APPENDIX I

BIOLOGICAL ASSESSMENT

U.S. ARMY CORPS OF ENGINEERS
NEW YORK DISTRICT

BIOLOGICAL ASSESSMENT FOR: THE POTENTIAL IMPACTS TO FEDERAL ENDANGERED AND THREATENED SPECIES FROM BEACH NOURISHMENT PROJECTS UTILIZING THE SEA BRIGHT OFFSHORE BORROW AREA: UNION BEACH, PORT MONMOUTH AND ELBERON TO LOCH ARBOUR, NEW JERSEY

October 2013

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1.0 INTRODUCTION

This Biological Assessment (BA) is submitted to the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) by the U.S. Army Corps of Engineers (USACE)-New York District (District) as part of the formal consultation process under Section 7 of the Endangered Species Act (ESA), as amended November 10, 1978. Due to the impacts of Hurricane Sandy on October 29, 2012 in the District's Area of Responsibility (AOR), and the resulting accelerated schedules of multiple proposed construction projects, NMFS and the District NYD agreed to "batch" multiple projects into several consultations based on project schedule (see Appendix A). This BA assesses the potential impacts to threatened and endangered species from construction of three proposed shore protection and/or flood risk management projects: Elberon to Loch Arbour; Union Beach; and Port Monmouth.

All three projects are congressionally authorized Federal projects lead by District and sponsored by the New Jersey Department of Environmental Protection. The projects propose to nourish each beach using sand from the Sea Bright Offshore Borrow Area (SBOBA) located 1-3 miles offshore of the southern end of Sandy Hook, NJ (USACE-WES 1996). Each project also proposes to construct structures along the shoreline, and ultimately aims to reduce damages from storm events.

Section 7 of the ESA requires that a BA be prepared for all major Federal actions when a federally listed or proposed endangered or threatened species may be affected. In 1995, a BA for whales and sea turtles was completed for similar beach nourishment projects on the South Shore of Long Island and the northern New Jersey (NJ) shore, including Elberon to Loch Arbour (Sandy Hook to Manasquan). In 2001, a Draft BA was completed for impacts to sea turtles for Beach Renourishment and Offshore Borrowing in the Raritan Bay Ecosystem, including an evaluation of Union Beach (USACE-NYD 2001A). The purpose of this BA is to: address potential impacts to the Atlantic sturgeon, which was recently listed under the ESA (Federal Register Vol 77, No. 24, Monday February 6, 2012; 50 CFR Part 224); to update the existing beach nourishment consultations to include Elberon to Loch Arbour, Union Beach and Port Monmouth for listed sea turtles and whales; and to acknowledge the change to the listing of loggerhead sea turtles[1].

2.0 PROJECT BACKGROUND AND GENERAL DESCRIPTION OF THE PROJECT

Since the 1950's, USACE has been involved in the construction of shore protection projects (USACE-ERDC 2007), which are currently ongoing in the District's AOR. The impacts of Hurricane Sandy resulted in severe damage to the coastline, including the three areas covered by the projects discussed in this BA, thereby increasing the risks and vulnerability of the shore communities from future storm events (ASA 2013). In response and with the aid of the Disaster Relief Appropriations Act of 2013 (DRAA), the USACE has accelerated the schedules of many

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[1] On March 16, 2010, NOAA published a proposed rule to list two distinct population segments (DPS) of loggerhead sea turtles as threatened and seven distinct population segments of loggerhead sea turtles as endangered (75 FR 12598). On September 16, 2011, a final listing determination was made designating the Northwest Atlantic Ocean DPS, South Atlantic Ocean DPS, Southeast Indo-Pacific Ocean DPS, and the Southwest Indian Ocean DPS as threatened. The Northeast Atlantic Ocean DPS, Mediterranean Sea DPS, North Indian Ocean DPS, North Pacific Ocean DPS, and South Pacific Ocean DPS have been designated as endangered (76 FR 58868). The listing became effective October 24, 2011, at which time, the species of loggerhead likely to be present in the action area went from globally listed threatened loggerhead, to the threatened Northwest Atlantic distinct population segment of loggerhead.

authorized storm damage reduction projects, including Union Beach, Elberon to Loch Arbour and Port Monmouth.

This assessment covers two projects in Raritan Bay (Union Beach and Port Monmouth) and one along the Atlantic Coast/NJ Shore (Elberon to Loch Arbour). Each proposed project, under separate authorizations and contracts, would dredge sand from the SBOBA for placement on the shoreline (Figure 1). The SBOBA is a 3-square mile area located 1-3 miles offshore of the southern end of Sandy Hook, NJ (USACE-WES 1996) and has been used for previous beach nourishment jobs. The mean water depth of the borrow area is 50 feet (USACE-NYD 2006).

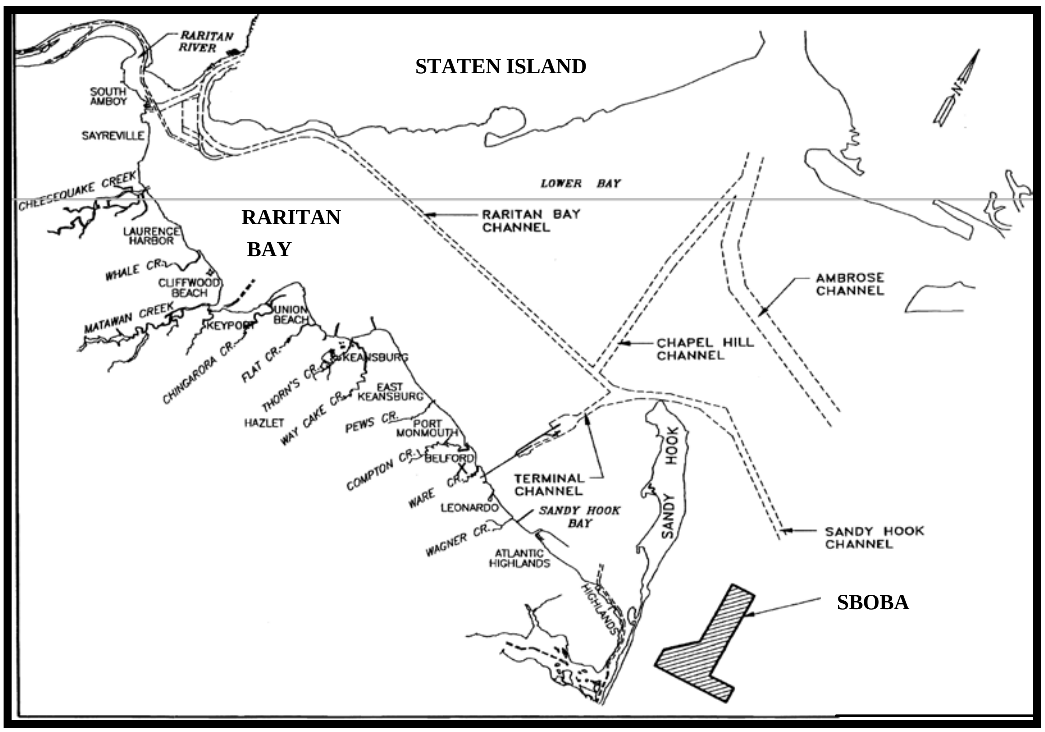

Figure 1: Location of the Sea Bright Offshore Borrow Area (SBOBA).

The order in which each project is currently scheduled for construction is Port Monmouth, Elberon to Loch Arbour, and Union Beach (schedule not yet determined).

2.1 PORT MONMOUTH

Construction of the Port Monmouth project was authorized under Section 101 of the Water Resources Development Act of 2000 but funds were never appropriated for its construction, making this an authorized but unconstructed project, in accordance with DRAA. Port Monmouth is located on Raritan Bay, NJ and is bordered by East Keansburg and Belford. The proposed project is separated into 2 components: Shore Protection and Flood Risk Management. Both phases have gone through the NEPA process, with a Record of Decision completed in May 2008 for both phases, and a Finding of No Significant Impact issued in February 2009 for a minor change to the Shore Protection design.

The Shore Protection component would extend from Pews Creek to the west and Compton Creek to the east (see Figure 2). This phase is currently scheduled for construction in the fall of 2013 and would be constructed prior to the Flood Risk Management component. It aims to reduce damages from coastal erosion and tidal inundation along the project's bay shoreline. Construction award is anticipated to occur in March 2014 and would last for approximately 13 months. The schedule and project duration could change based on contractual issues, inclement weather, equipment failures or other unforeseen circumstances.

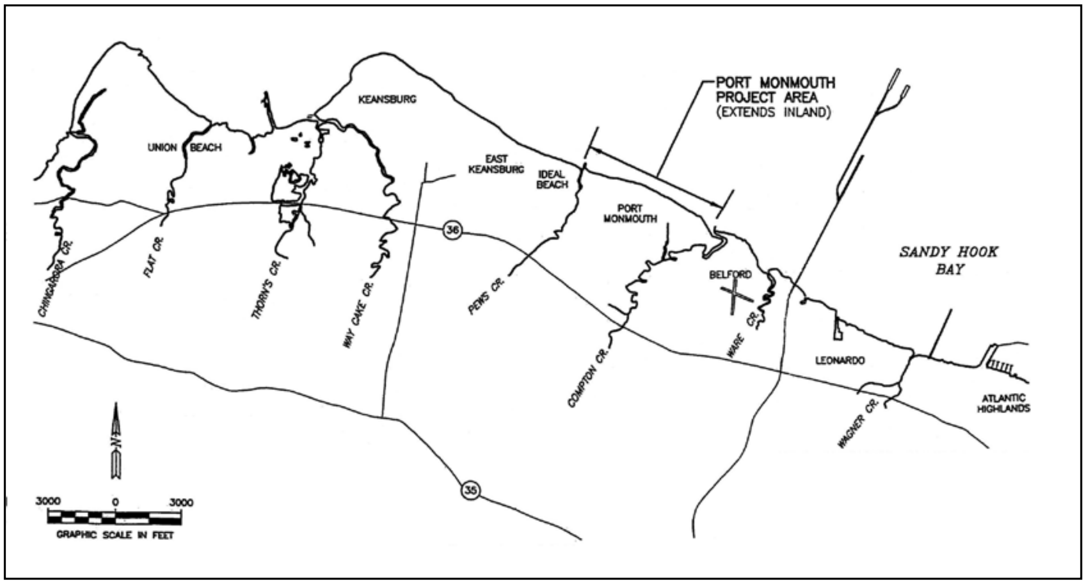

Figure 2: Location of Port Monmouth Project Area.

Several elements are proposed for construction:

1. Beach Nourishment and Sand Dune/Berm:
    a. Initial dredging of approximately 391,000 cubic yards (CY) of sand would occur at the SBOBA via a hopper dredge. The sand would be placed along approximately 3,300 linear feet of shoreline, and would include reconstruction of an existing dune.
    b. The hopper would dredge the material from the borrow area, sail to a pumpout area, and connect to a pumpout barge where it would pump the material from the hopper onto the shoreline via a pipeline. The approximate distance from the SBOBA to the pump out station is anticipated to be approximately 16 miles. The duration of actual dredging at the SBOBA would vary depending on the method used by the Contractor, including the number of dredges and size of the dredges. The dredge would vary from medium sized (e.g., the Padre Island and Dodge Island) to a larger sized dredge operating with two drag arms (e.g., The Terrapin Island). There are too many variables involved to predict the exact way in which the Contractor would carry out the sand nourishment operation (i.e., the dredge size or capacity to hold sand; the number of dredges; the distance of the pump-out equipment from shore; the type and number of pump-out equipment used, etc), including the duration of each segment of the operation (e.g., dredge sand at the SBOBA; transport of dredge to the pump-out station; hook-up of dredge to pump-out equipment; and transfer of sand from the dredge to the pump-out equipment

for placement on the beach). A beach nourishment project for Keansburg, NJ, which borders Port Monmouth, was recently awarded. Based on this project, and as an example of a construction scenario that may occur for a beach nourishment project, the Contractor has chosen to use one large hopper dredge. In one day, the amount of time the hopper spends dredging at SBOBA is approximately 4-6 hours. It takes the dredge approximately 3-6 hours per day to transport the sand from SBOBA to the pump-out equipment and back to the SBOBA. The remaining time is used for other work associated with the dredging equipment, but does not involved actual movement of the dredge vessel. This other work includes such tasks as: connecting and disconnecting the dredge to the pump-out equipment; and the transfer of sand from the dredge through the pump-out equipment into the project area. Typically, dredging operations occur 24 hours per day, but can vary depending on weather conditions and equipment break-down.

c. Since there has been evidence of unexploded ordnance (UXO) mined along with the sand at the SBOBA (USACE-WES 1996), and because of the danger to human safety posed by these objects if taken directly into a hopper dredge, dredging equipment utilizing suction heads (i.e., draghead of a hopper dredge) are equipped with UXO screens, which are longitudinal bar screens that typically have an opening of 1.25 - 1.5” x 6”. The dimensions of the screen bars are designed and constructed in a manner to maximize the total open area of the suction head through which sand can be dredged and maximize the hydraulic transport efficiency of the draghead.

d. The approximate and typical transit speed during the nourishment projects operating in the SBOBA to Raritan Bay are expected to be: 9.8-10.8 mph (8.5-9.4 knots) between the borrow area to Raritan Bay; and 2-3 mph (1.7-2.6 knots) while dredging. The area of SBOBA to be impacted by the dredge would be approximately 46 acres, with an average of 5.5 feet of dredged material to be removed.

2. <u>Beach Renourishment</u>: Dune integrity would be ensured by a beach cross-section seaward of the dune through periodic nourishment beginning approximately 10-years after initial construction and continuing at 10-year intervals for 40 years after initial construction; the interval can be shorter or longer depending on the project conditions over time. The estimated amount of sand for re-nourishment would be 95,200 CY per event and the source of sand would be upland. Sand would be transported via truck to the site.

   a. <u>Groin Construction</u>: Construction of one 305 ft-long stone terminal groin at the western end of the dune line. The groin would extend approximately 280 feet from the existing mean high water mark and approximately .57 acres of benthos would be affected by the footprint of the groin. Median armor stone size of approximately 6 tons would be used to construct the onshore and offshore portions of the structure. The cross-section consists of one layer of 6-ton median armor underlain by two layers of 1200 lb. median underlayer stone, underlain by a 1 ft thick layer of 60-lb. median bedding stone on top of geotextile. The stone placement method would not be dictated in the contract for the project. It is possible for the Contractor to begin construction of the groin at the furthest point from the shoreline using a barge and tugboat; alternatively, they may choose to begin construction from the landward side. If the landward side is chosen, typically all construction equipment would be initially placed on land and then on top of the partially constructed groin to continue building the structure. Potential equipment in both cases could include cranes, front end loaders, barge, tugboat or dozers. If constructed from the water, a crane mounted barge and excavator with a tugboat could be used to place the stones. Since the stones have to be placed in a precise manner and shape to meet the design of the structure (see sheets C-302-303), and to avoid fracturing the rock, the speed of equipment (tugboat/barge, and equipment used to place the stones from land or water) should be minimal. Additionally, since the stones stretch continuously along the groin structure, the barge/tugboat speed would be very slow while relocating to a new position to place new layers of stones. Once the contract is awarded, more specific details would be available.

   b. The groin would provide efficient transition from placed beach fill to the existing shoreline; reduce beach fill erosion rates: and reduce quantity of channel infilling and therefore the frequency of future dredging.

3. Fishing Pier Construction: Modifications to an existing timber fishing pier including a new ADA compliant access ramp and a 195 linear foot extension to the seaward end of the fishing pier to offset loss of water depth at the end of the pier due to placement of fill material.
   a. Per NJ DEP and NOAA-Sandy Hook requirements, all waterfront structures shall be constructed of non-polluting materials, such as plastic, natural cedar, or other untreated wood, concrete or other inert products.
   b. The method for placing the wood piles supporting the pier into the sediment would not be dictated in the contract for the project. The contractor will likely propose (bid) the method most cost effective for this aspect of the project. However, according to the District's Engineers, the most likely technique to be utilized would be to water jet/push the piles into place. Jetting using a pressurized water source could be used to install the piles via land and water. Jetting could be completed via land up to approximately 5-6 feet. A barge with a tugboat could be used beyond approximately 5-6 feet, which is the minimum depth these types of vessels need to safely navigate. The barge/tug would be stationary except when relocating to a new position to reach a new set of timber pile installation points. The speed of the tugboat/barge would be very minimal since the installation points are only 10 feet apart. Hammering/pile driving the wood pile is unlikely because the sand would compact under the pile and may cause it to split or break. Once the contract is awarded, more specific details would be available.
4. Pedestrian Walkover: Construction of two gravel surface pedestrian dune walkover.
5. Vehicular Walkover: Construction of two gravel surface vehicular dune crossover.

Through the contracting process, the mechanism in which the project components are built are not dictated by the District to the Contractor. In general, it is up to the Contractor to decide what equipment will be used and when the equipment will be deployed to accomplish the work. However, the District has developed an example of a potential **scenario** for this project, based on the assumption that the groin would be constructed prior to sand placement:

- Groin Construction – it is possible that the groin may be constructed prior to sand placement. In this case, starting in March 2014, the District estimates months 1-2 could be utilized for mobilization of equipment and to purchase the stone for the groin structure. Months 3-6 could be used to build the groin structure, with demobilization occurring in month 7.

- Dredging of Sand at SBOBA with placement of sand at Port Monmouth (to include sand replenishment at the beach, plus dune and berm construction): Mobilization of equipment could occur in months 6-7, with sand placement, dune and berm construction occurring in months 8-12. It is estimated that it would take approximately 65 days to dredge the material and place at the project site. Month 13 may be used for demobilization of equipment.
- Fishing Pier Construction Modification - mobilization of equipment could occur in month 6, with construction efforts occurring in months 7-9. Demobilization could occur in month 10.

In summary, the total amount of beach fill required for the Shore Protection construction events are as follows:

Projected Construction Year	**Estimated Beach Fill Quantity (CY)***	**Source of Sand**
Initial Construction – 2013	391,000	SBOBA
10 Years Post Initial Construction	95,200	Upland (trucking)
20 Years Post Initial Construction	95,200	Upland (trucking)
30 Years Post Initial Construction	95,200	Upland (trucking)
40 Years Post Initial Construction	95,200	Upland (trucking)
TOTAL	**771,800**	

Table 1: Estimated dredged quantities for Port Monmouth beach fill.
*Quantities based on surveys from April 2011 and would be updated prior to construction.

The second component of the project, Flood Risk Management, is currently scheduled for construction in 2014. This phase includes a system of levees and floodwalls to extend continuously from a levee in adjacent East Keansburg, NJ, across Pews Creek, to connect with the shore protection segment along the bay shore, and then along undeveloped lands adjoining Compton Creek to higher existing elevation (USACE-NYD 2000). Most features for this phase would be on land and would not impact threatened and endangered species outlined in this BA, except for a sector gate at Pews Creek. The gate would have a 40 ft width opening and would be 21 ft in height. The gate would be constructed across Pews Creek about 91.5 m (300 feet) south of the Pews Creek Bridge (e.g., where Port Monmouth road crosses the creek). This location is approximately 535 m (1,755 feet) from where the creek spills into Raritan Bay. The gate would connect to a concrete pile supported T-wall on the east side of Pews Creek for about 150 feet where it would join the existing Keansburg levee. Sheet piling may be used to support the gate. When a flood event is imminent, the gate would be closed and a bypass pump would divert Pews Creek flow into the Sandy Hook Bay. See Figure 3 for the approximate location.

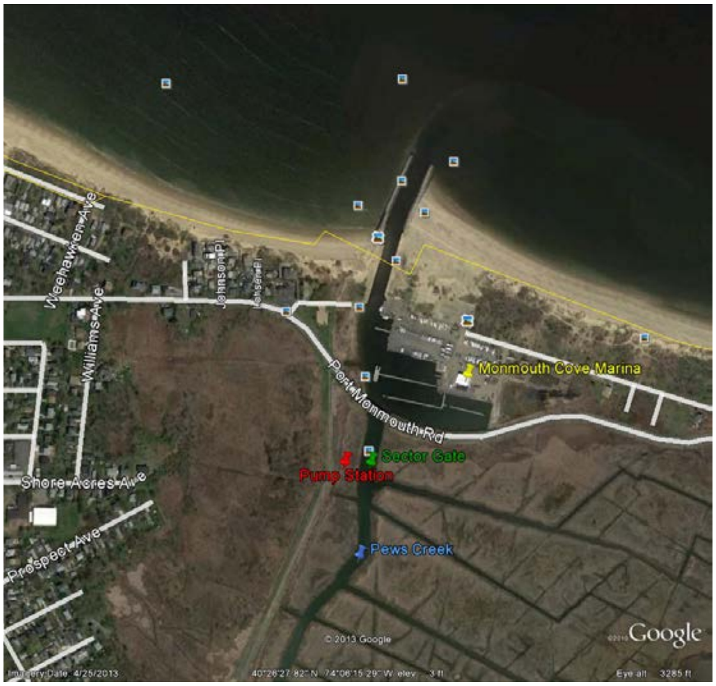

Figure 3: Approximate Locations for the Proposed Sector Gate and Pump Station.

2.2 ELBERON TO LOCH ARBOUR

The Elberon to Loch Arbour project is one designated reach within the larger 21 mile beach erosion control project that ranges from Sea Bright to Manasquan Inlet, NJ. The project provides beach erosion control and storm damage risk reduction to the highly populated communities and infrastructure located along this area of the NJ shoreline. Elberon to Loch Arbour is the only reach that has not been constructed because prior to Hurricane Sandy the property owners were not willing to provide easements; however, this is currently being re-visited.

The entire project was authorized under the River and Harbor Act of July 3, 1958, as modified by Section 854 of the Water Resources Development Act of 1986 (PL99-662), and further modified by Section 4 of the Water Resources Development Act of 1988 (PL100-676) and Section 102 (r) of the Water Resources Development Act of 1992 (PL102-580) but never constructed, characterizing it as an authorized but not constructed project, in accordance with DRAA. A Record of Decision was prepared in 1990 to meet NEPA requirements for projects from Sea Bright to Ocean Township and included Elberon to Loch Arbour; this project was also included as part of the Sandy Hook to Manasquan portion of the 1995 BO. An Environmental Assessment will be prepared to update NEPA requirements for the Elberon to Loch Arbour portion.

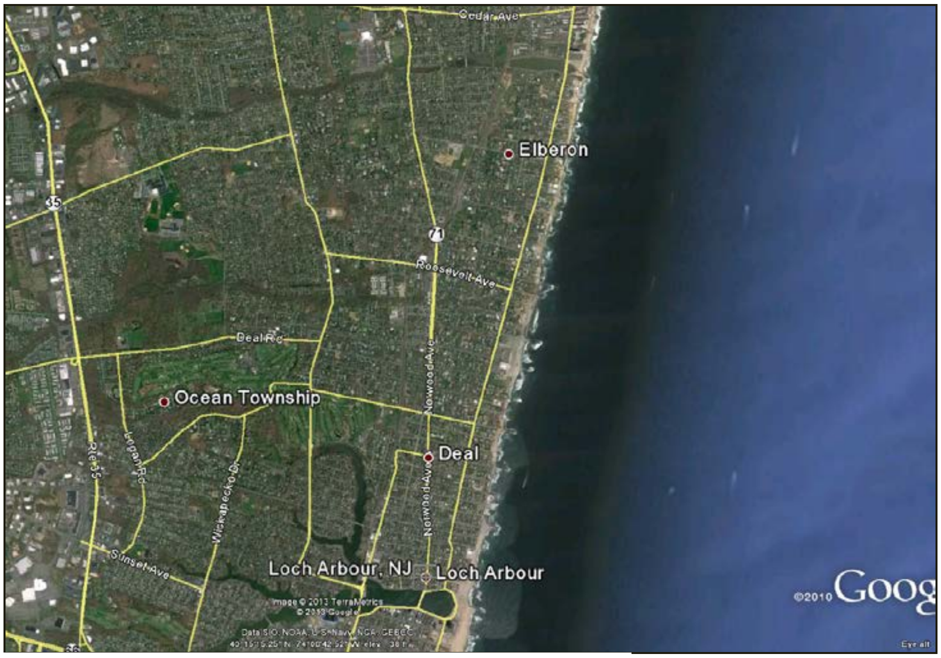

Figure 4: Elberon to Loch Arbour, Monmouth County, NJ

The Elberon to Loch Arbour project area covers approximately 3.5 miles from Lake Takanesee to Deal Lake. The construction schedule, as of October 2013, shows a contract award in early September 2014; dredging operations would not commence until the contractor mobilizes equipment, which typically takes 1-2 months after award. Construction would last for approximately 12-16 months (including both sand placement and outfall extensions). However, the project schedule and duration could change based on Contractor issues, inclement weather, equipment failure, and other unforeseen circumstances. The features of the project include:

1. Beach Nourishment and Sand Berm: Dredging of approximately 4,450,000 CY of sand would occur at the SBOBA via a hopper dredge equipped with a UXO screen. The sand would be placed along approximately 17,000 linear feet of shoreline, and would include construction of a 100 foot wide berm at an elevation of 10 feet above MLW with a 2 foot high storm berm cap.
    a. It is anticipated that the transport of the sand from the borrow area to the shoreline for pumpout would follow a similar process as described for Port Monmouth, including vessel speed and use of a UXO screen (see Section 2.1). Like Port Monmouth, dredging operations typically last 24 hours per day and include dredging of sand at SBOBA, transport of sand to the pump-out station, pumping sand onto the project area, and other tasks.
    b. Like the Port Monmouth project, the duration and details of the actual dredging operation would vary depending on the Contractor and equipment available. At this stage in the project, the area of SBOBA to be impacted by the dredge and the average number of feet of dredged material to be removed is unknown.
2. Beach Renourishment: The renourishment cycle is every 6 years for 50 years at an expected volume of 1,298,000 CY of sand per cycle (GDM).
3. Groin Construction: six existing stone groins within this reach of the project area would be notched to allow for sediment transport and to prevent sediment impoundment Notching involves removing a portion of the landward end of the groin such that water and sediment can follow its natural long shore flow and deposition patterns. It is

accomplished by land based heavy equipment, such as front loaders and cranes. Rocks from the groins are simply removed from the line of the groin and placed elsewhere, usually along side of the groin at the beach side of the “notch”. It is very shallow water, the equipment moves slowly, and most of the activity is land based.

4. Outfall Pipe Extensions: Since pipe plugging and trenching can occur from fill covering the pipe outfall, fourteen storm water outfalls will be extended beyond the construction template (final number of extensions may change based upon final construction template). Outfall extensions are to be supported by timber crib structures or a similar type structure fabricated from composite materials. The cribbing and outfall extensions would be constructed after the sand fill is placed under the pipe alignment. This allows for completion of pipe extension before placement of final grades of the pipe. The exact construction methods will be determined by the contractor, however it is possible that operations would consist of driving piles to anchor the cribs and placing and securing the outfall pipe. This operation will also take place in near shore waters. Construction in the landward (shallowest) sections of the pipe alignment will be done with land based equipment. For the outfall alignments that extend further seaward into subtidal areas it is possible that barge based equipment may be utilized. Although it has not been finalized at the time this document was developed, the District anticipates that some of the outfall work will begin as early as September 2014. All outfalls would not be constructed at once and would be sequenced throughout the overall beach construction schedule.

In summary, the total amount of beach fill required from the SBOBA for the construction and maintenance of Elberon to Loch Arbour is as follows:

Projected Construction Year	**Estimated Beach Fill Quantity (CY) from SBOBA***
Initial Construction – 2014	4,450,452
6 Years Post Initial Construction	1,298,000
12 Years Post Initial Construction	1,298,000
18 Years Post Initial Construction	1,298,000
24 Years Post Initial Construction	1,298,000
30 Years Post Initial Construction	1,298,000
36 Years Post Initial Construction	1,298,000
42 Years Post Initial Construction	1,298,000
48 Years Post Initial Construction	1,298,000
TOTAL	**50,438,068**

Table 2: Estimated dredged quantities for Elberon to Loch Arbour beach fill.
*Quantities would be updated prior to construction.

2.3 UNION BEACH

Union Beach is a residential community that occupies a 1.8 square miles area of land, including approximately 3,000’ of project shoreline along the coast of Raritan Bay, NJ. Union Beach is bordered by the Borough of Keansburg to the east and Chingarora Creek to the west. Construction of the Union Beach project was authorized in the Water Resources Development

Act of 2007 (Public Law 110-114) on November 8, 2007. However, Union Beach remains an authorized but unconstructed project under DRAA.

A Draft BA was completed for impacts to sea turtles for Beach Renourishment and Offshore Borrowing in the Raritan Bay Ecosystem, including an evaluation of Union Beach in 2001 (USACE-NYD 2001A). In addition, a final Feasibility report and Environmental Impact Statement (EIS) were approved and released to the public in January 2004. The report recommended implementation of a storm damage reduction project consisting of a combination of levees and floodwalls, tide gates, pump stations and a dune and beach berm with terminal groins. The project would also construct wetland mitigation sites to mitigate for the loss of wetlands. The final feasibility report and EIS were approved by Corps of Engineers Headquarters on January 4, 2006. The Record of Decision for the EIS was finalized in July 2008. In coordination with State and Borough representatives the Corps of Engineers began moving forward with the Preconstruction, Engineering and Design (PED), which was underway when the project area was struck by Hurricane Sandy in late October 2012. Figure 4 presents the recommended plan for Union Beach intended to provide protection against hurricane and storm damage, as well as shoreline erosion and wave attack along the Raritan Bay shoreline.

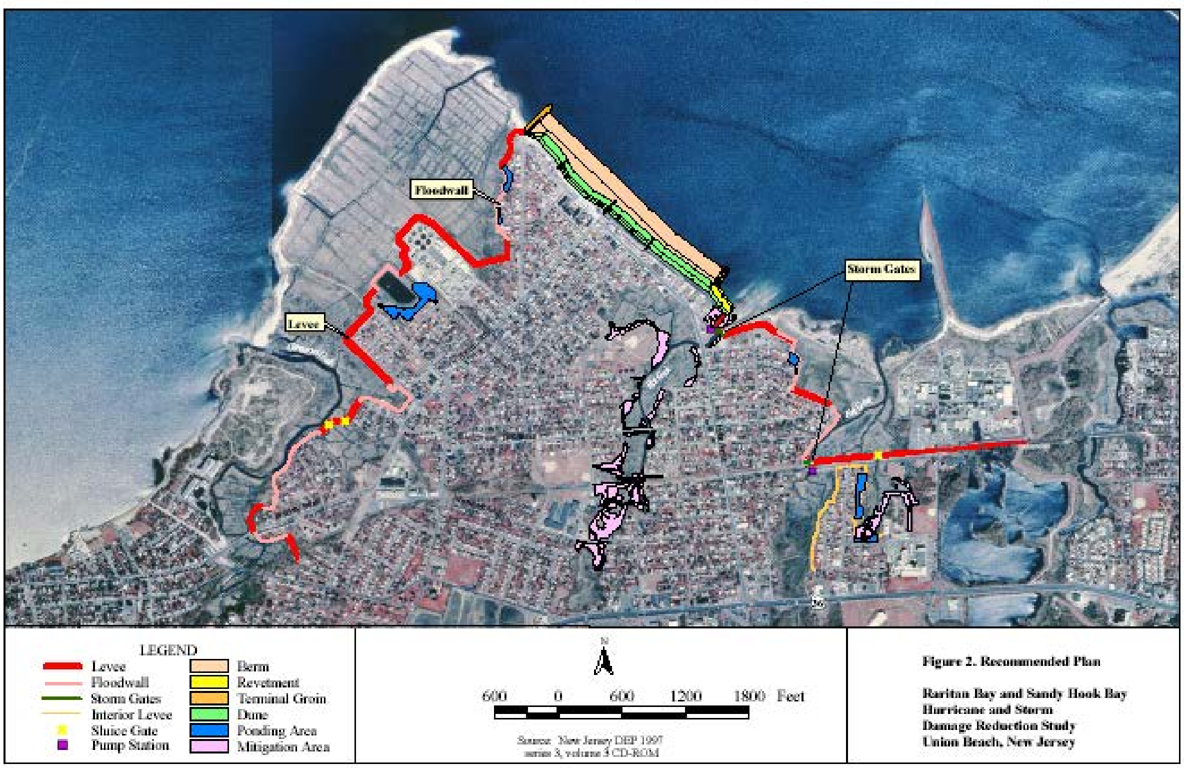

Figure 5: Location of the recommended plan for Union Beach

The significance of the damages caused by Hurricane Sandy requires re-visiting the engineering design of the recommended plan and applying the latest flood stage frequency curves. It is assumed that the project would continue with the recommended plan as determined before Hurricane Sandy and as described below. However, if details in the recommended plan for Union Beach change enough to influence this BA, the USACE would continue the on-going coordination with the NMFS.

The Union Beach project consists of the following three elements:

1. A levee/floodwall along Chingarora Creek. The **Chingarora Creek element** consists of a levee and floodwall alignment starting near the intersection of Florence Avenue and Bank Street and ending at the northwestern end of the shorefront element. Closure gates are provided at the Chingarora tributary and Broadway Avenue, and drainage structures are intended to provide interior drainage of runoff.
2. Beach nourishment along the Raritan Bay shoreline. The **Shorefront element** consists of a beach and dune incorporating terminal groins with adjoining revetments stretching from the Chingarora Creek levee/floodwall alignment to the southeastern limit of the dune that ties into the levee alignment near Flat Creek. The dune generally follows the shoreline and extends bayward along the existing bulkhead and beach.
3. A levee/floodwall along Flat and East Creeks. The **Flat Creek/East Creek element** consists of a floodwall and levee alignment that begins at the southeastern limit of the shorefront element and ties into the existing Keansburg levee at the eastern end of the project limits. A small interior levee is proposed for the low lying area between East Creek and an unnamed East Creek tributary. Drainage structures are included to provide interior drainage of runoff, and closure gates are proposed at Flat Creek, East Creek, and the East Creek tributary.

The construction schedule and project phasing for the recommended plan are currently under development. Current estimates (October 2013) have award scheduled for August 2014, with construction to be completed in approximately 2 years for all project components (beach nourishment and interior drainage); this may or may not include one continuous contract. The schedule and project duration could change based on contractual issues, inclement weather, equipment failure or other unforeseen circumstances. The USACE would continue the on-going coordination as details are developed, including construction timing and duration of the beach berm, dune, revetments, and terminal groins.

Since beach nourishment is a component of the proposed project in the shorefront element, impacts to the nearshore shallows of Raritan Bay and the offshore borrow area are addressed in this BA. Except for the storm surge barriers within the levees/floodwalls element, all other structures would be built on land and therefore do not require analysis in this BA. Fill material for the levees/floodwalls of the Flat Creek/East Creek element would require fill material sourced from a quarry.

The shorefront element of the Union Beach project includes the following components. Note that fill material quantities will be updated based on new surveys:

1. Construction of 3,160 ft of beach berm and dune system using sand from the existing SBOBA. The dune would be at 17 feet NGVD with a 50-foot-wide crest extending down to the 9 feet NGVD berm elevation. The width of the berm would range from 15 m (50 feet) near the two terminal groins to a maximum of 50m (164 feet) between Beach Street and Florence Avenue. The beach and dune are designed to contain 688,000 CY of fill, including advance fill, overfill, and tolerance. The dune section would be stabilized with dune grass and fencing, and three wood overwalks would be constructed to protect dune vegetation and provide public access to beach areas. In addition, a walkway connecting the overwalks would run along the crest of the dune to provide views of the bayfront. It is

anticipated that the transport of the sand from the borrow area to the shoreline for pumpout would follow a similar process as described for Port Monmouth (see Section 2.1), including duration of the trip, use of a UXO screen, vessel speed, and example described for Keansburg, which is approximately 2 miles east of Union Beach.

2. Construction of a 228-foot eastern terminal groin with an associated 630-foot revetment and a 245-foot western terminal groin with a 405-foot revetment. The heads of the groins will be constructed of 4-ton quarry stone placed over 2 to 40 lb core and bedding stone. The trunks of the groins will be constructed of 11-ton quarry stone and 2,200 lb underlayer stone placed of 6 to 110 lb core and bedding stone. The armor layers and underlayers will be two units thick. The bedding layers will be two feet thick. The total amount of acreage of benthos to be affected by groin placement would be .09 acres. The groin construction method described for Port Monmouth in Section 2.1 also applies to this project.
3. Beach nourishment every 9 years after initial construction, continuing for 50 years.

The levees/floodwalls along Chingarora Creek element and the Flat Creek/East Creek elements include the following components:

1. Construction of 3,313 m (10,870 feet) of levees at 15 feet NGVD and 1,033 m (3,388 feet) of interior levees at 2.5 m (8 feet) NGVD, requiring 85,500 CY of fill.
2. Construction of 2038 m (6,885 feet) of floodwalls with a top elevation of approximately 15 feet NGVD.
3. Construction of interior drainage features including 11 primary and 37 secondary interior drainage structures within the levee footprint to allow for drainage during normal conditions. The selected plan also includes three pump stations (40 cfs, 100 cfs, and 250 cfs capacity), six 6-ft by 6-ft sluice gates, raising of 580 ft of existing roads, and approximately 4.61 acres of ponding areas.
4. Construction of two primary swing storm surge barriers (across Flat Creek and East Creek) with pump stations that would be utilized to remove excess water from interior drainage areas during storm events when the drainage structures and storm gates are closed.

Construction of the beach and dune section would be accomplished by utilizing fill from the SBOBA. The shorefront element requires 688,000 CY of initial fill to be placed from the SBOBA including 18,000 CY of advance nourishment, and 21,000 CY of fill trucked from documented upland sites every nine years (five nourishment cycles) thereafter for 50 years. The construction of the levees requires 85,500 CY of fill that would be sourced from a quarry.

In summary, the total amount of beach fill required per Shore Protection construction event for the Union Beach project is listed in the table below. Please note the quantity of fill material will be updated based on a new survey. The nourishment cycles post-initial construction are projected to utilize sand sources from upland areas.

Projected Construction Year	**Beach Fill Quantity (CY)***	**Total SBOBA source (CY)**	**Total Upland source (CY)**
Initial Construction – date TBD	688,000	688,000	0
Advance Nourishment – date TBD	18,000	18,000	0

9 Years Post Initial Construction	21,000	0	21,000
18 Year Post Initial Construction	21,000	0	21,000
27 Years Post Initial Construction	21,000	0	21,000
36 Years Post Initial Construction	21,000	0	21,000
45Years Post Initial Construction	21,000	0	21,000
TOTAL	**811,000**	**706,000**	**105,000**

Table 3: Projected beach fill quantities and sand sources for the Union Beach project.
*Quantities would be updated based on a new survey.

3.0 HISTORY OF HOPPER DREDGING PROJECTS WITH THREATENED AND ENDANGERED SPECIES OBSERVERS

Numerous hopper dredging projects have been completed by the District in this area to deepen or maintain navigation channels and for borrowing sand to source beach nourishment projects. Table 4 shows a list of completed the District's hopper dredging projects that had a certified threatened and endangered species observer onboard, as well as recent dredging projects from the New England District (NED). Project and observer data from the NED and District were grouped because sea turtle ecology including abundance is regionally similar but distinct from USACE Districts south of NY/NJ. The dredged quantities in Table 4 are based on dredging that occurred during May 1 through November 15[2] during the year(s) of operation. Since the recent 2012 listing of Atlantic sturgeon, the table also includes dredged quantities for the Harbor Deepening Project (HDP) following the October 2012 BO requirement to including monitoring for Atlantic sturgeon take. In the cases where monthly quantities were not available, an average monthly quantity was calculated over the life of the project and multiplied by the number of months that dredging occurred during the turtle season to determine the total dredged quantity. It is important to note that for all the projects monitored in Table 4, only one take of a threatened turtle has ever been recorded for a total of approximately 22.5 million CY dredged from 1993 – 2013.

Project Name or Location	Year(s) of Operation	Project Type	Dredged Quantity during Turtle/Sturgeon Season (CY)	Turtle/ Sturgeon Take?	UXO Screen?
S-AM-3a	2011-2012	Channel Deepening	1,906,635	No	Yes
S-AM-3b	2011-2013	Channel Deepening	1,844,840	1 sub-adult Atlantic Sturgeon	Yes
Sandy Hook, NJ	October 2008	Maintenance Channel Dredging	3,138 (this represents one load from channel to HARS)	Sturgeon (species not identified)*	Unknown
S-AM-1, Ambrose Channel	2006 – 2008	Channel Deepening	2,449,038	No	Yes

[2] *Turtles are known to be present in the NY/NJ area from June through October. NMFS monitoring requirements extend from May 1 through November 15.*

S-AM-2b, S-AN-1B, Ambrose and Anchorage Channels	2009 – 2010	Channel Deepening	827,615	No	Yes
Buttermilk Channel, NY	2000	Maintenance Channel Dredging	95,000	No	Unknown
Buttermilk Channel, NY	2005	Maintenance Channel Dredging	78,000	No	Unknown
Westhampton, NY	1993	Beachfill	1,455,071	No	No
Westhampton, NY	1996	Beachfill	2,518,592	No	No
Westhampton, NY	1997	Beachfill	884,571	No	No
East Rockaway, NY	1995	Channel Deepening/ Maintenance	412,000	No	No
East Rockaway, NY	1996	Beachfill	2,685,000	No	No
East Rockaway, NY	2002	Channel Deepening/ Maintenance	140,000	No	No
Sea Bright, NJ	1996	Beachfill	2,058,333	No	Yes
Asbury, NJ	1999 – 2000	Beachfill	1,268,182	No	Yes
Kennebeck River, New England	2003	Maintenance Channel Dredging	57,469	No	No
Kennebeck River, New England	2003	Emergency Channel Dredging	22,310	No	No
Asbury Park, NJ	1997	Beachfill	3,758,333	1 Loggerhead	Yes

Table 4: Hopper Dredging Projects with sea turtle and Atlantic sturgeon take based on dredged quantity in the NY, NJ and New England region.
** Found in turtle cage during dredged material inspection and was noted on the disposal log sheets from Dredged Material Inspectors, who accompany all vessels disposing dredged material at the HARS. Dredging was East of Sandy Hook between coordinates: 40.41087, -73.88474 to 40.41080, -73.88464.*

4.0 SPECIES OF CONCERN: ATLANTIC STURGEON (*Acipenser oxyrinchus oxyrinchus*)

4.1 GENERAL ATLANTIC STURGEON INFORMATION

NMFS has determined that Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) is comprised of five distinct population segments (DPSs) that qualify as listed species under the ESA: Gulf of Maine (GOM), NY Bight (NYB), Chesapeake Bay (CB), Carolina, and South Atlantic. The Northeast Region of NMFS has listed the GOM DPS as threatened, and the NYB and CB DPSs as endangered. The proposed shore protection projects covered in this BA fall within the boundaries of the NYB population, although the marine range for all DPSs extends from Canada to Florida (NMFS 2012C) and it is therefore possible that any DPS may be present in/around the project areas.

The 2012 HDP BO (NMFS 2012A) contains a detailed outline of known Atlantic sturgeon life history characteristics and is incorporated by reference in this BA. A summary of the most relevant information to the proposed projects is provided in this document.

Atlantic sturgeon are anadromous, spending the majority of their adult phase in marine waters, migrating up rivers to spawn in fresh water and migrating to brackish waters in the juvenile growth phases (Bain 1997).The NYB DPS includes all Atlantic sturgeon whose range occurs in watersheds that drain into coastal waters, including Long Island Sound, the NYB, and Delaware Bay, from Chatham, MA to the Delaware-Maryland border on Fenwick Island. Within this range, Atlantic sturgeon have been documented from the Hudson and Delaware Rivers as well as at the mouth of the Connecticut and Taunton Rivers, and throughout Long Island Sound, (ASSRT 2007, as cited by USACE-NAP 2011).

There is little information on the behavior of the sturgeon in marine waters (Bain 1997). More recently, attention is being focused on understanding how oceanic habitat is used by migrant Atlantic sturgeon (Dunton et al. 2010, Erickson et al. 2011). By examining five fishery-independent surveys of Atlantic sturgeon, Dunton et al. (2010) determined potential coastal migration pathways for northerly summer and southerly winter migrations. Although Atlantic sturgeon are highly migratory, primary juvenile habitat and migrations are limited to narrow corridors in waters less than 20 m deep (Dunton et al., 2010). A hotspot of juvenile Atlantic sturgeon captures was found in waters less than 20 m along the eastern side of Sandy Hook, NJ and off of Rockaway, NY. The authors suggest that depth restricts movements, aggregations are related to food availability, and movement is triggered by temperature cues.

The Hudson River population of Atlantic sturgeon is one of two U.S. populations for which there is an abundance estimate (approximately 870 spawning adults/year, 600 males and 270 females; Kahnle et al. 2007) and it is considered one of the healthiest populations in the U.S. (ASSRT 2007). The Hudson River is the most significant spawning system within the NYB DPS (Erickson et al. 2011).

Adult females migrate to spawning grounds, which are deep, channel or off-channel habitats within the Hudson River Estuary starting in mid-May (Dovel and Berggren 1983), spawn from May through July or possibly August, and return to marine habitat the following fall (Dovel and Berggren 1983, Van Eenennaam et al. 1996). Mature males are present in the Hudson River from April to November (Dovel and Berggren 1983) and appear at spawning sites in association with females, suggesting they search for females while moving about in the river (Van Eenennaam et al. 1996).

4.2 DISTRIBUTION OF ATLANTIC STURGEON IN AND AROUND THE PROJECT AREAS – NEW YORK DISTRICT SURVEYS

As part of a project specific Aquatic Biological Survey (ABS) conducted by the District, there have been several sightings of sturgeon in Upper, Lower and Raritan Bays. From 1998 through 2011, bottom trawl surveys were conducted as part of the HDP from December to June. Throughout the 13-year sampling period, two Atlantic sturgeon were captured (Table 5). The first Atlantic sturgeon was captured in June 2005 at a non-channel station in the Upper Bay. It measured 790 mm total length and presumably was a late juvenile (Table 5). The other Atlantic sturgeon captured in the ABS surveys was 638 mm total length (an intermediate juvenile, Table 3) and was captured in December of 2009 at a channel station in the Lower Bay.

Bottom trawl surveys were also conducted in the fall of 2008 near the approach to

Ambrose channel in Lower Bay as part of an investigation of a navigational hazard. Two Atlantic sturgeon were captured in October 2008 (Table 5). The first Atlantic sturgeon measured 1,220 mm and the second measured 1,180 mm.

Another extensive Biological Monitoring Program was conducted by the District for the Atlantic Coast of NJ (USACE-NYD 2001B). A total of 300 tows were made during spring and fall 1995-1999. During this program, only 2 sturgeon were captured.

Observations of Atlantic sturgeon during the District's biological sampling programs and random sightings aboard USACE vessels are summarized in Table 5. Throughout these investigations, only 6 Atlantic sturgeon were observed over 17 years (1995-2011).

Species	**Date**	**Location**	**Length**	**Data Source/Comments**
Sturgeon (species not identified – may be a shortnose or Atlantic)	September 2010	1 1/2 miles south of the Verrazano Bridge and 1/2 mile east of Hoffman Island near coordinate 40.57917, -74.04017	42"- 48" long (estimate)	Injured sturgeon (head injury) spotted by USACE vessel while conducting routine drift patrol
Atlantic sturgeon	December 2009	Lower Bay(chapel hill south channel)	638 mm	HDP ABS program
Atlantic sturgeon	October 2008	Lower Bay near approach to Ambrose Channel (between 40.457833, -73.89633 and 40.46117, -73.90267	1220 mm	Investigation near navigational obstruction
Atlantic sturgeon	October 2008	Lower Bay near approach to Ambrose Channel (between 40.457833, -73.89633 and 40.46117, -73.90267	1180 mm	Investigation near navigational obstruction
Sturgeon (species not identified – likely Atlantic based on habitat requirements)	October 2008	East of Sandy Hook between coordinates: 40.41087, -73.88474 to 40.41080, -73.88464	not recorded	Found in turtle cage during dredged material inspection. Noted on disposal log sheets from Dredged Material Inspectors, who accompany all vessels disposing dredged material at the HARS)

Species	Date	Location	Length	Data Source/Comments
Atlantic sturgeon	June 2005	Port Jersey (east of Liberty Golf Course)	790 mm	HDP ABS program
Sturgeon (species not identified - may be a shortnose or Atlantic)*	October 1998	Port Jersey (adjacent and east of Global Marine Terminal)	not recorded	HDP ABS program
Atlantic sturgeon	1995-1998	Not recorded	Not recorded	Biological Monitoring program, Atlantic Coast of NJ: Asbury Park to Manasquan
Atlantic sturgeon	1995	borrow area (BBA-5), between Belmar and Manasquan	Not recorded	Biological Monitoring program, Atlantic Coast of NJ: Asbury Park to Manasquan

Table 5: Sturgeon observations in and around the New York District's AOR

4.3 FOOD RESOURCES

Overall, sturgeon appear to feed indiscriminately throughout their lives (Bigelow and Schroeder 1953, Vladykov and Greeley 1963, Murawski and Pacheco 1977, van den Avyle 1984, as cited by Gilbert 1989) and are generally characterized as bottom feeding carnivores (Bain 1997). Adult Atlantic sturgeon feed on polychaetes, oligochaetes, amphipods, isopods, mollusks, shrimp, gastropods, and fish (Johnson et al. 1997, Haley 1998, Bigelow and Schroeder 1953, Vladykov and Greeley 1963, Smith 1985b, as cited in Gilbert 1989).

5.0 GENERAL FACTORS THAT MAY AFFECT ALL DISTINCT POPULATION SEGMENTS OF ATLANTIC STURGEON

As described in Section 4.1, five Distinct Populations Segments (DPS) of Atlantic sturgeon were listed as threatened or endangered under the Endangered Species Act, including a New York Bight DPS. Known spawning populations for the New York Bight DPS exist in two rivers: the Hudson and Delaware Rivers. However, since the marine range for all DPSs extends from Canada to Florida (NMFS 2012C), this assessment is applicable to all DPSs. In the Hudson River estuary, spawning, rearing, and overwintering habitats were reported to be intact by Bain (1997), supporting the largest remaining Atlantic sturgeon stock in the U.S., however, a population decline from overfishing has also been observed for this area (Bain 1997, Bain 2001, Peterson et al. 2000). This section describes the general factors that may affect Atlantic sturgeon, many of which are not relevant to the projects assessed in this BA. However, this section is included to demonstrate the variety of threats to Atlantic sturgeon, most of which pose greater challenges to the species than the projects assessed in this BA.

Like all anadromous fish, Atlantic sturgeon are vulnerable to various impacts because of their wide-ranging use of rivers, estuaries, bays, and the ocean throughout the phases of their life. General factors that may affect Atlantic sturgeon include: dam construction and operation; dredging and disposal; and water quality modifications such as changes in levels of dissolved oxygen (DO), water temperature and contaminants (ASSRT, 2007, as cited by USACE-NAP 2011). Atlantic sturgeon also exhibit life history characteristics that make them particularly vulnerable to population collapse from overfishing (Boreman 1997, as cited by Bain 1997), including: "advanced age and large size at maturity, eggs that are numerous and small in relation to body size, and spawning that is episodic and seasonal" (Winemiller and Rose 1992, as cited by Bain 1997). Other threats to the species include vessel strikes.

Dredging in riverine, nearshore and offshore areas has the potential to impact aquatic ecosystems by removal/burial of benthic organisms, increased turbidity, alterations to the hydrodynamic regime and the loss of shallow water or riparian habitat (which is not within the habitat being assessed in this BA). Hydraulic dredges can directly impact sturgeon and other fish by entrainment in the dredge (ASSRT 2007, as cited by USACE-NAP 2011). According to Smith and Clugston (1997, as cited by USACE-NAP 2011), dredging may also impact important habitat features of Atlantic sturgeon if these actions disturb benthic fauna, or alter rock substrates (which does not occur in the project areas). Indirect impacts to sturgeon from either mechanical or hydraulic dredging include the potential disturbance of benthic feeding areas, disruption of spawning migration, or detrimental physiological effects of resuspension of sediments in spawning areas.

Atlantic sturgeon have been harvested for years. Many authors have cited commercial over-harvesting as the single greatest cause of the decline in abundance of Atlantic sturgeon (Ryder 1890, Vladykov and Greely 1963, Hoff 1980, ASMFC 1990, and Smith and Clugston 1997, as cited in ASSRT 2007 and USACE-NAP 2011). Even though the fishery has been closed coast-wide since 1995, poaching of Atlantic sturgeon continues and is a potentially significant threat to the species, but the magnitude of the impact is unknown (ASSRT 2007, as cited by USACE-NAP 2011).

Although little is known about natural predators of Atlantic sturgeon, there are several documented fish and mammal predators, such as sea lampreys, striped bass, common carp, minnow, smallmouth bass, walleye, grey seal, and fallfish (ASSRT 2007). There are some concerns that predation may adversely affect sturgeon recovery efforts in fish conservation and restoration programs, and by fishery management agencies (Brown et al. 2005, and Gadomski and Parsley 2005, as cited by ASSRT 2007; ASSRT 2007). However, further research is needed on predation affects on Atlantic sturgeon.

Atlantic sturgeon may compete with other bottom feeding species for food, although there is "no evidence of abnormally elevated interspecific competition" (ASSRT 2007), and it has been suggested by van den Avyle (1984, as cited by Gilbert 1989) that "non-selective feeding of juvenile and adult sturgeons may reduce the potential for competition with other fish species".

6.0 POTENTIAL PROJECT IMPACTS TO ATLANTIC STURGEON

The following sections (5.1 – 5.2) discuss the potential direct and indirect dredging impacts to Atlantic sturgeon from beach nourishment activities at Elberon to Loch Arbour, Union Beach and Port Monmouth. Potential impacts for all three projects at the SBOBA are addressed as one assessment (Section 5.1), while potential impacts at the placement sites (Section 5.2) are broken into Raritan Bay (Union Beach and Port Monmouth) and the Atlantic Coast (Elberon to Loch Arbour).

6.1 POTENTIAL DREDGING IMPACTS AT THE SBOBA (ELBERON TO LOCH ARBOUR, PORT MONMOUTH AND UNION BEACH)

6.1.1 POTENTIAL PHYSICAL INJURY AND BEHAVIORAL IMPACTS AT THE SBOBA

Direct potential impacts linked to dredging at SBOBA include physical injury or mortality of adult or sub-adult Atlantic sturgeon due to drag head strikes, entrainment or vessel strikes. Other direct impacts may include avoidance behavior due to noise disturbance or impacts associated increased turbidity from re-suspension of sediments. Re-suspension of sediments has the potential to cause respiratory impacts (gill abrasion). There would be no dredging related impacts to spawning activities since the closest known spawning site is in the Hudson River (i.e., km 60 – 148, Dovel and Berggren 1983), which is up-current from the projects and given the substantial spatial buffer, would have no direct impacts to spawning areas from dredging.

It is possible for Atlantic sturgeon to be entrained in a dredge via physical contact with a hopper dredge's drag-arm and impeller pumps. A minimum take of 0.6 Atlantic sturgeon per year in the Atlantic and Gulf coasts was estimated based on hopper dredge takes since 1995 and assuming dredging efforts were relatively similar among years (USACE-NYD 2006, as cited by ASSRT 2007). Dickerson (2006, as cited by USACE-NAP 2011) summarized sturgeon takes from Atlantic and Gulf Coast dredging activities conducted by the USACE between 1990 and 2005, which documented takes of 24 sturgeons (2 – Gulf, 11- Shortnose, and 11-Atlantic). The majority of the interactions were with a hopper dredge: sixteen takes with a Hopper dredge; five takes with a cutterhead dredge; and three takes with a mechanical dredge. Fifteen of the sturgeons were reported as mortalities, eight as alive, and one as unknown. These documented takes occurred during dredging operations in rivers and harbors, mainly in waterways along the eastern coast that, from the map in the report, appear to be more narrow than the wide pathways available to Atlantic sturgeon in the Raritan and Lower Bays and Atlantic Ocean off the coast of NJ (i.e., compared to Delaware River, Savannah Harbor, etc) . However, the risk still exists for Atlantic sturgeon to become entrained in a hopper dredge during mining of sand at the SBOBA. The SBOBA occupies 1.4%[3] compared with the surrounding area, a small percentage of the open

[3] *This percentage was calculated based on the following approximate values: SBOBA area of 5.81 square miles (3,719 acres) vs. Raritan Bay area of 61.6 square miles + Lower NY Bay area of 45 square miles + 10 miles off the coast of Manasquan to the western end of Rockaway area of 300 square miles. Except for the SBOBA, all other values were calculated in Google Earth. Maps of Lower NY Bay and Raritan Bay were outlined based on definition/ maps in Wikipedia.*

water (benthic) habitat available for migration. Although dredging would occur in a small area, this area is relatively close to the Sandy Hook hotspot for juvenile Atlantic sturgeon captures and is potentially within the sturgeon's migratory pathway. Therefore, the District proposes minimization measures outlined in Section 6 to further reduce the risk of entrainment.

Although the ASSRT (2007) reports that dredging activities impact sturgeon by disrupting spawning migrations and through dredge noise disturbance, it does not clearly state what the cause and rationale are for this threat, or specify the type of dredging equipment; however, this seems more relevant to narrow channels and rivers. In the case of the SBOBA, a noisy underwater environment is typical since dredging activities have been ongoing for over 100 years (e.g., for shore protection, and deepening and maintenance of navigation channels), and constant large vessel ship traffic to and from the NY/NJ Harbor is part of the ambient conditions. Despite a noisy aquatic environment (even greater in the harbor), the Hudson River population of Atlantic sturgeon is considered one of the healthiest populations in the U.S. (ASSRT 2007). Therefore, it would appear that Atlantic sturgeon are still finding and utilizing pathways through the NYB, including the Atlantic Ocean off the coast of NJ and potentially through Raritan Bay to reach spawning grounds in the Hudson River. This is likely because the waterways available for migration extending from the mouth of the Hudson River to the marine environment are sufficiently deep enough and wide enough to permit Atlantic sturgeon to avoid potential dredging-related disturbances, including active dredges and any associated noise, and that long-term impacts to their habitat and food source are not adversely affecting the population.

6.1.2 POTENTIAL HABITAT IMPACTS AT THE SBOBA

The potential impacts of dredging to Atlantic sturgeon habitat may include loss of habitat, prey resources and water quality changes. If sturgeon are present during changes to water quality this represents a direct impact while changes to depth, sediment type and prey resources are secondary.

At the SBOBA, there may be the potential for Atlantic sturgeon to be temporarily impacted by water quality changes, such as from increased turbidity and decreased dissolved oxygen content. Significant changes in turbidity due to dredging, such as sediment plumes, have only been observed with mechanical dredges working in areas that contain a majority of fine particles such as muds and clays etc. Hydraulic dredges removing coarse sands, as is the case for the three projects assessed here, have not been shown to create significant turbidty increases. Similarly benthic disturbances that can lead to decreases in dissolved oxygen are related to microbial decay (and respiration) of resuspended organic materials associated with fine sediments. Again, this would not occur with the coarse sands required for beach nourishment.

By definition, beach fill sediment must contain less than 10% fine particles (USACE-NYD 2011), therefore making the dredged sediment a majority of coarser material (sand). Also, hopper dredges draw in sand via suction while in contact with the sea floor, consequently there is very little re-suspended sediment or creation of turbidity related to the sediment removal process. An insignificant amount of very localized and temporary turbidity may be created by the mechanical action of the drag head running across the sand. However, re-suspension of sediment would not disperse to any degree. Any localized turbidity is not anticipated to impact Atlantic sturgeon since they are highly mobile and the areas in question are not restrictive in nature, providing much space within which to avoid a plume by moving away from the source. Even if Atlantic sturgeon movement is altered, it is unlikely that any temporary and localized suspended sediment would have a long term and adverse impact on Atlantic sturgeon migration to/from spawning grounds, or in the ability to find other food resources outside of the dredged area, which is small compared to the entire area available in the Raritan Bay, Lower Bay and Atlantic Ocean. Also, since Atlantic sturgeon are indiscriminate feeders, any turbidity would likely have little or no effect on finding alternate feeding grounds.

6.1.3 POTENTIAL IMPACTS TO FOOD RESOURCES AT THE SBOBA

Atlantic sturgeon are primarily benthic feeders and changes in bottom habitat that alter the benthic faunal community could result in a subsequent temporary loss of, or change in, prey resources. Sturgeon generally feed when the water temperature is greater than 10^{o}C (Dadswell 1979, and Marchette and Smiley 1982, as cited by USACE-NAP 2011) and in general, feeding is heavy immediately after spawning in the spring and during the summer and fall, and lighter in the winter. Haley and Bain (1997, as cited in ASSRT 2007) retrieved primarily polychaetes and isopods from Atlantic sturgeon in the Hudson River. The SBOBA represents a small area compared with the surrounding area in which additional resources are available for feeding; therefore, adverse significant impacts are not anticipated.

In 1989, the District conducted an investigation to characterize the infauna and epifauna resources at the SBOBA. Results revealed a diversity of species including those types considered primary prey species for Atlantic sturgeon. During the District's NJ Biological Monitoring Program (NJ BMP; USACE-NYD 2001B), multiple borrow sites were monitored for benthic characterization and showed similar faunal species including those considered sturgeon prey base. The NJ BMP also analyzed impacts of dredging on recovery times of the impacted habitat. The study concluded that in terms of abundance, diversity and biomass, the infauna resources are expected to recover and recolonize to pre-dredge condition in approximately 8 months, except for sand dollars biomass, which takes about 2 to 2.5 years to recover.

A comparison of the NJ BMP borrow areas to the SBOBA (Ray 2010) concluded that the infauna communities at the SBOBA and at the other NJ offshore borrow areas were very similar. Since the habitats and fauna are comparable it's reasonable to conclude that impacts to the SBOBA fauna community and their subsequent recovery and re-colonization rate are also analogous to the results of the BMP study.

In general, the changes in the benthic community observed between pre- and post-dredging time periods is typical of benthic responses to disturbance in which larger, longer-lived species are initially replaced by smaller, opportunistic taxa prior to full recovery. These studies have also shown that borrow area habitats and the regions that surround them support abundant and diverse communities of typical sturgeon prey species. Because these habitats supporting sturgeon prey exist on a regional scale temporary impacts to localized portions of the SBOBA over the duration of the projects describe would not significantly reduce the availability of prey resources of resident or migratory Atlantic sturgeon.

6.2 POTENTIAL IMPACTS DURING SHORELINE CONSTRUCTION (PLACEMENT AND STRUCTURES) AT THE ATLANTIC COAST- ELBERON TO LOCH ARBOUR

6.2.1 POTENTIAL PHYSICAL INJURY AND BEHAVIORAL IMPACTS DURING SHORELINE CONSTRUCTION

There is the potential for sturgeon to be directly impacted by transiting hopper dredges or other vessels associated with the project. Most reported vessel strikes have been associated with relatively confined areas, such as shipping channels, where the bottom of the hull and the propellers are relatively close to the sea bottom. This would not be the case at SBOBA or along the transit route to the booster (pump out) station. The depths that exist at the borrow area along the route to the booster would not bring the vessel or its propellers into proximity of the bottom since the vessels do not typically sail into areas where maximum water depth is not at least 6 feet greater than the maximum vessel draft. These are extensive flat areas that would not bottleneck sturgeon and necessarily bring them close to a vessel. Since sturgeon are demersal and rarely seen at the surface, their foraging and migratory behavior should keep them well below any vessels (in sufficiently deep water).

Potential direct impacts to Atlantic sturgeon due to placement in intertidal and littoral nearshore waters may consist of impacts related to an increase in suspended sediment; however, since sturgeon do not typically utilize the intertidal and very shallow nearshore waters, it is unlikely that any turbidity would affect sturgeon. Direct impacts from equipment leading to physical injury are extremely unlikely. Impacts from increased suspended sediments and resultant turbidity could include physical damage to gill structures, or avoidance behavior and movement away from the disturbance. Movement out of the area would minimize any physiological impacts.

Placement of notches in the existing groins, and extension of the existing outfall and pipes are not anticipated to have a significant impact on Atlantic sturgeon since they are unlikely to be present in relatively shallow waters. If present, any noise generated by the construction activities described in Section 2.2 would likely result in avoidance behavior and movement away from the disturbance.

6.2.2 POTENTIAL HABITAT IMPACTS DURING SHORELINE CONSTRUCTION

Results of the area wide and site intensive beach nourishment placement TSS monitoring (Sea Bright to Manasquan, N.J. USACE 1994-2000) yielded the following results with respect to temporal and spatial scales of sediment dispersal along ocean beaches. Placement operations resulted in short-term increases in turbidity/TSS conditions limited to a relatively localized area (less than 500 m) from the discharge point. Sediment dispersal was strongly influenced by prevailing surf and turbulence conditions, as well as by long shore currents. Long shore currents in the vicinity of Sandy Hook run predominantly to the north. Dispersal of suspended sediments was prominent in the swash zone in the immediate vicinity of the discharge operations. Observed elevated concentrations decline rapidly with dispersal through the surf zone. Another mitigating factor is the relatively low fractions of silts and clays of the sediments excavated from the borrow areas, generally less than 10 percent by weight. Slightly elevated turbidities/TSS (from ambient) extended into the surf zone along a narrow swath of beach, and into the near shore bottom portion of the water column.

The maximum TSS values measured near the fill operations were not outside the range that organisms would be exposed to during periods of high wave energies. With the exception of swash zone samples, the magnitude of elevation above ambient TSS conditions appears to be negligible. Measured TSS concentrations outside the swash zone seldom exceeded 25 mg/l, which can be considered the low end of the range of ambient TSS concentrations that many marine/estuarine species of the northern New Jersey shore, including Atlantic sturgeon, experience in estuaries including the Hudson-Raritan estuary. Ranges of ambient TSS within the Hudson estuary range from 20 to 60 mg/L (USACE Kate and PJ etc). Atlantic sturgeon within the Hudson/Raritan estuary experience ambient TSS/turbidity conditions generally much greater than those measured during fill activities along the Atlantic coast of NJ, except for the within the surf/swash zone. It is expected that the mobile behavior of the sturgeon would serve to limit the duration of exposure to any exceptionally elevated levels of TSS/turbidity.

Monitoring of NJ beaches, including both re-nourished beaches and reference beaches during strong storms revealed elevated TSS levels that extended well past the near shore zone to an extent much greater than the dispersal distances measured during placement activities. During storms, elevated TSS levels were often an order of magnitude greater than levels measured during placement activities, and, unlike the very localized affects seen during fill operations, these higher concentrations occurred over *regional coastal areas*.

In summary, the spatial scales of elevated turbidity/TSS associated with beach fill operations are relatively small. Likewise, the increment of suspended sediment concentrations above ambient attributable to fill operations is relatively small once sediments have dispersed outside the swash zone. No adverse affects to dissolved oxygen were observed in the surf or near shore zones during TSS and water quality monitoring during fill activities. TSS samples collected during or immediately after storm events showed that even mildly strong storms or wind events produce much greater impacts related to TSS or turbidity increases relative to beach fill operations.

6.2.3 POTENTIAL IMPACTS TO FOOD RESOURCES DURING SHORELINE CONSTRUCTION

As part of the NJ BMP (Sea Bright to Manasquan) 30 sample transects were established along approximately 10 km of intertidal beach (core) and adjacent near shore area (5 m depth, grab). Samples were collected and analyzed from 1994 through 2000. Sampling occurred before during and after nourishment.

The principal conclusions from this portion of the study are as follows:

1. Prior to any post construction sampling, monitoring results revealed that species abundance and diversity showed “natural” seasonal and annual variations.
2. Infaunal assemblages of intertidal and nearshore beach environments were similar in species composition and abundance to those reported elsewhere on the Atlantic Coast (USACE 2001C). Abundance was somewhat lower than that reported for beaches in Southern New Jersey.
3. Intertidal abundances were highest in the summer and lowest in mid-winter.
4. Intertidal sediments varied between depths, seasons, and years. Mean grain size declined

with depth and was generally highest in the spring.

5. Beach nourishment resulted in short-term declines in abundance, biomass, and taxa richness.
6. Recovery of intertidal assemblages was complete within 2-6.5 months of the conclusion of filling. Differences in the rate of recovery were most likely due to differences in when nourishment was complete. Sites where filling did not conclude until the low point in the seasonal cycle of infaunal abundance took the longest to recover.
7. Recovery rates are similar to those reported from other studies, particularly where the grain size of the fill material matched that of the beaches to be nourished.
8. There is no evidence of long-term impacts of beach nourishment operations on intertidal or nearshore infaunal assemblages.

Loss of the benthic community is anticipated to occur within the foot print of the fill, which would include intertidal areas and the nearshore littoral immediately adjacent. However, the area's temporary (see above) loss of benthic organisms is mitigated by the fact that this is a tiny percentage of available, comparable shore line environment and, sturgeon are not known to frequent or forage in this extremely shallow and energetic ocean environment.

6.3 POTENTIAL IMPACTS DURING SHORELINE CONSTRUCTION (PLACEMENT AND STRUCTURES) IN RARITAN BAY – PORT MONMOUTH AND UNION BEACH

6.3.1 POTENTIAL PHYSICAL INJURY AND BEHAVIORAL IMPACTS DURING SHORELINE CONSTRUCTION

During vessel transit from the SBOBA to Raritan Bay booster pump stations for sand placement, it is possible that the dredge could encounter sturgeon. However this is unlikely for the same reasons discussed in section 5.2.1. Also, a study conducted in the Delaware estuary, concluded that vessel strikes accounted for 50% of Atlantic sturgeon mortalities (Brown and Murphy 2010, as cited by USACE-NAP 2011). However, since the Delaware estuary is narrower and shallower than the area in which the dredge would travel for the proposed projects (e.g., SBOBA to Raritan Bay), it is less likely that the dredge would strike an Atlantic sturgeon.

Analogous to potential placement impacts along the Atlantic coast significant adverse direct impacts to Atlantic sturgeon associated with placement of sand are highly unlikely. The two types of physical impacts associated with this environment include direct contact with one or more pieces of equipment and movement of sediment, both of which are highly unlikely to occur. Since sand is carried to the beach and deposited on the dry beach by a stationary pipe, there is no threat of impact from the pump out equipment. Bulldozers, front-end loaders and similar equipment that could be used to re-grade the sand would have minimal contact with the swash zone making impacts with sturgeon unlikely, especially because sturgeon, adults or juveniles are not known to inhabit this zone. However unlikely, there is always the small possibility of a (small) sturgeon moving into this area but their ability to avoid the slow moving construction equipment that could be used to re-grade the sand (<5 mph), or the sand that is being moved, makes any contact doubtful. Consequently, contact or burial due to equipment or movement of sand into the intertidal and adjacent near shore zone is not expected to occur.

Placement of sand into the nearshore would cause localized increases in turbidity.

Because of the extreme shallow nature of the Raritan Bay nearshore zone, wind mixing may cause a greater duration and further extent of resuspended sediments then on the Atlantic coast. Thus, there may be a greater potential for a sturgeon to come into contact with a zone of high turbidity. However, sturgeon are not known to inhabit areas of high turbidity and it is unlikely that any impacts other than avoidance behavior would occur.

Features of the Port Monmouth project include construction of a terminal stone groin and extension of the fishing pier. Construction of these features, as described in Section 2.1, is extremely unlikely to cause any significant impacts to sturgeon given the types and speed at which these kinds of construction activities would take place. If an Atlantic sturgeon is present, its mobility would allow it to easily avoid contact with piles as they are being placed via jetting, as well as avoid stones being placed in the slow and precise manner required to avoid fracturing during construction of the groin. Although some of the construction equipment associated with building of the groin and pier may create a new and temporary sound source in the project area, this equipment is not known to create sounds/vibrations that would be harmful or disturbing to Atlantic sturgeon, as is the case with explosives and pile driving equipment. Also, the shallow nature of portions of the project site may greatly reduce the probability of sturgeon from being in the area.

Construction and operation of the sector gate at Port Monmouth and the storm surge barriers in Union Beach are not anticipated to significantly impact sturgeon. Both the gate and barriers would be placed in creeks that drain into Raritan Bay. In the unlikely event that a sturgeon would be present in the creeks, it is anticipated that they would move away from the source of noise during construction. Once constructed, the gates would be closed during a storm event, cutting off access between the creeks and Bay. It is possible, although highly unlikely, that a sturgeon could get temporarily caught in the creek until the gates re-opened.

6.3.2 POTENTIAL HABITAT IMPACTS DURING SHORELINE CONSTRUCTION

There are no Atlantic sturgeon spawning grounds in Raritan Bay; therefore impacts from the proposed projects on spawning grounds are not anticipated.

USACE has not conducted any TSS monitoring in Raritan Bay; however, monitoring was conducted along the Atlantic coast beaches in NJ (Sea Bright to Manasquan; USACE-NYD 1994-2000) and is summarized in Section 5.2.2. It can be inferred that turbidity/TSS conditions at the swash zone along project sites in Raritan Bay may be less than those on the Atlantic coast of NJ, which generally experiences greater surf zone wave activity. However, as previously described, the extreme shallow nature of the bay’s nearshore may prolong resuspension of finer sediments that “winnow” out of the newly placed sand under strong wind conditions. Nevertheless, turbidity impacts would be temporary, and the spatial scales of elevated turbidity/TSS are expected to be localized. Any increased localized turbidity is not anticipated to impact Atlantic sturgeon since they do not typically frequent the near shore placement zone and they are highly mobile and are capable of taking advantage of the unconfined space offshore to avoid a plume by moving away from the source.

6.3.3 POTENTIAL IMPACTS TO FOOD RESOURCES DURING SHORELINE CONSTRUCTION

A baseline (e.g., pre-construction) study to examine the distribution of infauna inhabiting the intertidal zone of beaches along the south shore of Raritan and Sandy Hook Bays was initiated in September 2002 by the District. Survey areas included Union Beach, Port Monmouth, Port Comfort and Keansburg. Results of the study were consistent with previous studies in the area (Ray 2004).

For Port Monmouth, annelids dominated the biomass at MLW and subtidal depths, while mollusks (principally *I. obsoleta*) made up most of the biomass at mid-tide depths. At Union Beach, T. heterochaetus (13.5%), Tubificidae (12.5%) and G. gemma (12.2%) were most abundant in the area. Therefore, these areas are a potential food resource for Atlantic sturgeon.

Based on information in the Final EIS for the Union Beach project (September 2003), construction of the revetments, terminal groins, beach berm, and periodic re-nourishments would result in a one-time, short-term adverse impact on the benthic communities. Negative impacts to the benthic community would include direct smothering of sessile benthic invertebrates within the construction area. During initial nourishment and periodic re-nourishments, motile invertebrates would be able to escape without injury. The construction of the levees, floodwalls, pump stations, and storm gates would be limited to the upland areas adjacent to the salt marshes and some other wetlands areas and are not expected to impact any life stages of the Atlantic sturgeon. In areas where they are constructed in the wetlands, a short, one-time burial of existing marsh invertebrates would occur if any are present at the time. No long-term adverse impacts to the existing marsh surface benthic invertebrates are expected as a result of the construction of the levees and floodwalls. These impacts are also applicable to the Port Monmouth project.

Even as other projects occur in the surrounding area, such as channel deepening in Ambrose channel (completed in 2012) and other beach nourishment projects (e.g., Sea Bright to Manasquan, all of which use the SBOBA), these areas still represent a small portion of the surrounding habitat available for Atlantic sturgeon, impacts would be temporary, and are not anticipated to have an adverse cumulative impact on the benthic community.

7.0 OTHER SPECIES OF CONCERN

The remaining federally listed species that may occur in the project areas are: the endangered Northwest Atlantic Ocean DPS of the loggerhead turtle (*Caretta caretta*); the endangered Kemp's ridley turtle (*Lepidochelys kempi*); the endangered green turtle (*Chelonia mydas*); the endangered leatherback turtle (*Dermochelys coriacea*); the endangered North Atlantic right whale (*Eubalaena glacialis*); the endangered humpback whale (*Megaptera novaeangliae*); and the endangered fin whale (*Balaenoptera physalus*).

NMFS issued a Biological Opinion (BO) to the District in 1995 to address the impacts of beach nourishment projects along the South Shore of Long Island and the Northern NJ Shore Sandy Hook to Manasquan) for sea turtles and whales. A BA was also developed in 2001 to assess impacts to sea turtles from beach re-nourishment and offshore borrowing in the Raritan Bay Ecosystem. The biological information in both documents is still relevant, and the conclusions are not anticipated to drastically change.

7.1 SEA TURTLES

7.1.1 GENERAL SEA TURTLE INFORMATION

In general, listed sea turtles are seasonally distributed in coastal US Atlantic waters, migrating to and from habitats extending from Florida to New England, with overwintering concentrations in southern waters.

As water temperatures rise in the spring, some of these turtles begin to move northward and reside in relatively shallow inshore waters of the north east to take advantage of abundant forage. As temperatures begin to decline rapidly in the fall, turtles in the north east Atlantic begin to migrate back to southern waters. Sea turtles can be expected to be in the vicinity of the SBOBA when the water temperature surpasses 15 C (60 F) which generally coincides with June 1. However, the window of residence for the 4 listed species is considered to be May1 through November 30. Southern migration begins when the water drops below 15 C. Turtles are migrating out of the NYB by the beginning of November. Future warming ocean trends may cause this window to be expanded.

Life history descriptions for each of the 4 listed sea turtle species were described in the NYD 1995 BA and the 1999 Harbor Deepening BA and are incorporated here by reference. There have been no significant changes to the distribution, population size, food availability requirements etc. of any of the species since that time. However, since the 1995 consultation, a change in the listing of loggerhead turtles has occurred, as described in Footnote 1 of Section 1.1.

7.1.2 POTENTIAL DREDGING IMPACTS AT THE SBOBA (ELBERON TO LOCH ARBOUR, PORT MONMOUTH AND UNION BEACH)

Direct entrainment of sea turtles during hopper dredging at the SBOBA is a possibility during the season in which they are present in NY/NJ waters (May through November). However, the likelihood of a migrating turtle being impacted by a hopper dredge is remote; only one take has been documented since monitoring procedures have been established in the NYB in 1993 (Table 4), during which approximately 22.5 million cy of material has been dredged from the navigation channels, SBOBA and other borrow sites.

Loggerhead and Kemp’s ridley turtles, which normally spend much time at or near the bottom feeding on benthic invertebrates, would be less vulnerable to contact with a draghead when they are migrating. Green turtles, which are the least common turtles in the north east, forage on submerged aquatic vegetation (SAV). This species is also expected to be only passing through the borrow area, not spending much time on or near the bottom due to the lack of sea grasses or other SAV. Leatherback turtles are fast swimming pelagic organisms and the least likely to be found in near shore coastal waters, especially at or near the bottom. This species feeds in the water column where it forages for jellyfish which is its primary prey. The bathymetry and topography of the project site also differs greatly from those confined areas where turtles have been most commonly encountered by hopper dredges in the south east.

The risk of injury or mortality due to contact during transit of the hopper exists for this project. However, the magnitude of risk to any of the populations of loggerhead, leatherback, green, and Kemp's ridley sea turtles is so small that it is unlikely to jeopardize the continuing existence of the populations of sea turtles that seasonally inhabit NYB waters. Best management practices under the guidance of NMFS would be implemented to assure minimization of direct risk to sea turtles during construction of these projects.

Boat strikes and propeller hits are probably the greatest source of injury and mortality to sea turtles in coastal areas in the northeast. Most of these are due to the abundance of speeding recreational boats. An injurious strike by a much slower moving hopper dredge is far less likely but possible.

Dredging sand from SBOBA would temporarily remove all non-mobile benthic fauna from the action footprint. Swimming crabs such as the blue claw *Callinectes sapidus* and the lady crab *Ovalipes occletus* are likely capable of avoiding the draghead. Slower moving crabs including spider crabs may be entrained or crushed. Bivalves, other infauna and non mobile epi-fauna would be lost. Crabs, both swimming and walking are important proponents of the diets of the loggerhead and Kemp’s ridley turtles. These young turtles are known to be migrating through and tracking them via satellite has shown that they do not linger in these coastal oceanic waters. Finding prey during their migration would simply be a matter of foraging anywhere along their route outside the dredge footprint, which makes up a very small portion of the overall habitat available for foraging. Previously referenced USACE studies have shown that the abundance and diversity of turtle prey items (crabs and mollusks) which can be found at the SBOBA are available throughout the entire NYB. As was also established previously, benthic recovery within the dredge footprint is relatively rapid and, more mobile species such as crabs are likely to re-occupy those areas within days.

7.1.3 POTENTIAL IMPACTS DURING SHORELINE CONSTRUCTION (ATLANTIC COAST AND RARITAN BAY)

In the event that a loggerhead or Kemp’s ridley sea turtles would migrate or forage close to shore during placement of sand, there is little probability that impacts might arise from direct contact with equipment utilized for placement, and/or potential burial from placement of sand. Reasons for this are similar to those predicted for sturgeon. Studies in the north east have shown that turtles spend almost all of their time in waters greater than 15’ which would put them well out of harm’s way in Raritan Bay. Coastal migratory corridors have also been observed to be in waters much greater than 15’, again keeping them well offshore. Generally speaking a healthy turtle would not be in the surf zone, which is the only area where it might come in contact with placement machinery. It is possible that a sea turtle may encounter a zone of increased turbidity along the Atlantic coast or in Raritan Bay during placement. Chances of this might increase under certain (weather) conditions. However, no significant impacts would be encountered since turtles are visual predators and they would likely move off into waters with better visibility.

As analogously discussed for sturgeon, Port Monmouth groin and pier construction methods, depth of water, and sea turtle mobility and behavior leads to similar expectations of no significant impacts. Turtles are not likely to be found in these shallow areas but in the unlikely case that they are, they would be able to avoid any direct impacts by moving away from the potential danger.

7.2 WHALES

7.2.1 POTENTIAL IMPACTS TO WHALES IN THE PROJECT AREAS

During coordination with NMFS, Danielle Palmer advised that listed species of whales do not occur in Raritan Bay or within the Lower Bay, and thus, there will be no direct or indirect effects to listed whales from any shoreline work to occur at Port Monmouth or Union Beach. Therefore, this section will only address impacts to whales at the SBOBA, while transiting from SBOBA to Elberon to Loch Arbour, and while transiting from SBOBA to the bend at the tip of Sandy Hook, and before entering Raritan Bay to reach the Port Monmouth and Union Beach project areas.

As described in the 1995 NY and NJ beach nourishment BO and 2012 HDP BO, several species of whales may occur in the NYB:

1. Right whales in the NYB are primarily transiting the area on their way to more northerly feeding and concentration areas. During late winter and early spring, they begin moving north along the coast past Cape Hatteras and near the Long Island Coast. Individuals have been sighted along the south shore of Long Island, Block Island Sound, Gardiners Bay and south shore inlets and bays. They are most likely to occur around the project areas from November 1 – April 30.
2. Humpback whale presence in the northwestern Atlantic is variable and probably a response to the changing distribution of preferred food sources. For the most part, humpbacks are in transit through the NY area from June through September on their northward migration to summering areas in the Gulf of Maine.
3. Finback whales occupy both deep and shallow waters and are probably the most abundant large cetacean in NY waters. They are most abundant in spring and summer, but do have some presence during the winter months.

Impacts to listed species of whales during sand mining are unlikely because the hopper dredge would move very slowly at $\leq$ 2.6 knots, a speed at which whales can avoid contact with the dredge. On the other hand, collisions with a transiting hopper dredge between SBOBA and the project areas might occur on the Atlantic side of the project areas. An analysis by Vanderlaan and Taggart (2006, as referenced in HDP BO) showed that at speeds greater than 15 knots, the probability of a ship strike resulting in death of a whale increases asymptotically to 100%. At speeds below 11.8 knots, the probability decreases to less than 50%, and at ten knots or less, the probability is further reduced to approximately 30%. The speed of the dredge in the proposed projects is not expected to exceed 2.6 knots while dredging and 9.4 knots while transiting to/from the SBOBA and shoreline, thereby reducing the likelihood of vessel collision impacts.

The proposed projects would cause a small, temporary increase in vessel traffic within the action area. This increase is not expected to significantly increase the risk of a collision relative to the existing vessel traffic traversing in and out of the Port of NY and NJ, which enters the Harbor through the Ambrose Channel. The approach areas to the channel are shown as shaded in pink in Figure 5. Vessels using the channel and approach areas should not cross paths with the dredge while transiting from the SBOBA to the project areas; therefore . There are ferries that operate from Belford, Highlands, Atlantic Highlands and Sandy Hook New Jersey to

New York City (Seastreak and the NY Waterway), and there are marinas for private boats along Raritan Bay and the NJ shore. Although vessel strikes are acknowledged as being one of the primary known sources of whale mortality in the northeast, ship strikes remain relatively rare events and a small increase in vessel traffic within the project area does not necessarily translate into an increase in ship strike events (NMFS Consultation Letter to USACE, NYD, Daniel S. Morris 1/20/2012).

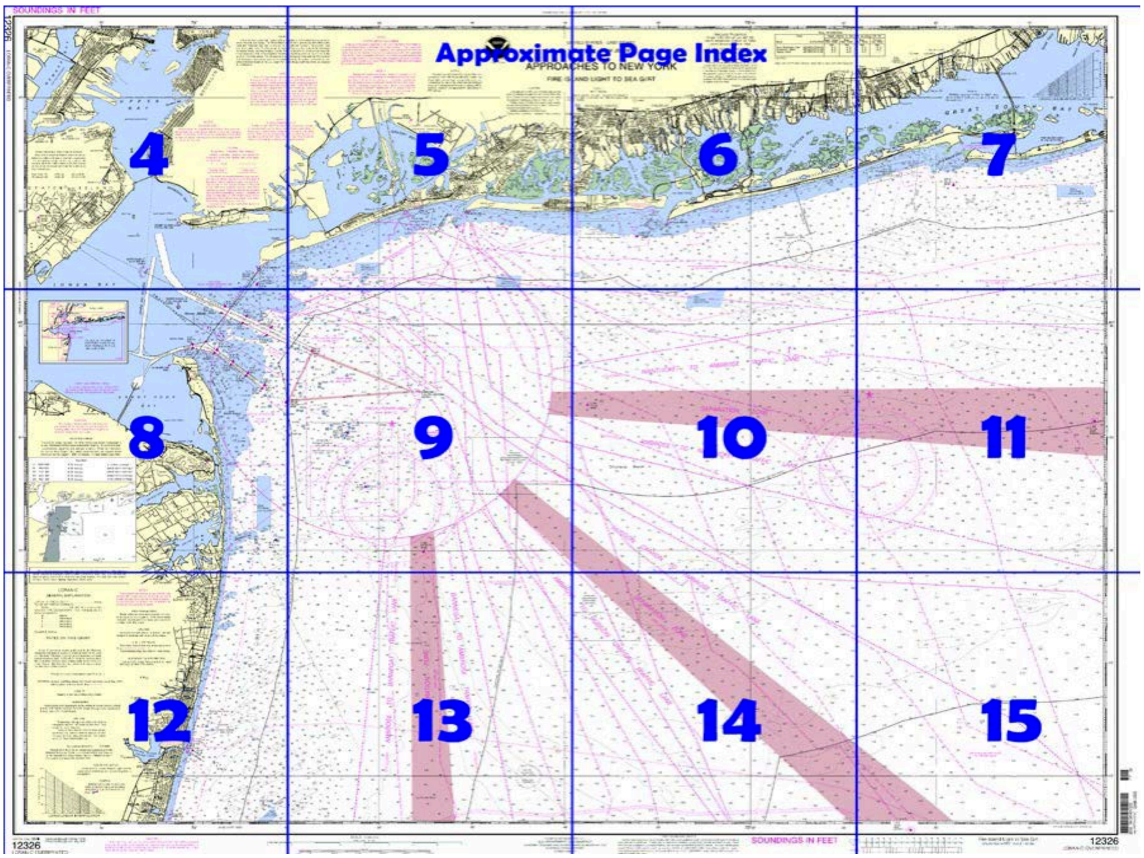

Figure 6: Approach areas, shaded in pink, to the Ambrose Shipping Channel. Source: http://ocsdata.ncd.noaa.gov/BookletChart/12326_BookletChart.pdf

For the Elberon to Lock Arbour project, it is possible that pile driving equipment would be used in the construction of outfall pipe extensions in the near shore waters. Noise from pile driving equipment generates sound waves within the water that have the potential to disturb or present a physical hazard to marine mammals (ICRC 2009). The intensity of sound decreases as it travels through a medium, including water. Underwater noise studies have not been conducted by the District for pile driving activities. However, underwater surveys done for the Port of Anchorage Marine Terminal Redevelopment Project during a pre-construction test pile-driving effort established marine mammal harassment zones at 350 m from impact pile driving and at 800 m from vibratory pile driving (ICRC 2009). A marine mammal exclusion and buffer zone of 152 m[4] was also established by NMFS to avoid exposing marine mammals to sounds at or above 180 dB from pile driving activities in Cobscook Bay, Maine (NMFS 2012B). On this basis, and in the event that a whale would be found within 152 m (500 ft) from the construction activity, it is possible that sound waves generated from pile driving activities could disturb any whales

[4] This radius was subject to change once underwater sounds were measured during construction.

transiting through the area.

Noise from the construction of the terminal groin and pier at Port Monmouth is not anticipated to cause a significant adverse impact to whales since the likely method of placing the wooden legs into the sand would be via jetting/pushing, as opposed to hammering. Similarly, the stones for the terminal groin are anticipated to be smoothly placed into the water to avoid fracturing.

8.0 CUMULATIVE EFFECTS

In the 2012 HDP BO, NMFS outlined the cumulative effects associated with sources of human-induced mortality, injury, and/or harassment of Atlantic sturgeon, whales, or sea turtles. In the BO, the definition of cumulative effects was referenced in 50 CFR 402.02 to include "*the effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions are not considered in the definition of cumulative effects."* The following provides an excerpt from the BO, as it is applicable to this document.

> *"Sources of human-induced mortality, injury, and/or harassment of Atlantic sturgeon, whales, or sea turtles' resulting from future State, tribal, local or private actions in the action area that are reasonably certain to occur in the future include incidental takes in state-regulated fishing activities, pollution, global climate change, and vessel collision. While the combination of these activities may affect Atlantic sturgeon, whales, or sea turtles, preventing or slowing the species' recovery, the magnitude of these effects in the action area is currently unknown...*
>
> *State Water Fisheries-Fishing activities are considered one of the most significant causes of death and serious injury for sea turtles. A 1990 National Research Council report estimated that 550 to 5,500 sea turtles (juvenile and adult loggerheads and Kemp's ridleys) die each year from all other fishing activities besides shrimp fishing. Fishing gear in state waters, such as bottom trawls, gillnets, trap/pot gear, and pound nets, take sea turtles each year… Action has been taken by some states to reduce or remove the likelihood of sea turtle takes in one or more gear types. However, given that state managed commercial and recreational fisheries along the Atlantic coast are reasonably certain to occur within the action area in the foreseeable future, additional takes of sea turtles in these fisheries are anticipated. There is insufficient information by which to quantify the number of sea turtle takes presently occurring as a result of state water fisheries as well as the number of sea turtles injured or killed as a result of such takes. While actions have been taken to reduce sea turtle takes in some state water fisheries, the overall effect of these actions on reducing the take of sea turtles in state water fisheries is unknown, and the future effects of state water fisheries on sea turtles cannot be quantified.*
>
> *Right and humpback whale entanglements in gear set for state fisheries are also known to have occurred (e.g., Waring et ai. 2007; Glass et ai. 2008). Actions have been taken to reduce the risk of entanglement to large whales, although more information is needed on the effectiveness of these actions. State water fisheries continue to pose a risk of entanglement to large whales to a level that cannot be quantified.*
>
> *Information on interactions with Atlantic sturgeon with state fisheries operating in the*

action area is not available, and it is not clear to what extent these future activities will affect listed species…

Vessel Interactions-…private vessel activities in the action area may adversely affect listed species in a number of ways, including entanglement, boat strike, or harassment. As vessel activities will continue in the future, the potential for a ·vessel to interact with a listed species exists; however, the frequency in which these interactions will occur in the future is unknown and thus, the level of impact to sea turtle, whale, or Atlantic sturgeon populations cannot be projected…

Pollution and Contaminants -Human activities in the action area causing pollution are reasonably certain to continue in the future, as are impacts from them on Atlantic sturgeon, sea turtles, or whales. However, the level of impacts cannot be projected. Sources of contamination in the action area include atmospheric loading of pollutants, stormwater runoff from coastal development, groundwater discharges, and industrial development. Chemical contamination may have an effect on listed species reproduction and survival…"

9.0 DISCUSSION/CONCLUSION

From reviewing the best available information on the life history and behavior of the threatened and endangered species that may be present in and around the proposed project areas, the following species may be affected:

1. Atlantic sturgeon: may be present in the vicinity of the project areas in three major capacities: as adults primarily while migrating between spawning grounds in the Hudson River and oceanic environments; migrating throughout their marine range as adults of any DPS; and as juveniles in waters less than 20 m along the eastern side of Sandy Hook, NJ, possibly aggregating due to food availability.
2. Sea Turtles: due to the feeding behavior of green and leatherback turtles, it is unlikely that either species would be encountered during construction of the proposed projects. However, migrating loggerhead and Kemp's Ridley turtles may be present within the projects areas during May through November.
3. Whales: depending on the time of year in which construction takes place for the proposed projects, right, humpback or fin whales may be present. Beach replenishment projects are typically constructed in the fall/winter, outside of the tourist season. If this trend continues, right and fin whales may be present in the project areas.

9.1 ATLANTIC STURGEON

Based on the information contained in this BA, several direct and indirect impacts to the Atlantic sturgeon from the proposed beach nourishment projects were identified. However, as summarized below, the threats are not likely to jeopardize the continued existence and recovery of the species.

As the dredge travels to/from the SBOBA to the shoreline for sand placement, it could encounter a migratory sturgeon. Although vessel strikes are possible, they are more common in narrower and shallower areas (e.g., Delaware estuary) compared to the wide-open areas of Raritan Bay and the Atlantic shoreline; it is also anticipated that an Atlantic sturgeon would avoid a slower moving dredge. Therefore, it is unlikely that injury or death from a dredge strike would occur.

A temporary and short-term loss and/or shift in the benthic communities within a localized area of SBOBA and at the sand placement site in each of the project areas would occur. Given the nature of the impact, the availability of resources surrounding the area of impact (i.e., the Lower Bay, Raritan Bay and Atlantic Ocean), and that Atlantic sturgeon are indiscriminate feeders, the impact of dredging on benthic resources is unlikely to have an adverse impact on the species.

Impacts to water quality from dredging activities at the SBOBA and at the sand placement sites are not anticipated to impact Atlantic sturgeon. Re-suspension of sediment (e.g., sand) would not disperse to any degree. Any localized turbidity that might be encountered by a sturgeon in the offshore borrow area could be avoided since they are highly mobile and capable of avoiding the tiny amount of re-suspended sediment that might form from dredging coarse sand. Impacts at the near shore placement sites are unlikely as sturgeon do not typically utilize the intertidal and very shallow nearshore waters.

Direct impacts to Atlantic sturgeon during construction at the shoreline are possible, but unlikely since they do not normally frequent such a shallow and high energy zone and equipment is largely confined to upland or intertidal portions of placement site. Impacts might arise from direct contact with one or more pieces of equipment used for placement, from potential burial or displacement during sand deposition, or during construction of the structures at Port Monmouth and Union Beach (e.g., terminal groin, pier, etc). It is anticipated that Atlantic sturgeon would avoid any equipment, structures, or sand that is being moved to make any contact unlikely.

Though the greatest potential risk to Atlantic sturgeon comes from the proposed activities is entrainment during dredging activities, even this is a very unlikely occurrence. Since the SBOBA and sand placement sites in the proposed project areas represent a small portion of the surrounding Atlantic Ocean, Lower and Raritan Bays, there are many opportunities available for Atlantic sturgeon to avoid active dredges. Despite this, an interaction between an Atlantic sturgeon and the draghead of a hopper is possible. As per the conditions outlined in the NMFS 1995 (beach nourishment) and 2000 (channel deepening) BOs, the District equips the draghead of hopper dredges with sea turtle deflectors during the turtle season. This measure is meant to reduce the risk of interaction with sea turtles that may be present in the impact area, and is expected to operate in a similar manner for encounters with migrating Atlantic sturgeon.

Additionally, as part of the Terms and Conditions of the 1995 and 2000 BOs, USACE has been required to use NMFS-approved sea turtle observers to monitor for sea turtle take onboard hopper dredges. The 2012 updated consultation for the HDP (NMFS 2012A) called into question the effectiveness of observers when a UXO screen is deployed on the dredge. Through discussions with NMFS, USACE Engineer Research Development Center, and other USACE Districts in the North Atlantic Division, the general opinion was that it is unlikely that a sea turtle or Atlantic sturgeon would fit through a UXO screen (1.25 – 1.5” x 6”), and that any parts that make it through would be difficult to find, identify, and confirm as a take.

A number of alternatives to observers were reviewed during the 2012 HDP consultation process, however, most were considered unviable. The alternatives were determined to be either inappropriate to monitor take, ineffective given the conditions of dredging in the Ambrose Channel (e.g., depth, light, turbidity, anthropogenic objects on seafloor; and uneven surface), or the technology is incompatible with the proper identification of a species. Alternatives considered include: camera deployed on the draghead; use of sonar/acoustic system; relocation trawling; shark silhouette fitted underneath the dredge and near the draghead; and inspection of sea turtle deflector for proper installation. During the consultation process, the District and NMFS concluded that a proxy take was the most appropriate method to monitor take when a UXO screen is deployed.

Since the 2012 BO, an intact sub-adult Atlantic sturgeon was found onboard a hopper in the Ambrose channel, and sea turtle parts were recently found onboard a hopper in the south east, well outside of the project impact area. (personal communication with Danielle Palmer); both dredges were operating with a UXO screen. In the case of the District's take, it was believed that a bar on the UXO grid was bent and allowed the sturgeon to pass through the screen intact.

In addition to the limited impacts of dredging activities in the District's AOR, and as described in Section 4.0, there are a variety of other factors that may contribute to the vulnerability of Atlantic sturgeon to habitat impacts and potential further population collapse, many of which are more likely to impact the Atlantic sturgeon than a dredging project exercising prudent measures to avoid/minimize takes. These include: their unique life history characteristics, vessel strikes, overfishing, dam construction and operation, water quality modifications, bycatch and poaching. In order for recovery efforts to succeed, it is vital to practically address all potential threats to Atlantic sturgeon.

9.2 SEA TURTLES

Based on the information contained in this BA, direct and indirect impacts to the leatherback and green turtles from the proposed beach nourishment projects are unlikely. The more pelagic offshore nature and water column feeding habits of the leatherback and the lack of vegetative forage at the project site required by green turtles all but remove these two species from the potential dangers of entrainment. Also, disruption of the existing benthic habitat would not affect the foraging of these two species as it does not provide them with a significant food source. Thus, the proposed actions are not likely to jeopardize the continued existence of these sea turtle populations.

Direct and indirect impacts to Kemp's ridley and the Northwest Atlantic DPS of loggerhead sea turtles during dredging at SBOBA are possible, but limited to a very low risk of entrainment by hopper dredge or by collision with a transiting hopper from the SBOBA to the pump out station. The potential for indirect impacts also exist via a temporary loss and/or shift in benthic community abundance, diversity, or habitat within the dredging footprint; however, these impacts are offset by the abundance of prey in the surrounding areas and relatively quick re-colonization times.

Based on the many years of documented sea turtle observer data (1993-2010), there was only one observed loggerhead turtle take out of approximately 22.5 million CY of dredged material in NY, NJ and New England. The take was considered a freak incidence and occurred during a beach re-nourishment project along the Sandy Hook to Barnegat Inlet in 1997 (Long

Branch borrow area), which is along the NJ shore. Also, when compared to other dredging projects along the East Coast (see Sea Turtle Warehouse at: http://el.erdc.usace.army.mil/seaturtles), the overwhelming majority of turtle takes has been in the Gulf (208 takes) and South Atlantic Regions (481 takes) where sea turtles may cluster in channels to over winter, not in the North Atlantic (68) or District (1) where juveniles migrate to feed. Based on this information, observed take appears to be a rare occurrence within the District and should be an indication that sea turtle occurrence is rare in the District project areas.

The District acknowledges that even though the probability of negatively impacting a sea turtle is rare, the possibility still exists and some level of protection is warranted. Therefore, turtle deflectors would continue to be used. Whether or not the use of sea turtle observers is an effective method when a UXO screen is deployed is questionable and the NYD is committed to work with NMFS. While we work with NMFS to evaluate appropriate measures to quantify take, the District will continue to employ onboard lookouts to determine if the deflectors are deployed properly, to check the UXO screen for any turtles or turtle parts, and to identify presence of turtles to vessel operators to avoid collisions.

Impacts from direct contact with equipment utilized for placement at all project areas, installation of various structures at Port Monmouth and Union Beach, and/or potential burial or displacement related to deposition of sand is unlikely since turtles have the ability to avoid these project elements and are unlikely to be in very shallow water where much of the construction activity would occur. Consequently, significant adverse impacts are not anticipated.

The proposed actions are not likely to jeopardize the continued existence of Kemp's ridley and Northwest Atlantic Ocean distinct population segment of loggerhead sea turtles.

9.3 WHALES

Impacts to listed species of whales during dredging operations are unlikely because during sand mining a hopper dredge moves very slowly (≤2.6 knots) and it is anticipated that whales can avoid contact with the dredge. Collisions with a transiting hopper might occur, but the suggested reduced speed (10 knots) during transit lessens the probability of a ship strike resulting in death. Although vessel strikes are acknowledged as being one of the primary known sources of whale mortality in the northeast, ship strikes remain relatively rare events and a small increase in vessel traffic within the project area does not necessarily translate into an increase in ship strike events (NMFS Consultation Letter to USACE, NYD, Daniel S. Morris 1/20/2012). Onboard lookouts would also reduce the risk of vessel-whale collisions. If the lookout on board the hopper dredge observes a whale in the vicinity of the vessel during transit throughout the project area, maximum vessel speeds would be limited to 10 knots. If a Right Whale is observed, the vessel would maintain a 500 yard buffer from the whale. For all other whale species, a 100 yard buffer would be maintained.

During construction of the outfall pipe extensions at Elberon to Loch Arbour, if pile driving activity occurs, there is a possibility that any whales transiting the area would be disturbed by pile driving in the near shore waters. However, this disturbance is not likely to cause a significant adverse affect.

The proposed actions are not likely to jeopardize the continued existence of these marine mammal populations.

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Appendix A – Letter Documenting March 8, 2013 Meeting/Conference between the New York District and NMFS to Discuss ESA Consultation and EFH Coordination Post-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

Planning Division

March 22, 2012

John K. Bullard - Regional Administrator
Northeast Regional Office
NOAA Fisheries
55 Great Republic Drive
Gloucester, MA 01930

Attention: Mary Colligan, Assistant Regional Administrator
Protected Species Division
Lou Chiarella, Assistant Regional Administrator
Habitat Conservation Division

Dear Mr. Bullard:

This letter is in reference to the March 8, 2013 meeting/conference call on the emergency activities occurring within the U.S Army Corps of Engineers, New York District's (District) Areas of Responsibility (AOR) that were a result of Super Storm Sandy. These activities include the rehabilitation of federally authorized and constructed hurricane or shore protection projects under Public Law (PL) 84-99, Flood and Coastal Storm Emergencies and PL 113-2, The Disaster Relief Appropriations Act - 2013. As you are aware, it is critical that the District moves out quickly to return protection to the communities and infrastructure before the upcoming storm season is within the AOR. It was a disappointment that our respective staffs did not meet in person at the Milford Lab, but weather conditions dictated prudence as far as not driving such long distances under those adverse conditions. Under the circumstances the conference call was the next best thing and I feel the group was successful in accomplishing our respective goals.

This letter is intended to execute one of the more immediate tasks that came out of that call by identifying a number of projects proceeding under our emergency authority contained in PL84-99 and PL 113-2. This request is specifically for:

- Atlantic Coast of New York City - Rockaway Inlet to Norton Point (Seagate), Brooklyn Coney Island Area Shore Protection Project;
- Atlantic Coast of New York City- East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York;
- Atlantic Coast of Long Island - Fire Island Inlet to Montauk Point, New York
  - Moriches to Shinnecock Reach (Westhampton Interim Shore Protection Project)
  - West of Shinnecock Inlet Interim Shore Protection Project.
- Atlantic Coast of New Jersey, Sea Bright to Ocean Township Beach Erosion Control Project, Sea Bright to Manasquan Inlet NJ; and
- Raritan Bay and Sandy Hook Bay, NJ Hurricane and Storm Damage Reduction (Borough of Keansburg, East Keansburg and Laurence Harbor).

As discussed, the above referenced projects are high priority emergency response actions intended to protect life and property in the most vulnerable, hardest hit portions of the coast before the next storm season threatens them. As that storm season is fast approaching time is of the essence, with projects scheduled to begin as early as this May to restore the damaged projects and return the authorized level of protection to the affected areas.

Endangered Species Act Consultation

Where emergency actions are required that may affect ESA-listed species and/or critical habitats, an emergency Section 7 consultation may be conducted (50 CFR§ 402.05). An emergency is a situation involving an act of God, disasters, casualties, national defense or security emergencies, etc., and includes response activities that must be taken to prevent the imminent loss of human life or property. The District is requesting emergency consultation pursuant to Section 7 of the ESA of 1973, as amended, for the above projects proceeding under PL84-99 and PL 113-2.

In accordance with those procedures, the District will continue to coordinate with your offices to minimize impacts to listed species. The District requests that your office provides us with a list of measures to be incorporated into the proposed actions that will serve to minimize and monitor effects to listed species during the emergency response activities. Because consultation on the effects of these beach nourishment projects on listed whales and sea turtles has been previously completed, the District expects many of the measures will already be included in the project description (refer to Attachment 1). Pursuant to the emergency consultation procedures, once the emergency response is completed, the District will provide you with a biological assessment that contains a description of the activities that were carried out and an assessment of any impacts on listed species, including documentation of any take that occurred.

A description of the emergency actions is attached (Attachment 2). It is important to stress that each of the actions is intended to restore the storm-damaged projects to their authorized conditions; no changes to the beach dimensions or new borrow areas will be employed and will utilize the same protective measures and conservation recommendations that the District put in place following the District's previously completed consultations (Attachment 1). It is the District's belief that these measures will be as protective of Atlantic sturgeon as they proved to be for the listed species that were successfully consulted on originally. Consequently, the District would very much appreciate your office confirming the initiation of emergency consultation for these activities as soon as possible.

Following the initiation of emergency consultation for the activities authorized under PL 84-99 and PL 113-2, the District will seek to initiate consultation for the next group of projects designed to address the impacts of Super Storm Sandy by quickly moving into construction projects that Congress has already authorized, but had not yet appropriated funds to build. These projects, funded under the PL 113-2, are intended to extend protection to areas deemed at risk to future storms. These actions are to be expedited as soon as their Plans and Specifications can be updated to reflect current conditions. As such, the District will be requesting that consultation be completed as expeditiously as possible. As highlighted in the attached table (Attachment 3), the District would like to bundle the consultation requests for projects to be executed later his year, and separately bundle those likely to be constructed in 2014. As with the emergency projects, the District will follow the designs authorized by Congress and apply the protective measures and conservation recommendations that came out of the prior consultations prior to their respective authorization. The District will shortly be providing you the details needed to initiate these consultations.

Essential Fish Habitat Coordination

Since all of the projects in the groups discussed up to now have completed coordination under the Magnusson-Stevens Act (MSA), and all are to be built to the same specifications identified during that coordination, no further action is intended to be initiated for Essential Fish Habitat (EFH) except to confirm our intent to implement the conservation measures identified during the authorization process for each of the projects. The last group of Sandy-related projects to be funded under the Sandy Relief Bill includes expedited completion and authorization/construction of ongoing studies for coastal protection in areas not covered by the first two groups. As these studies are not likely to be completed until 2014 and their recommended actions implemented shortly after, there is more time for them to complete consultation under ESA and MSA. It is hoped that our close collaboration to expedite the authorized projects will serve to quicken this process while ensuring the appropriate protection for listed species and EFH. This coordination will be coordinated via separate correspondence.

The District looks forward to our close collaboration as our respective staffs work toward achieving our respective missions. The District has every reason to expect these missions to be complimentary and encourage you to contact me as soon as there are any issues or questions that could enhance this effort, or delay it. For further questions or comments, please contact me at 917-790-8702/leonard.houston@usace.army.mil.

Sincerely,

WEPPLER.PETER.M.1228647353 Digitally signed by WEPPLER.PETER.M.1228647353 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=WEPPLER.PETER.M.1228647353 Date: 2013.03.22 17:24:58 -04'00'

Leonard Houston, Chief
Environmental Analysis Branch

Enclosures

CF:
CENAN-EOC
Tavolaro, Deputy Chief, Operations Division, CENAN