Final General Reevaluation Report
and
Final Environmental Impact Statement

on

Hurricane Protection and Beach Erosion Control

WEST ONSLOW BEACH AND NEW RIVER INLET (TOPSAIL BEACH), NORTH CAROLINA

Appendix I

Biological Assessment

BIOLOGICAL ASSESSMENT
ENDANGERED SPECIES

West Onslow Beach and New River Inlet (Topsail Beach), NC
Pender County, North Carolina
Shore Protection Project

1.00 PROPOSED PROJECT

The proposed project is the same as described in detail in the environmental impact statement, which precedes the appendices.

2.00 SPECIES CONSIDERED UNDER THIS ASSESSMENT

Updated lists of endangered and threatened (E&T) species for the project area were obtained from NMFS (Southeast Regional Office, St. Petersburg, FL) (email dated 16 August 2004) and the USFWS (Field Office, Raleigh, NC) (http://nc-es.fws.gov/). These lists were combined to develop the following composite list of E&T species that could be present in the area based upon their geographic range. However, the actual occurrence of a species in the area would depend upon the availability of suitable habitat, the season of the year relative to a species' temperature tolerance and migratory habits, and other factors.

Table I-1. Threatened and Endangered Species Potentially Present in Pender County, NC.

Species Common Names	Scientific Name	Federal Status
Mammals		
West Indian Manatee	*Trichechus manatus*	Endangered
Right whale	*Eubaleana glacialis*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Finback whale	*Balaenoptera physalus*	Endangered
Humpback whale	*Megaptera novaeangliae*	Endangered
Blue Whale	*Balaenoptera musculus*	Endangered
Birds		
Piping Plover	*Charadrius melodus*	Threatened
Red-cockaded woodpecker	*Picoides borealis*	Endangered
Reptiles		
American alligator	*Alligator mississippiensis*	T(S/A)
Green sea turtle	*Chelonia mydas*	Threatened[1]
Hawksbill turtle	*Eretmochelys imbricata*	Endangered
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened
Fish		
Shortnose sturgeon	*Acipenser brevirostrum*	Endangered
Vascular Plant		
Golden sedge	*Carex lutea*	Endangered
Chaffseed	*Schwalbea Americana*	Endangered
Cooley's meadowrue	*Thalictrum cooleyi*	Endangered
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	Endangered
Seabeach amaranth	*Amaranthus pumilus*	Threatened

Status	Definition
Endangered	A taxon "in danger of extinction throughout all or a significant portion of its range."
Threatened	A taxon "likely to become endangered within the foreseeable future throughout all or a significant portion of its range."
T(S/A)	Threatened due to similarity of appearance (e.g., American alligator)--a species that is threatened due to similarity of appearance with other rare species and is listed for its protection. These species are not biologically endangered or threatened and are not subject to Section 7 consultation.

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

3.00 ASSESSMENT OF IMPACTS TO LISTED THREATENED AND ENDANGERED SPECIES

3.01 General Impacts

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., cutting, suction, sediment removal, hydraulic pumping of water and sediment); physical contact with dredging equipment and vessels (i.e. impact); physical barriers imposed by the presence of dredging equipment (i.e. pipelines); and placement of dredged material in various disposal locations (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 lost or degraded as a result of erosion. 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.

All the proposed work will occur within the Atlantic Ocean to approximately 5.5 miles offshore (borrow areas A, B, C, D, E, and F). The selected 1250X beach nourishment plan consists of a 26,200-foot long dune and berm system. The plan has a main fill length of 23,200 feet, from approximately 400 feet southwest of Godwin Avenue, in reach 3, to the Topsail Beach town limit in reach 26 (See Section 7.01.1). A 2,000-foot northern transition and a 1,000 southern transition will extend beyond the limits of the main fill. The transition areas will consist of a tapered berm only resulting in a starting transition berm width of 155 feet that uniformly tapers to zero (See Section 7.01.2). Any potential impacts on federally listed threatened and endangered species would be limited to those species that occur in habitats provided by these areas. Therefore, the proposed work will not affect any listed species, which generally reside in freshwater, forested habitats, or savannas, including the American alligator, red-cockaded woodpecker, golden sedge, chaffseed, Cooley's meadowrue, and rough-leafed loosestrife.

Federally listed threatened or endangered species which could be present in the project area during the proposed action are the blue whale, finback whale, humpback whale, right whale, sei whale, sperm whale, West Indian manatee, green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, shortnose sturgeon, seabeach amaranth, and piping plover.

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. The accounts, which follow, will summarize this information as it applies to the proposed action.

3.02 Species Accounts

3.02.1 American Alligator, Red-cockaded Woodpecker, Golden Sedge, Chaffseed, Cooley's Meadowrue, and Rough-leaved Loosestrife.

These are all terrestrial, freshwater, woodland, or savanna species. Since this habitat type is not present in the areas to be affected by the proposed action, these species are unlikely to occur.

Effect Determination. It has been determined that the proposed action is not likely to adversely affect any of these species or their habitat.

3.02.2 Blue Whale, Finback Whale, Humpback Whale, Right Whale, Sei Whale, and Sperm Whale

a. Status. Endangered

b. Occurrence in Immediate Project Vicinity. These whale species all occur infrequently in the ocean off the coast of North Carolina. Of these, only the right whale and the humpback whale routinely come close enough inshore to encounter the project area. Humpback whales were listed as "endangered" throughout their range on June 2, 1970 under the Endangered Species Act and are considered "depleted" under the Marine Mammal Protection Act. Humpbacks are often found in protected waters over shallow banks and shelf waters for breeding and feeding. They migrate toward the poles in summer and toward the tropics in winter and are in the vicinity of the North Carolina coast during seasonal migrations, especially between December and April. Since 1991 humpback whales have been seen in nearshore waters of North Carolina with peak abundance in January through March (NMFS, 2003). In the Western North Atlantic, humpback feeding grounds encompass the eastern coast of the United States, the Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland. Major prey species include small schooling fishes (herring, sand lance, capelin, mackerel, small Pollock, and haddock) and large zooplankton, mainly krill (up to 1.5 tons per day) (http://www.nmfs.noaa.gov). Based on an increased number of sightings and stranding data, the Chesapeake and Delaware Bays and the U.S. mid-Atlantic and southeastern states, particularly along Virginia and North Carolina coasts, have become increasingly important habitat for juvenile humpback whales (Wiley *et al*., 1995).

There are 6 major habitats or congregation areas for western North Atlantic right whales; these are the coastal waters of the southeastern United States, the Great South Channel, Georges Bank/Gulf of Maine, Cape Cod and Massachusetts Bays, the Bay of Fundy, and the Scotian Shelf. However, the frequency with which right whales occur in offshore waters in the southeastern U.S. remains unclear (NMFS, 2003). While it usually winters in the waters between Georgia and Florida, the right whale can, on occasion, be found in the waters off North Carolina. Right whales swim very close to the shoreline and are often noted only a few hundred meters offshore (Schmidly, 1981). Right whales have been documented along the North Carolina coast, as close as 250 meters from the beach, between December and April with sightings being most common from mid to late March (Dr. Frank J. Schwartz, personal communication). Sighting data provided by the Right Whale Program of the New England Aquarium indicates that 93 percent of all North Carolina sightings between 1976 and 1992 occurred between mid-October and mid-April (Slay, 1993).

The occurrence of right whales in the State's waters is usually associated with spring or fall migrations. Due to their restriction to oceanic environments, the only aspects of the proposed action, which might result in an encounter with these species, will be the operation of the hopper dredge in the offshore borrow areas.

c. Current Threats to Continued Use of the Project Area. None.

d. Project Impacts.

(1) Habitat. None.

(2) Food Supply. In the Western North Atlantic, right whales feed primarily on copepods (*Calanus* sp.) and euphausids (krill) (NMFS, 1991) and humpback whales feed on small fish and 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. Using a photo-identification technique to estimate the minimum population size of individual whales, Kraus *et al*. (2001) identified 291 right whales in 1998. Based on this estimated population size, current models suggest that, if current trends continue, the population could go extinct in less than 200 years (Caswell *et al*., 1999). Ship strikes are a major cause of mortality and injury to right whales within several major shipping corridors on the eastern U.S. and southeastern Canadian coasts. From 1997-2001 the average reported mortality and serious injury due to ship strikes was 0.8 whales per year (Kraus 1990; Knowlton and Kraus 2001). According to Jensen and Silber's (2003) large whale ship strike database, a total of 292 large whale ship strikes have occurred worldwide from 1975-2002 of which 38 (13%) were right whales (~1.4 whales per year). Based on the data provided for each strike, the average ship speed was 18.1 knots. Ship strikes are responsible for over 50 percent of known human-related right whale mortalities and are believed to be one of the principal causes for the lack of recovery of the population (Federal Register/Vol. 69, No. 105).

On 01 June 2004, NMFS identified in the Federal Register an advance notice of proposed rulemaking for right whale ships strike reduction. According to the NMFS proposed regulatory measures for right whale ship strike reduction, speed restrictions for vessels 65 ft and greater would likely be in the range of 10-14 knots. Ocean going hopper dredges that could be used for this project do not reach speeds, loaded (8-10 knots) or un-loaded (10-12 knots), greater than the proposed speed restrictions. Thus, the presence of a hopper dredge in the nearshore ocean waters should pose less of a threat to migrating whales than normal commercial ship traffic. Furthermore, potential hopper dredging activities for this project will be accomplished under the NMFS South Atlantic Regional Biological Opinion (NFMS 1997), which addresses right whale interactions. Therefore, hopper dredging for this project is exempt from the regulatory measures for right whale ship strike reduction. In order to maximize protection of the right and humpback whales, 100 percent daytime whale observer coverage will occur from December 1 through March 31 in accordance with this biological opinion.

The overall North Atlantic population of humpback whales is estimated at 10,600 individuals and is increasing (Waring *et al*., 1999); however the minimum population estimates for the Gulf of Maine

stock is 647 individuals with a steadily increasing trend (NMFS, 2003). For the period 1993-1997, the total estimated human-caused mortality and serious injury from fishery interactions and vessel collisions is estimated at 4.4 per year (NMFS, 2003). According to Jensen and Silber's (2003) large whale ship strike database, of the 292 records of confirmed or possible ship strikes to large whales, 44 records (15%) were of humpback whales, the second most often reported species next to finback whales (75 records) (26%). Of the 5 documented ship strikes resulting in serious injury or mortality for North Atlantic humpback whales from January 1997-December 2001, 3 where located in North Carolina and South Carolina waters. Though the total level of human-caused mortality and serious injury is unknown, current data indicate that it is significant; furthermore, mortality off the U.S. Mid-Atlantic States continues to increase (NMFS, 2003).

(4) Effect Determination. Of the six species of whales being considered, only the right whale and humpback whale would normally be expected to occur within the project area during the construction period. Therefore, the other species of whales are not likely to be affected. According to Jensen and Silber (2003), the mean vessel speed during vessel/whale collisions is 18.1 knots. Considering that hopper dredges travel at speeds less than or equal to 14 knots depending on their load condition, the presence of a hopper dredge in this area should pose less of a collision threat to migrating whales than normal commercial ship traffic. However, to reduce the potential for accidental collision, a whale observer with at-sea large whale identification experience will be present on the hopper dredge during use (December 1 through March 31) to conduct daytime observations. If any marine mammals are observed, collisions will be avoided either through reduced vessel speed, course alteration, or both.

Since existing habitat conditions and food supplies will be maintained, hopper dredge speeds (loaded and unloaded) are at or below recommended measures for right whale ship strike reduction, and whale observer coverage will be implemented in accordance with the South Atlantic Regional Biological Opinion, it has been determined that the dredging of sediment from offshore borrow areas may affect but is not likely adversely affect the above listed species of whales.

3.02.3 West Indian Manatee

a. Status. Endangered.

b. Occurrence in Immediate Project Vicinity. The manatee is an occasional summer resident off the North Carolina coast with presumably low population numbers (Clark, 1987). The species can be found in shallow (5 ft to usually <20 ft), slow-moving rivers, estuaries, saltwater bays, canals, and coastal areas (USFWS, 1991). The West Indian manatee is herbivorous and eats aquatic plants such as hydrilla, eelgrass, and water lettuce (USFWS, 1999a). Manatees are thermally stressed at water temperatures below 18ºC (64.4ºF) (Garrot *et al*., 1995); therefore, during winter months, when ambient water temperatures approach 20ºC (68ºF), the U.S. manatee population confines itself to the coastal waters of the southern half of peninsular Florida and to springs and warm water outfalls as far north as southeast Georgia. During the summer months, sightings drop off rapidly north of Georgia (Lefebvre *et al., 2001*) and are rare north of Cape Hatteras (Rathbun *et al., 1982*; Schwartz, 1995). However, they are sighted infrequently in southeastern North Carolina with most records occurring in July, August, and September, as they migrate up and down the coast (Clark, 1993). The Species is considered a seasonal inhabitant of North Carolina with most occurrences reported from June through October (USFWS, 2001).

According to Schwartz (1995), manatees have been reported in the state during nine months, with most sightings in the August-September period. Manatee population trends are poorly understood, but deaths have increased steadily. A large percent of mortality is due to collisions with watercrafts, especially of calves. Another closely related factor in their decline has been the loss of suitable habitat through incompatible coastal development, particularly destruction of sea grass beds by boating facilities (USFWS, 2001).

Manatees are rare visitors to the Topsail Beach Region. According to Schwartz (1995), a total of 68 manatee sightings have been recorded in 11 coastal counties of North Carolina during the years 1919-1994. Though none of these sightings occurred within the project vicinity, since sightings occurred north and south of Topsail Beach, it is likely that manatees transit through the Topsail Beach region. Manatees are known to infrequently occur within nearly all North Carolina ocean and inland waters (Schwartz, 1995) with four North Carolina records having been from inlet-ocean sites and six from the open ocean (Rathbun, 1982).

According to the existing literature, numbers of manatees using the region are not known but are presumed to be very low. More research is needed to determine the status of the species in North Carolina and identify areas (containing food and freshwater supplies), which support summer populations.

c. Current Threats to Continued Use of the Area. Current threats to this species in the Topsail Beach area cannot be clearly assessed due to our lack of knowledge regarding its population, seasonality, distribution, and the habitat components in the project area that may be needed for its use. However, considering that manatees become thermally stressed at water temperatures below 18ºC (64ºF) (Garrot *et al*., 1995), cold winter temperatures keep the species from over wintering in the project area.

d. Project Impacts.

(1) Habitat. Impacts to estuarine and nearshore ocean habitat of the area should be minor. The effect of these impacts on the value of the area to the manatee is unknown. With the current state of knowledge on the habitat requirements for the manatee in North Carolina, it is difficult to determine the magnitude of such impacts. Studies currently underway by the USFWS using animals fitted with satellite transmitters will hopefully provide data on the nature of these seasonal movements and habitat requirements during migrational periods.

(2) Food Supply. Foods, which are used by the manatee in North Carolina, are unknown. In Florida, their diet consists primarily of vascular plants. The proposed action will involve minimal change to the physical habitat of the estuary with no known impacts to 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 North Carolina coast, the proposed action should have little effect on the manatee since its habitat and food supply will not be significantly impacted. In regards to vessel collisions, the proposed borrow sites are located up to 5.5 miles offshore; thus, hopper dredging will not occur in the estuarine or nearshore habitat and direct

impacts from collision will not occur. Nonetheless, the Corps will implement precautionary measures for avoiding impacts to manatees 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 hopper dredging will occur in the offshore environment, and precautionary measures for avoiding impacts to manatees, as established by USFWS, will be implemented, the proposed action may affect, but is not likely to adversely affect the manatee.

3.02.4 Hawksbill and Kemp's Ridley

a. Status. Hawksbill and Kemp's Ridley Sea Turtles are listed as endangered.

b. Occurrence in Immediate Project Vicinity. In North Carolina, the Kemp's ridley sea turtle is found in estuarine and oceanic waters and according to Epperly *et al*. (1994), inshore waters, such as Pamlico and Core Sounds, are important developmental and foraging habitats with densities at least as great as in the ocean. Nearly all sea turtles found within these sounds are immature individuals immigrating into the sounds in the spring and emigrating from the sounds in the late fall and early winter. Hawksbill sea turtles infrequently enter inshore waters (Epperly *et al.*, 1995) and are normally associated solely with oceanic waters (Schwartz 1977). Both Hawksbill and Kemp's ridley sea turtles are found in offshore waters of North Carolina throughout the year; however, the hawksbill is only occasionally observed migrating through. Kemp's ridleys can be present from April through December in inshore waters (Epperly et. al, 1995) but has been documented to nest twice in North Carolina, once on Oak Island in 1992 and once on Cape Lookout in 2003 (Godfrey, 2006).

c. Current Threats to Continued Use of the Area. 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 the hopper dredge during excavation of dredged material. With the exception of hopper dredges, none of the dredge plants (i.e. pipeline dredges) proposed for use in the construction of this project are known to take sea turtles.

d. Project Impacts.

1) Habitat. There are no documented nesting attempts of hawksbill and Kemp's ridley sea turtles on the project beaches. With a few exceptions, the entire Kemp's ridley population nests on the approximately 15 miles of beach in Mexico between the months of April and June (USFWS, 1991). The hawksbill sea turtle nests primarily in tropical waters in south Florida and the Caribbean. Therefore, the placement of dredged material on the beaches from New Topsail Inlet to the Topsail Beach/Surf City town line will not impact hawksbill or Kemp's ridley

sea turtle nesting habitat.

2) Food Supply. Hawksbill and Kemp's ridley sea turtles are carnivorous (Mortimer, 1995). The principal food sources for these sea turtle species are crustaceans, mollusks, other invertebrates, and fish (Schwartz, 1977). Hawksbills feed on encrusting organisms such as sponges, tunicates, bryozoans, mollusks, and algae; whereas Kemp's ridleys feed predominantly on portunid crabs (Bjomdal, 1995). Dredging will temporarily impact the benthic community in the proposed offshore borrow areas. Potential impacts will be minor as dredging will only affect a limited portion of the borrow sites. Therefore, the project should not significantly affect the food supply of Hawksbill and Kemp's ridley sea turtle species.

3) Relationship to Critical Periods in Life Cycle. The placement of dredged sediment from designated borrow sites on Topsail Beach will be done outside of the sea turtle nesting season. Initial construction will be performed using a pipeline dredge from 16 November to 30 April. Periodic nourishment cycles would be performed using a hopper dredge and would adhere to a 1 December to 31 March dredging window considering that the potential for in water sea turtle interactions using hopper dredges is higher during the warmer months., Since hawksbill and Kemp's ridley sea turtles do not regularly nest in North Carolina, the project should not significantly affect their nesting habitat. According to Epperly et. al. (1995), both of these species migrate in North Carolina's offshore waters (>3.5 miles) throughout the year, and in inshore waters (0-3.5 miles) mostly between April and December. Though adherence to a hopper dredge window of 1 December to 31 March during periodic nourishment cycles would avoid peak migratory movements, the presence of turtles in the project area is still likely; thus, hopper dredging may impact migrating juvenile, sub-adult, and adult turtles.

4) Effect Determination. Considering that these species do not regularly nest along North Carolina coasts, their nesting habitat will not be impacted by beach nourishment. However, dredging activities may impact these species during periods of offshore and inshore migration (Epperly *et al.*, 1995) depending on the time of year. Pipeline and hopper dredges will be used to dredge material from the designated borrow sites and transport it to the shore. Cutterhead pipeline dredges have not been known to take sea turtles; however, hopper dredges potentially pose the greatest risk to sea turtles through physical injury or death by entrainment. Hopper dredges move rapidly over the bottom sediments and can injure or kill sea turtles lying on the sea bottom. In order to minimize potential impacts, hopper dredges would be used only from 1 December to 31 March of any year when water temperatures are cooler, generally <14°C (57.2°F). However, because some sea turtle species may be found year-round in the offshore area, hopper-dredging activities may occur during low levels of sea turtle migration. Therefore, hopper dredging activities associated with this project may affect, and are likely to adversely affect hawksbill and Kemp's ridley sea turtles. To reduce these impacts, we anticipate taking certain precautions as prescribed by NMFS and USACE under standard hopper dredging protocol. We will abide by the provisions of the September 25, 1997 Regional Biological Opinion for The Continued Hopper Dredging Of Channels And Borrow Areas In The Southeastern United States and will maintain observers on hopper dredges for the periods prescribed by NMFS to document any takes of turtle species and to ensure that turtle deflector dragheads are used properly. According to the incidental take statement provided in the 1997 Regional Biological Opinion, up to 7 Kemp's ridley and 2 hawksbill sea turtles may be taken by injury or mortality. These takes are not likely to jeopardize the continued existence of these species.

Despite these precautions, the chance of impacting migrating sea turtles with a hopper dredge still exists. Therefore, it has been determined that the proposed project may affect, and is likely to adversely affect, the hawksbill and Kemp's ridley sea turtles in water.

3.02.5 Loggerhead, Green, and Leatherback Sea Turtles

a. Status. Loggerhead sea turtles are listed as threatened. Leatherback sea turtles are listed as endangered. Green sea turtles are listed as threatened, except for breeding populations in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

b. Occurrence in Immediate Project Vicinity. In the project area, the green and loggerhead sea turtles are known from both estuarine and oceanic waters. According to Epperly *et al.* (1994), inshore waters, such as Pamlico and Core Sounds, are important developmental and foraging habitats and both of these species are considered to be residents primarily from the spring through the fall although occasional winter records exist. Of these two species, only the loggerhead is considered to be a regular nester in the state, while green sea turtle nesting is primarily limited to Florida's east coast (300 to 1,000 nests reported annually), but has been observed as far north as North Carolina. Leatherback sea turtles infrequently enter inshore waters (Epperly *et al.*, 1995) and are normally associated solely with oceanic waters (Schwartz 1977). However, Lee and Palmer (1981) document that leatherbacks normally frequent the shallow shelf waters rather than those of the open sea, with the exception of long-range migrants. The leatherback sea turtle is not a common nester in North Carolina and is only occasionally observed migrating through North Carolina waters. However, according to Rabon *et al*. (2003), seven leatherback nests have been confirmed in North Carolina since 1998 constituting the northernmost nesting records for leatherbacks along the East Coast of the United States. Though almost all confirmed nesting activity in North Carolina has been between Cape Lookout and Cape Hatteras, the potential for leatherback nesting on Topsail Beach is likely.

For the purposes of this assessment the loggerhead, green, and leatherback sea turtles are considered to be the only species likely to nest in the project area. Topsail Island is considered to be one of the more heavily nested areas along the North Carolina coast, averaging 98.5 nests per season (1990-2004) for the whole island. Table I-2, shows the total number of recorded sea turtle nests in 22 one-mile Sea Turtle Management Zones (STMZ) that extend from New River Inlet (#219) to New Topsail Inlet (#240). Numbers in the table represent loggerhead nests except where otherwise noted. Loggerhead turtles are known to regularly nest along all of Topsail Island from New Topsail inlet to New River Inlet, including the entire stretch of the project site at Topsail Beach, utilizing the upper beach front for its seasonal (May to September) nesting events. Though records were kept as early as 1984, consistent turtle nesting data has been recorded on Topsail Island only since 1990. Of the 1477 nests laid on Topsail Island since 1990, loggerhead sea turtles laid 1468 nests and 9 nests were laid by greens (Matthew Godfrey, pers. comm.). As shown in Table I-2, sea turtle nesting numbers declined following hurricanes in the 1990's - Hurricane Emily, 1993, Hurricanes Bertha and Fran, 1996, and Hurricane Floyd, 1999. As part of the terms of local cooperation for this project, the project area will be monitored for sea turtle nesting and hatchling activity on an annual basis by the town of Topsail Beach.

Like the Kemp's ridley and green sea turtles, loggerheads are known to frequently use coastal waters as travel corridors (Wynne, 1999) and have been observed migrating along the North Carolina coast (Epperly et. al., 1995). Off the Carolina coast these turtles commonly occur at the edge of the continental shelf when they forage around coral reefs, artificial reefs, and boat wrecks.

Table I-2. Total sea turtle nest numbers for Topsail Island from 1990-2004. (* All nests are loggerheads with the exception of 6 greens in 1999 and 3 greens in 2000). Nest numbers are broken down into 22 sea turtle management zones (STMZ) extending from New River Inlet (219) to New Topsail Inlet (240). Nest numbers for 2004 are not available by zone however; there were 55 nests, total. Zones 236-240 are located within the town of Topsail Beach. (“)

	YEAR															
STMZ	‘90	‘91	‘92	‘93	‘94	‘95	‘96	‘97	‘98	‘99	‘00	‘01	‘02	'03	‘04	Total
219	4	6	1	2	1	4	5	3	10	2	3	7	2	2	NA	52
220	2	4	1	2	0	4	3	4	2	11	6	8	5	1	NA	53
221	1	5	2	1	6	0	3	0	6	5	7	2	3	3	NA	44
222	1	5	6	5	7	5	4	3	5	4	1	1	5	0	NA	52
223	1	4	6	0	5	1	8	5	5	20	3	3	3	3	NA	67
224	7	18	11	7	13	8	10	4	8	22	14	2	9	6	NA	139
225	7	7	7	3	1	12	8	9	5	26	5	11	3	4	NA	108
226	2	7	8	3	8	7	6	7	8	14	3	2	6	2	NA	83
227	5	6	6	2	7	10	4	1	3	7	9	1	2	4	NA	67
228	4	3	8	1	3	4	7	2	3	5	2	5	3	3	NA	53
229	6	9	6	3	2	2	2	4	4	6	3	3	6	1	NA	57
230	4	6	7	3	3	0	6	3	5	2	0	1	4	3	NA	47
231	0	5	1	4	5	4	5	3	6	4	4	3	3	2	NA	49
232	7	10	5	1	4	2	12	0	9	4	6	2	1	2	NA	65
233	5	13	8	7	6	1	10	9	11	12	9	6	12	6	NA	115
234	4	6	6	5	3	4	3	5	1	8	11	4	7	3	NA	70
235	8	2	2	4	6	2	7	0	2	5	4	1	3	8	NA	54
236	11	3	1	3	5	3	2	0	3	7	3	4	2	2	NA	49
237	5	4	2	2	6	9	1	1	3	7	2	3	I	7	NA	53
238	4	3	1	3	5	4	6	2	3	4	5	4	1	5	NA	50
239	1	10	3	2	2	7	9	0	/	7	3	0	0	0	NA	45
240	0	4	2	3	6	4	2	1	2	3	3	5	5	10	NA	50
Total	89	140	100	66	104	97	123	66	105	185	106	78	86	77	55	1477

c.. 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 becomes an important technique for nesting beach restoration (Crain *et al.*, 1995). Most of the Topsail Beach has experienced severe erosion because of frequent hurricanes passing over or near the area since 1996. In many locations the dune and beach berm have been eroded away, and no sufficient nesting habitat is available. Since consistent turtle nesting surveys began on Topsail Island in 1990, there has been a gradual decline in the average numbers of nests laid per year (Table I-2). Coupled with this decline is the increase in nest relocations for those that are laid. For those nests that are relocated, they are moved higher up on the berm to different incubating environments; thus, the practice of moving them to a safer area of similar habitat type is not possible. One potential cause for decreased nest numbers and

increased relocation numbers is loss of nesting habitat (Jean Beasley, pers. comm.).

Over the years, the project area has experienced long term erosion and accretion episodes; however, the erosion rate for the southern end of Topsail Beach is greater resulting in an overall loss of beach and nesting habitat. The southern twelve reaches of the project area (-12,000 ft) have an average long-term erosion rate of –2.34 ft./year. Large northeaster and hurricane events compound the long-term erosion problem; thus, nesting habitat loss is of great concern for the entire island. In areas were erosion is most severe, the tide is so high there is not acceptable beach to nest and without relocation efforts in these highly erosive areas, nests will be inundated and lost. Though concerns about beach nourishment as it relates to nest success are evident, with overall loss of habitat over time due to erosion, there will be complete loss of nesting on Topsail Island (Jean Beasley, pers. comm.).

Topsail Island is considered to be one of the major rookeries for the declining Northern loggerhead population; thus restoration of this important nesting habitat on Topsail Island is critical. Historically, the north and south ends of Topsail Island have experienced beach disposal operations from the maintenance of navigation channels. These small-scale disposal events have re-established lost nesting habitat and have allowed for some turtles to continue nesting in areas that would have otherwise been lost. In regards to suitability for nesting, turtles continue to nest on disposal beaches with hatch rate successes similar to non-disposal beaches (Jean Beasley, pers. comm.).

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 use in the construction of this project are known to take sea turtles.

d. Project Impacts.

1) Habitat. The proposed project will restore lost turtle nesting habitat by placing up to 14.5 million cubic yards over the life of the project. A total of 3.223 million cubic yards of predominantly sandy dredged material will be placed on the project area during initial construction and about 866,000 cubic yards during each four-year periodic re-nourishment interval. Significant alterations in beach substrate properties may occur with the input of sediment types from other sources. Sediment density (compaction), shear resistance (hardness), sediment moisture content, beach slope, sediment color, sediment grain size, sediment grain shape, and sediment grain mineral content can be changed by beach nourishment. Changes in particle size can have a direct influence on the shear resistance of the sediment and therefore make the beach relatively harder after nourishment. Females may respond to harder physical properties of the beach by spending more time on the beach nesting, which may result in physiological stress and increased exposure to disturbances and predation; thus, in some cases leading to a false dig. Hard

sediment can prevent a female from digging a nest or result in a poorly constructed nest cavity. Harder or more compact nourished beaches result primarily from angular, finer grain sediment dredged from stable offshore borrow sites, whereas less compacted beaches result from smoother, coarse sediment dredged from high energy locations such as inlets (Nelson and Dickerson, 1989). If nesting occurs, embryonic development within a nourished nest cavity can be affected by insufficient oxygen diffusion and variability in moisture content levels within the egg clutch (Ackerman, 1980; Mortimer, 1990; Ackerman *et al.*, 1992). Ambient nest temperature and incubation time may be affected by changes in sediment color, sediment grain size, and sediment shape as a result of beach nourishment (Milton *et al*, 1997). In marine turtles, sex is determined by temperature; males are produced at low temperatures and females at high temperatures (Mrosovsky *et al.*, 1998). Therefore, fluctuation in ambient nest temperature could directly impact sex determination.

Based on geophysical analyses and sediment compatibility analyses from identified borings (Appendix C), the dredged material to be placed on the beaches averages > 90 percent sand. Most of the remaining material consists of fine grain particles (silt and clay), which will not remain on the beach. These fines may temporarily lead to a darkening of the beach. If this darkening persisted it could raise the temperature of nests in the area, and potentially change the sex ratio of the hatchlings. If sand compaction in the nourishment area exceeds 500 cone penetrometer units (CPUs), tilling will be performed, and scarps over 18 inches and 100 ft. or longer will be graded.

2) Food Supply. After leaving the nesting beach, hatchling green and loggerhead turtles head towards the open ocean pelagic habitats (Carr, 1987) where their diet is mostly omnivorous with a strong carnivorous tendency in green turtles (Bjorndal, 1985). At about 20-25 cm carapace length Atlantic green turtles enter benthic foraging areas and shift to an herbivorous diet, feeding predominantly on sea grasses and algae but may also feed over coral reefs and rocky bottoms (Mortimer, 1982). At about 40 to 50 cm carapace length, loggerheads move into shallow water where they forage over benthic hard and soft bottom habitats (Carr, 1986). Loggerhead sea turtles feed on benthic invertebrates including mollusks, crustaceans, and sponges (Mortimer, 1982) but have also been found to eat fish, clams, oysters, sponges, jellyfish, shrimp, and crabs when near shore. Hawksbill. Leatherback sea turtles are carnivorous (Mortimer, 1995) and feed primarily on cnidarians and tunicates (salps, pyrosomas) throughout the water column but are commonly observed feeding at the surface (Bjorndal, 1985).

Dredging will be performed at six borrow sites approximately 3 to 5.5 miles offshore and will not affect these resources in the inshore environment. Impacts on benthic habitat at the offshore borrow sites will be minor as dredging will only affect a limited portion of the offshore benthic habitat. Hardbottom surveys were performed within all proposed borrow sites offshore and no hardbottom was present; thus, lost foraging habitat within the borrow areas is sandy bottom. Therefore, the project should not significantly affect the food supply of loggerhead and green sea turtle species in the offshore borrow sites. Considering that leatherbacks feed primarily within the water column on non-benthic organisms, the project should not significantly affect the food supply of this species

3) Relationship to Critical Periods in Life Cycle. The dredging of sediment from designated borrow sites and placement on Topsail Beach will be done outside of the sea turtle nesting season. Initial construction will be performed using a pipeline dredge from 16

November to 30 April. Periodic nourishment cycles would be performed using a hopper dredge and would adhere to a 1 December to 31 March dredging window considering that the potential for in water sea turtle interactions using hopper dredges is higher during the warmer months. Since loggerhead, green, and leatherback sea turtles nest in North Carolina, the project may affect their nesting habitat. Furthermore, these species migrate within North Carolina waters throughout the year, mostly between April and December; thus, hopper dredging may impact migrating juvenile, sub-adult, and adult sea turtles.

4) Effect Determination. The proposed project could potentially affect loggerhead, green, and leatherback sea turtles in three ways. First, proposed hopper dredging activities may occur in areas used by migrating turtles. Loggerhead and green sea turtles migrate within North Carolina waters throughout the year, mostly between April and December. Pipeline and hopper dredges will be used to dredge material from the designated borrow sites and transport it to the shore. Cutterhead pipeline dredges have not been known to take sea turtles; however, hopper dredges potentially pose the greatest risk to sea turtles through physical injury or death by entrainment. Hopper dredges move rapidly over the bottom sediments and can injure or kill loggerhead and green sea turtles lying on the sea bottom. Based on historic hopper dredging take data, leatherback sea turtles are not known to be impacted by hopper dredging operations. In order to minimize potential impacts, hopper dredges would be used only from 1 December to 31 March of any year when water temperatures are cooler, generally <14°C (57.2°F). However, because some sea turtle species may be found year-round in the offshore area, hopper dredging activities may occur during low levels of sea turtle migration. Therefore, hopper dredging activities associated with this project may affect, and are likely to adversely affect loggerhead and green sea turtles. To reduce these impacts, we anticipate taking certain precautions as prescribed by NMFS and USACE under standard hopper dredging protocol. We will abide by the provisions of the September 25, 1997 Regional Biological Opinion for The Continued Hopper Dredging Of Channels And Borrow Areas In The Southeastern United States and will maintain observers on hopper dredges for the periods prescribed by NMFS to document any takes of turtle species and to ensure that turtle deflector dragheads are used properly. According to the incidental take statement provided in the 1997 Regional Biological Opinion, “up to 35 loggerheads may be taken by injury or mortality as well as 7 green turtles. These takes are not likely to jeopardize the continued existence of these species..”

Second, beach nourishment sediment from the proposed borrow areas may affect, but is not likely to adversely affect, nesting activities of loggerhead, green, and leatherback sea turtles by altering nesting habitat. Sediment density (compaction), shear resistance (hardness), sediment moisture content, beach slope, sediment color, sediment grain size, sediment grain shape, and sediment grain mineral content can be changed by beach nourishment. If the beach becomes too hard through the compaction of deposited nourishment sediments by construction equipment, it could present a physical barrier to turtle nest digging. Hard sediment can prevent a female from digging a nest or result in a poorly constructed nest cavity. Furthermore, beach nourishment may influence physical characteristics of beaches such as sand-grain size and shape, silt-clay content, sand compaction, moisture content, porosity/water retention, gas diffusion rates, and color of sand grains, which could alter the temperature of the beach. These factors could reduce reproductive success of nests laid in nourished areas (Crain *et al.*, 1995; Ackerman, 1996). The USACE plans to alleviate impacts to nesting sea turtles in the project area by implementing steps that are now common practice or commonly listed as conditions on permits (to be determined by regulatory

agencies), such as contingency plans, sediment quality monitoring, compaction tests, tilling (when necessary), leveling scarps in the fill, and monitoring for nests.

Lastly, although significant alterations in beach substrate properties may occur with the input of sediment types from other sources, re-establishment of a berm and dune system with a gradual slope can enhance nesting success of sea turtles by expanding the available nesting habitat beyond erosion and inundation prone areas. As previously stated, in regards to suitability for nesting, turtles continue to nest on disposal beaches of Topsail Island with hatch rate successes similar to non-disposal beaches (Jean Beasley, pers. comm.).

Despite dredging windows and precautions, the chance of impacting migrating sea turtles with a hopper dredge still exists. Furthermore, though construction will occur outside of the nesting timeframe, alterations of the nesting environment may occur. However, the proposed project would restore the dune and beach berm in many locations where it has been eroded away, thus re-establishing important sea turtle nesting habitat.

3.02.6 Shortnose Sturgeon

a. Status. Endangered

b. Occurrence in Immediate Project Vicinity. Populations of shortnose sturgeon range along the Atlantic seaboard from the Saint John River in New Brunswick, Canada to the Saint Johns River, Florida (USFWS, 1999b). It is apparent from historical accounts that this species may have once been fairly abundant throughout North Carolina's waters; however, many of these early records are unreliable due to confusion between this species and the Atlantic sturgeon (*Acipenser oxyrhynchus*). There are historical records of the shortnose sturgeon both in Albemarle Sound and the nearshore ocean (Dadswell, *et al*., 1984). However, in the recent past, this species was thought to be extirpated from North Carolina (Schwartz, *et al*., 1977). During the winter of 1986-87, the shortnose sturgeon was taken from the Brunswick River, a component of the Cape Fear River basin. With this discovery, the species is once again considered to be a part of the state's fauna; however, there are still no recent records of the species from the project area (F. Rhode 2004, pers. comm.). Because of the lack of suitable freshwater spawning areas in the project area and the requirement of low salinity waters by juveniles, any shortnose sturgeons present would most likely be non-spawning adults (NMFS, 1998).

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. The prohibition by North Carolina Division of Marine Fisheries (NCDMF) on taking any sturgeon in North Carolina should help to protect the species from commercial and recreational fishing pressure.

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 parts per thousand (ppt.) salinity or greater) as adults during the winter. Habitat conditions suitable for juvenile and adult shortnose sturgeon could occur within 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 channels during the day and the shallower areas adjacent to the channel 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.

Dredging for this project will occur at six offshore borrow sites; therefore, shallow water feeding areas will not be affected by the project.

(3) Relationship to Critical Periods in Life Cycle. Because of the mobility of adult and juvenile shortnose sturgeon and infrequent occurrence in the project area, direct impacts as a result of the project are not likely to occur.

(4) Effect Determination. It is unlikely that the shortnose sturgeon occurs in the project area (Fritz Rohde, pers. comm.). Because no known shortnose sturgeon have been documented in the project area, it has been determined that the proposed action is not likely to adversely affect this species or its habitat. However, should it occur, its habitat would be only minimally altered by project construction. This species feeds on a wide variety of invertebrates and while some food resources may be initially affected, most invertebrates will quickly re-establish from adjacent unaffected areas. 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. Because of the unlikelihood of shortnose sturgeon being present in the project area and since dredging will occur in the offshore environment, it has been determined that the actions of the proposed project are not likely to adversely affect the shortnose sturgeon.

3.02.7 Seabeach Amaranth

a. Status. Threatened

b. Occurrence in Immediate Project Vicinity. Seabeach amaranth is an annual or sometimes perennial plant that usually grows between the seaward toe of the dune and the limit of the wave uprush zone occupying elevations ranging from 0.2 to 1.5 m above mean high tide (Weakly and Bucher, 1992). Greatest concentrations of seabeach amaranth occur near inlet areas of barrier islands, but in favorable years many plants may occur away from inlet areas. It is considered a pioneer species of accreting shorelines, stable foredune areas, and overwash fans (Weakly and Bucher, 1992; Hancock and Hosier, 2003). Seed dispersal of seabeach amaranth is achieved in a number of ways, including water and wind dispersal (USFWS, 1995).

Historically, seabeach amaranth was found from Massachusetts to South Carolina, but according to recent surveys (USACE 1992-2004), its distribution is now restricted to North and South Carolina with several populations on Long Island, New York. The decline of this species is caused mainly by development of its habitat, such as inlet areas and barrier islands, and increased ORV and human traffic, which tramples individual plants (Fussell, 1996).

Since 1992 the USACE has surveyed Topsail Beach for seabeach amaranth. A total of 34,942 plants (ranging from 3 to 22,410 per year) have been recorded in Topsail Beach since 1992 within 5 survey reaches (Table I-3). Hurricanes, and subsequent habitat loss, may play a role in the dramatic reduction in plant numbers from 1997-2000 as evidenced by the post-hurricane data from hurricane Fran (1996) and Hurricane Floyd (1999).

Table I-3. Annual seabeach amaranth survey results (1991-2004) on Topsail Beach, NC. Numbers represent estimates.

Subpart	A1	A2	A3	A4	B	Total
Length	5,300 ft	3,925 ft	4,250 ft	4,125 ft	2,825 ft	
1991	no survey					
1992	792	<<<	<<<	<<<	21,618	22,410
1993 (H)	49	<<<	<<<	<<<	2,040	2,089
1994	34	<<<	<<<	<<<	101	135
1995	1,079	<<<	<<<	<<<	846	1,925
1996 (H)	393	<<<	<<<	<<<	607	1,000
1997	2	0	0	0	1	3
1998	110	<<<	<<<	<<<	0	110
1999 (H)	5	1	1	1	31	39
2000	12	<<<	<<<	<<<	<<<	12
2001	773	838	131	46	2,253	4,041
2002	27	2	44	1	339	413
2003	191	64	245	62	481	1,043
2004	226	76	210	172	1,038	1,722

(H) = year of hurricane impact <<< = count included under sub reach A1.

Since sea beach amaranth seeds are fairly resilient and germination is dependent on critical physical conditions, populations of seabeach amaranth are very dynamic with numbers of plants fluctuating dramatically from year to year. Germination begins in April as temperatures reach about 25ºC (77ºF) and continues at least through July with greatest germination occurring at 35ºC (95ºF) (USFWS, 1996b; Hancock and Hosier, 2003). Seed production begins in July or August, peaks in September, and continues until the plant dies (USFWS, 1996b). According to Hancock and Hosier (2003) sea beach amaranth is physically controlled (salt water inundation, temperature, emergence at depth, etc.) rather than biologically controlled (web worm). Furthermore, seedlings are unable to emerge from depths greater than 1cm; however, seabeach amaranth seeds are resilient, and century–old seeds of some species of amaranth are capable of successful germination and growth (USFWS, 1996b).

c. Current Threats to Continued Occurrence in the Project Area. Seabeach amaranth has been eliminated from approximately two-thirds of its historic range. Habitat loss and degradation are the greatest threats to the continued existence of seabeach amaranth with localized herbivory by webworms also contributing to mortality in North Carolina. According to the data collected from surveys on Topsail Beach (Table I-3), it appears that hurricanes in 1993, 1996, and 1997 led to dramatic reductions in plant numbers in the subsequent years. Though beach stabilization efforts are thought to be a leading contributor to the decrease in the population (USFWS, 1996b), new populations have been observed to follow sand placement on beaches where sand has been disposed by the Corps of Engineers (ex. Wrightsville Beach and Bogue Banks) (USFWS, 1996b; CSE, 2004). Seabeach amaranth is dependent on terrestrial, upper beach habitat that is not flooded during the growing season from May in to the fall. Therefore, beach erosion is probably the primary threat to the continued presence in the area. Furthermore, beach bulldozing is common practice on Topsail Beach and in many cases may add to the existing erosion problem and loss of seabeach amaranth habitat.

d. Project Impacts.

(1) Habitat. The selected plan has a main fill length of 23,200 feet, from approximately 400 feet southwest of Godwin Avenue, in reach 3, to the Topsail Beach town limit in reach 26 (See Section 7.01.1). A 2,000-foot northern transition and a 1,400 southern transition will extend beyond the limits of the main fill. The transition areas will consist of a tapered berm only resulting in a starting transition berm width of 155 feet that uniformly tapers to zero (See Section 7.01.2). Of the 3.86 miles of beach surveyed for seabeach amaranthus on Topsail Beach since 1992 (Table I-3), reach B (0.54 miles), located adjacent to the inlet, accounts for about 84% of the total plants surveyed. The proposed project limits avoid the inlet areas where amaranth most commonly occurs; thus, impacts to the densest populations (84%) of seabeach amaranth will be avoided. The beachfront within the project limits is currently conducive to the growth of seabeach amaranth; however, due to high erosion rates and inundation from storm events its available habitat is deteriorating. Beach nourishment would have initial impacts through burial of existing plants and seeds; however, much of the habitat requirements for seabeach amaranth lost to erosion will be restored.

(2) Relationship to Critical Periods in Life Cycle. Beach nourishment will be conducted during the colder months. Initial construction will be performed using a pipeline dredge from 16 November to 30 April. Periodic nourishment cycles would be performed using a hopper dredge and would adhere to a 1 December to 31 March dredging window. If dredging takes place in the winter when only seabeach amaranth seeds are present, the impacts on individual plants are likely to be minor. However, deeply burying seeds during any season could have serious effects on populations. While such construction is not an ideal management practice for the species, the restoration of the habitat is of prime importance. Beach nourishment rebuilds habitat for seabeach amaranth and can have long-term benefits (USFWS, 1996b). The project area would be included in the USACE monitoring program during the seabeach amaranth growing season for the life of the beachfill.

(3) Effect Determination. Beach nourishment will restore much of the existing habitat lost to erosion and is expected to provide long-term benefits to seabeach amaranth;

however, construction and deep burial of seeds on a portion of the beaches during project construction may slow germination and population recovery over the short-term. Therefore, the project may affect, but is not likely to adversely affect seabeach amaranth.

3.02.8 Piping Plover

a. Status. Threatened

b. Occurrence in Immediate Project Vicinity: The Atlantic Coast piping plover population breeds on coastal beaches from Newfoundland to North Carolina (and occasionally in South Carolina) and winters along the Atlantic Coast (from North Carolina south), the Gulf Coast, and in the Caribbean where they spend a majority of their time foraging. Since being listed as threatened in 1986, only 800 pairs were known to exist in the three major populations combined and by 1995 the number of detected breeding pairs increased to 1,350. This population increase can most likely be attributed to increased survey efforts and implementation of recovery plans (Mitchell *et. al*., 2000).

Piping plovers are known to nest in low numbers in widely scattered localities on North Carolina's beaches. The species typically nests in sand depressions on unvegetated portions of the beach above the high tide line on sand flats at the ends of sand spits and barrier islands, gently sloping foredunes, blowout areas behind primary dunes, sparsely vegetated dunes, and washover areas cut into or between dunes. Piping plovers head to their breeding grounds in late March or early April (http://pipingplover.fws.gov/overview.html) and nesting usually begins in late April; however, nests have been found as late as July (Potter, *et al*., 1980; Golder, 1985). During a statewide survey conducted in 1988, 40 breeding pairs of piping plovers were located in North Carolina. LeGrand (1984a) states that "all of the pipings in the state nest on natural beachfronts, both completely away from human habitation and [yet] in moderate proximity to man". The largest reported nesting concentration of the species in the State appears to be on Portsmouth Island where 19 nests were discovered in 1983 by John Fussell (LeGrand, 1983). The southernmost nesting record for the state was one nest located in Sunset Beach by Phillip Crutchfield in 1983 (LeGrand, 1984b). Feeding areas include intertidal portions of ocean beaches, washover areas, mud flats, sand flats, wrack lines, and shorelines of coastal ponds, lagoons, or salt marshes (USFWS, 1996a). Prey consist of worms, fly larvae, beetles, crustaceans, mollusks, and other invertebrates (Bent, 1928).

The piping plover is a fairly common winter resident along the beaches of North Carolina (Potter *et al*., 1980). On 10 July 2001, the USFWS designated 137 areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas as critical habitat for the wintering population of the piping plover where they spend up to 10 months of each year on the wintering grounds. Constituent elements for the piping plover wintering habitat are those habitat components that are essential for the primary biological needs of foraging, sheltering, and roosting, and only those areas containing these primary constituent elements within the designated boundaries are considered critical habitat. The USFWS has defined textual unit descriptions to designate areas within the critical habitat boundary. These units describe the geography of the area using reference points, include the areas from the landward boundaries to the MLLW, and may describe other areas within the unit that are utilized by the piping plover and contain the

primary constituent elements. Unit NC-11 encompasses approximately 1114 acres in Pender and New Hanover counties extending southwest from 1.0 km northeast of MLLW of New Topsail Inlet on Topsail Island to 0.53 km southwest of MLLW of Rich Inlet on Figure Eight Island. This unit includes Topsail Inlet and associated lands including emergent sandbars, from MLLW on Atlantic Ocean and sound side to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur. In Topsail Sound, the unit stops as the entrance to tidal creeks become narrow and channelized (Federal Register/Vol. 66, No 132, July 10, 2001).

Most piping plovers at Topsail Beach have been observed as predominantly migratory and winter residents utilizing intertidal flats exposed at low tide for feeding and roosting. However, breeding pairs have been observed on Topsail Beach from which seven nests have been documented since 1999 (Table I-4). All nests were located in the critical habitat area and were laid on the inlet spit in front of the main dune system. Of the nests laid on Topsail Beach only one was successful with one documented fledgling in 1999 (Sue Cameron, pers. comm.).

Table I-4. Piping Plover nests on Topsail Beach from 1999-2004.

Year	Number of Birds	Number of Nests	Number of Fledglings	Location
1999	1 pair	1	1	Inlet Spit/Critical Habitat
2001	1 pair	2	0	Inlet Spit/Critical Habitat
2002	1 pair	2	0	Inlet Spit/Critical Habitat
2003	1 pair	1	0	Inlet Spit/Critical Habitat
2004	1 pair	1	0	Inlet Spit/Critical Habitat

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. The current commercial, residential, and recreational development has decreased the amount of coastal habitat available for piping plovers to nest, roost, and feed. Furthermore, beach 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. Since project beaches are wintering area for the piping plover, the major threat to its occupation of the area during the winter months would be continued degradation of beach foraging habitat. Similar degradation of beaches elsewhere could be a contributing element to declines in the state's nesting population.

d. Project Impacts.

(1) Habitat. The existing shoreline of Topsail Beach is heavily developed, with the exception of the designated critical habitat (Unit-NC11), and is experiencing significant shoreline erosion. 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 (http://nc-es.fws.gov/birds/pipiplov.html). 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 will be performed using a pipeline dredge from 16 November to 30 April. Periodic nourishment cycles would be performed using a hopper dredge and would adhere to a 1 December to 31 March dredging window. Since piping plovers head to their breeding grounds in late March and nesting occurs in late April, it is possible that the project construction may impact breeding and nesting piping plovers. This potential impact will only be during the start of the breeding and nesting season and for a short period. However, all of the piping plover breeding and nesting activity documented since 1999 has occurred on the inlet spit and within the designated critical habitat area. The project construction limits do not include the critical habitat area and will therefore avoid this documented nesting habitat on the inlet spit. Furthermore, during initial construction as well as each re-nourishment event, the order of work for beach template construction will be from south to north so that construction activities will be north of the breeding and nesting habitat, located at the inlet spit, during the March and April time-frame; thus, further minimizing project impacts.

Wintering habitat for roosting and foraging may also be impacted. Direct short-term foraging habitat losses will occur during construction of the project fill. Since only a small portion of the foraging habitat is directly affected at any point in time during pumpout and adjacent habitat is still available, overall direct loss of foraging habitat will be minimal and short-term. However, the critical habitat designation (Unit NC-11) encompassing the entire inlet spit adjacent to New Topsail Inlet will not be directly impacted.

(2) Food Supply. Piping plovers feed along beaches and intertidal mud and sand flats. Primary prey includes polychaete worms, crustaceans, insects, and bivalves. According to Section 8.01.6 of the EIS, the benthic invertebrate community will suffer short-term impacts from the placement of sediment on the beach; thus, a diminished prey base will subsequently impact piping plovers over the short term. However, only a portion of the beach is affected at any point in time (approximately 4-5,000 feet per month). Once construction passes that point, recruitment from adjacent beaches can begin. Therefore, un-impacted or recovering foraging habitat on Topsail Beach will be available throughout the duration of the project.

(3) Relationship to Critical Periods in Life Cycle. Beach placement of sand derived from identified borrow sites is expected to occur from 16 November to 30 April during initial construction and 1 December to 31 March for each periodic nourishment interval. Therefore, the breeding and nesting season (April 1 through 31 July) will be impacted for a period of about 30 days during initial construction. Delaying potential breeding and nesting of piping plovers could affect the outcome of the breeding season. Birds may decide not to nest or may nest late in the season, a time when nests are typically less successful. However, considering that only 7 nesting attempts have been made in the area since 1999, only one quarter of the nesting season will be impacted during initial construction, and avoidance of the piping plover critical habitat will allow for un-impacted portions of the beach during the breeding and nesting season, impacts to the piping plover nesting season are expected to be minimal. However, designated constituent elements of

the critical habitat for piping plovers may be impacted by the project; thus, foraging, sheltering, and roosting habitat may be temporarily impacted."

(4) Effect Determination. The long-term effects of the project may restore lost roosting and nesting habitat through the addition of beach fill; however, short-term impacts to breeding, foraging, sheltering, roosting habitat and potentially nesting habitat may occur during project construction. Therefore, it has been determined that the project may affect, but is not likely to adversely affect the piping plover.

4.00 COMMITMENTS TO REDUCE IMPACTS TO LISTED SPECIES

The following list 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 agencies, mitigation measures, and construction practices.

1. The National Marine Fisheries Service Regional Biological Opinion for the continued hopper dredging of channels and borrow areas in the southeastern United States dated 25 September, 1997 will be strictly adhered to. Furthermore, Hopper dredging activities will comply with the South Atlantic Division Corps of Engineers hopper dredging protocol which requires a hopper dredging window of 1 December to 31 March, the use of turtle deflecting dragheads, inflow and/or overflow screening, and NMFS certified turtle and whale observers.

2. In order to determine the potential taking of whales, turtles and other species by hopper dredges, NMFS certified observers will be on board the hopper dredges during construction. To the maximum extent feasible, the observers will record all species taken along with length and weight and any unusual circumstances that might have led to the species capture. Observers will also record all whale observations within the project vicinity

3. The Corps will avoid the sea turtle nesting season to the maximum extent practicable during initial construction. If the nesting window cannot be adhered to, the Corps will implement a sea turtle nest monitoring and relocation plan through coordination with USFWS and NCWRC

4. Monitoring of sea turtle nesting activities in beach nourishment areas will be required to assess post nourishment nesting activity. This will include daily surveys beginning at sunrise from May 1 until September 15. Information on false crawl location, nest location, and hatching success of all nests will be recorded.

5. The beach will be monitored for escarpment formation prior to each nesting season. Escarpments that are identified prior to and/or during the nesting season that interfere with sea turtle nesting (exceed 18 inches in height for a distance of 100 ft.) will be leveled. If it is determined that escarpment leveling is required during the nesting or hatching season, leveling actions should be directed by the USFWS

6. USFWS compaction assessment guidelines will be followed and tilling will be performed as deemed necessary by the USFWS and NCWRC.

7. Throughout the duration of each nourishment event, both initial construction and periodic re-nourishment, the Contractor will be required to monitor for the presence of stranded sea turtles, live or dead. If a stranded sea turtle is identified, the Contractor will immediately notify the NCWRC of the stranding and implement the appropriate measures, as directed by the NCWRC. Construction activities will be modified appropriately as not to interfere with stranded animals, live or dead.

8. The Corps is interested in understanding the threshold of sediment color change and resultant heat conduction on impacting temperature dependent sex determination of sea turtles. The Corps will contribute funds for the NCWRC to continue its temperature studies in order to

gather nest temperatures on nourished beaches throughout the state, including Topsail Beach, in comparison to non-nourished native sediment temperatures. This data could be used to help develop management criteria for sediment color guidelines

9. Monitoring for seabeach amaranth~~us~~ on Topsail Beach will be required to assess the post nourishment presence of plants. This survey will broken down into 5 survey reaches (A1, A2, A3, A4, B) in accordance with the designated USACE sea beach amaranth survey reaches from 1991-2004 in order to maintain consist data and survey techniques over time.

10. The Corps will implement precautionary measures for avoiding impacts to manatees during construction activities as detailed in the "Guidelines for Avoiding Impacts to the West Indian Manatee in North Carolina Waters" established by the USFWS.

11. During initial construction, as well as each re-nourishment event, the order of work for beach template construction will be from south to north so that construction activities will be north of the breeding and nesting habitat, located at the inlet spit, during the March and April time-frame; thus, further minimizing project impacts. Furthermore, all pipeline and associated construction activities will avoid the piping plover critical habitat.

5.00 SUMMARY EFFECT DETERMINATION

It has been determined that the project, as currently proposed, may affect, but is not likely to adversely affect, piping plover and seabeach amaranth as well as nesting leatherback sea turtle, loggerhead sea turtle, green sea turtles. Hopper dredging activities associated with this project may affect, and are likely to adversely affect the loggerhead, green, Kemp's ridley, and hawksbill sea turtles in the water. The Corps will strictly adhere to Regional Biological Opinion and incidental take statement provided by the NMFS for the continued hopper dredging of channels and borrow areas in the southeastern United States dated 25 September, 1997.

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