APPENDIX H

ESSENTIAL FISH HABITAT ASSESSMENT

- **Sea Bright Offshore Borrow Area**
- **Near Shore Placement Site**

ESSENTIAL FISH HABITAT ASSESSMENT

For The Use of Sand Resources at the Sea Bright Offshore Borrow Area

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I INTRODUCTION

The U.S. Congress on July 3, 1958, pursuant to its River and Harbor Act, authorized the U.S. Army Corps of Engineers (USACE) to investigate the potential to provide hurricane and storm protection benefits to communities from Sandy Hook to Barnegat Inlet, New Jersey that experience damages caused by hurricanes and severe storms. This initial authorization was modified several times pursuant to the Water Resources Development Act (WRDA) of 1986 and 1988.

The authorized study area is separated into three sections and are known as:

- Section I - Sea Bright to Ocean Township, New Jersey
- Section II – Asbury Park to Manasquan Inlet, New Jersey and
- Section III – Manasquan Inlet to Barnegat Inlet, New Jersey

The USACE, New York District (District) was assigned to meet requirements of the National Environmental Policy Act (NEPA) for Sections I and II; the Philadelphia District (CENAP) was assigned to meet NEPA requirements for Section III.

II CRITERIA FOR THIS EFH ASSESSMENT

For the purpose of this Essential Fish Habitat (EFH) assessment the following criteria is applied:

1. This EFH assessment is being done as a courtesy and to implement the USACE's Environmental Operating Principles because the removal of sand in the Sea Bright Offshore Borrow Area (SBOBA) began in 1994, which began prior to provisions in the reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act of 1996, which required the preparation of an EFH assessment in locations that are designated as EFH for species with Fishery Management Plans, and their important prey species.

2. In 1994, the District initiated a consecutive nine year, multi-component Biological Monitoring Program (BMP) to quantify the impacts and subsequent recovery to aquatic resources that occupy offshore borrow areas. Accordingly, the results of the BMP are applicable to this EFH assessment because the resources at the SBOBA and at the offshore borrow areas that were evaluated as components of the BMP are alike (Clarke *et al*. 1991 and USACE 2001).

3. The area to be assessed is named "The Sea Bright Offshore Borrow Area", which encompasses both the Sea Bright 88 and 89 offshore borrow areas.

4. This EFH assessment is action/activity (hydraulic dredging) specific, not project specific. As a component of this EFH assessment, several existing projects will be identified along with their estimated initial nourishment and periodic

renourishment volumes and a tentative construction schedule of each existing project will be identified.

5. As this EFH assessment covers dredging in the SBOBA, not a specific project, neither a new/revised EFH assessment nor reconsultation with the NMFS will need to be performed if either estimated volumes change or construction schedules change or a project that is not identified in this EFH assessment, but requires sand resources to prevent/reduce damages caused by hurricanes and severe storm events.

6. This EFH assessment is applicable for an action/activity that requires the use of sand to prevent/reduce damages caused by hurricane and severe storm events or has a goal to restore habitat.

7. The District conducted investigations that produced 2 separate Environmental Impact Statements (EIS). The Section I EIS (USACE, 1989) and the Section II EIS (USACE, 1995), and their supporting documents will serve as the foundation that previously addressed in detail the analysis of alternatives, economic justification, identification of existing resources, discussion of adverse impacts, to include cumulative impacts to these existing resources and identification of mitigation.

8. The material within the SBOBA is 90% sand and therefore contains no more than a minute level of fine grain sediments, which can be associated with contaminants (USACE 1989).

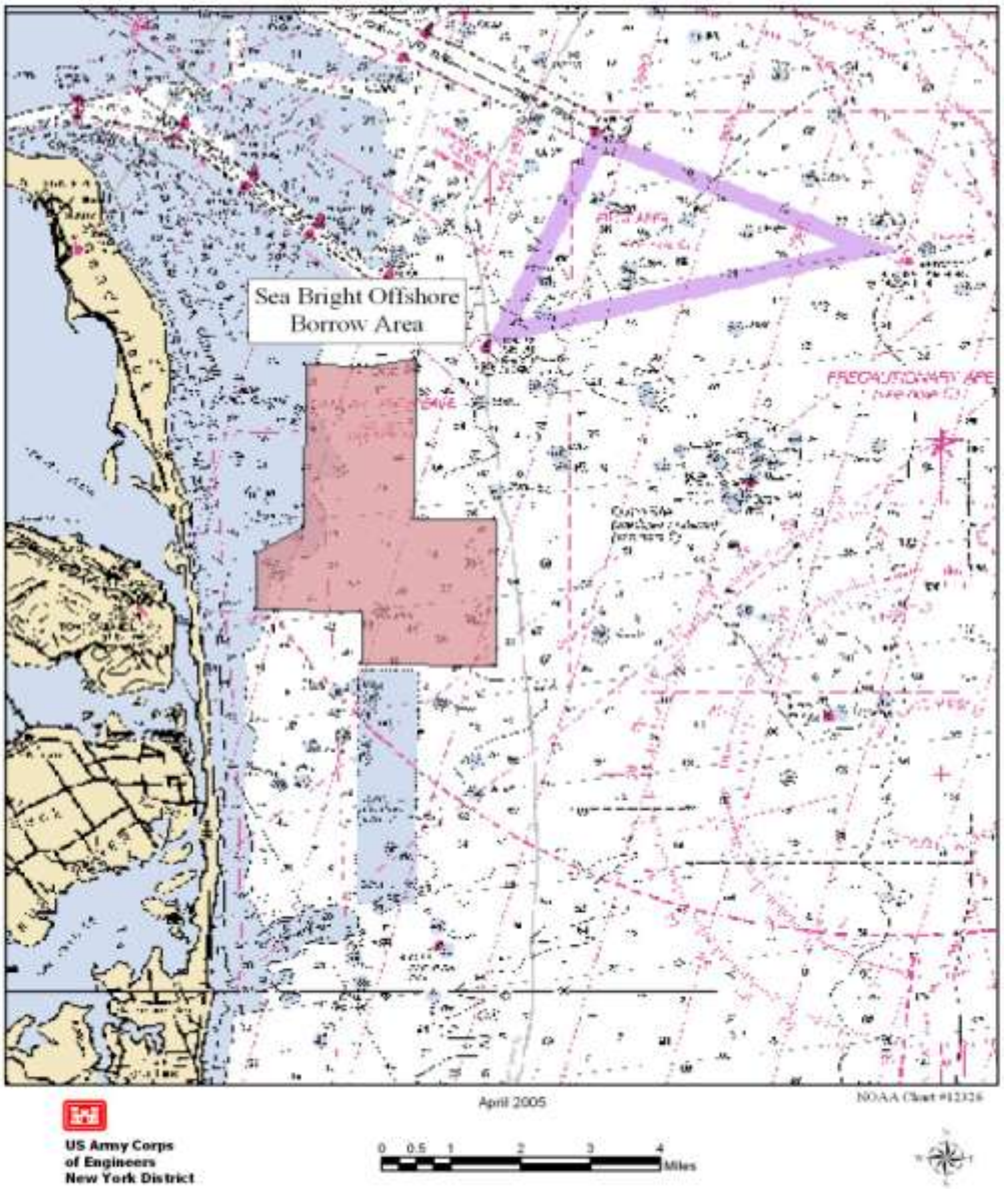
9. The alteration of the SBOBA's bathymetry will not affect surface wave conditions (USACE 1989 and 1995). As a result, the resources that occupy the nearby intertidal zone and beach habitats will not be affected.

III STUDY AREA FOR THIS EFH ASSESSMENT

Beach nourishment with periodic renourichment cycles is the selected alternative for both Section I and II, as well as other hurricane and shore protection projects within the boundary of the District. This alternative is recognized as an acceptable engineering solution that is both economically justifiable and environmentally sustainable to protect local communities from damages caused by hurricanes and severe storm events. The District performed geotechnical analyzes to find suitable material in sufficient quantities that would be needed to restore sandy beaches. Each analysis investigated upland sources, as well as sources located in the Raritan Bay and Atlantic Ocean waters offshore of the coastline of northern New Jersey. The results identified 2 areas that meet grain size compatibility and economic validation. These areas are known as the Sea Bright 88 and the Sea Bright 89 offshore borrow areas. Although each offshore borrow area has been assigned its own title, they are located next to one another and form one continuous footprint, which is known as "The Sea Bright Offshore Borrow Area (SBOBA)". The

SBOBA is the study area for this EFH Assessment. The SBOBA is located approximately 1 nautical mile east of Sandy Hook, New Jersey (see Figure 1 and Table 1).

Figure 1



The SBOBA has an estimated volume of 84,426,000 cubic yards of sand and is roughly 3,719 acres in size. Its bottom elevation ranges in depths from –24 to –63 feet National Geodetic Vertical Datum (NGVD), that slope from northwest to deeper water at its southeastern boundary. The SBOBA is not considered a shoal, because the adjacent bathymetry elevations are similar to the elevations within the SBOBA.

Table 1: Sea Bright Offshore Borrow Area (Geographic Coordinates NAD83) (1) (2)

SBOBA ID Point	Longitude	Latitude
1	73.963775066	40.398380249
2	73.963674696	40.408041780
3	73.953787792	40.412592720
4	73.953498319	40.440040082
5	73.940565978	40.439959588
6	73.930636868	40.441214360
7	73.930935048	40.413822032
8	73.913842355	40.413712011
9	73.914117148	40.389009498
10	73.941972413	40.389187404
11	73.941875427	40.398245062

(1) Coordinates approximate, as scaled from NOAA Chart #12326.
(2) Coordinates in decimal degrees.

The area formally known as the Mud Dump Site (MDS) is located about four nautical miles to the east. The area designated as the Historic Area Remediation Site (the HARS) is located about one nautical mile east of the SBOBA. In addition, the HARS is also situated down drift from the prevailing ocean current. This means that the prevailing ocean current first passes over the SBOBA and then it flows away from the SBOBA to pass over the HARS. As previously mentioned in Section II, 8 above, the material within the SBOBA is 90% sand and therefore contains no more than a minute level of fine grain sediments, which can be associated with contaminants (USACE 1989).

IV Previous Utilization of Sand at the SBOBA

The District began to use sand located within the SBOBA in 1994 and its use continues to present day. An estimated volume of 15,490,000 cubic yards has been placed along about 18 miles of shoreline from Sandy Hook south to Spring Lake, New Jersey. Furthermore, pursuant to its Support For Others program, the District partnered with the U.S. Department of Interior, National Park Service to place sand within the critical zone to widen their beach to protect the main access road into the Gateway National Park located at Sandy Hook, New Jersey. Table 2 below identifies the volumes of sand per location that were used to initially restore and maintain sandy beaches.

Table 2: Shows the location, starting date and volume of sand that was used from the SBOBA to restore sandy beach habitat.

Location	Completion Date	Volume of Sand [3]
Contract 1A – Monmouth Beach, NJ	November 1995	4,600,000
Contract 1B – Sea Bright, NJ	October 1996	3,800,000
Sandy Hook National Park [1]	February 1998	300,000
Contract 2 – Long Branch, NJ	December 1998	4,300,000
1st Renourishment Contract 1A and 1B[2]	October 2002	2,242,000
Sandy Hook National Park[1]	October 2002	300,000
Section II, Spring Lake, NJ	October 2002	225,000

[1] Support For Others Program.
[2] Includes the communities of Sea Bright, Monmouth Beach and Spring Lake, NJ.
[3] Measured in cubic yards.

V Proposed Utilization of Sand at the SBOBA

In addition to the initial placement of sand, the design of beaches involves periodic renourishment. Periodic renourishment provides long-term protection to the design beach by restoring the beach to its original design footprint. Placement of sand to renourishment a beach is accomplished the same manner as initial beach construction. Table 3 below shows the estimated volume of sand needed at a specific site and its proposed future date for initial placement and renourishments.

Table 3: Shows the estimated volume of sand, the location for sand placement, and proposed future date for initial placement and renourishment cycle.

Location	Date	Nourishment Cycle[6]	Estimated Volume of Sand
Section II – South Reach[1]	2006	1st	1,000,000
Long Branch, NJ	2006	1st	1,000,000
Port Monmouth, NJ[2]	2007	Initial	400,000
Keansburg, NJ[2]	2007	Initial	2,000,000
Laurence Harbor, NJ[2]	2007	Initial	600,000
Union Beach, NJ[2]	2008	Initial	700,000
Section I – Contract 3[3]	2008	Initial	4,460,000
Section II – North Reach[4]	2008	1st [6]	2,600,000
Section I – 1A, 1B, and 2[5]	2009	2nd[6]	3,500,000
Section II – Entire Reach	2010	2nd[6]	2,600,000
Section I – 1A, 1B and 2	2013	3rd[6]	3,500,000
Section II – Entire Reach	2018	3rd[6]	2,600,000
Section I – 1A, 1B and 2	2021	4th[6]	3,500,000
Section II – Entire Reach	2024	4th[6]	2,600,000
Section I – 1A, 1B and 2	2027	5th[6]	3,500,000

Section II – Entire Reach	2030	5th[6]	2,600,000
Section I – 1A, 1B and 2	2031	6th[6]	3,500,000
Section II – Entire Reach	2036	6th[6]	2,600,000
Section I – 1A, 1B and 2	2039	7th[6]	3,500,000
Section II – Entire Reach	2042	7th[6]	2,600,000

[1] Belmar to Manasquan, NJ
[2] Sand for periodic renourishment to come from upland sources.
[3] Includes the communities of Elberon, Deal, Allenhurst and Loch Arbour, NJ.
[4] Asbury Park to Avon-by-the-Sea, NJ
[5] 1A = Monmouth Beach, NJ; 1B = Sea Bright, NJ; 2 = Long Branch, NJ
[6] Renourishment planning estimates only. Actual placement dates, volumes, and locations are based on funding availability, storm occurrences and fill longevity.

VI Method to Dredge Sand at the SBOBA

The method that has been used almost exclusively to dredge sand from the SBOBA involves the use of a hopper dredge. The hopper dredge uses hydraulic arms that are lowered from the vessel to the ocean bottom. Using large pumps located on-board the vessel, sand is sucked from the ocean bottom and transported up through hydraulic arms and then deposited into the hopper of the vessel. Once the vessel has reached its maximum holding capacity of sand, each hydraulic arm is lifted out of the water. The hopper dredge then transports its load of sand to the beach where the sand will be transported from the vessel by a floating pipeline and placed on the beach as a slurry mixture. The sand is then spread and contoured to design specifications by earth-moving equipment. It is expected that a hopper dredge will be used almost exclusively in the future.

However, a cutter-head dredge was used to dredge and transport sand from the SBOBA to locations within the Sandy Hook National Park and in the northern section of Sea Bright, NJ. The selection of a cutter-head dredge was made to reduce the cost to restore the beach in these areas. A cutter-head dredge, like the hopper dredge, uses suction to remove sand from the ocean bottom and place the sand onto the beach. The difference is that a cutter-head dredge transports the sand from the ocean bottom to the placement site in one continuous operation by using a pipeline. The hopper dredge has to fill-up its hopper with sand, and then carrying the sand, travel to the placement site to discharge the sand by a floating pipeline.

VII EXISTING RESOURCES

Under provisions of the reauthorized Magnuson-Stevens Fishery Conservation and Management Act of 1996, the entire area of the SBOBA is designated as EFH for species with Fishery Management Plans (FMP's), and their important prey species. The National Marine Fisheries Service has identified EFH within 10-minute x 10-minute squares. The study area contains EFH for various life stages for 28 species of managed fish and shellfish. Table 4 presents the managed species and their life stage for which EFH is identified within the 10 x 10 minute squares (North Boundary 40^0 30.0' N; East Boundary 73^0 50'.0 W; South Boundary 40^0 20.0' N; West Boundary 74^0 00.0' W) that cover the study area. The habitat requirements for identified EFH species and their representative life stages are provided in Table 5. The square description include waters west of and east of the Sandy Hook peninsula, along with waters east of Sea Bright and north of Monmouth Beach, New Jersey

Table 4: EFH managed species and their representative life stage at the SBOBA.

MANAGED SPECIES	**EGGS**	**LARVAE**	**JUVENILES**	**ADULTS**
Atlantic cod (*Gadus morhua*)				x
Whiting (*Merluccius bilinearis*)	x	x	x	x
Red hake (*Urophycis chuss*)	x	x	x	
Witch flounder (*Glyptocephalus cynoglossus*)		x		
Winter flounder (*Pleuronectes americanus*)	x	x	x	x
Yellowtail flounder (*Pleuronectes ferruginea*)	x	x		
Windowpane flounder (*Scopthalmus aquosus*)	x	x	x	x
Atlantic sea herring (*Clupea harengus*)			x	x
Monkfish (*Lophius americanus*)	x	x		
Bluefish (*Pomatomus saltatrix*)	x	x	x	x
Atlantic butterfish (*Peprilus tricanthus*)			x	
Summer flounder (*Paralicthys dentatus*)			x	x
Scup (*Stenotomus chrysops*)			x	x
Black sea bass (*Centropristus striata*)			x	x
Ocean quahog (*Artica islandica*)				x
King mackerel (*Scomberomorus cavalla*)	x	x	x	X
Spanish mackerel (*Scomberomorus maculatus*)	x	x	x	x
Cobia (*Rachycentron canadum*)	x	x	x	x
Dusky shark (*Charcharinus obscurus*)		x1	x	
Sand tiger shark (*Odontaspis taurus*)		x1		
Sandbar shark (*Charcharinus plumbeus*)		x1	x	x
Tiger shark (*Galeocerdo cuvieri*)		x1		
Shortfin mako shark (*Isurus oxyrhyncus*)		x1		
Bluefin tuna (*Thunnus thynnus*)			x	
Skipjack tuna (*Katsuwonus pelamis*)				x
Clearnose skate (*Raja eglanteria*)			x	x
Little skate (*Leucoraja erinacea*)			x	x
Winter skate (*Leucoraja ocellata*)			x	x

1 Shark larvae are neonate.

Table 5: Habitat utilization of identified EFH species for representative life stages in the SBOBA (USACE 2002)

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
Atlantic cod (*Gadus morhua*)				**Habitat**: Bottom (rocks, pebbles, or gravel) winter for Mid-Atlantic Prey: shellfish**Error! Bookmark not defined.**, crabs, and other crustaceans (amphipods) and polychaetes, squid and fish (capelin redfish, herring, plaice, haddock).
Whiting (*Merluccius* bilinearis)	**Habitat**: Pelagic continental shelf waters in preferred depths from 50-150 m.	**Habitat**: Pelagic continental shelf waters in preferred depths from 50-130 m.	**Habitat**: Bottom (silt-sand) nearshore waters in preferred depths from 150-270 m in spring and 25-75 m in fall. **Prey**: fish, crustaceans (euphasids, shrimp), and squids.	
Red hake (*Urophycis chuss*)	**Habitat**: Surface waters, May – Nov.	**Habitat**: Surface waters, May –Dec. Abundant in mid-and outer continental shelf of Mid-Atlantic. Bight. **Prey**: copepods and other micro crustaceans under floating eelgrass or algae.	**Habitat**: Pelagic at 25-30 m and bottom at 35-40 m. Young inhabit depressions on open seabed. Older juveniles inhabit shelter provided by shells and shell fragments. **Prey**: small benthic and pelagic crustaceans (decapod shrimp, crabs, mysids, euphasiids, and amphipods) and polychaetes).	
Witch flounder (*Glyptocephalus cynoglossus*)	.	**Habitat**: Pelagic generally over deep water in depths ranging from 10 – 1250 m.		
Winter Flounder (*Pseudopleuronectes americanus*)	**Habitat**: Pelagic and bottom water at depths less than 5 meters with a broad range of salinity, abundant February through July.	**Habitat**: Pelagic and bottom water at depths less than 5 meters with a broad range of salinity, abundant February through July.	**Habitat**: Young of the year (YOY) are demersal, nearshore low (primarily inlets and coves) energy shallows with sand, muddy sand, mud and gravel bottoms. **Prey**: YOY Amphipods and annelids JUV – Sand dollar, Bivalve siphons, Annelids,	**Habitat**: Demersal offshore (in spring) except when spawning where they are in shallow inshore waters (fall). **Prey**: Amphipods, Polychaetes, Bivalves or siphons, Capelin eggs, Crustaceans.

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
			Amphipods.	
Yellowtail flounder (*Pleuronectes ferruginea*)	**Habitat**: Pelagic waters ranging from 10 to 750 meters.	**Habitat**: Pelagic waters. **Prey**: Polychaetes.		
Windowpane flounder (*Scopthalmus aquosus*)	**Habitat**: Surface waters <70 m, Feb-July; Sept-Nov.	**Habitat**: Initially in pelagic waters, then bottom <70m, May-July and Oct-Nov. **Prey**: copepods and other zooplankton.	**Habitat**: Bottom (fine sands) 5-125 m in depth, in nearshore bays and estuaries less than 75 m. **Prey**: small crustaceans (mysids and decapod shrimp) polychaetes and various fish larvae.	**Habitat**: Bottom (fine sands), peak spawning in May, in nearshore bays and estuaries less than 75 m **Prey**: small crustaceans (mysids and decapod shrimp) polychaetes and various fish larvae.
Atlantic sea herring (*Clupea harengus)*			**Habitat**: Pelagic waters and bottom, < 10 C and 15-130 m depths. **Prey**: zooplankton (copepods, decapod larvae, cirriped larvae, cladocerans, and pelecypod larvae).	**Habitat**: Pelagic waters and bottom habitats. **Prey**: chaetognath, euphausiids, pteropods and copepods.
Monkfish (*Lophius americanus*)	**Habitat**: Surface waters, Mar. – Sept. peak in June in upper water column of inner to mid continental shelf.	**Habitat**: Pelagic waters in depths of 15 – 1000 m along mid-shelf also found in surf zone. **Prey**: zooplankton (copepods, crustacean larvae, chaetognaths).		
Bluefish (*Pomatomus saltatrix*)	**Habitat**: April through August in Pelagic waters over the Continental shelf at mid-shelf depth at temp > 18^0C.	**Habitat**: Pelagic waters over the continental shelf and in Mid-Atlantic estuaries and intertidal and nearshore zones June through Sept.	**Habitat**: Pelagic waters of continental shelf and in Mid Atlantic estuaries and intertidal and nearshore zones from May-Nov.	**Habitat**: Pelagic waters; found in Mid Atlantic estuaries April – Oct.
Atlantic butterfish (*Peprilus tricanthus*)			**Habitat**: Pelagic waters in 10 – 360 meters. **Prey:** Feed mainly on planktonic prey, including thaliaceans, squids, copepods, amphipods, decapods, coelenterates,	

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
			polychaetes, small fishes, and ctenophores.	
Summer flounder (*Paralicthys dentatus*)			**Habitat**: Demersal waters, muddy and sandy (preferred) substrates.	**Habitat**: Demersal waters (mud and sandy substrates). Shallow coastal areas in warm months, offshore in cold months.
Scup (*Stenotomus chrysops*)			**Habitat**: Demersal waters.	**Habitat**: Demersal waters offshore from Nov – April.
Black sea bass (*Centropristus striata*)			**Habitat**: Demersal waters over rough bottom, shellfish and eelgrass beds, man-made structures in sandy-shelly areas and winters off shore at depths of 1-38 m in shell beds and shell patches.	**Habitat**: Demersal waters over structured habitats (natural and man-made), and sand and shell areas and winters off shore at depths of 25-50 m in shell beds and shell patches.
Ocean quahog (*Artica islandica)*				**Habitat**: Throughout the substrate to a depth of 3 m.
King mackerel (*Scomberomorus cavalla*)	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone.	**Habitat**: Pelagic waters with sandy shoals of capes an offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone.	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone.	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone.
Spanish mackerel (*Scomberomorus maculates*)	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory.	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory.	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory.	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory.
Cobia (*Rachycentron canadum*)	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory.	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory.	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory.

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
		shelf break zone. Migratory.		
Sand tiger shark (*Odontaspis taurus)*		**Habitat**: is shallow coastal waters from Barnegat Inlet, NJ to Cape Canaveral, FL out to the 25m isobath, entirely outside of the project area.		
Dusky shark (*Charcharinus obscurus*)		**Habitat**: in shallow coastal waters, inlets, and estuaries to the 25m isobath from Montauk to Cape Lookout, NC.	**Habitat**: juveniles found in coastal and pelagic waters between the 25- and 200-meter isobath.	
Sandbar shark (*Charcharinus plumbeus*)		**Habitat**: is shallow coastal water from Barnegat Inlet, NJ to Cape Canaveral, FL out to the 25 m isobath, entirely outside of the project area. Also found in salinity greater than 22 ppt and temperatures greater than 70 F°.	**Habitat**: found in coastal and pelagic waters north of 40° North and at the shelf break in the mid-Atlantic during winter. Also found in salinity greater than 22 ppt and temperatures greater than 70 F°.	**Habitat**: demersal shallow coastal waters from the coast to the 50-meter isobath. Habitat areas of particular concern are shallow areas in the mouth of the Great Bay, NJ, lower and middle Delaware Bay, lower Chesapeake Bay, and on the Outer Banks, NC in areas of Pamlico Sound adjacent to Hatteras Island and offshore.
Tiger shark (*Galeocerdo cuvieri*)		**Habitat**: is from shallow coastal areas to 200 m isobath from Cape Canaveral, FL to Montauk, NY.		
Shortfin mako shark (*Isurus oxyrhyncus*)		**Habitat**: is found between the 25- and 50-meter isobath.		
Bluefin tuna (*Thunnus thynnus*)			**Habitat**: is primarily surface water, also found in inshore and pelagic waters between the 25 and 200-meter isobath.	
Skipjack tuna (*Katsuwonus pelamis)*				**Habitat**: is pelagic surface waters.
Clearnose skate (*Raja eglanteria*)			**Habitat**: is bottom habitats with soft bottom along the continental shelf and rocky or gravelly bottom, from shore to 500 meters, but	**Habitat**: is both soft bottom and rocky or gravelly bottom habitats, from the shore to 400 meters, but they are most abundant at depths less than 111 meters. Migration along the New Jersey shoreline

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
			most abundant at depths less than 111 meters. Migration along the New Jersey shoreline occurs in late April through May and October through November. Temperature range of 9-30 °C, salinity ranges from 22-36ppt.	occurs in late April through May and October through November.
Little skate (*Leucoraja erinacea*)			**Habitat**: is found in sandy or gravelly substrate or mud, found from the shore to 137 meters, with the highest abundance from 73-91 meters, found between 4-15°C, at salinities of 15 ppt, but the preferred range is 31-34ppt. Move inshore during spring and autumn, and offshore in mid to late summer, and midwinter.	**Habitat**: is similar habitat as juveniles.
Winter skate (*Leucoraja ocellata*)			**Habitat**: is primarily sand and gravel bottom but also found in mud bottoms, from shoreline to about 400 meters and are most abundant at depths less than 111 meters, temperature range for these skates is from -1.2°C to around 21°C, with most found from 4-16 °C, salinities as low as 23 ppt but prefer a salinity range of 32-34ppt.	**Habitat**: is similar habitat as juveniles.

Other aquatic resources that occupy the SBOBA include phytoplankton, which is an important food source for filter-feeding bivalves. Infauna resources include polycheate worms mostly *Spiophanes bombyx* and *Prionospio malmgreni*. The most important bivalve species are the surf clam (*Spisula solidissima*), tellin (*Tellina agilis*), razor clam (*Ensis directus*). In addition, there are gastropods, amphipods, isopods, sand dollars, starfish and decapod crustaceans. Common decapod species include the blue claw crab (*Callinectes sapidus*), American lobster (*Homarus americanus*), rock crab (*Cancer *irroratus*), hermit crab (*Pagurus longicarpus*) and lady or calico crab (*Ovalipes ocellatus*) (USACE 1989).

VIII ANALYSIS OF EFFECTS ON EFH SPECIES

As discussed in the Section VII above, there are a number of Federally-managed fish species where EFH was identified for one or more life stages within the SBOBA. Fish occupation of waters within the impact area is highly variable both spatially and temporally. Some of the species are strictly offshore, while others may occupy both nearshore and offshore waters. In addition, some species may be suited for the open ocean or pelagic waters, while other species may be more oriented to bottom or demersal waters. This can also vary between life stages of Federally managed species. Also, seasonal abundances are highly variable, as many species are highly migratory. Table 6 below briefly discusses the direct and indirect impacts on identified EFH species and their representative life stages.

Table 6: Direct and indirect impacts on identified EFH species for representative life stages (USACE 2002).

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
Atlantic cod (*Gadus morhua*)				**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions, but at deeper water depths. Adults should be capable of relocating during dredging. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.
Whiting (*Merluccius bilinearis*)	Eggs are pelagic and are concentrated in depth of 50 – 150 meters; therefore no **direct** or **indirect** effects are expected.	Larvae are pelagic and are concentrated in depth of 50 –150 meters; therefore no **direct** or **indirect** effects are expected.	**Direct**: Occur near bottom. Physical habitat in borrow site should remain basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect:** Temporary disruption of benthic food prey organisms in immediate dredging area. .	**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. Adults should be capable of relocating during dredging. **Indirect:** Temporary disruption of benthic food prey organisms in immediate dredging area.
Red hake (*Urophycis chuss*)	Eggs occur in surface waters; therefore, no	Larvae occur in surface waters; therefore, no **direct**	**Direct**: Physical habitat in the borrow site should remain	

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
	direct or **indirect** effects are expected.	or **indirect** effects are expected.	basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.	
Witch flounder (*Glyptocephalus cynoglossus*)		Larvae are typically found in surface waters and would not be affected by dredging; therefore, no **direct** or **indirect** impact is expected.		
Winter flounder (*Pseudopleuronectes americanus*)	Eggs are demersal in very shallow waters of coves and inlets in Spring. Dredging may have some effect on eggs if construction occurs during Spring.	Larvae are initially planktonic, but become more bottom-oriented as they develop. Potential for some to become entrained during dredging in borrow areas.	**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.	**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. Adults should be capable of relocating during dredging. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.
Yellowtail flounder (*Pleuronectes ferruginea*)	Eggs are pelagic, generally over deep water; therefore no **direct** or **indirect** effects are expected.	Larvae occur in pelagic waters; therefore, no **direct** or **indirect** effects are expected.		
Windowpane flounder (*Scopthalmus aquosus*)	Eggs occur in surface waters; therefore, no **direct** or **indirect** effects are expected.	Larvae occur in pelagic waters; therefore, no **direct** or **indirect** effects are expected.	**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.	**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. Adults should be capable of relocating during dredging. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.
Atlantic sea herring (*Clupea harengus*)			**Direct**: Occur in pelagic and near bottom. Physical habitat in borrow site	**Direct**: Occur in pelagic and near bottom. Physical habitat in borrow site

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
			should remain basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect**: None, prey items are planktonic.	should remain basically similar to pre-dredge conditions. Adults should be capable of relocating during dredging. **Indirect**: None, prey items are primarily planktonic.
Monkfish (*Lophius americanus*)	Eggs occur in surface waters with depths greater than 75 ft; therefore, no **direct** or **indirect** effects are expected.	Larvae occur in pelagic waters with depths greater than 75 ft; therefore, no **direct** or **indirect** effects are expected.		
Bluefish *(Pomatomus saltatrix*)	Eggs occur in pelagic waters over the Continental Shelf. No **direct** or **indirect** impact is expected.	Larvae occur in pelagic waters over the Continental Shelf. No **direct** or **indirect** impact is expected.	**Direct:** Juvenile bluefish are pelagic species. No significant direct effects anticipated. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.	**Direct**: Adult bluefish are pelagic species and should be capable of relocating during dredging. No significant direct effects anticipated. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.
Atlantic butterfish (*Peprilus tricanthus*)			**Direct**: Juvenile butterfish are pelagic species. No significant direct effects anticipated. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.	
Scup (*Stenotomus chrysops*)			**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.	**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. Adults should be capable of relocating during dredging. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.
Black sea bass (*Centropristus striata*)			**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. Offshore sites are mainly	**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. Adults should be capable of

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
			sandy soft-bottoms, however, some pockets of gravelly or shelly bottom may be impacted. Some mortality of juveniles could be expected from entrainment into the dredge. Some intertidal and subtidal, rocky habitat may be impacted due to sand partially covering groins and potential shipwrecks along the shoreline. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.	relocating during dredging. Offshore sites are mainly sandy soft-bottoms, however, some pockets of gravelly or shelly bottom may be impacted. Some intertidal and subtidal**Error! Bookmark not defined.** rocky habitat may be impacted due to sand partially covering groins and potential shipwrecks along the shoreline. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.
Ocean quahog (*Artica islandica*)				**Direct**: Complete removal within borrow site during dredging. Similar substrate and slight increase in depth would allow for recruitment. No adult quahogs were found in the SBOBA. **Indirect**: Temporary reduction in reproductive potential.
King mackerel (*Scomberomorus cavalla*)	**Direct**: Eggs are pelagic; therefore no adverse impacts are anticipated. **Indirect**: None anticipated.	**Direct**: Larvae are pelagic; therefore no adverse impacts are anticipated. **Indirect**: None anticipated.	**Direct**: Juveniles are pelagic; therefore no adverse impacts are anticipated. **Indirect**: Minor indirect adverse effects on food chain through disruption of benthic community; however, mackerel are highly migratory.	**Direct**: Adults are pelagic, highly migratory and should be capable of relocating during dredging. Therefore no adverse impacts are anticipated. **Indirect**: Minor indirect adverse effects on food chain through disruption of benthic community; however, mackerel are highly migratory.
Spanish mackerel (*Scomberomorus maculatus*)	**Direct**: Eggs are pelagic;, therefore no adverse impacts are anticipated. **Indirect**: None anticipated.	**Direct**: Larvae are pelagic; therefore no adverse impacts are anticipated. **Indirect**: None anticipated.	**Direct**: Juveniles are pelagic; therefore no adverse impacts are anticipated. **Indirect**: Minor indirect adverse effects on food chain through disruption of benthic community; however, mackerel are highly migratory.	**Direct**: Adults are pelagic, highly migratory should be capable of relocating during dredging., Therefore no adverse impacts are anticipated. **Indirect**: Minor indirect adverse effects on food chain through disruption of benthic community;

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
				however, mackerel are highly migratory.
Cobia (*Rachycentron canadum*)	**Direct**: Eggs are pelagic; therefore no adverse impacts are anticipated. **Indirect**: None anticipated.	**Direct**: Larvae are pelagic; therefore no adverse impacts are anticipated. **Indirect**: None anticipated.	**Direct**: Cobia are pelagic and migratory species. No significant direct effects anticipated. **Indirect**: Temporary disruption of benthic food prey organisms.	**Direct**: Cobia are pelagic, migratory and should be capable of relocating during dredging. No significant direct effects anticipated. **Indirect**: Temporary disruption of benthic food prey organisms in immediate dredging area.
Dusky shark (*Charcharinus obscurus*)		**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. Mortality from dredge unlikely because embryos are reported up to 3 feet in length . Therefore, the newborn may be mobile enough to avoid a dredge. **Indirect**: Temporary disruption of benthic food prey organisms and small fish.	Due to the mobility of this life stages, no **direct** or **indirect** impact is expected.	
Sand tiger shark (*Odontaspis taurus)*		No **direct** of i**ndirect** effects are expected because they occur outside of the study area.		
26. Sandbar shark (*Charcharinus plumbeus*)		**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. However, some mortality of larvae may be possible from entrainment into the dredge **Indirect**: Temporary disruption of benthic food prey organisms and small fish .	**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. Juveniles are mobile and are capable of avoiding impact areas. **Indirect**: Temporary disruption of benthic food prey organisms, fish and food chain within borrow area.	**Direct**: Physical habitat in the borrow site should remain basically similar to pre-dredge conditions. Adults are highly mobile and are capable of avoiding impact areas. **Indirect**: Temporary disruption of benthic food prey organisms, fish and food chain within borrow area.
Tiger shark (*Galeocerdo cuvieri*)		Physical habitat in borrow site should remain basically similar to pre-dredge conditions. **Direct**: some mortality of larvae may be possible from entrainment into the dredge. Indirect: None are expected.		

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
Shortfin mako shark (*Isurus oxyrhyncus*)		**Direct**: May be affected by the entrainment into the dredge. However, due to the vertical distribution of this life stages, no more than minimal impact is expected. **Indirect**: None are expected.		
Bluefin tuna (*Thunnus thynnus*)			No more than minimal **direct** or **indirect** impact is expected because of their vertical distribution (surface waters) and high mobility would avoid dredge entrainment.	
Skipjack tuna (*Katsuwonus pelamis)*				No more than minimal **direct** or **indirect** impact is expected because of their vertical distribution (surface waters) and high mobility would avoid dredge entrainment.
Clearnose skate (*Raja eglanteria*)			**Direct**: Some skates will get entrained into the dredge. **Indirect**: Temporary disruption of benthic food prey organisms and food chain within SBOBA.	**Direct**: Some skates will get entrained into the dredge, but have the ability to avoid entrainment. **Indirect**: Temporary disruption of benthic food prey organisms and food chain within SBOBA.
Little skate (*Leucoraja erinacea*)			**Direct**: Some skates will get entrained into the dredge. **Indirect**: Temporary disruption of benthic food prey organisms and food chain within SBOBA.	**Direct**: Some skates will get entrained into the dredge, but have the ability to avoid entrainment. **Indirect**: Temporary disruption of benthic food prey organisms and food chain within SBOBA.
Winter skate (*Leucoraja ocellata*)			**Direct**: Some skates will get entrained into the dredge. **Indirect**: Temporary disruption of benthic food prey organisms and food chain within SBOBA.	**Direct**: Some skates will get entrained into the dredge, but have the ability to avoid entrainment. **Indirect**: Temporary disruption of benthic food prey organisms and food chain within SBOBA

Direct Impacts

A major concern with respect to physical changes involves the potential reduction of sandy habitat due to the removal of sand for its placement onto the beach. The area of the SBOBA may be considered broad from an individual spatial perspective but it's insignificant when examined to the totality of nearshore sandy bottom habitat available for EFH species. The lowering of the physical habitat at the SBOBA, which is the main effect to the habitat, is expected to have minimal impact to EFH species because most of substrate that will be exposed after dredging has similar sedimentary characteristics as the current overlying sediments (USACE 1989). Furthermore, the depth of dredging will vary from 6 feet to no more than 20 feet. This type of construction allows for the formation of preferred feeding habitat (depression), which is generally considered attractive to fish. Entrainment of species with a designated EFH is also likely to occur. Adult winter and summer flounder and perhaps some juvenile winter flounder will be entrained and result in their mortality. However, the majority of bottom dwelling EFH species that are found within the SBOBA have matured to a state where the disturbance caused by dredging would alarm them resulting in their successful evacuation of the immediate area to nearby contiguous waters. In addition, EFH species that occupy levels of the water column that are above the sea bottom are located outside and away from the impacted sea floor. Overall, dredging operations at the SBOBA should have nominal mortality on adult and juvenile EFH species.

In general, fish larvae are known to occur in nearshore waters. The USACE (2001) collected larval fish in the nearshore that illustrated a diverse assemblage of fishes representing 33 families. Fish larvae designated as an EFH species are found within the area of the SBOBA. Their occurrence is limited to the upper portion of the water column, which is away from the impacted sea floor and only in restricted numbers. However, it is a possibility that maturing winter flounder larvae can be found at the bottom habitat of the SBOBA; but their quantity is also expected to be limited and restricted just to the springtime. In general, entrainment of ichthyoplankton is likely, but is not expected to have a detectable effect to designated EFH species.

Indirect Impacts

In general, adverse impacts to Federally-managed fish species stem from alterations of the bottom habitat, which results from dredging in the SBOBA. EFH can be adversely impacted temporarily through water quality impacts such as increased turbidity and decreased dissolved oxygen content. These impacts would subside upon cessation of dredging activities. More long-term impacts to EFH involve physical changes to the bottom habitat, which involve changes to bathymetry, sediment substrate, and benthic community as a food source.

In 1989, the District conducted an investigation to characterize the infauna and epifauna resources at the SBOBA. The results of this study (USACE 1991) and in consultation with the USACE's Engineering and Design Research Center (ERDC) (Burlas 2005, personnel communication) conclude that the infauna communities at the SBOBA and at the offshore borrow areas that were evaluated as a component of the District's BMP

(USACE 2001) are very similar. Since the offshore infauna resources are very similar, it is reasonable to conclude that impacts to the SBOBA fauna community and their subsequent recovery and recolonization rate is comparable to the results of the BMP study. The results of the BMP study are:

- 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.

- Borrow area fish showed no detectable changes in abundance, species composition, or feeding habits.

- Important bottom-feeding fish, such as summer and winter flounder, did not appear to rely on the borrow area in particular for food.

- Grain size was smaller/finer due to dredging.

Since the SBOBA is located near land, another anticipated effect of dredging is change in wave refraction. The lowering of the ocean bottom can alter wave height, direction and angle potentially modifying the habitat of the nearby shoreline and intertidal zone. An analysis was performed using a numerical model that was subjected to various scenarios with respect to depth of dredging, frequency of wave occurrence and angle/direction of wave. The results showed that dredging at the SBOBA altered wave refraction, but only nominally. Accordingly, wave impacts to the nearby shoreline and intertidal zone are not expected (USACE 1989).

Table 6: Direct and indirect impacts on identified EFH species for representative life stages

SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
Atlantic cod (Gadus morhua)				**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. **Indirect:** Temporary disruption of benthic food prey organisms.
Whiting (Merluccius bilinearis)	Eggs are pelagic and are concentrated in depth of 50 –150 meters, therefore no direct or indirect effects are expected.	Larvae are pelagic and are concentrated in depth of 50 –150 meters, therefore no direct or indirect effects are expected.	**Direct:** Occur near bottom. Physical habitat in borrow site should remain basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect:** Temporary disruption of benthic	**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. **Indirect:** Temporary disruption of benthic food prey organisms.

Table 6: Direct and indirect impacts on identified EFH species for representative life stages				
SPECIES	**EGGS**	**LARVAE**	**JUVENILES**	**ADULTS**
			food prey organisms.	
Red hake (Urophycis chuss)	Eggs occur in surface waters; therefore, no direct or indirect effects are expected.	Larvae occur in surface waters; therefore, no direct or indirect effects are expected.	**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect:** Temporary disruption of benthic food prey organisms.	
Witch flounder (Glyptocephalus cynoglossus)		Larvae are typically found in surface waters and would not be affected by dredging Therefore, no direct or indirect impact is expected.		
Winter flounder (Pseudopleuronectes americanus)	Eggs are demersal in very shallow waters (. 5 m) of coves and inlets in spring. Dredging may have some effect on eggs during spring if eggs drift into the SBOBA and are entrained. .	Larvae are initially planktonic, but become more bottom-oriented as they develop. Potential for some to become entrained during dredging in borrow areas.	**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect**: Temporary disruption of benthic food prey organisms	**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. **Indirect:** Temporary disruption of benthic food prey organisms.
Yellowtail flounder (Pleuronectes ferruginea)	Eggs are pelagic, generally over deep water, therefore no direct or indirect effects are expected.	Larvae occur in pelagic waters; therefore, no direct or indirect effects are expected.		
Windowpane flounder (Scopthalmus aquosus)	Eggs occur in surface waters; therefore, no direct or indirect effects are expected.	Larvae occur in pelagic waters; therefore, no direct or indirect effects are expected.	**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect:** Temporary disruption of benthic prey within SBOBA..	**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. . **Indirect:** Temporary disruption of benthic prey within SBOBA.
Atlantic sea herring (Clupea harengus)			**Direct**: Occur in pelagic and near bottom. Physical habitat in borrow site should remain	**Direct: Occur in** pelagic and near bottom. Physical habitat in borrow site should remain

Table 6: Direct and indirect impacts on identified EFH species for representative life stages				
SPECIES	**EGGS**	**LARVAE**	**JUVENILES**	**ADULTS**
			basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect:** None, prey items are planktonic	basically similar to pre-dredge conditions. **Indirect:** None, prey items are primarily planktonic
Monkfish (Lophius americanus)	Eggs occur in surface waters with depths greater than 75 ft; therefore, no direct or indirect effects are expected.	Larvae occur in pelagic waters with depths greater than 75 ft; therefore, no direct or indirect effects are expected.		
Bluefish (Pomatomus saltatrix)	Eggs occur in pelagic waters over the Continental Shelf. No direct or indirect impact is expected.	Larvae occur in pelagic waters over the Continental Shelf. No direct or indirect impact is expected.	**Direct**: Juvenile bluefish are pelagic species. No significant direct effects anticipated. **Indirect:** Temporary disruption of benthic prey within SBOBA..	**Direct:** Adult bluefish are pelagic species. No significant direct effects anticipated. **Indirect:** Temporary disruption of benthic prey within SBOBA.
Atlantic butterfish (Peprilus tricanthus)			**Direct:** Juvenile butterfish are pelagic species. No significant direct effects anticipated. **Indirect:** Temporary disruption of benthic prey within SBOBA..	
Summer flounder (Paralicthys dentatus)			**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect:** Temporary disruption of benthic prey within SBOBA..	**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. **Indirect:** Temporary disruption of benthic prey within SBOBA.
Scup (Stenotomus chrysops)			**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. However, some mortality of juveniles could be expected from entrainment into the dredge. **Indirect:** Temporary disruption of benthic prey within SBOBA..	**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. Adults should be capable of relocating during impact. **Indirect:** Temporary disruption of benthic prey within SBOBA..
Black sea bass			**Direct:** Physical	**Direct:** Physical

Table 6: Direct and indirect impacts on identified EFH species for representative life stages				
SPECIES	**EGGS**	**LARVAE**	**JUVENILES**	**ADULTS**
(Centropristus striata)			habitat in borrow sites should remain basically similar to pre-dredge conditions. Some mortality of juveniles could be expected from entrainment into the dredge **Indirect:** Temporary disruption of benthic prey within SBOBA..	habitat in borrow sites should remain basically similar to pre-dredge conditions. **Indirect:** Temporary disruption of benthic prey within SBOBA..
Ocean quahog (Artica islandica)				**Direct:** No adult quahogs were found in the SBOBA.
King mackerel (Scomberomorus cavalla)	**Direct Impacts:** Eggs are pelagic, therefore no adverse impacts are anticipated. **Indirect Impacts:** None anticipated.	**Direct Impacts:** Larvae are pelagic, therefore no adverse impacts are anticipated. **Indirect Impacts:** None anticipated.	**Direct Impacts:** Juveniles are pelagic, therefore no adverse impacts are anticipated. **Indirect Impacts:** Temporary disruption of benthic prey within SBOBA., however, mackerel are highly motile.	**Direct Impacts:** Adults are pelagic and highly motile, therefore no adverse impacts are anticipated. **Indirect Impacts:** Temporary disruption of benthic prey within SBOBA., however, mackerel are highly motile.
Spanish mackerel (Scomberomorus maculatus)	**Direct Impacts:** Eggs are pelagic, therefore no adverse impacts are anticipated. **Indirect Impacts:** None anticipated.	**Direct Impacts:** Larvae are pelagic, therefore no adverse impacts are anticipated. **Indirect Impacts:** None anticipated.	**Direct Impacts:** Juveniles are pelagic, therefore no adverse impacts are anticipated. **Indirect Impacts:** Minor indirect adverse effects on food chain through disruption of benthic community, however, mackerel are highly motile.	**Direct Impacts:** Adults are pelagic and highly motile, therefore no adverse impacts are anticipated. **Indirect Impacts:** Minor indirect adverse effects on food chain through disruption of benthic community, however, mackerel are highly motile.
Cobia (Rachycentron canadum)	**Direct Impacts:** Eggs are pelagic, therefore no adverse impacts are anticipated. **Indirect Impacts:** None anticipated.	**Direct Impacts:** Larvae are pelagic, therefore no adverse impacts are anticipated. **Indirect Impacts:** None anticipated.	**Direct:** Cobia are pelagic and migratory species. No significant direct effects anticipated. **Indirect:** Temporary disruption of benthic prey within SBOBA..	**Direct:** Cobia are pelagic and migratory species. No significant direct effects anticipated. **Indirect** Temporary disruption of benthic prey within SBOBA..
Dusky shark (Charcharinus obscurus)		**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. Mortality from dredge unlikely because embryos are reported up to 3 feet in length (McClane, 1978). Therefore, the newborn may be	Due to the motility of this life stages, no direct or indirect impact is expected.	

Table 6: Direct and indirect impacts on identified EFH species for representative life stages				
SPECIES	**EGGS**	**LARVAE**	**JUVENILES**	**ADULTS**
		mobile enough to avoid a dredge. **Indirect:** Temporary disruption of benthic food prey organisms and food chain within SBOBA.		
Sand tiger shark (*Odontaspis taurus)*		No direct of indirect effects are expected because they occur outside of the study area.		
Sandbar shark (Charcharinus plumbeus)		**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. However, some mortality of larvae may be possible from entrainment into the dredge **Indirect** Temporary disruption of benthic prey within SBOBA.	**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. Juveniles are motile and are capable of avoiding impact areas. **Indirect** Temporary disruption of benthic prey within SBOBA.	**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. Adults are highly motile and are capable of avoiding impact areas. **Indirect** Temporary disruption of benthic prey within SBOBA.
Tiger shark (Galeocerdo cuvieri)		**Direct:** Physical habitat in borrow site should remain basically similar to pre-dredge conditions. However, some mortality of larvae may be possible from entrainment into the dredge.		
Shortfin mako shark (*Isurus oxyrhyncus*)		**Direct:** May be entrained into the dredge. However, due to the vertical distribution of this life stages, no more than minimal impact is expected. No indirect impacts are expected.		
Bluefin tuna (*Thunnus thynnus*)			No more than minimal direct or indirect impact is expected because of their vertical distribution (surface waters) and high motility would avoid dredge entrainment.	
Skipjack tuna (*Katsuwonus pelamis)*				No more than minimal direct or indirect impact is expected because of their vertical distribution

Table 6: Direct and indirect impacts on identified EFH species for representative life stages				
SPECIES	**EGGS**	**LARVAE**	**JUVENILES**	**ADULTS**
				(surface waters) and high motility would avoid dredge entrainment
Clearnose skate (*Raja eglanteria*)			**Direct:** Some skates will get entrained into the dredge. Indirect: Temporary disruption of benthic prey within SBOBA.	**Direct:** Some skates will get entrained into the dredge, but have the ability to avoid entrainment. Indirect: Temporary disruption of benthic prey within SBOBA.
Little skate (*Leucoraja erinacea*)			**Direct:** Some skates will get entrained into the dredge. **Indirect:** Temporary disruption of benthic prey within SBOBA.	**Direct:** Some skates will get entrained into the dredge, but have the ability to avoid entrainment. **Indirect:** Temporary disruption of benthic prey within SBOBA.
Winter skate (*Leucoraja ocellata*)			**Indirect:** Temporary disruption of benthic prey within SBOBA.	**Indirect:** Temporary disruption of benthic prey within SBOBA

Cumulative Impacts

The USACE is also involved with beach nourishment along the middle and southern portions of New Jersey, as well as along Long Island, New York. Their proposed offshore borrow areas have similar characteristics to the SBOBA with respect to fauna and epifauna resources, grain size, water depth and gently sloping bathymetry. The removal of sand is expected to be the same because a hopper dredge or sometimes perhaps a cutter-head dredge will be used. Likewise, the depth of dredging will not exceed 20 feet below existing grade. Finally, these potential borrow may be considered large from an individual spatial perspective but they're insignificant when examined to the totality of nearshore sandy bottom habitat available for EFH species.

Given all these similarities, it is realistic to conclude that the effects to EFH species at these borrow areas are alike. Accordingly, as previously discussed in the above direct impact section, the cumulative direct impacts on designated EFH species are not considered significant. In the same manner, cumulative indirect effects to the recovery of benthic resources and the change in water quality variables are considered minor and temporary in nature.

IX MITIGATION

Through avoidance and minimization practices, the District plans to minimize adverse effects to designated EFH species and other aquatic resources that use or migrate thought the SBOBA by implementing the following procedures:

- The pumps that extract the sand will not be turned on until the drag-head is at or near the sea bottom and will be turned off prior to its being lifted from the sea bottom. The implementation of this measure will eliminate the entrainment of resources that occupy areas in the lower, middle and upper levels of the water column. This practice is common because it facilitates optimal operating efficiency to reduce operating costs.

- The maximum depth that will be dredged for each dredging event will not exceed 20 feet below existing grade. This practice will avoid making deep holes, thus minimizing the potential to create anoxic environments.

REFERENCES

Burlas, M.H. 2005. Personnel communication with Dr. Gary Ray from the USACE's Engineering, Research and Design Center. Vicksburg, MS.

Clarke, D., Ray, G., Wilbur, P. and J Sims. October 1991. Baseline Characterization of the Benthic Resources and Their Use by Demersal Fishes at the Proposed at A proposed Beach Nourishment Borrow Site in New Jersey Coastal Waters. 12 pps.

USACE 1989. General Design Memorandum. Atlantic Coast of New Jersey, Sandy Hook to Barnegat Inlet, Beach Erosion Control Project, Section I – Sea Bright to Ocean Township, New Jersey.

USACE 1995. General Design Memorandum. Atlantic Coast of New Jersey, Sandy Hook to Barnegat Inlet, Beach Erosion Control Project, Section II – Asbury Park to Manasquan, New Jersey.

USACE 2001. Draft Final Report, The New York District's Biological Monitoring Program for the Atlantic Coast of New Jersey, Beach Erosion Control Project, Section II – Asbury Park to Manasquan, NJ.

USACE 2002. Final Integrated Feasibility Report. Atlantic Coast of New Jersey, Sandy Hook to Barnegat Inlet, Beach Erosion Control Project, Section III – Manasquan Inlet to Barnegat Inlet, New Jersey.

US Army Corps of Engineers
New York District

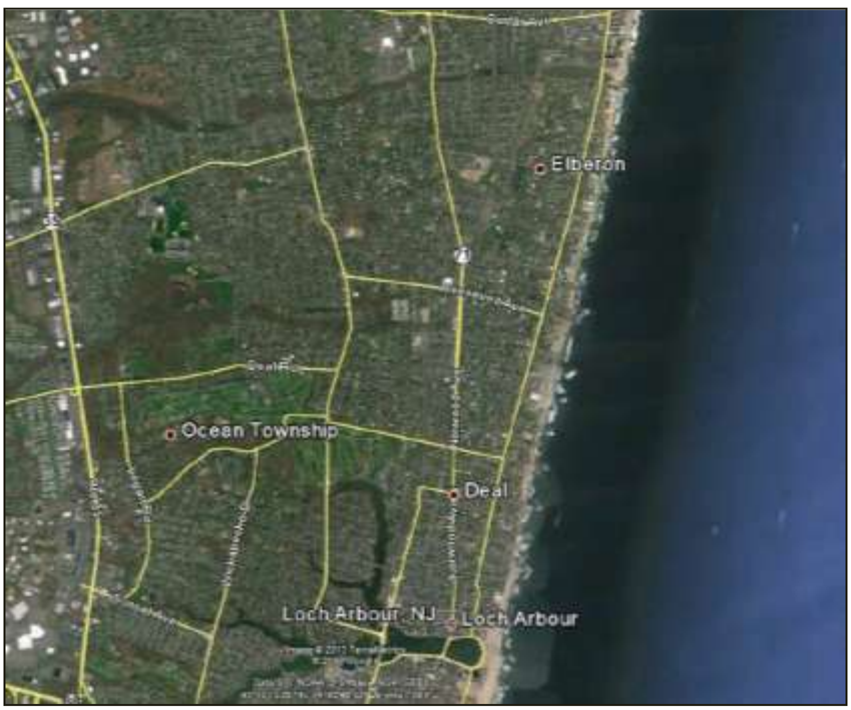
ESSENTIAL FISH HABITAT ASSESSMENT
NEAR SHORE PLACEMENT SITE

ATLANTIC COAST OF NEW JERSEY, SANDY HOOK TO BARNEGAT INLET

BEACH EROSION CONTROL PROJECTSECTION I

SEA BRIGHT TO OCEAN TOWNSHIP, NEW JERSEY:

ELBERON TO LOCH ARBOUR REACH



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1.0 Introduction

The U.S. Army Corps of Engineers (Corps), New York District (District), in partnership with the non-Federal sponsor, New Jersey Department of Environmental Protection (NJDEP), is proposing to construct the Elberon to Loch Arbour Beach Erosion Control Project which encompasses the Elberon neighborhood of the City of Long Branch, the Township of Deal, the Borough of Allenhurst, and the Village of Loch Arbour, in Monmouth County, New Jersey (Figure 1).

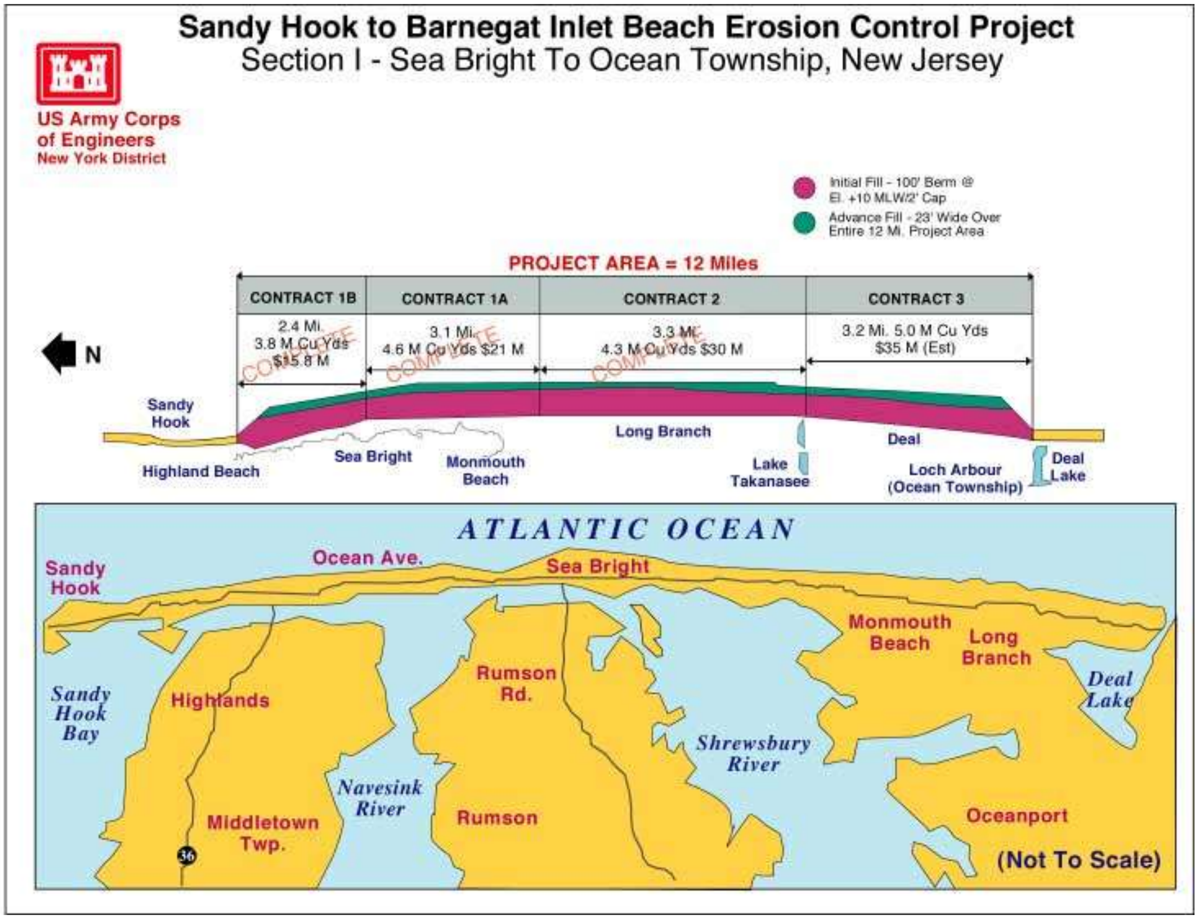
1.1 Overview

The recommended plan consists of constructing a 100 foot wide berm at elevation 10 feet above Mean Low Water (MLW) with a two foot high storm cap. Six existing groins would be notched to allow sediment to pass through and prevent sediment impoundment. The remaining 18 groins will be buried by the fill within the fill template. Ten existing storm water runoff outfalls will be extended as a result of the beach/berm creation. The project includes a re-nourishment cycle of every six years for fifty years. The Elberon to Loch Arbour Beach Erosion Control Project is approximately 3.5 mile long and the last segment to be constructed of Section I of the Sandy Hook to Barnegat Inlet Beach Erosion Control project. The Sandy Hook to Barnegat Inlet Beach Erosion Control project, including the Elberon to Loch Arbour component, was originally authorized by the River and Harbor Act of July 3, 1958.

Construction of the other segments in Section 1 of the Sandy Hook to Barnegat Inlet Beach Erosion Control project was initiated in 1994 and completed in 1999. However, construction of the Elberon to Loch Arbour Beach Erosion Control project was deferred due to issues acquiring the necessary real estate to build the project.

In response to extensive storm damages resulting from Hurricane Sandy and an increased vulnerability to future events, Congress passed the Disaster Relief Appropriations Act of 2013 (P.L. 113-2). The Elberon to Loch Arbour Beach Erosion Control project was identified in the Second Interim report to Congress as an authorized but unconstructed project. Therefore, the proposed work in this assessment is being funded under PL-113-2.

Figure 1: Elberon to Loch Arbour Storm Reduction Project Area



2.0 Project Design

Project Description

The Elberon to Loch Arbour project area extends approximately 3.5 miles, beginning at Lake Takanesee in the City of Long Branch neighborhood of Elberon and ending near Deal Lake, in the Village of Loch Arbour (Figure 2). Construction is currently scheduled to begin in October 2014 and be completed in 2015. The features of the project include the following:

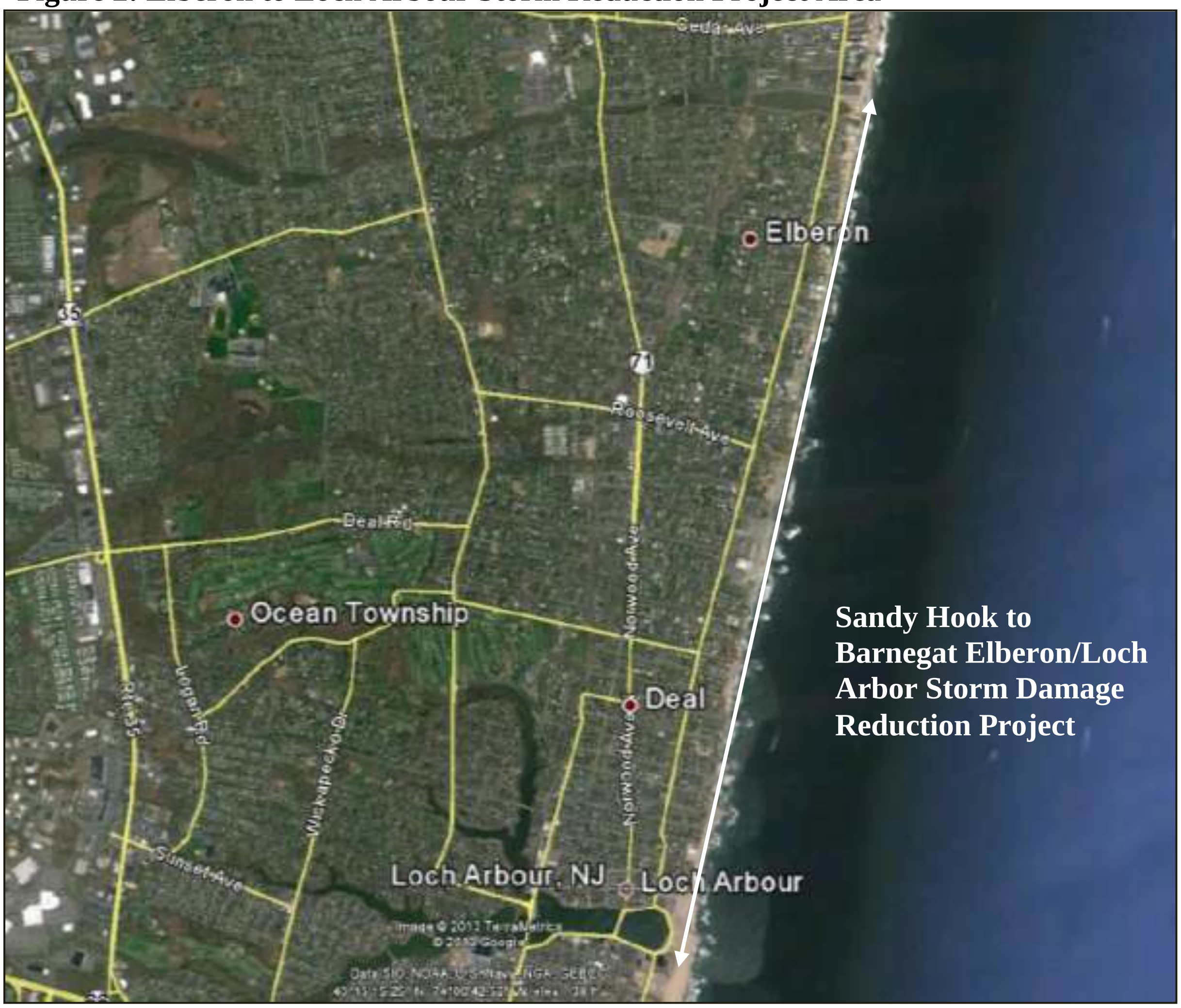
- Placement of 4,450,000 CY of sand to construct a 100 foot wide berm at an elevation of +9.3 NAVD 83 with an onshore slope of 1V:10H to Mean Low Water (MLW) and an offshore slope of with a 2 foot high storm berm cap and a 1 ft construction tolerance..
- Notching six existing stone groins to allow for sediment transport and prevent sediment impoundment;
- Extending 10 existing stormwater outfalls that will 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 fill is placed under the pipe alignment to allow for completion of pipe extension before placement of final grades of the pipe. Pipe extension from MHW will range from @ 180' to 630' and is dependent on the width of the fill foot print at each location. The pipe must be long enough to prevent impoundment of fill sand. Extension construction will be implemented after the completion of the fill at each location.

- A beach renourishment cycle of every 6 years for 50 years at an expected volume of 1,298,000 CY of sand per cycle (GDM).

The 4.5 million cy of material to create the berm and cap would come from the Sea Bright Borrow Area (SBBA). The SBBA 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 actions. The mean water depth of the borrow area is at 50 feet.

Figure 2: Elberon to Loch Arbour Storm Reduction Project Area



3.0 Magnuson-Stevens Fishery Conservation & Management Act

Essential fish habitat (EFH) is defined under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (PL 94-265), as amended by the Sustainable Fisheries Act (SFA) of 1996 (PL 104-267), as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". The SFA requires the identification of EFH for those species actively managed under Federal Fishery Management Plans (FMP). This includes species managed by the eight regional Fishery Management Councils (FMC) established under the MSFCMA, as well as those managed by the National Oceanic and Atmospheric Administration – Fisheries (NOAA-Fisheries) under FMPs developed by the Secretary of Commerce.

EFH designations have been defined for specific life stages based on their occurrence in tidal freshwater, estuarine (i.e., mixing/brackish salinity zone) and marine (i.e., seawater salinity zone) waters. EFH is summarized in ten-minute squares of latitude and longitude in the waters along the Atlantic coast and inshore estuaries (NOAA 2004). The Elberon to Loch Arbour project is located in along the Atlantic coast of New Jersey 10' square # 40107350 and includes the area from 40° 20' N, 74° 00' W to 40° 10' N, 73° 50' W. This square covers waters within the Atlantic ocean affecting the following from Monmouth Beach N.J. on the north, south to east of Asbury Park N.J., including east of and within Pleasure Bay, North Long Branch, Long Branch, Elberon, Branchport and West End N.J. This EFH evaluation focuses specifically on impacts related to placement operation in the near shore project area. EFH analysis for dredging at the Sea Bright Offshore Borrow Area previously completed under separate cover.

4.0 Potential Project Species with Designated EFH

The project site has been identified as EFH for 31 species of fish. The life stages of the Highly Migratory Species are broken down into neonates, juveniles, and adults. As the shark species bare live young, there are no 'egg' designations and neonates correspond to the "larvae" heading.

An account of the general habitat parameters for the applicable life stages of the designated EFH species for the project site is available in Appendix A. The habitat parameters were obtained from the *Guide to Essential Habitat Descriptions* (NOAA-Fisheries 2004a) and where necessary, supplemented by the *EFH Tables* (NOAA-Fisheries 2004b) and other sources as noted. If more than one geographic region was given in a description, the habitat parameters for the geographic region associated with the project area were used. Table 1 summarizes these life histories.

Table 1: Summary of Life Histories (Sources as noted in text, Appendix A)

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
Atlantic cod (*Gadus morhua*)				x
Whiting (*Merluccius bilinearis*)	x	x	x	x
Red hake (*Urophycis chuss*)	x	x	x	

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
Atlantic Cod (*Gadus morhua*)				x
Witch flounder (*Glyptocephalus cynoglossus*)		x		
Winter flounder (*Pleuronectes americanus*)	x	x	x	x
Yellowtail flounder (*Pleuronectes ferruginea*)	x	x		
Windowpane flounder (*Scopthalmus aquosus*)	x	x	x	x
Atlantic sea herring (*Clupea harengus*)			x	x
Monkfish (*Lophius americanus*)	x	x		
Bluefish (*Pomatomus saltatrix*)	x	x	x	x
Atlantic butterfish (*Peprilus tricanthus*)			x	
Summer flounder (*Paralicthys dentatus*)			x	x
Scup (*Stenotomus chrysops*)			x	x
Black sea bass (*Centropristus striata*)			x	x
Surf Clam (*Spisula solidissima*)			x	x
Ocean quahog (*Artica islandica*)				x
King mackerel (*Scomberomorus cavalla*)	x	x	x	X
Spanish mackerel (*Scomberomorus maculatus*)	x	x	x	x
Cobia (*Rachycentron canadum*)	x	x	x	x
Blue Shark ((*Prionace glauca*)		x1		
Dusky shark (*Charcharinus obscurus*)		x1	x	
Sand tiger shark (*Odontaspis taurus*)		x1		
Sandbar shark (*Charcharinus plumbeus*)		x1	x	x
Tiger shark (*Galeocerdo cuvieri*)		x1		
Shortfin mako shark (*Isurus oxyrhyncus*)		x1		
Bluefin tuna (*Thunnus thynnus*)			x	
Skipjack tuna (*Katsuwonus pelamis*)				x
Clearnose skate (*Raja eglanteria*)			x	x
Little skate (*Leucoraja erinacea*)			x	x
Winter skate (*Leucoraja ocellata*)			x	x

1 **Shark larvae/ neonate**

Application of the above data support elimination of a number of the above listed species from individual species impact assessment as their listed (Appedix A) habitat needs, and thus their presence, may not exist within the project area. The following species are not expected to be at the project site and therefore no further impact analysis was conducted.

Those species include, Atlantic cod, whiting, witch flounder, shortfin mako, bluefin tuna, blue shark yellowtail flounder, monkfish, king mackerel, and spanish mackerel (all life stages).

5.0 Potential (general) Impacts to EFH Species

No significant direct impacts to EFH species are anticipated from contact with any of the earth moving equipment typically utilized for moving and grading fill material. Likewise, no contact injuries to fish are expected from the operation required to extend the outfall pipes. However, some studies have shown that pressure waves generated by pile driving may be harmful to fish with airbladder. If pile driving is used there is a potential for adverse direct impact to species within a minimal threshold distance. Pilings themselves will take up a very small foot print within the benthic surface. This impact would be minimal and offset by the benefits of having structural elements that can act as refuge and eventually foraging area. Groin burial will constitute permanent loss of "reef" habitat in the nearshore. Monitoring for surf zone fish showed that areas near groins were the most productive in terms of fish abundance and biomass. Notching operations on the remaining six groins should not cuase any significant impacts.

There will be localized increases in turbidity in the water in front of and adjacent to the area of deposition as fill material is deposited and graded out. This will occur sequentially as construction progresses along the beach. These conditions will dissipate quickly as one moves away from the area of deposition. Suspended sediment monitoring conducted during fill operations for the Asbury to Manasquan Biological Monitoring Plan (1997 -2001) showed that turbidity plumes temporarily existed on scales of 100's of meters and except for concentrations in the swash zone, near shore TSS was significantly lower than levels measured during moderately strong coastal storms, which were orders of magnitude greater, on a regional scale. The study also showed that typical nearshore TSS concentrations that occurred during placement operations was no greater than typical ambient levels found in many east coast estuaries (USACE BMP 2001)

Higher turbidity may cause a secondary impact to visual predators that rely on sight cues to capture prey. These species will leave the area to forage nearby in identical habitats not affected by the project action. Increased suspended sediments may also have the potential to cause respiratory distress to EFH species residing in the swash or surf zones during pumping. This potential adverse affect may be greater to larvae and small juveniles that would have a more difficult time retreating out of the plume.

Approximately 222 acres of intertidal and near shore bottom will be covered by the project fill. Mortality of sessile and slow moving benthic species (direct impact to habitat and invertebrate prey, and an indirect impact to fish) is the most significant EFH impact. However, most of these near shore and intertidal species have evolved life histories compatible with high energy quickly changing environments and will re-colonize and recover quickly. Some of this loss will be compensated for by the release of prey species from deposition of fill. The USACE BMP also noted high numbers fish caught in areas that were recently placed, and species included northern kingfish and juvenile flounder known to prey on benthic common benthic invertebrates.

Species /Life Stage Impact Assessments

Multiple life stages of the following species may occur within the EFH quadrant previously identified for the Elberon to Loch Arbour project (placement) site. For the analysis below only those stages that meet the appropriate habitat parameters with the project site are assessed.

Red Hake

No direct impact is expected to red hake eggs as they are found in surface pelagic surface water environments and are not expected to occur at the project site in large numbers.

Windowpane

Direct impacts to windowpane eggs and larvae and younger juveniles may experience direct impacts from the filling process, as these less mobile species may not be able to escape burial. This impact can be minimized through best management practices including timing the construction to coincide with low tide. Adults and older juveniles are expected to be able to leave the construction area and avoid direct impacts.

Winter Flounder

All four life stages of winter flounder may be present at the project site. The demersal eggs eggs and plankgtonic larvae, may experience a direct impact as they may be unable to move away placement actions. Most eggs and larvae however are more likely to be found at slightly deeper areas than will be strongly affected by this construction. Juveniles prefer low energy environments and will be out of the surf and swash zones. Older juveniles and adult Winter flounder are generally found at 0.3-4.5 m., and are fully capable of moving out of the impacted area and are expected to do so. Disturbance impacts are expected, but affects should be minimal.

Butterfish

Butterfish juveniles and adults would be expected to escape the construction area to nearby undisturbed habitat. Any direct or indirect impacts should therefore be minimal.

Black Sea Bass

Black sea bass juveniles enter Mid Atlantic Bight estuaries from July through September. Both juveniles and adults are highly mobile therefore no direct impacts are expected from filling activities. Permanent indirect impacts in the form of loss of rocky substrate, refuge and forage will occur to juveniles and possibly adults that reside in and around the subtidal portions of the groins that will be buried. These individuals will be forced to find new, similar structural habitats.

Bluefish

Direct impacts to juvenile and adult bluefish are expected to be minor as these life stages are highly mobile and would leave the construction area for nearby unaffected areas. Indirect localized adverse impacts are expected as the sheltering aspects and abundant prey related to rock groins will be eliminated. These impacts though permanent will also be minor due high mobility and migratory nature of bluefish.

Scup

Juvenile scup are known to inhabit the shallow nearshore waters of project site often showing preferences for structure. Beneficial aspect of the rock groins to juveniles will be lost after burial. Both juvenile and adults would be expected to escape the construction area for nearby similar habitat, limiting the direct impacts. Adults would not be expected to be in the project site November through April.

Summer Flounder

Planktonic summer flounder larvae are found offshore and would not be affected by this construction. From October through May, post-larvae juveniles migrate in shore (Packer et al 1999). Post-larvae and young juveniles could therefore be directly impacted fill activities at the project site. Older juveniles and adults are expected to escape the construction area, so that impacts will be minimal but will include temporary displacement.

Skate Species (Clearnose Skate, Little Skate, Winter Skate)

Juveniles and adults of these species occupy the same habitats though at different times of the year. As they are specialized benthic species generally in contact with the bottom they are expected to experience increased turbidity if they remain in that localized plume area. Burial is highly unlikely. Skates tend to hunker down on the bottom and are not overly sensitive to disturbances. Should the impacts be great enough they will move on to undisturbed areas.

Cobia

Cobia eggs and larvae should may be impacted by fill activities. The depth of the project site is relatively shallow limiting its use by juveniles and adults. Any juveniles and adults are expected to be temporarily displaced as a result of the construction, but are expected to find suitable habitat nearby or move offshore. Adverse indirect impacts to cobia may include loss groins that support productive crustaceans and small fish preferred prey of cobia (Arendt et al. 2001). However, this may be at least partially compensated for by opposing in kind beneficial impacts from the construction of the outfall extensions.

Spanish Mackerel and King Mackeral

All four life stages of Spanish and King mackerel are listed for the EFH quadrant. Eggs and larvae will may be directly impacted in the surf or swash zone. As with most species any impacts cause by construction to eggs and larvae would be insignificant due to the vast numbers eggs and larvae produced.   Spanish mackerel juveniles and adults are fast swimming transient species in nearshore waters. They are not expected in the project area in great numbers or for extended periods of time. If present they will disperse to other undistrubed areas.

Skipjack Tuna

This small tuna can be seasonally found in the near shore waters of the project site. It is an extremely fast, ever moving species that will not be affected by any aspect of the project.

Atlantic Herring

Adults may be found in the near shore waters of the project site. Like most adult EFH species previously discussed significant direct physical impacts related to equipment etc are not expected. However within the project site are two freshwater impoundment outfalls, Lake Takanassee and Deal Lake, which according to the NJDEP may still support spawning runs of this species. Interference with spawning migration pathways via direct construction or disturbance would constitute a very significant adverse impact to this species if it prevented them from entering the lakes.   The NJDEP may recommend a general project construction window during this period of March through June which would prevent such an occurence.

Highly Migratory Species

The dusky shark, sand tiger, and sand bar and blue shark neonates, could utilize habitat near the project site. These life stages could be susceptible to turbidity affect as stated for other early post egg stages.   Adults and juveniles are highly mobile transient species and are not expected to be found in large numbers. If present, these species would be temporarily displaced to nearby suitable habitats during construction.   Any direct impacts to these species are expected to be minimal.

Surf Clams and Ocean Quahogs

Adult ocean quahogs and juvenile and adult surf clams may be found in the project site well seaward of the MLW line, but in general concentrations of these bivalves are found further off shore.   Clams of both species may be buried by placement sand at the outer reaches of the fill template.   Mortality could occur from burial depending on the thickness of the overburden of the fill on top of the clams.   Theses species are known to reside as deep as 3’ below the benthic surface and are considered very active within the sediment.   Surf clams and ocean quahogs will not be found in large abundances in the near shore and will be able to survive burial by moving up towards the water sediment interface. No significant direct impacts are anticipated to these to species at the placement site.

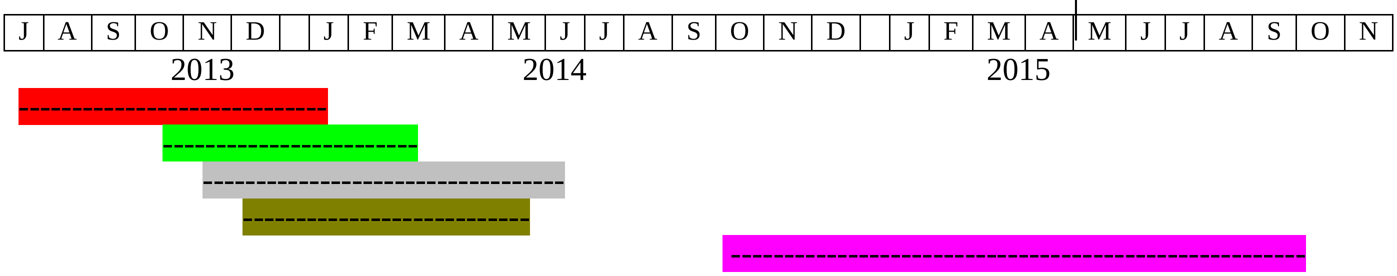
6.0 Cumulative impacts Invert- recovery intertidal/near shore

USACE has four related Sea Bright to Manasquan beach nourishment project under construction concurrently/sequentially with Elberon to Loch Arbour. See Figure 3 below.

Figure 3

Cumulative Impact Placement Projects
(With Elberon to Loch Arbour)

Location of Placement	Approximate Duration	@ Vol	Fill (Acre)*
1 Sea Bright to Monmouth	July 2013 - January 2014	2.2 mcy	138
2 Belmar to Manasquan	Oct 2013 - March 2014	1.5 mcy	90
3 Long Branch	November 2013 - June 2014	3.3 mcy	335
4 Asbury to Avon	December 2013 – May 2014	1.2 mcy	55
5 Eberon Loch Arbour	October 2014 – October 2015	4.5 mcy	222



Approximately 618 acres (does not include Elberon to Loch Arbour) of fill will be placed upon the shorelines of the four other NJ coastal projects. The pumping of the sand slurry onto the beach in conjunction with the ambient wave climate will cause a noticeable increase in Total Suspended Sediments (TSS) within the swash zone and within a limited area of the near shore. The turbidity plumes will be temporary and sequential following the sand placement activity of each project. Prior TSS monitoring at active nourishment sites along the New Jersey coast (Asbury to Manasquan, USACE BMP 2001) has shown that increases in TSS are limited to a scale of 100s of meters from the point of dispersion on the beach, and, these elevations are not incompatible with TSS levels of many northeast estuaries and are well below the ambient TSS levels that are produced on a regional scale by coastal storms of even moderate strength (USACE NJ BMP 2001). However, increased TSS and turbidity levels may temporarily displace fish from nearshore areas and inhibit feeding by predators dependent on visual cues. Gill abrasion and impacts to respiration may also be a concern in these areas if fish are not displaced to nearby unaffected waters.

The fill design templates will bury most if not all of what was the existing intertidal area as well as a portion of the landward extent of the shallow littoral zone. Most of the invertebrate infauna and much of the epifauna common to these newly buried areas will no longer be accessible forage areas to EFH fish species that inhabit and feed in those areas. Though these areas have been buried, a new intertidal/nearshore benthic community will quickly develop due to the very nature of this extremely dynamic environment. Depending on the initial existing benthic community and time of year a section is completed, recovery can take anywhere from 3 months to a year (USACE BMP 2001). . Another factor that will compensate for this temporary loss is that the sand slurry that is placed as fill contains organisms similar to those that were buried. During placement of sand many small invertebrates are released from the sediments which appear to be an attractant to benthic feeding nearshore shallow water species such as scup and flounder species. This was observed during capture studies implemented adjacent to active fill sites.

Cumulative impacts are not expected to cause a significant adverse impact to the managed species assessed, but are expected to improve the overall habitat characteristics of Jamaica Bay.

7.0 Conclusion

The intertidal and landward near shore bottom will be permanently covered and raised in elevation. Adjacent near shore EFH habitats will be temporarily impacted during the construction phase, principally through very small, localized, and short-lived increases in sedimentation and turbidity. An increase in sedimentation and turbidity may reduce the area's value for feeding and nursery functions. However, sedimentation and turbidity will be minimized to the fullest extent possible through timing the construction. Also, the use of sand should limit this impact as it is expected to settle out quickly. Juvenile and adult life stages of fish will be able to avoid impacts by relocating to other areas within the bay during construction. Project site benthic recovery will occur within three months to a year. No long term significant direct or indirect impacts to EFH or designated species are anticipated.

Bibliography

Arendt, M.D. J.E. Olney, and J. A. Lucy. 2001. Stomach content analysis of cobia, Rachycentron canadum, from lower Chesapeake Bay. Fisheries Bulletin. 99:665-670. Available online at: http://fishbull.noaa.gov/994/are2.pdf

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. U.S. Fish. Wildl. Serv. Bull. 53. 577 p.

Buckley, J. 1989. Species Profiles: Life histories and environmental requirements of coastal fishes and invertebrates (North Atlantic)-winter flounder. U.S. Fish and Wildlife Service, Coastal Ecology Group, Waterways Experiment Station, Vicksburg, MS. (NTIS) 21 pages.

Croker, R.A. 1965. Planktonic fish eggs and larvae of Sandy Hook Estuary. Ches. Sci. 6:92-95.

Cross, J. N., C. A. Zetlin, P. L. Berrien, Donna L. Johnson, and Cathy McBride. 1999. Essential fish habitat source document: butterfish, Peprilus triacanthus, life history and habitat characteristics. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS-NE-145.

Danie, D. S., J. G. Trial, and J. G. Stanley. 1984. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (North Atlantic) -

Fahay, M.P., P.L. Berrien, D.L. Johnson and W.W. Morse. 1999. Essential fish habitat source document: bluefish, Pomatomus saltatrix, life history and habitat characteristics. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS-NE-144

Ferraro, S.P. 1980. Daily time of spawning of 12 fishes in the Peconic Bay, New York. Fishery Bulletin 78:455-464.

Godcharles, M. F., and M. D. Murphy. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (South Florida) – King and Spanish Mackerel. US Fish and Wildlife Service Biological Report 82(11). US Army Corps of Engineers, TR EL—82-4. 18pp. Available online at: http://www.nwrc.usgs.gov/wdb/pub/0124.pdf.

Howe, A. B., P. G. Coates, and D. E. Pierce. 1976. Winter flounder estuarine year-class abundance, mortality, and recruitment. Trans. Amer. Fish. Soc. 105(6):647-657.

McBride, R.S. and D.O. Conover. 1993. Recruitment of young-of-year bluefish Pomatomous saltatrix to the New York Bight: variation in abundance and growth of spring- and summer-spawned cohorts. Marine Ecological Progress Series 78(3):205-216.

Morse, W.W. 1978. Biological and fisheries data on scup, Stenotomus chrysops (Linnaeus). Sandy Hook Lab. Tech. Rept. No. 14 (NEFSC). 41 pp.

New England Fisheries Management Council (NEFMC). March 2004 (on-line). Final Fishery Management Plan for the Northeast Skate Complex. Website address: http://www.nefmc.org/skates/index.html.

NOAA-Fisheries. March 2004a (on-line). Guide To Essential Fish Habitat Descriptions. Compiled by the Northeast Regional Office, Habitat Conservation Division. Website address: http://www.nero.noaa.gov/ro/doc/list.htm

NOAA-Fisheries. March 2004b (on-line). Summary of Essential Fish Habitat (EFH) and General Habitat Parameters for Federally Managed Species. Table compiled by the Northeast Regional Office, Habitat Conservation Division. Website address: http://www.nero.noaa.gov/ro/doc/efhtables.pdf.

NOAA-Fisheries. March 2004c2004c (on-line), Guide to Essential Fish Habitat Designations in the Northeastern United States. Compiled by the Northeast Regional Office, Habitat Conservation Division. Website address: http://www.nero.noaa.gov/ro/doc/index2a.htm.

NOAA-Fisheries. March 2004d (on-line), Summary table of Cobia (Rachycentron canadum) life history for the Gulf of Mexico. Compiled by the Southeast Regional Office, Habitat Conservation Division. Website address: http://www.sefscpanamalab.noaa.gov/docs/Cobia.doc.

NOAA-Fisheries. March 2004e (online). Summary table of King Mackerel (Scomberomoru cavalla) life history for the Gulf of Mexico. Compiled by the Southeast Regional Office, Habitat Conservation Division. Website address: www.sefscpanamalab.noaa.gov/docs/King_Mackerel.doc.

NOAA-Fisheries. March 2004f (on-line). Essential Fish Habitat. Website address: http://www.nmfs.noaa.gov/habitat/habitatprotection/essentialfishhabitat.htm

Packer, D.B., S.J. Griesbach, P.L. Berrien, C.A. Zetlin, D.L. Johnson, and W.W. Morse. 1999. Essential Fish Habitat Source Document: summer flounder, Paralichthys dentatus, life history and habitat characteristics. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS-NE-151.

Packer, David B., Christine A. Zetlin, and Jospeh J. Vitaliano. 2003a. Essential fish habitat source document: Clearnose Skate, Raja eglanteria, life history and habitat characteristics. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS-NE-174.

Packer, D. B., C. A. Zetlin, and J. J. Vitaliano. 2003c. Essential fish habitat source document: Winter Skate, Leucoraja ocellata, life history and habitat characteristics. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS-NE-179.

Pereira, J.J., R. Goldberg and J.J. Ziskowski. 1998. Winter flounder, Pseudopleuronectes americanus (Walbaum), Life History and Habitat Characteristics. Amendment #11 to the Northeast Multispecies Fishery Management Plan. New England Fishery Management Council (NEFMC).

Perrotta, T. January 2004 (on-line). Ichthyology: King Mackerel. Florida Museum of Natural History. Website address: http://www.flmnh.ufl.edu/fish/Gallery/Descript/KingMackerel/KingMackerel.html

Reid, R.N., L.M. Cargnelli, S.J. Griesbach, D.B. Packer, D.L. Johnson, C.A. Zetlin, W.W. Morse and P.L. Berrien. 1999. Essential fish habitat source document: Atlantic herring, Clupea harengus, life history and habitat characteristics. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS-NE-126.

Steimle, F.W., W.W. Morse, P.L. Berrien and D.L. Johnson. 1999a. Essential fish habitat source document: Red Hake, Urophycis chuss, life history and habitat characteristics. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS-NE-133.

Steimle, F.W., C.A. Zetlin, P.L. Berrien, D.L. Johnson and S. Chang. 1999b. Essential fish habitat source document: Scup: Stenotomus chrysops, life history and habitat characteristics. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS-NE-149.

Steimle, F.W., C.A. Zetlin, P.L. Berrien and S. Chang. 1999c. Essential fish habitat source document: black sea bass, Centropristis striata, life history and habitat characteristics. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS-NE-143.

U. S. Army Corps of Engineers(2001 The New York District Biological Monitoring Program for the Atlantic Coast of New Jersey, Asbury Park to Manasquan Section Beach Erosion Control Program

U. S. Army Corps of Engineers 1989. General Design Memorandum, Sandy Hook to Barnegat Storm Protection Project.

Appendix A Life Stage History

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
Atlantic cod (*Gadus morhua*)				**Habitat**: Bottom (rocks, pebbles, or gravel) winter for Mid-Atlantic Prey: shellfish**Error! Bookmark not defined.**, crabs, and other crustaceans (amphipods) and polychaetes, squid and fish (capelin redfish, herring, plaice, haddock).
Whiting (*Merluccius bilinearis*)	**Habitat**: Pelagic continental shelf waters in preferred depths from 50-150 m.	**Habitat**: Pelagic continental shelf waters in preferred depths from 50-130 m.	**Habitat**: Bottom (silt-sand) nearshore waters in preferred depths from 150-270 m in spring and 25-75 m in fall. **Prey**: fish, crustaceans (euphasids, shrimp), and squids.	
Red hake (*Urophycis chuss*)	**Habitat**: Surface waters, May – Nov.	**Habitat**: Surface waters, May –Dec. Abundant in mid-and outer continental shelf of Mid-Atlantic. Bight. **Prey**: copepods and other micro crustaceans under floating eelgrass or algae.	**Habitat**: Pelagic at 25-30 m and bottom at 35-40 m. Young inhabit depressions on open seabed. Older juveniles inhabit shelter provided by shells and shell fragments. **Prey**: small benthic and pelagic crustaceans (decapod shrimp, crabs, mysids, euphasiids, and amphipods) and polychaetes).	
Witch flounder (*Glyptocephalus cynoglossus*)	.	**Habitat**: Pelagic generally over deep water in depths ranging from 10 – 1250 m.		
Winter Flounder (*Pseudopleuronectes americanus*)	**Habitat**: Pelagic and bottom water at depths less than 5 meters with a broad range of salinity, abundant February through July.	**Habitat**: Pelagic and bottom water at depths less than 5 meters with a broad range of salinity, abundant February through July.	**Habitat**: Young of the year (YOY) are demersal, nearshore low (primarily inlets and coves) energy shallows with sand, muddy sand, mud and gravel bottoms. **Prey**: YOY Amphipods and annelids JUV – Sand dollar,	**Habitat**: Demersal offshore (in spring) except when spawning where they are in shallow inshore waters (fall). **Prey**: Amphipods, Polychaetes, Bivalves or siphons, Capelin eggs, Crustaceans.

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
			Bivalve siphons, Annelids, Amphipods.	
Yellowtail flounder (*Pleuronectes ferruginea*)	**Habitat**: Pelagic waters ranging from 10 to 750 meters.	**Habitat**: Pelagic waters. **Prey**: Polychaetes.		
Windowpane flounder (*Scopthalmus aquosus*)	**Habitat**: Surface waters <70 m, Feb-July; Sept-Nov.	**Habitat**: Initially in pelagic waters, then bottom <70m, May-July and Oct-Nov. **Prey**: copepods and other zooplankton.	**Habitat**: Bottom (fine sands) 5-125 m in depth, in nearshore bays and estuaries less than 75 m. **Prey**: small crustaceans (mysids and decapod shrimp) polychaetes and various fish larvae.	**Habitat**: Bottom (fine sands), peak spawning in May, in nearshore bays and estuaries less than 75 m **Prey**: small crustaceans (mysids and decapod shrimp) polychaetes and various fish larvae.
Atlantic sea herring (*Clupea harengus)*			**Habitat**: Pelagic waters and bottom, < 10 C and 15-130 m depths. **Prey**: zooplankton (copepods, decapod larvae, cirriped larvae, cladocerans, and pelecypod larvae).	**Habitat**: Pelagic waters and bottom habitats. **Prey**: chaetognath, euphausiids, pteropods and copepods.
Monkfish (*Lophius americanus*)	**Habitat**: Surface waters, Mar. – Sept. peak in June in upper water column of inner to mid continental shelf.	**Habitat**: Pelagic waters in depths of 15 – 1000 m along mid-shelf also found in surf zone. **Prey**: zooplankton (copepods, crustacean larvae, chaetognaths).		
Bluefish (*Pomatomus saltatrix*)	**Habitat**: April through August in Pelagic waters over the Continental shelf at mid-shelf depth at temp > 18^0C.	**Habitat**: Pelagic waters over the continental shelf and in Mid-Atlantic estuaries and intertidal and nearshore zones June through Sept.	**Habitat**: Pelagic waters of continental shelf and in Mid Atlantic estuaries and intertidal and nearshore zones from May-Nov.	**Habitat**: Pelagic waters; found in Mid Atlantic estuaries April – Oct.
Atlantic butterfish (*Peprilus tricanthus*)			**Habitat**: Pelagic waters in 10 – 360 meters. **Prey:** Feed mainly on planktonic prey, including thaliaceans, squids, copepods, amphipods,	

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
			decapods, coelenterates, polychaetes, small fishes, and ctenophores.	
Summer flounder (*Paralicthys dentatus*)			**Habitat**: Demersal waters, muddy and sandy (preferred) substrates.	**Habitat**: Demersal waters (mud and sandy substrates). Shallow coastal areas in warm months, offshore in cold months.
Scup (*Stenotomus chrysops*)			**Habitat**: Demersal waters.	**Habitat**: Demersal waters offshore from Nov – April.
Black sea bass (*Centropristus striata*)			**Habitat**: Demersal waters over rough bottom, shellfish and eelgrass beds, man-made structures in sandy-shelly areas and winters off shore at depths of 1-38 m in shell beds and shell patches.	**Habitat**: Demersal waters over structured habitats (natural and man-made), and sand and shell areas and winters off shore at depths of 25-50 m in shell beds and shell patches.
Ocean quahog (*Artica islandica)*				**Habitat**: Throughout the substrate to a depth of 3 m.
King mackerel (*Scomberomorus cavalla*)	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone.	**Habitat**: Pelagic waters with sandy shoals of capes an offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone.	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone.	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone.
Spanish mackerel (*Scomberomorus maculates*)	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory.	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory.	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory.	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory.
Cobia (*Rachycentron canadum*)	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf	**Habitat**: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory.

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
	the shelf break zone. Migratory.	side waters from the surf to the shelf break zone. Migratory.	break zone. Migratory.	
Sand tiger shark (*Odontaspis taurus)*		**Habitat**: is shallow coastal waters from Barnegat Inlet, NJ to Cape Canaveral, FL out to the 25m isobath, entirely outside of the project area.		
Dusky shark (*Charcharinus obscurus*)		**Habitat**: in shallow coastal waters, inlets, and estuaries to the 25m isobath from Montauk to Cape Lookout, NC.	**Habitat**: juveniles found in coastal and pelagic waters between the 25- and 200-meter isobath.	
Sandbar shark (*Charcharinus plumbeus*)		**Habitat**: is shallow coastal water from Barnegat Inlet, NJ to Cape Canaveral, FL out to the 25 m isobath, entirely outside of the project area. Also found in salinity greater than 22 ppt and temperatures greater than 70 F°.	**Habitat**: found in coastal and pelagic waters north of 40° North and at the shelf break in the mid-Atlantic during winter. Also found in salinity greater than 22 ppt and temperatures greater than 70 F°.	**Habitat**: demersal shallow coastal waters from the coast to the 50-meter isobath. Habitat areas of particular concern are shallow areas in the mouth of the Great Bay, NJ, lower and middle Delaware Bay, lower Chesapeake Bay, and on the Outer Banks, NC in areas of Pamlico Sound adjacent to Hatteras Island and offshore.
Tiger shark (*Galeocerdo cuvieri*)		**Habitat**: is from shallow coastal areas to 200 m isobath from Cape Canaveral, FL to Montauk, NY.		
Shortfin mako shark (*Isurus oxyrhyncus*)		**Habitat**: is found between the 25- and 50-meter isobath.		
Bluefin tuna (*Thunnus thynnus*)			**Habitat**: is primarily surface water, also found in inshore and pelagic waters between the 25 and 200-meter isobath.	
Skipjack tuna (*Katsuwonus pelamis)*				**Habitat**: is pelagic surface waters.
Clearnose skate (*Raja eglanteria*)			**Habitat**: is bottom habitats with soft bottom along the continental shelf and rocky or gravelly	**Habitat**: is both soft bottom and rocky or gravelly bottom habitats, from the shore to 400 meters, but they are most abundant at depths less than

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
			bottom, from shore to 500 meters, but most abundant at depths less than 111 meters. Migration along the New Jersey shoreline occurs in late April through May and October through November. Temperature range of 9-30 °C, salinity ranges from 22-36ppt.	111 meters. Migration along the New Jersey shoreline occurs in late April through May and October through November.
Little skate (*Leucoraja erinacea*)			**Habitat**: is found in sandy or gravelly substrate or mud, found from the shore to 137 meters, with the highest abundance from 73-91 meters, found between 4-15°C, at salinities of 15 ppt, but the preferred range is 31-34ppt. Move inshore during spring and autumn, and offshore in mid to late summer, and midwinter.	**Habitat**: is similar habitat as juveniles.
Winter skate (*Leucoraja ocellata*)			**Habitat**: is primarily sand and gravel bottom but also found in mud bottoms, from shoreline to about 400 meters and are most abundant at depths less than 111 meters, temperature range for these skates is from -1.2°C to around 21°C, with most found from 4-16 °C, salinities as low as 23 ppt but prefer a salinity range of 32-34ppt.	**Habitat**: is similar habitat as juveniles.
Surf clam (Spisula solidissima			Depth 0-60' Low density beyond 38' S% 2-30 Throughout substrate to a depth of three feet within federal waters. (Burrow in med. To coarse sand	(spawn-summer to fall at 19 -30 °C) Throughout substrate to a depth of three feet within federal waters

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
			and gravel substrates. Also found in silty to fine sand, not in mud)	