE*
  - *OVER SPEED*
- AIR FILTER
- ENGINE OPERATORS MANUAL

GENERATOR DATA:

- ***12 LEAD*** GENERATOR
- 4 POLE / 1800 RPM
- BROAD RANGE kW RATING:
  45 kW @ 80° C. TEMPERATURE RISE ON ARMATURE
- 3 PHASE
- INSULATION CLASS: H
- .8 POWER FACTOR
- AMBIENT TEMPERATURE: 40° C.
- 12 LEAD RECONNECTABLE FOR VARIOUS VOLTAGE COMBINATIONS
- SOLID STATE VOLTAGE REGULATOR
  - *ENCAPSULATED FOR MOISTURE PROOF PROTECTION*
  - *± 1% VOLTAGE REGULATION*
  - *SENSING & POWER INPUT 190-240 VAC*
  - *OUTPUT POWER-CONTINUOUS: 75 VDC @ 3.5ADC*
  - *UNDER FREQUENCY PROTECTION*
  - *OPERATING TEMPERATURE: -40° C. TO + 60° C.*
- BRUSHLESS EXCITATION SYSTEM

LOAD BANK TESTED PRIOR TO DELIVERY
FREQUENCY & VOLTAGE PRE-SET

PRICE: $ 15,550.00 EACH
DELIVERY: 1 WEEK (PRICES ARE VALID FOR 30 DAYS.)
(2) YEAR – 2000 HOUR WARRANTY ON ENGINE
(1) YEAR WARRANTY ON GENERATOR

45MKC OPTIONS:

Day Tank Kit **$105.00**
Expansion tank pressure cap adapter flange to convert cap connection to utilize an engine room coolant day tank. Requires welding a hose bib onto the adapter.

Exhaust Connection Kit **$295.00**
Includes: (1) 4 inch NPT flange
(1) exhaust gasket, nuts, bolts, washers
(1) 4 inch x 18 inch stainless steel flex connection with 4 inch NPT male threads on each end.

Engine Service Manual **$125.00**

Engine Parts Manual **$ 75.00**

Thanks,

Sean Farrell
Memphis Diesel Powe

JOHN DEERE

ENGINE PERFORMANCE CURVE

POWERTECH 4.5 L Engine
Model: 4045DFM70

Rating: Marine

Application: Generator
Prime Power

62 hp (46 kW) @ 1800 rpm
54 hp (40 kW) @ 1500 rpm

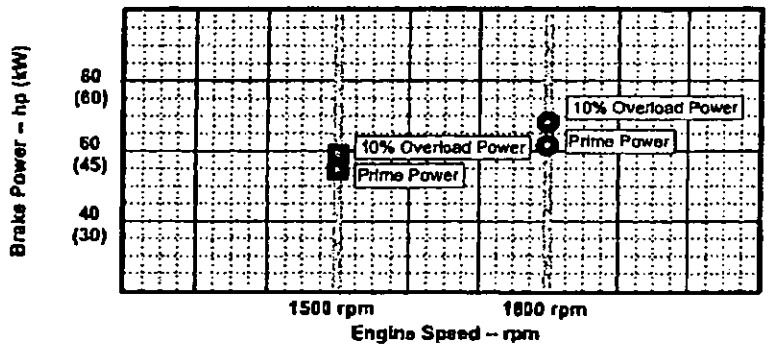
Speed rpm (Hz)	Generator Efficiency %	Keel Cooled (no fan)		Power Factor	Calculated Gen-Set Rating	
					kW	kVA
1500 (50)	88-92	--	--	0.8	35-37	44-46
1800 (60)	88-92	--	--	0.8	40-42	50-53

Air Intake Restriction .....12 in.H_2O (3 kPa)
Exhaust Back Pressure ..... 30 in.H_2O (7.5 kPa)

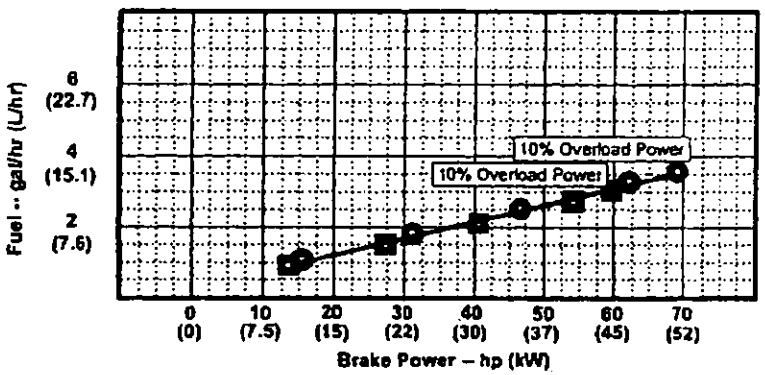
Gross power guaranteed within + or - 5% at SAE J1995 and ISO 8665 conditions:
77 °F (25 °C) air inlet temperature
29.31 in.Hg (99 kPa) barometer
104 °F (40 °C) fuel inlet temperature
0.853 fuel specific gravity @ 60 °F (15.5 °C)

Conversion factors:
Power: kW = hp x 0.746
Fuel: 1 gal = 7.1 lb, 1 L = 0.85 kg
Torque: N-m = lb-ft x 1.356

All values are from currently available data and are subject to change without notice.



■ - 1500 rpm ● - 1800 rpm



Notes:

1800 RPM Emission Certifications:	1500 RPM Emission Certifications:
• EPA Commercial Marine (40 CFR Part 94) • IMO Exempt*	¥ IMO Exempt*
Ref: Engine Emission Label	Ref: Engine Emission Label

Certified by:

NEAL LEEPER 1 Apr 2004

* Revised Data
Curve 4045DFM7062MG.....Sheet 1 of 2
April 2004

Engine Specification Data

General Data

Model	4045DFM70
Number of Cylinders	4
Bore and Stroke–in. (mm)	4.2 x 5.0 (106.5 x 127)
Displacement–in.^{3} (L)	275 (4.5)
Compression Ratio	17.6:1
Valves per Cylinder–Intake/Exhaust	1 / 1
Firing Order	1-3-4-2
Combustion System	Direct Injection
Engine Type	In-line, 4-Cycle
Aspiration	Natural
Engine Crankcase Vent System	Closed
Max. Crankcase Pressure–in. H_2O (kPa)	2 (0.5)

Physical Data

Length–in. (mm)	34.8 (885)
Width–in. (mm)	28.0 (712)
Height, Crank Center to Top–in. (mm)	24.4 (620)
Height, Crank Center to Bottom–in. (mm)	11.1 (282.5)
Weight, dry–lb (kg)	1019 (462)
(Includes flywheel housing, flywheel & electrics)	
Center of Gravity Location From	
Rear Face of Block (X-axis)–in. (mm)	11.0 (280)
Right of Crankshaft (Y-axis)–in. (mm)	-1.0 (-25)
Above Crankshaft (Z-axis)–in. (mm)	7.9 (200)
Max. Allow. Static Bending Moment at Rear Face of Flywhl Hsg w/ 5-G Load–lb-ft (N•m)	600 (814)
Thrust Bmg. Load Limit (Forward)–lb (N)	900 (4003)
Maximum Installation Angle	
Front up–degrees	12*
Front down–degrees	0

Air System

	1800 rpm	1500 rpm
Min. Ventilation Area–In.^{2} (m^2)	34.1(0.022)	23.3(0.015)
Maximum Allowable Air Temperature Rise, Ambient to Engine Inlet–°F (°C)	30 (17)	30 (17)
Engine Air Flow–ft^3/min (m^3/min)	127 (3.6)	85 (2.4)
Maximum Air Intake Restriction		
Dirty Air Cleaner–in. H_2O (kPa)	25 (6.25)	25 (6.25)
Clean Air Cleaner–in. H_2O (kPa)	12 (3.0)	12 (3.0)

Cooling System

	1800 rpm	1500 rpm
Eng. Heat Reject.–BTU/min (kW)	2391 (42)	1793 (31.5)
Eng. Radiated Heat–BTU/min (kW)	353 (6.2)	290 (5.1)
Coolant Flow–gal/min (L/min)	32* (125*)	30* (116*)
Min. Coolant Fill Rate–gal/min (L/min)	3.2 (12)	3.2 (12)
Thermostat Start to Open–°F (°C)	180 (82)	180 (82)
Thermostat Fully Open–°F (°C)	203 (95)	203 (95)
Maximum Top Tank Temp–°F (°C)	212 (100)	212 (100)
Minimum Sea Water-to-Boil–°F (°C)	90 (32)	90 (32)
Min. Water Pump In. Press.–in. H_2O (kPa)	00 (00)	00 (00)
Rec'd. Pressure Cap–psi (kPa)	10 (70)	10 (70)
Max. Pressure Drop Across Keel Cooler–psi (kPa)	4 (30)	3 (20)
Engine Coolant Capacity–qt (L)	13 (12)	13 (12)

Electrical System

	12 Volts	24 Volts
Recommended Battery Capacity CCA @ 32 °F (0 °C)–amp	640	570
Max. Starting Circuit Resist.–Ohm	0.0012	0.002
Starter Rolling Current @ 32 °F (0 °C)–amp	780	600

Exhaust System

	1800 rpm	1500 rpm
Exhaust Temperature–°F (°C)	1089 (587)	1049 (565)
Exhaust Gas Flow–ft^3/min (m^3/min)	367 (10.4)	237 (7.0)
Min. Exhaust Pipe Dia. Dry–in. (mm)	2.0 (50)	2.0 (50)
Min. Exhaust Pipe Dia. Wet–in. (mm)	2.5 (65)	2.5 (65)
Max. Allow. Back Press.–in. H_2O (kPa)	30 (7.5)	30 (7.5)
Max. Weight on Turbo–lb (kg)	26.5(12.0)	26.5(12.0)

Fuel System

	1800 rpm	1500 rpm
Fuel Injection Pump–Stanadyne	DB-2	
Governor Type	Mech.	
Governor Regulation–percent	5	
Total Fuel Flow–lb/hr (kg/hr)	214 (97)	205 (93)
Total Fuel Flow–gal/hr (L/hr)	30 (114)	29 (109)
Min. Rec'd. Fuel Line ID–in. (mm)	0.25 (6)	
Min. Rec'd. Fuel Line Size	-5	
Fuel Cons. 'Prime' –lb/hr (kg/hr)	23.4 (10.6)	19.0 (8.6)
Fuel Cons. 'Prime' –gal/hr (L/hr)	3.3 (12.5)	2.7 (10.1)
Max Leak-off Line Press.–psi (kPa)	4 (30)	
Max. Fuel Trans. Pump Suction–ft (m)	10(3.0)	
Max. Fuel Ht. Above Inj.Pump–ft (m)	10(3.0)	
Max. Fuel Inlet Temp. w/o derate–°F (°C)	104 (40)	
Fuel Filter @ 98% Efficiency–Microns	2	

Lubrication System

	1800 rpm	1500 rpm
Oil Press. at Rated Speed–psi (kPa)	50 (345)	45 (311)
Oil Pressure at Low Idle–psi (kPa)	15 (105)	15 (105)

Sea Water System

	1800 rpm	1500 rpm
Sea Water Pump Flow–gal/min (L/min)	22 (84)	18 (70)
Max. Inlet Restriction–in. H_2O (kPa)	120 (30)	100 (25)
Max. Outlet Press–psi (kPa)	20 (135)	20 (135)
Max. Suction Lift–ft (m)	10 (3.0)	10 (3.0)

Performance Data

	1800 rpm	1500 rpm
Rated 'Prime' Power–hp (kW)	62 (46)	54 (40)
10% Overload Engine Power–hp (kW)	67 (50)	59 (44)
Low Idle Speed–rpm	1400	1400
Rated Torque–ft-lb (N•m)	178 (241)	260 (353)
BMEP–psi (kPa)	97 (669)	103 (707)
Friction Power @ Rated Speed–hp (kW)	17 (13)	13 (10)
Smoke @ Rated Speed–Bosch No.	NA	NA

Fuel Consumption

	1800 rpm	1500 rpm
Prime:		
25 % Power– gal/hr (L/hr)	1.1 (4.3)	0.9 (3.4)
50 % Power– gal/hr (L/hr)	1.9 (7.1)	1.5 (5.5)
75 % Power– gal/hr (L/hr)	2.6 (9.9)	2.1 (7.8)
100 % Power– gal/hr (L/hr)	3.3 (12.5)	2.7 (10.1)
10% Overload Power– gal/hr (L/hr)	3.6 (13.5)	3.0 (11.3)

Data based on keel-cooled engine.
All values at rated speed and power with standard options unless otherwise noted.

* Revised Data
Curve 4045DFM7062MG ..... Sheet 2 of 2
April 2004

Marine Engine Emissions Data

Propulsion (labeled, "For applications not subject to EPA or EU emission regulations.")

Engine Model	Power bhp (kW) @ rpm	NO_x g/kWhr	HC g/kWhr	CO g/kWhr	Pm g/kWhr
4045DFM50	85 (63) @ 2500	9.98	0.27	3.55	0.30
4045TFM50	135 (101) @ 2500	13.37	0.20	0.33	0.13
4045TFM50	150 (112) @ 2600	9.75	0.19	0.40	0.16
6068TFM50	175 (130) @ 2400	8.43	0.28	0.44	0.16
6068TFM50	225 (168) @ 2600	9.16	0.20	0.32	0.16
6081AFM01	235 (175) @ 2100				
6081AFM01	300 (224) @ 2200				
6081AFM01	330 (246) @ 2300				
6081AFM01	375 (280) @ 2400	8.31			
6125AFM01	340 (254) @ 1800				
6125AFM01	375 (280) @ 1900				
6125AFM01	400 (298) @ 2000				
6125AFM01	450 (336) @ 2100	9.68	0.15	0.47	0.07

Gen Set (labeled, "Tier-2 Compliant")

Engine Model	Power bhp (kW) @ rpm	NO_x g/kWhr	HC g/kWhr	CO g/kWhr	Pm g/kWhr
4045DFM70	62 (46) @ 1800	✓	✓		
4045TFM75	98 (73) @ 1800	6.33	0.39		0.17
6068TFM76	148 (110) @ 1800	6.05	0.62		0.24
6081AFM75	261 (195) @ 1800	6.45	0.26	1.27	0.12
6125AFM75	402 (300) @ 1800	6.62	0.31	1.06	0.17

Gen Set (labeled, "For applications not subject to EPA or EU emission regulations.")

Engine Model	Power bhp (kW) @ rpm	NO_x g/kWhr	HC g/kWhr	CO g/kWhr	Pm g/kWhr
4045DFM70	54 (40) @ 1500				
4045TFM75	74 (55) @ 1500	8.87	0.48	1.48	0.14
6068TFM76	119 (89) @ 1500	8.72	0.52		0.16
6081AFM75	217 (162) @ 1500	7.10	0.19	2.02	0.10

WHITE NEAR COASTAL TOWING CORP

333 JACKSON AVENUE, SYOSSET, NY 11791
RWHITE4@OPTONLINE.NET

TEL: 516 802-7126 FAX: 516 802-7125

DOLLARS PER TON EMISSIONS

Primary Proposal (#1)

$169,700 / 38.928 saved tons emissions = $4,359.33 / Ton

Primary Proposal (#2)

$180,700 / 38.928 saved tons emissions = $4,641.903 / Ton

***Cost per ton for #2 does not include the savings that would be realized with the addition of the monitoring system. As they are not immediately quantifiable we have worked with the same number of tons saved as in option #1.**

CURRY MARINE
PO BOX 610
NEWPORT OR 97365
541 265-7955

To: White Near Coastal Towing 04/15/08

Att: Jim

Fax: 631 547-0231

TOTAL

2ea Cummins QSK 19 600 HP @ 1800 RPM Marine Engine **$185,700.00**

Includes: Full authority electronic engine
Continuous Duty rating
Keel cooled configuration
24 Volt electrical, starter & alternator
Engine room & pilot house instrument panels
Extension wiring harnesses for instrument panels
Air cleaner
Front engine mount
Marine gear oil cooler
Spin on fuel, lube oil and water filters
Racor crank vent system
Ethernet connection for remote engine monitoring
Sea Command Elite monitoring system
EPA Tier 2 compliant
Standard Commercial Warranty
F.O.B. Newport OR

2ea Optional Cummins Eliminator lube oil centrifuge **$8,200.00**

Engine mounted
No spin on lube filters required

Note: Start up and sea trial at your location not included.

Thank you,

Scott Graf

PERRY H. BEEBE & ASSOCIATES, LLC

Marine Surveyors & Consultants

352 Fairfield Avenue, Gretna, LA 70056
Office & Fax (504) 348-1488
Cell (504) 343-4532, Home (504) 368-4532

SURVEY REPORT

SUBJECT:	Valuation Survey
DATE OF SURVEY:	27 April 2007
VESSEL:	M/V "CAPTAIN ZEKE"
SURVEY REPORT NUMBER:	775-427
AUTHORIZED BY:	Mark C. Shiffer on behalf of Mr. Roy White
FOR THE ACCOUNT OF:	Mark C. Shiffer Independent Marine Surveyor
LOCATION OF VESSEL:	N/A
STATUS OF VESSEL:	N/A
OWNER OF VESSEL:	Mr. Roy White (purchaser)
ATTENDING SURVEY:	Perry H. Beebe Perry H. Beebe & Associates, LLC

DESCRIPTION

TYPE OF VESSEL:	Model Bow Tug (1400 HP rated)
OFFICIAL NUMBER:	629331
GROSS TONS:	88
NET TONS:	70
BUILT:	1980
DIMENSIONS:	68' x 24' x 9' 6" draft (64.0' x 24.0' x 8.6' documented)

MARKET VALUE: $1,100,000.00

REPLACMENT: $2,100,000.00

PERRY H. BEEBE & ASSOCIATES, LLC

Marine Surveyors & Consultants

352 Fairfield Avenue, Gretna, LA 70056
Office & Fax (504) 348-1488
Cell (504) 343-4532, Home (504) 368-4532

775-427 M/V "CAPTAIN ZEKE"

On 24 April 2007, the undersigned was requested by, Mr. Mark Shiffer on behalf of Roy White, to attend the M/V "CAPTAIN ZEKE" for the purpose of determining the general condition and principal characteristics and against these to then enter an opinion as to the vessel's value and suitability for service, for consideration by Owners and for whom it may concern.

THIS IS TO CERTIFY that on 27 April 2007, the undersigned marine surveyor did conduct a **"DESK TOP"** survey.

No determination of structural integrity or inherent stability has been made and no opinion is expressed in that regard.

The undersigned attests that every reasonable effort has been expended to examine the present condition of the subject vessel and her outfit however, Owners should be aware deficiencies might exist in addition to those items detailed in this report.

It should be noted subject vessel was not seen at this time however, under signed did review numerous spec's, exhibits, photographs, diagrams, layout, documentation, and a resent General

Condition survey by Mark C. Shiffer Marine Surveyors, report dated 20 April 2007 and the following details were noted.

GENERAL

Vessel is a typical model bow twin screw tug of all welded steel construction built by Main Iron Works (reported) Houma, Louisiana. Vessel appears in accordance with original lay out, plan, arrangement & scanting without any major or significant structural alterations or damages repairs noted.

Vessel's hull profile presents a straight bow stem, elliptical stern with full bodied single chine midship section, "V" bottom and cutaway stern. Vessel's main deck is arranged with open bow, deck, center superstructure, port and starboard side passageways, open stern deck, raised decking over steering gear.

Vessel's superstructure presents a typical raised two and one half level with auxiliary pilothouse located at aft port corner of Texas Deck. Vessel's main deck perimeter protected by enclosed bulwarks. Bulwarks serviced by freeing ports, which appear to be of adequate size and number.

MACHINERY

Main Engines:

Two (2) General Motors Detroit Diesel engines, model V 16-71 NA, developing 1400 HP @ 1800 RPM, two cycle, sixteen cylinder, natural aspirated, fresh water cooled via; enclosed cooling system. (0 hours since major overhaul)

Reduction Gears:

Two (2) Twin Disc, model MG 518, ratio 648:1

Generators:

Two (2) General Motors Detroit Diesel, model 3-71, driving International generators, rated @ 40KW

Tail Shafts:

Two (2) 5.5" shafts (estimated) typically running through packing glands, strut legs and cutless bearings.

Propellers:

Two (2) 63" x 68" S/S four blade propellers

Kort Nozzles:

Two (2) Type- 37

Rudders:

Two (2) steering rudders

Winch:

One (1) General Motors Detroit Diesel, model 3-71, radiator cooled, air start, PTO, hydraulic transmission driving a double drum, 50,000# with 2000' of 1-14" cable.

Misc.:

Vessel serviced with usually pumps, piping, hydraulics, winches, electrical appliances, electronics, etc.

COMMENTS

Vessel appears to be in above average condition considering the vessel's age and service. Vessel appears to be well maintained with excellent housekeeping evident. Vessel's machinery space and equipment including main engines, auxiliary machinery, shafting, pumps, piping

arrangements, electrical system and equipment appear to be well maintained and in excellent condition. Subject vessel considered suitable for its intended purpose, coastwise and offshore towing.

VALUES

It should be noted in this survey, values were obtained from one (1) or a combination but not limited to the following sources:

- Marine and equipment brokers.
- Shipyards or contractors that construct like vessels, equipment, etc.
- Known recent sales of similar vessels.
- As advertised in Marine equipment sales periodicals.
- The depreciation method, given vessel's age and useful life left, with regards to improvements and general condition of component parts.
- As estimated by the undersigned using the method of material cost, labor cost, overhead, material mark up, total and profit margin.

MARKET VALUE:

A sum of money that a vessel should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently, knowledgeably and assuming the price is not affected by undue stimulus. Implicit in this definition is the consummation of a sale whereby title is passed from seller to buyer under conditions whereby.

- Buyer and seller are typically motivated.
- Both parties are well informed and acting in what they consider their own best interest and...

- A reasonable time is allowed for exposure in the open market and arrangements similar thereto and...
- Payment is made in terms of cash in U.S. dollars or in terms with financial arrangements similar. It should be noted in this survey, values were obtained from one (1) or a combination but not limited to and...
- The price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale.

MARKET:

In the opinion of this undersigned, subject vessel has a fair current MARKET VALUE, Gulf Coast Area, of approximately, **$1,100,000.00**

REPLACEMENT:

In the opinion of the undersigned, subject vessel has a REPLACEMENT VALUE, Gulf Coast Area, of approximately **$2,100,000.00**

CONCLUSION

I certify to the best of my knowledge and belief that the statements of fact contained in this report are true and correct.

The reported analyses and opinions are limited only by the reported assumptions and limiting conditions, and are my personal, unbiased professional analyses and opinion.

I have no present or prospective interest in the property that is the subject of this report, and I have no personal interest or bias with respect to the parties involved.

My compensation is not contingent upon the reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value estimate, the attainment of a

stipulated result or the occurrence of a subsequent event.

My analysis and opinions were developed, and this report has been prepared, in conformity with the **UNIFORM STANDARDS OF PROFESSIONAL APPRAISAL PRACTICE.**

I have made a personal inspection of the property that is the subject of this report.

No one provided significant professional assistance to the person signing this report.

In accepting this report, it is understood that this survey was performed for general condition purposes only and that no warrant as to the condition, seaworthiness or marketability of subject vessel is expressed or implied.

All of the above findings are actual and the survey was made without prejudice to the rights of all concerned parties.

PERRY H. BEEBE
No. 118-601
CERTIFIED MARINE SURVEYOR

Perry H. Beebe, NAMS-CMS #118-601

Perry H. Beebe & Associates, LLC

DHS, USCG, CG-1270 (REV. 06-04)

OMB APPROVED
1625-0027

UNITED STATES OF AMERICA

DEPARTMENT OF HOMELAND SECURITY
UNITED STATES COAST GUARD

NATIONAL VESSEL DOCUMENTATION CENTER

CERTIFICATE OF DOCUMENTATION

VESSEL NAME	OFFICIAL NUMBER	IMO OR OTHER NUMBER	YEAR COMPLETED
CAPTAIN ZEKE	629331	71	1980

HAILING PORT	HULL MATERIAL	MECHANICAL PROPULSION
NEW YORK, NY	STEEL	YES

GROSS TONNAGE	NET TONNAGE	LENGTH	BREADTH	DEPTH
88 GRT	70 NRT	64.0	24.0	8.6

PLACE BUILT
HOUMA, LA

OWNERS
WHITE NEAR COASTAL TOWING CORP

OPERATIONAL ENDORSEMENTS
COASTWISE

MANAGING OWNER
WHITE NEAR COASTAL TOWING CORP
12 DUMBARTON DR
HUNTINGTON, NY 11743

RESTRICTIONS
NONE

ENTITLEMENTS
NONE

REMARKS
NONE

ISSUE DATE
JUNE 29, 2007

THIS CERTIFICATE EXPIRES
JUNE 30, 2008

WJB
7390868

DIRECTOR, NATIONAL VESSEL DOCUMENTATION CENTER

PREVIOUS EDITION OBSOLETE, THIS CERTIFICATE MAY NOT BE ALTERED

WHITE NEAR COASTAL TOWING CORP.
333 JACKSON AVE SUITE 9
SYOSSET, NY 11791
PHONE: 516-802-7126 FAX: 516-802-7125

CXZ VESSEL LOG

VESSEL: CAPT ZEKE DATE: 05-15-08 Thursday TRIP NO.
CAPTAIN : Richard Canty MATE: Al Hartman
ENGINEER: JJ Hand DECKHAND: Isaiah S.
DECKHAND: TANKERMAN:

TIME	LOG ENTRY
0000	Secured at Mays Ship float. Sby for tide.
0745	U/w for Jersey City, NJ
0945	Secured at Eastern Terminal, Jersey City, NJ
2045	U/w for Erie Basin
2320	Secured at Erie Basin
2340	U/w l/t for Gowanus
2355	Made up to barge "130" at 25th st.
2400	U/w w/"130" to Hamilton Ave.

Representative page from log. Original on file

TERRANCE J. STEVENSON

CAPTAIN'S SIGNATURE

WHEELHOUSE PRE-SAIL CHECKLIST (33 CFR 164.80)

X VHF RADIO(S)	X GPS/LORAN	X DEPTH INDICATOR	X RADAR(S)
X SEARCH LIGHTS	X NAVIGATION LIGHTS	X WHITSTLE	X COMPASS
X STEERING SYSTEM	X JOY STICKS/WHEEL	X MORSE CONTROLS	X ENGINE GUAGES
X ENGINE ALARMS	X GENERAL ALARM	X RUDDER INDICATOR	X NTM':S
X CHARTS UPDATED	X PUBLICATION UPDATED	X TOWLINES/WIRE	X AUTO PILOT/GYRO

ATTACHMENT A

AGREEMENT ON TERMS OF DISCUSSION

The Port Authority's receipt or discussion of any information (including information contained in any proposal, vendor qualification, ideas, models, drawings, or other material communicated or exhibited by us or on our behalf) shall not impose any obligations whatsoever on the Port Authority or entitle us to any compensation therefore (except to the extent specifically provided in such written agreement, if any, as may be entered into between the Port Authority and us). Any such information given to the Port Authority before, with or after this Agreement on Terms of Discussion ("Agreement"), either orally or in writing, is not given in confidence. Such information may be used, or disclosed to others, for any purpose at any time without obligation or compensation and without liability of any kind whatsoever. Any statement which is inconsistent with this Agreement, whether made as part of or in connection with this Agreement, shall be void and of no effect. This Agreement is not intended, however, to grant to the Port Authority rights to any matter, which is the subject of valid existing or potential letters patent. The foregoing applies to any information, whether or not given at the invitation of the Authority.

Notwithstanding the above, and without assuming any legal obligation, the Port Authority will employ reasonable efforts, subject to the provisions of the Authority's Freedom of Information Resolution adopted by its Committee on Operations on August 13, 1992, which may be found on the Authority website at *http://www.panynj.gov/AboutthePortAuthority/ContactInformation/foi_policy.html*, not to disclose to any competitor of the undersigned, information submitted which are trade secrets or is maintained for the regulation or supervision of commercial enterprise which, if disclosed, would cause substantial injury to the competitive position of the enterprise, and which information is identified by the Proposer as proprietary, which may be disclosed by the undersigned to the Port Authority as part of or in connection with the submission of a proposal.

White Bear Coastal
(Company)

Raz Lobat
(Signature)

Pres.
(Title)

4/17/2008
(Date)

ORIGINAL AND PHOTOCOPIES OF THIS PAGE ONLY.
DO NOT RETYPE.

Attachment 5 – Bid Package & Contract Language Examples

SECTION 01 13 55.00 18

AIR EMISSIONS REQUIREMENTS
(nyd 09)

PART 1 GENERAL

1.1 BACKGROUND

The Contractor shall comply with the air emissions requirements of this section which are intended to ensure compliance with the Federal Clean Air Act and limit the emission of Nitrogen Oxides (NOx)produced by the combustion of fossil fuels.

1.2 AIR EMISSIONS CONSULTANT (AEC)

The Contractor shall retain an independent firm having a minimum of 3 years of experience in calculating air emissions for equipment in the utility, process, construction or manufacturing industries to assist the Contractor in fulfilling the requirements of this section.

1.3 NOx EMISSIONS LIMIT

a. The Contractor shall not adversely affect the attainment plans established by the States of New York and New Jersey. The Government has allocated Air Quality Units for this contract; therefore the Contractor is limited to the following allowable NOx emissions per calendar year unless the Contractor is able to obtain additional Air Quality Units at its own expense.

Calendar Year	Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons)
2010	20.2
2011	34.6

b. NOx emissions shall be calculated for all marine based equipment, with a maximum horsepower output of greater than or equal to **25**, operated in the area as shown on the map at the end of this Section. Emissions from the following equipment, including their auxiliary engines, shall be calculated: dredges, tugs, scows, drill boats, survey boats, supply boats, crew boats, tenders and other water based equipment associated with the Contractor's dredging operation. **Emissions shall be calculated for activities directly related to the performance of the contract.**

c. The Contractor is responsible for ensuring that contract emissions do not exceed the calendar year Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons) for NOx in a given calendar year. Once the Contractor reaches Allocated Air Quality Units (NOx Emissions Allowable

Limit - Tons) in a given calendar year, all water based equipment must cease operations for the remainder of the calendar year unless the Contractor is able to obtain additional Air Quality Units at its own expense. The Contractor will not be entitled to additional time or money in the event that the Contractor exhausts the Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons) made available by the Government and must stop work.

d. The Government has developed an Air Emissions Calculator that must be used by the Bidder during the preparation of its bid to ensure that NOx emissions of all equipment associated with the contract are within the calendar year Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons). The calculator may be downloaded from fedteds.gov web site with the plans and specs.

1.4 AIR EMISSIONS SUBMITTAL REQUIREMENTS

1.4.1 The Contractor shall submit ten (10) copies of the following information within **Five (5) calendar days** of being notified of being the apparent low bidder.

A. The qualifications of the Contractor's Air Emissions Consultant (AEC).

B. Air Emissions Calculator

The Contractor **shall** use the air emissions calculator to estimate the emissions of NOx and provide printed versions of all emission calculation tabs.

The following is provided to describe the calculator and the input data required.

List all engines to be used on the contract on a separate line.

The calculator requires knowledge of the equipment to be used on the project, including the engine horsepower, year of manufacture (its model year), and its regulatory "Tier" level (i.e., Tier 1, Tier 2).

The calculator consists of **four** worksheets within a Microsoft® Excel workbook.
The **four** worksheets are:

- Instructions
- **Dredge Inputs and Calcs**
- **Vessel Input and Calcs**
- Emission Summary

The Instruction Worksheet provides for descriptions of the field names and the action required to input data on the Input and Calculations Worksheet.

Input and Calculations Worksheet: **These worksheet are** where the Contractor inputs information about the equipment that is or will be operating for this contract, such as the dredge engine type and name, "Tier" level, horsepower, NOx Control Method and expected number of hours of operation. Operating hours are those hours that the diesel engine is actually running or operating (not the total time spent onsite) and will be entered for each month of work. Each engine shall be entered on a separate line. Data is only entered on this worksheet; no entries are to be made on the Emission

Summary worksheet.

If an emission control technology such as a fuel emulsion or a catalytic converter is used, or will be used, to reduce NOx emissions, there is a column on the worksheet, entitled NOx Control Method, to incorporate the reduction that the technology is recognized to achieve. The NOx emission control systems effectiveness must be approved by the U.S. Environmental Protection Agency (EPA).

This worksheet also calculates the estimated emissions from the equipment information entered.

The Emission Summary worksheet presents the emission estimates by year. This worksheet is provided to help the Contractor adjust the technology or timing of their dredging operations to ensure that the estimated NOx emissions do not exceed the Allocated Air Quality Units in a given calendar year, thereby indicating whether the projected emissions are at an acceptable level.

C. Certification from the independent Air Emissions Consultant stating the following:

1)That the information provided in 1.4.1.A and 1.4.1.B is accurate;

2)That the construction schedule developed by the Contractor with its' associated marine equipment is within the calendar year Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons); and

3)That any technologies, techniques, or methods identified to reduce emissions are approved by the U.S. Environmental Protection Agency (EPA).

D. Information as identified in Section 00 80 00.00 18, paragraph 1.45.**C**, Air Emissions Information to be submitted by the Contractor.

E. Should the Contractor choose to provide additional Air Quality Units at its own expense for this contract, the Contractor must provide evidence that these additional Air Quality Units are available to the Contractor, are appropriate for use on this contract for the calendar year they are to be used and can be obtained by the Contractor within 35 calendar days of being notified of being the apparent low bidder.

1.4.2 The Contractor shall submit the following information within 35 calendar days of being notified of being the apparent low bidder. If there are no changes to Contractor's 5 calendar day submission, the Contractor shall resubmit the information noting on the cover letter that there were no changes to the respective items.

A. Air Emissions Calculator (described in 1.4.1.B above).

B. Certification from an independent Air Emissions Consultant stating the following:

1)That the information provided in 1.4.2.A is accurate;

2)That the construction schedule developed by the Contractor with its' associated equipment is within the calendar year Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons); and

3)That any technologies, techniques, or methods identified to reduce

emissions are approved by the U.S. Environmental Protection Agency (EPA).

C. Should the Contractor choose to provide additional Air Quality Units for this contract at its own expense, the Contractor must provide documentation that the Air Quality Units are appropriate for use on this contract for the calendar year they are to be used and provide evidence in the form of a contract or agreement, that these additional Air Quality Units are available for use by the Contractor by the 35th calendar day after being notified of being the apparent low bidder.

1.4.3 Information to be provided monthly during the execution of the contract.

A.Air Emissions Calculator and Narrative

1)The Air Emissions calculator and Narrative shall be updated monthly and submitted electronically. Updated calculations, narrative and other information associated with this task are due 10 days after the end of the month.

2)The Air Emissions Calculator shall be updated monthly to reflect actual hours worked, equipment actually used, **and daily runtime per reportable engine, and other applicable information, on the data logging sheet provided at the end of this section**; and actual emission control methods used during the previous month; and

3)Revise future emissions to reflect future hours of work remaining, equipment and emission control method adjustments.

4)A narrative explaining the changes from the baseline (Air Emissions Calculator submitted within 30 calendar days after award) to the updated Air Emissions Calculator shall be submitted.

B.Certification from an independent Air Emissions Consultant stating the following:

1)That the information provided in 1.4.3.A is accurate;

2)That the construction schedule developed by the Contractor with its' associated equipment is within the calendar year Allocated Air Quality Units (NOx Emissions Allowable Limit - Tons); and

3)That any technologies, techniques, or methods used to reduce emissions are approved by the U.S. Environmental Protection Agency (EPA).

C. If after the NTP is issued and during the execution of the Contract the Contractor chooses to provide additional Air Quality Units at its own expense, the Contractor must provide, **at least two weeks** prior to the use of the Air Quality Units, documentation that these additional Air Quality Units are appropriate for use on this contract for the calendar year they are to be used.

1.5 OPERATIONAL MONITORING, RECORDKEEPING, AND REPORTING

The Contractor shall be required to install appropriate instrumentation (data loggers) on the dredges to record and measure as a minimum engine hours of operation, , engine speed, engine temperature, and fuel use rates. The Contractor shall download data from the data loggers and

provide the information to the COR on a quarterly basis. The Contractor shall provide access to the Government and its contractors to observe the installation, operation, and download of data from the data loggers. The Contractor shall maintain the data loggers. Should a data logger fail, the Contractor shall notify the COR and maintain records manually on an hourly basis until the data logger is repaired.

The Contractor shall maintain daily records on engines that are not equipped with a data logger (i.e., engines other than dredge engines). These records will be provided to the Government on a regular basis. The records will be maintained as part of the Contractor's daily report and provided to the Government on that basis (i.e., with the same frequency as the daily report). An example of the log sheet for keeping these required records is attached at end of this section.

1.6 IN-USE TESTING OF DREDGING EQUIPMENT

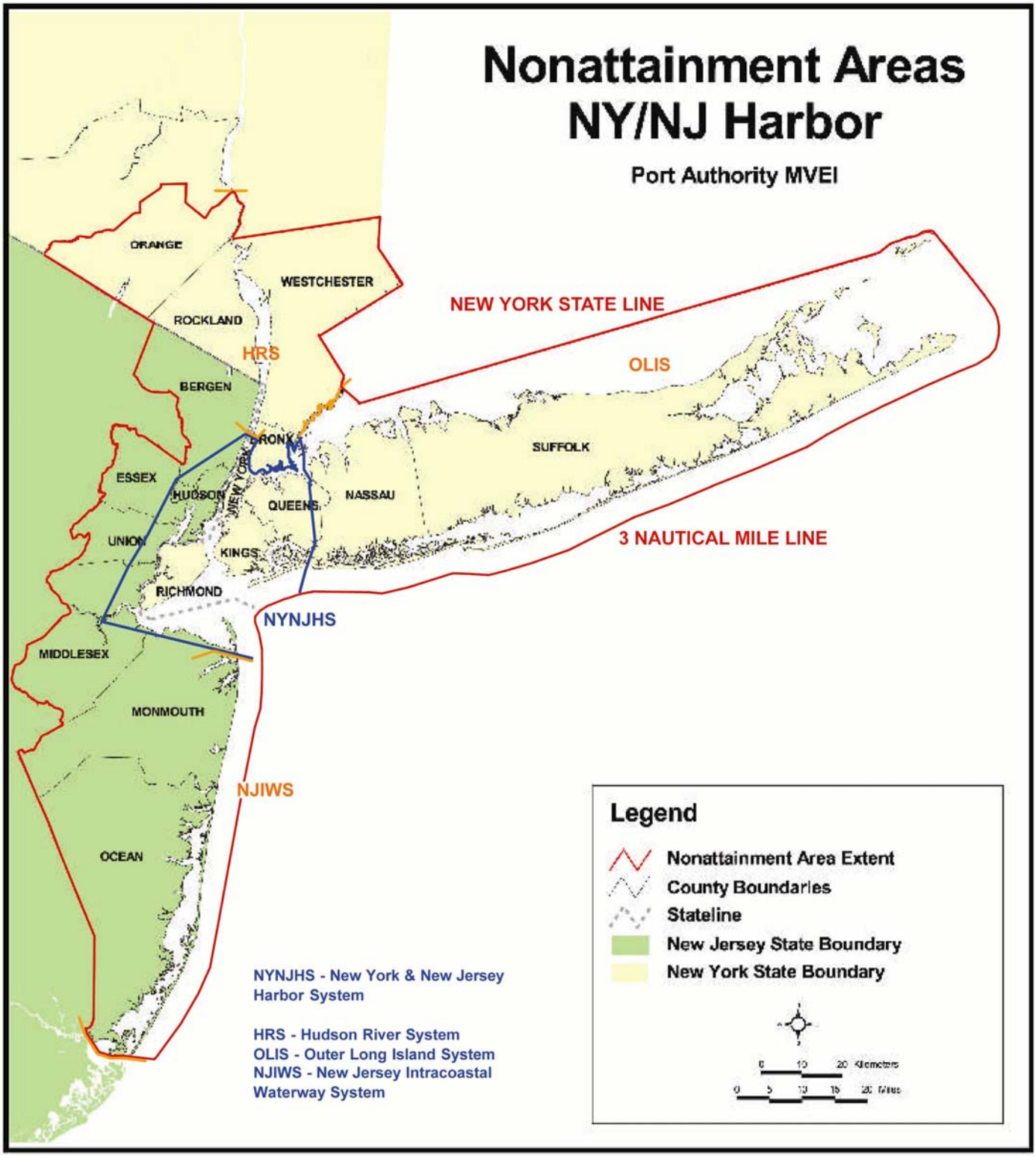
The Contractor shall cooperate with and assist the Government and its contractor(s) in obtaining measurements of emissions from the major engines powering the dredge(s) and associated equipment. The Government will be responsible for the testing program and the required equipment, while the Contractor will be responsible for making such minor physical modifications to the dredging equipment as may be necessary for successful emission testing. (Such modifications may include the installation of sampling ports on exhaust ducts or mounting brackets to support measuring equipment.) The Government and its emission testing contractor(s) will provide specific instructions on any physical modifications the Contractor is required to make after the issuance of the NTP.

The Contractor shall notify the COR of any plans to substitute or add major pieces of equipment to allow the Government to determine whether additional emission testing will be warranted. Engines with test equipment attached shall not be removed from the contract area without written consent from the COR.

1.7 MEASUREMENT AND PAYMENT

No separate payment shall be made for this item.

-- End of Section --


Nonattainment Areas
NY/NJ Harbor
Port Authority MVEI
ORANGE
WESTCHESTER
ROCKLAND
HRS
BERGEN
NEW YORK STATE LINE
OLIS
BRONX
SUFFOLK
ESSEX
HUDSON
NEW YORK
QUEENS
NASSAU
UNION
KINGS
3 NAUTICAL MILE LINE
RICHMOND
NYNJHS
MIDDLESEX
MONMOUTH
NJIWS
OCEAN
Legend
Nonattainment Area Extent
County Boundaries
Stateline
New Jersey State Boundary
New York State Boundary
NYNJHS - New York & New Jersey Harbor System
HRS - Hudson River System
OLIS - Outer Long Island System
NJIWS - New Jersey Intracoastal Waterway System

PAGE 6

U.S. Army Corps of Engineers - New York District PJ4

SAN2 Contract 10 Vessel Data Logging Sheet Page 7

THE PORT AUTHORITY OF NY & NJ

MONTH: _____

YEAR: _____

Page: _____ of _____

Vessel Name:

	Engine Information				Activity Information			
Date	Engine Name	Engine Type (Propulsion, Auxiliary, etc.)	Daily Runtime (hours)	Daily Fuel Consumption (tons or gallons)	# of Daily Trips to HARS or Reef	Average Transit Time Within 3-Nautical Mile Line (hours)	Average Loaded Speed (knots)	Average Unloaded Speed (knots)

U.S. Army Corps of Engineers - New York District

SAN2 Contract 10 Dredge Data Logging Sheet Page 8

THE PORT AUTHORITY OF NY & NJ

MONTH: _____
YEAR: _____
Page: of _____ _____

Dredge/Barge Name:

	Engine Information				Activity Information			
Date	Engine Name	Engine Type (Main, Aux, Pump, etc)	Daily Runtime (hours)	Daily Fuel Consumption (tons or gallons)	Sediment Type	Daily Dredged Volume (cubic yards)	Scow Capacity (cubic yards)	Daily Number of Scows Filled

Emissions have been estimated using project planning information developed by the New York District, consisting of anticipated equipment types and estimates of the horsepower and operating hours of the diesel engines powering the equipment. In addition to this planning information, conservative factors have been used to represent the average level of engine load of operating engines (load factors) and the average emissions of typical engines used to power the equipment (emission factors). The basic emission estimating equation is the following:

$$E = hrs \times LF \times EF$$

Where:

E = Emissions per period of time such as a year or the entire project.
hrs = Number of operating hours in the period of time (e.g., hours per year, hours per project).
LF = Load factor, an estimate of the average percentage of full load an engine is run at in its usual operating mode.
EF = Emission factor, an estimate of the amount of a pollutant (such as NO_x) that an engine emits while performing a defined amount of work.

In these estimates, the emission factors are in units of grams of pollutant per horsepower hour (g/hphr). For each piece of equipment, the number of horsepower hours (hphr) is calculated by multiplying the engine's horsepower by the load factor assigned to the type of equipment and the number of hours that piece of equipment is anticipated to work during the year or during the project. For example, a crane with a 250-horsepower engine would have a load factor of 0.43 (meaning on average the crane's engine operates at 43% of its maximum rated power output). If the crane were anticipated to operate 1,000 hours during the course of the project, the horsepower hours would be calculated by:

$$250 \text{ horsepower} \times 0.43 \times 1{,}000 \text{ hours} = 107{,}500 \text{ hphr}$$

The emissions from diesel engines vary with the age of an engine and, most importantly, with when it was built. Newer engines of a given size and function typically emit lower levels of pollutants than older engines. The NO_x emission factors used in these calculations assume that the equipment pre-dates most emission control requirements (known as Tier 0 engines in most cases), to provide a reasonable "upper bound" to the emission estimates. If newer engines are actually used in the work, then emissions will be lower than estimated for the same amount of work. In the example of the crane engine, a NO_x emission factor of 9.5 g/hphr would be used to estimate emissions from this crane on the project by the following equation:

$$\frac{107{,}500 \text{ hphr} \times 9.5 \text{ g } NO_x/\text{hphr}}{453.59 \text{ g/lb} \times 2{,}000 \text{ lbs/ton}} = 1.1 \text{ tons of } NO_x$$

As noted above, information on the equipment types, horsepower, and hours of operation associated with the project have been obtained from the project's plans and represent current best estimates of the equipment and work that will be required. Load factors have been obtained from various sources depending on the type of equipment. Marine engine load factors are primarily from a document associated with the New York and New Jersey Harbor Deepening Project (HDP): "Marine and Land-Based Mobile Source Emission Estimates for the Consolidated Schedule of 50-Foot Deepening Project, January 2004," and from EPA's 1998 Regulatory Impact Analysis (RIA): "EPA Regulatory Impact Analysis: Control of Commercial Marine Vessels." Land-side nonroad equipment load factors are from the documentation for EPA's NONROAD emission estimating model, "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, EPA420-P-04-005, April 2004."

Emission factors have also been sourced from a variety of documents and other sources depending on engine type and pollutant. The NO_x emission factors for marine engines have been developed primarily from EPA documentation for the Category 1 and 2 standards (RIA, "Control of Emission from Marine Engines, November 1999) and are consistent with emission factors used in documenting emissions from the HDP, while the VOC emission factors for marine engines are from the Port Authority of New York and New Jersey's (PANYNJ) "2014 Multi-Facility Emissions Inventory" which represent the range of marine engines operating in the New Jersey harbor and coastal region in terms of age and regulatory tier level. Nonroad equipment NO_x emission factors have been derived from EPA emission standards and documentation, while the nonroad VOC emission factors have been based on EPA's Diesel Emissions Quantifier (DEQ, accessed at: *www.epa.gov/cleandiesel/quantifier/*), run for moderately old equipment (model year 1995). On-road vehicle emission factors have also been developed from the DEQ, assuming a mixture of Class 8, Class 6, and Class 5 (the smallest covered by the DEQ) on-road trucks.

Greenhouse gas (GHG) emissions are represented as CO_2, which makes up by far the greatest amount of GHG emitted from the diesel-fueled engines that will be used on the project. GHG emissions are calculated in the same manner as the emissions discussed above, except that GHG emissions are expressed as metric tons (tonnes) instead of short tons to be consistent with standard GHG reporting methodology. The CO_2 emission factors were obtained from the most recent emissions inventory released by the PANYNJ, using the average nonroad equipment and on-road heavy-duty diesel vehicle emission factors.

As noted above, the emission factors have been chosen to be moderately conservative so as not to underestimate project emissions. Actual project emissions will be estimated and tracked during the course of the project and will be based on the characteristics and operating hours of the specific equipment chosen by the contractor to do the work.

The following pages summarize the estimated emissions of pollutants relevant to General Conformity, NO_x, VOC, $PM_{2.5}$, SO_2, and CO_2 in sum for the project and by calendar year based on the schedule information also presented (in terms of operating months per year). Following this summary information are project details including the anticipated equipment and engine information developed by the New York District, the load factors and emission factors as discussed above, and the estimated emissions for the project by piece of equipment.

USACE - New York District
NAN - ABU Sandy-Related Projects
General Conformity-Related Emission Estimates & Greenhouse Gas Estimates
Emission Estimates & Supporting Information - FIMP 5-May-16
DRAFT

General Conformity-applicable emissions per calendar year based on project duration

	Estimated Emissions, tons per year								
Pollutant	**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

GHG emissions per calendar year based on project duration

	Estimated Emissions, tonnes per year								
GHG	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
CO_2	0.0	11,055	14,593	12,382	7,960	7,517	7,075	6,191	884

Supporting information and data

				Shore crew*	
	Dredge	**Auxiliary**	**Pumps**	**Dozer**	**Front-end loader**
Horsepower	8,000	600	2,000	310	25
Load factors	0.66	0.40	0.80	0.59	0.59
Emission factors					
NO_x	9.7	7.3	4.9	9.5	9.5
VOC	0.37	0.20	0.20	0.19	0.19
$PM_{2.5}$	0.51	0.29	0.29	0.16	0.16
SO_2	0.005	0.005	0.005	0.005	0.005
CO_2	1.06	1.27	1.27	1.21	1.21

* Per NYDEC finding, land-side emissions are accounted for in the applicable SIP and are therefore not considered in the General Conformity evaluation.

Project Duration and Working Months per Year

Cu yds	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**Total Months Dredging**
6,440,000	0	3	6	6	6	6	6	6	1	40

Due to environmental and ozone season windows in place for the NY projects, there will be a maximum of 6 months of dredging per year for the NY projects Shore-side work proceeds when dredging occurs. Combination of environmental and ozone season windows results in no dredging during April through September each year.

USACE - New York District

NAN - ABU Sandy-Related Projects

General Conformity Related Emission Estimates & Greenhouse Gas Estimates

Methodology

DRAFT 5-May-16

The emission estimating methodology is designed to be conservatively high in terms of calculated horsepower-hours. Operating parameters and schedules may be revised as project plans are developed in more detail.

Equipment & Engines to be Used	Nominal horsepower	Operating hours/day	Operating days/year	Load Factor	Emission Factors NOx	VOC g/hphr	$PM_{2.5}$	CO	SO_2
Dredge & related									
Dredge engines	8,000	22	assume 30 x 12	0.66	9.7	0.37	0.51	1.06	0.0050
Pump engines	2,000	22	assume 30 x 12	0.80	4.9	0.20	0.29	1.27	0.0048
Dredge auxiliary engines	600	22	assume 30 x 12	0.40	7.3	0.20	0.29	1.27	0.0048
Dozer	310	22	assume 30 x 12	0.59	9.5	0.19	0.16	1.21	0.0050
Loader (working dredged material)	25	22	assume 30 x 12	0.59	9.5	0.19	0.16	1.21	0.0050
Groin construction									
Loader (groin construction)	26	10	assume 30 x 12	0.59	9.5	0.19	0.16	1.21	0.0050
Excavator	23	10	assume 30 x 12	0.59	9.5	0.19	0.16	1.21	0.0050
Barge aux.	20	10	assume 30 x 12	0.40	7.3	0.20	0.29	1.27	0.0048

Terms

Horsepower	hp	Total horsepower of type of dredge likely to be used on projects
Operating hours per day	hrs/day	Operating hours per day based on `
Operating days per year	days/yr	Estimated number of operating days per year based on volume of work, expected production rate, and schedule limitations resulting from environmental windows
Load factor	LF	Load factors from NONROAD model tables for similar equipment
Emission factors	EF	NOx EF derived from emission standards for similar engine types, g/hp-hr
	e.g., dredge Dodge Island equipped with Tier 0 propulsion engines, Tier 2 pump engines	

Calculations

Emissions calculated using the following equation:

Emissions, tons per year = (hp x hrs/day x days/yr x LF x EF)/(453.59 g/lb x 2,000 lbs/ton)

CO_2 emissions, tonnes per year = (hp x hrs/day x days/yr x LF x EF)/1,000,000 g/tonne

USACE - New York District
NAN - ABU Sandy-Related Projects
General Conformity Related Emission Estimates & Greenhouse Gas Estimates
Methodology
DRAFT 5-May-16

VOC, $PM_{2.5}$, CO emission factors:

2010 PANYNJ Emissions Inventory, marine vessel emisison factors used as a reasonable surrogate for the variety of vessels in use in the New York/New Jersey area in the absence of specific information regarding the vessels to be used on any specific project.

		VOC	$PM_{2.5}$	CO
Propulsion (g/kWhr)	Table 5.35	0.50	0.68	1.42
Propulsion (g/hphr)		0.37	0.51	1.06
Auxiliary (g/kWhr)	Table 5.35	0.27	0.39	1.70
Auxiliary (g/hphr)		0.20	0.29	1.27

Off-road: DEQ results for representative 600 hp crawler tractor (MY 1995)

Default hrs/year: 936 Horsepower: 600

Emissions, short tons per year:	0.1925	0.1667	1.2671
Estimated EF, g/hphr:*	0.183	0.16	1.21
Conversion factor	1.053 VOC/THC		
Estimated VOC EF, g/hphr:	0.19		

* Hydrocarbons provided by DEQ converted to VOC

Assumed load factor for off-road: 0.59 (from PANYNJ Emissions Inventory)

Conversion factor 0.7457 kW/hp g/kWhr x kW/hp = g/hphr

SO_2 emission factors:

Quantification of emissions from ships associated with ship movements between ports in the European Community
Final Report, July 2002, Entec UK Limited. Chapter 2

	g/kWhr	g/hphr	g S/hphr	g SO_2/hphr
Medium and high speed auxiliary, distillate fuel (Tal	217	162	0.0024	0.0048
Medium and high speed propulsion, distillate fuel (1	223	166	0.0025	0.0050

(maneuvering)

ULSD as of 2014: 15 g S/1,000,000 g fuel

Land-side diesel engines exhibit similar fuel consumption characteristice as marine propulsion engines,* so the same SO2 EFs are used.

*Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition
EPA-420-R-10-018 NR-009d July 2010
Table C1. Average Emission Test Results for 1988 to 1995 Mod 0.367 lb fuel/hphr
From the text: "Due to lack of data, the brake-specific fuel consumption (BSFC) for the 1988-and-later pre-control (Tier 0) engines is used for all engines, both earlier pre-control engines and later engines subject to emissions standards."
Converted to g/hphr: 167 g/hphr

CO_2 emission factors

Nonroad	571 g/hphr	The nonroad engine CO2 emission factor is the average of nonroad equipment in the PANYNJ 2014 emissions inventory, representative of nonroad engines in general.
Onroad	1812 g/mi at 35 mph	Onroad emission factor is the heavy-duty truck emisison factor in the PANYNJ 2014 emissions inventory.

APPENDIX O

PERTINENT CORRESPONDENCE

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

MAY 3 2016

Peter Weppler, Chief
Environmental Analysis Branch
Planning Division
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278-0900

RE: Fire Island Inlet to Montauk Point Reformulation Study

Dear Mr. Weppler:

We have reviewed the essential fish habitat (EFH) assessment dated December 17, 2015, and the information in your October 13, 2015, letter summarizing the Fire Island to Montauk Point Reformulation Study. The project area extends from Fire Island Inlet east to Montauk Point in Long Island, New York. This area includes the entire Atlantic coast of Suffolk County covering an ocean shoreline length of approximately 83 miles and over 200 miles of additional shoreline within the estuary system. The proposed action includes beach and dune restoration, inlet modifications, groin modifications, a breach response plan, and other non-structural measures, as well as, the continuation of the authorized dredging in Fire Island, Moriches and Shinnecock Inlets and the ebb shoals outside of the inlets with the placement of the dredged material in down drift areas. You previously consulted with us on a portion of this project under the Fire Island Inlet to Moriches Inlet; Fire Island Stabilization Project – Hurricane Sandy Reevaluation Report. We provided conservation recommendations for this Hurricane Sandy Reevaluation project in our letter dated May 14, 2014.

The Fish and Wildlife Coordination Act (FWCA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) require federal agencies to consult with one another on projects such as this that may affect EFH and other aquatic resources. Because this project affects EFH, this process is guided by the requirements of our EFH regulation at 50 CFR 600.905, which mandates the preparation of EFH assessments, lists the required contents of EFH assessments, and generally outlines each agency's obligations in this consultation procedure.

Fish and Wildlife Coordination Act

The inlets of the project area provides access to the Great South Bay, Moriches Bay, Shinnecock Bay and their freshwater tributaries for many aquatic species including both state and federally managed species and their forage including bluefish (*Pomatomus saltatrix*), summer flounder (*Paralichthys dentatus*), scup (*Stenotomus chrysops*), black sea bass (*Centropristis striata*), Atlantic butterfish (*Peprilus triacanthus*), winter flounder (*Pseudopleuronectes americanus*), windowpane flounder *(Scophthalmus aquosus)*, weakfish (*Cyanoscion regalis*), striped bass (*Morone saxatilis*), tautog (*Tautoga onitis*), spot (*Leiostomus xanthurus*), Atlantic croaker

The project area is also EFH for several highly migratory species including common thresher shark (*Alopias vulpinus*), white shark (*Carcharodon carcharias*), tiger shark (*Galeocerdo cuvieri*), basking shark (*Cetorhinus maximus*), blue shark (*Prionace glauca*), dusky shark (*Carcharhinus obscurus*), sandbar shark (*Carcharhinus plumbeus*), sand tiger shark (*Odontaspis taurus*), shortfin mako shark (*Isurus oxyrhynchus*), bluefin tuna (*Thunnus thynnus*), skipjack tuna (*Katsuwonus pelamis*), and yellowfin tuna (*Thunnus albacares*). Sand tiger and dusky sharks have also been listed as Species of Concern by NOAA.

The EFH assessment evaluates some of the potential impacts to EFH that could result from the implementation of the Tentative, Federally-Supported Plan (TFSP), but it lacks any discussion of the specific details of the project components including the areal extent of the sand placement below the high tide line and the amount and extent of dredging within the inlets and ebb shoals. The offshore borrow areas are not identified and there are no estimates on the amount of material that will be removed or the frequency of the disturbance of each borrow area or inlet. Detailed, site specific information on the borrow areas and inlet ebb shoals is also lacking. The absence of these details prevents a full evaluation of the direct, indirect, individual and cumulative effects of the actions proposed. As a result, we can only provide general comments and EFH conservation recommendations. Additional consultation will be necessary for each individual action or dredging event undertaken as part of this project, so that site specific EFH conservation recommendations can be developed. We can work with your staff to complete a programmatic consultation for this entire project to reduce the need for individual consultations, but the additional information discussed above will be needed as part of any programmatic consultation.

The dredging of sand for beach nourishment and to construct feeder beaches has the potential to impact both the EFH of a particular species as well as the organisms themselves in a variety of ways. Dredging can result in the impingement of eggs and larvae in the dredge plant and create undesirable suspended sediment levels in the water column. Increased suspended sediment levels can reduce dissolved oxygen, can mask pheromones used by migratory fishes, and can smother immobile benthic organisms and newly-settled juvenile demersal fish (Auld and Schubel 1978; Breitburg 1988; Newcombe and MacDonald 1991; Burton 1993; Nelson and Wheeler 1997). Sustained water column turbulence can reduce the feeding success of sight-feeding fish such as winter flounder and summer flounder.

The inlets within the project area provide a hydrologic connection between the marine and estuarine environments, and are responsible for regulating local salinity regimes, and serve as the conduit for planktonic exchange and related movements of diadromous species, estuary dependent fishes, and invertebrates between the ocean and inland bays. Dredging within the inlet can impede the movements of fish into and out of the back bays. Dredging can also remove the substrate used by federally managed species as spawning, refuge and forage habitat. Benthic organisms that are food sources for federally managed species may also be removed during the dredging. These impacts may be temporary if the substrate conditions return to preconstruction condition and benthic community recovers with the same or similar organisms. The impacts may be permanent if the substrate is altered in a way that reduces its suitability as habitat, if the benthic community is altered in a way that reduces its suitability as forage habitat or if the dredging occurs so often that the area does not have time to recover.

as feeding habitat and the definition of EFH includes waters and substrate necessary to fish for feeding. Therefore, actions that reduce the availability of prey species, either through direct harm or capture, or through adverse impacts to the prey species' habitat may also be considered adverse effects on EFH.

Stemile et al. (2000) report that winter flounder diets include the siphons of surf clams. Buckel and Conover (1997) in Fahay et al. (1999) reports that diet items of juvenile bluefish include *Alosa* species. As a result, activities that adversely affect the surf clams or the spawning success and the quality of the nursery habitat for anadromous fish can adversely affect the EFH for winter flounder juvenile and bluefish by reducing the availability of prey items. Water quality degradation, increased turbidity, noise and vibrations from dredging operations may impede the migration of anadromous fish through the inlets to their upstream spawning grounds.

The Mid-Atlantic Fisheries Management Council (MAFMC) has developed policy statements on beach nourishment activities that may affect federally managed species under their purview including summer flounder, scup, black sea bass, monkfish and butterfish. These policies are intended to articulate the MAFMC's position on various development activities and facilitate the protection and restoration of fisheries habitat and ecosystem function. The MAFMC's policies on beach nourishment are:

1. Avoid sand mining in areas containing sensitive fish habitats (e.g., spawning and feeding sites, hard bottom, cobble/gravel substrate, shellfish beds).

2. Avoid mining sand from sandy ridges, lumps, shoals, and rises that are named on maps. The naming of these is often the result of the area being an important fishing ground.

3. Existing sand borrow sites should be used to the extent possible. Mining sand from new areas introduces additional impacts.

4. Conduct beach nourishment during the winter and early spring, when productivity for benthic infauna is at a minimum.

5. Seasonal restrictions and spatial buffers on sand mining should be used to limit negative impacts during fish spawning, egg development, young-of-year development, and migration periods, and to avoid secondary impacts to sensitive habitat areas such as SAV.

6. Preserve, enhance, or create beach dune and native dune vegetation in order to provide natural beach habitat and reduce the need for nourishment.

7. Each beach nourishment activity should be treated as a new activity (i.e., subject to review and comment), including those identified under a programmatic environmental assessment or environmental impact statement.

8. Bathymetric and biological monitoring should be conducted before and after beach nourishment to assess recovery in beach borrow and nourishment areas.

We look forward to our continued coordination with your office on this project as it moves forward. As stated above, because the EFH assessment provided lacks sufficient detail on each action proposed as part of the TFSP, individual consultations are needed prior to the initiation of each activity so that site specific conservation recommendations can be developed. We can work with your staff to complete a programmatic consultation to reduce the need for individual consultations. If you have any questions or need additional information, please do not hesitate to contact Karen Greene at karen.greene@noaa.gov or (732) 872-3023.

Sincerely,

Louis A. Chiarella,
Assistant Regional Administrator
for Habitat Conservation

cc: NYD Corps – R. Smith
PRD Daniel Marrone
NEFMC – T. Nies
MAFMC – C. Moore

associated contaminants upon hatching success and larval survival of winter flounder, Pleuronectes americanus, a laboratory study. Final report, Grant CWF #321-R, to Connecticut Department Environmental Protection, by National Marine Fisheries Service, Milford CT.

Newcombe, C.P. and D.D. MacDonald. 1991. Effects of suspended sediments on aquatic ecosystems. N. Amer. J. Fish. Manag. 11:72-82.

Pearcy, W.C. 1962. Ecology of an estuarine population of winter flounder, *Pseudopleuronectes americanus* (Walbaum). Bull. Bingham Oceanogr. Coll. 18(1):1-78.

Pereira, J. J., R. Goldberg, J. J. Ziskowski, P.L. Berrien, W.W. Morse and D.L. Johnson. 1999. Essential Fish Habitat Source Document: Winter Flounder, *Pseudopleuronectes americanus,* life history and habitat characteristics. U.S. Dep. Commer., NOAA Technical Memorandum NMFS-NE-138.

Phelan, B. Personal Communication, January 13, 2014.

Rhodes, M.P. 2008. Dynamics of the larval fish assemblage at two coastal Delaware Inlets. M.S. thesis. University of Delaware, Lewes. 65 pp.

Saila, S.B. 1961. The contribution of estuaries to the offshore winter flounder fishery in Rhode Island. *Proc. Gulf. Carib. Fish. Inst.* 14:95-109.

Steimle, F.W., R.A. Pikanowski, D.G. McMillan, C.A. Zetlin, S.J. Wilk. 2000. Demersal fish and American lobster diets in the Lower Hudson-Raritan Estuary. NOAA Technical Memorandum NMFS-NE-161. Woods Hole, MA. 106 p.

Targett, T.E. and M.P. Rhode. 2008. Ingress of larval fishes through Indian River Inlet: patterns of abundance and development of a Juvenile Fish Index to assess water quality in the Inland Bay system. Final Report. University of Delaware, Lewes. Submitted to the Delaware Center for Inland Bays.

Weinstein MP, Weiss SL, Hodson RG, Gerry LR (1980) Retention of three taxa of postlarval fishes in an intensively flushed tidal estuary, Cape Fear River, North Carolina. Fishery Bulletin 78(2):419-436

Weinstein MP, Weiss SL, Hodson RG, Gerry LR (1980) Retention of three taxa of postlarval fishes in an intensively flushed tidal estuary, Cape Fear River, North Carolina. Fishery Bulletin 78(2):419-436

EMailed 1/27/16

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

January 26, 2016

Mr. Peter M. Weppler
Chief, Environmental Analysis Branch
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278-0900

Dear Mr. Weppler:

This is in response to the U.S. Army Corps of Engineers'(Corps) October 1, 2015, request (received via electronic mail) for the U.S. Fish and Wildlife Service (Service) to identify information that would be pertinent to the Endangered Species Act (ESA) of 1973, consultation (87 Stat., 884,. as amended; 16 U.S.C. 1531 *et seq.*) for the Corps' Fire Island Inlet to Montauk Point Reformulation Study (FIMP). This response is also provided pursuant to the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*).

The Corps' October 1 request for information to assist in the ESA consultation followed guidance the Service provided to the Corps at the September 15, 2015, FIMP interagency coordination meeting. Specifically, the Service recommended that the Corps initiate informal consultation to extend discussions relative to conservation measures that could be incorporated into the project description and included in the formal consultation process.

In this letter, we provide recommendations and request information that would assist both our agencies in the ESA and FWCA consultations. The information that is requested for the FWCA consultation will assist us in moving forward on or analysis of the impacts of the project on fish and wildlife resources, identifying fish and wildlife resource concerns and opportunities, evaluating mitigation alternatives, and making recommendations to avoid, minimize, and compensate for loss of fish and wildlife species and or their habitats. The ESA recommendations will assist the Corps in meeting its section 7(a)(2) of the ESA responsibility of ensuring any project that it authorizes, carries out, or funds does not jeopardize the continued existence of listed species.

We would appreciate your immediate attention and written response so that we can continue to make progress on these consultations. Please note that we may have additional information needs as both consultations proceed.

ESA Recommendations/Information

1) Since 1999, we have recommended that the Corps undertake a comprehensive regional approach to listed species management for this project due to its geographical and temporal scope as part of the FIMP planning process. At that time, we indicated that a plan addressing protection and conservation of listed species and their habitat, experimental investigations into artificial habitat creation, and identification and protection of locations within the barrier island system where processes of overwashing and breaching could occur in as natural a setting as possible would greatly facilitate the formal ESA consultation. Specifically, we recommended, and continue to recommend, that the Corps incorporate a Long-term Regional Comprehensive Management Plan (LTRCMP) for Threatened and Endangered Species into the FIMP project description. During the early 2000s, both our agencies worked collaboratively on the initial phases of the LTRCMP, but the Corps discontinued the effort in 2004. We were encouraged to learn in your October 15, 2014, correspondence that the Corps would be re-engaging with us on its development, but we have not been approached to date. Our recommendations related to aspects of the LTRCMP are provided below.

2) We continue to recommend the inclusion of "Land Manager Protection Plans," which would address the project-induced effects of increased recreational disturbance (U.S. Fish and Wildlife Service 2001) in the FIMP study area. They would include, but not be limited to, intensive protection of breeding plovers on all habitats (natural, artificially enhanced, and stabilized) in the planning area from human disturbance and predation. Incorporation of these overall plans, would also assist in offsetting impacts of habitat degradation on the plover population's vulnerability by maximizing productivity on the remaining habitat.

3) We recommend that the Corps include a list, map, and detailed plans of habitat restoration activities in the FIMP project description, that directly benefit listed species and their habitats, so the Service can review and provide input on their viability and potential benefit to listed species. We reference the Corps' 2008 document entitled, "*Restoration Opportunities in Conjunction with Breach Response Alternatives*," as an early effort to undertake and incorporate this into the FIMP project description, but have seen no advancement of this effort. Habitat restoration will be key to addressing adverse effects to listed species and their habitat due to barrier island and inlet stabilization and loss of early successional habitat formation from overwashing and breaching events, or development spurred by the proposed plan.

4) Please provide your agency's plans for the distribution of naturally functioning and artificially-enhanced habitat areas across the planning area. Distribution of highly productive habitats and birds among multiple sites reduces a species' vulnerability to environmentally-driven variance due to predation, weather, etc. These might include not only undeveloped areas, but the potential "buy-out" of developments in areas that are sparsely-developed and/or have high potential habitat value (*e.g.*, proximity to feeding areas, prone to overwashes, etc. (see U.S. Fish and Wildlife Service 2001);

5) Please provide breach fill profiles for the Breach Response Plans that foster natural habitat creation and maintenance for piping plover (*Charadrius melodus*), seabeach amaranth (*Amaranthus pumilus*), and red knot (*Calidris canutus*), as well as other shore-dependent species.

6) Section 7(a)(1) of the ESA directs each federal agency to carry out programs for the conservation of threatened and endangered species in consultation with the Service. We recommend that the Corps include in the ESA consultation a list of section 7(a)(1) activities that the Corps has undertaken for the conservation of threatened and endangered species in the study area as part of its general civil works program. We also recommend that the Corps review the Service's conservation recommendations provided for prior federal projects and provide a report to the Service which summarizes the status and outcomes of their implementation.

7) Information related to the creation, restoration, or enhancement of habitat will be important in evaluating the project and developing the Biological Assessment and Biological Opinion. Please provide detailed reports on Corps' projects which created artificial and high quality plover habitats. Planning considerations for habitat creation and/or enhancement must include avoidance of hazards posed to plovers when habitats are bisected by a road (see U.S. Fish and Wildlife Service 2001);

8) Please provide maps which show planned implementation of the Corps' FIMP Restoration Framework, *i.e.*:

   "The five key physical processes that need to be sustained, restored, or enhanced to re-establish protective features are: 1. Longshore sediment transport; 2. Cross-shore sediment transport; 3. Dune growth and evolution; 4. Bayside shoreline processes; 5. Circulation and water quality," with particular attention to cross-shore sediment transport. (see U.S. Army Corps of Engineers 2009b)

9) Please provide plans which illustrate the Corps' planning criteria which states,

   "Preference will be given to measures that protect and restore coastal landforms and natural habitats, aid in recovery of threatened and endangered species, enhance public recreation and use, and ensure perpetuation of essential physical and biological processes." (see U.S. Army Corps of Engineers 2009a)

<u>FWCA Comments</u>

The Service has initiated the preparation of the a Draft FWCA report, however, in order for the Service to be able to fully assess the project's impacts to fish and wildlife resources, additional information, as listed below, is requested.

1) In order to fully assess the direct, indirect, and cumulative impacts of the nonstructural alternatives on fish and wildlife resources and their habitats, including an assessment of

sensitive habitats within or adjacent to the immediate project areas, please provide the following:

a) the techniques that will be used to elevate the roadways;
b) the footprint of the proposed road dikes;
c) the locations of all public and private structures to be elevated,
d) the area of jurisdictional wetlands filled, if any;
e) specific wetlands and upland areas to be acquired along with their final disposition (federally-, state-, or locally-owned);
f) the land uses that will be allowed on acquired properties; and
g) the area of coastal zones, wetlands, and uplands that may be indirectly impacted by the construction of the road dikes.

The Corps has indicated via electronic mail that separate environmental assessments will be conducted as non-structural components are developed. Please confirm if that is how the Corps plans on developing these components.

2) In order to assess the impacts of this offshore dredging and beach nourishment on nearshore and barrier island flora and fauna that may be directly impacted by construction activities, or indirectly impacted by increased recreational activities or reduction in overwash and breaching processes, please provide the following:

a) cross-sections of proposed beach nourishment/fill;
b) a detailed description and location of the proposed borrow areas;
c) any studies regarding use of the borrow areas by avian species;
d) beachfill volumes; volumes of sediment to be dredged from federal navigation channels at Fire Island, Moriches and Shinnecock Inlets;
e) the maintenance depths of these inlets; and
f) and the specifications for proposed beach grass plantings and sand fence placement (if proposed).

3) It is well established that the overwash and breaching regime on the south shore barrier islands has influenced back barrier saltmarsh development and that saltmarsh growth and development are important components to barrier island resiliency and occur over a significant portion of the barrier islands in the project area. In order to understand the measures the Corps is taking to address barrier island resiliency, which includes conservation and restoration of backbay saltmarshes, please provide a detailed assessment on how the rate and areas of saltmarsh development will be mitigated under the scenario of barrier island stabilization over 50 years.

4) In order to assess whether the habitat evaluation procedures (HEP) alternatives that create or restore wetlands are viable measures and will not result in a net loss of wetland functions and values in the project area, please provide any supporting research undertaken by the Corps or others that examines the ecological and functional roles of artificial wetland creation as a surrogate for natural marsh creation.

5) Implementation of the mitigation alternatives is necessary to address the attendant impacts of any alternative. In order to understand whether the construction and mitigation alternatives will actually be implemented across the project area, as described in the Corps' project description, and to better evaluate the project as whole, and more accurately determine whether a proposed alternative will be beneficial, adverse, or neutral in terms of its environmental impacts, please provide letters from the local cost share sponsor, the New York State Department of Environmental Conservation, and other jurisdictional landowners and environmental regulators that illustrate their position on wetland creation or sand filling in the back bays to mitigate for the prevention or reduction of barrier island breaching and overwashing.

6) In order to accurately assess impacts to backbay fish and wildlife resources, including invertebrate and vertebrate colonizing species, and submerged aquatic and terrestrial plants, please quantify the volumes and area and design for sub- and supra-tidal areas that would be created in the back bays as mitigation for the prevention of breaches.

Thank you for the opportunity to assist you in these consultations. We look forward to our continued participation in the consultation. If you have any questions, please have your staff contact Steve Papa (ESA consultation), and Steve Sinkevich (FWCA consultation), of the Long Island Field Office, at (631) 286-0485, extensions 2120 and 2121, respectively.

Sincerely,

for Patricia Cole

David A. Stilwell
Field Supervisor

Literature Cited

U.S. Army Corps of Engineers. 2009a. Evaluation of Restoration Opportunities Using the Habitat Evaluation Procedures (HEP) Method Final Phase II Report Volume 2 – Appendices. U.S. Army Corps of Engineers, New York District, Planning Division (CENAN-PL-E), New York, NY. 375 pp.

U.S. Army Corps of Engineers. 2009b. Fire Island Inlet to Montauk Point New York Reformulation Study Draft Formulation Report. U.S. Army Corps of Engineers, New York District, Planning Division (CENAN-PL-E), New York, NY. 381 pp.

U.S. Fish and Wildlife Service. 2001. Biological Opinion on the U.S. Army Corps of Engineers Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, Reach II: Moriches Inlet to Shinnecock Inlet, West of Shinnecock Inlet Interim Storm Damage Protection Project." U.S. Fish and Wildlife Service, Long Island Field Office, Islip, NY. 63 pp.

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS, NEW YORK DISTRICT
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK NY 10278-0090

Environmental Branch

October 13, 2015

Mr. Jeffrey Zappieri
Consistency Review Unit
Office of Planning and Development
New York Department of State Suite 1010
One Commerce Place, 99 Washington Avenue
Albany, New York 12231-0001

Subject: Fire Island Inlet to Montauk Point Reformulation Study (FIMP)

Dear Mr. Zappieri:

This letter is in reference to the Fire Island Inlet to Montauk Point, New York Reformulation Study. This letter has been prepared to summarize our approach to conduct Coastal Zone Management (CZM) coordination and then to finalize the FIMP Reformulation Study and associated Environmental Impact Statement (EIS).

In March 2011, the U.S. Army Corps of Engineers (Corps), the U. S. Fish and Wildlife Service (USFWS) and the National Park Service (NPS) jointly signed and transmitted a letter to the New York State Department of Environmental Conservation (NYSDEC), identifying the Tentative, Federally Supported Plan (TFSP) as the basis for moving forward with the Project. New York State, by letter in June 2013, agreed in concept with the TFSP. This agreement noted the details that required refinement, which include the breach response, life-cycle management of the project, alignment, and nature-based features.

The Corps finds that the best course of action to resolve these remaining plan details is through the Corps' formal report review process, the National Environmental Policy Act (NEPA) process, and necessary regulatory coordination. The formal review process is an efficient means to formally describe the alternative plan in its entirety, and to finalize a mutually agreeable plan that has local sponsor support. The Corps intends to move forward with what we will identify as the Tentatively Selected Plan (TSP) in our EIS.

A description of the TSP is provided as an enclosure. The adjustments that have been made to the TFSP include the following:

- The TFSP recommended a conditional breach response plan 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 breach response plan for this area, to more closely match the plan features, and level of risk reduction that has been provided by

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS, NEW YORK DISTRICT
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK NY 10278-0090

Environmental Branch

October 13, 2015

Mr. David Stilwell
Field Supervisor
U.S. Fish and Wildlife Service
3817 Luker Road
Cortland, New York 13045

Subject: Fire Island Inlet to Montauk Point Reformulation Study (FIMP)

Dear Mr. Stilwell:

This letter is in reference to the Fire Island Inlet to Montauk Point, New York Reformulation Study. This letter has been prepared to summarize our approach request a Fish and Wildlife Coordination Act Report (FWCAR) and start the Section 7 coordination and then finalize the FIMP Reformulation Study and associated Environmental Impact Statement (EIS).

In March 2011, the U.S. Army Corps of Engineers (Corps), the U. S. Fish and Wildlife Service (USFWS) and the National Park Service (NPS) jointly signed and transmitted a letter to the New York State Department of Environmental Conservation (NYSDEC), identifying the Tentative, Federally Supported Plan (TFSP) as the basis for moving forward with the Project. New York State, by letter in June 2013, agreed in concept with the TFSP. This agreement noted the details that required refinement, which include the breach response, life-cycle management of the project, alignment, and nature-based features.

The Corps finds that the best course of action to resolve these remaining plan details is through the Corps' formal report review process, the NEPA process, and necessary regulatory coordination. The formal review process is an efficient means to formally describe the alternative plan in its entirety, and to finalize a mutually agreeable plan that has local sponsor support. The Corps intends to move forward with what we will identify as the Tentatively Selected Plan (TSP) in our EIS.

A description of the TSP is provided as an enclosure. The adjustments that have been made to the TFSP include the following:

- The TFSP recommended a conditional breach response plan 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 breach response plan for this area, to more closely match the plan features, and level of risk reduction that has been provided by

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS, NEW YORK DISTRICT
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK NY 10278-0090

Environmental Branch

October 13, 2015

Melissa D. Alvarez, PWS
Marine Habitat Resource Specialist
Habitat Conservation Division
National Marine Fisheries

Subject: Fire Island Inlet to Montauk Point Reformulation Study (FIMP)

Dear Ms. Alvarez:

This letter is in reference to the Fire Island Inlet to Montauk Point, New York Reformulation Study. This letter has been prepared to summarize our approach to conduct Essential Fish Habitat (EFH) coordination under the Magnuson-Stevens Fishery Conservation and Management Act and then finalize the FIMP Reformulation Study and associated Environmental Impact Statement (EIS).

In March 2011, the U.S. Army Corps of Engineers (Corps), the U. S. Fish and Wildlife Service (USFWS) and the National Park Service (NPS) jointly signed and transmitted a letter to the New York State Department of Environmental Conservation (NYSDEC), identifying the Tentative, Federally Supported Plan (TFSP) as the basis for moving forward with the Project. New York State, by letter in June 2013, agreed in concept with the TFSP. This agreement noted the details that required refinement, which include the breach response, life-cycle management of the project, alignment, and nature-based features.

The Corps finds that the best course of action to resolve these remaining plan details is through the Corps' formal report review process, the National Environmental Policy Act (NEPA) process, and necessary regulatory coordination. The formal review process is an efficient means to formally describe the alternative plan in its entirety, and to finalize a mutually agreeable plan that has local sponsor support. The Corps intends to move forward with what we will identify as the Tentatively Selected Plan (TSP) in our EIS.

A description of the TSP is provided as an enclosure. The adjustments that have been made to the TFSP include the following:

- The TFSP recommended a conditional breach response plan 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 breach response plan 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.

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, NEW YORK DISTRICT
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK NY 10278-0090

August 10, 2015

Planning Division

Mr. Alan A, Fuchs, P.E.
Director, Bureau of Flood Protection and Dam Safety, Division of Water
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-3504

Dear Mr. Fuchs:

This letter is in reference to the Fire Island Inlet to Montauk Point, New York Reformulation Study. Identical copies of this letter have been provided to New York State DEC, Suffolk County, US Fish and Wildlife Service, and National Park Service. This letter has been prepared to summarize our approach to bring the FIMP Reformulation Study to a conclusion.

In March 2011, the Corps, USFWS and NPS jointly signed and transmitted a letter to NYSDEC, identifying the Tentative, Federally Supported Plan (TFSP) as the basis for moving forward with the Project. We recognize this as a significant milestone in advancing this Reformulation Study. New York State, by letter in June 2013, agreed in concept with the TFSP. This agreement noted the details that required refinement, which include the breach response, life-cycle management of the project, alignment, and nature-based features.

Following Hurricane Sandy, we have continued to work collaboratively to refine the TFSP 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. We have collectively recognized that adjustments to the TFSP were necessary for the stabilization efforts, and will be necessary to implement the overall Reformulation Plan.

Multiple meetings have convened to finalize the FIMP plan details, and it has become apparent that the interrelationship of the features within the recommended alternative and the level of risk tolerance acceptable to each agency impedes a multi-agency consensus on specific features. Therefore, the Corps finds that the best course of action to resolve these remaining plan details is to through the Corps' formal report review process, the NEPA process, and necessary regulatory coordination. The formal review process is an efficient means to formally describe the alternative plan in its entirety, and to finalize a mutually agreeable plan that has local sponsor support. Rather than ending the ongoing coordination between our respective offices, we find the formal review process allows for a thoughtful evaluation of the interrelated features and their contributions to coastal storm risk reduction in a more formal, open process.

The Corps intends to move forward with what the Corps will identify as the Tentatively Selected Plan (TSP) in our General Reevaluation Report and Environmental Impact Statement.

MEMORANDUM OF UNDERSTANDING
between the
THE UNITED STATES ARMY
and
THE DEPARTMENT OF THE INTERIOR

I. PURPOSE

The purpose of this Memorandum of Understanding (MOU) is to provide a foundation for collaboration between the United States Army (Army), represented by the United States Army Corps of Engineers (Corps) and the Department of the Interior (DOI), for purposes of 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 Fire Island to Montauk Point, New York project (FIMP).

II. BACKGROUND

The Corps and DOI stipulate that:

A. Congress authorized the FIMP for beach erosion control and hurricane protection in section 101 of the Rivers and Harbors Act of 1960, Public Law 86-645;

B. Section 8 of the Act establishing the Fire Island National Seashore, Public Law 88-587 directed that the authority of the Corps to undertake or contribute to shore erosion control or beach protection measures on lands within the Fire Island National Seashore lands shall be exercised in accordance with a plan that is mutually acceptable to the Secretary of the Army and the Secretary of the Interior;

C. The Corps initiated a reformulation study of the FIMP in 1980;

D. In 2004, the Corps, DOI, and other partners adopted a Vision Statement for the reformulation study that acknowledged a preference for measures that protect and enhance natural processes and minimize adverse environmental impacts;

E. In 2011, the Corps in consultation with the DOI developed a Tentatively Federally Selected Plan in the FIMP reformulation study that included a combination of soft structural, nonstructural, and nature based solutions as well as monitoring and adaptive management components to address uncertainties;

F. In 2012, Hurricane Sandy damaged portions of the FIMP project area, increasing risk and vulnerability of coastal developments in the project area to flooding; and,

G. Congress provided funding in the Disaster Relief Appropriations Act of 2013, Public Law 113-2 to reduce future flood risk in ways that will support the long-term

E. This MOU may be modified as necessary, by mutual agreement of both parties, by a written amendment signed and dated by an authorized representative of each party.

F. Either party may terminate this MOU by providing 45 days written notice to the other. Otherwise this MOU will remain in force through completion of the GRR/EIS for the FIMP project and during the period of initial construction of the project.

V. **POINTS OF CONTACT.** The following individuals will be the points of contact for this MOU:

CORPS
Mr. Joe Vietri
Chief, Planning and Policy, North Atlantic Division
Building 301, General Lee Avenue
Fort Hamilton Military Community
Brooklyn, New York 11252
Joseph.R.Vietri@usace.army.mil
917-613-3873

FISH AND WILDLIFE SERVICE
Mr. David Stilwell
Field Supervisor, New York Field Office
U.S. Fish and Wildlife Service
3817 Luker Road
Cortland, NY 13045
607-753-9334

NATIONAL PARK SERVICE

K. Christopher Soller, Superintendent
Fire Island National Seashore
120 Laurel St.
Patchogue, NY 11772
631-687-4752

Mary Foley, Regional Chief Scientist
Northeast Region
National Park Service
15 State St.
Boston, MA 02109
617-223-5024

USGS
Walter Barnhardt
Center Director, Woods Hole Coastal and Marine Science Center
384 Woods Hole Road

INTERAGENCY AGREEMENT BETWEEN U.S. ARMY CORPS OF ENGINEERS AND USDA-APHIS-WILDLIFE SERVICES

WORK PLAN

Introduction

The U.S. Department of Agriculture (USDA) is authorized to protect American agriculture and other resources from damage associated with wildlife. The primary authority for Wildlife Services (WS) is the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426c) as amended.

Wildlife Services activities are conducted in cooperation with other Federal, State and local agencies; private organizations and individuals. This interagency agreement will be a reimbursable agreement and the US Army Corps of Engineers will only be billed for costs of work performed, not to exceed $44,060.00.

The WS program uses an Integrated Wildlife Damage Management (IWDM) approach (sometimes referred to as IPM or "Integrated Pest Management') in which a series of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1, 1-7 of the Animal Damage Control Program Final Environmental Impact Statement (USDA 1994). These methods include the alteration of cultural practices as well as habitat and behavioral modification to prevent damage. However, controlling wildlife damage may require that the offending animal(s) are killed or that the populations of the offending species be reduced.

Long Island Shoreline from Democrat Point to South Hampton

The shoreline between Democrat Point, NY and South Hampton, NY is approximately 30 miles and serves as an important nesting site for the New York State Endangered and Federally Threatened Piping Plover in addition to other shorebirds and colonial water birds. One factor that contributes to reduced recruitment levels in these species is predation by mammalian and avian predators. The US Army Corps of Engineers has a plan for restoration of Piping Plover populations and other bird populations along this 30-mile span of Long Island shoreline. Predation management is an important component of this plan.

In addition to the work listed below, any location between these two geographical points will be worked as needed or requested by the US Army Corps of Engineers.

At the request of the US Army Corps of Engineers, USDA WS will be conducting predator management activities specifically along the six miles of the Smith Point Beach location during the fall months in 2015. USDA WS will target the species listed below.

Red fox, coyote, and raccoons prey on the nests, young, and adults of Piping Plovers, other shorebirds, and colonial water birds nesting on Long Island's shoreline. The occurrence of one

Resources Required

Wildlife Services employees will conduct the fox, coyote, raccoon, gull, and crow removal work. Cooperating agency personnel will provide Wildlife Services staff with technical assistance on working in and around the various nesting bird species and colonies to minimize disturbances of these species. Housing may also be provided on site if available.

Procurement

Purchase of supplies, equipment and miscellaneous needs including salaries will be made by Wildlife Services as outlined under the Financial Plan of the Inter-agency Agreement. All expenditures will be processed through Wildlife Services' administrative system and charged to the US Army Corps of Engineers as described in the Inter-agency Agreement.

Stipulations and Restrictions

Wildlife Services' activities under this cooperative effort will be limited to New York State. Techniques will be environmentally sound, safe, and selective. If applicable, both Federal and State permits will be secured by the resource owner to perform wildlife damage management activities, and these activities will be within the policy guidelines of US Army Corps of Engineers and USDA-APHIS-Wildlife Services. All program activities will be conducted within Federal and State regulations.

Reports

Wildlife Services will be responsible for the preparation of a final report on activities conducted under this Inter-agency Agreement, submitted to the US Army Corps of Engineers by September 30, 2015 through September 30, 2020.

Effective Dates

The cooperative agreement shall commence in April 20, 2015 and shall expire on April 20, 2020.

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

REPLY TO
ATTENTION OF
Environmental Analysis Branch

December 17, 2015

Melissa D. Alvarez, PWS
Marine Habitat Resource Specialist
Habitat Conservation Division
National Marine Fisheries

Subject: Fire Island Inlet to Montauk Point Reformulation Study (FIMP)

Dear Ms. Alvarez:

This letter is in reference to the Fire Island Inlet to Montauk Point, New York Reformulation Study. This letter has been prepared to submit our official Essential Fish Habitat (EFH) coordination under the Magnuson-Stevens Fishery Conservation and Management Act in order to finalize the FIMP Reformulation Study and associated Environmental Impact Statement.

I look forward to working with you and your staff on finalizing this project. The District appreciates your continued cooperation in expediting this process. If you should have any questions, please contact Mr. Robert J. Smith of my staff at 917-790-8729.

Sincerely,

Peter Weppler
Chief, Environmental Branch

Attachments

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

REPLY TO
ATTENTION OF
Environmental Analysis Branch

December 17, 2015

Melissa D. Alvarez, PWS
Marine Habitat Resource Specialist
Habitat Conservation Division
National Marine Fisheries

Subject: Fire Island Inlet to Montauk Point Reformulation Study (FIMP)

Dear Ms. Alvarez:

This letter is in reference to the Fire Island Inlet to Montauk Point, New York Reformulation Study. This letter has been prepared to submit our official Essential Fish Habitat (EFH) coordination under the Magnuson-Stevens Fishery Conservation and Management Act in order to finalize the FIMP Reformulation Study and associated Environmental Impact Statement.

I look forward to working with you and your staff on finalizing this project. The District appreciates your continued cooperation in expediting this process. If you should have any questions, please contact Mr. Robert J. Smith of my staff at 917-790-8729.

CJ1

Sincerely,

Peter Weppler
Chief, Environmental Branch

Attachments

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

30 September 2013

REPLY TO
ATTENTION OF
Commander

Honorable Joseph J. Martens
Commissioner
New York State Department of Environmental Conservation
Albany, New York 12233-1010

Dear Commissioner Martens:

Thank you for your letter of September 5, 2013, expressing New York State support of the new dune alignment for the Fire Island to Montauk Point (FIMP) Reformulation project, and affirming Suffolk County's role in project implementation. We also appreciate the State's continued attention to the breach at Old Inlet.

In your letter, you also requested that the Corps take the lead to acquire the approximately 39 properties impacted by the new alignment and obtain the other perpetual easements required to construct and maintain the project. Although real estate acquisition remains the responsibility of the non-Federal sponsor under the Project Partnership Agreement, the Corps of Engineers is willing to provide technical assistance to the State and County. The real estate requirements for this project are complex, and timely completion of the real estate acquisition is critical to the success of the project.

The New York District Real Estate leadership has already initiated contact with real estate representatives from both your office and Suffolk County for project requirements, staff capabilities and available resources. These discussions will assist in determining the best way to proceed, which may include Corps technical assistance with preliminary activities such as title, appraisal, and mapping. If necessary, it may also include assistance with property acquisition; however, at this time, the Corps of Engineers will not pursue acquisition of any properties required for the Fire Island to Montauk Point Project through eminent domain proceedings in Federal court. Once a plan is developed it will be memorialized in a Memorandum of Agreement, which must be executed prior to beginning the work.

In reference to the existing Old Inlet Breach, we are positioning ourselves to close this breach as was done last year for the other two Sandy breaches. However, we cannot complete any significant steps until after the property owner, the U.S. Department of the Interior, National Park Service, issues the required written permission to perform the actual work. We understand that they have concluded they will produce a National Environmental Policy Act Environmental Impact Statement and Record of Decision in order to issue that permission.

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

REPLY TO
ATTENTION OF

DISTRICT COMMANDER

August 16, 2013

Honorable Joe Martens, Commissioner
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Dear Mr. Martens:

Thank you for letter dated 14 June, 2013, that supports the implementation of the Fire Island to Montauk Point (FIMP) Project. In response, I am providing documentation to support the recommendation that the beachfill component of the plan for Fire Island be implemented along a more landward alignment than the original, more seaward alignment proposed prior to Hurricane Sandy.

The attached document compares the quantities of sediment required for initial construction and subsequent periodic maintenance over the fifty year study period for the more seaward, pre-Sandy minimum real estate alignment proposal and the more recent, post-Sandy, more landward alignment.

The analysis confirms that the sediment requirements for the more landward alignment are lower than those of the more seaward alignment. Further, the attachment demonstrates that even with the cost estimate for the necessary real estate acquisitions to allow construction of the more landward alignment combined with initial construction and maintenance costs, the new proposed alignment is considerably less expensive than the more seaward, original minimum real estate proposal.

This more landward alignment is more economical, resilient and sustainable over the 50 year project life. Accordingly, your concurrence with the Tentative Federal Selected Plan (TFSP) implementation in the revised alignment is expected, as the 14 June letter indicated concurrence once the revised alignment was proven to achieve these goals.

An accelerated schedule has been developed to provide emergency stabilization within the next construction window. Therefore, it is the District's intent to immediately proceed with analysis of the TFSP along this more landward alignment and seek higher authority approvals by each Federal Agency. Without immediate indication to the contrary, your support of the TFSP is assumed from the statements in the 14 June letter and the supporting analysis provided in this response. Please contact Mr. Anthony Ciorra, Chief of Coastal Restoration and Special Projects Branch at (917) 790-8208 or Mr. Frank Verga, Project Manager, at (917) 790-8212, should you have any questions.

Sincerely,

Paul E. Owen
Colonel, U.S. Army
Commander

Enclosure

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

July 29, 2013

Mr. Leonard Houston
Chief, Environmental Analysis Branch
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Dear Mr. Houston:

This response to your letter dated July 15, 2013, requesting consultation with the U.S. Fish and Wildlife Service (Service) pursuant to the Fish and Wildlife Coordination Act (FWCA) of 1958 (48 Stat. 401, as amended; 661 *et seq.*) for the U.S. Army Corp of Engineers' (Corps) proposed emergency stabilization projects on Fire Island and Montauk Beach, Suffolk County, New York. These projects are being proposed to address shoreline erosion associated with Hurricane Sandy, and are part of the Corps' 83-mile Fire Island Inlet to Montauk Point Reformulation Study.

The Service requests that the Corps submit detailed project plans to our office as soon as possible so that we may begin to provide feedback on the draft scopes of work that your office submitted to us for review concerning preparation of Fish and Wildlife Coordination Act 2(b) Reports for each of these projects. In addition, please inform us as to whether the Corps will be requesting formal consultation with the Service pursuant to the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) and Coastal Barrier Resources Act (CBRA) of 1982, as amended (16 U.S.C. 3501 *et seq.*). Listed species that occur in the proposed project areas include the piping plover (*Charadrius melodus*; threatened), roseate tern (*Sterna dougallii dougallii*; endangered), sandplain gerardia (*Agalinus acuta*; endangered), and seabeach amaranth (*Amaranthus pumilus*; threatened). The red knot (*Calidris canutus rufa*), a candidate species for protection under the ESA, may also be present in the Fire Island project area.

If you have any questions or require further assistance, please have your staff contact Steve Papa of the Long Island Field Office at (631) 286-0485.

Sincerely,

David A. Stilwell
Field Supervisor

ANDREW M. CUOMO
GOVERNOR

JOE MARTENS
COMMISSIONER

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233-1010

June 14, 2013

Colonel Paul E. Owen
District Commander
United States Army Corps of Engineers
New York District
26 Federal Plaza
Room 2109
New York, NY 10278

Dear Colonel Owen:

I am pleased to inform you that New York State supports implementation of the fully federally funded Fire Island to Montauk Point (FIMP) project, including the United States Army Corps of Engineers' (Corps) proposal to expedite the implementation of elements of FIMP, such as the immediate restoration of dunes and beaches damaged by Hurricane Sandy on Fire Island and downtown Montauk. This support is based on the overall concepts of the FIMP project subject to the items further described in this letter.

On March 11, 2011, representatives of the Corps and the United States Department of Interior sent a letter to me outlining the potential plan of improvement for the Fire Island to Montauk Point ("FIMP") Reformulation Study. This "Tentative Federal Supported Plan" ("TFSP") was proposed as the basis to move forward with Reformulation Study efforts for the entire FIMP study area – encompassing approximately 83 miles of Atlantic Ocean coastal and bay areas of Suffolk County, New York. As noted in the federal letter, New York State must find the general plan of improvement acceptable before its attributes can be finalized through a collaborative process. New York's approval at this stage, I understand, would allow the Corps and State to move forward with a final analysis of the TFSP, including such matters as plan formulation, engineering, economics, environmental assessment, model certifications and formal agency policy-level approvals.

After a series of discussions, on December 29, 2011, DEC sent a letter to the Army Corps presenting information requests aimed at better understanding some of the basic elements of the TFSP so that DEC would be in a position to accurately explain project elements, costs, maintenance obligations and impacts of the TFSP to the required local community sponsor(s). While further discussions were taking place, Hurricane Sandy arrived – altering the physical and fiscal landscape in a variety of ways. On May 16, 2013 the Corps responded to the Department's letter which addressed a number of the concerns raised by the Department, but deferred a response on a few issues that are currently under review based on the impacts from Sandy.

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

REPLY TO
ATTENTION OF
Project Management Division

16 MAY 2013

Mr. Alan A. Fuchs, P.E.
Director, Bureau of Flood Protection and Dam Safety
New York State Department of Environmental Conservation
Division of Water
Bureau of Flood Protection and Dam Safety, 4th Floor
625 Broadway
Albany, New York, 12233-3504

Dear Mr. Fuchs:

Thank you for your letter dated December 29, 2011 regarding the Fire Island Inlet to Montauk Point (FIMP) Reformulation Study, which requested additional information on the Tentative Federal Supported Plan (TFSP). This was in response to the March 11, 2011 jointly signed letter from both the U.S. Army Corps of Engineers and the U.S. Department of Interior (DOI) which requested New York State's review and verification of acceptability of the TFSP.

We recognize there have been significant changes since the exchange of this correspondence, most notably Hurricane Sandy, the passage of PL 113-2 (The Disaster Relief Appropriations Act; 2013) which includes provisions that establish a framework for proceeding with Sandy affected authorized and unconstructed projects, and the increased support to bring the FIMP Reformulation Study to a conclusion.

Prior to Hurricane Sandy, the Corps was coordinating proposed responses with both your office and the DOI, as well as in the process of developing the requested information. As we are currently in the process of updating this information to account for necessary changes due to Hurricane Sandy, we have attached preliminary responses to your comments for your immediate review.

Since Hurricane Sandy, our offices have also been engaged in a number of discussions regarding appropriate revisions to the TFSP, and the evaluation of alternatives which properly reflect the post-Sandy condition. The revisions to the TFSP that are currently under consideration include the following:

Fire Island Inlet to Montauk Point, New York
Fire Island Alignment
Post-Sandy Considerations

BACKGROUND:

The Corps and the DOI had agreed to a Tentative Federally Selected Plan (TFSP) as part of the Fire Island Inlet to Montauk Point Reformulation Study that includes a beachfill along Fire Island, prior to Hurricane Sandy. Agreement upon the beachfill plan was reached following evaluation of a number of alternatives, and coordination of these alternatives with the local municipalities.

Alternatives varied the scale of beachfill alternatives, the alongshore extent of fill, and the alignment (cross-shore placement of fill). The TFSP was identified based upon what was cost-effective, economically justified, supported by the NPS policies, and locally acceptable.

The TFSP generally consisted of a beachfill plan with a dune at elevation +15 ft, a berm with a width of 90 ft placed in front of the communities, and aligned seaward of the existing buildings to minimize real estate acquisition requirements.

The Corps, NPS, and NYS have agreed to review components of the TFSP to determine if changes to the selected plan are warranted in light of the changes in the beach and dune condition on Fire Island that occurred as a result of Hurricane Sandy. This analysis considered changes in the alongshore extent of beachfill, and also in the alignment of the beachfill (cross-shore placement of fill). The beachfill dimensions are based upon performance of similar projects, and do not require revision.

EVALUATION CRITERIA OF DIFFERENT ALIGNMENTS:

1) Cost calculation to construct a dune and beachfill project generally include:

- The initial costs associated with dredging and placing the initial quantity of sand required for construction, which vary with the alignment and alongshore extent;
- The upfront costs associated with acquiring the necessary Real Estate for construction of the beachfill project, which vary based upon the alignment;
- The long-term, life-cycle costs associated with dredging and placing sand required to maintain the design condition over a period of 50 years which vary based upon the erosion rate.

2) Tradeoffs are often considered when comparing possible alignments between the quantity of sand required both up-front and over time, and the up-front cost of Real Estate acquisition for more landward alignments.

- An alignment constructed south, more seaward, of the existing development would require a large volume of sand and incur a relatively high cost for initial construction, but requires limited Real Estate acquisition and low Real Estate costs for initial construction. This plan would also

is estimated to be $47 M. Based upon this preliminary estimate, the acquisition cost is nearly offset by the savings in the initial cost of sand.

Renourishment of the more landward alignment would require approximately 30% less sand over the project life, which translates to approximately 13 Million CY of less sand over 50 years and is equivalent to savings of an additional $160 Million over the project life.

CONCLUSIONS:

These costs are based upon current survey data, and real estate data, that are still under review for the FIMP report. This analysis clearly indicates that the project that is more closely aligned to the current dune position is clearly less expensive over the project life. This project requires significantly less fill volume, and is clearly more sustainable, and environmentally preferable.

ATTACHMENTS:

Detailed costs and figures which present the derivation of these quantities are costs are attached.

and safe load, area of borrow site, distance to borrow site, and current fuel, labor, and equipment costs, etc.

2.2 Construction Schedule and Mobilization / Demobilization Costs

The Corps has developed a preliminary construction schedule for the initial construction of the MREI and MIDU plan. The schedule for both plans assumes that the initial construction may be completed with three contracts:

- Contract 1: Smith Point County Park (MB-1A, MB-1B, MB-2A);
- Contract 2: Lonelyville to Robert Moses State Park (GSB-1A, GSB-1B, GSB-2A);
- Contract 3: Davis Park to Town Beach (GSB-2B, GSB-2C, GSB-2D, GSB-3A, GSB-3C, GSB-3E, GSB-3G).

Mobilization and demobilization costs for each contract have been shared between design reaches. The cost of Mob/Demob is $4 million and is distributed proportionately to each design reach based on the volume of fill within each deign reach. The same construction schedule and Mob/Demob costs are to the Renourishment Costs as well.

2.3 First Costs

First costs include dredging, mobilization, and demobilization for the initial fill volumes estimated. First cost estimates also include a 15% contingency on costs. Engineering and design (E&D) costs are assumed to be 7% of the construction cost. Supervision and administration (S&A) costs are also assumed to be a percentage of the construction cost, which was computed according to the Corps formula:

$$\% = \frac{17 - \log\left(\frac{subottal}{1000}\right)}{100}$$

Where *subtotal* is the total construction cost for the entire project. Note that the total construction cost does not include contingency, E&D costs, or S&A costs.

2.4 Renourishment Costs

Renourishment costs include dredging, mobilization, and demobilization; the same dredging unit costs are assumed for both initial fill and renourishment fill. Renourishment costs include a 15% contingency, 7% for E&D, and the S&A percentage computed as given in Section 2.3.

TABLE 1-1. FIRST COSTS - OPTIMIZED
MREI MINIMUM REAL ESTATE BASELINE AND MEDIUM DESIGN TEMPLATE
FIRE ISLAND INTERIM

Design Reach	Reach Name	DREDGING			MOB/ DEMOB Cost	Total Construction Cost	Contingency Cost	E&D Cost	S&A Cost	Total Cost
		Total Initial Fill	Unit Price	Placement Cost						
		CY	$ / CY				15%	7.00%	6.44%	
GSB-1A	RMSP	898,860	$ 16.36	$ 14,705,344	$ 1,864,010	$ 16,569,354	$ 2,485,403	$ 1,333,833	$ 1,226,894	$ 21,615,484
GSB-1B	FILT	389,349	$ 17.77	$ 6,918,723	$ 807,412	$ 7,726,135	$ 1,158,920	$ 621,954	$ 572,089	$ 10,079,098
GSB-2A	Kismet to Lonelyville	640,664	$ 12.61	$ 8,078,777	$ 1,328,578	$ 9,407,355	$ 1,411,103	$ 757,292	$ 696,577	$ 12,272,327
GSB-2B	Town Beach to Corneille Estates	645,301	$ 11.67	$ 7,530,663	$ 614,731	$ 8,145,394	$ 1,221,809	$ 655,704	$ 603,133	$ 10,626,041
GSB-2C	Ocean Beach to Seaview	484,775	$ 11.24	$ 5,448,868	$ 461,809	$ 5,910,677	$ 886,602	$ 475,810	$ 437,662	$ 7,710,750
GSB-2D	OBP to POW	668,653	$ 10.86	$ 7,261,572	$ 636,977	$ 7,898,549	$ 1,184,782	$ 635,833	$ 584,856	$ 10,304,020
GSB-2E	Sailors Haven	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
GSB-3A	Cherry Grove	25,511	$ 11.74	$ 299,497	$ 24,302	$ 323,799	$ 48,570	$ 26,066	$ 23,976	$ 422,411
GSB-3B	Carrington Tract	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
GSB-3C	Fire Island Pines	1,182,187	$ 10.66	$ 12,602,116	$ 1,126,183	$ 13,728,299	$ 2,059,245	$ 1,105,128	$ 1,016,525	$ 17,909,197
GSB-3D	Talisman to Water Island	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
GSB-3E	Water Island	25,974	$ 8.95	$ 232,463	$ 24,743	$ 257,206	$ 38,581	$ 20,705	$ 19,045	$ 335,537
GSB-3F	Water Island to Davis Park	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
GSB-3G	Davis Park	1,166,516	$ 9.31	$ 10,860,260	$ 1,111,254	$ 11,971,514	$ 1,795,727	$ 963,707	$ 886,442	$ 15,617,390
GSB-3H	Watch Hill	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
GSB-4A	Bellport Beach	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
GSB-4B	Old Inlet	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
MB-1A	SPCP-TWA	326,589	$ 11.44	$ 3,736,182	$ 750,744	$ 4,486,926	$ 673,039	$ 361,198	$ 332,239	$ 5,853,401
MB-1B	SPCP	744,675	$ 12.87	$ 9,583,971	$ 1,711,815	$ 11,295,786	$ 1,694,368	$ 909,311	$ 836,407	$ 14,735,872
MB-2A	MB-2A	668,819	$ 11.49	$ 7,684,726	$ 1,537,441	$ 9,222,166	$ 1,383,325	$ 742,384	$ 682,864	$ 12,030,740
MB-2B	MB-2B	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total		7,867,872	$ -	$ 94,943,162	$ 12,000,000	$ 106,943,162	$ 16,041,474	$ 8,608,925	$ 7,918,708	$ 139,512,269

TABLE 1-3. O&M COSTS - OPTIMIZED - (Costs Per 2 Year Cycle)
MREI - MINIMUM REAL ESTATE BASELINE AND MEDIUM DESIGN TEMPLATE
FIRE ISLAND INTERIM

Design Reach	Reach Name	Berm Maintenance		Fill Maintenance		O&M Cost	Contingency Cost	E&D Cost	S&A Cost	Total Cost
		Length of Fill	Unit Price	Length of Fill	Unit Price					
		ft	$ / ft	ft	$ / ft		15%	7.00%	9.77%	
GSB-1A	RMSP	12,000	$ 15.00	12,000	$ 2.00	$ 408,000	$ 61,200	$ 32,844	$ 45,848	$ 547,892
GSB-1B	FILT	5,400	$ 15.00	5,400	$ 2.00	$ 183,600	$ 27,540	$ 14,780	$ 20,632	$ 246,552
GSB-2A	Kismet to Lonelyville	9,000	$ 15.00	9,000	$ 2.00	$ 306,000	$ 45,900	$ 24,633	$ 34,386	$ 410,919
GSB-2B	Town Beach to Corneille Estates	4,400	$ 15.00	4,400	$ 2.00	$ 149,600	$ 22,440	$ 12,043	$ 16,811	$ 200,894
GSB-2C	Ocean Beach to Seaview	3,800	$ 15.00	3,800	$ 2.00	$ 129,200	$ 19,380	$ 10,401	$ 14,519	$ 173,499
GSB-2D	OBP to POW	7,200	$ 15.00	7,200	$ 2.00	$ 244,800	$ 36,720	$ 19,706	$ 27,509	$ 328,735
GSB-2E	Sailors Haven	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
GSB-3A	Cherry Grove	3,000	$ 15.00	3,000	$ 2.00	$ 102,000	$ 15,300	$ 8,211	$ 11,462	$ 136,973
GSB-3B	Carrington Tract	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
GSB-3C	Fire Island Pines	6,400	$ 15.00	6,400	$ 2.00	$ 217,600	$ 32,640	$ 17,517	$ 24,452	$ 292,209
GSB-3D	Talisman to Water Island	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
GSB-3E	Water Island	2,000	$ 15.00	2,000	$ 2.00	$ 68,000	$ 10,200	$ 5,474	$ 7,641	$ 91,315
GSB-3F	Water Island to Davis Park	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
GSB-3G	Davis Park	4,200	$ 15.00	4,200	$ 2.00	$ 142,800	$ 21,420	$ 11,495	$ 16,047	$ 191,762
GSB-3H	Watch Hill	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
GSB-4A	Bellport Beach	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
GSB-4B	Old Inlet	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
MB-1A	SPCP-TWA	6,400	$ 15.00	6,400	$ 2.00	$ 217,600	$ 32,640	$ 17,517	$ 24,452	$ 292,209
MB-1B	SPCP	13,000	$ 15.00	13,000	$ 2.00	$ 442,000	$ 66,300	$ 35,581	$ 49,669	$ 593,550
MB-2A	MB-2A	4,600	$ 15.00	4,600	$ 2.00	$ 156,400	$ 23,460	$ 12,590	$ 17,575	$ 210,025
MB-2B	MB-2B	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
Total		81,400		81,400		$ 2,767,600	$ 415,140	$ 222,792	$ 311,004	$ 3,716,536

TABLE 2-1. FIRST COSTS - OPTIMIZED
MIDU - MIDDLE UPDATED BASELINE AND MEDIUM DESIGN TEMPLATE
FIRE ISLAND INTERIM

Design Reach	Reach Name	DREDGING Total Initial Fill CY	DREDGING Unit Price $ / CY	DREDGING Placement Cost	MOB/ DEMOB Cost	Total Construction Cost	Contingency Cost 15%	E&D Cost 7.00%	S&A Cost 6.79%	Total Cost
GSB-1A	RMSP	898,837	$ 16.36	$ 14,704,970	$ 2,343,570	$ 17,048,540	$ 2,557,281	$ 1,372,408	$ 1,330,557	$ 22,308,786
GSB-1B	FILT	366,609	$ 17.77	$ 6,514,640	$ 955,873	$ 7,470,513	$ 1,120,577	$ 601,376	$ 583,038	$ 9,775,504
GSB-2A	Kismet to Lonelyville	268,687	$ 12.61	$ 3,388,141	$ 700,557	$ 4,088,698	$ 613,305	$ 329,140	$ 319,103	$ 5,350,246
GSB-2B	Town Beach to Corneille Estates	378,793	$ 11.67	$ 4,420,511	$ 1,050,925	$ 5,471,435	$ 820,715	$ 440,451	$ 427,019	$ 7,159,621
GSB-2C	Ocean Beach to Seaview	188,920	$ 11.24	$ 2,123,466	$ 524,142	$ 2,647,608	$ 397,141	$ 213,132	$ 206,633	$ 3,464,515
GSB-2D	OBP to POW	176,802	$ 10.86	$ 1,920,068	$ 490,520	$ 2,410,588	$ 361,588	$ 194,052	$ 188,135	$ 3,154,363
GSB-2E	Sailors Haven	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
GSB-3A	Cherry Grove	9,623	$ 11.74	$ 112,979	$ 26,699	$ 139,678	$ 20,952	$ 11,244	$ 10,901	$ 182,775
GSB-3B	Carrington Tract	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
GSB-3C	Fire Island Pines	334,628	$ 10.66	$ 3,567,135	$ 928,394	$ 4,495,529	$ 674,329	$ 361,890	$ 350,855	$ 5,882,604
GSB-3D	Talisman to Water Island	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
GSB-3E	Water Island	12,674	$ 8.95	$ 113,430	$ 35,162	$ 148,592	$ 22,289	$ 11,962	$ 11,597	$ 194,439
GSB-3F	Water Island to Davis Park	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
GSB-3G	Davis Park	340,310	$ 9.31	$ 3,168,285	$ 944,158	$ 4,112,442	$ 616,866	$ 331,052	$ 320,956	$ 5,381,317
GSB-3H	Watch Hill	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
GSB-4A	Bellport Beach	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
GSB-4B	Old Inlet	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -
MB-1A	SPCP-TWA	326,589	$ 11.44	$ 3,736,182	$ 750,744	$ 4,486,926	$ 673,039	$ 361,198	$ 350,183	$ 5,871,346
MB-1B	SPCP	744,675	$ 12.87	$ 9,583,971	$ 1,711,815	$ 11,295,786	$ 1,694,368	$ 909,311	$ 881,582	$ 14,781,047
MB-2A	MB-2A	668,819	$ 11.49	$ 7,684,726	$ 1,537,441	$ 9,222,166	$ 1,383,325	$ 742,384	$ 719,746	$ 12,067,622
MB-2B	MB-2B	0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total		4,715,966	$ -	$ 61,038,503	$ 12,000,000	$ 73,038,503	$ 10,955,775	$ 5,879,599	$ 5,700,306	$ 95,574,184

TABLE 2-3. O&M COSTS - OPTIMIZED - (Costs Per 2 Year Cycle)
MIDU - MIDDLE UPDATED BASELINE AND MEDIUM DESIGN TEMPLATE
FIRE ISLAND INTERIM

Design Reach	Reach Name	Berm Maintenance		Fill Maintenance		O&M Cost	Contingency Cost	E&D Cost	S&A Cost	Total Cost
		Length of Fill	Unit Price	Length of Fill	Unit Price					
		ft	$ / ft	ft	$ / ft		15%	7.00%	9.77%	
GSB-1A	RMSP	12,000	$ 15.00	12,000	$ 2.00	$ 408,000	$ 61,200	$ 32,844	$ 45,848	$ 547,892
GSB-1B	FILT	5,400	$ 15.00	5,400	$ 2.00	$ 183,600	$ 27,540	$ 14,780	$ 20,632	$ 246,552
GSB-2A	Kismet to Lonelyville	9,000	$ 15.00	9,000	$ 2.00	$ 306,000	$ 45,900	$ 24,633	$ 34,386	$ 410,919
GSB-2B	Town Beach to Corneille Estates	4,400	$ 15.00	4,400	$ 2.00	$ 149,600	$ 22,440	$ 12,043	$ 16,811	$ 200,894
GSB-2C	Ocean Beach to Seaview	3,800	$ 15.00	3,800	$ 2.00	$ 129,200	$ 19,380	$ 10,401	$ 14,519	$ 173,499
GSB-2D	OBP to POW	7,200	$ 15.00	7,200	$ 2.00	$ 244,800	$ 36,720	$ 19,706	$ 27,509	$ 328,735
GSB-2E	Sailors Haven	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
GSB-3A	Cherry Grove	3,000	$ 15.00	3,000	$ 2.00	$ 102,000	$ 15,300	$ 8,211	$ 11,462	$ 136,973
GSB-3B	Carrington Tract	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
GSB-3C	Fire Island Pines	6,400	$ 15.00	6,400	$ 2.00	$ 217,600	$ 32,640	$ 17,517	$ 24,452	$ 292,209
GSB-3D	Talisman to Water Island	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
GSB-3E	Water Island	2,000	$ 15.00	2,000	$ 2.00	$ 68,000	$ 10,200	$ 5,474	$ 7,641	$ 91,315
GSB-3F	Water Island to Davis Park	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
GSB-3G	Davis Park	4,200	$ 15.00	4,200	$ 2.00	$ 142,800	$ 21,420	$ 11,495	$ 16,047	$ 191,762
GSB-3H	Watch Hill	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
GSB-4A	Bellport Beach	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
GSB-4B	Old Inlet	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
MB-1A	SPCP-TWA	6,400	$ 15.00	6,400	$ 2.00	$ 217,600	$ 32,640	$ 17,517	$ 24,452	$ 292,209
MB-1B	SPCP	13,000	$ 15.00	13,000	$ 2.00	$ 442,000	$ 66,300	$ 35,581	$ 49,669	$ 593,550
MB-2A	MB-2A	4,600	$ 15.00	4,600	$ 2.00	$ 156,400	$ 23,460	$ 12,590	$ 17,575	$ 210,025
MB-2B	MB-2B	0	$ 15.00	0	$ 2.00	$ -	$ -	$ -	$ -	$ -
Total		**81,400**		**81,400**		**$ 2,767,600**	**$ 415,140**	**$ 222,792**	**$ 311,004**	**$ 3,716,536**

Joint Signed TFSP, dated March 11, 2011

NYS comments, dated December 29, 2011

NYS comments, dated June 28, 2012

If the State finds any components of the TFSP not acceptable, we request the State provide a locally preferred alternative (LPA). The LPA should include specific components that could be supported, in order to move forward with the required additional analysis. Both Federal agencies would still need to assess their ability to support the LPA.

We look forward to your timely review and are willing to arrange a meeting with your office in the March/April timeframe in order to further discuss the elements of the TFSP as necessary. Please do not hesitate to contact Mr. Anthony Ciorra, Chief of Civil Works at (917) 790-8208, or Mr. Frank Verga, Project Manager at (917) 790-8212, if you have any questions.

Sincerely,

John R. Boulé II
Colonel, Corps of Engineers
District Commander

K. Christopher Soller
Superintendent, Fire Island National Seashore
National Park Service

David Stilwell
Field Supervisor, New York Field Office
U.S. Fish and Wildlife Service

Enclosure

CF:
Al Fuchs, NYS Department of Environmental Conservation
Fred Anders, NYS Department of State, Coastal Resources

S Date: 15 October 20

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

September 11, 2013

Colonel Paul E. Owen
District Engineer
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Dear Colonel Owen:

The U.S. Fish and Wildlife Service is requesting clarification from the U.S. Army Corps of Engineers (Corps) on the planning and integration of several overlapping storm damage protection projects that are currently being planned, permitted or have already been constructed within the U.S. Army Corps of Engineers' (Corps) Fire Island Inlet to Montauk Point Storm Damage Reduction Reformulation Study Area (FIMP) on Fire Island. We are particularly interested in the Smith Point County Park area where the following projects have been recently proposed or constructed: beach nourishment and dune construction at Smith Point County Park, Fire Island, New York (Corps' Public Notice [PN] NAN-2013-00873-EBO; applicant, Suffolk County Department of Public Works dated August 1, 2013); the Corps' proposed Fire Island Interim Project (emergency stabilization project); the Corps' proposed FIMP; and the Corps' constructed Breach Contingency Plan (BCP; Smith Point Breach Fill Project, November 2012).

In terms of planning and integration of projects, the Service has worked with the Corps and the National Park Service to develop a Tentatively Supported Federal Plan (TSFP) for the Fire Island Reach of the FIMP, calling for a feeder beach along portions of Smith Point County Park. However, the PN describes a large-scale beach nourishment and dune construction project which is much greater in scale than the concept of a feeder beach envisioned in the TSFP. In addition, the PN also appears to address areas where the Corps' BCP was implemented to close a small partial breach in Smith Point County Park in November of 2012. If the Smith Point PN were approved it would seem to run counter to the Corps' BCP, which is supposed to be in effect until the FIMP is constructed, providing a period where overwash habitat could be maintained for the benefit of the federally-listed piping plover (*Charadrius melodus;* threatened) as discussed in the Corps' BCP biological assessment, environmental assessment, and Service biological opinion (U.S. Army Corps of Engineers 1996, U.S. Fish and Wildlife Service 1995).

Overall, the Service requests clarification on how these projects will be implemented in the context of a comprehensive and coordinated approach to shoreline and ecosystem resiliency, as

ANDREW M. CUOMO
GOVERNOR

JOE MARTENS
COMMISSIONER

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233-1010

September 5, 2013

Colonel Paul E. Owen
Commander and District Engineer
United States Army Corps of Engineers
New York District
26 Federal Plaza
New York, NY 10278-0090

Dear Colonel Owen:

Thank you for your letters of July 29, 2013 and August 16, 2013. As you are aware, the State has taken some major steps to move the Fire Island to Montauk Point (FIMP) project forward. In addition, the State continues to work with the Breach Contingency Plan (BCP) Coordination Team to track the movement of the breach. The purpose of this letter is to update the Corps on a few items and clarify other issues.

The State has obtained a local sponsor for the FIMP project. Suffolk County has volunteered to take on this role, based largely on the 100 percent fully federally-funded project, which has brought the possibility of the full implementation of FIMP one step closer. Suffolk County has had a representative on the FIMP Executive Steering Committee throughout the project. This is to formally notify you that Gil Anderson, Commissioner of Suffolk County Department of Public Works, will represent the County on the Committee. In addition, the New York State Department of State (DOS) has also had a representative on the Executive Steering Committee, Fred Anders, who has retired. Therefore, Jeff Herter will take over this role and represent DOS on the Committee.

The Corps' August 16, 2013 letter indicates that the Corps has completed its assessment of the re-alignment of the Fire Island dune, which will require the acquisition or relocation of approximately 39 properties, and resulted in a positive cost benefit analysis. This is to confirm the State's support of the Corps moving forward quickly to implement the Fire Island Emergency Interim project along this new dune alignment. As stated in my June 14, 2013 letter, I want to reiterate the State's request to have the Corps take the lead on the acquisition of these properties, both from willing and unwilling sellers, in order to expedite the implementation of this emergency interim project. In addition, the State requests the Corps to also obtain the perpetual beach easements necessary to construct and maintain this project. Since this is a 100 percent federally-funded project and the acquired property will most likely be retained by the Federal Government (these properties are located within the Fire Island National Seashore and managed by the National Park Service), it is logical that the Federal Government (Corps) would take the lead in these acquisitions. Please let me know how the State can assist you in obtaining these properties and easements in the most expeditious manner.

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

REPLY TO
ATTENTION OF
Environmental Analysis Branch

May 6, 2011

Mr. David A. Stilwell
Field Supervisor
Fish and Wildlife Service
3817 Luker Road
Cortland, New York 13045

Dear Mr. Stilwell:

The letter is in response to your letter dated March 16, 2011 regarding mitigation and Endangered Species Act (ESA) consultation as they relate to the Fire Island to Montauk Point (FIMP) Reformulation Study. The Service expresses concerns regarding the Proactive Breach Response component of the Tentatively Supported Federal Plan (TSFP), as well as concerns regarding progress in advancing mitigation the overall TSFP. The letter also referred to reinitiating Section 7 Consultation under the ESA regarding the FIMP Interim Breach Contingency Plan (Interim BCP).

In short, the U.S. Army Corps of Engineers, New York District (District) believes that in the absence of a fully coordinated recommended plan, development of site-specific mitigation plans for the TSFP is premature, and may be unwarranted with respect to the breach response component. With respect to reopening Section 7 Consultation under the Endangered Species Act regarding the FIMP Interim Breach Contingency Plan (Interim BCP), the District's position has not changed since the latest discussion of this topic. Please find the District's response to specific comments in the attached enclosure. The District does acknowledge an importance in discussing impacts and related mitigation measures in general, and suggests that this may best be accomplished in conjunction with the detailed development of a restoration component to the TSFP, as described in our April 4, 2011 letter. The District strongly recommends that our two agencies meet soon to work out a task list and schedule to address these related items in depth at your earliest convenience. To resolve these concerns, I request that you contact my Environmental Analysis Branch chief, Len Houston, by phone (917-790-8702) or Email (leonard.houston@usace.army.mil) to arrange a meeting.

Sincerely,

Mr. Frank Santomauro, P.E.
Chief, Planning Division

Enclosure
cc: USFWS – LIFO
NYSDEC, Region 1, Stony Brook, NY (P. Scully)
NYSDOS, Albany, NY (F. Anders; B. Pendergrass)
USGS, Woods Hole, MA (W. Schwab)
NPS-FIIS, Patchogue, NY (C. Soller)
NPS, Boston, MA (M. Foley)

recommended plan also be the NED/NER plan must be obtained from ASA(CW). Unless and until those conditions are met, there cannot be a recommended plan that will analyze potential environmental impacts as part of the NEPA process. Any analysis of the TSFP as the "recommended plan" prior to achieving the state support or receipt of waiver would appear to be premature. Also, please note that some alternatives discussed in the Draft Formulation Report contain design elements whose purpose is to minimize the impacts.

Some examples of mitigative measures are as follows:

(a) Avoid: Adjust the time of construction activities to avoid periods of fish migration, shorebird nesting;
(b) Minimize: Adding to the traditional storm damage reduction design a component to increase back-bay habitat,
(c) Rectify: Restore water flow to the back-bay; increase or develop new wetlands
(d) Reduce: replacement of beachfill alternatives with breach response, and smaller beach cross-section templates that are comparable to the breach closure alternatives

5. *Section 7 Consultation - Endangered Species Act*
The Service has noted on several occasions their opinion that the Storm Damage Reduction (SDR) measures developed as part of FIMP will reduce optimal habitat for Threatened and Endangered (T&E) shore species such as the Piping Plover, by reducing the frequency and severity of overwash and breaching. The Service has noted that by inhibiting the formation of early successional habitat, SDR measures may lower productivity of these species. The District has worked with the Service to develop a Draft T&E Management Plan to increase T&E species productivity at locations where SDR measures might be implemented. The Service has indicated in the past that the Management Plan should be implemented at all locations managed by FIMP Partners, where T&E species are present. In addition, the Service has identified a series of locations within the FIMP study area, where there are opportunities to enhance habitat for T&E Species. Many of these are within the FIIS and there may be opportunities to address bayside erosion and T&E concerns at some locations under the TSFP. The District agrees that efforts should resume in establishing the long-term management plan, and would welcome the Service's feedback on the report that was submitted to the USFWS for input.

6. *Section 7 Consultation Breach Contingency Plan*
The Interim BCP was established via coordination among all involved local, state, and Federal agencies and reflects interagency recognition of the benefits of coordinated, rapid response to a barrier island breach. The proposed methods discussed as well as project area conditions have not been changed, thereby making re-initiating consultation unnecessary. It is noted that District staff has been working with Service staff and other resource agencies throughout the duration of the FIMP Study to incorporate management measures for threatened and endangered species into both the BCP and TSFP. If in place, these would address impacts through implementation of specific monitoring and protection measures during and post construction. To date, these discussions have not yielded an agreement, but the District remains hopeful that an agreement can be reached.

7. The Allowable Conditional Breach Closure Characteristics within the Large, Publically Owned Tracts where then described. Breach closure could be accomplished, if the breach was not naturally closing, within 45 to 60 days of the breach opening. Contracting procedures can be started at the occurrence of the breach, but may need to be cancelled if the breach closes naturally. Under any scenario, the breach would be closed at Day 60. The cross-section of the breach closure would be at +9.5 ft NGVD height at a minimum, the breach cross-section would match the 0.0 ft NGVD shorelines on both the ocean and bay sides making smooth shorelines without indentations, and the cross-section slope would match adjacent bayside and ocean-side slopes. No cross-sectional sand maintenance of the breach closure template would be allowed after the breach closure.

If a breach closed naturally, no additional fill material would be allowed in that location to bring the section to the above cross-section characteristics. Only on the occurrence of a new breach, that did not close naturally in that location, would additional material be allowed to be placed to bring the cross-section to the +9.5 ft NGVD height and shoreline to shoreline width. It was discussed that there would be increasing likelihood of re-breaching and subsequent vulnerability in those locations that did not close naturally with the increased berm height.

8. Discussed, but not resolved, was the issue of placement of additional sand material in the bay during the hydraulic construction closure of the breach, to emulate flood shoal volumes of breaches allowed to remain open. It was acknowledged that the proposed volume and dimensions of any additional bay material placed during breach closure operations would need to be resolved at future technical meetings within the plan identification process, although it was recognized that it could be reasonable to target placement of sand consistent with the volume of material that would be expected to be deposited over a period of 9-12 months.

9. Also discussed but not resolved was the make-up of the Science Advisor Panel and its relationship to the institutional and governmental decision makers. It was hoped that a technical panel could be formed, with academics and consultants, which could make recommendations to the decision makers on the likelihood of breaches within the large, publically-owned tracts closing naturally prior to 45 to 60 days from the time of the breach. These advisors would need to meet right after the breach and frequently thereafter, and considerable monitoring data would need to be collected to aid the Science Panel in its recommendations.

10. Considerable time was spent outlining modeling and monitoring needs for the conditional breach response protocol. Below is the listing on modeling and monitoring needs. This list may be more fully detailed and amended with future FIMP technical team discussions.

<u>Physical Monitoring Outline Requirements:</u>

A. Develop a Model to predict likelihood of natural closing of breaches in the large, publically owned tracts on Fire Island, using a Bayesian approach, based on empirical physical, climatological and hydraulic data, time of year considerations, etc.

B. Conduct a Tabletop exercises to run through breaching and closing scenarios after development of the Bayesian model.

12. Respectfully submitted by Lynn M. Bocamazo, P.E., CENAN-EN, (917) 790-8396

Attendees:
Lynn Bocamazo, CENAN-EN
Steve Couch, CENAN-PL-F
Robert Smith, CENAN-PL-E
Mary Foley – NPS Regional Scientist
Chris Soller - NPS, FIIS Superintendent
Charley Roman – NPS
Cheryl Hapke – USGS
Steve Pappa – USFWS
Al Fuchs – NYS DEC
Eric Star – NYS DEC
Santiago Alfageme – Moffat Nichol
By teleconference (partial time):
Fred Anders – NYS DOS
Barry Pendergrass – NYS DOS
Sue McCormick – NYS DEC
Kevin Kispert – NYS DEC

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

REPLY TO
ATTENTION OF
Environmental Analysis Branch

April 4, 2011

Mr. David A. Stilwell
Field Supervisor
United States Department of the Interior
Fish and Wildlife Service
3817 Luker Road
Cortland, New York 13045

RE: Fire Island to Montauk Point (FIMP) Reformulation Study

Dear Mr. Stilwell:

An action item coming out of the January 28, 2011 regional-level meeting with Congressman Bishop on the progress and path forward on FIMP's Tentatively Federal Selected Plan (TFSP) was to continue a dialogue with respect to natural resources. At this time we fully expect that the TFSP will also include strategies for both large-scale restoration of coastal processes and site specific habitat restorations.

To aid in those strategies, the U.S. Army Corps of Engineers, New York District (District) prepared a community Habitat Evaluations Procedures Model (HEP) (in which your agency participated) to identify and assist in the evaluation of benefits of potential restoration alternatives under consideration. The HEP model assessment resulted in a large array of Restoration Designs in the FIMP project area. The restoration framework identified five key physical processes to be targeted for restoration, including 1) longshore transport, 2) cross-island transport, 3) dune growth and evolution, 4) bay shoreline processes, and 5) estuarine circulation and water quality. In the consideration of restoration alternatives, two main categories of process restoration present themselves:

- Restoration of processes with the primary objective of storm damage reduction. These are restoration alternatives that were designed for the purpose of using habitat features for protection purposes. These include measures such as sand bypassing, and some bayside habitat restoration in breach vulnerable areas
- Restoration of processes with the primary objective of habitat restoration. These are measures developed by an HEP interagency team to identify optimal locations for restoration to primarily achieve ecological objectives, with a secondary objective of reducing storm damages.

Over 80 sites across the 83-mile Project area were evaluated by the District and interagency HEP Team for restoration potential. Eighteen (18) sites were selected as having real opportunities for restoration and a total of 57 restoration design alternatives (three to four per restoration site) were developed and evaluated. The information acquired through this restoration evaluation process will facilitate future selection of alternatives based on ecological need at the time of construction, the location of the storm damage reduction activity and availability of funding and support.

As part of the ongoing FIMP collaborative planning process, District staff met on June 25, 2010 with the Fire Island National Seashore (FIIS) to define National Park Service (NPS) restoration goals for (FIIS). Although the U.S. Fish and Wildlife Service (USFWS) was not present at the meeting, it was noted that "goals set forth during this meeting were to meet their (UFWS) request as it pertains to FIIS as well." The particular focus for FIIS was the need to address bayside erosion with the purpose of restoring natural processes and reducing storm damages.

It is our understanding that NPS seeks to accomplish habitat improvements through long-term, adaptive management; with "processes" being monitored instead of a site-by-site specific location determination. NPS' first preference is that the land manager (NPS) allow for natural processes to occur. If this is not a viable approach, then the next preference would be to adopt measures that replicate these natural processes in a sustainable manner. The least-preferred approach would be in restoring a particular landform, or habitat that is not directly linked with a process restoration. NPS also highlighted that they will allow the monitoring of breaches and their closure if there is an imminent threat to human life and harm.

Using materials from the above referenced HEP Model Report, the outcome of the meeting highlighted restoration opportunities (see Attachment 1) at the following sites within FIIS citing those needing highest priority first:

- **T-2 Sunken Forest**
- **T-3 Reagan Property**
- **Other areas** within this "stretch" that NPS would like (bayside) restoration measures to include those in the "Water Island" and "Talisman Beach" area(s).
  - **T-5 Great Gun.** While this is technically not within NPS boundaries, NPS supports Alternatives 1 and 2 at this site. A selection and discussion of these sites demonstrates that NPS would like other areas, not just those within current Park boundaries and/or those previously studied under FIMP (HEP), to be considered. This serves to further reiterate NPS' goal of a multi-dimensional, multi-location, multi-year and multi-phased (restoration) project design(s) throughout the FIMP area. For further consideration, the property owner (the Town of Brookhaven) will have to be contacted.
  - **T-25 Atlantique to Corneille**. This site is supported by NPS, as it simulates a breach/overwash event and creates a feeder beach.

In order to ensure that restoration goals are included within the TSFP, it is important that the partner agencies begin to identify specific sites and an overall process by which they can be

incrementally implemented without delay. Only in this manner can they achieve an equal footing with the storm damage risk reduction options in terms of design and funding. The District's initial goal would be to set forth an agreement with respect to inclusion of the above four sites in the TSFP. This would include developing a monitoring program, including success criteria, by which to evaluate the above alternatives and make reasonable decisions with regard to bringing additional sites per the restoration at other locations over the out years.

The District recognizes that the impact analysis of potential adverse environmental effects of implementing the TSFP still needs to occur before any decisions on the type and quantity of mitigation if any, is addressed. This restoration effort is separate and distinct from that exercise, and would seek to put the selected restoration opportunities in place regardless of any subsequent analysis of mitigation needs. During the upcoming environmental analysis of the TSFP, adaptive management, monitoring and mitigation measures, if applicable, would be added to the TSFP, possibly utilizing some of the restoration sites identified during the effort highlighted in this letter. Your participation in this restoration planning process is critical. It is our desire to reinitiate this effort in the near future with a working meeting of the resource agencies to formulate the appropriate design option for each of the four sites at FIIS, and then prioritize the 18 priority HEP sites and formulate an implementation schedule to advance future efforts. Toward that end I am requesting that you identify a POC for this effort. I will then have Mr. Leonard Houston, Chief of our Environmental Analysis Branch contact the designated individual to plan the date and agenda for the meeting, which may conceivably be a multiday effort.

If you have any additional questions/concerns please contact Mr. Houston, at (917)790-8702 or leonard.houston@usace.army.mil for further information.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

cc: USFWS-LIFO (Papa)
NPSIFIIS, Patchogue, NY (C. Soller)
NPS, Boston, MA (M. Foley)

Memorandum for the Record 25 June 2010

Subject: Fire Island Inlet to Montauk Point, New York (FIMP) Reformulation Study Meeting of the US Army Corps of Engineers (USACE), New York District with the National Park Service (NPS) on 25 June 2010, at 26 Federal Plaza, New York, New York.

Participants: Peter Weppler, Steve Couch and Pamela Lynch (USACE-Planning); Patti Rafferty (NPS), Mary Foley {via conference call} (NPS) and Chris Soller (Superintendent – FIIS) 1.

1. Background.

The goal of subject meeting was to define NPS restoration goals for Fire Island National Seashore (FIIS) as part of the ongoing FIMP collaborative planning process. It was noted, although USFWS was not present at the meeting, that "goals sets forth during this meeting met their requests as it pertains to FIIS as well." Of particular concern to the NPS, was the need to address bayside erosion, whatever its cause, within the FIIS, with the purpose of restoring natural processes and reducing storm damages. NPS, as part of FIMP also wanted to address, long-term, adaptive management; with "processes" being monitored instead of a site-by-site specific location determination.

In previous meetings and through the FIMP study process, the USACE has developed a number of strategies for strengthening barrier island resiliency as part of breach response procedures and restoration opportunities which involve bayside sediment placement. USACE has presented these as "initial projects" in a phased implementation strategy that would utilize monitoring and adaptive management to expand the number of locations at which these strategies could be constructed over the life of the project. USACE has sought specific input from the NPS to aid in identifying those additional locations for inclusion in the Collaborative Plan.

Pamela Lynch presented a "historical" perspective, from HEP documentation, for each potential restoration site. As each site was addressed, the number of (restoration) alternatives (& accompanying descriptions) were characterized. Prior issues such as "landowner support," "permitting" and HEP-team consensus agreement were also mentioned, if documented. Sites (and alternatives) determined to be "cost effective" (by the USACE), on the HEP Priority (i.e. "Green") List and/or those that were shown to significantly effect 1 of the 5 "natural processes" were also denoted.

2. Meeting.

Mary Foley, Patti Rafferty and Chris Soller offered some introductory remarks; these were a summary of those expressed at past HEP/Restoration meetings as well. The NPS goals were to have no project on Major Federal Tracks with only natural processes should operate in these areas, since there have been minimal actions in the past that have degraded these areas. The NPS reiterated their tiered approach to management. In simple terms, NPS' first preference is that the land manager (NPS) allow for natural processes to occur. If this is not a viable approach, then the next preference would be to adopt measures that replicate these natural processes in a sustainable manner, the least-preferred approach would be in restoring a particular landform, or habitat that is not directly linked with a process restoration. The NPS policies are that all land habitats are equally valued as long as

they are natural result of unimpeded processes. One exception to this philosophy - NPS will allow the monitoring of breaches and their closure if there is an extensive threat to human harm.

Using materials from the prior HEP activities, that described the various restoration opportunities at sites within FIIS (that were also part of the alternative that maximizes NER benefits – as part of the HEP process), Foley, Rafferty and Soller then provided comments on the following specific locations (with those needing highest priority first):

I. Sites within the *"Sunken Forest" to "Water Island"* segment of FIIS.

a. **T-2 Sunken Forest.** NPS presently supports an alternative similar to Alternative 1, without coir log structures. The NPS is going to proceed with this restoration project independent of FIMP. FIIS has funds to study the ongoing erosion, and plans to construct a demonstration scale feeder beach using by-passed sand. NPS may consider more dramatic changes to the Marina in the future (consistent with Alternatives 2, 3, and 4 in the report), but these would need to be directed by the General Management Plan (GMP) process since they could have an impact on existing public access. From a FIMP Study perspective, this either will be part of the Existing Condition or of the No Action Alternative. It can be considered as having an indirect effect and will be analyzed in the cumulative effects analyses.

   Note: From a (HEP) historical perspective, this site was not part of the "Green" (priority) HEP list and/or one that significantly benefitted a coastal process. However, alternatives at this site were cost effective and are still viable options under current FIMP restoration measures.

b. **T-3 Reagan Property.** NPS supports Alternatives 1 and 3 in this location, which includes fill placement in front of the Federal tract of land, and in front of the community bulkhead. NPS does not support the use of the coir log alternative, based upon their functioning in Jamaica Bay in a high wave environment. They might consider another temporary alternative such as sheet piling or Aqua Bags to 'perch' the beach during construction. NPS does not support Alternative 2. This opportunity could be replicated at other bulkhead-erosion-induced locations using the Reagan Property as the first increment (locations TBD). It was acknowledged that typically restoration is designed to be sustainable, with no recurring commitment for re-nourishment; therefore there is a real challenge with trying to maintain this type of feature. It was discussed that other on-going projects (such as other dredging projects, etc.) could serve as a maintenance component, with opportunistic re-nourishment when material is available.

   Note: From a (HEP) historical perspective this site (Alternative. 2) was part of the "Green" (priority) HEP list. While it was not recognized as one that significantly benefitted a coastal process, the alternatives were cost effective and all are still viable options under current FIMP restoration measures.

c. **Other areas** within this "stretch" that NPS would like (bayside) restoration measures include those in the "Water Island" and "Talisman Beach" area(s). While these are not specifically identified as "HEP" sites, they are contained within the FIMP (HEP) study footprint and all measures, upon further study, can certainly be considered. It is anticipated, based on HEP studies in similar areas, that these would rank and score similarly to others and would thus be both cost-effective and offer significant NER (restoration) opportunities.

II. Other areas:

a. **T-5 Great Gun.** While this is technically not within NPS boundaries, NPS supports Alternatives 1 and 2 at this site. A selection and discussion of these sites demonstrates that NPS would like other areas, not just those within current Park boundaries and/or those previously studied under FIMP (HEP), to be considered. This serves to further reiterate NPS' goal of a multi-dimensional, multi-location, multi-year and multi-phased (restoration) project design(s) throughout the FIMP area.

   For further consideration, the property owner (the Town of Brookhaven) will have to be contacted.

   Note: From a (HEP) historical perspective this site (Alternatives 1 and 2) were both part of the "Green" (priority) HEP list. Alternative 2 was also recognized as one to significantly benefit a coastal process. All alternatives were cost effective and all are still viable options under current FIMP restoration measures.

b. **T-25 Atlantique to Corneille**. This site is supported by NPS, as it simulates a breach/overwash event and creates a feeder beach. NPS supported concepts within Alternatives 1 and 3 (and opposed Alternative 2, wetland restoration). It was discussed that these alternatives may need new conceptual plans. One (modified) concept was to initially restore a smaller area, with the idea that over time additional material could be placed to de-vegetate the area, offset erosional losses, and possibly enlarge the habitat. Additional concepts were also discussed and this highlighted that the NPS would like (as stated in T-5 discussion above) to have options remain open (at all sites) to study, modify and manipulate alternatives and designs over the project life.

   Note: From a (HEP) historical perspective this site (Alternative 1) was part of the "Green" (priority) HEP list. Alternative 1 was also recognized as one to significantly benefit a coastal process. All alternatives were cost effective and all are still viable options under current FIMP restoration measures.

III. Conclusions:

The meeting concluded with the USACE asking NPS if there were any additional locations for bayside habitat restoration, or bayside sediment placement, which should be considered (consistent with the discussion held). NPS replied that there were no specific additional sites they

were interested in pursuing within the existing FIMP (HEP) parameters; the scope of the existing proposed restoration measures were satisfactory and address their concerns regarding the long-term need for bayside sediment placement.

However, as these sites/restoration opportunities are being considered, and as the project progresses, they would like to have an open-ended option to add additional locations (both within and outside of NPS boundaries) if opportunities arise and are practical. It was further noted that in areas where SDR measures were being implemented additional considerations should be given to bayside restoration measures (as sediment transport may be impacted as a result). This may occur during the initial construction phase or at some time thereafter (perhaps with a scheduled re-nourishment and/or multi-phased project schedule).

3. For any questions or comments, please contact the undersigned or Peter Weppler at Pamela.A.Lynch@usace.army.mil or Peter.M.Weppler@usace.army.mil

Pamela Lynch
Project Biologist
CENAN-PL-E

Faxed 3/16/11

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

March 16, 2011

Colonel John R. Boulé
Commander, New York District
U.S. Army Corps of Engineers
26 Federal Plaza, Rm. 2109
New York, NY 10278

Dear Colonel Boulé: John

This letter is a follow up to the U.S. Army Corps of Engineers (Corps) December 15, 2010, Breach Response Plan (BRP) meeting for the Fire Island Inlet to Montauk Point Storm Damage Protection (FIMP) Study area, and to a discussion you and I had during a briefing for Congressman Bishop. The BRP meeting was held at the New York District Office in New York and included representatives from the National Park Service (NPS), New York State Department of State (NYSDOS), New York State Department of Environmental Conservation (NYSDEC), and U.S. Geological Survey (USGS). We very much appreciated the opportunity to participate in the meeting. We request a copy of the minutes for our review due to the significance of the discussions related to development and implementation of the BRP on Fire Island National Seashore. We note that the meeting did not include any substantive discussions on environmental mitigation for breach closure activities, which can result in the disruption of natural processes and habitat formation, or regulatory compliance with Federal laws. In addition, from the U.S. Fish and Wildlife Service's (Service) perspective, there was no definitive agreement between the agencies regarding alternatives for a Proactive Breach Closure Plan (Proactive BCP) for the Westhampton barrier island.

During the course of coordinating with the Corps and other agencies on the FIMP and BRP, the Service has continued to stress and recommend that planning efforts should address mitigation and focus on consultations pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), and Fish and Wildlife Coordination Act (FWCA) of 1958, as amended (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*). These recommendations were provided at the December 15 meeting and reiterated in comments we provided via electronic correspondence dated January 21, 2011, on the Tentatively Supported Federal Plan (TSFP) for the FIMP. Our concerns and recommendations relative to these areas are discussed in more detail below.

RECEIVED
NYS DEC
MAR 18 2011
REGIONAL DIRECTOR
REGION 1

ESA Section 7," we anticipate that the Corps will be contacting us in the near future to ensure compliance with the ESA and FWCA. The Service encourages the Corps to resume coordination with the Service and Federal, State, and local landowners on a comprehensive long-term management plan for listed species in the study area.

The Service recommends that the Corps finalize consultation prior to implementing any breach response plan. We are aware that the Corps was recently issued a Water Quality Certification (Permit Number 1-4799-00023/00007) by the NYSDEC-Region 1 to conduct breach fill activities, and recommend the Corps obtain and complete all other necessary permits and consultations prior to proceeding with undertaking any breach fill activities. We understand that the Corps may undertake breach fill projects in compliance with provisions of the National Environmental Policy Act and the ESA that permit emergency consultations, but we hope that the fact that the Corps has worked to obtain a NYSDEC permit prior to any breach event illustrates the Corps intent to fulfill ESA compliance earlier rather than later as a necessary component of breach response planning.

I welcome the opportunity to further discuss these concerns and recommendations with you, or for your staff to contact Steve Papa or Steve Sinkevich, of the Long Island Field Office, to further explore these issues.

Sincerely,

David A. Stilwell
Field Supervisor

cc: NYSDEC, Region 1, Stony Brook, NY (P. Scully)
NYSDOS, Albany, NY (F. Anders; B. Pendergrass)
USGS, Woods Hole, MA (W. Schwab)
NPS/FIIS, Patchogue, NY (C. Soller)
NPS, Boston, MA (M. Foley)

US Army Corps of Engineers®

March 11, 2011

Honorable Joe Martens, Commissioner
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Dear Mr. Martens:

We write together to ask for your consideration of a newly developed potential plan of improvement for the Fire Island Inlet to Montauk Point, New York, Reformulation Study.

Any plan developed for this area that involves erosion control and beach nourishment must be mutually acceptable to the United States Secretary of the Army and Secretary of the Interior. Through a series of meetings spanning nearly 18 months, the U.S. Army Corps of Engineers and the U.S. Department of Interior now stand ready to move forward with Reformulation Study efforts by utilizing this potential plan of improvement for the entire project study area. This plan of improvement is the Tentative Federal Supported Plan (TFSP) and outlines a plan that appears to meet the Federal agency objectives and requirements necessary for mutual acceptability.

We have enclosed for your review a summary of the TFSP components. While this is a brief overview, supporting information for this plan is included in the May 2008 Draft Formulation Report, similar to Alternative 3G. The State of New York, the non-Federal sponsor, must find the general plan of improvement acceptable before any finalization can occur, including completion of the Reformulation Study Draft General Reevaluation Report and Draft Environmental Impact Statement.

If the State finds the components of the TFSP acceptable, we would immediately move forward with final analysis of the TFSP plan (plan formulation, engineering, economics, environmental assessment, model certifications, internal/external reviews), including higher authority approvals by each Federal agency.

FIRE ISLAND INLET TO MONTAUK POINT, NY
Tentative Federally-Supported Plan
Summary of Components

INLETS: FIRE ISLAND, MORICHES, SHINNECOCK

- Continuation of authorized projects, with increased sediment bypassing at each inlet

MAINLAND

- 10-year floodplain non-structural building retrofits, including road raisings
- Over 4,400 structures, and 4 road raising locations

BARRIER ISLANDS:

FIRE ISLAND @ DEVELOPED LOCATIONS (communities, minor Federal Tracts)

- Beachfill (+15 ft dune, with berm)
- minimum real estate impact alignment
- No tapers into Federal tracts; with overfill in communities

FIRE ISLAND @ UNDEVELOPED LOCATIONS (major Federal Tracts & Smith Point Park)

- Conditional Breach Response (+9.5 ft berm only), guidelines to be developed, anticipated closure to be initiated within 45-60 days
- @ Lighthouse - Reactive Breach Response (+9.5 ft berm only), closure initiated w/in 45 days
- @ Smith Point County Park - short term beachfill in western, developed section to allow relocation of infrastructure, then Conditional Breach Response
- Science Response Team to advise the decision makers for conditional closure
- No maintenance fill for breach closure, action taken only when a breach occurs

WESTHAMPTON BARRIER ISLAND:

- Beachfill (+15ft dune with berm) fronting Moriches Bay
- Breach Response (+13 ft dune, with berm), fronting Shinnecock Bay
- Breach Response to include action to be taken when vulnerable to breaching (specifics still to be defined)

DOWNTOWN MONTAUK AND POTATO ROAD

- Sediment management measures at both sites (feeder beach)
- Potato Road contingent upon a local pond opening management plan for Georgica Pond

GROIN MODIFICATION

- Taper existing Westhampton Groins (13) and existing Ocean Beach Groins (2)

RESTORATION

- Various alternatives at locations throughout study area

INTEGRATION OF ADAPTIVE MANAGEMENT

- Period of renourishment subject to adaptive management considerations and local land use regulations, or 50 year period of renourishment
- 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)

INTEGRATION OF LOCAL LAND USE REGULATIONS AND MANAGEMENT

- Local Land Management planning to include enforcement of federal and state zoning requirements, land acquisition or other measures is a necessary component for long-term risk reduction
- Improved land management can allow for adaptation to reduce costs for renourishment
- Important to ensure that the project does not induce development.

New York State Department of Environmental Conservation
Division of Water
Bureau of Flood Protection and Dam Safety, 4th Floor
625 Broadway, Albany, New York 12233-3504
Phone: (518) 402-8185 • **FAX:** (518) 402-9029
Website: www.dec.ny.gov

Joe Martens
Commissioner

December 29, 2011

Colonel John R. Boulé II
United States Army Corps of Engineers
New York District
26 Federal Plaza
Jacob K. Javits Federal Building
New York, New York 10278

Re: Fire Island Inlet to Montauk Point (FIMP) Reformulation Study

Dear Colonel Boulé:

Thank you for the March 11, 2011, letter regarding the Federal Government's (New York District of the Army Corps of Engineers, National Park Service Fire Island National Seashore Office, and U.S. Fish and Wildlife Service New York Field Office) request for New York State to consider a potential plan of improvement for the Fire Island Inlet to Montauk Point area which is identified in the March 11th letter as the "Tentatively Federally Supported Plan" ("TFSP"). As the March 11th letter notes, the TFSP "appears to meet the Federal agency objectives and requirements," yet will need further approvals in the respective federal agencies before it would be fully approved.

The State has reviewed the TFSP and has had discussions with potential local sponsors. Unfortunately, we find that additional information is needed for the State and the potential local sponsors to respond to your request. As you understand, a positive response, or an adequately formulated request for a locally preferred alternative, will require the State to have support from its potential local partners. It is highly difficult for the State to fully understand, and to present the TFSP to potential local sponsors to seek their response or participation, when the TFSP is general in nature and does not contain the supporting information needed to justify its attributes. Therefore, the State respectfully requests the following information:

1. The March 11th letter provides a one page summary of the components of the TFSP. In May 2009 the Corps issued a Draft FIMP Reformulation Study ("Study"). Within this Study the Corps identified a number of options, including "Alternative 3G." The March 11th letter stated that Alternative 3G is "similar" to the TFSP. In the Study, we understand that alternative 3G was identified as being the National Economic Development/National Ecosystem Restoration ("NED/NER") plan, which was identified as the plan that best accomplishes the storm damage reduction objectives, based upon the integration of the alternatives. The NED/NER plan previously was discussed at a FIMP Executive Steering Committee meeting on November 10, 2009, and was presented by the Corps as the plan recommended for further development. Alternative 3G was also recommended for inclusion in the Draft General Re-evaluation Report and the

Environmental Impact Statement for evaluation as a part of the public review process. Unfortunately, it is impossible to identify the significant differences between the newly developed TFSP and alternative 3G and we would appreciate receiving a detailed comparison of the two plans. We request that this comparison include a detailed description of the increased or decreased risks and impacts to the communities within in the study, as well as the level of storm damage reduction that would be provided by the TFSP.

2. For the State and potential local sponsors to determine the feasibility of agreeing to all or some of the TFSP, it is necessary to understand the costs involved with each phase. The State requests that the Corps provide the detailed cost-estimate/cost-breakdown for various elements of the TFSP and compare TFSP costs to those for Alternative 3G and the NED/NER plan. The Department is currently not clear on which plan is the NED/NER plan.

3. The March 11th letter indicates that the "plan *appears* to meet the Federal Agency objectives" (emphasis supplied). The State respectfully requests confirmation that the TFSP does, in fact, meet Federal Agency objectives and is the Corps "Recommended Plan". It is an extensive process for the State, in conjunction with potential local sponsors, to determine if the TFSP is fully acceptable or if a locally preferred alternative needs to be proposed for all or some of the project area. The State would strongly prefer to undertake this more extensive consultation with the knowledge that the TFSP will be acceptable to the Federal Government (subject to NEPA review and modifications, as well as appropriations) if endorsed by the State.

4. The TFSP calls for significant non-structural measures, such as elevation or relocation of structures. The State would appreciate detailed information on the Corps' proposed options for implementation of this portion of the TFSP. As one might expect, this is of great interest to potential local sponsors. The State would also be interested in the results of any consultations the Corps has undertaken with the Federal Emergency Management Agency on these proposed measures and their implementation. This non-structural effort has a direct relationship to FEMA's flood plain management and flood insurance programs, and they may be of great assistance in this implementation. Also, we request that the Corps provide a comparison of the levels of flood protection provided by the TFSP, Alternate 3G and the NED/NER plan versus the residual flood risks associated with maintaining the existing inlets.

5. Please provide more detailed information on the various barrier island breach and breach closure plans (current and proposed via the TFSP) including their locations, impacts, timeframes for closure, benefits, future estimated costs and how they relate to flood risk. It would be very useful to know how the level of storm damage reduction increases or decreases with the proposed breach plans in the TFSP in comparison to Alternative 3G and the NED/NER plan.

6. The State has discussed with the Federal Agencies its interest in evaluating the option of reducing or phasing out the re-nourishment portion of this project over the project's 50-year life span. This option might allow the beach configuration to eventually return to a more naturalized status or to possibly have beach

FIRE ISLAND INLET TO MONTAUK POINT (FIMP) REFORMULATION STUDY

Below are New York State comments to the "MODIFIED 2B" plan which the Corps has proposed as an alternative to be prepared to other alternatives in order to respond to the State letter dated December 29, 2011. The Corps has recommended that a comparison be made of alternatives 3A, TFSP, and MODIFIED 2B, and no action. These alternatives will be prepared in order to address the questions raised in the State's letter.

June 28, 2012

1. In "MODIFIED 2B" plan the non-structural measures need to stand alone and the benefits cost ratio of the overall plan cannot depend on them.

2. "MODIFIED 2B" proposes 13 ft dune under Proactive Breach Response at Fire Island Developed Locations. Why is the dune 2 ft lower than under Plans 3A and TFSP? How is the berm width affected?

3. What is the cross-section for 25-year plan Proactive Breach Response for "MODIFIED 2B" and what does subject to evaluation mean for all the project locations?

4. What will the real estate impact alignment be under "MODIFIED 2B"?

5. Under Integration of Adaptive Management in "MODIFIED 2B" nourishment is not included. Does that mean that it is not planned?

6. Will there be any maintenance fill for any of the breach closures under "MODIFIED 2B" and other remaining plans?

7. Is there an ability to taper off the State's involvement over time under any of the remaining plans?

8. Will FIMP prevent non-federal entities from constructing non-project activities within the project footprint such as building higher dunes, planting additional vegetation, installing snow fences, or privately funding beach replenishment?

9. Will FIMP allow non-federal entities (state, county, communities) take advantage of dredge mobilization to build a larger locally preferred alternative? Should they choose to provide additional funding to do so? Can they mobilize their own dredge in the event FIMP is providing less protection than they desire?

10. Will FIMP prevent non-federal entities from securing FEMA damage assistance or FEMA mitigation grant monies within the project footprint? (FEMA funded replenishment of non-federal engineered beaches, or FEMA funded home elevations through programs such as "project impact")?

Responses to NYS Comments

The comparisons of the alternative plans are documented in the May 2009 Report (Chapter 10). This information has also been summarized in the following sub-attachments:

- Attachment #1 – Table that provides a comparison of the remaining potential plans
- Attachment #2 – Text description of the TFSP
- Attachment #3 – A series of figures that compares the effectiveness of the TFSP

Please note: in coordinating the proposed responses to comments, the Corps suggested that the analysis consider the effectiveness of an additional alternative, identified as Plan 2B. Plan 2B is included in the table that compares alternatives. This table reflects the comments that were provided by NYS and DOI by email on 28 June 2012. Plan 2B is presently under evaluation.

NYS Comment #2

For the State and potential local sponsors to determine the feasibility of agreeing to all or some of the TFSP, it is necessary to understand the costs involved with each phase. The State requests that the Corps provide the detailed cost estimate/cost-breakdown for various elements of the TFSP and compare TFSP costs to those for Alternative 3G and the NED/NER plan. The Department is currently not clear on which plan is the NED/NER plan.

➢ NAN Response #2

Updated project costs are being developed to show costs associated with each remaining plan. Please note, all costs will change as the plan is updated to account for post-Sandy changes.

In general, costs include the upfront costs associated with construction, and recurring costs associated with renourishment, breach response, and sand bypassing.

- Attachment #4 shows costs associated with the following plans, based upon information contained in the May 2009 Report.
    - 1) Plan 3A, which appears to be the plan that maximizes net benefits
    - 2) TFSP, the plan supported by the Federal Agencies

NYS Comment #3

The March 11th letter indicates that the "plan appears to meet the Federal Agency objectives" (emphasis supplied). The State respectfully requests confirmation that the TFSP does, in fact, meet Federal Agency objectives and is the Corps "Recommended Plan". It is an extensive process for the State, in conjunction with potential local sponsors, to determine if the TFSP is fully acceptable or if a locally preferred alternative needs to be proposed for all or some of the project area. The State would strongly prefer to undertake this more extensive consultation with the knowledge that the TFSP will be acceptable to the Federal Government (subject to NEPA review and modifications, as well as appropriations) if endorsed by the State.

➢ NAN Response #3

The Corps anticipates further confirmation that the TFSP is acceptable to the Federal agencies, but can only document its understanding of agency priorities communicated in the most recent coordination. These plans were briefed at the Secretary-level and general

actuarial rates, based upon the elevation of their house. As such, it is expected that the decision whether or not to participate in the non-structural program could have a bearing on the individual's financial responsibility for their individual flood insurance. In our discussions with FEMA, it also appears that the inclusion of the non-structural program will have a bearing on a homeowner's eligibility for participation in various FEMA programs. Similar to the funding of repair of engineered beaches, FEMA and the Corps need to consider the need to avoid augmentation. We are working to obtain a legal opinion on this, but at this point, it would be best to assume that the Corps program could limit the availability of FEMA funds, through certain programs.

NYS Comment #5.
Please provide more detailed information on the various barrier island breach and breach closure plans (current and proposed via the TFSP) including their locations, impacts, timeframes for closure, benefits, future estimated costs and how they relate to flood risk. It would be very useful to know how the level of storm damage reduction increases or decreases with the proposed breach plans in the TFSP in comparison to Alternative 3G and the NED/NER plan.

- NAN Response #5:

  Chapters 8 and 9 of the draft formulation report summarize the breach response plans to the extent they were developed at the time. The report identified the expected number of breaches for each plan alternative. Refinements to the breach closure measures which have been made since the compilation of the formulation report draft, as well as additional changes that have been requested will require that the team assess changes which may result if we allow for "natural closure" at a lower elevation than the breach closure design level. Further evaluation of the impacts will be sensitive to the assumptions in the trigger for action to be taken.

  The information provided in Attachment #2, in response to NYS Comment #1, provides a comparison as it presently exists of the comparison between the two plans.

NYS Comment #6.
The State has discussed with the Federal Agencies its interest in evaluating the option of reducing or phasing out the re-nourishment portion of this project over the project's 50-year life span. This option might allow the beach configuration to eventually return to a more naturalized status or to possibly have beach configuration addressed by property owners, local municipalities or local zoning entities. The State requests information on the manner in which this option would be addressed within the proposed TFSP. If these concepts are not addressed in the TFSP, the State requests that they be addressed.

- NAN Response #6:
  Presently the May 2009 draft Formulation Report includes text on three different alternatives for lifecycle management of these alternatives. These three scenarios are the ones jointly developed by the involved agencies, and are described in Chapter 11, Consideration of Lifecycle Management.

- NAN Response #8:

The Corps' Sea Level Change (SLC) guidance has been superseded twice since the May 2009 Draft Formulation Report. The current Corps Guidance is EC 1165-2-212 Sea-Level Change Considerations for Civil Works Programs, dated 1 October 2011. A 9 June 2010 workshop with the FIMP stakeholders considered the implementation and inclusion of prior guidance, EC 1165-2-211, dated July 2009, into the analysis of the alternatives and the selected plan and a scope of work for SLC analysis resulted from the meeting. Subsequent coordination with the Corps' leadership on the Corps guidance, which requires analysis of a three scenarios: "low" (historic), "intermediate" and "high" rates of sea level change further refined this scope of work. An AE is under contract to complete this analysis and to reflect the impact of SLC on the costs and benefits of the various alternatives.

In general, adaptive management of beach renourishment for sea level change considerations can be determined by sea level change and physical project features monitoring. Beach renourishment is highly adaptable due to its "soft" nature, and project features can be revised throughout the life of the projects. Monitoring will be specifically recommended as a feature of the plan, and as a cost-shared project requirement.

Similarly, based upon our discussions with HQUSACE, a similar course of action is recommended for non-structural solutions so that proposed plans can be adapted in the future based upon actual or realized SLC.

FIMP - COMPARISON OF REMAINING PLANS OF IMPROVEMENT ---- AS OF MAY 2, 2013

*** Final comparison will also include the *NO ACTION PLAN* ***

Plan 3A *NOTE; THIS PLAN IS NOT ACCEPTABLE TO ALL PARTNERS	Updated TFSP Tentative Federally Supported Plan (dated March 11, 2011) *This contains updates to reflect post-Sandy considerations	Plan 2B * Full Analysis of this plan still to be undertaken *This contains updates to reflect post-Sandy considerations
INLETS: FIRE ISLAND + MORICHES + SHINNECOCK Continuation of authorized projects, with increased sediment bypassing	INLETS: FIRE ISLAND + MORICHES + SHINNECOCK Continuation of authorized projects, with increased sediment bypassing	INLETS: FIRE ISLAND + MORICHES + SHINNECOCK Continuation of authorized projects, with increased sediment bypassing
MAINLAND 6-year floodplain Non-structural building retrofits, including road raisings Over 3,200 structures	MAINLAND 10-year floodplain Non-structural building retrofits, including road raisings Over 4,400 structures + 4 road raising locations	MAINLAND 10-year floodplain Non-structural building retrofits, including road raisings Over 4,400 structures + 4 road raising locations
BARRIER ISLANDS: FIRE ISLAND @ DEVELOPED LOCATIONS Communities + minor Federal Tracts Beachfill (+15 ft dune, with berm) Minimum real estate impact alignment Groin Modifications; Taper existing Ocean Beach Groins (2)	BARRIER ISLANDS: FIRE ISLAND @ DEVELOPED LOCATIONS Communities + minor Federal Tracts Beachfill (+15 ft dune, with berm) Post-Sandy Adjusted Beachfill Alignment Tapers into Federal tracts; alternately overfill in communities @ Lighthouse; Beachfill (+15 ft dune, with berm) Groin Modifications; Taper existing Ocean Beach Groins (2)	BARRIER ISLANDS: FIRE ISLAND @ DEVELOPED LOCATIONS Communities + minor Federal Tracts Beachfill (+13 ft dune, with berm) Post-Sandy Adjusted Beachfill Alignment Tapers into Federal tracts; alternately overfill in communities @ Lighthouse; Beachfill (+13 ft dune, with berm) No set renourishments; renourish when cross-section falls below design level (25-year) Groin Modifications; Taper existing Ocean Beach Groins (2)
FIRE ISLAND @ UNDEVELOPED LOCATIONS Major Federal Tracts + Smith Point County Park Beachfill (+13 ft dune, with berm) Minimum real estate impact alignment	FIRE ISLAND @ UNDEVELOPED LOCATIONS Major Federal Tracts + Smith Point County Park Conditional Breach Response (details TBD) - guidelines TBD; anticipated closure to be initiated within 45-60 days @ Smith Point County Park (East + West) Feeder Beach - beachfill to offset inlet effects, details TBD Long-term relocation of park facilities to minimize renourishment Science Response Team to advise decision makers for conditional closure No maintenance fill for breach closure; action taken only when breach occurs	FIRE ISLAND @ UNDEVELOPED LOCATIONS Major Federal Tracts + Smith Point County Park Conditional Breach Response (details TBD) - guidelines TBD; anticipated closure to be initiated within 45-60 days @ Smith Point County Park (East + West) Feeder Beach - beachfill to offset inlet effects, details TBD Long-term relocation of park facilities to minimize renourishment Science Response Team to advise decision makers for conditional closure No set renourishments; renourish when cross-section falls below design level (25-year)
WESTHAMPTON (fronting Moriches Bay) Beachfill (+15 ft dune, with berm) Groin Modifications; Taper existing Westhampton Groins (13)	WESTHAMPTON (fronting Moriches Bay) Beachfill (+15 ft dune, with berm) Groin Modifications; Taper existing Westhampton Groins (13)	WESTHAMPTON (fronting Moriches Bay) Beachfill (+13 ft dune, with berm) No set renourishments; renourish when cross-section falls below design level (25-year) Groin Modifications; Taper existing Westhampton Groins (13)
SHINNECOCK (fronting Shinnecock Bay) Proactive Breach Response (+13 ft dune, with berm)	SHINNECOCK (fronting Shinnecock Bay) Beachfill / Proactive Breach Response (+13 ft dune, with berm) No set renourishments; renourish when cross-section falls below design level (25-year)	SHINNECOCK (fronting Shinnecock Bay) Beachfill (+13 ft dune, with berm) No set renourishments; renourish when cross-section falls below design level (25-year)

ATTACHMENT #2

C. Inlet Modification Plan

Based upon the engineering and economic evaluation of the inlet modification and management measures, including the multiple criteria screening matrix, the recommended plan for inlet management is 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 is included to allow for future changes or improvements in the inlet management, over time. The inlet management measures are generally described as follows:

Shinnecock Inlet: Continuation of authorized project + Ebb shoal dredging; -16' deposition basin
- 2 year cycle; additional 100,000 CY/yr

Moriches Inlet: Continuation of authorized project + Ebb shoal dredging
- 1 year cycle; additional 100,000 CY/yr;

Fire Island Inlet: Continuation of authorized project + Ebb shoal dredging; deposition basin expansion, with additional updrift disposal
- 2 year interval; additional 100,000 CY/yr; and

D. Groin Modification Plan

Based upon engineering and economic analysis of groin modifications, recommendation is shortening (or tapering) of Westhampton groin field (15 existing), which will increase the amount of sediment transported to the west, and will reduce renourishment requirements for the shoreline downdrift of the groins. This plan includes:
- Shortening of groins, varying between 70 – 100 ft;
- Releases 0.5M to 2M CY of sand to west

E. Breach Response Plan (BRP)

Based upon engineering and economic analysis of the alternatives, recommendation is:

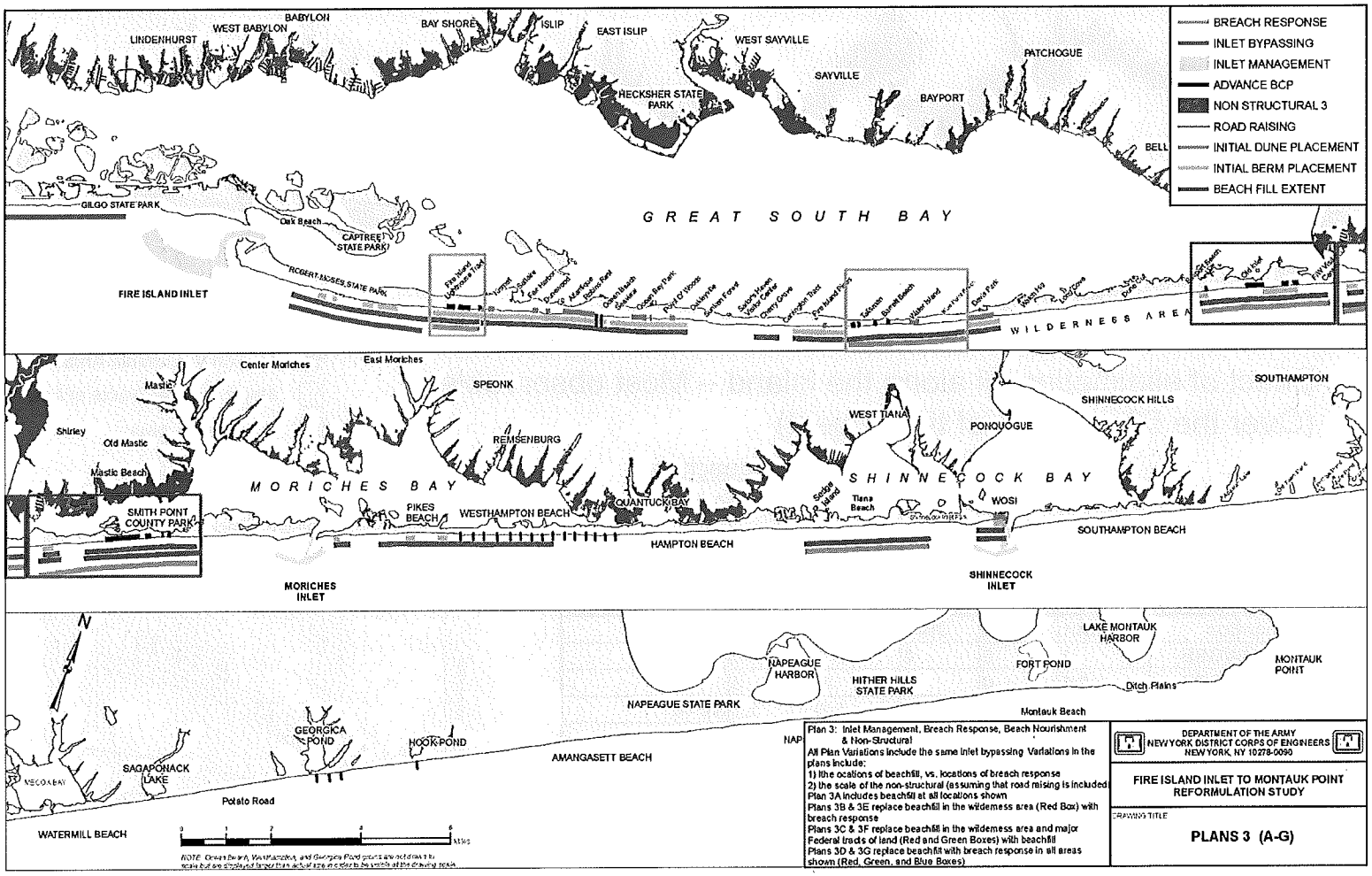
- Conditional Breach Response Plan in Fire Island undeveloped areas, with threshold details currently under development
- Proactive Breach Response Plan for areas along Shinnecock Bay, where a beachfill plan is not recommended:
    - Breach Closure Template: +13' NGVD dune, berm height +9.5 ft NGVD, berm width generally 90 ft wide, but vary depending on conditions prior to the breach and within adjacent areas
    - Proactive Response Plans include restoring the template to the design condition when the shoreline is degraded to an effective width of 50 ft.

F. Sediment Management Plans

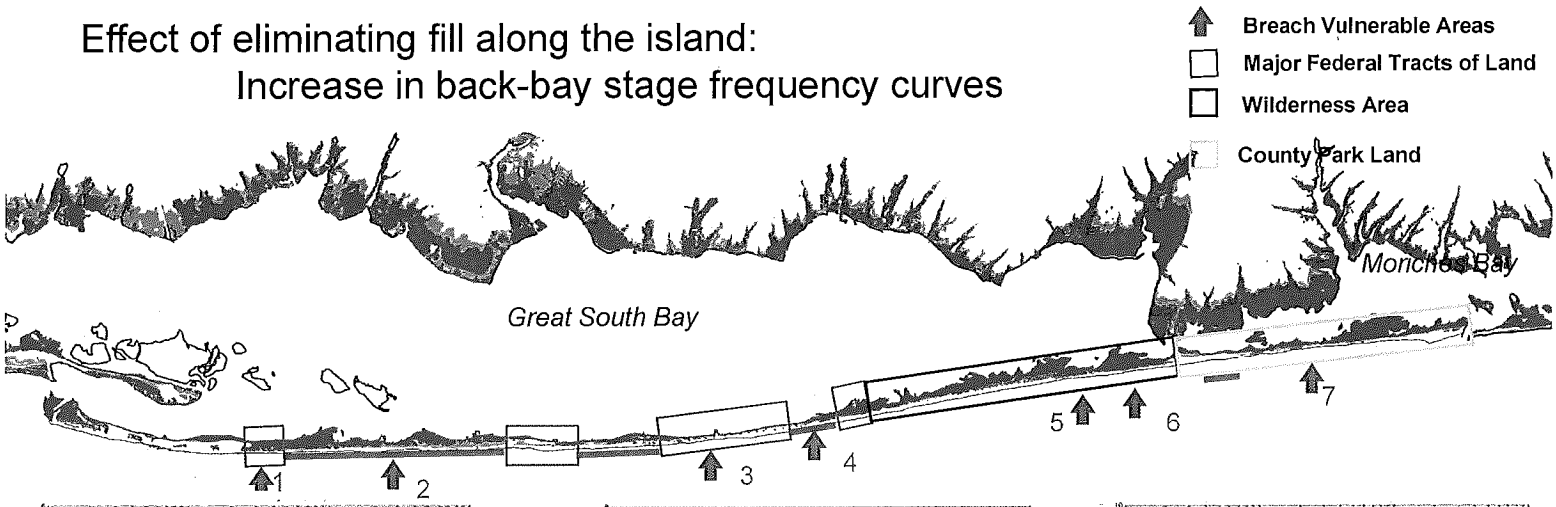
The engineering and economic analyses identified two areas of high damages where a conventional beach nourishment project was not economically viable (Downtown Montauk, and Potato Road). In these areas, Sediment Management Alternatives were evaluated to offset the long-term erosion trend, to maintain the current protection, and prevent conditions from getting worse; these features would also serve as feeder beaches. In the area of Potato Road, the implementation of this plan

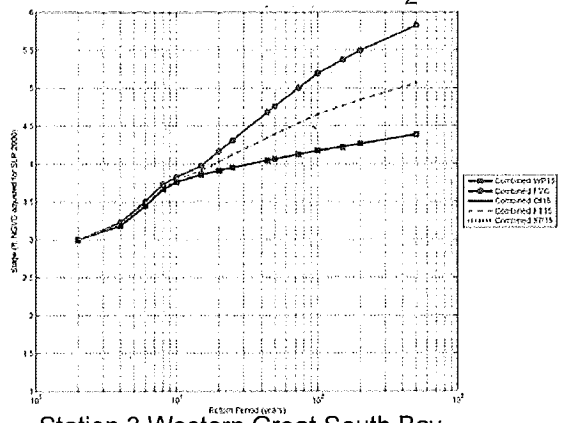
ATTACHMENT #3

FIMP – Alternative 3 Summary

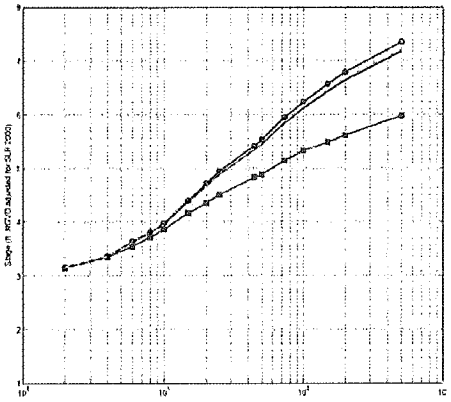


Effect of eliminating fill along the island: Increase in back-bay stage frequency curves

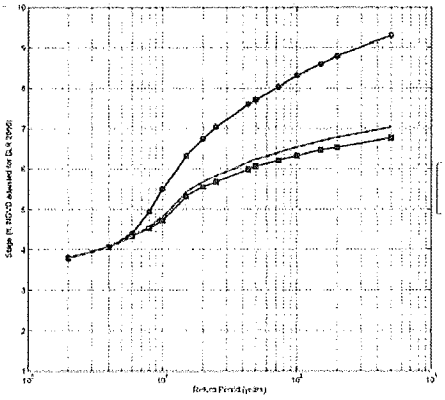




Station 3 Western Great South Bay



Station 8 Eastern Great South Bay



Station 10 Moriches Bay

The figures above show the engineering modeling used as input into the lifecycle damages model. The upper and Lower (red) curves represent the variability in the back-bay stages that are likely in the future without project condition based upon projected changes in the barrier Island condition, considering storm activity, and local actions that may be implemented. Plan 3A is represented by the lower red curve, which is comparable to the baseline condition. The intermediate curves show the effect of eliminating beachfill in various locations. Western GSB is most influenced by eliminating fill in the MFTL. Eastern GSB is most influenced by eliminating fill In the wilderness area. Moriches Bay is relatively insensitive to the effects of fill removal.

Differences Between Plans 3A and 3G/TFSP:

Plan 3A Reduces Breaching in all locations in Great South and Moriches Bay

Plan 3G/TFSP Allows Breaching in Multiple Locations, but includes a larger N-S Plan

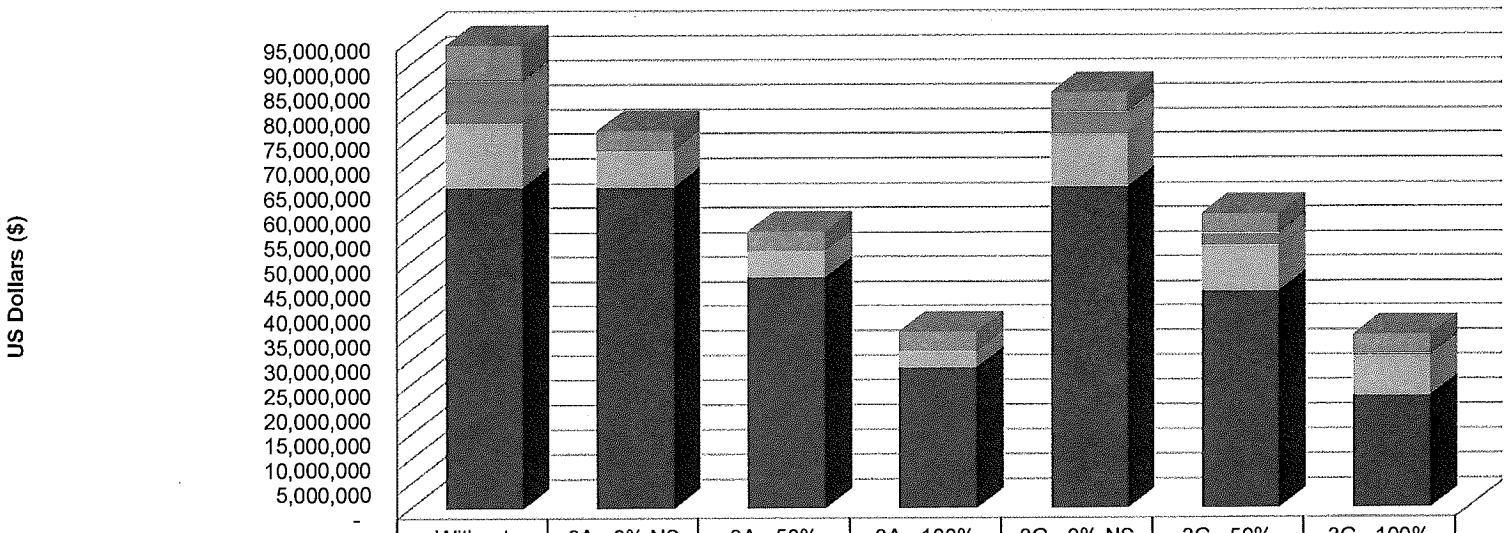
Success of Both Plans (but greater for 3G/TFSP) depends upon participation in N-S Plan

Reduction in "breach reduction benefits" between 3A and 3G/TFSP is: $140M

Increase in "non-structural benefits" between 3A and 3G/TFSP is: $110M

3G/TFSP relies more upon N-S, and is also significantly more expensive than 3A, $105M more

FIMP Damage Contributions by Alternatives



	Without Project	3A - 0% NS	3A - 50% NS	3A - 100% NS	3G - 0% NS	3G - 50% NS	3G - 100% NS
Shorefront Damages	7,305,200	4,045,200	4,045,200	4,045,200	4,045,200	4,045,200	4,045,200
Post-breach Damages	8,651,600	0	0	0	4,547,100	2,463,600	380,000
Breach-forming Inundation Damages	12,982,400	7,419,000	5,372,400	3,308,500	10,509,700	9,254,500	7,999,300
Inundation Damages	65,257,800	65,257,800	46,881,250	28,504,700	65,257,800	43,975,600	22,693,500

FIMP Cost Overview by Plan Feature

*** Please note costs are presently being updated to account for changed conditions, and current price levels**

*** Costs below reflect those contained in the May 2009 Draft Report**

- **Plan 3A**

Beach fill = $160,000,000
Building Retrofits = $407,000,000
Road Raising = $14,900,000
Groin Modification = $10,000,000
Inlet Management (additional cost of bypassing)
    Shinnecock Inlet = $756,000 per cycle
    Moriches Inlet = $600,000 per cycle
    Fire Island Inlet = $4,100,000 per cycle
Breach Response ($6-$12M per closure)
Restoration Alternatives = up to $60,000,000

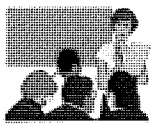
- **Plan TFSP**

Beach fill = $140,000,000
Building Retrofits = $550,000,000
Road Raising = $14,900,000
Groin Modification = $10,000,000
Inlet Management (additional cost of bypassing)
    Shinnecock Inlet = $756,000 per cycle
    Moriches Inlet = $600,000 per cycle
    Fire Island Inlet = $4,100,000 per cycle
Breach Response ($6-$12M per closure)
Restoration Alternatives = up to $60,000,000

ATTACHMENT #5

REFORMULATION/PLANNING PHASE:

This first phase is now being undertaken by the FIMP Study Team, and will identify building retrofit plans for alternative levels of protection, using input from the municipalities. Next, the benefits, costs, and impacts of the different plans will be evaluated to determine which measures are best suited for the different portions of the study area. Based upon these results, the Reformulation Study will recommend plans for Congressional authorization and funding.



DESIGN PHASE

If Congress authorizes a plan that includes non-structural measures, the Corps then coordinates with participating homeowners to discuss and select retrofit options. After considering homeowner preferences, the Corps prepares design alternatives and evaluates the cost-effectiveness of each option. The Corps would then meet with homeowners to refine the details of the plan. After the final alternative is selected, final cost estimates are developed. Please note that all retrofit work will be done in compliance with FEMA/National Flood Insurance Program (NFIP) regulations, and may provide some reduction in flood insurance premiums.

IMPLEMENTATION PHASE

At the start of this phase, individual municipalities enter into Project Cooperation Agreements with New York State and the Corps, and sponsor funding is obtained. Real Estate Agreements are then executed with participating homeowners. (Participation in the program is strictly voluntary, and at the discretion of the individual homeowner.) Next, each homeowner issues a Corps-provided RFP and guide specifications to contractors, and evaluates submitted bids (designs, cost estimates, and qualifications). Based upon this evaluation, the homeowner decides which firm they would like to hire to retrofit their home.

Nationally, non-structural projects typically have a 65/35 federal/non-federal cost-sharing arrangement. The State of New York as non-federal sponsor would pay between 50% and 70% of the non-federal share, while the remainder would be borne by local municipalities, who can in turn pass the cost onto participating homeowners. A homeowner would be responsible for up to 50% of the 25% non-federal share, or 12.5% of the total project cost. Temporary relocation during construction would be included in the cost-sharing arrangement as a project component.

Each participating homeowner is then required to submit a proposal to the Corps, stating their selection. Upon approval, the Corps meets with the homeowner and their selected contractor to sign a Contractor/Homeowner Agreement (CHA).

Construction activities then begin. The Corps will periodically provide construction inspectors as necessary to review the work. The homeowner is responsible for ensuring that their selected contractor complies with the CHA, and adheres to the approved scope of work and required safety measures.

In the event of unforeseen conditions requiring changes to selected project plans, an appeals process would be established whereby homeowners can submit requests for change orders. The Corps deems the construction phase complete upon a Final Inspection of the building.

MONITORING PHASE

Upon completion of the construction phase, the homeowner is responsible for adhering to the requirements set forth in the Real Estate Agreement regarding acceptable uses. Periodic inspections to ensure continued compliance are conducted by State, County, or local officials.

Above: Residential structure elevation project underway in the Village of Freeport

Some **key points** to keep in mind during project implementation:

- Local height restrictions may be exceeded by elevated buildings, requiring the issuance of variances.
- Legislation in your municipality may require that homes be reassessed after elevation *(in Freeport, this requirement was waived for participating homeowners).*
- Traffic slowdowns during construction due to driver curiosity are common.
- Your local utility company likely has height restrictions for electrical panels, meters, etc. This equipment may need to placed at acceptable heights after the building is elevated.
- During the winter months, ensure that contractors insulate pipes to prevent freezing.
- For small lots with limited workspace, helical piles are a space-saving alternative for building elevation, if substantial wave action is not anticipated.

D. <u>Consideration of the life cycle management of these plans.</u>

Alternative Plans 3A and 3G, were developed with a 50-year project life, and 50 years of renourishment. These plans do not meet the Vision objectives that "the plan addresses long-term demands for public resources". These plans do not include provisions that would change the need for continued renourishment within the project life, or alter the conditions so that a different solution could be expected following the 50-year project life.

In order to achieve a reduction in the long-term commitment for renourishment, alternatives would need to be implemented that would reduce the infrastructure that is at risk, or remove infrastructure to allow for a more efficient use of resources. The integration of land and development management regulations identifies improvements in the application of land use regulations, acquisition planning, and post-storm response planning that could help to reduce the infrastructure at risk along the shorefront.

With this as a component of the overall plan, there are several approaches which could be undertaken in the life-cycle management of the project to achieve this. The options that have been identified include:

1 – A scheduled reduction in the scale of protection for the beachfill in a timeframe that coincides with the acquisition planning. Under this scenario a beachfill plan would be maintained for a shorter period of time, over which purchase of property would be offered to shorefront structures at risk. After this period of time, the scale of protection would be reduced, thus reducing the commitment of resources for continued renourishment. The benefit of this approach is that the reduction in protection is not dependent upon the acquisition occurring.

2 – A scheduled relocation of the proposed line of protection that coincides with the acquisition planning. Under this scenario, the beachfill plan would be linked with the proposed acquisition plan. After a period of time, the footprint of the project would be maintained in a more landward location on a scheduled timeframe. The difficulty with this initiative is that the movement of the dune on a prescribed timeframe would require guaranteed acquisition, and could not be guaranteed with a willing-seller program.

3 – Adaptive Management. Under this scenario, the beachfill plan and the acquisition plan could proceed independently. On a periodic basis, coinciding with the scheduled renourishment, the constructed project would be revisited to identify if opportunities exist for adjustment of the maintained profile based upon the relative success in implementing the acquisition plan.

Under any of these scenarios, it is important to 1) identify the time scale that would be necessary for the implementation of alternatives, and 2) identifying the effect that these changes would have on project economics.

It is recognized that the acquisition of shorefront property through a willing-seller program is not an instantaneous action, particularly with consideration for acquisition strategies that could allow for a homeowner to sell their property but be allowed to continuously use the property.

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE

Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

April 5, 1999

Frank Santomauro
Chief, Planning Division
Department of the Army
New York District, Corp of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0090

Dear Mr. Santomauro:

RE: CORPS
Storm Damage Protection
Islip/Brookhaven, Suffolk County
96PR1724

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We are reviewing the recent submission in accordance with Section 106 of the National Historic Preservation Act of 1966.

We concur with the survey plan and look forward to reviewing the resulting report.

If you have any questions, feel free to contact Ellen Cesarski at (518) 237-8643 ext. 281. Please be sure to refer to the SHPO Project Review (PR) number noted above.

Sincerely,

Ruth L. Pierpont

Ruth L. Pierpont
Director, Historic Preservation
Field Services Bureau

RLP:bsd

An Equal Opportunity/Affirmative Action Agency
printed on recycled paper

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

December 20, 1999

REPLY TO
ATTENTION OF

Environmental Analysis Branch
Environmental Assessment Section

Cynthia Blakemore
Historic Preservation Program Analyst
Historic Preservation Field Services Bureau
New York State Office of Parks, Recreation and
Historic Preservation
Peebles Island
P.O. Box 189
Waterford, New York 12188-0189

RE: CORPS
Storm Damage Protection/Fire Island Inlet
Moriches Inlet
Islip/Brookhaven, Suffolk County
96 PR1724

Dear Ms. Blakemore,

As you are aware the U.S. Army Corps of Engineers, New York District (New York District), is currently undertaking a number of studies to identify potentially significant cultural resources within the above referenced project area to determine if the proposed project would have an effect on any identified resources. As part of these studies, the New York District has conducted a remote sensing survey of the near shore sand placement area. Enclosed is a copy of the draft report entitled "Remote Sensing Survey, Tidal Zone and Near Shore Project Area, Atlantic Coast of Long Island, Fire Island Inlet to Moriches Inlet, Fire Island, Suffolk County, New York, Interim Project" (Enclosure 1).

The survey consisted of a near-shore survey utilizing a side scan sonar and magnetometer and a low-water survey using a magnetometer to identify targets and anomalies that may represent potentially significant submerged cultural resources. The total survey effort identified 78 anomalies within the entire project area. The analysis of the data suggests that 52 anomalies are non-significant and require no further work. The remaining 26 anomalies fit the criteria for potentially significant submerged cultural resources. Of these anomalies, four have a side scan signature associated with a magnetic anomaly indicating a portion of the target lies above the sea bed. It is not anticipated that covering the potentially significant resources with sand will constitute an adverse effect. Potentially harmful activities associated with beach fill operations, such as anchoring, anchor dragging or dredging, will not occur in locations where potentially significant resources have been identified and no further work is recommended. If, however, project

plans change to include any activities that may disturb these resources, then additional work, including underwater investigations, may be required.

Please review and provide comments on the enclosed draft report in accordance with Section 106 of the National Historic Preservation Act and 36 CFR 800.4. Please note this report contains sensitive information regarding the location of potentially significant cultural resources that should not be released to the public. Two versions of the final remote sensing report, one with locational data and one without, will be provided to your office once all comments are received and incorporated into the report. If you have any questions or require additional information, please call Nancy Brighton, Project Archaeologist, at (212) 264-2198. Thank you for your assistance.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

Enclosure

cf. Mark Peckham, New York State Office of Parks, Recreation and Historic Preservation
Larry Murphy, Submerged Cultural Resources Unit, National Park Service
Steve Pendry, Northeast, Cultural Resources Center, National Park Service
Constantine Dillon, Fire Island National Seashore, National Park Service

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

December 20, 1999

REPLY TO
ATTENTION OF

Environmental Analysis Branch
Environmental Assessment Section

Constantine J. Dillon
Superintendant
Fire Island National Seashore
National Park Service
120 Laurel Street
Patchogue, New York 11772-3596

RE: Remote Sensing Survey
Tidal Zone and Near Shore Area
Fire Island, Suffolk County
New York

Dear Superintendent Dillon,

As you are aware the U.S. Army Corps of Engineers, New York District (New York District) has recently completed a remote sensing survey along twelve miles of the Fire Island coastline, including a portion of the Fire Island National Seashore. The remote sensing survey consisted of a survey of the near shore area using a side scan sonar and magnetometer and a low water survey using a magnetometer. Enclosed is a copy of the report entitled "Remote Sensing Survey, Tidal Zone and Near Shore Project Area, Atlantic Coast of Long Island, Fire Island Inlet to Moriches Inlet, Fire Island, Suffolk County, New York, Interim Project" (Enclosure1). The comments assembled by my staff are provided for your review (Enclosure 2).

The total survey effort identified 78 anomalies within the entire project area. The analysis of the data suggested that 52 anomalies are non-significant and require no further work. The remaining 26 anomalies fit the criteria for potentially significant submerged cultural resources. Of these anomalies, four have a side scan signature associated with a magnetic anomaly indicating a portion of the target lies above the sea bed. It is not anticipated that covering the potentially significant resources with sand will constitute an adverse effect. Potentially harmful activities associated with beach fill operations, such as anchoring, anchor dragging or dredging, will not occur in locations where potentially significant resources have been identified and no further is work is recommended. If, however, project plans change to include any activities that may disturb these resources, then additional work, such as an underwater investigation, may be required.

Please review and provide comments on the enclosed report by January 31, 2000. Please note this report contains sensitive information regarding the location of potentially significant cultural resources, which should not be released to the public. Two versions of the final remote sensing report, one with locational data, and one without, will be

provided to your office once all comments are received and incorporated into the report. If you have any questions or require additional information, please call Nancy Brighton, Project Archaeologist, at (212) 264-2198. Thank you for your assistance.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

cf. Larry Murphy, Submerged Cultural Resources Unit, National Park Service
Steve Pendry, Northeast Cultural Resources Center, National Park Service
Mark Peckham, New York State Office of Parks, Recreation and Historic Preservation
Cynthia Blakemore, New York State Office of Parks, Recreation and Historic Preservation

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

December 20, 1999

REPLY TO
ATTENTION OF

Environmental Analysis Branch
Environmental Assessment Section

Larry Murphy
Submerged Cultural Resources Unit
National Park Service
P.O. Box 728
Santa Fe, New Mexico 87504-0728

RE: Remote Sensing Survey
Tidal Zone and Near Shore Area
Fire Island, Suffolk County
New York

Dear Mr. Murphy,

As you are aware the U.S. Army Corps of Engineers, New York District (New York District) has recently completed a remote sensing survey along twelve miles of the Fire Island coastline, including a portion of the Fire Island National Seashore. The remote sensing survey consisted of a survey of the near shore area using a side scan sonar and magnetometer and a low water survey using a magnetometer. Enclosed is a copy of the draft report entitled "Remote Sensing Survey, Tidal Zone and Near Shore Project Area, Atlantic Coast of Long Island, Fire Island Inlet to Moriches Inlet, Fire Island, Suffolk County, New York, Interim Project" (Enclosure1). The comments on the draft report from my staff are provided for your review (Enclosure 2).

The total survey effort identified 78 anomalies within the entire project area. The analysis of the data suggested that 52 anomalies are non-significant and require no further work. The remaining 26 anomalies fit the criteria for potentially significant submerged cultural resources. Of these anomalies, only four have a side scan signature associated with a magnetic anomaly indicating a portion of the target lies above the sea bed. It is not anticipated that covering the potentially significant resources with sand will constitute an adverse effect. Potentially harmful activities associated with beach fill operations, such as anchoring, anchor dragging or dredging, will not occur in locations where potentially significant resources have been identified and no further work is recommended. If, however, project plans change to include any activities that may disturb these resources, then additional work, such as underwater investigations, may be required.

Please review the enclosed draft report and provide comments to this office by January 31, 2000. Please note this report contains sensitive information regarding the location of potentially significant cultural resources, which should not be released to the public. Two versions of the final remote sensing report, one with locational data and one

without, will be provided to your office once all comments are received and incorporated into the report. If you have any questions or require additional information, please call Nancy Brighton, Project Archaeologist, at (212) 264-2198. Thank you for your assistance.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

cf. Mark Peckham, New York State Office of Parks, Recreation and Historic Preservation
Cynthia Blakemore, New York State Office of Parks, Recreation and Historic Preservation
Steve Pendry, Northeast Cultural Resources Center, National Park Service
Constantine Dillon, Fire Island National Seashore, National Park Service

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

December 20, 1999

REPLY TO
ATTENTION OF

Environmental Analysis Branch
Environmental Assessment Section

Steve Pendry
Archaeology Branch
Northeast Cultural Resources Center
National Park Service
400 Foot of John Street
Lowell, Massachusetts 01852

RE: Remote Sensing Survey
Tidal Zone and Near Shore Area
Fire Island, Suffolk County
New York

Dear Mr. Pendry,

As you are aware the U.S. Army Corps of Engineers, New York District (New York District) has recently completed a remote sensing survey along twelve miles of the Fire Island coastline, including a portion of the Fire Island National Seashore. The remote sensing survey consisted of a survey of the near shore area using a side scan sonar and magnetometer and a low water survey using a magnetometer. Enclosed is a copy of the report entitled "Remote Sensing Survey, Tidal Zone and Near Shore Project Area, Atlantic Coast of Long Island, Fire Island Inlet to Moriches Inlet, Fire Island, Suffolk County, New York, Interim Project" (Enclosure1). The comments on the draft report assembled by my staff are provided for your review (Enclosure 2).

The total survey effort identified 78 anomalies within the entire project area. The analysis of the data suggested that 52 anomalies are non-significant and require no further work. The remaining 26 anomalies fit the criteria for potentially significant submerged cultural resources. Of these anomalies, four have a side scan signature associated with a magnetic anomaly indicating a portion of the target lies above the sea bed. It is not anticipated that covering the potentially significant resources with sand will constitute an adverse effect. Potentially harmful activities associated with beach fill operations, such as anchoring, anchor dragging or dredging, will not occur in locations where potentially significant resources have been identified and no further is work is recommended. If, however, project plans change to include any activities that may disturb these resources, then additional work, such as underwater investigations, may be required.

Please review the enclosed draft report and provide comments to this office by January 31, 2000. Please note this report contains sensitive information regarding the location of potentially significant cultural resources, which should not be released to the public. Two versions of the final remote sensing report, one with locational data, and one

without, will be provided to your office once all comments are received and incorporated into the report. If you have any questions or require additional information, please call Nancy Brighton, Project Archaeologist, at (212) 264-2198. Thank you for your assistance.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

cf. Mark Peckham, New York State Office of Parks, Recreation and Historic Preservation
Cynthia Blakemore, New York State Office of Parks, Recreation and Historic Preservation
Larry Murphy, Submerged Cultural Resources Unit, National Park Service
Constantine Dillon, Fire Island National Seashore, National Park Service

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE

Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

March 23, 2000

Frank Santomauro, P.E.
Chief, Planning Division
U.S. Army Corps of Engineers
New York District
Jacob K. Javits Federal Building
New York, New York 10278-0090

Dear Mr. Santomauro:

Re: CORPS
Storm Damage Protection/Fire Island
Inlet-Moriches Inlet
Brookhaven/Islip, Suffolk County
96PR1724

The State Historic Preservation Office (SHPO) has reviewed the information submitted for this project. Our review has been in accordance with Section 106 of the National Historic Preservation Act and relevant implementing regulations.

The SHPO has reviewed the Remote Sensing Survey prepared for the project. While we do not have concerns with the filling over the anomalies which are entirely beneath the sea bed, we are concerned with placing fill on the four having a side scan signature. We recommend diver verification of the four anomalies (#2, 13, 63, and 78) so we can determine whether filling is appropriate for these potentially significant resources.

If you have any questions, please contact Cynthia Blakemore at (518) 237-8643, extension 3288.

Sincerely,

Ruth L. Pierpont

Ruth L. Pierpont
Director

RLP:bsd

An Equal Opportunity/Affirmative Action Agency
printed on recycled paper

United States Department of the Interior

NATIONAL PARK SERVICE
Fire Island National Seashore
120 Laurel Street
Patchogue, New York 11772

IN REPLY REFER TO:

February 10, 2000

L7617 (FIIS)

Mr. Frank Santomauro
Chief, Planning Division
Department of the Army
New York District, Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0090

Dear Mr. Santomauro:

Thank you for the opportunity to review the U.S. Army Corps of Engineers' draft report, Remote-Sensing Survey, Tidal Zone and Near-Shore Project Area, Atlantic Coast of Long Island, Fire Island Inlet to Moriches Inlet, Fire Island, Suffolk County, New York Interim Project. We found the study to be adequate but had a number of concerns that are outlined below.

- The remote sensing study is adequate, but the model used, 50 gammas in an area of 80 feet (Pearson 1991), is an untested model. One effect of this is that anomalies that do not appear on more than one lane have been eliminated. Please justify the use of this model.

- Site formation processes have been ignored in the remote sensing survey. Pieces of wrecks, such as hull fragments, are not captured by the survey methods. While in many cases these may not be National Register eligible, but, those located within NPS boundaries may be significant to Fire Island National Seashore (FIIS). This needs to be clarified in the report.

- Of the four anomalies congruent with sidescan sonar targets and tentatively identified as shipwrecks, those located within NPS boundaries should be evaluated by a diver for significance. We disagree that burial under sand constitutes

a no-adverse effect. Rather, the effect of burial is presently unknown and the response of submerged organic structures to compaction under sand requires further study. Burial also impedes access to and identification of these potentially significant anomalies. An effort should be made to identify them before they are either buried or impacted by dredging, anchoring, or other beach fill activities.

- The report should include a section addressing "accidental discoveries" and the appropriate protocol.

- Several years ago, FIIS' dive team used an underwater video to document remnants of a wooden shipwreck in the surf zone in the vicinity of Watch Hill. The NPS regional archeologist also documented this shipwreck, which is buried in the beach and dune but extends south into the ocean. This documentation may be difficult to locate at the present time, but should be part of the survey report. If there is an interest in pursuing this further, please contact FIIS Environmental Compliance Specialist Danette Woo at (631) 289-1711.

- After a major northeaster (c. 1988?) a wooden copper plated hull was exposed on the beach west of Watch Hill. Eventually the hull was buried again by natural dynamics. The park has photo-documentation of the hull in its archives. Shouldn't this information be part of the report? For more information, please contact FIIS Curator Steve Czarniecki at (631) 395-9693.

- This draft report deals entirely with shipwrecks and refers to the McCormick study on page 12 paragraph 2 with regards to archeological expectations. Nonetheless, page 64 paragraph 2 of the same study also states that the shoreline of Fire Island extended 100 miles SE of present shoreline 18,000 years ago. Therefore, there continues to be a possibility of "resources" other than cultural that could be transported via sand transfer to the beach or disturbed by other support activities taking place offshore. These issues should be documented in the report.

- On page 39, a no-work zone is designated from Sunken Forest to Cherry Grove. The only NPS restriction was the beach area in front of Sailors Haven. This was so designated for reasons of endangered species habitat protection. This should not have precluded use of other survey techniques to survey this small area of beach. And should not have precluded other beach

areas to be surveyed. It is not clear to us why this stretch was omitted from the survey.

- Ocean Beach is not mapped consistently with the other communities, as the maps do not reflect the houses at Ocean Beach even though anomalies 31 and 32 indicate the Ocean Beach groins.

If you have any questions, please feel free to contact Danette Woo, Environmental Compliance Specialist at (631) 289-1711 or danette_woo@nps.gov.

Sincerely,

Constantine J. Dillon
Superintendent

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE
Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

March 17, 2003

Chris Ricciardi
U.S. Army Corps of Engineers
Planning Division
26 Federal Plaza
21st Floor
New York, New York 10278

Re: FIMP Reformulation Project

Chris,

I have just a few thoughts on the scope of the survey:

Contexts:

I think it should be emphasized to the bidders that sufficient research should be done prior to field work to develop the contexts needed for the evaluation of properties and, in particular, historic districts. The development of the south shore took several directions in several waves, such as initial settlement, agriculture and fisheries, venue for wealthy New Yorkers to establish their country estates, expansion of the railroads, summering by the middle class – this especially in the Hamptons in the late 19th century when many private residences were converted to boarding houses to cater to the summer folk.

State-Wide Survey

As stated in the NHPA, Sec. 101:

(b)(3) It shall be the responsibility of the State Historic Preservation Officer to administer the State Historic Preservation Program and to —

> *(A) in cooperation with Federal and State agencies, local governments, and private organizations and individuals, direct and conduct a comprehensive statewide survey of historic properties and maintain inventories of such properties;*

I guess, then, that it behooves us to find a way to make the survey product something that we can use to enhance our state-wide survey. Much of the FIMP area was surveyed in the late 1970s and early 1980s, but the inventory forms generated are out of date. The surveys were also not as comprehensive as hoped; those doing the field work tended to ignore newer structures in favor of 18th & 19th century buildings that appeared to their eyes as "historic." The surveyor should contact our office regarding prior surveys and evaluation, but many inventoried buildings were not evaluated at the time of survey and will likely have been altered.

Let's keep thinking about a format that can be used by USCOE & our office. The Town of Islip has borrowed all our inventory forms so that they can scan them for their own use. They will be providing us with copies of the forms as .tif files with a resolution of 150 v. the 300 you specify.

An Equal Opportunity/Affirmative Action Agency
printed on recycled paper

Scope

...Both time & space. Since the project was authorized over 40 years ago, I think we can assume at least 10 years to completion of the "non-structural" solution. In this case the 50 year guideline for NRHP eligibility should be liberalized; perhaps structures constructed prior to 1963 should be evaluated. The description of the project area as just south of the Montauk Highway would seem larger than needed, particularly in the Mastic beach area. Will the 10 year flood plain maps be provided for bidding purposes ?

The Draft Scope/RFP notes that the survey will be of approximately 1600 structures. This seems low. Is this the total number in the survey area or only those that may be NRHP eligible by being 50 (40?) years old?

Misc.

OPRHP should probably SHPO, given that this is a federal undertaking.

I'm sure your doing this already, but just to make sure...the project should be coordinated with the NYS Department of State as well as DEC.

Steve Resler
New York State Department of State
Division of Coastal Resources
41 State Street, Albany, NY 12231-0001
Phone: (518) 473-2470; Fax: (518) 473-2464
E-mail: sresler@dos.state.ny.us

We have a new database that is in most ways an improvement over the old except in printing reports from our survey database. This needs more programming time which, at the moment, is an expense we would be able to fund. We can generate tables of listed properties and eligible properties, but they would be in HTML format with a rather amateurish appearance. I'm not even that certain all data was "migrated" successfully from the old system to the new.

Keep me posted on your thoughts regarding format, scope & methodology. Call me at (518) 237-8643, x3283 if useful, or james.warren@oprhp.state.ny.us.

Sincerely,

James Warren
H.P. Program Analyst

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

REPLY TO
ATTENTION OF

15 June 2003

Environmental Analysis Branch

Re: Cultural Resources Technical Management Group meeting for the US Army Corps of Engineers – Fire Island to Montauk Point Storm Damage Reduction Project

The United States Army Corps of Engineers, New York District, (Corps) is currently undertaking a Reformulation Study of the Fire Island to Montauk Point (FIMP) area. As part of this study, an Environmental Impact Statement (EIS) is being prepared. Not only focusing on the natural environmental, the EIS will take into consideration cultural resource issues such as, but not limited to, archaeological remains both on land and under water, the landscape and how it has changed over time and the current built environment (i.e. standing structures). The Corps invites you, and other members of your organization with expertise in these areas to attend and participate in this data gathering process.

Aside from providing those in attendance with an update on the FIMP Project, the main goal will be to devise a plan of action that will allow for the identification and data collection of the various standing structures and landscapes within the project area. A sampling of standing structures/landscapes within the project area is beginning this summer. As part of this inventory, the Corps will be looking to identify structures that are currently located on the National Register of Historic Places, State and local landmarks, historic districts, as well as to identify structures, districts and/or landscapes that may be eligible for the National Register, State or local landmarks. This is a daunting task that is going to require the corporation and involvement of many groups.

We have scheduled a workshop meeting for Friday, August 8, 2003 between the hours of 10am and 1pm. Thanks to the generosity of the National Parks Service the meeting will be held at the Fire Island National Seashore Headquarters in Patchogue, New York in the River Room. Directions from Sunrise Highway are:

Sunrise Highway to the Waverly Avenue (South) Exit
Follow the bend to the left – to West Avenue (also called Holbrook at this point)
Go through the first traffic light (Main Street) and then through the second traffic light (the Rail Road tracks) and continue down West Avenue.
Look for the signs that say to the ferry terminal. The Fire Island National Seashore Headquarters is on the right just at the corner of West Avenue and Laurel Street)

Fire Island to Montauk Point Reformulation Study Mailing List – June 2003

Federal/State/Local Officials:

Cynthia Blakemore, Robert Kuhn,
Douglas Mackey, Mark Peckham
New York State Office of Parks, Recreation
and Historic Preservation
Historic Preservation Field Service Bureau
Peebles Island - P.O. Box 189
Waterford, New York 12188-0189
(518) 237-8643

Jim Warren
New York State Office of Parks, Recreation
and Historic Preservation
Historic Preservation Field Service Bureau
Peebles, Island - P.O. Box 189
Waterford, New York 12188-0189
Phone: (518) 237-8643 x 3283

Richard Martin, Director
Division of Cultural and Historic Services
Suffolk County Parks Department
P.O. Box 144
West Sayville, New York 11796
(631) 854-4949

Michael S. Bilecki,
Chief Resource Management
Fire Island National Seashore
Department of the Interior –
National Park Service
120 Laurel Street
Patchogue, New York 11773
(631) 289-4810 (ext. 234)

Richard Stavdal
Fire Island National Seashore
Department of the Interior –
National Park Service
120 Laurel Street
Patchogue, New York 11773
(631) 399-2030

Daniel J. Lenihan
Submerged Cultural Resources Unit
Department of the Interior –
National Park Service
P.O. Box 728
Sante Fe, New Mexico 87504-0728

Steve Pendry, Archaeology Branch
Northeast Cultural Resources Center
Department of the Interior –
National Park Service
400 Foot of John Street
Lowell, Massachusetts 01852

Gary Gentile
Regional Cultural Resource Coordinator
NYS Department of Transportation
State Office Building
250 Veterans Memorial Highway
Hauppauge, NY 11788-5518
(631) 952-6219

Tom Oelerich, Acting Regional Director
NYS Department of Transportation
State Office Building
250 Veterans Memorial Highway
Hauppauge, NY 11788-5518

Jeanmarie Brennan
Town of Islip - Dept. of Planning
655 Main Street
Islip, NY 11751
(631) 224-5450
Fax: (631) 224-5444
Jeanmarie-brennan@hotmail.com

Native American Groups:

Peter E. Smith, Sr., Chairman
Trustees of the Shinnecock Indian Nation
P.O. Box 5006
Southampton, New York 11969-5006

Individuals:

Mr. Bellows, Chairperson
Landmarks and Historic Districts Board
52 Lewis Street
Southampton, New York 11968
(631) 283-2282

David J. Bernstein and Daria Merwin
Long Island Institute of Archaeology
Department of Anthropology
S-549 Social and Behavioral Studies
SUNY-Stony Brook
Stony Brook, New York 11794-4364
(631) 632-7615

Robert Hefner
18 Sag Harbor Road
East Hampton, New York 11937

Lynne C. Maher, President
Long Island Divers Association
P.O. Box 56
Brookhaven, New York 119719-9540
(631) 286-3505
lynmermaid@aol.com

Gary Nilsen, President
Institute for Marine Archaeology
P.O. Box 770
Deer Park, New York 11729

Nancy Solomon, Director
Long Island Traditions
382 Main Street
Port Washington, New York 11050
(516) 767-8803 or (516) 767-8805 (fax)
litrad@i2000.com

Dr. Gaynell Stone
2322 North Wading River Road
Wading River, New York 11792
(631) 929-8725

Dr. John Strong
Suffolk County Archaeological Association
54 Harthorne Road
Southampton, New York 11968
(631) 283-4338 or (631) 287-8203
jstrong1@optonline.net

Museums:

East End Seaport Maritime Museum
P.O. Box 624 – Third Street
Greenport, New York 11944
(631) 477-2100

East Hampton Historical Society Marine Museum
Bluff Road
East Hampton, New York
(631) 267-6544

Doug Shaw, Administrator
Long Island Maritime Museum
P.O. Box 184
West Sayville, New York 11796
(631) 447-8679

Montauk Point Lighthouse Museum
P.O. Box 943
Montauk, New York 11954
(631) 668-2544

Robert MacKay, Director and Sharla Bolton
Society for the Preservation of
Long Island Antiquities (SPLIA)
161 Main Street - P.O. Box 148
Cold Spring Harbor, New York 11724
(631) 692-4664 (631-692-5265 - fax)

Helen Watkin, Director
South Street Seaport Museum
Long Island Marine Education Center
202 Woodcleft Avenue
Freeport, New York 11520
(516) 771-0399

Elaine Barcel, President
Southold Indian Museum
P.O. Box 268
Southold, New York 11971
(631) 765-5577

Historical Society – Town Historians:

Amagansett Historical Association
Montauk Highway at Windmill Lane
P.O. Box 7077
Amagansett, New York 11930
(631) 267-3020

Alice Zaruka, President
Village of Babylon Historical and
Preservation Society
P.O. Box 484
Bablyon, New York 11702
(631) 669-7086

Bay Shore Historical Society
22 Maple Avenue
Bay Shore, New York 11706

Bayport Heritage Association
P.O. Box 4
Bayport, New York 11705
(631) 472-4625

Bellport-Brookhaven Historic Society
12 Bell Street
Bellport, New York 11713
(631) 286-0888

Geoffrey Fleming
Bridgehampton Historical Society
P.O. Box 977
Bridgehampton, New York 11932
(631) 537-1088 or (631) 537-4225 (fax)
bhhs@hamptons.com

David Overton, Office of the Historian
Town of Brookhaven
Brookhaven Town Hall
205 S. Ocean Avenue
Patchogue, New York 11772
(631) 654-7897

East Hampton Historical Society
101 Main Street
East Hampton, New York
(631) 324-6850 or x9885 (fax)

Fire Island Lighthouse Preservation Society
4640 Captree Island
Captree Island, New York 11702
(631) 661-4876

Hampton Bays Historical Society
P.O. Box 588
Hampton Bays, New York 11946-0588
(631) 728-9325

Carl Starace, Community Historian
Town of Islip
214 Tahulah Lane
West Islip, New York 11795
(631) 661-0137

Central Islip Historical Society
490 Irving Street
Central Islip, New York 11795

Thomas Curr, President
East Islip Historical Society
P.O. Box 389
Great River, New York 11739-0389
(631) 581-9085

Al Chiesa
East Islip Historical Society
P.O. Box 389
Great River, New York 11739-0389
(631) 581-9085

Islip Hamlet Historical Society
P.O. Box 601
Islip, New York 11751

Friends for Long Island's Heritage
1864 Muttontown Road
Syosset, New York 11791

Mary and Warren Seeley
Manorville Historical Society
P.O. Box 4
Manorville, New York 11949-0004

Montauk Historical Society
RFD#2 – P.O. Box 112
Montauk, New York 11954

Moriches Bay Historical Society
P.O. Box 31
Center Moriches, New York 11934
(631) 878-1776

Ocean Beach Historical Society
P.O. Box 701
Ocean Beach, New York 11770

Ann Swezey, Village Historian
Greater Patchogue Historical Society
P.O. Box 102
Patchogue, New York 11772

Sag Harbor Historical Society
P.O. Box 1709
Sag Harbor, New York 11963-1709
(631) 725-5092

Nancy Donohue
Sagtikos Manor Historical Society
179 Anchorage Drive
West Islip, New York 11795
(631) 661-8348 or (631) 661-1256 (fax)

Charles Webber, President
Sayville Historical Society
P.O. Box 41
Sayville, New York 11782
(631) 563-0186

Emily Oster, Historian
Town of Southampton
116 Hampton Road
Southampton, New York 11968
(631) 283-1612

Adele Cramer, Curator
Southampton Colonial Society and
Historical Museum
P.O. Box 303
Southampton, New York 11968

Southampton Historical Society
17 Meeting House Lane
Southampton, New York 11968
(631) 283-2494

Southold Historical Society
P.O. Box 1
Southold, New York 11971
(631) 765-5500

Stony Brook Historical Society
P.O. Box 802
Stony Brook, New York 11790

Suffolk County Archaeological Association
P.O. Box Drawer AR
Stony Brook, New York 11790

Bob Muller
United States Lighthouse Society –
Long Island Chapter
P. O. Box 744
Patchogue, New York 11772
(631) 207-4331 or (631) 645-5230 (fax)
BobMuller@LILighthouseSociety.org

Wally Broege, Director
Suffolk County Historical Society
300 West Main Street
Riverhead, New York 11901
(631) 727-2881 or (631) 727-3467 (fax)
histsoc@suffolk.lib.ny.us

Marsha Hamilton
Suffolk County Historical Society
300 West Main Street
Riverhead, New York 11901
(631) 727-2881 or (631) 727-3467 (fax)
histsoc@suffolk.lib.ny.us

Westhampton Beach Historical Society
Mill Road - P.O. Box 686
Westhampton Beach, New York 11978
(631) 288-1139

Fire Island National Seashore Headquarters
River Room
120 Laurel Street
Patchogue, NY 11772
Park Headquarters
Phone: (631) 289-4810
Fax: (631) 289-4898

We hope that you, or a representative of your organization, will be able to attend this working session. Any information that your organization can provide with regard to known or eligible National Register structures, districts or landscapes will be greatly appreciated. Without the help of your organization this project will not work as effectively and efficiently as it should.

It is important to know who will be attending the meeting prior to August 8th.Please, Please RSVP to:

Christopher Ricciardi, Archaeologist
U.S. Army Corps of Engineers - Planning Division
Jacob K. Javits Federal Building
26 Federal Plaza – Room 2131
New York, New York 10278-0090
Phone: (212) 264-0204
Fax: (212) 264-0961
E-mail: christopher.g.ricciardi@usace.army.mil

by phone, fax or e-mail no later than August 1, 2003.

Thank you very much for your consideration and your participation in our meeting as well as your continued interest in the Reformulation Study. Whether you or a representative from your organization can attend or not, we will continue to keep informed as to the progress of the Study.

Sincerely,

L. Houston

Leonard Houston

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

REPLY TO
ATTENTION OF

11 July 2003

Environmental Analysis Branch

Dave Spirtes, Superintendent
Fire Island National Seashore
120 Laurel Street
Patchogue, New York 11772

Dear Mr. Spirtes:

On behalf of the U.S. Army Corps of Engineers, New York District, I would like to request that we use the facilities at the Fire Island National Seashore for a meeting with regard to the Fire Island to Montauk Point (FIMP) Project.

As part of the ongoing Environmental Impact Statement (EIS), the Corps is conducting a Cultural Resource – Buildings Survey of the project area. The Project's Archaeologist, Chris Ricciardi, has been working with Michael Bilecki and Richard Stavadal to coordinate on this effort.

Mr. Bilecki suggested that we contact to with regard to using the NPS's facility to hold a meeting relating to this project. The meeting date would be Friday, August 8, 2003 at 10am. The meeting should last till approximately 1pm. Aside from our State partner, the Department of Environmental Conservation, other State, Federal and local agencies and institutions are to be invited. We expect anywhere from 10 to 30 people to attend.

I hope that we can secure your approval for this meeting. Please let us know as soon as possible. If you have any questions with regard to this request please contact Chris Ricciardi at (212) 264-0204.

Thank you very much.

Sincerely,

Josephine R. [illegible]

for Leonard Houston
Chief, Environmental Analysis Branch

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
250 VETERANS MEMORIAL HIGHWAY
HAUPPAUGE, N.Y. 11788-5518

SUBIMAL CHAKRABORTI, P.E.
REGIONAL DIRECTOR

JOSEPH H. BOARDMAN
COMMISSIONER

July 30, 2003

Mr. Christopher Ricciardi, Archaeologist
U.S. Army Corps of Engineers - Planning Division
Jacob K. Javits Federal Building
26 Federal Plaza - Room 2131
New York, NY 10278-0090

Dear Mr. Ricciardi:

This letter is in reply to your request that the NYSDOT send a representative from its Long Island (Region 10) office to your planned workshop on August 8, 2003. The subject of the workshop is the "Fire Island to Montauk Point Storm Damage Reduction Project."

Mr. Gary Gentile, Sr. Landscape Architect, will attend this workshop and will be our contact person for items relating to Cultural Resources and Landscape Archeology.

Should you have any questions regarding this matter, please contact Gary at (631) 952-6210.

Very truly yours,

Christopher Cotter, R.L.A.
Regional Landscape Architect

AMAGANSETT HISTORICAL ASSOCIATION
P.O. BOX 7077, AMAGANSETT, NY 11930 (631) 267-3020

September 13, 2003

Christopher Ricciardi, Archaeologist
U.S. Army Corps of Engineers – Planning Division
Jacob K. Javits Federal Building
26 Federal Plaza – Room 2131
New York, NY 10278-0090

Re.: Reformulation Study – Fire Island to Montauk Point Storm Damage Reduction Project – Cultural Resource Historic Structure Survey

Dear Mr. Ricciardi:

With reference to the above-captioned study, please see the enclosed maps of two Historic Districts in Amagansett.

The Main Street Historic District contains three properties already listed on the National and State Registers of Historic Places. This and the Bluff Road Historic Districts contain many structures that are eligible for inclusion on these registers. A survey of these structures, and the preliminary National Register nomination forms, has been prepared by Robert Hefner, an architectural historian under contract as a consultant to the East Hampton Town Board.

Additional information about these districts, and the details of the eligible structures within them, may be obtained from:

Planning Department
Town of East Hampton
300 Pantigo Place
East Hampton, NY 11937.

Please feel free to contact us if we may of further assistance.

Sincerely,

Peter Garnham
President, Board of Trustees

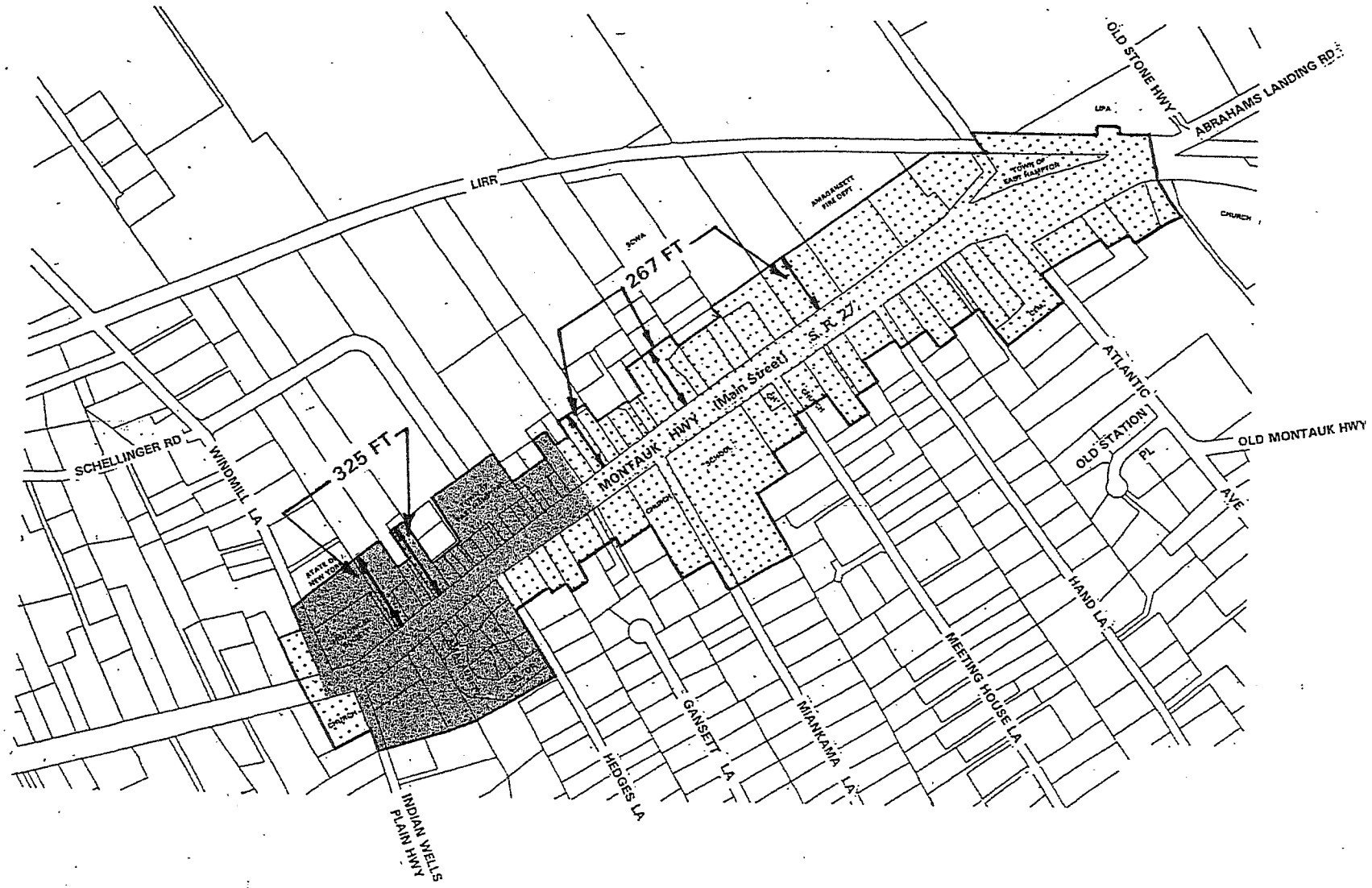
The Amagansett Historical Association is a 501(c)(3) non-profit educational institution
with an absolute charter from the New York State Board of Regents.
Donations are tax deductible to the full extent permitted by law.

LEGEND

Residential District

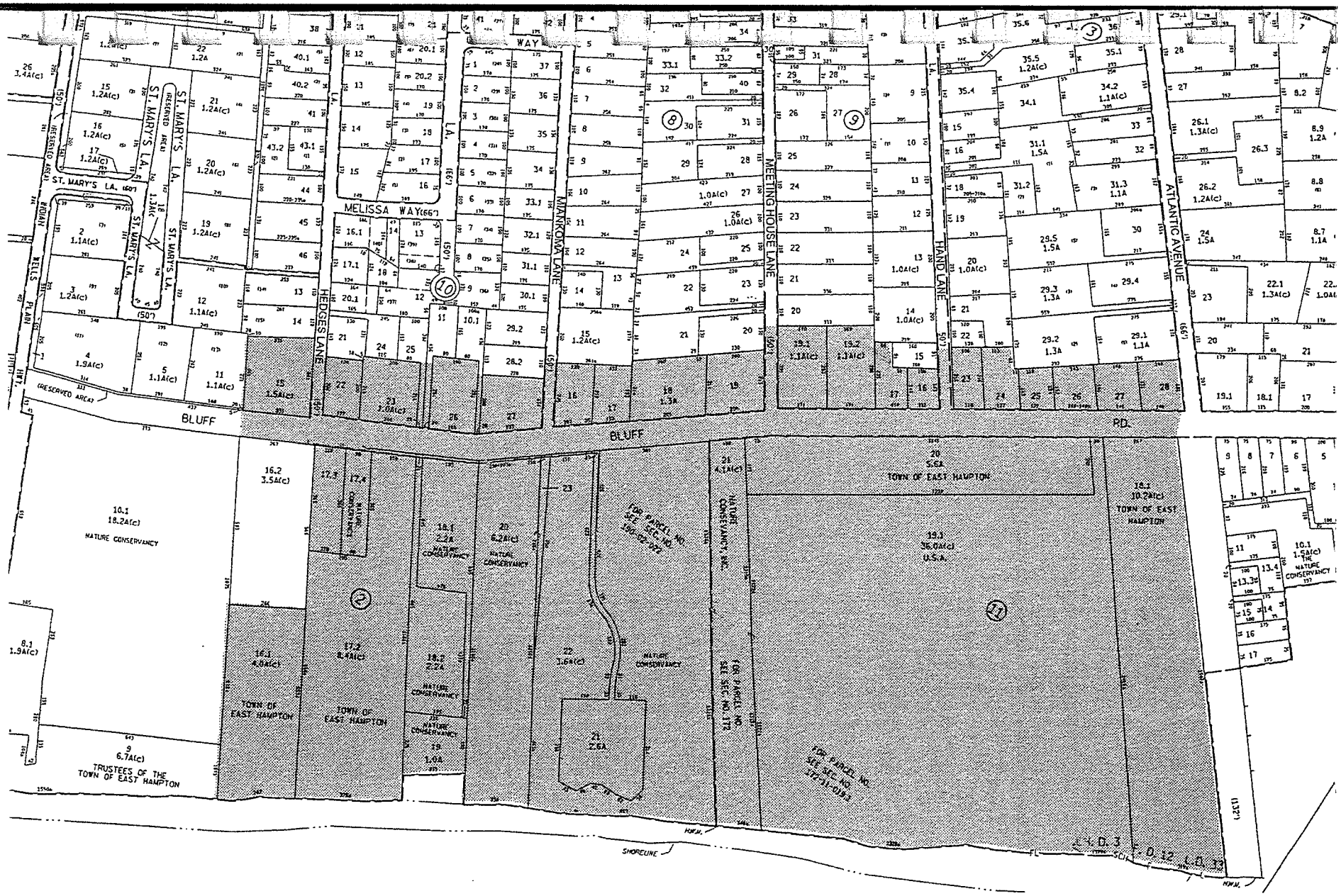
Central Business District

NOT TO SCALE



Prepared by
TOWN OF EAST HAMPTON
Planning Department
EAST HAMPTON, NEW YORK

AMAGANSETT HISTORIC DISTRICT



BLUFF ROAD HISTORIC DISTRICT

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

REPLY TO
ATTENTION OF

September 24, 2003

Environmental Analysis Branch

Ms. Ruth L. Pierpont, Director –
Bureau of Field Services
NYS Office of Parks, Recreation & Historic Preservation
Peebles Island – P. O. Box 189
Waterford, New York 12188-0189

Re: CORPS
Fire Island to Montauk Point (FIMP) Reformulation Project
Suffolk County, New York

Dear Ms. Pierpont:

The New York District of the United States Army Corps of Engineers (USACE) is undertaking a Reformulation Study of an extended hazard-prone corridor along the south shore of Long Island. The purpose of the ongoing Fire Island to Montauk Point (FIMP) Reformulation Study is to identify, evaluate and recommend long-term solutions for hurricane and storm damage reduction for homes and businesses within the floodplain extending along 83-miles of ocean and bay shorelines from Fire Island Inlet to Montauk Point. The study considers all areas within the maximum estimated limit of flooding, and is located entirely within Suffolk County. The objective of this study is to evaluate and recommend a long-term, comprehensive plan for storm damage reduction, which maintains, preserves or enhances the natural resources. The New York State Department of Environmental Conservation (DEC) is the USACE non-Federal partner.

The USACE has retained URS Corporation to undertake a Cultural Resource Historic Structural Survey of the project area. This historic resource survey, combined with earlier studies, will allow for the identification and evaluation of historic properties, the assessment of effects as related to multiple project alternatives, and the opportunity for ongoing consultation regarding alternatives which avoid, minimize or mitigate adverse effects to historic resources. Due to the large size of the project area and the early nature of project alternative planning, this survey will be part of a phased identification and evaluation, per 36 CFR 800(4)(b)(2).

The information from this historic resource survey will also be useful in the preparation of an Environmental Impact Statement (EIS). As part of this process, the USACE will coordinate review of this project under Section 106 of the National Historic Preservation Act (16USC470) and its implementing regulations 36 CFR Part 800 with the New York State Office of Parks, Recreation & Historic Preservation (NYSOPRHP). Information from the historic resource survey will also be used by Allee, King, Rosen and Fleming (AKRF), a consulting firm, which is assisting the USACE in undertaking the EIS.

This letter is to inform your agency that URS will be assisting the USACE with this project and in carrying out Section 106 consultation responsibilities.

Please find enclosed a work plan for this project. The work plan provides detailed information regarding the project goals, methodology and approach. We welcome input and comments from the NYSOPRHP regarding this work plan.

Unless otherwise directed, further consultation will be conducted directly with James Warren of your office, the Regional Coordinator for Nassau and Suffolk Counties.

If you have any questions, please contact the Project Archaeologist, Chris Ricciardi, at (212) 264-0204. Thank you for your time and cooperation.

Sincerely,

L. Houston

Leonard Houston
Chief, Environmental Analysis Branch

Enclosure

cc:

James Warren, NYSOPRHP
Steve Tull, URS
Brian Beckenbaugh, URS
Anne Locke, AKRF

Work Plan

Project Scope

URS Group (URS) has been contracted by the United States Army Corp of Engineers (USACE) to conduct a Historic Resource Survey identifying historic properties listed, eligible for, or potentially eligible for listing on the National Register of Historic Places within the area for the Fire Island to Montauk Point (FIMP) Reformulation Project. The project is being conducted in support of a large-scale study of non-structural coastal flood mitigation alternatives (elevation, demolition, acquisition, flood proofing, etc.) across an approximately 240 square-mile project area in Long Island (from Fire Island to Montauk Point.)

URS will undertake a Historic Structures Survey for the areas lying along the south shore of Long Island from Fire Island Inlet to Montauk Point, New York. Given the large project area this project will be part of a phased identification and evaluation, per 36 CFR 800(4)(b)(2). This project will provide a comprehensive view of historic resources within the project area, but will also employ a sampling methodology in which representative resources are documented. This project will also identify areas where further research, evaluation or consultation may be undertaken as particular USACE non-structural projects become better defined. USACE has given a target number of 1600 field forms to be produced.

Project Objectives

The objectives of the project are based on the assumption that there are at least 1600 properties/resources within the area of potential effect which may be fifty years of age or older. With that understanding, the objectives for the Historic Properties Survey of Fire Island to Montauk Point Reformulation Project Area are to:

- Identify above-ground historic resources (inclusive of landscapes, landscape features, structures, sites, districts, and objects) that could be considered eligible for listing on the National Register of Historic Places in accordance with the criteria established in the National Historic Preservation Act of 1966, as amended, sections 60.1-60.4 within the area of potential effects.
- Provide the USACE with a discussion of a sample decision-making process to minimize adverse effects of coastal flooding to historic properties, potential mitigation measures which offset adverse effects to historic properties, and other future project initiatives (including items for future programmatic consultation).

Project Methodology and Approach

I. Initial Coordination

A. *Identification of SHPO/THPO*
On behalf of USACE, URS will coordinate the Historic Resource Survey in consultation with the State Historic Preservation Office, known as the New York Office of Parks, Recreation and Historic Preservation (OPRHP). URS will consult with OPRHP regarding the work plan and methodology, research design, identification, evaluation and assessment of effects for historic properties within the project area. Although state-recognized tribal groups may have historic ties to the

project area, none has formally designated a Tribal Preservation Officer. Consultation with tribal groups will occur as outlined in 36 CFR 800.2(c)(2).

B. *Consulting Parties.*
USACE and URS have created a preliminary list of groups and individuals who may have historic ties or a specialized knowledge of the project area's historic resources. This list includes members of historical societies, advocacy organizations and local government officials. USACE and URS will refine this list in consultation with OPRHP, have taken initial steps to communicate and consult with these groups, and will continue to communicate with them throughout the Historic Resource Study, as described in 36 CFR 800.3(f).

C. *SHPO Coordination*
URS has made initial informal contact with the OPRHP.
URS, on behalf of USACE, will initiate formal and continue written and informal consultation with OPRHP, as described in 36 CFR 800.3(c)(3).

URS will work closely and consistently with the OPRHP throughout the project. URS will make every effort to make data compatible with that which is housed in the OPRHP's collection. URS, with USACE, will also consult with OPRHP through the review of project deliverables (including the work plan, research design, survey data and conclusions, and report).

D. *Coordination with other reviews*
This Historic Resource Survey will provide information for use in an ongoing separate Environmental Impact Statement (EIS) being conducted in support of the National Environmental Policy Act, as described in 36 CFR 800.3(b).

Although this Historic Resource Survey will demonstrate an appropriate level of involvement by the OPRHP, consulting parties, and the public, it is also assumed that the separate ongoing EIS effort will provide ongoing consultation as well as adequate opportunities for public involvement, as described in 36 CFR 800.2(d)(3).

II. Area of Potential Effects

A. The Reformulation Project area is defined by the USACE, is the area falling within the ten year flood plan between Fire Island Inlet and Montauk Point, roughly bordered by the Montauk Highway to the area's north. The specific initial project area, and the focus of the Historic Resource Study, will be within or proximate to the ten-year flood plain.

B. The Area of Potential Effects, as defined in 36 CFR 800.16(d) as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." In consultation with OPRHP, URS will further define the APE to include areas within or proximate to the specific initial project area. The inclusion and level of appropriate documentation for historic districts partially within the APE will be discussed.

III. Research & Historic Context Development

A. *Goals:*
With the goal of aiding research efforts, URS will produce a research design utilizing historic maps, information provided by local historical organizations, and other background research resources which will outline important thematic topics, expected associated property types a preliminary bibliography and significant questions. The research design will be developed in consultation with OPRHP.

The research design will be used as the basis for conducting a detailed research program utilizing primary and secondary information sources. This research will establish the foundation for the development of a historic context.

The historic context include a narrative history of the project area, a detailed analysis of historic and architectural contextual themes associated with the project area, a detailed description of typical property types associated with each contextual theme, and specific evaluation criteria (including character-defining features) for each property type. The historic context will serve as a project tool in the identification and evaluation of historic properties.

B. *Anticipated Topics:*
It is anticipated that, at a minimum, the following themes will be discussed within the research design: farming, maritime industries, duck hunting, Native American populations, extension of railroad services and roadways from New York City and the boroughs, resort development, post WWI and WWII residential and commercial developments, and the advent of storms impacting the project area.

C. *Identifying Previous Research:*
URS will review all information on identified historic properties and information on potentially significant properties that have not yet been officially identified through survey for the purpose of determining the property's eligibility for the Register.

D. *Stakeholder Involvement*
Additionally, through the assistance of the USACE, URS will seek public involvement in identifying properties holding significance for particular communities.

URS will also contact the *Shinnecock* Tribal Council in attempt to gather information allowing for the identification of properties on and off tribal lands that may be of religious and cultural significance to the tribal nation, and potentially are eligible for listing on the Register. URS will work with USACE to identify other social groups with historic ties to the project area.

E. *Level of Research Required to Develop the Historic Contexts of the Area of Potential Effect:*
In accordance with 36 CFR 800.4(b)(1), URS will in good faith carry an appropriate level of investigation to identify historic properties within the area of potential effect including background research, oral history interviews, sample field investigation, and field survey.

The level of research necessary for a survey of this type is limited to the identification and description of historic general trends, groups, and events occurring in the communities within the area of potential effect and how the development of the communities was impacted by these factors. This information will set up a framework for future identification and evaluation efforts for the SHPO and USACE. URS will use the Secretary of Interior's *Standards and Guidelines for Identification of Historic Properties* as a yardstick by which to measure efforts against.

F. *Anticipated Sources to be Utilized:*

i. Primary sources
   1. Back issues of local Long Island and New York City newspapers and magazines
   2. Family papers and records
   3. Accounts of travelers
   4. Church Histories
   5. Maps-plat, tax, fire, insurance, historic, and land survey
   6. Photographs

ii. Secondary sources
   1. Historic Preservation Plan formulated and updated by the New York Office of Recreation, Parks, and Historic Preservation
   2. Inventories of previously identified historic properties and archeological sites
   3. Local and regional histories compiled in files, monographs, and pamphlets held in the local historical societies and public libraries
   4. HABS/HAER Reports and the National Register of Historic Places
   5. The *American Guide Series*
   6. Various other available resources produced from other studies and inquiries regarding the history of physical development of Long Island more specifically the southeastern section of the island within the project area

G. *Research Methods*

In researching the historic contexts associated with the area of potential effect, URS will use the following methods:

1. Identify sources and relevant bodies of data in existing information using the bibliographies and citations.
2. Assess the reliability of the information:
   a. Determine if any potential biases by the author may affect the accuracy and impartiality of their retelling of an event or occurrence
   b. Identify any major gaps in data
3. Synthesize the information gathered into a narrative with reference to the issues important to the historic contexts identified.
4. Identify those properties emblematic or associated with the appropriate historic context
5. Determine areas within the area of potential effect with a high probability for significant properties associated with the historic contexts utilizing historic maps, atlases, plats, and survey information from other studies

6. Create hypotheses based on preceding research and establish the likely condition and type properties to be investigated
7. Identify the information necessary to be obtained through the survey (allow this to inform the type questions asked on the survey/field form)

H. *Repositories to be Utilized:*

i. United States Army Corp of Engineers New York District Archives
ii. New York State Office of Parks, Recreation, and Historic Preservation
iii. New York State Museum
iv. Fire Island National Seashore (National Park Service)
v. Suffolk County Planning Commission
vi. Suffolk County Historical Society
vii. Shinnecock Tribal Council
viii. State University of New York at Stony Brook
ix. Long Island University
x. Hofstra University-Long Island Studies
xi. United State Library of Congress-HABS/HAER Surveys & Map Collections
xii. Queensboro Public Library
xiii. New York Public Library
xiv. Local town historical societies
xv. Local town public libraries

IV. Field Survey

A. *Strategies for Surveying Project Area*

The project area approximately encompasses 249 square miles. As previously mentioned, clearer and more precise boundaries for the project area will be necessary prior to the initiation of the field survey. URS will divide 1600 field forms across the geographic range prior to beginning the fieldwork, based upon population levels, potential for historic properties, and other information from the historic context. URS will produce a Historic Resource Survey providing baseline locations for concentration of resources within the Area of Potential Effect; this will be the basis of a phased identification and evaluation effort, which will identify areas for future evaluation, and may be used as USACE project alternatives become more specifically defined.

B. *Field Form Production*

URS will produce 1600 field forms for properties which are approximately fifty years of age or older within the area of potential effect. Resources identified through the research design, and/or fieldwork, which may be considered to meet the threshold of "exceptional significance" but which may be less than fifty years of age or older, will be recorded. The fieldwork will identify various classes of properties, important resources, representative resources-those typical within in a large district, and those resources requiring further investigation.

C. *Flexibility of Field Forms*

Field forms will be based on the basic historic resource form (known as the "blue form") used by OPRHP with augmentation to better accommodate the particular needs of this project. URS will produce variations of forms that may be used for broad property categories, such as buildings, landscape features, districts, and

traditional cultural properties. The forms will also contain basic evaluative information for determining a property's integrity.

The field form will relate each surveyed site to a developed context and specific property type; however the field form will not contain individual written building descriptions or statements of significance.

The form will also contain basic construction information for buildings to be used in confirming data needed for USACE non-structural alternatives.

D. *Documentation Standards*

Those properties surveyed will occur typically in areas determined to have a high probability of historic properties. In effort to not miss any historic properties, a cursory windshield investigation will occur in areas thought to have a lesser probability of historic properties. Identifying areas with high probability of historic properties will be accomplished through various means:

- Windshield survey
- Existing survey information
- Historic map research

URS may undertake representative documentation of districts and/or collections of similar resources in which representative character-defining features are documented (including streetscapes) and approximate boundaries are noted. More specific information, such as the documentation of contributing and non-contributing resources, and precise boundary delineation, would not be included as part of this initial Historic Resource Survey, but could be determined at a later date as USACE alternatives become better defined.

As outlined in 36 CFR 800.11(a), URS will ensure that a determination, finding, or agreement under the procedures is supported by sufficient documentation to enable any reviewing parties, including OPHRP, to understand its basis. During a phased identification or evaluation project, the documentation standards regarding description of historic properties may be applied flexibly, as described in this work plan.

E. *Strategy for Surveying Properties Dating Circa 1954*

A resource is typically fifty years of age or older to be considered eligible for listing in the National Register of Historic Places. Some surveyed resources within a larger district may have portions that were constructed after 1954. In addition, field identification of properties built in the early to mid 1950s (as opposed to the mid to late 1950s), is difficult even with a trained eye; for these reasons the survey may include some properties which are slightly less than fifty years old.

However, URS will make reasonable efforts to ensure that those properties surveyed meet this basic age criterion through the use of maps, aerial photography, and other sources that will help determine the stages of post WW II development.

Additionally, URS will set up a general framework for evaluating post-1954 building types in accordance with the National Register Multiple Property Documentation Form and accompanying National Register Bulletin, "Historic Residential Suburbs in the Unites States 1830-1960."

F. *Survey Methodology*

Sixteen hundred (1600) historic sites will be surveyed from a public right-of-way, at a reconnaissance level. The Survey information is intended to identify properties potentially eligible for listing in the National Register of Historic Places, as part of a phased identification and evaluation.

Although the survey will focus on resources not previously surveyed, some update of previously surveyed sites may be needed if this information is inaccurate or in need of update.

Survey information will be entered directly into a handheld computer that will later be synchronized with a MS Access database. The database will allow querying and GIS mapping, in accordance with section 112 (a)(2) of the *National Historic Preservation Act*.

Geographic information, including UTM numbers, will be identified for each property with a commercial handheld GPS (Global Position System) unit. Property addresses will also be recorded when clearly visible from the right-of-way.

Each of the 1600 sites will be digitally photographed, with a minimum of one photograph per property. The images will have a resolution of no less than 300 dpi and will be in tiff format. Representative photographs will be integrated into the final report, but the entire survey product will also be made available as an appendix.

URS will conduct survey documentation according to the standards defined by the Secretary of Interior in the *Standards and Guidelines for Identification* of historic properties.

V. Evaluation

A. URS will, on behalf of USACE and in consultation with OPRHP, apply the National Register criteria to each surveyed property, as outlined in 36 CFR 800(4)(c). Rather than individualized written determinations of eligibility, URS will rely upon the application of detailed evaluation criteria developed for specific property types (developed in the project historic context) as well as general standards described in National Register Bulletin 15, "How to Apply the National Register Criteria for Evaluation." This approach is consistent with 36 CFR 800.11, in which documentation standards for a phased identification and evaluation project may be applied flexibly, as described in this work plan.

B. The passage of time, changing perceptions of significance, or incomplete prior evaluations may require URS, on behalf of USACE, to reevaluate properties previously determined eligible or ineligible, in consultation with OPRHP.

C. URS acknowledges that Native American tribes and certain other traditional social groups may possess special expertise in assessing the eligibility of historic properties that may possess religious and cultural significance to them. Traditional Cultural Properties will be identified and evaluated using National Register Bulletin #38 "Guidelines for Evaluating and Documenting Traditional Cultural Properties"

VI. Assessment of Effects

A. Adverse effects, as described in 36 CFR 800.5(2), are actions which may impair character-defining features which qualify a property for listing in the National Register of Historic Places. In consultation with the OPRHP, URS (on behalf of USACE) will undertake an application of the criteria of adverse effect to those resources that URS (on behalf of USACE and in consultation with OPRHP) has found to be listed in, eligible for or potentially eligible for listing in the National Register of Historic Places.

B. This is a flexible application of the criteria of adverse effect, in which typical and representative adverse effects are described and evaluated for specific property types; as the exact project alternatives for each historic resource within the project area has not been determined. Different project alternatives, such as retrofitting or relocation, may have different effects upon different property types.

The flexible approach will allow this Historic Resource Survey to be an important decision-making tool later in the USACE planning process. Where alternatives under consideration consist of corridors or large land areas (such as this project), or where access to properties is restricted, URS may use a phased process in applying the criteria of adverse effect consistent with phased identification and evaluation efforts conducted pursuant to Sec. 800.4(b)(2).

VII. Further consultation

A. URS will discuss, in broad terms, measures allowing USACE to minimize adverse effects to historic properties, eligible, potentially eligible for, or listed in the National Register of Historic Places.

Specifically, this decision-aiding process will allow USACE to consider the application of the least intrusive alternatives for the most historic properties, while achieving cost-effective non-structural project alternatives. This decision-aiding process will be discussed only for broad planning purposes.

B. URS will also discuss multiple project alternatives mitigating adverse effects to historic properties, eligible, potentially eligible for, or listed in the National Register of Historic Places. Approximate project costs and details will be discussed, although only for broad planning purposes.

C. URS will also outline broad programmatic interagency procedures scaled for future phases, if any, of the USACE project. These may allow for ongoing, phased identification, evaluation, and decision-making for historic properties. These items will be discussed only for broad planning purposes.

i. These alternatives will be discussed in consultation with OPRHP.

D. It is anticipated that additional consideration of project alternatives, including avoidance, will be included as part of the separate, ongoing EIS effort. It is anticipated that additional public involvement and consultation with OPRHP and consulting parties will be conducted in support of the EIS.

VIII. Report

An illustrated final survey report will be produced with an introduction stating the purpose and goals of the report and summarizing all pertinent section of the report.

Section 1, will be concerned with research design and historic context. It will be divided into sub categories: objectives, properties investigated and recorded, and methodology for how data was collected for both the historical context and for the surveys.

Section 2 will be dedicated to the description of the physical setting of the identified significant properties. This section will include photography, maps, site context, and pertinent environmental data.

Section 3, will be a brief summary of the other studies and surveys that have been conducted within the project site or adjacent to it.

Section 4 will be a description of field methods used and the rationale for the methods in gathering data during the survey. The section will explicitly describe how information was gathered and analyzed.

Section 5 will focus on the analysis and synthesis of the information gathered in the background research and surveys. This section will show how the properties surveyed are a part of, and contribute to the Historical Context of the project area. Additionally, this section will identify the types of historic properties found.

Section 6 will contain the conclusions and recommendations ascertained through the survey. The conclusions will focus on what properties were identified as being potentially eligible for the National Register. The section will discuss recommendations for areas and properties requiring additional study.

Section 7 will be citations for references used for the project.

Appendices:

a. Log of Persons/Institutions contacted as part of the project.
b. Supporting documentation
c. Resumes of key personnel
d. Scope of work

* All reports will be produced in accordance with the format specifications described in the Scope of Work developed by the USACE.

IX. Public Participation

As described in 36 CFR 800(2)(d) the public will be given the opportunity to participate and voice their views in a manner that reflects the nature and complexity of the undertaking.

The public has been asked by USACE for their assistance in identifying historic resources and themes through their local historical societies, town historians, or tribal councils.

Notices and information about the Historic Resource Survey will be established through a media campaign including brief announcements in local newspapers and mailings to local public libraries and historical societies, and summarized information placed on USACE's web site, with an opportunity to contact USACE with input.

It is also assumed that the separate ongoing EIS effort will provide adequate opportunities for public involvement, including formal public comment, as described in 36 CFR 800.2(d)(3).

These efforts for public involvement are in keeping with requirements of Section 106 of the National Historic Preservation Act of 1966, as amended, as well as 36 CFR 800.3 (e) 36 CFR 800.3 (f), and 36 CFR 800.2 (d).

X. Qualifications

As described in 36 CFR 800.2(a)(1), all key URS project staff will meet or exceed relevant Secretary of the Interior's Professional Qualification Standards (36 CFR 61), including Historian, Architectural Historian, Folklorist, Historic Preservationist and/or Cultural Anthropologist, as required by project conditions.

VII. Project Timeline

Attached Excel Spreadsheet

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

REPLY TO
ATTENTION OF

September 26, 2003

Environmental Analysis Branch

Re: U.S. Army Corps of Engineers – New York District
Fire Island to Montauk Point (FIMP) Reformulation Project
Phase I Structural Building's Survey – Draft Work Plan

To Whom It May Concern:

The New York District of the United States Army Corps of Engineers (USACE) is undertaking a Reformulation Study of an extended flood hazard-prone corridor along the south shore of Long Island. The purpose of the ongoing Fire Island to Montauk Point (FIMP) Reformulation Study is to identify, evaluate and recommend long-term solutions for storm damage reduction for homes and businesses within the floodplain extending along 83-miles of ocean and bay shorelines from Fire Island Inlet to Montauk Point.

The USACE has retained URS Corporation to undertake a Cultural Resource Historic Structural Survey of the project area. This historic resource survey, combined with earlier studies, will allow for the identification and evaluation of historic properties, the assessment of effects as related to multiple project alternatives, and the opportunity for ongoing consultation regarding alternatives which avoid, minimize or mitigate adverse effects to historic resources.

In August of 2003, you, or representatives from your organization, attended an information meeting held at the National Park Service's headquarters in Patchogue. At that time you expressed interest in reviewing the Scope of Work that was being developed to best undertake this daunting task.

Enclosed, please find enclosed a work plan for this project. The work plan provides detailed information regarding the project goals, methodology and approach. We welcome input and comments from you with regard to this work plan.

If you have any questions, please contact the Project Archaeologist, Chris Ricciardi, at (212) 264-0204. Comments on the Draft Work should also be addressed to Mr. Ricciardi christopher.g.ricciardi@usace.army.mil. Thank you for your time and cooperation.

Sincerely,

L Houston

Leonard Houston
Chief, Environmental Analysis Branch

Enclosure

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

REPLY TO
ATTENTION OF

14 November 2003

Environmental Analysis Branch

Mr. Frank Manhardt, President
Bay Shore Historical Society
40 Hiawatha Drive
Brightwaters, New York 11718

Dear Mr. Manhardt:

On behalf of the U.S. Army Corps of Engineers, New York District (District), I want to thank you, and Ms. Priscilla Hancock, Research Librarian, for the information you provided to the District with regard to historical properties within the area of Bay Shore and Brightwaters.

The data collected from the various historical societies within Fire Island to Montauk Point (FIMP) Storm Damage Reduction Project Reformulation Study area will be used in the Environmental Impact Statement. The information gathered will assist the District in acting as a responsible steward of historic resources within the project area.

If you have any questions, please contact:

Christopher Ricciardi, Archaeologist
U.S. Army Corps of Engineers - Planning Division
Jacob K. Javits Federal Building
26 Federal Plaza – Room 2151
New York, New York 10278-0090
Phone: (212) 264-0204
Fax: (212) 264-0961
E-mail: christopher.g.ricciardi@usace.army.mil

Once again, thank you for assisting the District with the project.

Sincerely,

Leonard Houston
Chief, Environmental Analysis Branch

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

REPLY TO
ATTENTION OF

29 December 2003

Environmental Analysis Branch

Orla M. Smyth
Town of Islip –
Department of Planning and Development
One Manitton Court
Islip, New York 11751

Re: Fire Island to Montauk Point (FIMP) Project – Historical Structures Survey

Dear Ms. Smyth:

On behalf of the U.S. Army Corps of Engineers, New York District (District) I want to thank you for assistance with regard to the District's Fire Island to Montauk Point (FIMP) – Historical Structures Survey Project. The information you provided will greatly help us in our endeavor to identify as many of the historic structures within the project area as possible.

Upon completion and review of the report, the District will be happy to send you a copy of the report for the Town's files.

Once again, thank you for your assistance. If you have any questions, please contact the Project Archaeologist, Chris Ricciardi, at (212) 264-0204 or at christopher.g.ricciardi@usace.army.mil(.)

Sincerely,

Josephine Axt, Acting Chief,
Environmental Analysis Branch

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

REPLY TO
ATTENTION OF

16 June 2004

Environmental Analysis Branch

Re: Cultural Resources Technical Management Group Request for the US Army Corps of Engineers – Fire Island to Montauk Point Storm Damage Reduction Project

The United States Army Corps of Engineers, New York District, (District) is currently undertaking a Reformulation Study of the Fire Island to Montauk Point (FIMP) area. As part of this study, an Environmental Impact Statement (EIS) is being prepared. Not only focusing on the natural environmental, the EIS will take into consideration cultural resource issues such as, but not limited to, archaeological remains both on land and under water, the landscape and how it has changed over time and the current built environment (i.e. standing structures).

Last year you, or representatives from your office, participated in the FIMP Cultural Resources Technical Management Group (CRTMG) to discuss the upcoming Historic Structures Building Survey Project. This fieldwork for this work has been completed and the draft report is in production. We would like to send you a draft of the report for your comments and review.

The document is large, approximately 4500 pages. We will not be sending the entire document but rather the text chapters only. The full report contains a large appendix with the various recording forms, databases and photographs. The entire draft document can be reviewed, if you wish, on CD-ROM. The document comprises at least four CDs. As this is a draft only, no portion of the report can/should be released and/or discussed with the general public. The information in this report will be made public, and available for comment, along with the FIMP DEIS. The New York State Office of Parks, Recreation and Historic Preservation will be concurrently reviewing the complete draft report as well.

If you would rather not participate in the review of this document please let us know. We anticipate that the draft document will be ready for review by the end of July. A meeting of the CRTMG will be scheduled for September to discuss the draft report and to update you on other developments within the Project.

If you have any questions please contact the Project, Archaeologist, Christopher Ricciardi:

Christopher Ricciardi, Ph.D., R.P.A., Project Archaeologist
U.S. Army Corps of Engineers - Planning Division - Environmental Branch
Jacob K. Javits Federal Building
26 Federal Plaza – Room 2151
New York, New York 10278-0090
Phone: (212) 264-0204
Fax: (212) 264-0961
E-mail: christopher.g.ricciardi@usace.army.mil

Thank you very much for your consideration and your participation in the FIMP Reformulation Study.

Sincerely,

for Leonard Houston

cc: FIMP Cultural Resources Technical Management Team

Ron and Marilyn Abrams – Representatives – Shinnecock Native American Nation
Fred Anders – NYS Department of State – Division of Coastal Resources
Amy Balaban – Town of Brookhaven – Division of Environmental Protection
David Bernstein and Daria Merwin – Long Island Institute of Archaeology – SUNY Stony Brook
Michael Bilecki – National Parks Service
Jeanmarie Brennan – Town Of Islip – Department of Planning
Wally Broege – Suffolk County Historical Society
Mollie Frerichs – Mastic-Shirley Historic Society
Jeffrey Fullmer, NYS Department of State – South Shore Estuary Reserve
Gary Gentile – NYS Department of Transportation – Cultural Resource Coordinator
David Griese – Fire Island Lighthouse Preservation Society
Thomas Isles – Suffolk County Division Office – County Planning
Randy King –Shinnecock Native American Tribal Council
Robert MacKay and Sharla Bolton – Society for the Preservation of Long Island Antiquities
Richard Martin – Suffolk County Parks Department
Tom Oelerich – NYS Department of Transportation
Bertram Seides – Ketcham Inn Foundation
Orla Smith – Town of Islip Planning Division
Nancy Solomon – Long Island Traditions
Georege Stafford – NYS Department of State – Division of Coastal Resources
Richard Stavdal – National Parks Service
Dr. Gaynell Stone – Suffolk County Archaeological Association
Paula Valentine – National Parks Service
Margrete Wolfson – Town of Easthampton

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

REPLY TO
ATTENTION OF

10 January 2005

Environmental Analysis Branch

Ms. Ruth Pierpont, Director
Historic Preservation Field Service Bureau
NYS Office of Parks, Recreation and Historic Preservation
Peebles Island – P. O. Box 189
Waterford, New York 12188-0189

Re: CORPS
Fire Island to Montauk Point (FIMP) Reformulation Project
Suffolk County, New York

Dear Ms. Pierpont:

The U.S. Army Corps of Engineers, New York District (Corps), is pleased to furnish you with a copy of the draft report, *The Built Environment Along Long Island's South Shore – Historic Structure Study*. This report will be included in the overall Fire Island to Montauk Point (FIMP) Reformulation Study and Environmental Impact Statement that the Corps is currently undertaking.

Ms. Virginia Bartos, and her predecessor, Mr. James Warren, have worked closely with the Corps to insure that the best possible project scope was created for this phase of the project. This report outlines work undertaken to begin the initial process of identifying what, if any structures and historical districts, may be eligible for inclusion on the National Register of Historic Places within the Area of Potential Effect (APE) within the FIMP study area. It is part of a larger phased approached to the overall Section 106 Process.

The Corps concurs with the conclusions and recommendations of the draft report. This baseline study will serve as a guide for helping the Corps, and all involved parties, to devise the best possible protection for historic properties and areas within the APE. The Corps will continue to work closely with your office as well as all interested parties to insure that cultural resource issues are considered as more definitive plans are created for the overall FIMP Project.

In keeping with Section 106 compliance of the Historic Preservation Act of 1966, as amended, the Corps requests a review of the enclosed draft report and your assessment of our determinations by 18 February 2005. We hope that your office will concur with all of the conclusions and determinations made in the report. If you have any questions, please contact the Project Archaeologist, Dr. Christopher Ricciardi, at (212) 264-0204.

Sincerely,

for Leonard Houston
Chief, Environmental Analysis Branch

Enclosure

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE
Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

January 24, 2005

Dr. Christopher Ricciardi
Project Archaeologist
U.S. Army Corps of Engineers
New York District
Planning Division - Environmental Analysis Branch
26 Federal Plaza - Room 2151
New York, New York 10278-0090

RE: FIMP HSR (03PR04748)

Dear Chris:

First of all, let me thank you for forwarding a copy of the *Fire Island to Montauk Point (FIMP) Reformulation Project* report. The area and resources included within the study area are overwhelming at best and URS should be congratulated for submitting a coherent report. I've shared the report with Field Services Bureau (FSB) archeologist Douglas Mackey and with Mark Peckham, the FSB National Register and Survey Unit Supervisor, who also handles historic maritime properties. This letter includes their responses, along with my observations regarding the historic resource study for Long Island's south shore.

My immediate response to the report is that the State Historic Preservation Office (SHPO) is left out of any decision making process. I suspect (as does my supervisor) that the consultant failed to realize that the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) has a larger role than just a caretaker of historic sites. There are two distinct bureaus within OPRHP, one being the FSB that functions as the SHPO and the other being the Bureau of Historic Sites (BHS) that oversees parks and state owned historic resources. Whenever OPRHP is mentioned in the report, it seems that consultation is an option rather than a requirement. In order to comply with Section 106, the SHPO must review any federal undertaking for potential effects to historic resources. In his letter of 17 March 2003, Jim Warren of the FSB anticipated such confusion and recommended that the term SHPO be used rather than OPRHP, advice that was ignored. The role of the SHPO in the decision-making process should be at the beginning of any undertaking and I suggest that a box be added to the chart on page 8.1 between the first and second boxes that states "Consult with SHPO on project scope/potential effects."

In the section on interagency cooperation, the SHPO should again be added to the list of agencies. The consultants mention developing a programmatic agreement to streamline the evaluation process. The FSB has done this in the past with various types of undertakings (wind farms, cell towers, etc.) and it only seems logical to do the same with the FIMP, given the vast area and large number of identified

An Equal Opportunity/Affirmative Action Agency
printed on recycled paper

and potential resources. Mark Peckham indicated that the SHPO is unable to comment on the districts and properties in the report due to the lack of necessary information (photographs, adequate maps, addresses of properties). The property typology in the report fails to indicate which resources if any meet eligibility criteria, making it unusable for our purposes. More definitive data will be required for our review and we can certainly come to some agreement about when and what information is required as FIMP projects are planned by the Army Corps of Engineers. We can certainly streamline the review process and further refine the eligibility criteria. (From some of the sample photos supplied, it is clear that the consultants have a more liberal application of National Register eligibility criteria than the SHPO.) From a cultural resource perspective, the SHPO can certainly help refine or re-define the area of potential effect (APE).

With the general comments out of the way, it is time to turn attention to specifics:

Archeology

Overall, the report has little to say about archeology. URS stated that that this was on purpose, but then included statements about areas where no archeology would be found. FSB archeologist Douglas Mackey offers the following comments:

- The Section describing prehistoric contexts is extremely short and addresses the various stages of prehistoric cultures that have occupied the area and attempts to discuss the different types of sites that may be associated with each. The discussion jumps from a very quick introduction to the Paleo-Indian period and how Long Island may have originally been populated to the major language and cultural groups encountered at the time of European settlement. It almost appears as if the authors believe that the seventeenth century Native American occupants were directly related to the Paleo-Indians that first occupied the area. While this is one theory, there is a 10,000-12,000 year interval of dynamic cultural adaptation and change which is glossed over with no discussion.

- On pages 5.1-5.3 several previous studies are discussed which conclude that large portions of the study area have no potential for archeological resources due to natural and manmade disturbances. Recent studies contradict this information by reporting that a number of sites have been identified in these areas since the initial evaluation was conducted, and it is likely that our knowledge of the geological factors involved has increased since 1980. Therefore it is recommended that this review be updated and that information gathered over the last twenty-five years be included in a re-evaluation of the area's potential.

- On a related topic, although several previous reports have developed models indicating that archaeological sites are unlikely in portions of the project, it is not clear if these models have ever been tested. Given the potential extent of the current project, it will be prudent to test any models proposed to determine if they are valid. Failure to test such far reaching models could potentially result in the failure to identify numerous archaeological sites if the model is wrong.

Maritime Resources

These sections were reviewed by the FSB's Mark Peckham who stated that the report is quite correct in pointing to a large number of marine accidents. Although the report indicated that at least four are

eligible, it is highly likely that the number should be much higher. There is extensive literature on the subject, including a report commissioned by the Corps in 1997 by Greeley, Polhemus & Dolan. In addition to submerged sites, there is the potential of encountering historic shipwrecks and sites buried beneath shifting beaches and dunes.

Property Types (reviewed by Virginia Bartos)

- Many of the URS definitions are too simplistic for Long Island resources. With European occupation from as early as ±1640, there is more variety in the property types than they indicate. For example, in the discussion of late-nineteenth century property types, the report states that the Queen Anne style dominates the landscape. This period had a rich diversity of styles and the photograph identified on page 4.1 is of a Colonial Revival style house, not Queen Anne.

- The report makes generalizations about suburban development based on a Delaware study that begs the question if the same holds true for Long Island.

- The report should give a little more emphasis to commercial property types since the area became part of the late-nineteenth century vacation industry that developed more as part of a trend, and less about tuberculosis that was much more of an issue in Staten Island (Seaview Hospital). With the current return of heritage tourism, it is important to examine the modern vacation industry along with the serious development pressures many of the communities in the study area are facing.

- The list on page 5.3 should be expanded to include a more current list of properties recently added to the National Register of Historic Places. Historic resource studies done by Robert Hefner are missing from the bibliography. These are useful documents that mostly cover the Town of East Hampton and its surroundings.

I presume that this report is part of a proactive approach that the Corps is developing for the Long Island south shore. The real value of the document is that it is a good beginning point for consultants who may be involved with historic resource evaluation as part of future projects since it includes a brief historic overview and a handy encapsulation of the National Register Criteria. The consultants correctly recommend that the Corp work with other agencies, especially when it comes to streamlining the review process. The SHPO looks forward to working with the Corp on this and with any other historic property related issues that are part of the FIMP. If you have any questions about this letter, please contact me at (518) 237-8634 Ext. 3256 or at virginia.bartos@oprhp.state.ny.us.

Sincerely,

Virginia

Virginia L. Bartos, Ph.D.
Historic Preservation Program Analyst

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

REPLY TO
ATTENTION OF

2 June 2005

Environmental Analysis Branch

Ms. Ruth L. Pierpont, Director –
Bureau of Field Services
NYS Office of Parks, Recreation & Historic Preservation
Peebles Island – P. O. Box 189
Waterford, New York 12188-0189

Re: CORPS
Fire Island to Montauk Point (FIMP) Reformulation Project
Historic Structures Study (03PR04748)
Suffolk County, New York

Dear Ms. Pierpont:

This letter is with regard to comments the U.S. Army Corps of Engineers – New York District (Corps) received from your staff in a letter dated January 25, 2005. The letter, a response to the Draft Report, *The Built Environment Along Long Island's South Shore – Historic Structure Study*, was signed by Ms. Virginia Bartos, and included sections by Mr. Douglas Mackey and Mr. Mark Peckham.

On Friday, May 20, 2005, Dr. Christopher Ricciardi, the Project Archaeologist, met with Mr. Douglas Mackey and Dr. Virginia Bartos to discuss the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP)'s response to the draft report and the letter from earlier this year.

I am pleased to hear that the meeting between our staff members went well, as outlined in the attached Memorandum for the Record (MFR) to this letter. The continued coordination between our two agencies will be key to advancing specifically the Fire Island to Montauk Point (FIMP) Project, as well as all of the Corps ongoing Projects.

As discussed in the MFR, the Corps will work on specific sections of the draft report to include your staff's issues and concerns. Dr. Bartos now has a greater appreciation for all of the coordination between the Corps and Mr. Warren during the two years prior to the draft arriving for review.

If you have any questions please do not hesitate to contact our Project Archaeologist, Dr. Christopher Ricciardi at (917) 790-8630 or christopher.g.ricciardi@usace.army.mil.

Thank you very much for your understanding.

Sincerely,

L. Houston

Leonard Houston, Chief
Environmental Analysis Branch

cc: Dr. Virginia Bartos
Mr. Douglas Mackey
Mr. Mark Peckham

CENAN-PL-E 1 June 2005

MEMORANDUM FOR THE RECORD

SUBJECT: Report on meeting between Virginia Bartos from the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP) and the U.S. Army Corps of Engineers, New York District on Friday, 20 May 2005.

1. On Friday, May 20, 2005, Christopher Ricciardi, Ph.D., Project Archaeologist, met with Virginia Bartos, Ph.D., at the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP) to discuss the Fire Island to Montauk Point (FIMP) Reformulation Project and the draft Historic Structures Survey Report, previously submitted to the NYSOPRHP for comments/review.

2. Dr. Ricciardi began by providing Dr. Bartos with information relating to the previous coordination efforts between the two agencies. This information helped Dr. Bartos to gain a better understanding of the level of effort that went into the planning phase of the Historic Structures Survey Project.

3. Dr. Ricciardi provided an overall view of the FIMP Project (see Appendix A for listing of previously submitted/completed reports) as well as the specific Historic Structures Survey. He detailed where the Project is and is going. He provided Dr. Bartos with the five (5) DVDs that constituted the "technical" sections of the Historic Structures Survey Report including the maps, recording forms, images, etc.

4. Dr. Ricciardi then discussed the specifics of the Historic Structure Survey. He outlined how the report was never intended to serve, as a comprehensive Cultural Resource Report and that terrestrial and underwater archaeology were not considered for this phase of the report. Those phases have been and will continue to be undertaken as separate components and reports as the overall FIMP Project progresses.

5. Dr. Ricciardi agreed with Dr. Bartos on some of the specific issues she raised with draft report including that of the references to Hefner's work, the need for a stronger linkage between the Project on Long Island and the references to the author of the Delaware Project and the general historical background to some specific details on structure's title and identification. He would also insure that the previous history, relating to the coordination efforts, be included in the report as well.

6. Dr. Bartos discussed the issue of "50 Years". According to Section 106 Guidelines, any structure that is of 50 years or older must be evaluated. Dr. Bartos, understanding, that a majority of the structures within the project area fall into this category, stated that both organizations should work together to developed guidelines/a specific time period for dealing with structures that are post 1950. Both agencies will work together to develop a Memorandum of Agreement/Understanding (MOA/U) on this specific issue.

7. Both Dr. Ricciardi and Bartos were happy to have clear up the issues raised in Dr. Bartos' letter from the end of January 2005. Both agreed that the report will be updated and completed in the fashion that it was intended as, an introductory study to the overall Project area. Both agreed that the best way to complete this portion of the Section 106 process for the Project will be through a MOA/Us between the two agencies. Perhaps an over-arching MOA/U can be developed to deal with the issue of the date of structures, as referenced in Issue 6, as well as the overall Cultural Resource process for the rest of the project?

8. Dr. Ricciardi thanked Dr. Bartos for her understanding of the FIMP situation as well as her comments. Dr. Bartos was happy to have restored the open lines of communication as well. Both agreed to keep the lines of communication open.

Christopher Ricciardi, Ph.D., Project Archaeologist
Environmental Analysis Branch

Appendix 1: FIMP Cultural Resource Reports

COMPLETED:

Barber, Russell J., Michael E. Roberts and C.C. Lamberg-Karlovsky.

1980 A Survey of Archaeological and Historical Resources, Fire Island Beach Erosion and Hurricane Protection Project, Westhampton Beach, New York. Report on file with the U.S. Army Corps of Engineers - New York District. New York, New York.

Greeley-Polhemus Group, Incorporated and Dolan Research, Incorporated.

1997a Interim Report #2: Cultural Resource Study - Fire Island to Montauk Point, Suffolk County, New York Reformulation Study: Phase 1 Archaeological Survey. Report on file with the U.S. Army Corps of Engineers - New York District. New York, New York.

1997b Remote Sensing Survey: Cultural Resource Study - Fire Island to Montauk Point, Suffolk County, New York Reformulation Study: Reach 2: Interim Project West of Shinnecock Inlet. Report on file with the U.S. Army Corps of Engineers - New York District. New York, New York.

1998 Research on Shipwrecks in the Near Shore Area - Fire Island to Montauk Point, Long Island, Suffolk County, New York – Reach 1: Interim Project - Fire Island to Moriches Inlet. Report on file with the U.S. Army Corps of Engineers - New York District. New York, New York.

John Milner and Associates.

2000 Cultural Resource Baseline Study - Fire Island Inlet to Montauk Point, Suffolk County, New York - Reformulation Study Report on file with the U.S. Army Corps of Engineers - New York District. New York, New York.

Panamerican Consultants, Inc.

2003 Remote Sensing Survey, Tidal Zone and Near Shore Project Area, Atlantic Coast of Long Island, Fire Island Inlet to Moriches Inlet, Fire Island, Suffolk County, New York – Interim Project. Report on file with the U.S. Army Corps of Engineers - New York District. New York, New York.

Reiss, Warren, WCH Industries, Inc. and Boston Affiliates, Inc.

1994 Atlantic Coast of Long Island, Fire Island to Montauk Point – Westhamtpon Beach Interim Protection – Plan Remote Sensing Survey of Two Borrow Areas. Report on file with the U.S. Army Corps of Engineers - New York District. New York, New York.

Tidewater Atlantic Research, Incorporated.
2001 Remote Sensing Archaeological Survey of Borrow Areas 2A, 2B, 2C, 3A, 4A, 4B, 5A, 5B, 6A, 7A, and 8A - Atlantic Coast of Long Island, Fire Island Inlet to Moriches Inlet, Suffolk County, New York - Reformulation Study. Report on file with the U.S. Army Corps of Engineers - New York District. New York, New York.

Vetter, John F. and Bert Salwen.
1974 Report on an Archaeological Reconnaissance of Fire Island, Suffolk County, New York. Report on file with the U.S. Army Corps of Engineers - New York District. New York, New York.

IN PROGRESS:

URS Corporation.
2004 The Built Environment along Long Island's South Shore: Historic Resource Study Report on file with the U.S. Army Corps of Engineers - New York District. New York, New York.
DRAFT only.

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

REPLY TO
ATTENTION OF

June 28, 2006

Environmental Assessment Branch

Chief Harry Wallace
Poospatuck-Unkechaug Native American Nation
207 Poospatuck Lane
Mastic, New York 11950

Dear Mr. Wallace:

On behalf of the United States Army Corps of Engineers – New York District (Corps) I am writing to you and the Poospatuck-Unkechaug Nation as a prelude to establishing formal contact and an introduction from our Commanding Officer.

The Corps is currently undertaking a major Storm Damage Reduction Project along the southern coast of Long Island, the Fire Island to Montauk Point (FIMP) Reformulation Study. As the project area also includes the lands of your Nation, we would like to formally meet with you and others from the Nation to: a) establish formalized contact b) have a discussion on the FIMP Project and c) to introduce to you what the mission of the Corps is and how we may be able to provide assistance, if you require or wish.

The initial formalized contact would be with our Commanding Officer, followed by future meetings with various technical staff.

I hope that you will consider our request for contact and future meetings. If this is something that interests you, please contact the Project Archaeologist, Dr. Christopher Ricciardi by phone (917-790-8630), email (christopher.g.ricciardi@usace.army.mil) or by mail: U.S. Army Corps of Engineers – New York District – 26 Federal Plaza – Environmental Branch – Room 2151, New York, New York 10278-0090 so that formal arrangements can begin.

Thank you very much for your time and consideration.

Sincerely,

L. Houston

Leonard Houston,
Chief, Environmental Branch

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

REPLY TO
ATTENTION OF

April 27, 2006

Environmental Assessment Branch

Ruth L. Pierpont, Director
Historic Preservation Field Services Bureau
New York State Office of Parks, Recreation and Historic Preservation
Peebles Island - P.O. Box 189
Waterford, New York 12188-0189

Re: CORPS
Fire Island to Montauk Point (FIMP) Reformulation Project
Historic Structures Study (03PR04748)
Suffolk County, New York

Dear Ms. Pierpont:

The U.S. Army Corps of Engineers, New York District is pleased to furnish you with the final report, *The Built Environment along Long Island's South Shore – Historic Structure Study* and a set of DVDs containing the various data sets referenced in the report.

I would also like to thank Dr. Virginia Bartos for her efforts in working with our Project Archaeologist, Dr. Christopher Ricciardi, throughout this process. Together, they had to wrestle with a complex situation that went beyond the more traditional ways of completing a project such as this.

The Corps is now moving forward with the overall project. As per the recommendations of the coordinated efforts between our offices (see attached MFR from the more recent meeting), we will now begin the process of outlining a Memorandum of Agreement for the next phase of the overall Fire Island to Montauk Point (FIMP) Reformulation Project.

If you have any questions please do not hesitate to contact our Project Archaeologist, Dr. Christopher Ricciardi at (917) 790-8630 or christopher.g.ricciardi@usace.army.mil(.)

Thank you.

Sincerely,

L. Houston

Leonard Houston
Chief, Environmental Analysis Branch

Enclosures

APPENDIX P

ENVIRONMENTAL COMPLIANCE

Environmental Compliance

Federal Policies	Compliance
Abandoned Shipwreck Act of 1987	Pending
Archaeological and Historic Preservation Act of 1979, as amended	Pending
Clean Air Act OF 1977, as amended	Pending
Clean Water Act of 1977, as amended	Pending
Coastal Zone Management Act of 1972, as amended	Pending
Endangered Species Act of 1973, as amended	Pending
Estuary Protection Act (PL 90-454)	N/A
Federal Water Project Recreation Act, as amended	N/A
Fish and Wildlife Coordination Act 0f 1958, as amended	Pending
Floodplain Management (E.O.11988)	N/A
Gateway National Recreation Area 1972 Legislation	N/A
Land and Water Conservation Fund Act of 1965, as amended	Pending
Marine Protection, Research and Sanctuary Act of 1969, as amended	N/A
National Environmental Policy Act of 1969, as amended	Pending
National Historic Preservation Act of 1966, as amended	Pending
Rivers and Harbors Appropriation Act of 1899, as amended	N/A
Toxic Substances Control Act (PL-94-469), as amended	N/A
Watershed Protection and Flood Prevention Act, as amended	N/A
Wild and Scenic River Act, as amended	N/A

Executive Orders, Memoranda

Protection of Wetlands (E.O. 11990)	Pending
Environmental Effects Abroad of Major Federal Actions (E.O. 12114)	N/A
Impacts Upon Prime and Unique Farmlands (CEQ Memo 8-30-76)	N/A
Protection and Enhancement of the Cultural Environment (E.O. 11593)	N/A

APPENDIX Q

404(B)(1)

SECTION 404(b)(1) GUIDELINES EVALUATION

Introduction

This appendix of the Atlantic Coast of New York, Fire Island Inlet to Montauk Point Combined Beach Erosion Control and Hurricane Protection Project (FIMP) (hereafter referred to as "Project") presents a Section 404(b)(1) Guideline evaluation for the comprehensive evaluation of improvements to the project area. The evaluation is based on the regulations found at 40 CFR 230, Section 404(b)(1): Guidelines for Specification of Disposal Sites for Dredged or Fill Material. The regulations implement Sections 404(b) and 501(a) of the Clean Water Act, which govern the disposal of dredged and fill material inside the territorial sea baseline (§230.2(b)).

Generic 404 (b)(1) Evaluation

The following Section 404(b)(1) evaluation is presented in a format consistent with typical evaluations in the New York area and addresses all required elements of the evaluation.

(1) Project Description

a) Location: 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.

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

b) General Description: The 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 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 EIS, 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.

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 EIS. As discussed in Chapter 2, the proposed action for this EIS, 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.

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 EIS 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.

c) Authority and Purpose: The problems along the shorefront include storm damages due to erosion, wave attack, and flooding. Along the barrier island there is also the threat of barrier island overwash and breaching. Along the back bay, there is the threat of 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 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. As such, each of these agencies has a purpose and need for action, as discussed below

d. General Description of Placement Material: Sand that is compatible to the existing beach that will be pumped in from offshore borrow area.

e. Proposed Discharge Site: 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.

f. Disposal Method: Use of hydraulic dredging equipment for the initial construction and renourishment efforts.

Factual Determinations

a. Physical Substrate Determinations

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 restoration 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.

(2) ***<u>Sediment Type</u>***: Sediments similar to those present in the placement area will be utilized. No impacts are anticipated.

(3) ***Dredged Material Movement***: Minor short-term movement and existing shore processes will continue.

(4) ***Physical Effects on Benthos***: Minor short-term disruption. No long-term impact.

(5) ***Other Effects***: None identified

(6) ***Action to Minimize Impacts***: See EIS section (4.0)

b. Water Circulation, Fluctuations, and Salinity Determinations

(1) Water

(a) Salinity: Proposed project is not expected to affect salinity because beach fill does not govern the overall water mass movements (tidal flow and river discharge) that control salinity.

(b) Water Chemistry: No major impacts are expected.

(c) Clarity: Temporary increase in turbidity will occur from sediment resuspension during placement of the material.

(d) Color: Minor temporary changes possible but no major impacts are expected.

(e) Odor: No measurable impacts are expected.

(f) Taste: Not applicable

(g) Dissolved Gas Levels: Possible short-term variation may occur due to turbulence created by placement of the material on the beach.

(h) Nutrients: Temporary and localized nutrient increases may occur due to sediment resuspension during beach fill activities. No long-term increase in nutrients and eutrophication will result from the proposed project.

(i) Eutrophication: None identified

(j) Other: None identified

(2) Current Patterns and Circulation: No impacts identified

(3) Normal Water Level Fluctuations: No impacts identified

(4) Salinity Gradients: No impacts expected

(5) Actions to Minimize Impacts: Not applicable

c. Suspended Particulate/Turbidity Determination

(1) Change at Disposal Site: Short-term, localized increases in suspended particulates/turbidity as a result of placement of material, but no long-term changes.

(2) Effects on Chemical and Physical Properties of the Water Column: Impact should be minimal since particles will settle out fairly rapidly and no toxic metals or organic compounds are anticipated to be encountered.

(3) Effects on Biota: Short-term exposure due to localized sediment resuspension during placement of material. No long-term effects are projected.

(4) Action to Minimize Impacts: Placement of material will be completed as early as possible to allow for optimum recruitment of benthic organism within the placement area.

d. Contaminant Determination: No impacts identified.

e. Aquatic Ecosystems and Organisms Determination: Possible effects to the gills of nekton species that are in the immediate area of placement. No major impacts are expected.

f. Proposed Disposal Site Determination: Not applicable.

g. Determination of Cumulative Effects on the Aquatic Ecosystem: See section (4.0).

h. Determination of Secondary Effects on the Aquatic Ecosystem: None identified.

Findings of Compliance or Noncompliance

a. There are no practicable alternatives for the proposed action under the jurisdiction of Section 404(b)(1) Guidelines.

b. The proposed action does not appear to violate applicable state water quality standards or effluent standards.

c. The proposal will not have significant adverse impacts on endangered species or their critical habitats. Formal coordination with the USFWS under section 7 of the Endangered Species Act of 1973 is ongoing to insure the safety of any transient species that may be present during construction. Informal consultation with NMFS is ongoing at this time.

d. The proposed action will not result in significant adverse impacts on human health or welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish, shellfish, wildlife and special aquatic sites.

e. All appropriate steps to minimize adverse environmental impacts have been taken.

f. No significant adaptations of the guidelines were made relative to this evaluation.

Conclusions

Based on all of the above, the proposed action is determined to be in compliance with the Section 404(b)(1) Guidelines, subject to appropriate and reasonable conditions, to be determined on a case-by-case basis, to protect the public interest.