EDISTO BEACH

COASTAL STORM DAMAGE REDUCTION

GENERAL INVESTIGATION STUDY

APPENDIX F

BIOLOGICAL ASSESSMENT OF
THREATENED AND ENDANGERED SPECIES

US Army Corps
Of Engineers®
Charleston District

BIOLOGICAL ASSESSMENT

COASTAL STORM DAMAGE REDUCTION
GENERAL INVESTIGATION STUDY

EDISTO BEACH, COLLETON COUNTY
SOUTH CAROLINA

January 2014

1.0 INTRODUCTION

Edisto Beach is a barrier island located at the mouth of the Edisto River in Colleton and Charleston Counties, South Carolina, approximately 45 miles southwest of Charleston, South Carolina and approximately 20 miles east-northeast of Beaufort, South Carolina (see Figure 1). The incorporated Town of Edisto Beach is located on the island, as is Edisto Beach State Park. The specific study area (See Figure 2) includes Edisto Beach, two Coastal Barrier Resources Act (CBRA) zones (the Edisto Complex (Unit M09) to the northeast and Otter Island (Unit M10) to the southwest), and the coastal Atlantic Ocean waters where offshore borrow investigations will be conducted and potential borrow areas will be identified and located.

The Town of Edisto Beach and Edisto Beach State Park are part of Edisto Island. They are separated from the main body of Edisto Island by Big Bay Creek, Scott Creek, and the associated salt marsh to the northwest and Jeremy Inlet to the northeast. The Town of Edisto Beach and Edisto Beach State Park are also bounded by the South Edisto River and St. Helena Sound to the southwest and the Atlantic Ocean to the southeast. The maximum width at the southern end of this portion of Edisto Island is approximately 1.5 miles, while the northern end is much narrower. The Town of Edisto Beach occupies the central and southern portions of the island and is generally separated from Edisto Beach State Park by State Highway 174, which provides the only access to the island. Its beachfront extends approximately 4.5 miles between Highway 174 and the South Edisto River/St. Helena Sound. The town has been developed as a permanent and seasonal residential area with limited commercial development. Edisto Beach State Park occupies approximately 1,255 acres of the island and is structured around a dense live oak and maritime forest. It offers ocean and marsh side camping sites, as well as cabins, picnic areas, and nature and hiking trails. The park is one of the most heavily visited of the South Carolina state parks, with approximately 327,000 recorded visitors in 2002. Its beachfront extends approximately 1.5 miles between Jeremy Inlet and Highway 174.

An environmental assessment (EA) has been prepared to evaluate the overall environmental impacts of the proposed project. This document evaluates the impact of the proposed project on threatened and endangered species and will be incorporated in the EA.

The Town of Edisto Beach has indicated that the most significant problem facing the study area in the near future and over the next 50 years is the threat to buildings and infrastructure from coastal storms, particularly along the northern shoreline. The threat to structures is exacerbated by high levels of long-term beachfront erosion. The loss of the beachfront threatens not only the local economy and tourism in the small coastal community, but has National Economic Development impacts as well when resources that could be used elsewhere are devoted to storm recovery and rebuilding efforts that could have been prevented. Additionally, there is a lack of local resources, both natural and financial for addressing coastal storm damage problems. Sources of beach quality sand are becoming increasingly difficult to obtain and local funding for renourishment projects is diminishing.

The overall goal of the study is to reduce the adverse economic effects of coastal storms at Edisto Beach, South Carolina. Specific goals are to:

(1) Provide coastal storm damage reduction (as measured by increases in NED net benefits) to approximately 4.5 miles of the Edisto Beach shoreline.

(2) Reduce the risks of damages to SC Hwy 174, which is the only emergency evacuation route for the community.

(3) Preserve sea turtle nesting habitat and protect shorebird nesting habitat, foraging areas, and roosting areas.

2.0 PROPOSED PROJECT

The proposed project was determined after a detailed alternatives analysis documented within the Feasibility Study/Environmental Assessment. The project consists of the following elements: 1) A 15-foot high (elevation), 15-foot wide dune beginning at the northern end of the project (i.e., the southern end of the State Park) and extending southward along the beach for 16,530 feet. This dune would be fronted by a 7-foot high (elevation) berm. The first 7,740 feet of berm length would have a width of 75 feet. The width would then taper to a 50-foot width for the remaining length of the berm. The width of each end of the berm would taper to tie into the existing beach profile; 2) The dune would then transition into a 14-foot high (elevation), 15-foot wide dune that extends around the end of the island for 5,290 feet. No berm would be constructed in front of this dune because the existing beach profile provides an adequate berm; and 3) Approximately 1,130 feet of total groin lengthening across 23 of the existing groins (Figure 2, Table 1). Results of a coastal engineering analysis determined that this minimal amount of lengthening will not have any downdrift impacts as the design is simply to stabilize the proposed berm width. Because the distance between the landward toe of the dune and the seaward edge of the berm for the beach design exceeds the existing condition distance between these same points along certain reaches within the project, the effective length of the groins in these areas will be reduced. Consequently, the length of some groins will need to be increased in order to create beach width necessary to maintain the design cross-section. The proposed groin lengthening is not provided as a means for trapping more sand and increasing beach width or significantly changing the rate of sand bypassing the groins. The renourishment interval for the proposed project has been estimated to occur every 16 years.

Construction will be by means of either a hydraulic cutterhead dredge or a hopper dredge that will transport the sand through a pipeline. The pipeline will run adjacent to the groins and parallel with the beach. Beach compatible material (sand) from an offshore source will be pumped along the 21,820 linear feet of the project and will be discharged as a slurry. During construction, temporary training dikes of sand will be used to contain the discharge and control the fill placement. Fill sections will be graded by land-based equipment, such as bulldozers, articulated front-end loaders, and other equipment as necessary to achieve the desired beach profile. Equipment will be selected based on whatever generates only minimal

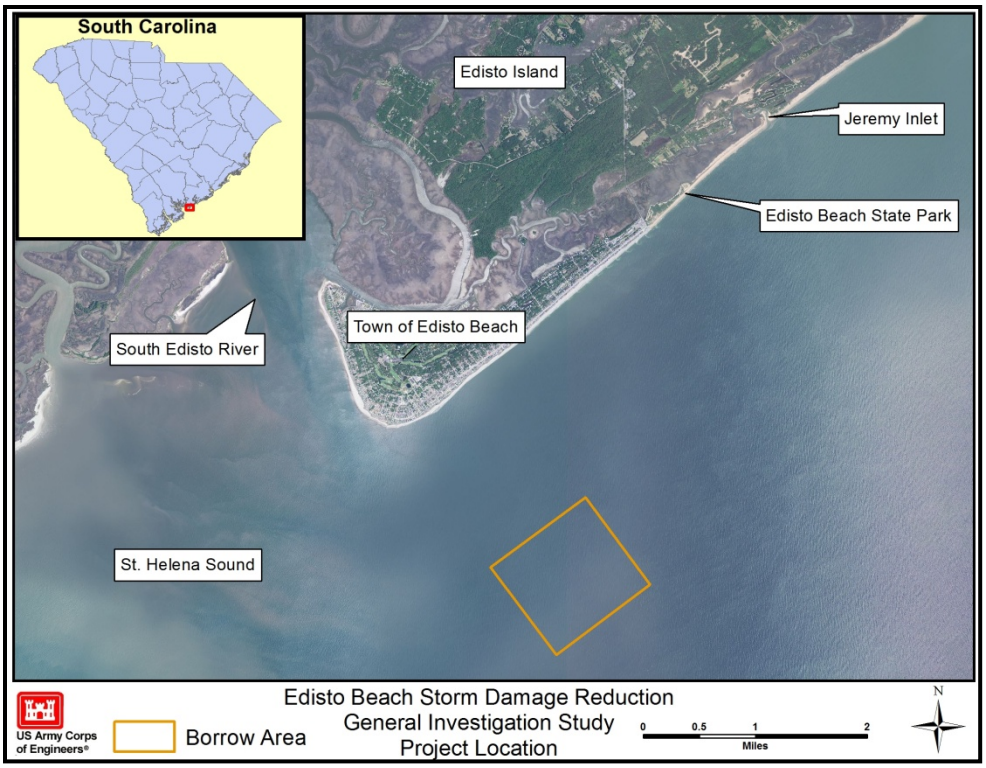

Figure 1. Location of Edisto Beach and proposed borrow site

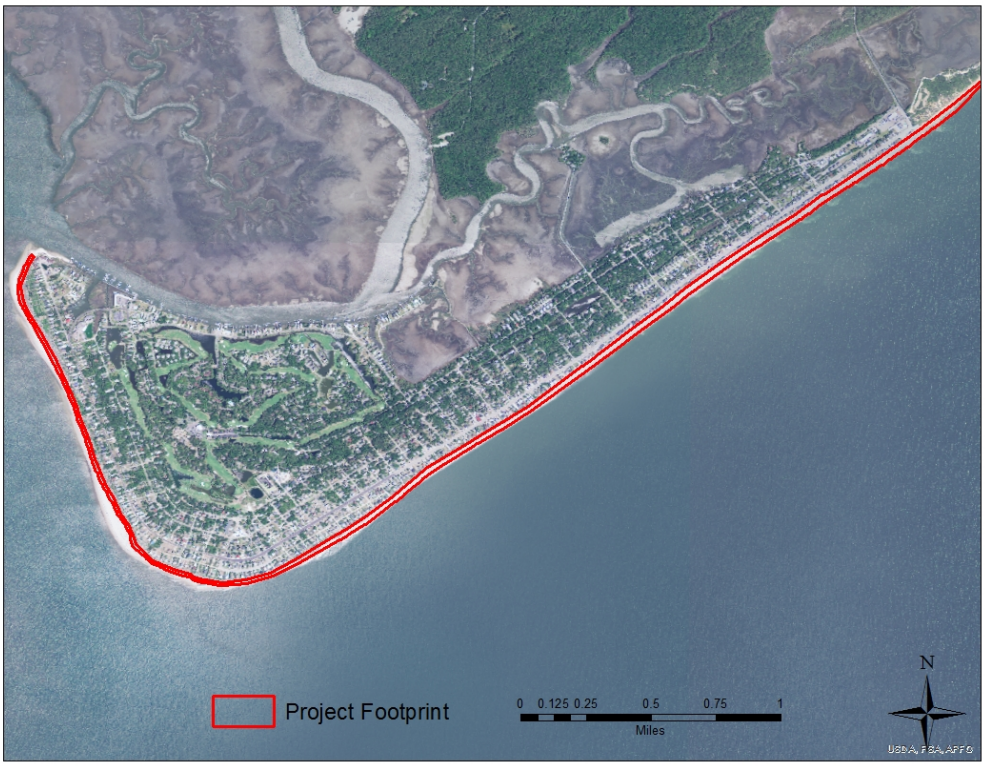

Figure 2. Project footprint from landward toe of dune to seaward berm crest

Figure 3. Project footprint along inlet reaches

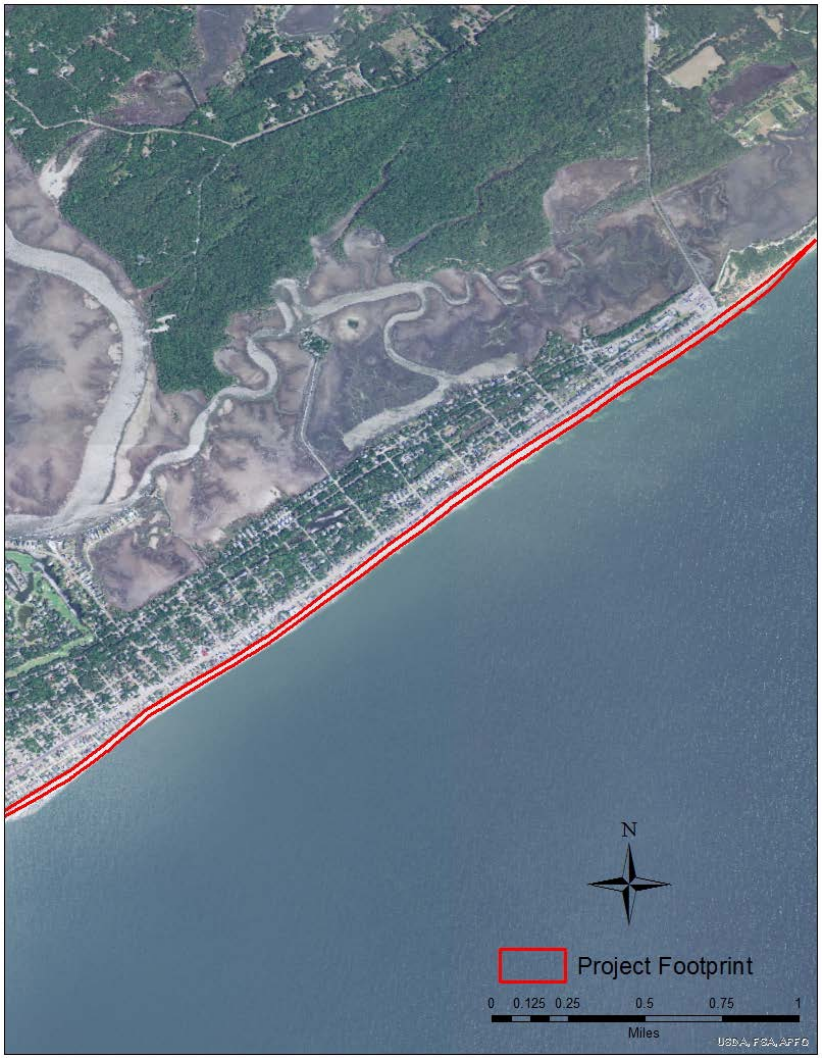

Figure 4. Project footprint along Atlantic Ocean facing reaches

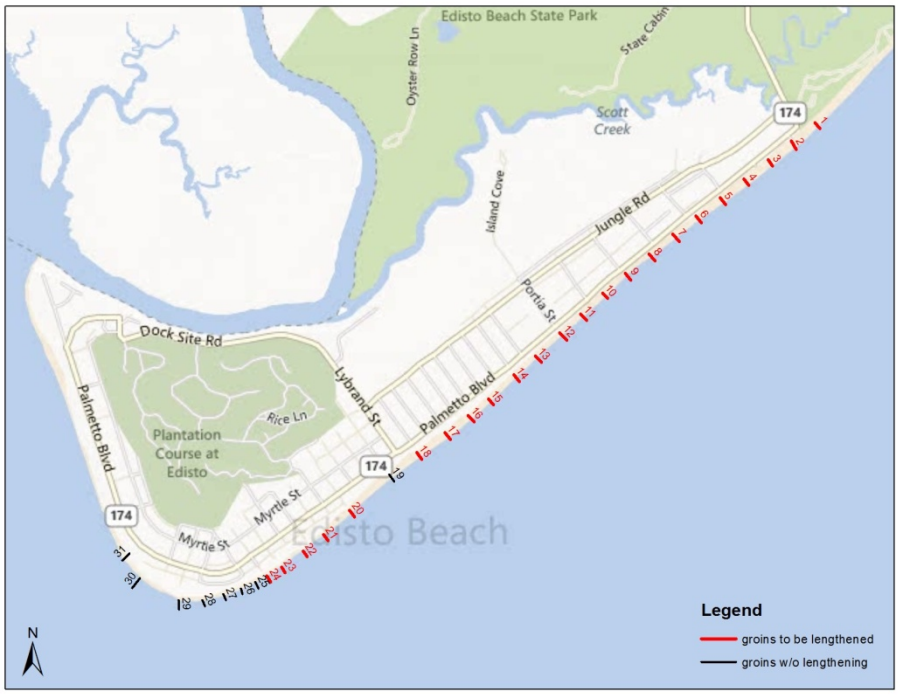

Figure 5. Spatial location of proposed groin lengthenings

Table 1. Proposed groin lengthening dimensions by groin number

Groin Extension Lengths			
Groin #	**Extension length (ft)**	**Groin #**	**Extension length (ft)**
1	80	13	40
2	80	14	30
3	90	15	20
4	90	16	20
5	100	17	20
6	100	18	20
7	80	20	20
8	60	21	30
9	50	22	30
10	50	23	20
11	40	24	20
12	40		
Total Groin Lengthening: 1,130 feet			

and acceptable temporary environmental impacts, as well as whatever proves to be the most advantageous economically. The sand will then be graded, raked, and tilled as necessary in coordination with recommendations and requirements from regulatory agencies. It is anticipated that construction will begin in late-2018 and will require approximately 4 to 5 months for completion. A construction window of November 1 through April 30 will minimize

impacts to sea turtles, fish, shellfish, and infauna, and will be utilized whenever possible (see USFWS Construction Windows, Appendix A). The schedule could change due to congressional funding, contractual issues, inclement weather, equipment failure, or other unforeseen difficulties.

The borrow area for the proposed project occurs on an ebb-tidal shoal located approximately 1.5 miles to 2.5 miles southeast of the southern point of Edisto Beach and is approximately 649 acres in size (Figure 1). The site was determined from a larger search area and was narrowed down to include sands that most appropriately match the native beach sands on Edisto Beach. The borrow area contains approximately 7.2 million cubic yards of beach compatible sands. Native beach sands were determined based on beach samples collected at 34 stations along Edisto Beach and reflects conditions after the 2006 renourishment project (completed by Coastal Science and Engineering). Each station included four grab samples – one each from the toe of the dune, berm, beach face, and low tide swash zone. Results of this analysis determined that the beach sands have a mean phi size of 1.31, 0.1 % silt/clay mix, and 26.9% visual shell hash. These results compare favorably with the borrow area sands (see Table 2 and Figure 5).

Additionally, a cultural and hardbottom resources survey was completed at the borrow area in March 2013. The survey utilized three techniques: 1) Side scan sonar, 2) Sub-bottom profiling, and 3) Magnetometer. Results of this survey determined that there are no hardbottom resources within the proposed borrow area. The borrow area location has been shared with multiple resource agencies over the course of the study and no additional issues have been raised to date.

Edisto Beach has very coarse sand and previous attempts at using fencing along a constructed berm to create an eolian transport driven dune have been unsuccessful. Therefore, the proposed project involves the creation of a 14 to 15 foot high dune at 15 feet width and a 3:1 slope. This dune feature may bury existing dune vegetation in some areas, especially along the inlet section of the beach. The proposed project consists of planting dune vegetation along the constructed dune including foreslope and backslope. The use of native vegetation will provide an environmental enhancement to the beach front while helping to stabilize the constructed dune. Plantings will be done in a matrix fashion and consist of native vegetation including but not limited to sea oats, Bitter panicum, and American beachgrass (Bogue variety). The total area of necessary dune planting is 29.68 acres.

Table 2. Edisto Beach grain size comparison between borrow site and native beach sands

	MEAN (phi)	STD DEV (phi)	% PASSING #5	%PASSING #10	% PASSING #200	% PASSING #230	% VISUAL SHELL
Edisto Native Beach	1.31	1.33	97.8	93.5	0.1	0.0	26.9
Borrow - Scenario A	1.73	1.31	94.7	90.0	0.4	0.2	18.8
NOTE: The data comparison above is not a Federal requirement, but is provided to gain a perspective as to the quality of material in the borrow area which is proposed for placement as nourishment material on the beach.							

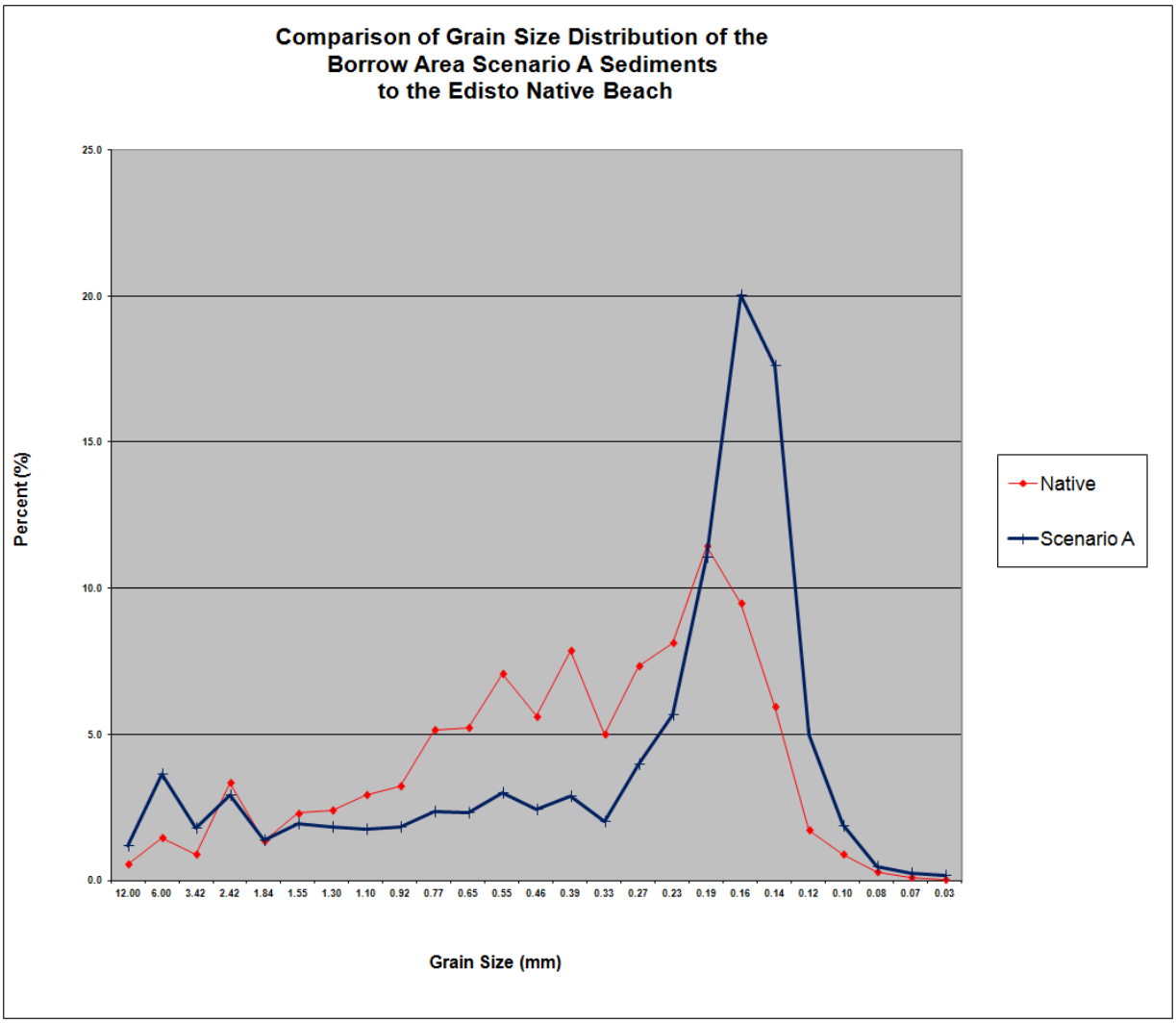

Figure 5. Histogram of native beach sands vs. proposed borrow site

3.0 PRIOR CONSULTATIONS

No previous Section 7 formal or informal consultations are known to have occurred for this proposed Project.

4.0 LIST OF SPECIES

4.1 US FISH AND WILDLIFE SERVICE

Table 3 contains a list of species that have been listed by the U.S. Fish and Wildlife Service as occurring or possibly occurring in Colleton County.

Table 3. USFWS Threatened and Endangered Speciesin Colleton County, South Carolina

COLLETON COUNTY T&E Species			
Common Name	**Scientific Name**	**Status**	**Occurrence**
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	Known
Wood stork	*Mycteria americana*	E	Known
Red-cockaded woodpecker	*Picoides borealis*	E	Known
Piping plover	*Charadrius melodus*	T, CH	Known
Kemp's ridley sea turtle	*Lepidochelys kempii**	E	Known
Leatherback sea turtle	*Dermochelys coriacea**	E	Known
Loggerhead sea turtle	*Caretta caretta*	T, CH*	Known
Green sea turtle	*Chelonia mydas**	T	Known
Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
Atlantic sturgeon	*Acipenser oxyrinchus**	E	Known
Pondberry	*Lindera melissifolia*	E	Possible
Canby's dropwort	*Oxypolis canbyi*	E	Known
Southern dusky salamander	*Desmognathus auriculatus*	SC	Possible
Angiosperm (no common name)	*Elytraria caroliniensis*	SC	Known
Godfrey's privet	*Forestiera godfreyi*	SC	Known
Pondspice	*Litsea aestivalis*	SC	Known
Boykin's lobelia	*Lobelia boykinii*	SC	Known
Carolina bird-in-a-nest	*Macbridea caroliniana*	SC	Known
Crested fringed orchid	*Pteroglossaspis ecristata*	SC	Known
Bachman's sparrow	*Aimophila aestivalis*	SC	Possible
Kirtland's warbler	*Dendroica kirtlandii*	E	
Henslow's sparrow	*Ammodramus henslowii*	SC	Possible
Rufa Red knot	*Calidris canutus rufa*	P	Possible
Black-throated green warbler	*Dendroica virens*	SC	Possible
Swallow-tailed kite	*Elanoides forficatus forficatus*	SC	Known
American kestrel	*Falco sparverius*	SC	Possible
American oystercatcher	*Haematopus palliatus*	SC	Known
Loggerhead shrike	*Lanius ludovicianus*	SC	Possible
Black rail	*Laterallus jamaicensis*	SC	Possible
Painted bunting	*Passerina ciris ciris*	SC	Possible
Gull-billed tern	*Sterna nilotica*	SC	Known
Bluebarred pygmy sunfish	*Elassoma okatie*	SC	Known
Southern hognose snake	*Heterodon simus*	SC	Possible
Island glass lizard	*Ophisaurus compressus*	SC	Known
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known

E - Federally endangered Federally threatened P - Proposed
BGEPA - Bald and Golden Eagle Protection Act CH - Critical Habitat Designated CH - proposed*
SC - State Species of Concern. These species are rare or limited in distribution but are not currently legally

4.2 NOAA FISHERIES (NATIONAL MARINE FISHERIES SERVICE)

Table 4 contains a list of threatened and endangered species in South Carolina under the jurisdiction of NOAA Fisheries.

Table 4: NMFS Threatened and Endangered Species in South Carolina

Common Name	Scientific Name	Status	Date Listed
Marine Mammals			
Blue whale	*Balaenoptera musculus*	E	12/2/1970
Finback whale	*Balaenoptera physalus*	E	12/2/1970
Humpback whale	*Megaptera movaeangliae*	E	12/2/1970
North Atlantic right whale	*Eubalaena glacialis*	E	12/2/1970
Sei whale	*Balaenoptera borealis*	E	12/2/1970
Sperm whale	*Physeter macrocephalus*	E	12/2/1970
Turtles			
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	12/2/1970
Leatherback sea turtle	*Dermochelys coriacea*	E	6/2/1970
Loggerhead sea turtle	*Caretta caretta*	T, CH*	7/28/1978
Green sea turtle	*Chelonia mydas*	T	7/28/1978
Hawksbill sea turtle	*Eretmochelys imbricata*	E	6/2/1970
Fish			
Atlantic sturgeon	*Acipenser Oxyrinchus*	E	2/6/2012
Shortnose sturgeon	*Acipenser brevirostrum*	E	3/11/1967
E - Federally endangered	*T - Federally threatened*	*CH - Critical Habitat proposed*	

* Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

** Candidate species are not protected under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. Federal agencies and the public are encouraged to consider these species during project planning so that future listings may be avoided.

5.0 GENERAL EFFECTS ON LISTED SPECIES/CRITCAL HABITAT

Dredging and placement of beach quality sand have the potential to affect animals and plants in a variety of ways. The potential for adverse impacts may result from actions of the dredging equipment (i.e. suction, sediment removal, hydraulic pumping of water and sediment); physical contact with dredging equipment and vessels; physical barriers imposed by the presence of dredging equipment (i.e. pipelines); and placement of dredged material on the beach within the proposed construction template (i.e. covering, suffocation). Although beach placement of material, and associated construction operations (i.e. operation of heavy equipment, pipeline route, etc.), may adversely affect some species and their habitat, the resultant constructed beach profile also promotes restoration of important habitat that has been degraded as a result of erosion along Edisto Beach. Potential impacts vary according to the type of equipment used, the nature and location of sediment discharged, the time period in

relation to life cycles of organisms that could be affected, and the nature of the interaction of a particular species with the dredging activities.

Any potential impacts on federally listed threatened and endangered species would be limited to those species that occur in habitats provided by the project area. Therefore, the proposed work will not affect any listed species which could be found within adjoining habitats surrounding the study area but do not have interrelated linkage to the habitats directly within the study area. Dredging methods and placement of beach quality sand associated with the proposed action are similar to current maintenance dredging methods and existing beach nourishment projects. These methods have been addressed in a number of previous environmental documents, including biological assessments and biological opinions rendered regarding endangered and threatened species. Detailed discussions of the dredging methods and associated activities for this project are provided in section 7.01 the Integrated Feasibility Study/Environmental Assessment. The accounts, which follow, will summarize this information as it applies to the proposed action.

6.0 SPECIES ASSESSMENTS

6.1 BLUE WHALE, FINBACK WHALE, HUMPBACK WHALE, NORTH ATLANTIC RIGHT WHALE (NARW), SEI WHALE, AND SPERM

a. Status. Endangered

The blue whale may be the largest mammal ever to inhabit the earth. It may have reached lengths of up to 100 feet - roughly the length of a basketball court. Blue whales have weighed up to 160 tons. They feed on small shrimp-like crustaceans. The whales consume up to eight tons of these animals a day during their feeding period. A blue whale produced the loudest sound ever recorded from an animal, and some scientists have speculated that they may be able to remain in touch with each other over hundreds of miles. The number of blue whales in the southern hemisphere was severely depleted by whaling. Due to commercial whaling the size of the population is less than ten percent of what it was originally.

The finback whale is the second largest whale, reaching lengths of up to 88 feet and weighs up to 76 tons. The finback whale because of its crescent-shaped dorsal fin, and obvious characteristic, is easily seen at sea. Depending on where they live, finback whales eat both fish and small pelagic crustaceans, and squids. It sometimes leaps clear of the water surface, yet it is also a deeper diver than some of the other baleen whales. The finback's range is in the Atlantic from the Arctic Circle to the Greater Antilles, including the Gulf of Mexico. In the Pacific Ocean the Finback ranges from the Bering Sea to Cape San Lucas, Baja California.

The humpback whale reaches a maximum length of about 50 feet long and a maximum weight of about 37.5 tons. They are mostly black, but the belly is sometimes white. Flippers and undersides of the flukes are nearly all white. They are migratory. They eat krill and schooling fish. In the Atlantic they migrate from Northern Iceland and Western Greenland south to the West Indies, including the Northern and Eastern Gulf of Mexico. In the Pacific Ocean they migrate from the Bering Sea to Southern Mexico. The humpback is one of the most

popular whales for whale watching on both the east and west coasts. Scientists estimate that there are 10,000 humpbacks worldwide, only about 8% of its estimated initial population.

The sei whale is one of the largest whales. It can reach a length of 60 feet and a weight of 32 tons. They feed primarily on krill and other small crustaceans, but also feed at times on small fish. The sei whale is the fastest of the baleen whales and can reach speeds of more than 20 miles per hour. In the Atlantic Ocean the Sei whale ranges from the Arctic Circle to the Gulf of Mexico. The Sei whale is endangered due to past commercial whaling.

Unlike the other great whales on the endangered species list, the sperm whale is a toothed whale. It is the largest of the toothed whales reaching a length of 60 feet in males and 40 feet in females. Sperm whales are noted for their dives that can last up to an hour and a half and go as deep as 2 miles under the surface. It is the most abundant of all the endangered whales, with an estimated population of two million. Sperm whales feed mainly on squid, including the giant squid. They range in the Atlantic Ocean from the Arctic Circle to the Gulf of Mexico. In the Pacific Ocean the sperm whale ranges from the Bering Sea to Southern Mexico. The sperm whale was almost hunted to extinction for its oil (spermaceti). This oil was used in the manufacture of ointments, cosmetics, and candles. The sperm whales usually inhabit the offshore waters.

The right whale is the most endangered species of whale off of the U.S. coasts. The right whale got its name because it was the "right" whale to hunt. It was slow moving and floated after being killed. Current estimates indicate that presently no more than a few hundred exist. Right whales can reach a length of 60 feet and a weight of 100 tons. Although the species has been internationally protected since 1937, it has failed to show any signs of recovery. The National Marine Fisheries Service (NMFS) now acknowledge three distinct right whale lineages as separate phylogenetic species: North Atlantic (*Eubalaena glacialis*), North Pacific (*Eubalaena japonica*), and southern (*Eubalaena australis*) right whales. Of concern along the eastern seaboard of the United States is the North Atlantic right whale, and more specifically, the western population.

Right whales have been observed along the eastern coast of North America from the Florida Keys north to the Gulf of St. Lawrence in Canada. They are found in relatively large numbers around Massachusetts and near Georges Bank in the spring, and then they migrate to two areas in Canadian waters by mid-summer. Most cows that give birth in any given year travel in the winter to the coastal waters of Georgia and Florida to calve and raise their young for the first three months. The Bay of Fundy, between Maine and Nova Scotia, appears to serve as the primary summer and fall nursery hosting mothers and their first-year calves. The calf will stay with its mother through the first year and it is believed that weaning occurs sometime in the fall. Calves become sexually mature in about 8 years. Females are believed to calve about every three to four years. Sightings of right whales and their occurrence in the inshore waters of the State, although very rare, are generally assumed to represent individuals seen during this migration. The current size of the western North Atlantic population is approximately 300 animals (NMFS, 2006).

Right whales are large baleen whales that feed primarily on copepods and euphausids (NMFS, 2006). They swim very close to the shoreline, often noted only a few hundred meters

offshore. Because of their habit of traveling near the coast, there is concern over impacts resulting from collisions with boats and ships, as well as entanglement in fishing gear (NMFS, 2006). Some right whales have been observed to bear propeller scars on their backs resulting from collisions with boats (NMFS, 1984). Available evidence strongly suggests that the western population of North Atlantic right whale cannot sustain the number of deaths resultant from vessel and fishing gear interactions. However, there is no designation of critical habitat for right whales in SC.

b. Project Impacts

(1) Habitat. No critical habitat has been designated for humpback whales or NARWs within the project area.

(2) Food Supply. NARWs feed primarily on copepods (Calanus sp.) and euphausids (krill) (NMFS 1991). Humpback whales are generally piscivorus but also feed on krill. The proposed dredging will not diminish productivity of the nearshore ocean; therefore, the food supply of these species should be unaffected.

(3) Relationship to Critical Periods in Life Cycle. Detailed life history information for humpback whales and NARWs and potential effects from dredging activities area provided within the following Section 7 consultation document:

> *National Marine Fisheries Service. 1997. Regional Biological Opinion for the Continued Hopper Dredging of Channels and Borrow Areas in the Southeastern United States. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Silver Spring, Maryland*

(4) Effect Determination. Of these six species of whales being considered, only the humpback whale and NARW would normally be expected to occur within the project area; therefore the other species of whales are not likely to be adversely affected. Therefore the proposed project is not likely to adversely affect the blue whale, finback whale, sei whale, and sperm whale. The majority of right whale sightings occur from December through February. Conditions outlined in previous consultations in order to reduce the potential for accidental collision (i.e. contractor pre-project briefings, large whale observers, slow down and course alteration procedures, etc.) will be implemented as a component of this project. If the proposed work is expected to occur during this time period, the dredge will be required to have endangered species observers standing watch on the bridge of the dredge to look for whales during construction. The presence of a hydraulic cutterhead pipeline or hopper dredge in this area should pose no direct impacts to the right whale or humpback whale, however, when relocating, the dredge and any supporting vessels are required to alter course and stop if necessary to avoid approaching whales. If whales are spotted during the day within 10 miles of the dredging operation, then the dredge is required to reduce transit speed at night, should it need to relocate during that time period. Corps contract specifications expressly require avoidance of right whales. The project will not impact existing near-shore habitat conditions and food supplies already available to the right whale or humpback whale. All in water dredging activities are addressed and covered by reference in the 29 October 1997 “National Marine Fisheries Service, Regional Biological Opinion on Hopper Dredging along the South Atlantic

Coast", which has jurisdiction on humpback and NARW effects. The beach placement portion of the project will have **no effect** on the humpback or NARW.

6.2 WEST INDIAN MANATEE

West Indian manatees are massive fusiform-shaped animals with skin that is uniformly dark grey, wrinkled, sparsely haired, and rubber-like. Manatees possess paddle-like forelimbs, no hind limbs, and a spatulate, horizontally flattened tail. Females have two axillary mammae, one at the base of each forelimb. Adults are about 10 feet in length and weigh 800-1200 pounds (USFWS, 2010). Newborns average 4 to 4½ feet in length and about 66 pounds (Odell 1981).

The West Indian manatee (*Trichechus manatus*) was listed as endangered on March 11, 1967, under a law that preceded the Endangered Species Act of 1973, as amended (16 USC 1531 et seq.). Additional Federal protection is provided for this species under the Marine Mammal Protection Act of 1972, as amended (16 USC 1461 et seq.). The manatee population in the United States is confined during the winter months to the coastal waters of the southern half of peninsular Florida and to springs and warm water outfalls as far north as southeast Georgia (USFWS, 1996). However, during the summer months, they may migrate as far north as coastal Virginia on the East Coast and as far west as Louisiana on the Gulf of Mexico (USFWS, 1991).

a. Status. Endangered

b. Occurrence in Immediate Project Vicinity. SC DNR indicates that manatees have been observed in SC since 1850. From 1850-2004 there have been 1117 records of manatees were documented in SC. These data suggest that manatees are infrequent visitors in SC (http://www.dnr.sc.gov/manatee/dist.html). However, in 2012, the SCDNR online reporting system noted that manatee sightings were reported beginning in April and lasting until October. There is no designation of critical habitat for the West Indian manatee in SC.

c. Project Impacts.

(1) Habitat. Typical coastal habitats utilized by manatees which are found within South Carolina include coastal tidal rivers, salt marshes, and vegetated bottoms where they feed on the aquatic vegetation and, in some cases, smooth cordgrass (*Spartina alterniflora*) (USFWS 2007). Project related impacts to estuarine and nearshore ocean habitat of the area associated with the placement of sediment on the beach should be minor and direct impacts to specific habitat requirements will be avoided.

(2) Food Supply. Specific food sources utilized by the manatee in South Carolina are unknown; however, the manatee diet in Florida consists primarily of vascular plants and is likely the same in South Carolina, including aquatic vegetation and salt marsh grasses. The proposed action will involve negligible change to the physical habitat of the beach and nearshore environment with no known impacts to aquatic vascular plants and overall estuarine and nearshore productivity should remain high throughout the project area. Therefore, potential food sources for the manatee should be unaffected.

(3) Relationship to Critical Periods in Life Cycle. Since the manatee is considered to be an infrequent summer resident of the South Carolina coast, the proposed action should have little effect on the manatee since its habitat and food supply will not be significantly impacted. The Corps will implement precautionary measures for avoiding impacts to manatees from associated transiting vessels during construction activities, as detailed in the "Guidelines for Avoiding Impacts to the West Indian Manatee" established by the USFWS.

(4) Effect Determination. Since the habitat and food supply of the manatee will not be significantly impacted, overall occurrence of manatees in the project vicinity is infrequent, all dredging will occur in the offshore environment, and precautionary measures for avoiding impacts to manatees, as established by USFWS, will be implemented for transiting vessels associated with the project, the proposed action is **not likely to adversely affect the west Indian manatee**.

6.3 KEMP'S RIDLEY, LEATHERBACK, LOGGERHEAD, GREEN, AND HAWKSBILL SEA TURTLES

a. Status. There are five species of sea turtles on the Atlantic Coast, Kemp's ridley sea turtle (*Lepidochelys kempii*), Leatherback sea turtle (*Dermochelys coriacea*), Loggerhead sea turtle (*Caretta caretta*), Green sea turtle (*Chelonia mydas)*, and the Hawksbill sea turtle (*Eretmochelys imbricata*). These five species of sea turtles are protected by the Convention on International Trade in Endangered Species (CITES). They are also listed as endangered or vulnerable in the Red Data Book by the International Union for the Conservation of Nature (IUCN). The hawksbill, Kemp's ridley and leatherback were listed as endangered by the U. S. Endangered Species Act in 1973. The green turtle and the loggerhead were added to the list as threatened in 1978.

b. Critical Habitat. Critical habitat is not currently designated in the continental U.S. for the five species of sea turtles identified to occur within the proposed project vicinity. However, USFWS and NMFS have proposed listing critical habitat for nesting beaches and various ocean waters of the Northwest Atlantic Ocean Distinct Population Segment of the loggerhead sea turtle (50 CFR Part 17 in Federal Register Vol. 78, No. 57 and 50 CFR Part 226 in Federal Register Vol. 78, No. 138). Critical habitat has been proposed by USFWS for Edisto Beach and all surrounding beaches, including Otter Island, Pine Island, Edisto Beach State Park, Edingsville Beach, Interlude Beach, and Botany Bay Island and Botany Bay Plantation (Figures 6 and 7). Critical habitat has been proposed by NMFS for the nearshore waters (i.e., from mean high water seaward for 1.6 km) off of Edisto Beach and all the surrounding beaches (Figure 8).

The description of the USFWS proposed Critical Habitat at Edisto Beach is as follows:

> *"This unit consists of 6.8 km (4.2 miles) of island shoreline along the Atlantic Ocean and South Edisto River. This unit includes a section of Edisto Island, which is separated from the mainland by the Atlantic Intracoastal Waterway, Big Bay Creek, a network of coastal islands, and salt marsh. The unit extends from 32.50307 N, 80.29625 W (State Park boundary separating Edisto Beach State Park and the Town of Edisto Beach) to South Edisto Inlet. The unit includes lands from the MHW line to*

the toe of the secondary dune or developed structures. The unit occurs within the town limits of Edisto Beach. Land in this unit is in private and other ownership (see Table 1). This unit was occupied at the time of listing and is currently occupied. This unit supports expansion of nesting from an adjacent unit (LOGG–T–SC–16) that has high density nesting by loggerhead sea turtles in South Carolina. This unit contains all of the PBFs and PCEs. The PBFs in this unit may require special managementconsiderations or protections to ameliorate the threats of recreational use, predation, beach sand placement activities, in-water and shoreline alterations, beach erosion, climate change, artificial lighting, humancaused disasters, and response to disasters. The Town of Edisto Beach has a Local Comprehensive Beach Management Plan that includes the implementation of sea turtle nesting surveys, nest marking, and beach management to protect nesting and hatchling loggerhead sea turtles from anthropogenic disturbances (Town of Edisto Beach 2011, p. 25). These measures apply to the private lands within this critical habitat unit although the degree of implementation is uncertain."

The description of the NMFS proposed Critical Habitat in the vicinity of Edisto Beach is as follows:

"LOGG-N-7—Folly, Kiawah, Seabrook, Botany Bay Islands, Botany Bay Plantation, Interlude Beach, and Edingsville Beach, Charleston County, South Carolina; Edisto Beach State Park, Edisto Beach, and Pine and Otter Islands, Colleton County, South Carolina. This unit contains nearshore reproductive habitat only. The unit consists of nearshore area from Lighthouse Inlet to Saint Helena Sound (crossing Folly River, Stono, Captain Sam's, North Edisto, Frampton, Jeremy, South Edisto and Fish Creek Inlets) from the MHW line seaward 1.6 km."

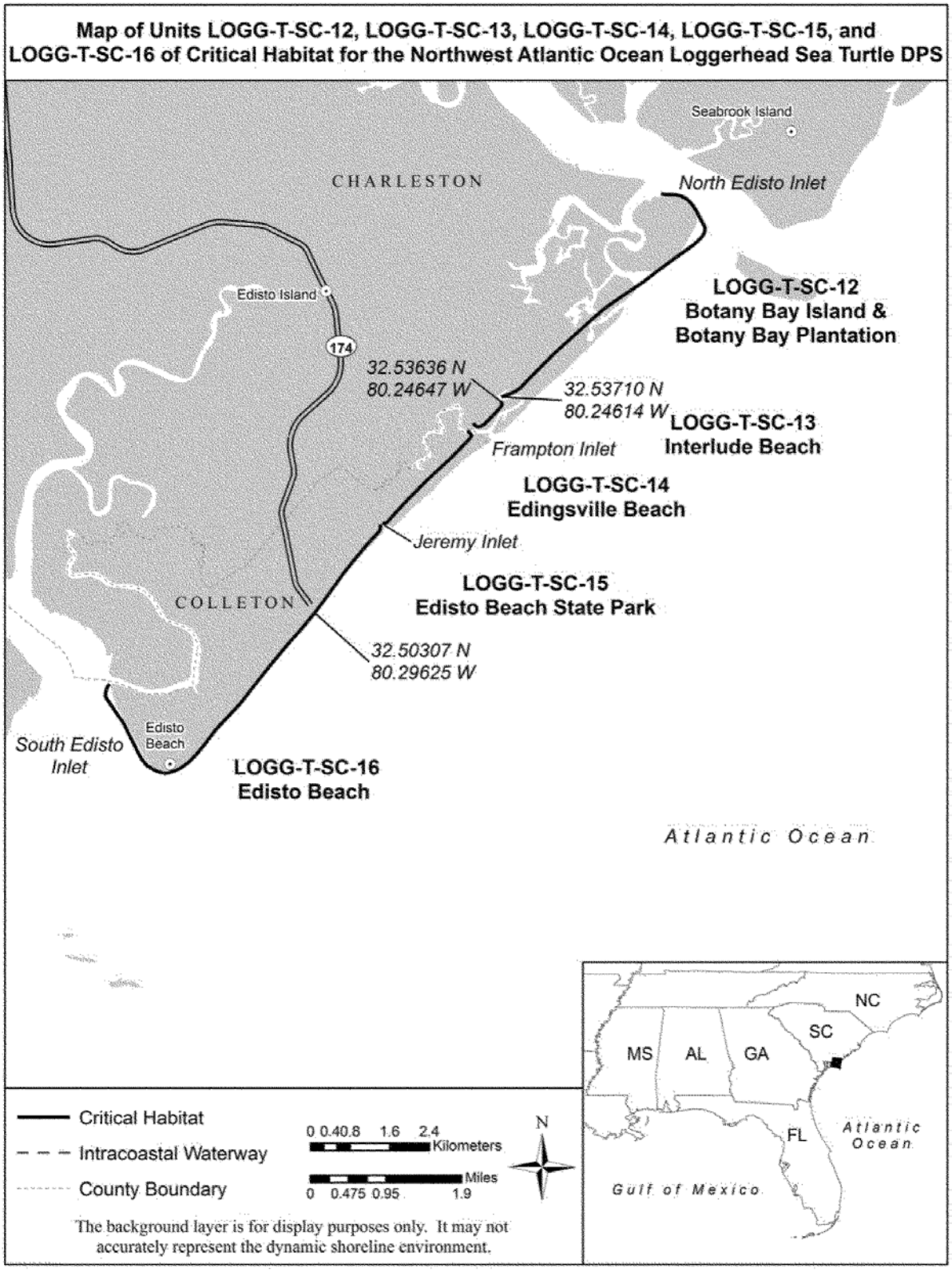

Figure 6. USFWS Proposed Critical Habitat for Loggerhead nesting turtles

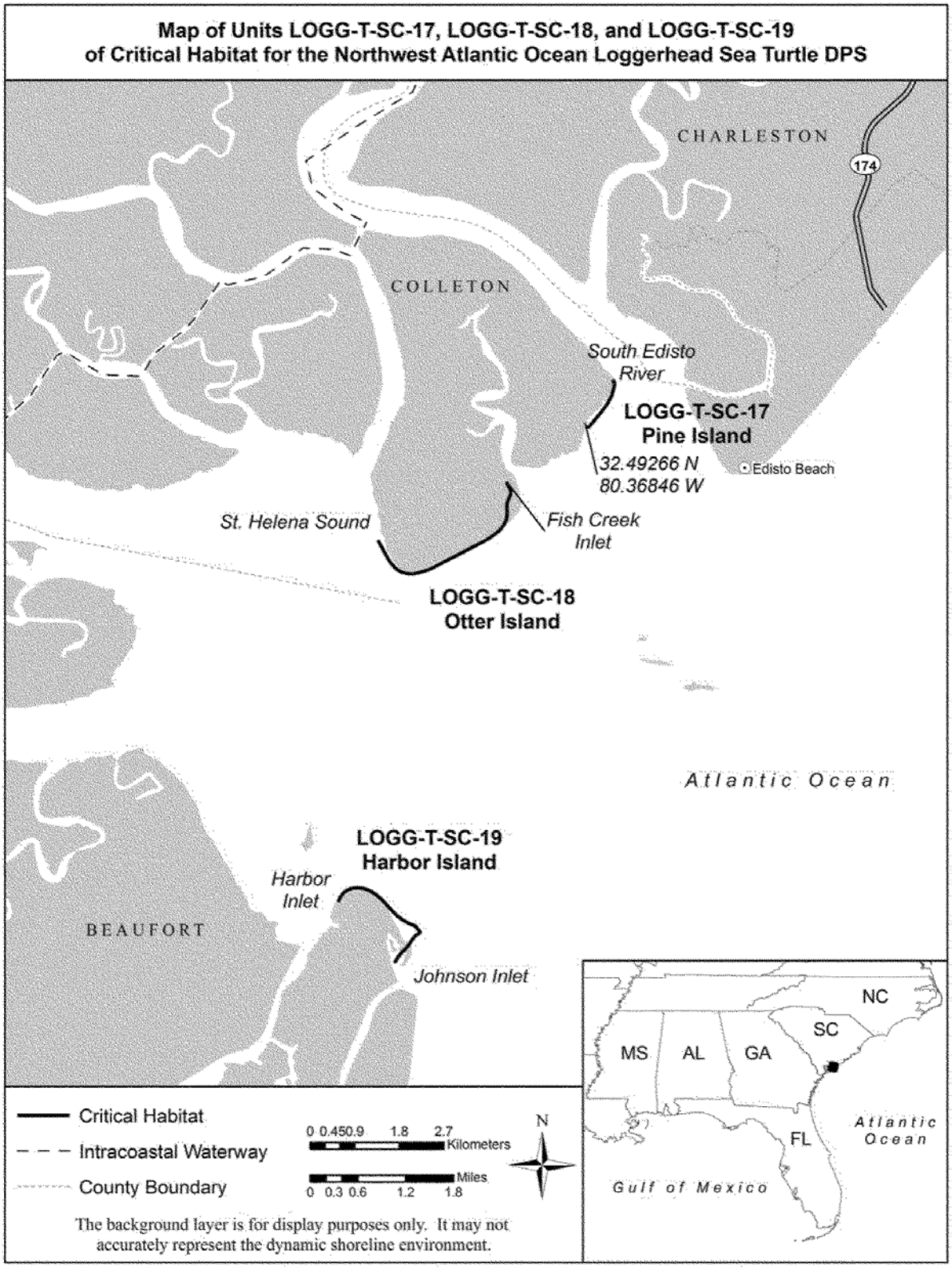

Figure 7. USFWS Proposed Critical Habitat for Loggerhead nesting turtles south of proposed project

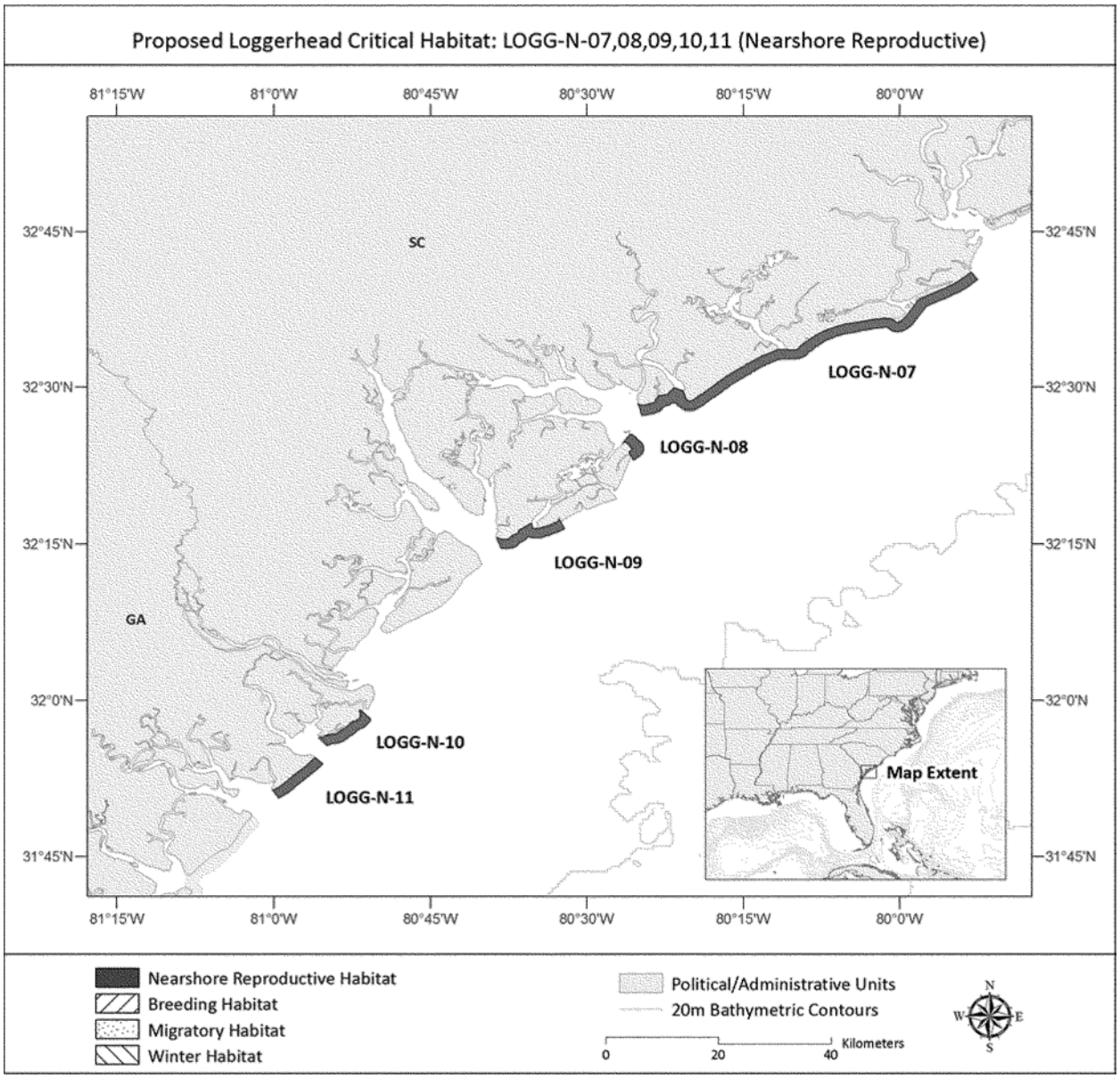

Figure 8. NMFS Proposed Critical Habitat for Loggerhead Sea turtles in the vicinity of the proposed project

c. Background. Sea turtles vary in size from an average of 75 pounds for the olive ridley (does not occur in the project area) to the giant leatherback, which may exceed 800 pounds. Modified for living in the open ocean, they have paddle-like front limbs for swimming. The thick neck and head cannot be drawn back into the body. Sea turtles also have special respiratory mechanisms and organs to excrete excess salt taken in with seawater when they feed.

Detailed life history information associated with the in-water life cycle requirements for sea turtles and a subsequent analysis of impacts from the proposed dredging activities is provided within the following NMFS Section 7 consultation document:

National Marine Fisheries Service. 1997. Regional Biological Opinion for the Continued Hopper Dredging of Channels and Borrow Areas in the Southeastern United States. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Silver Spring, Maryland

d. Occurrence in Immediate Project Vicinity. Of the five listed species of sea turtles, only the loggerhead is considered to be a regular nester in SC. However, in September 1996, a green sea turtle nested on Garden City Beach and another also nested on Garden City Beach in September 2002. Leatherback nests were recorded on Huntington Beach State Park in 2000, at Botany Bay in June 2003, on Folly Beach in July 2003, and on Edisto Beach in 2009. Figure 9 shows the history of sea turtle nesting at both Edisto Beach and Edisto Beach State Park over the past 30 years. There is currently no critical habitat designation for sea turtles in SC, however, USFWS and NMFS have issued proposed rulings to designate critical habitat for the northern Distinct Population Segment of loggerhead sea turtles and Edisto Beach and the nearshore waters are proposed critical habitat. Data from DNR indicates that the mean number of nests for the period 2006-2011 was 60.33 for the Town of Edisto Beach and 69.83

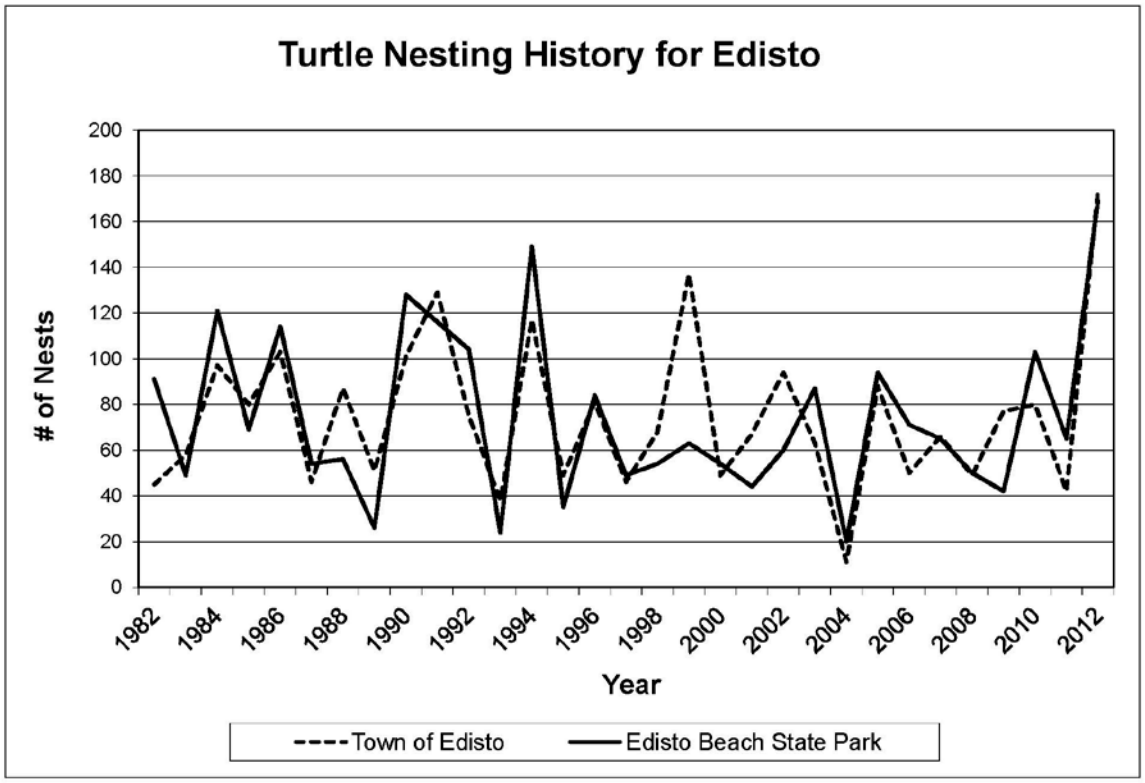

Figure 9. Loggerhead nesting on Edisto Beach from 1982 - 2012

for Edisto Beach State Park. The nesting densities were 7.8 nests/km and 32.4 nests/km, respectively (Dubose Griffin, personal communication). For purposes of this assessment, the loggerhead is considered to be the only species likely to nest in the project area.

Teleconference with former S.C. Department of Natural Resources personnel, Ms. Sally Murphy, indicates that the waters off-shore of Edisto are very active with sea turtles, particularly loggerheads and leatherbacks. Ms. Murphy indicated that they are frequently seen in higher numbers in this area during airplane surveys then in any other area of the state. Ms. Murphy also indicated that the lack of suitable habitat in the project area resulted in false crawls, false nesting attempts and the need to relocate nests frequently to more suitable habitat. Finally, Ms. Murphy expressed concerns that any sand placement on the beach areas should be restricted to the cooler months of the year so as not to impact sea turtle nesting.

e. Current Threats to Continued Use of the Area. In addition to affecting the coastal human population, coastal sediment loss also poses a threat to nesting sea turtles. A large percentage of sea turtles in the United States nest on nourished beaches (Nelson and Dickerson 1988a), therefore, nourishment has become an important technique for nesting beach restoration (Crain *et al.* 1995). Edisto Beach and Edisto Beach State Park are important nesting beaches for the Northern Recovery Unit of the loggerhead population; thus restoration of nesting habitat on this eroding beach is critical. Most of the project area has experienced severe erosion over the last decades. In response to short and long term erosion processes, the beach community continues to implement short term efforts to mitigate the lost beach. Past mitigative efforts included the construction of 34 groins, beach scraping, dune building, beach nourishment, revetments, etc.

The primary threats facing these species worldwide are the same ones facing them in the project area. Of these threats, the most serious seem to be loss of breeding females through accidental drowning by shrimpers (Crouse, *et al.* 1987) and human encroachment on traditional nesting beaches. Research has shown that the turtle populations have greatly declined in the last 20 years due to a loss of nesting habitat along the beachfront and by incidental drowning in shrimp trawl nets. It appears that the combination of poorly placed nests coupled with unrestrained human use of the beach by auto and foot traffic has impacted this species greatly. Other threats to these sea turtles include excessive natural predation in some areas and potential interactions with hopper dredges during the excavation of dredged material. With the exception of hopper dredges, none of the dredge plants (i.e., pipeline dredges) proposed for potential use in the construction of this project are known to take sea turtles.

f. Project Impacts. The areas of affected environment for this proposed project are the borrow area (an approximately 1.5 nm2 site located between 1 and 2.5 miles offshore) (see Figure 1) and the placement of approximately 800,000 cubic yards of sand along 21,820 feet of beach from the northern most groin southward (see Figure 2). This sand placement will result in an increase in the size of the dry beach, conversion of existing intertidal beach to dry beach and shifting the intertidal zone seaward from its existing location, and conversion of some subtidal beach to intertidal beach and shifting the subtidal zone seaward from its existing location.

In order to avoid periods of peak sea turtle abundance during warm water months and minimize impacts to sea turtles in the offshore environment, all beach placement of sediment will occur outside of the South Carolina sea turtle nesting season of 1 May through 31 October,

where practible. If a hopper dredge will be used, the construction will occur within the dredging window for hopper dredging from 1 December through 31 March and the drag heads will be equipped with turtle deflectors. By adhering to this dredging window to the maximum extent practicable, impacts to sea turtles will be minimized.

In the unanticipated event that construction activities extend into the nesting season (i.e. weather, equipment breakdown, etc.), all available data associated with the nesting activities within the project area will be utilized to consider risks of working within the nesting season. Variables to consider will include the number of days construction will extend into the nesting season, existing conditions of the pre-project nesting habitat such as: erosion rates, existing protective measures (i.e. sandbags, beach bulldozing, etc.), development, recreational use, the historic nesting density within the project area, etc. In coordination with the USFWS and SCDNR, an evaluation of these variables will be used to potentially incorporate project modifications (i.e. modified pipeline routes, staging areas, etc.) during the nesting season that may avoid or minimize potential impacts.

Upon evaluation of site-specific conditions, if nourishment beach activities extend into a portion of the nesting season, monitoring for sea turtle nesting activity will be considered throughout the construction area including the disposal area and beachfront pipeline routes so that nests laid in a potential construction zone can be bypassed and/or relocated outside of the construction zone prior to project commencement. The location and operation of heavy equipment on the beach within the project area will be limited to daylight hours to the maximum extent practicable in order to minimize impacts to nesting sea turtles.

(1) Beach Placement. Post-nourishment monitoring efforts have documented potential impacts on nesting loggerhead sea turtles for many years (Fletemeyer 1984; Raymond 1984; Nelson and Dickerson 1989; Ryder 1993; Bagley *et al*. 1994; Crain *et al*. 1995; Milton *et al*. 1997; Steinitz *et al.* 1998; Trindell *et al*. 1998; Davis *et al*. 1999; Ecological Associates, Inc. 1999; Herren 1999; Rumbold *et al*. 2001; Brock 2005; and Brock *et al.* 2009). Results from these studies indicate that, in most cases, nesting success decreases during the year following nourishment as a result of escarpments obstructing beach accessibility, altered beach profiles, and increased compaction. A comprehensive post-nourishment study conducted by Ernest and Martin (1999) documented an increase in abandoned nest attempts on nourished beaches compared to control or pre-nourished beaches as well as a change in nest placement with subsequent increase in wash-out of nests during the beach equilibration process.

As suggested by the historical literature, there are inherent changes in beach characteristics as a result of mechanically placing sediment on a beach from alternate sources. The change in beach characteristics often results in short-term decreases in nest success and/or alterations in nesting processes. However, when done properly, beach construction projects may mitigate the loss of nesting beach when the alternative is severely degraded or non-existent habitat (Brock et al. 2009).

i. Pipe Placement. In the event unanticipated circumstances arise and construction operations extend into the sea turtle nesting season pipeline routes and pipe staging areas may act as an impediment to nesting females approaching available nesting habitat or to hatchlings orienting to the water's edge. If the pipeline route or staging areas

extend along the beach face, including the frontal dune, beach berm, mean high water line, etc., some portion of the available nesting habitat will be blocked. Nesting females may either encounter the pipe and false crawl, or nest in front of the pipeline in a potentially vulnerable area to heavy equipment operation, erosion, and washover. If nests are laid prior to placement of pipe and are landward of the pipeline, hatchlings may be blocked or mis-oriented during their approach to the water.

Though pipeline alignments and staging areas may pose impacts to nesting females and hatchlings during the nesting season, several measures can be implemented to minimize these impacts. If construction activities extend into the nesting season, monitoring should be done in advance to document all nests within the beach placement template. Construction operations and pipeline placement could be modified to bypass existing nests. If bypassing is not a practical alternative for a given project, the relocation of nests outside of construction areas could be implemented. Throughout the period of sea turtle nesting and hatching, construction pipe that is placed on the beach parallel to the shoreline should be placed as far landward as possible so that a significant portion of available nesting habitat can be utilized and nest placement is not subject to inundation or wash out. Furthermore, temporary storage of pipes and equipment can be located off the beach to the maximum extent practicable. If placement on the beach is necessary, it will be done in a manner so as to impact the least amount of nesting habitat by placing pipes perpendicular to shore and as far landward as possible without compromising the integrity of the existing or constructed dune system.

ii. Slope and escarpments. Beach nourishment projects are designed and constructed to equilibrate to a more natural profile over time relative to the wave climate of a given area. Changes in beach slope as well as the development of steep escarpments may develop along the mean high water line as the constructed beach adjusts from a construction profile to a natural beach profile (Nelson *et al.* 1987). Though escarpment formation is a natural response to shoreline erosion, the escarpment formation as a result of the equilibration process during a short period following a nourishment event may have a steeper and higher vertical face than natural escarpment formation and may slough off more rapidly landward.

Though the equilibration process and subsequent escarpment formation are features of most beach projects, management techniques can be implemented to reduce the impact of escarpment formations. For completed sections of beach during beach construction operations, and for subsequent months following as the construction profile approaches a more natural profile, visual surveys for escarpments and slope adjustments could be performed. Escarpments that are identified prior to or during the nesting season that interfere with sea turtle nesting (exceed 18 inches in height for a distance of 100 ft.) can be leveled to the natural beach for a given area. If it is determined that escarpment leveling is required during the nesting or hatching season, leveling actions will be directed by the SCDNR and USFWS and coordinated with the Town of Edisto Beach. Additionally, allowing sufficient time for the equilibration process to adjust the constructed profile to the pre-project profile of the native beach prior to the nesting season could facilitate improved nesting success (Brock *et al.* 2009).

iii. Incubation Environment. Physical changes in sediment properties that result from the placement of sediment, from alternate sources, on the beach pose concerns for

nesting sea turtles and subsequent nest success. Nesting can be affected by insufficient oxygen diffusion and variability in moisture contenct levels within the egg clutch. Additionally, nest temperature can affect the sex ratio of developing turtles. Eggs incubated at constant temperatures of 28°C or below develop into males. Those kept at 32°C or above develop into females. Therefore, the pivotal temperature, those giving approximately equal numbers of males and females, is approximately 30°C (Yntema and Mrosovsky 1982). Matching borrow site sands with the native beach sands is extremely important to maintain consistency. As addressed previously, the borrow site sand and native beach sands are compatible.

iv. Lighting. Extensive research has demonstrated that the principal component of the sea finding behavior of emergent hatchlings is a visual response to light. Artificial beachfront lighting from buildings, streetlights, dune crossovers, vehicles and other types of beachfront lights has been documented in the disorientation (loss of bearings) and misorientation (incorrect orientation) of hatchling turtles. The results of disorientation or misorientation are often fatal. As hatchlings head toward lights or meander along the beach their exposure to predators and likelihood of desiccation is greatly increased. Misoriented hatchlings can become entrapped in vegetation or debris, and many hatchlings are found dead on nearby roadways and in parking lots after being struck by vehicles. Hatchlings that successfully find the water may be misoriented after entering the surf zone or while in nearshore waters. Intense artificial lighting can even draw hatchlings back out of the surf (NMFS, USFWS, 1991). Artificial lighting on beaches tends to deter sea turtles from emerging from the sea to nest; thus, evidence of lighting impacts on nesting females is not likely to be revealed by nest to false crawl ratios considering that no emergence may occur (Mattison *et al*. 1993; Witherington 1992; Raymond 1984). The presence of artificial lighting on or within the vicinity of nesting beaches is detrimental to critical behavioral aspects of the nesting process including nesting female emergence, nest site selection, and the nocturnal sea-finding behavior of both hatchlings and nesting females. The impact of light on nesting females and hatchlings can be minimized by reducing the number and wattage of light sources or by modifying the direction of light sources through shielding, redirection, elevation modifications, etc. (Figure 10). If shielding of light sources is not effective, it is important that any light reaching the beach has spectral properties that are minimally disruptive to sea turtles like long wavelength light. The spectral properties of low-pressure sodium vapor lighting are the least disruptive to sea turtles among other commercially available light sources.

During beach placement construction operations associated with the proposed project, lighting is required during nighttime activities at both the hopper dredge pumpout site and the location on the beach where sediment is being placed. In compliance with the US Army Corps of Engineers Safety and Health Requirements Manual (2008), a minimum luminance of 30 lm/ft2 is

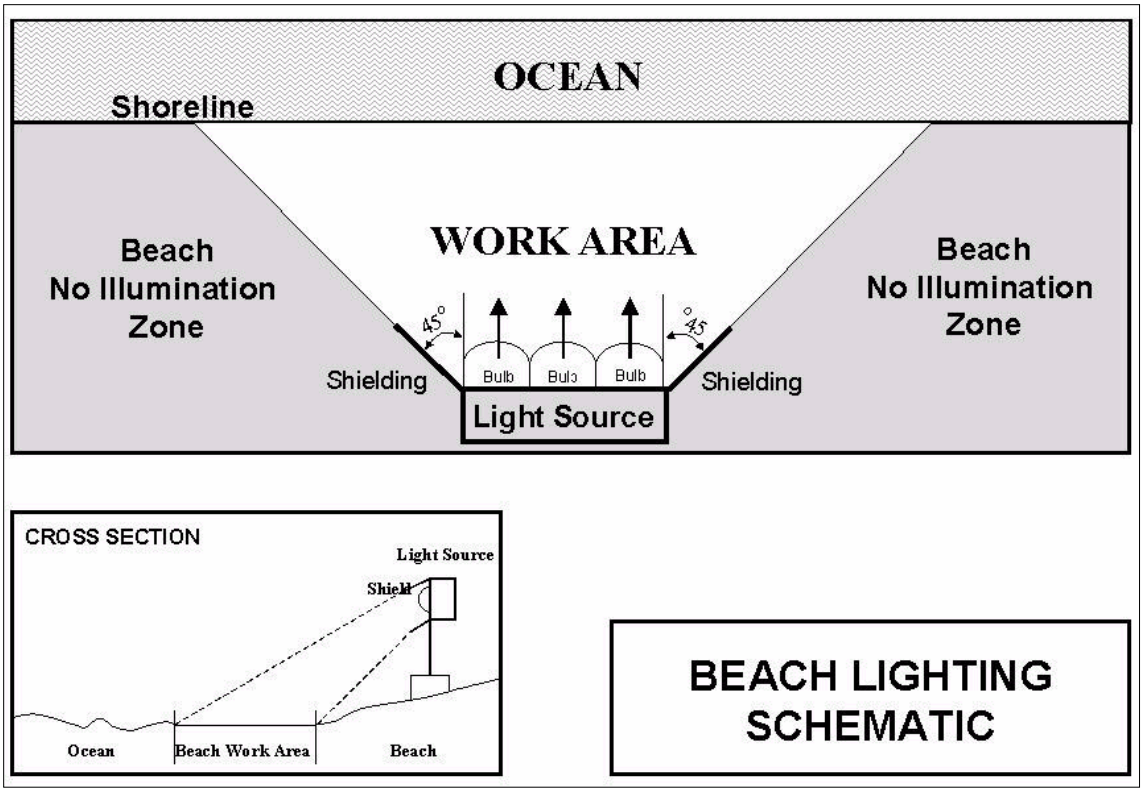

Figure 10. Beach lighting schematic

required for dredge operations and a minimum of 3 lm/ft2 is required for construction activities on the beach. For dredging vessels, appropriate lighting is necessary to provide a safe working environment during nighttime activities on deck (i.e. general maintenance work deck, endangered species observers, etc.). During beach construction operations, lighting is generally associated with the active construction zone around outflow pipe and the use of heavy equipment in the construction zone (i.e. bulldozers) in order to maintain safe construction operations at night.

USFWS has expressed concerns that on newly nourished beaches where the elevation of the beach berm is raised for coastal storm damage reduction purposes, it is possible that lighting impacts to nesting females and emerging hatchlings from adjacent lighting sources (streets, parking lots, hotels, etc) may become more problematic as shading from dunes, vegetation, etc. is not longer evident (Brock 2005; Brock et al. 2009; Ehrhart and Roberts 2001). In a study on Brevard county beaches, Brock (2005) found that loggerhead hatchling disorientations increased significantly post-nourishment. This was attributed to the increase in light sources not previously visible to be seen by hatchlings as a result of the increase in profile elevation combined with an easterly expansion of the beach. However, a dune feature will be constructed as a component of this project and is, therefore, expected to reduce lighting impacts to nesting and hatchling sea turtles that are associated with raising the beach elevation. Additionally, as stated in section 1.0 above, the berm will not be raised above the existing elevation, and instead the width will be expanded.

If beach construction activities extend into the sea turtle nesting and hatching season, all lighting associated with project construction will be minimized to the maximum extent practicable while maintaining compliance with all Corps, U.S. Coast Guard, and OSHA safety requirements. Direct lighting of the beach and near shore waters will be limited the immediate construction area(s). Lighting aboard dredges and associated vessels, barges, etc. operating near the sea turtle nesting beach shall be limited to the minimal lighting necessary to comply with the Corps, U.S. Coast Guard, and OSHA requirements. Lighting on offshore or onshore equipment will be minimized through reduced wattage, shielding, lowering, and/or use of low pressure sodium lights, in order to reduce illumination of adjacent beach and nearshore waters will be used to the extent practicable.

(2) Dredging Impacts. The effects of dredging are evidenced through the degradation of habitat and incidental take of marine turtles. Channelization of inshore and nearshore habitat and the disposal of dredged material in the marine environment can destroy or disrupt resting or foraging grounds (including grass beds and coral reefs) and may affect nesting distribution through the alteration of physical features in the marine environment. Hopper dredges are responsible for incidental take and mortality of marine turtles during dredging operations, however the use of turtle deflectors on the drag heads has dramatically reduced the incidence of "takes". Other types of dredges (clamshell and pipeline) have not been implicated in incidental take (NMFS, USFWS, 1991). Incidental takes of sea turtles by hopper dredges comes under the jurisdiction of NOAA Fisheries and is covered by a separate Biological Opinion (NMFS, 1997).

(3) Summary Effect. Currently, there is very little suitable sea turtle nesting habitat in the area of the project (e.g., dry beach/dune habitat). Upon completion of the project, the total area of suitable nesting habitat will be approximately 2,280 acres.

Loggerhead sea turtle nesting activities have been recorded within the project area on Edisto Island. The placement of sand and construction activities associated with the placement of that sand on this reach of beach could adversely affect any existing sea turtle nests and sea turtles attempting to nest. The extent of nesting on Edisto Island beach is somewhat irregular when compared with many other beaches along the coast; however, it does average approximately 14 nests per mile (despite the high erosion rate and resultant damage). Placement of the dredged material is anticipated to occur during the months of November through April; however, it is possible that the start of construction work will be delayed until nesting season or that completion of the project will be delayed and construction will extend into the nesting season. If any construction work occurs during sea turtle nesting season, then the following precautions will be taken to minimize the effects to sea turtles:

- If any construction of the project occurs during the period between May 1 and September 15, the dredging contractor will provide nighttime monitoring along the beach where construction is taking place to ensure the safety of female turtles attempting to nest. Cease construction activities if a sea turtle is sighted on an area of beach scheduled for fill until the turtle returns to the ocean. A buffer zone around the female will be imposed in the event of an attempt to nest.

- If any construction of the project occurs during the period between May 1 and September 15, daily nesting surveys will be conducted starting either May 1 or 65 days prior to the start of construction, whichever is later. These surveys will be performed between sunrise and 9:00 A.M. and will continue until the end of the project, or September 15, whichever is earlier. Any nests found in the area that will be impacted by construction activities will be moved to a safe location. The nesting surveys and nest relocations will only be performed by people with a valid South Carolina DNR license.
- If all construction of the project occurs during the period September 15 to April 30, no nesting surveys will be performed.
- For construction activities occurring during the period May 1 through October 31, staging areas for equipment and supplies will be located off of the beach to the maximum extent possible.
- For construction activities occurring during the period May 1 through October 31, use of heavy equipment will be limited to the area undergoing renourishment or dune building and shaping.
- For construction activities occurring during the period May 1 through October 31, all on-beach lighting associated with the project will be limited to the minimum amount necessary around active construction areas to satisfy Occupational Safety and Health Administration (OSHA) requirements.
- For construction activities occurring during the period May 1 through October 31, use predator proof trash receptacles to minimize presence of species that prey upon hatchlings.
- If a hopper dredge is used, in order to minimize the risk of incidental takes of sea turtles, the USACE requires the use of sea turtle deflecting dragheads on all hopper-dredging projects where the potential for sea turtle interactions exist.
- The USFWS and SCDNR must be notified immediately if a sea turtle, nest, or hatchlings are impacted by the construction.
- For construction activities occurring during the period May 1 through October 31, hold a preconstruction meeting between the contractor, USFWS, and SCDNR

Immediately after completion of the project, the Corps of Engineers will perform tilling to a depth of at least 24 inches in order to reduce compaction associated with newly placed sand. Visual surveys for escarpments along the Project area will be made immediately after completion of the project and prior to May 1 for 3 subsequent years, if needed. Results of the surveys will be submitted to the USFWS prior to any action being taken. Since the Project should not occur during the sea turtle nesting season, escarpment leveling will not be performed until immediately prior to the nesting season. The USFWS will be contacted immediately if subsequent reformation of escarpments exceeding 18 inches in height for a distance of 100 feet occurs during nesting and hatching season. This coordination will

determine what appropriate action must be taken. An annual summary of escarpment surveys and action taken will be submitted to the USFWS.

Adherence to the above precautions should minimize the effects to nesting loggerhead sea turtles and emerging loggerhead sea turtle hatchlings. The monitoring and relocation program will minimize potential adverse affects to nesting sea turtles. Completion of the project will recreate lost habitat and protect existing turtle nesting habitat as well as the structures on the island. However, because of the possibility of missing a sea turtle nest during the nest monitoring program or inadvertently breaking eggs during relocation, it has been determined that the proposed project **is likely to adversely affect the loggerhead sea turtle for beach placement activities**. This determination has been made per USFWS ESA Consultation Handbook and states that, "in the event the overall effect of the proposed action is beneficial to the listed species, but also is likely to cause some adverse effects, then the proposed action "is likely to adversely affect" the listed species." The project is **not likely to adversely modify proposed critical habitat (either terrestrial or marine) for loggerhead sea turtles**. Since leatherback nesting has been documented in the past but is not common, the proposed project **may affect but is not likely to adversely affect the leatherback sea turtle for beach placement activities**. **There will be no effect on all other sea turtle species for beach placement activities.** Since all in water dredging activities are addressed and covered by reference in the 1997 NMFS SARBO, no additional sea turtle consultation with NMFS is required.

6.4 SHORTNOSE STURGEON

Detailed life history information associated with the life cycle requirements for shortnose Sturgeon and a subsequent analysis of impacts from the proposed dredging activities are provided within the following Section 7 consultation document:

> *National Marine Fisheries Service. 1997. Regional Biological Opinion for the Continued Hopper Dredging of Channels and Borrow Areas in the Southeastern United States. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Silver Spring, Maryland*

a. Status. Endangered

b. Occurrence in Immediate Project Vicinity. The Shortnose Sturgeon occurs in Atlantic seaboard rivers from southern New Brunswick, Canada to northeastern Florida, USA. They typically inhabit estuarine and riverine habitats and are not often found offshore. SCDNR reports that in SC they inhabit Winyah Bay Rivers, those that drain into Lake Marion, The Santee, Cooper and Savannah rivers, and the ACE Basin. Within the ACE Basin, shortnose sturgeons are found at the freshwater-saltwater interface, where the adult and sub-adult shortnose sturgeons are known to inhabit that area during spring through fall. Whereby spawning may take place well upriver, the existence of a spawning stock in the ACE Basin is yet to be determined (SCDNR, 2009). Additionally, through a multi-state telemetry study, only 2 shortnose sturgeon have been documented passing through the borrow site area and only during the month of March. Four shortnose sturgeon have more than likely passed through the area during the north/south migrations along the coast. Since the study only picks up fish with

transmitters on them, there are likely to be others in the vicinity (Bill Post, personal communication 5/2/2013).

Studies have shown that the shortnose sturgeon exists in many of the large coastal river systems in South Carolina. Little is known about the shortnose sturgeon population level, life history or ecology. Their status is probably due to exploitation, damming of rivers and deterioration of water quality. Because there is no coastal river associated with this project, there is a lack of suitable freshwater spawning areas for the sturgeon in the immediate project area.

c. Current Threats to Continued Use of the Area. Pollution, blockage of traditional spawning grounds, and over fishing are generally considered to be the principal causes of the decline of this species.

d. Project Impacts.

(1) Habitat. The shortnose sturgeon is principally a riverine species and is known to use three distinct portions of river systems: (1) non-tidal freshwater areas for spawning and occasional over wintering; (2) tidal areas in the vicinity of the fresh/saltwater mixing zone, year-round as juveniles and during the summer months as adults; and (3) high salinity estuarine areas (15 ppt salinity or greater) as adults during the winter. Habitat conditions suitable for juvenile and adult shortnose sturgeon could occur within the estuaries behind the project area; however, spawning habitat should lie well outside of the project area and should not be affected by this project. The presence of juvenile shortnose sturgeon is not likely due to high salinity. Adults are found in shallow to deep water (6 to 30 feet) and, if present, would be expected to occupy the deeper waters during the day and the shallower areas adjacent to the deeper waters during the night (Dadswell *et al*. 1984).

(2) Food Supply. The shortnose sturgeon is a bottom feeder, consuming various invertebrates and stems and leaves of macrophytes. Adult foraging activities normally occur at night in shallow water areas adjacent to the deep-water areas occupied during the day. Juveniles are not known to leave deep-water areas and are expected to feed there. The foraging ecology of the shortnose sturgeon is not known for any portion of its range, and little information exists on the animal's food habits (SCDNR, 2009). Dredging for this project will occur at a borrow site located offshore; therefore, shallow water feeding areas will not be affected by the project.

(3) Effect Determination. Since shortnose sturgeons rarely inhabit coastal ocean waters, and tend to stay closer to the freshwater/saltwater divide, it is unlikely that the shortnose sturgeon occurs in the project area along the beachfront of Edisto Beach. However, should it occur, its habitat would be only minimally altered by the proposed project. Any shortnose sturgeon in the area should be able to avoid being taken by a slow moving pipeline dredge or hopper dredge. Although hopper dredges have been known to impact shortnose sturgeons, dredging for this project will occur in offshore environments, outside of its habitat range. Therefore, impacts from dredges are not anticipated to occur, but are covered by reference in the 1997 NMFS SARBO. For beach placement activities it has been determined that the proposed project will have **no effect on shortnose sturgeon.**

6.5 ATLANTIC STURGEON

a. Status. Endangered.

Within the Federal Register dated February 6, 2012 (Volume 77, Number 24), NMFS issued a final determination to list the Carolina and South Atlantic distinct population segments (DPSs) of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) as endangered under the Endangered Species Act (ESA) of 1973, as amended. This final rule was made effective April 6, 2012. NMFS had not designated any "critical habitat" for this species at the time this document was prepared. Since the Atlantic sturgeon is found within the project area, the purpose of this section is to address project impacts on this potentially listed species.

b. Occurrence in Immediate Project Vicinity. Although specifics vary latitudinally, the general life history pattern of Atlantic sturgeon is that of a long lived, late maturing, estuarine dependent, anadromous species. The species' historic range included major estuarine and riverine systems that spanned from Hamilton Inlet on the coast of Labrador to the Saint Johns River in Florida (Murawski and Pacheco 1977; Smith and Clungston 1997).

Atlantic sturgeon spawn in freshwater, but spend most of their adult life in the marine environment. Spawning adults generally migrate upriver in the spring/early summer; February-March in southern systems, April-May in mid-Atlantic systems, and May-July in Canadian systems (Murawski and Pacheco 1977; Smith 1985; Bain 1997; Smith and Clungston 1997; Caron *et al*. 2002). In some southern rivers, a fall spawning migration may also occur (Rogers and Weber 1995; Weber and Jennings 1996; Moser *et al.* 1998). Comprehensive information on current or historic abundance of Atlantic sturgeon is lacking for most river systems; however, use of waters within the ACE Basin for spawning and nursery habitat is well documented (SCDNR). Atlantic sturgeon spawning is believed to occur in flowing water between the salt front and fall line of large rivers, where optimal flows are 46-76 cm/s and deep depths of 11-27 meters (Borodin 1925; Leland 1968; Crance 1987; Moser *et al*. 1998; Bain *et al*. 2000). Sturgeon eggs are highly adhesive and are deposited on the bottom substrate, usually on hard surfaces (e.g., cobble) (Gilbert 1989; Smith and Clungston 1997). Additionally, through a multi-state telemetry study, 13 Atlantic sturgeon have been documented passing through the borrow site area during February – May and October – November. Thirty two Atlantic sturgeon have more than likely passed through the same area during north/south migrations along the coast (Bill Post, personal communication 5/2/2013).

Juveniles spend several years in the freshwater or tidal portions of rivers prior to migrating to sea (Gilbert 1989). Upon reaching a size of approximately 76-92 cm, the subadults may move to coastal waters (Murawski and Pacheco 1977; Smith 1985), where populations may undertake long range migrations (Dovel and Berggren 1983; Bain 1997; Van den Avyle 1984). Tagging and genetic data indicate that subadult and adult Atlantic sturgeon may travel widely once they emigrate from rivers. Subadult Atlantic sturgeon wander among coastal and estuarine habitats, undergoing rapid growth (Dovel and Berggren 1983; Stevenson 1997). These migratory subadults, as well as adult sturgeon, are normally captured in shallow (10-50m) near shore areas dominated by gravel and sand substrate (Stein *et al*. 2004). Coastal features or shorelines where migratory Atlantic sturgeon commonly aggregate include the Bay of Fundy,

Massachusetts Bay, Rhode Island, New Jersey, Delaware, Delaware Bay, Chesapeake Bay, and North Carolina, which presumably provide better foraging opportunities (Dovel and Berggren 1983; Johnson *et al*. 1997; Rochard *et al*. 1997; Kynard *et al*. 2000; Eyler *et al*. 2004; Stein *et al*. 2004; Dadswell 2006).

c. Current Threats to Continued Use of the Area. According to the Atlantic sturgeon status review (Atlantic Sturgeon Status Review Team, 2007), projects that may adversely affect sturgeon include dredging, pollutant or thermal discharges, bridge construction/removal, dam construction, removal and relicensing, and power plant construction and operation. Potential direct and indirect impacts associated with dredging that may adversely impact sturgeon include entrainment and/or capture of adults, juveniles, larvae, and eggs by dredging and closed net sea turtle relocation trawling activities, short-term impacts to foraging and refuge habitat, water quality, and sediment quality, and disruption of migratory pathways.

d. Project Impacts.

(1) Habitat and Food Supply. Dredging activities can impact benthic assemblages either directly or indirectly and may vary in nature, intensity, and duration depending on the project, site location, and time interval between maintenance operations. However, the relatively small size of the proposed borrow area and the short duration of disturbance will limit any disruption of food supply to the Atlantic sturgeon.

(2) Relationship to Critical Periods in Life Cycle. Analyses of the surficial and sub-bottom sediments have been conducted within the proposed borrow areas to assure compatibility with the native sediment. Several vibracore samples were taken to document the physical characteristics of the sediment relative to depth and sub-bottom geophysical surveys were conducted to correlate the physical samples with the underlying geology layers of the borrow area. These data are used to evaluate quality and quantity of sediment relative to depth so that post-dredging surface sediments are not different from pre-dredging conditions. Assuming similarity in post dredging composition of sediment, no long term impacts to sturgeon from alterations physical habitat (i.e. changes in benthic substrate) are expected.

(3) Effect Determination. Atlantic sturgeons have been taken by hopper dredges in the past and to lesser extent mechanical dredges. Therefore, the proposed dredging activity will have **no effect if performed by a cutterhead dredge and may affect and is likely to adversely affect the Atlantic sturgeon if performed by a hopper dredge.** Since USACE has initiated consultation with NMFS on a new regional Biological Opinion, no additional Atlantic sturgeon consultation with NMFS is required.

Endangered species observers (ESOs) on board hopper dredges as well as trawlers will be responsible for monitoring for incidental take of Atlantic sturgeon. For hopper dredging operations, dragheads as well as all inflow and overflow screening will be inspected for sturgeon species following the same ESO protocol for sea turtles. Furthermore, all ESOs on board trawlers will be capable of identifying Atlantic sturgeon as well as following safe handling protocol as outlined in Moser *et al.* 2000.

6.6 PIPING PLOVER

Piping plovers are small shorebirds approximately six inches long with sand-colored plumage on their backs and crown and white under parts. Breeding birds have a single black breast band, a black bar across the forehead, bright orange legs and bill, and a black tip on the bill. During the winter, the birds lose the black bands, the legs fade to pale yellow, and the bill becomes mostly black. The piping plover breeds on the northern Great Plains, in the Great Lakes, and along the Atlantic coast (Newfoundland to North Carolina); and winters on the Atlantic and Gulf of Mexico coasts from North Carolina to Mexico, and in the Bahamas West Indies.

Piping plovers nest along the sandy beaches of the Atlantic Coast from Newfoundland to North Carolina, the gravelly shorelines of the Great Lakes, and on river sandbars and alkali wetlands throughout the Great Plains region. They prefer to nest in sparsely vegetated areas that are slightly raised in elevation (like a beach berm). Piping plover breeding territories generally include a feeding area, such as a dune pond or slough, or near the lakeshore or ocean edge. The piping plover winters along the coast, preferring areas with expansive sand or mudflats (feeding) in close proximity to a sandy beach (roosting). The primary threats to the piping plover are habitat modification and destruction, and human disturbance to nesting adults and flightless chicks. A lack of undisturbed habitat has been cited as a reason for the decline of other Piping plovers are considered threatened species under the Endangered Species Act of 1973, as amended, when on their wintering grounds. Additionally, the U.S. Fish and Wildlife Service has designated critical habitat under the Endangered Species Act for the piping plover (*Charadrius melodus*) on breeding grounds in the Great lakes and Northern Great Plains Regions, and in the wintering grounds along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas. Georgia and South Carolina were reported to have the highest density of wintering populations (Nicholls and Baldassarre, 1990). Sites with the highest concentrations of piping plovers have expansive sandflats, or sandy mudflats, and sandy beaches (Nicholls and Baldassarre, 1990).

a. Status. Threatened

b. Occurrence in Immediate Project Vicinity. There are 4 areas of designated critical wintering habitat for the piping plover near the project area of Edisto Island (Figure 11). From north to south these areas are: (1) Seabrook Island (approx 8 miles NE of Jeremy Inlet), (2) Deveaux Bank (approx 6 miles NE of Jeremy Inlet), (3) Otter Island (approx 3 miles E of the south Edisto River Inlet), and (4) Harbor Island (approx 6 miles SE of South Edisto River Inlet). None of these four areas of critical habitat are directly in the project area. Edisto Beach is not known to have any overwintering piping plovers (Melissa Bimby, USFWS, personal communication).

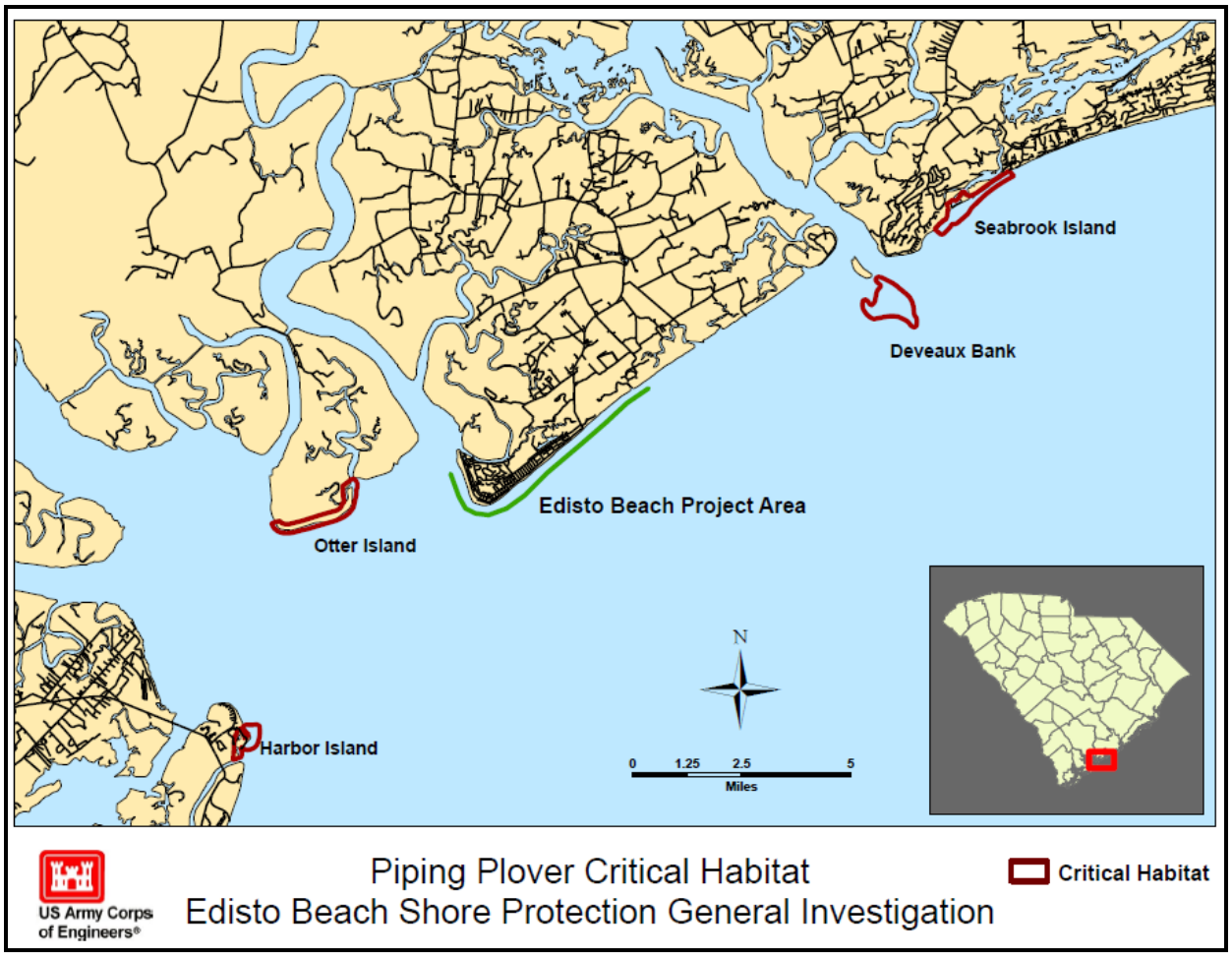

Figure 11. Piping Plover Critical Habit

c. Current Threats to Continued Use of the Area. Loss and degradation of habitat due to development and shoreline stabilization have been major contributors to the decline of piping plovers. Depending on timing and location, anthropogenic coastal stabilization activities may degrade plover habitat by altering natural processes of dune and beach erosion and accretion (Melvin et al. 1991). The current commercial, residential, and recreational development has decreased the amount of coastal habitat available for piping plovers to nest, roost, and feed. Washover habitat created after large hurricane events is a significant feature of natural barrier islands and serves as important habitat for piping plovers. However, these features are usually developed and/or rebuilt with residential homes shortly after they are created resulting in a continued decrease in nesting habitat availability. Dune construction and subsequent vegetative stabilization is often utilized to protect property and can serve as an impediment to natural overwash features; thus, limiting available nesting habitat. Cross-island transport of sediment and subsequent washover fan formation is considered a primary constituent element used in defining piping plover critical habitat. These low lying sand flats contain sparse vegetation and offer optimum habitat for piping plovers. Beach construction projects can also reduce sparse vegetation and coarse substrate, which may affect Piping Plover

nest site selection (Cohen *et al.* 2008). Long and short-term coastal erosion and the abundance of predators, including wild and domestic animals as well as feral cats, have further diminished the potential for successful nesting of this species.

d. Project Impacts.

(1) Habitat. Piping plover breeding territories on the Atlantic Coast typically include a feeding area along expansive sand or mudflats in close proximity to a sandy beach that is slightly elevated and sparsely vegetated for roosting and nesting. As erosion and development persist, piping plover breeding, nesting, roosting, and foraging habitat loss continues. Habitat loss from development and shoreline erosion and heavy public use has led to the degradation of piping plover habitat in the project area. The enhancement of beach habitat through the addition of beach fill may potentially restore lost roosting and nesting habitat; however, short-term impacts to foraging and roosting habitat may occur during project construction.

Initial construction and each periodic nourishment cycle will be performed using either a hydraulic cutterhead dredge or a hopper dredge and will adhere to a 1 November to 31 April dredging window to the maximum extent practicable. Since piping plovers head to their breeding grounds in late March and nesting occurs in late April, project initial construction and nourishment events will avoid impacts to breeding and nesting piping plovers to the maximum extent practicable. Additionally, the project construction limits and activities, including pipeline routes, heavy equipment, staging, etc., and associated direct impacts to habitat will avoid the designated piping plover critical wintering habitat. Lastly, the extension of 23 groins a total of 1,130 feet should have no downdrift impacts because they are only being extended enough to maintain the constructed berm.

(2) Effect Determination. All construction activities will avoid USFWS designated critical habitat areas. Direct loss of nests from the disposal of the dredged material should not occur, as the species is not known to nest in the project area. Potential piping plover foraging habitat on the beach during the winter months may be altered as beach food resources may be affected by placement of material along the project area, however they are not known to occur on Edisto Beach. Such disruptions will be temporary and of minor significance. Since only a small portion of the foraging habitat is directly affected at any point in time during pump out and adjacent habitat is still available, overall direct loss of foraging habitat will be minimal and short-term.

Any shorebird habitat area originally existing along the length of the island has suffered severe erosion. Dredged material will likely help restore the habitat lost to erosion in this area while the protective berm is being constructed. The placement of dredged material into the intertidal zone will provide additional foraging habitat for the wintering piping plover. For these reasons, it has been determined that the proposed project may affect, but is **not likely to adversely affect the piping plover.** Additionally, since the project is far enough removed from areas of Piping Plover Critical Habitat, it will have **no effect on critical habitat**.

6.6 Rufa Red Knot

Rufa red knots (*Calidris canutus rufa*) are medium-sized shorebirds approximately 9 to 11 inches long. Red knots have a proportionately small head, small eyes, and short neck, and a black bill that tapers from a stout base to a relatively fine tip. The bill length is not much longer than head length. Legs are short and typically dark gray to black, but sometimes greenish in juveniles or older birds in nonbreeding plumage. Nonbreeding plumage is dusky gray above and whitish below. Juveniles resemble nonbreeding adults, but the feathers of the scapulars (shoulders) and wing coverts (small feathers covering base of larger feathers) are edged with white and have narrow, dark bands, giving the upperparts a scalloped appearance. Breeding plumage of red knots is a distinctive rufous (red). The face, prominent stripe above the eye, breast, and upper belly are a rich rufous-red to a brick or salmon red, sometimes with a few scattered light feathers mixed in. The feathers of the lower belly and under the tail are whitish with dark flecks. Upperparts are dark brown with white and rufous feather edges; outer primary feathers are dark brown to black. Females are similar in color to males, though the rufous colors are typically less intense, with more buff or light gray on the dorsal (back) parts (USFWS, 2013a).

Each year red knots make one of the longest distance migrations known in the animal kingdom, traveling up to 19,000 mi annually. This migration occurs between the red knot's breeding grounds in the Canadian Arctic and several wintering areas, including the Southeast United States, the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America ("Winter" is used to refer to the nonbreeding period of the red knot life cycle when the birds are not undertaking migratory movements.). During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed. Southbound red knots tend to be less concentrated than during either their northbound migrations and in their wintering areas (USFWS, 2013a).

Red knots undertake long flights that may span thousands of miles without stopping. As red knots prepare to depart on long migratory flights, they undergo several physiological changes. Before takeoff, the birds accumulate and store large amounts of fat to fuel migration and undergo substantial changes in metabolic rates. In addition, leg muscles, gizzard, stomach, intestines, and liver all decrease in size, while pectoral muscles and heart increase in size. Due to these physiological changes, red knots arriving from lengthy migrations are not able to feed maximally until their digestive systems regenerate, a process that may take several days. Because stopovers are time-constrained, red knots require stopovers rich in easily digested food to achieve adequate weight gain (USFWS, 2013a).

Red knots generally nest in dry, slightly elevated tundra locations, often on windswept slopes with little vegetation. Breeding areas are located inland, but near arctic coasts. Nests may be scraped into patches of mountain avens (*Dryas octopetala*) plants, or in low spreading vegetation on hummocky ground containing lichens, leaves, and moss. Female red knots lay only one clutch (group of eggs) per season, and, as far as is known, do not lay a replacement clutch if the first is lost. The usual clutch size is four eggs, though three-egg clutches have been recorded. The incubation period lasts approximately 22 days from the last egg laid to the last egg hatched, and both sexes participate equally in egg incubation. After the eggs hatch, red

knot chicks and adults quickly move away from high nesting terrain to lower, wetland habitats. Young are precocial, leaving the nest within 24 hours of hatching and foraging for themselves. Females are thought to leave the breeding grounds and start moving south soon after the chicks hatch in mid-July. Thereafter, parental care is provided solely by the males, but about 25 days later (around August 10) they also abandon the newly fledged juveniles and move south. Not long after, they are followed by the juveniles (USFWS, 2013a).

Red knots are a specialized molluscivore, eating hard-shelled mollusks, sometimes supplemented with easily accessed softer invertebrate prey, such as shrimp and crab-like organisms, marine worms, and horseshoe crab eggs. Red knots do not necessarily prefer hard-shelled mollusks (in fact they do not, when given the choice), but they are specialized in finding and processing such prey. Due to this specialization, red knots have less ability to find the actively crawling soft-bodied worms and small crustaceans on which other sandpiper species specialize. Foraging activity is largely dictated by tidal conditions, as red knots rarely wade in water more than 0.8 to 1.2 in deep. Due to bill morphology, red knots are limited to foraging on only shallow-buried prey, within the top 0.8 to 1.2 in of sediment. Red knots and other shorebirds that are long-distance migrants must take advantage of seasonally abundant food resources at migration stopovers to build up fat reserves for the next non-stop, long-distance flight. During the migration period, although foraging red knots can be found widely distributed in small numbers within suitable habitats, birds tend to concentrate in those areas where abundant food resources are consistently available from year to year. A prominent departure from typical prey items occurs each spring when red knots feed on the eggs of horseshoe crabs, particularly during the key migration stopover within the Delaware Bay of New Jersey and Delaware. The Delaware Bay serves as the principal spring migration staging area for the red knot because of the abundance and availability of horseshoe crab eggs. Horseshoe crab eggs are a superabundant source of easily digestible food. Horseshoe crabs occur along the Atlantic coast from Maine to Florida, along Florida's Gulf coast, and along Mexico's Yucatan Peninsula. Within this geographic range, horseshoe crabs are most abundant between Virginia and New Jersey, with the largest population occurring in Delaware Bay. Each spring, adult horseshoe crabs migrate from deep bay waters and the Atlantic continental shelf to spawn on intertidal sandy beaches. Beaches within estuaries are preferred spawning areas because they are low energy environments and are protected from the surf. Horseshoe crab spawning generally occurs from March through July, with the peak spawning activity occurring around the evening new and full moon high tides in May and June. Horseshoe crabs and surface egg availability are not found in similar densities in other areas on the Atlantic coast, which may explain why shorebirds concentrate in the Delaware Bay. Besides supporting red knots, Delaware Bay supports high numbers of other shorebird species, and ranks among the 10 largest shorebird migration staging sites in the Western Hemisphere. Outside of Delaware Bay, horseshoe crab eggs are eaten opportunistically when available in nonbreeding habitats but are not considered a primary food resource for red knots in these areas. Delaware Bay provides the final Atlantic coast stopover for a significant majority (50 to 80 percent) of the red knot population making its way to the arctic breeding grounds each spring. Red knots stopping in Delaware Bay depend on horseshoe crab eggs to achieve remarkable rates of weight gain. No single stopover area is more important for the red knot than the Delaware Bay because the nutritive yield of the bay is

so high. The timing of the arrival of red knots and other shorebirds in Delaware Bay typically coincides with the annual peak of the horseshoe crab spawning period. Red knots in Delaware Bay rely almost entirely on horseshoe crab eggs to support their very high rates of weight gain. Research has provided strong evidence that a majority of red knots stop at the Delaware Bay during the spring migration, and that these birds are highly reliant on a superabundance of horseshoe crab eggs to gain weight during their stopover period. On the breeding grounds, the red knot's diet consists mostly of terrestrial invertebrates, though early in the season, before insects and other macroinvertebrates are active and accessible, red knots will eat grass shoots, seeds, and other vegetable matter (USFWS, 2013a).

Red knots are restricted to ocean coasts during winter, and occur primarily along the coasts during migration. Habitats used by red knots in migration and wintering areas are similar in character, generally coastal marine and estuarine (partially enclosed tidal area where fresh and salt water mixes) habitats with large areas of exposed intertidal sediments. In North America, red knots are commonly found along sandy, gravel, or cobble beaches, tidal mudflats, salt marshes, shallow coastal impoundments and lagoons, and peat banks. In the southeastern U.S., red knots forage along sandy beaches during spring and fall migration from Maryland through Florida. In addition to the sandy beaches, red knots also forage along peat banks and tidal mudflats during migration. Along the Atlantic coast, dynamic and ephemeral features are important red knot habitats, including sand spits, islets, shoals, and sandbars, often associated with inlets. From South Carolina to Florida, red knots are found in significantly higher numbers at inlets than at other coastal sites (USFWS, 2013a).

Red knots occupy all known wintering areas from December to February, but may be present in some wintering areas as early as September or as late as May. Wintering areas for the red knot include the Atlantic coasts of Argentina and Chile (particularly the island of Tierra del Fuego that spans both countries), the north coast of Brazil (particularly in the State of Maranhão), the Northwest Gulf of Mexico (discussed below) from the Mexican State of Tamaulipas through Texas (particularly at Laguna Madre) to Louisiana, and the Southeast United States from Florida (particularly the central Gulf coast) to North Carolina. Smaller numbers of knots winter in the Caribbean, and along the central Gulf coast (Alabama, Mississippi), the mid-Atlantic, and the Northeast United States. The core of the Southeast wintering area (i.e., that portion of this large region supporting the majority of birds) is thought to shift from year to year among Florida (particularly the central Gulf coast), Georgia, and South Carolina. However, the geographic limits of this wintering region are poorly defined. Although only small numbers are known, wintering knots extend along the Atlantic coast as far north as Virginia, Maryland, and New Jersey. Still smaller numbers of red knots have been reported between December and February from Long Island, New York, through Massachusetts and as far north as Nova Scotia, Canada. Small numbers of red knots also winter along the central Gulf coast (Florida Panhandle, Alabama, Mississippi, and eastern Louisiana). Red knots occupy the southernmost wintering areas, in Tierra del Fuego, from late October to February, with some birds arriving as early as late September. Birds wintering in the Caribbean or the United States typically stay later, through March or even May. Birds wintering in the Southeast seem to arrive in November, while birds wintering in Texas seem to arrive much earlier, in late July or

August. Major spring stopover areas along the Atlantic coast include Río Gallegos, Península Valdés, and San Antonio Oeste (Patagonia, Argentina); Lagoa do Peixe (eastern Brazil, State of Rio Grande do Sul); Maranhão (northern Brazil); the Virginia barrier islands; and Delaware Bay. However, large and small groups of red knots, sometimes numbering in the thousands, may occur in suitable habitats all along the Atlantic and Gulf coasts from Argentina to Massachusetts (USFWS, 2013a).

Some red knots from the Southeast-Caribbean wintering area, and from South American wintering areas, utilize spring stopovers along the Southeast United States, from Florida to North Carolina. The length of stopover at these locations is generally believed to be brief; although data exist showing that some stopovers last for several weeks. Red knots typically use mid-Atlantic stopovers from late April through late May or early June. The stopover time in Delaware Bay is about 10 to 14 days. From Delaware Bay and other mid-Atlantic stopovers, birds tend to fly overland directly northwest to the central Canadian breeding grounds, with many stopping briefly along the shores of James and Hudson Bays. Knots that winter in Tierra del Fuego tend to work their way up the South America Atlantic coast, using stopover sites in Argentina and Uruguay before departing from Brazil (USFWS, 2013a).

Important fall stopover sites include southwest Hudson Bay (including the Nelson River delta), James Bay, the north shore of the St. Lawrence River, the Mingan Archipelago, and the Bay of Fundy in Canada; the coasts of Massachusetts and New Jersey and the mouth of the Altamaha River in Georgia; the Caribbean (especially Puerto Rico and the Lesser Antilles); and the northern coast of South America from Brazil to Guyana. However, birds can occur all along the coasts in suitable habitat. In the mid-Atlantic, southbound red knots start arriving in July. Numbers of adults peak in mid-August and most depart by late September, although data shows that some birds stay through November. Migrant juveniles begin to appear along the U.S. Atlantic coast in mid-August, occurring in much lower numbers and scattered over a much wider area than adults. Several studies suggest that adult red knots fly directly to South America from the eastern seaboard of the United States, arriving in northern South America in August (USFWS, 2013a).

The primary threats to the red knot are loss of both breeding and non-breeding habitat; reduced prey availability throughout the non-breeding range; potential for disruption of natural predator cycles on the breeding grounds; and increasing frequency and severity of asynchronies (i.e., mismatches) in the timing of their annual migratory cycle relative to favorable food and weather conditions (USFWS, 2013b).

The red knot is a regular visitor along the South Carolina coast during both the spring and fall migrations. Flocks of over 1000 birds have been observed in the spring with lesser numbers being observed in the fall. The red knot also uses the South Carolina coast as a wintering area. The mud flats on Botany Bay Plantation get some red knot activity during migration (Sept/Oct and April/May); however, the red knot has not been surveyed on Edisto Island based on the last two winter surveys. SCDNR indicates that red knots do not likely concentrate on Edisto Beach (Felicia Sanders, personal communication, 11/22/2013).

(1) Effect Determination

Placement of the dredged material is anticipated to occur during the winter months. Direct loss of nests from the disposal of the dredged material will not occur, since the species does not nest in the project area. Red knot foraging distribution on the beach during the spring and fall migrations and winter months may be altered as beach food resources may be affected by placement of material along the project area; however, this impact is expected to be minor since most birds use areas outside of the immediate project area. In addition, previous studies of beach nourishment projects have shown a short term impact to the beach and surf zone infaunal community with a recovery within six months (SCDNR, 2009b). Due to the expected short term impacts to the beach infaunal community and since the number of red knots in the immediate project area is limited, it has been determined that the proposed project may affect but is **not likely to adversely affect the rufa red knot**.

7.0 SUMMARY OF PROTECTIVE MEASURES

The following is a summary of environmental commitments to protect listed species related to the construction and maintenance of the proposed project. These commitments address agreements with resource agencies, mitigation measures, and construction practices.

7.1 WEST INDIAN MANATEE

Should a change in the schedule necessitate work during the manatee migration period, personnel will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees. The Contractor may be held responsible for any manatee harmed, harassed, or killed as a result of vessel collisions or construction activities. Failure of the Contractor to follow these specifications is a violation of the Endangered Species Act and could result in prosecution of the Contractor under the Endangered Species Act or the Marine Mammals Protection Act. The standard manatee conditions apply annually from 1 June to 30 September, however in order to take precaution for the early and late sightings noted by SCDNR reporting, these protective measures will be implemented if construction occurs between April 1 – October 31. The Contractor will be instructed to take necessary precautions to avoid any contact with manatees. If manatees are sighted within 100 yards of the dredging area, all appropriate precautions will be implemented to insure protection of the manatee. The Contractor will stop, alter course, or maneuver as necessary to avoid operating moving equipment (including watercraft) any closer than 100 yards of the manatee. Operation of equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment.

7.2 NORTH ATLANTIC RIGHT WHALE

Since the construction is anticipated to be scheduled during the right whale migration period, personnel will be advised that there are civil and criminal penalties for harming, harassing, or killing right whales. The Contractor may be held responsible for any whale harmed, harassed, or killed as a result of vessel collisions or construction activities. Failure of the Contractor to follow these specifications is a violation of the Endangered Species Act and

could result in prosecution of the Contractor under the Endangered Species Act or the Marine Mammals Protection Act. The time when most right whale sightings occur is December, January, and February. The Contractor will be instructed to take necessary precautions to avoid any contact with whales. If whales are sighted within 1000 feet of the borrow area, all appropriate precautions shall be implemented to insure protection of the whale. In addition, the Contractor will stop, alter course, or maneuver as necessary to avoid operating moving equipment (including watercraft) any closer than this distance.

7.3 SEA TURTLES

Should the schedule necessitate work during the sea turtle nesting time period, in order to minimize impacts to nesting sea turtles a beach monitoring and nest relocation program for sea turtles will be implemented. This program will include nighttime monitoring along the beach where construction is taking place to ensure the safety of female turtles attempting to nest; daily patrols of sand placement areas at sunrise; relocation of any nests laid in areas to be impacted by sand placement; and monitoring of hatching success of the relocated nests. Sea turtle nests will be relocated to an area suitable to both the USFWS and the SCDNR. The Corps or the Town of Edisto Beach will perform any necessary maintenance of beach profile (tilling and shaping or knocking down escarpments) during construction and prior to the three subsequent nesting seasons.

During construction of this project, staging areas for construction equipment will be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all dredge pipes that are placed on the beach will be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Temporary storage of pipes will be off the beach to the maximum extent possible. Temporary storage of pipes on the beach will be in such a manner so as to impact the least amount of nesting habitat and will likewise not compromise the integrity of the dune systems (placement of pipes perpendicular to the shoreline will be recommended as the method of storage).

During construction of this project, all on-beach lighting associated with the project will be limited to the immediate area of active construction only. Such lighting will be shielded, low-pressure sodium vapor lights to minimize illumination of the nesting beach and nearshore waters. Red filters will be placed over vehicle headlights (i.e., bulldozers, front end loaders). Lighting on offshore equipment will be similarly minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast Guard and OSHA requirements. Shielded, low pressure sodium vapor lights will be highly recommended for lights on any offshore equipment that cannot be eliminated.

7.4 STURGEONS

Endangered species observers (ESOs) on board hopper dredges as well as trawlers will be responsible for monitoring for incidental take of shortnose and Atlantic sturgeon species. For hopper dredging operations, dragheads as well as all inflow and overflow screening will be

inspected for sturgeon species following the same ESO protocol for sea turtles. Furthermore, all ESOs on board trawlers will be capable of identifying shortnose and Atlantic sturgeon as well as following safe handling protocol as outlined in Moser *et. al.* 2000.

8.0 SUMMARY EFFECT DETERMINATION

This Biological Assessment of Threatened and Endangered Species has examined the potential impacts of the proposed project on the habitat and listed species of plants and animals that are, or have been, present in the project area. Both primary and secondary impacts to habitat have been considered. Critical habitat has not been designated for whales, manatees, sea turtles, or sturgeon in South Carolina; therefore, none would be affected. The USFWS designated critical habitat for the wintering piping plover is adjacent and to the north of the island, but not on the island. Based on the analysis presented in this Biological Assessment, the following determinations have been made (Table 5):

Table 5. Threatened and endangered species effect determination

Listed Species w/in the Project Area		Effect Determination	
		Beach Placement Activities (USFWS)	In-Water Dredging Activities (Cutterhead/Hopper) (NMFS)
Sea Turtles	Leatherback	MANLAA	Covered by 1997 SARBO
	Loggerhead	MALAA	
	Green	NE	
	Kemp's Ridley	NE	
	Hawksbill	NE	
Large Whales	Blue	NE	
	Finback	NE	
	Sei	NE	
	Sperm	NE	
	Humpback	NE	
	NARW	NE	
West Indian Manatee		NE	
Piping Plover and Critical Wintering Habitat		MANLAA/NE	
Rufa Red Knot		MANLAA	
Shortnose Sturgeon		NE	
Atlantic Sturgeon		NE	NE / MALAA (Covered by Reinitiation of Consultation under 1997 SARBO)

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Appendix A: USFWS Construction Windows

INFORMATION ON OCCURANCES OF FEDERALLY THREATENED AND ENDANGERED ANIMAL SPECIES IN SOUTH CAROLINA

SCIENTIFIC NAME	COMMON NAME	STATUS	TIME PERIOD	COMMENTS
Acipenser brevirostrum	Shortnose sturgeon	Endangered	February 15 – April 30	spawning migration
Ambystoma cingulatum	Flatwoods salamander	Threatened	January – April	larvae present in breeding ponds
Caretta caretta	Loggerhead sea turtle	Threatened	May 1 – October 31	nesting and hatching
Charadrius melodus	Piping plover	Threatened	July 15 – May 1	migration and winter
Dermochelys coriacea	Leatherback sea turtle	Endangered	April 15 – September 30	nesting and hatching
Drymarchon corais couperi	Eastern Indigo snake	Threatened	November – March	breeding season
Haliaeetus leucocephalus	Bald eagle	Threatened	October 1 – May 15	nesting season
Lasmigona decorada	Carolina heelsplitter	Endangered	March – September	optimal survey window
Mycteria americana	Wood stork	Endangered	February 15 – September 1	nesting season
Myotis sodalis	Indiana bat	Endangered	August – late March	winter migration and
Picoides borealis	Red-cockaded woodpecker	Endangered	April 15 – July 31	nesting season
Trichechus manatus	West Indian manatee	Endangered	May 15 – October 15	in coastal waters

For additional information about these species, please visit the U.S. Fish and Wildlife Service web page at http://endangered.fws.gov.