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 J

Cumulative Impact Assessment

APPENDIX J

Cumulative Impact Assessment
West Onslow Beach and New River Inlet (Topsail Beach), NC
Shore Protection Project

The Council on Environmental Quality (CEQ) defines cumulative impact as:

The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). This analysis follows the 11-step process outlined by the CEQ in their 1997 publication Considering Cumulative Effects Under the National Environmental Policy Act.

1. Significant Cumulative Effects Issues

This assessment of cumulative impacts will focus on impacts of dredging from the proposed ocean borrow sites, and impacts of placement of sand material on the beach (whether for beach nourishment or disposal of dredge maintenance material) on significant coastal shoreline resources. In making this assessment, we have reviewed the following reports:

- U.S. Department of the Interior, Minerals Management Service (MMS) report entitled "Use of Federal Offshore Sand Resources for Beach and Coastal Restoration in New Jersey, Maryland, Delaware, and Virginia," dated November 1999 (DOI 1999)
- MMS report entitled "Collection of Environmental Data Within Sand Resource Areas Offshore North Carolina and the Environmental Implications of Sand Removal for Coastal and Beach Restoration, dated 2003 (Byrnes et al. 2003)
- U.S. Army Corps of Engineers Dare County Beaches (Bodie Island Portion) Final Feasibility Report and EIS on Hurricane Protection, dated September 2000
- U.S. Army Corps of Engineers Draft Evaluation Report and Environmental Assessment, Morehead City Harbor Section 933, dated May 2003.

The last two reports listed above included comprehensive assessments of state-wide cumulative impacts. In discussing the potential cumulative impacts of offshore borrow area dredging and beach nourishment, we consider time crowded perturbations, and space crowded perturbations, as defined below, to be pertinent to this action.

> ***Time crowded perturbations*** *– repeated occurrence of one type of impact in the same area.*
> ***Space crowded perturbations*** *– a concentration of a number of different impacts in the same area.*

2. Geographic Scope

This analysis will focus on cumulative impacts within the project area since portions of affected beaches under the current proposal have received fill in the past and the proposed action represents an approximately 1.5% increase in the area of North Carolina beaches affected by sand placement as described in the Dare County Beaches EIS (COE 2000) and Morehead City Harbor Section 933 (COE 2003) documents referenced. Additionally, this analysis will study the cumulative impacts, within the project area, of increased offshore borrow area use. The proposed project represents a new impact to the offshore benthic resources in the Topsail Island area. However, cumulative impacts of beach nourishment/disposal and offshore borrow area use on a statewide scale will also be assessed herein.

3. Time Frame

This analysis considers known past, present and the reasonably foreseeable future sand placement and offshore borrow on a statewide scale and project vicinity scale over a 50-year period of analysis from 1965 to 2015. This time period was selected to include the first U.S. Army Corps of Engineers Wilmington District, beach nourishment projects in 1965 and includes the first Wilmington District placement of dredged material within the project area (in the vicinity of Topsail Beach) in about 1969. While historic accounts of local shore protection efforts including sand placement on Wrightsville Beach dating back to the mid-1930s were considered in this assessment, no attempt was made to quantify these actions since detailed data were not available. Projections were extended to 2015, as that date represents a reasonably foreseeable future, and the majority of remaining ocean beach that could reasonably be expected to have federal projects implemented is currently under study and included in this analysis.

At the project vicinity scale the cumulative assessment considers past periodic beach disposal of AIWW maintenance material either annually or on a six-year basis along portions of Topsail Island. This assessment assumes continued periodic beach disposal of maintenance material along Topsail Island and construction of the proposed project. The cumulative analysis also considers the potential that a future beach nourishment project could be constructed along North Topsail and Surf City beaches as that length of beach is undergoing a feasibility study.

4. Actions Affecting Resources of Concern

This analysis of cumulative effects of the proposed action will focus on the impacts of dredging from the proposed ocean borrow sites and placement of sand material on the beach. In making this assessment, we have reviewed an Environmental Report prepared for and published by the U.S. Department of Interior, Minerals Management Service, entitled “Use of Federal Offshore Sand Resources for Beach and Coastal Restoration in New Jersey, Maryland, Delaware, and Virginia,” dated November 1999 (DOI 1999) and the report titled “Collection of Environmental Data Within Sand

Resource Areas Offshore North Carolina and the Environmental Implications of Sand Removal for Coastal and Beach Restoration," dated 2003 (Byrnes et al. 2003).

4a. Actions Affecting Benthic Resources

Dredging: As a result of dredging areas for beach nourishment sand, there is concern for potential cumulative impacts due to repeated dredging in a borrow area within short periods of time such that the benthic community may not have time to recover. Dredging in subsequent areas close to one another may result in impacts to potential adult organism recruitment to the dredged areas, further lengthening the time for recovery in an area (DOI 1999).

Other factors affecting Benthic Resources: Many factors unrelated to dredging of sand from borrow areas may affect benthic resources including, beach resources and ocean fish stocks. The factors can be a result of natural events such as natural population cycles or as a result of favorable or negative weather conditions including La Niña, El Niño, and major storms or hurricanes to name a few. These global events have far greater impacts on these resources at the population level than relatively local activities such as removal of sand from a given area of ocean bottom. Primary man-induced factors affecting fish stocks are over fishing and degradation of water quality due to pollution. When examining the cumulative effect of space crowded perturbations, these other factors far outweigh the potential incremental effects of borrow dredging of sand on benthic or fish populations.

4b. Actions Affecting Beach Resources

The major sources of beach impacts are local beach maintenance activities (which include local beach nourishment), disposal of dredged material from maintenance of navigation channels, and beach nourishment (berm and dune construction with long-term periodic maintenance). Of particular concern are macroinvertebrate, fisheries, shorebird, and sea turtle species that utilize or occur on or adjacent to ocean beaches. These resources are also impacted by natural events and anthropomorphic activities that are unrelated to disposal of sand on the beach as discussed below.

Local Maintenance Activity: Under the existing condition the project area is subjected to repeated and frequent maintenance disturbance by individual homeowners and local communities following major storm events. These efforts are primarily made to protect adjacent shoreline property. Such repairs consist of dune rebuilding using sand from beach scraping. Limited fill and sandbags are generally used to the extent allowable by CAMA permit. Such frequent maintenance efforts could keep the natural resources of the barrier island ecosystems from reestablishing a natural equilibrium with the dynamic coastal forces of the area.

Permitted Beach Nourishment: Local efforts can also include beach nourishment such as that conducted along Pine Knoll Shores, Salter Path, Indian Beach, and Emerald Isle by local interests in 2001-2004. While locally funded beach

nourishment activities are not wide spread, they also occur along other developed North Carolina beaches. Beaches that have been nourished under permit, or may be permitted to be nourished, include Figure Eight Island, Holden Beach, North Topsail Beach, Emerald Isle, Onslow Beach and Ocean Isle Beach. These beaches represent approximately 35 miles of beach or 11% of North Carolina beach. These frequent maintenance efforts could keep the natural resources of the barrier island ecosystems from reestablishing a natural equilibrium with the dynamic coastal forces of the area.

COE Beach Disposal: Maintenance material from dredging in the vicinity of Topsail Beach has historically been disposed along 1.8 miles of beach. Throughout North Carolina, maintenance dredging of navigation channels places sand along approximately 22 miles of the 320 miles of beachfront along the North Carolina shoreline (about 7 percent). The Wilmington District currently uses about 50 percent of the length of beach in North Carolina that is approved for this purpose and does not anticipate significant increases in beach disposal in the foreseeable future.

Beach quality sand is a valuable resource that is highly sought by beach communities to provide wide beaches for recreation and tourism, as well as to provide hurricane and wave protection for public and private property in these communities. When beach quality sand is dredged from navigation projects, it has become common practice of the COE to make this resource available to beach communities, to the maximum extent practicable. Placement of this sand on beaches merely represents return of material, which eroded from these beaches, and is, therefore, replenishment with native material. The design of beach placement sites is very simple; generally it extends the elevation of the natural berm seaward. Widths of beach placement zones generally reflect the wishes of the local government relative to the choice between a long, narrow beach, or a shorter, wider beach.

COE Beach Nourishment: Beach nourishment activities typically include the construction and long-term (50-year) maintenance of a berm and dune. The degree of cumulative impact would increase proportionally with the total length of beach nourishment project constructed. The first federal North Carolina beach nourishment projects were constructed at Carolina and Wrightsville Beaches in 1965, and totaled approximately 6.4 miles. An additional 3.8 miles of federal beach nourishment project was constructed in 1975 at Kure Beach. In 2004, shore protection along 14 miles of Dare County Beaches was approved, but has not yet been constructed. Most of the remaining developed North Carolina beaches (including the proposed project area) are currently under study by the Wilmington District for potential future beach nourishment projects. Considering existing and proposed Federal nourishment projects, approximately 91 miles or 28 percent of the North Carolina coast could have private or federal beach nourishment projects by 2015.

Other factors affecting Beach Resources: Many factors unrelated to placement of sand on the beach may affect beach resources including, benthic resources, shorebird populations and ocean fish stocks. The factors can be a result of natural events such as natural population cycles or as a result of favorable or negative weather conditions

including droughts, floods, La Niña, El Niño, and major storms or hurricanes to name a few. A primary anthropogenic factor affecting shorebird populations is beach development resulting in a loss or disturbance of nesting habitat and invasion of domestic predators. Primary man-induced factors affecting fish stocks are over fishing and degradation of water quality due to pollution.

5. Significant Resources

Based on scoping comments from resource agencies and others, the primary concerns with the proposed beach disposal are direct and indirect impacts to macroinvertebrates, fish, shorebirds, and sea turtles. Federally listed threatened or endangered species which could be present along the North Carolina coast 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. Impacts to all species are summarized below and include, but are not limited to, mortality, reduction in prey species, habitat change, and disturbance during construction activities. Also discussed are the benefits of periodic renourishments, which are expected to enhance nesting success of sea turtles and to provide additional habitat for sea beach amaranth. In relation to dredging of offshore sites for material, the primary concerns are the potential impacts to benthic organisms, fish species and hardbottom habitat areas. Discussion of all significant resources considered in this assessment is included in Sections 2.0 and 8.0 of the EIS.

Beach and Dune. Terrestrial habitat types within these areas include sandy or sparsely vegetated beaches and vegetated dune communities. Mammals occurring within this environment are opossums, cottontails, gray foxes, raccoons, feral house cats, shrews, moles, voles, and house mice. Common vegetation of the upper beach includes beach spurge, sea rocket and pennywort. The dunes are more heavily vegetated, and common species include American beach grass, panic grass, sea oats, broom straw, seashore elder, and salt meadow hay. Seabeach amaranth, a Federally listed threatened species, is present throughout most of North Carolina. Ghost crabs are important invertebrates of the beach/dune community. The beach and dune also provide important nesting habitat for loggerhead and green sea turtles as well as habitat for a number of shorebirds and many other birds, including resident and migratory songbirds. Placement of material along the ocean beach enhances and improves important habitat for a variety of plants and animals, and restores lost habitat in the areas of most severe erosion. This is especially important for nesting loggerhead sea turtles and seabeach amaranth. Historic nesting data from Topsail Island indicate that sea turtles continue to nest on disposal beaches with hatch rate successes similar to non-disposal beaches (Jean Beasley, pers. comm.). Furthermore, new populations of seabeach amaranth 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). Individually and cumulatively, in addition to providing important habitat, beach nourishment projects protect public infrastructure, public and private property, and human lives.

Marine Waters. Along the coast of North Carolina, marine waters provide habitat for a variety of ocean fish and are important commercial and recreational fishing grounds. Kingfish, spot, bluefish, weakfish, spotted seatrout, flounder, red drum, king mackerel, and Spanish mackerel are actively fished from boats, the beach, and local piers. Offshore marine waters serve as habitat for the spawning of many estuarine dependent species. Oceanic large nekton located offshore of North Carolina are composed of a wide variety of bony fishes, sharks, and rays, as well as fewer numbers of marine mammals and reptiles. Marine mammals and reptiles that may be present in the offshore borrow sites are addressed in the Biological Assessment. Dredging and placement of beach fill may create impacts in the marine water column in the immediate vicinity of the activity, potentially affecting the surf zone and nearshore ocean. These impacts may include minor and short-term suspended sediment plumes and related turbidity, as well as the release of soluble trace constituents from the sediment. Overall water quality impacts for any given project are expected to be short-term and minor. Cumulative effects of multiple simultaneous beach nourishment operations could be potentially harmful to fishes of the surf zone. However, the high quality of the sediment selected for beach fill and the small amount of beach affected at any point in time would not suggest that this activity poses a significant threat.

Intertidal and Nearshore Zones. The intertidal zone within the proposed beach nourishment areas serves as habitat for invertebrates including mole crabs, coquina clams, amphipods, isopods, and polychaetes, which are adapted to the high energy, sandy beach environment. These species are not commercially important; however, they provide an important food source for surf-feeding fish and shore birds. The surf zone is suggested to be an important migratory area for larval/juvenile fish moving in and out of inlets and estuarine nurseries (Hackney *et al*., 1996). Disposal operations along the beach can result in increased turbidity and mortality of intertidal macrofauna, which serves as food sources for various fish and bird species. Therefore, feeding activities of these species may be interrupted in the immediate area of beach sand placement. These mobile species are expected to temporarily relocate to other areas as the project proceeds along the beach. Though a short-term reduction in prey availability may occur in the immediate disposal area, only a small area is impacted at any given time, and once complete, organisms can recruit into the nourished area. The anticipated construction timeframes for beach projects are typically from 15 November to 30 April and would avoid a majority of the peak recruitment and abundance time period of surf zone fishes and their benthic invertebrate prey source. To summarize, the impacts of beach renourishment projects on the intertidal and nearshore zones are considered temporary, minor and reversible. Cumulative effects of multiple simultaneous beach nourishment operations could be potentially harmful to fishes of the surf zone, however, the high quality of the sediment selected for beach fill and the small amount of beach affected at any point in time would suggest that this activity would not pose a significant threat.

Hardbottoms. Hardbottoms are also called "live-bottoms" because they support a rich diversity of invertebrates such as corals, anemones, and sponges, which are refuges

and food sources for fish and other marine life. They provide valuable habitat for reef fish such as black sea bass, red porgy, and groupers. Hardbottoms are also attractive to pelagic species such as king mackerel, amberjack, and cobia. While hardbottoms are most abundant in southern portions of North Carolina, they are located along the entire coast (USFWS, 1990), no hardbottoms are present in the nearshore zone off of Topsail Beach. Hardbottoms in the Topsail Beach area are discussed in detail in Section 2.01.10. In order to confirm the presence or absence of hardbottom within the nearshore environment (<-23 ft. NGVD) of Topsail Beach, sidescan and multibeam survey techniques were performed. Based on the survey data collected, the Corps concludes that no hard bottom features are located within the -23 depth of closure limits of the West Onslow Beach and New River Inlet (Topsail Beach) Shore Protection Project. After review of the data, the high backscatter depressional features identified through side scan and multi beam sonar, as well as the surface sediment samples collected within and outside of theses features, are consistent with previous descriptions in the available literature of Rippled Scour Depressions (RSD), Rippled Channel Depressions (RCD), and/or sorted bedform features. A summary evaluation and detailed survey reports are provided in Appendix R. Since there are no nearshore hardbottoms within the depth of closure at Topsail Beach and offshore hardbottoms will be avoided, cumulative effects to hardbottoms are expected to be negligible.

Nearshore Zone. Beach nourishment projects introduce fill into nearshore waters out to a specified depth of closure, usually from about –20 to –25 feet. Benthic organisms, phytoplankton, and seaweeds are the major primary producers in this community with species of *Ulva* (sea lettuce), *Fucus*, and *Cladocera* (water fleas) being fairly common where suitable habitat occurs. Many species of fish-eating birds are typically found in this area including gulls, terns, cormorants, loons, and grebes (Section 2.02.3). Marine mammals and sea turtles also are frequently seen in this area and are discussed in detail in Section 2.02.4 and the Biological Assessment. Fishes and benthic resources of this area are discussed in Sections 2.01.7 and 2.01.9 respectively.

5a. Other Resources

Air Quality. The ambient air quality for all of coastal North Carolina has been determined to be in compliance with the National Ambient Air Quality Standards. All coastal counties in North Carolina are designated as attainment areas and do not require conformity determinations.

Additionally, although ozone is not a significant problem in the coastal counties, ozone is North Carolina's most widespread air quality problem, particularly during the warmer months. High ozone levels generally occur on hot sunny days with little wind, when pollutants such as nitrogen oxides and hydrocarbons react in the air. The ozone season is April through October. Dredging with beach disposal or renourishment typically takes place during the cooler months of the year, during times of low biological activity and outside of the ozone season. The proposed project and all other existing similar projects

along the North Carolina coast are not anticipated to create any adverse effect on air quality.

Social and Economic. The coastal areas of North Carolina will continue to grow and expand both with and without beach nourishment projects. Therefore, the economic benefit analysis for the proposed project claims no increase in benefits or hurricane and storm damage due to induced development. Development of vacant lots is limited to lots buildable under the regulations set forth by CAMA, flood plain regulations, State and local ordinances, and applicable requirements of the Federal Flood Insurance Program.

IWR Report 96-PS-1, FINAL REPORT: An Analysis of the U.S. Army Corps of Engineers Shore Protection Program, June 1996 states: "Corps projects have been found to have no measurable effect on development, and it appears that Corps activity has little effect on the relocation and/or construction decisions of developers, homeowners, or housing investors."

Wave Conditions. Localized deepening of offshore borrow areas is the only potential source of impacts on wave conditions, however, these changes are not expected to be significant. For the proposed Topsail Beach project, the borrow area use plan identifies six detached, relatively small borrow areas scattered across an 8 or 9 mile swath in water depths of 40 to 50 feet, which should have less impact on wave conditions than dredging of a large, contiguous area.

Shoreline and Sand Transport. Existing water depths in offshore borrow areas are substantially deeper than the estimated active profile depths. Therefore no impacts to the active profile are expected due to borrow area dredging for this project or any other projects in the State.

Net movement of material placed on Topsail Beach will be predominantly to the north based on transport analysis, with northerly sediment transport being roughly twice that of southerly transport on average. On a regional basis, renourishment projects add material to the longshore transport system, thus providing positive impacts. Although a regional sediment budget analysis has not been completed, it is expected that the proposed action and the combined effects of all other existing and proposed beach projects will have a minimal effect on shoreline and sand transport.

6. Resource Capacity to Withstand Stress and Regulatory Thresholds

There are no known thresholds relating to the extent of ocean bottom that can be disturbed without significant population level impacts to fisheries and benthic species. Therefore, a comparison of cumulative impacts to established thresholds is not made. It is clear from the analysis in Section 4a above, that the potential impact area is small relative to the area of available similar habitat on a local, vicinity, and statewide basis. It is expected that there is a low risk that the direct and cumulative impacts of the proposed action and other known similar activities would reach a threshold with potential for population level impacts on important commercial fish stocks. In regard to physical habitat alterations it is expected that alterations in depths and bottom sediment may occur

and be persistent. However, site modifications would be within the range of tolerance by these species and, although man-altered, consistent with natural variations in depth and sediment within the geographic range of EFH for local commercial fish species. The Final Report, Collection of Environmental Data Within Sand Resource Areas Offshore North Carolina and The Environmental Implications of Sand Removal for Coastal and Beach Restoration (Byrnes et al. 2003) provided the following assessment of potential impacts to benthic organisms from dredging:

Because the sedimentary regime of North Carolina sand source areas is vertically uniform, recolonization of surficial sediments by later successional stages likely will proceed even if dredged shoals are not completely reestablished. Furthermore, dredging of only a small portion of the area within each of the resource areas will ensure that a supply of non-transitional, motile taxa will be available for rapid migration into dredged sites. While community composition may differ for a period of time after the last dredging, the infaunal assemblage type that exists in mined areas will be similar to naturally occurring assemblages in the study area, particularly those assemblages inhabiting inter-ridge troughs. Based on previous observations of infaunal reestablishment in dredged sites, the infaunal community in dredged sites most likely will become reestablished within 2 years, and will exhibit levels of infaunal abundance, diversity, and composition comparable to nearby non-dredged sites.

In a 1999 Environmental Report on the use of federal offshore sand resources for beach and coastal restoration, the U.S. Department of Interior, Minerals Management Service (DOI 1999) provided the following assessment of potential impacts to beach fauna from beach disposal:

Because benthic organisms living in beach habitats are adapted to living in high energy environments, they are able to quickly recover to original levels following beach nourishment events; sometimes in as little as three months (Van Dolah et al. 1994; Levison and Van Dolah 1996). This is again attributed to the fact that intertidal organisms are living in high energy habitats where disturbances are common. Because of a lower diversity of species compared to other intertidal and shallow subtidal habitats (Hackney et al. 1996), the vast majority of beach habitats are recolonized by the same species that existed before nourishment (Van Dolah et al. 1992; Nelson 1985; Levison and Van Dolah 1996; Hackney et al. 1996).

While the proposed beach disposal may adversely impact intertidal macrofauna, these organisms are highly resilient and any effects will be localized, short-term, and reversible.

7. Baseline Conditions

The following EIS section describes the status of significant resources that may be affected by this and other similar projects that are pertinent to this analysis.

Section 2.0, Affected Environment.

8. Cause and Effect Relationships

The following EIS section describes impacts of the proposed action on significant resources. Cause and effect relationships described in the EIS are consistent with those that would be expected for other similar projects that are pertinent to this analysis.

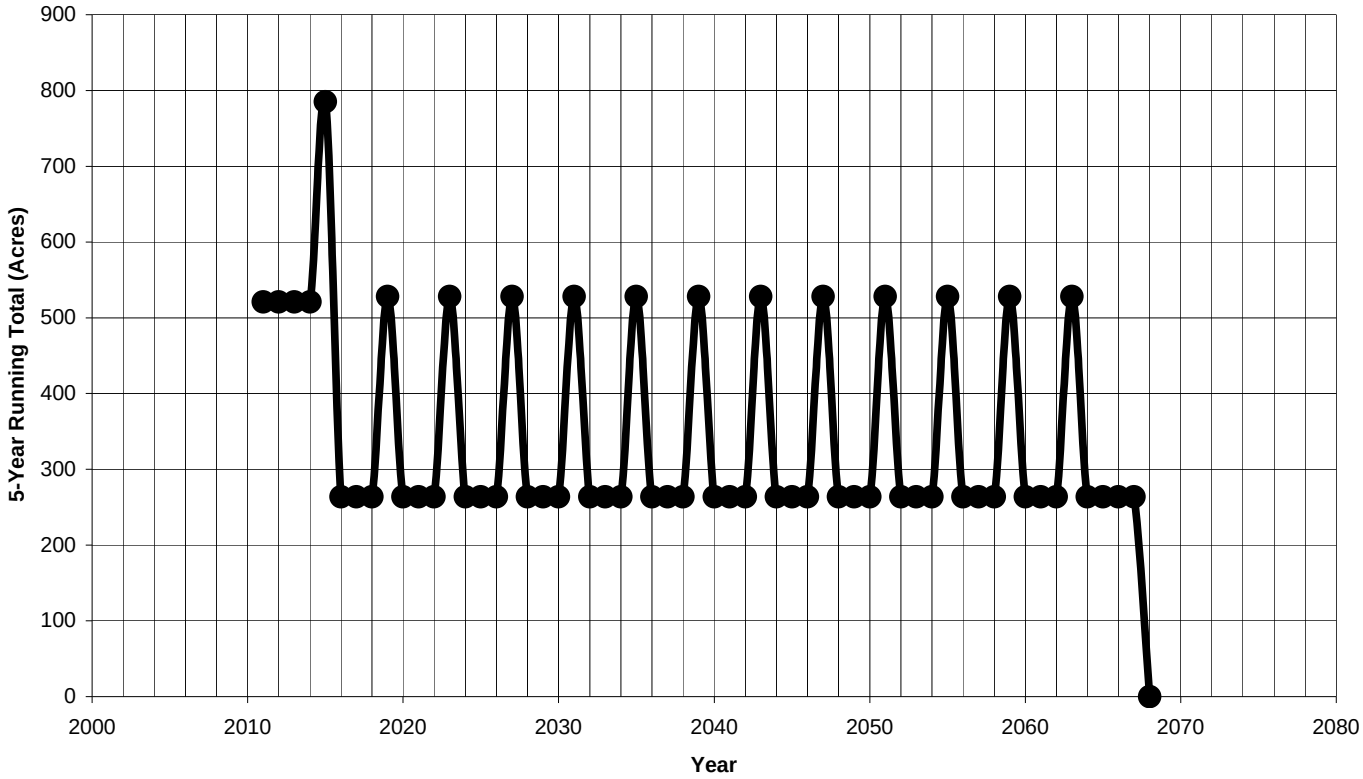
Section 8.0, Environmental Effects.

9. Magnitude and Significance of Resource Impacts

9a. Offshore Borrow Areas

Site Specific Impacts: Concept plans for the potential use of borrow sites A, B, D-F for project construction and maintenance are shown on Figures A-1 and A-2 in Appendix. Borrow Area C as shown on the same figures would be held in reserve as a contingency borrow area. Under the proposed plan, borrow area A (2,297 acres available) would be used for initial construction of the proposed project. Approximately 3.3 million cubic yards of material would be required for initial construction with direct impacts to approximately 521 acres of sandy ocean bottom. The impacts of this activity on ocean invertebrates are discussed in Section 8.01, Marine Environment. Maintenance activities would involve direct dredging impacts to borrow areas A, B, D-F with portions of each area used for the four-year renourishment cycle. The total area available for use (borrow areas A – F) would be approximately 3,870 acres. Dredging for maintenance would impact 264 acres per cycle, or an average of 79 acres per year beginning in year 4 and continuing throughout the 50-year project life. Assuming that the borrow areas are not impacted by repeatedly dredging recently used areas, unusually high sedimentation rates, or some other disturbance, a natural succession of species should occur, potentially restoring the area to its original levels of abundance and biomass within 1-5 years (DOI 1999). This cyclic use of borrow areas A, B, D-F would result in cumulative effects from space crowded perturbations on a local scale. Based on a 5-year running total, the largest area of affect would be at year 2012 when 785 acres are in recovery. After 2016, the area in recovery would average 187 acres. As shown on Figure J-1, the area in recovery will cycle between 264 and 528 acres depending on where in the renourishment cycle the project is.

Figure J-1, Area in Recovery



Local Impacts:

Existing Sites: Cumulative impacts from space crowded perturbations would occur at the local scale, resulting from the use of sites A, B, D-F for initial project construction and periodic maintenance on a four-year interval. Average annual impacts of the proposed plan would be an estimated 79 acres/year on a local scale.

Potential Sites: Should the North Topsail Beach/Surf City project be implemented, proposed borrow areas G – T (Figure J-2) would experience cumulative impacts from space crowded perturbations at the local scale.

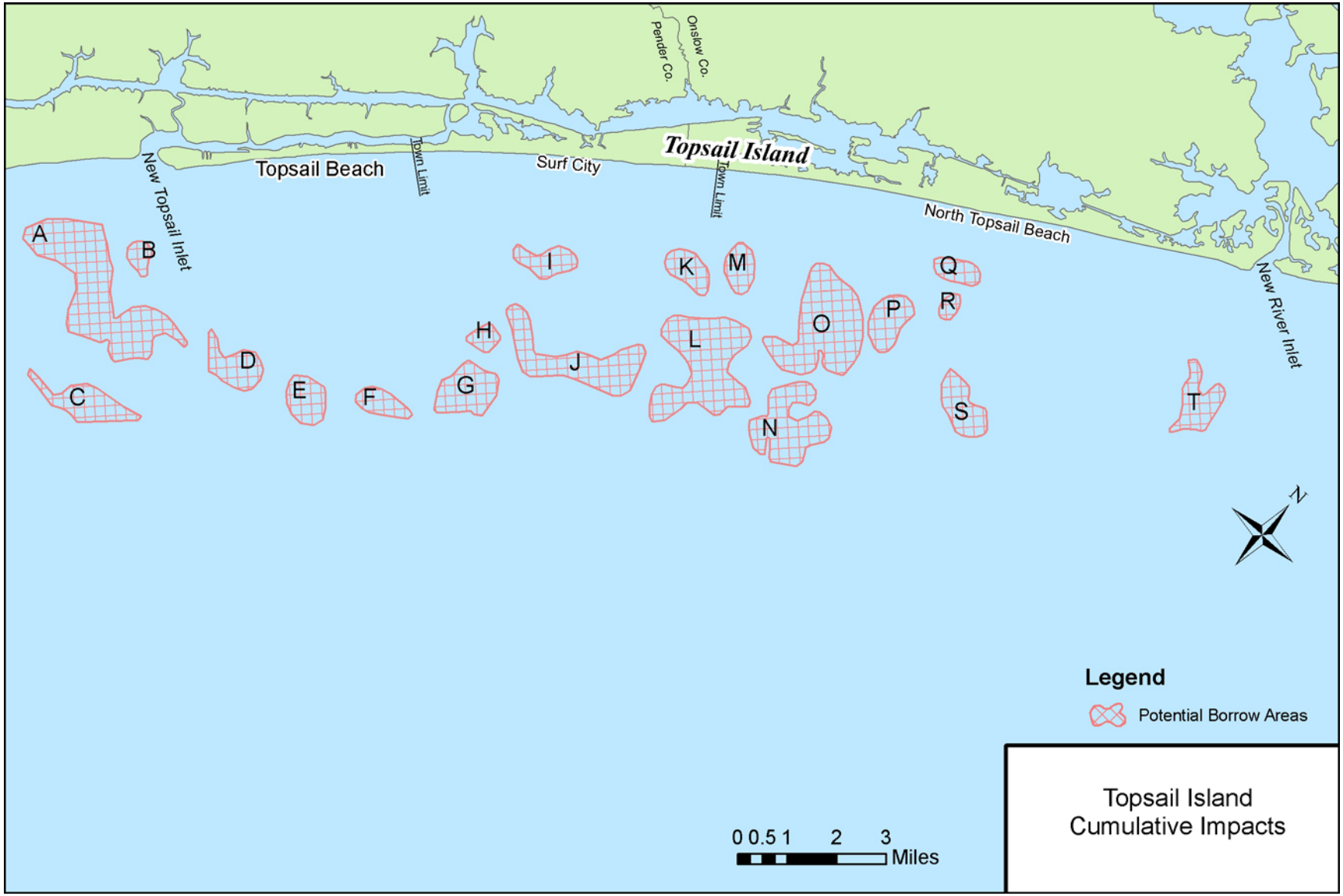


Figure J-2, Topsail Island, Local Potential Borrow Areas

Statewide Impacts:

Existing Sites: There is currently only one North Carolina ocean borrow site in use. It is located in the nearshore ocean off of Kure Beach (approximately 30 miles to the south). For the purposes of this analysis, the borrow areas for Dare County Beaches (Bodie Island Portion) are considered as existing although no material has been dredged from them as of this writing. Dredging requirements for Kure Beach are about 766,000 cy every 3 years, about 90% of the 4 year maintenance requirement of the proposed action. Assuming that the addition of this project would cause an incremental increase in impact area of about 90% (~71 acres/year), and including the annual use for Dare County Beaches (Bodie Island Portion) of approximately 372 acres (COE 2000), the cumulative impact area from space crowded perturbations statewide is estimated to be approximately 511 acres.

Potential Sites: The Wilmington District is in the early reconnaissance planning stages of four major beach nourishment studies. These studies include Bogue Banks, Brunswick County Beaches, Dare County Beaches (Hatteras to Ocracoke Portion), and North Topsail Beach/Surf City beaches. While extensive information on potential offshore borrow areas is not available at this stage other than for North Topsail Beach/Surf City, and any assumptions are highly speculative, consideration of potential beach nourishment that may come from this study was considered prudent for a worst case assessment.

Bogue Banks: Proposed project would involve approximately 23 miles of beach from Atlantic Beach in the north to Bogue Inlet to the south. Using the figures cited for the Dare County Beaches (Bodie Island Portion) for borrow area use, this project (Bogue Banks) would cover about 160% of the 14.2 mile beach area (Dare County project length) with a resulting use of approximately 595 acres of borrow annually.

Brunswick County Beaches: Proposed project would encompass approximately 19 miles of beach including Caswell Beach, Oak Island and Holden Beaches. Use of the projected borrow area requirements for Dare County Beaches (Bodie Island Portion) shows that this project (Brunswick County Beaches) would cover about 134% of the 14.2 mile beach area (Dare County project length) with a resulting use of approximately 498 acres of borrow annually.

Dare County Beaches (Hatteras to Ocracoke Portion): Public concerns have identified 10 “hot spots” of beach erosion where potential beach nourishment is proposed. It is assumed for this analysis that 10 miles of beach nourishment could occur as early as 2008. This project could cover about 70% of the beach area (14.2 miles) proposed for the Dare County Beaches (Bodie Island Portion) with a resulting use of approximately 260 acres of borrow annually.

North Topsail Beach/Surf City: Proposed project encompasses approximately 10 miles of beach. Using preliminary study data, the project would require around 9.2

million cubic yards of sandy material for construction and 2.2 million cubic yards every four years for renourishment. Based on these figures, annual borrow area use would be approximately 84 acres.

The following tables graphically illustrate the relationship of the proposed borrow areas to the available habitat in the area. The available habitat area is estimated by multiplying the shoreline length of the area of consideration by the distance from the shore of the offshore limit of the proposed borrow areas. For this study, the proposed borrow areas are located between one to six miles offshore, so the offshore extent used is 5 miles. We recognize that other methods could be used to establish an area of available habitat, but believe this method to be both reasonable, and conservative, given the broad geographic range of species considered in this analysis.

Table J-1: Local Cumulative Impact Area for Borrow Sites
Topsail Beach (A, B, D-F) and N. Topsail Beach/Surf City (G-T)

Impact Area		Available Habitat			% Impacts	
Existing & Proposed	Potential	Shoreline Length	Offshore Extent	Area	Existing & Proposed	Potential
79 ac. (0.1 mi2)	163 ac. (0.3 mi2)	14.7 mi.	5 mi.	47,040 ac. (73.5 mi2)	0.2%	0.3%

Table J-2: Project Vicinity Cumulative Impact Area for Borrow Sites
(~50 mile radius) Topsail Beach (A, B, D-F), N. Topsail Beach/Surf City (G-T), Bogue Banks, Brunswick County Beaches, Kure Beach

Impact Area		Available Habitat			% Impacts	
Existing & Proposed	Potential	Shoreline Length	Offshore Extent	Area	Existing & Proposed	Potential
139 ac. (0.2 mi2)	1,324 ac. (2.1 mi2)	100 mi.	5 mi.	320,000 ac. (500 mi2)	0.04%	0.4%

Table J-3: Statewide Cumulative Impact Area for Borrow Sites
Topsail Beach (A, B, D-F), N. Topsail Beach/Surf City (G-T), Dare County Beaches (N1, N2, S1), Kure Beach, Bogue Banks, Brunswick County Beaches, Dare County Beaches (Hatteras to Ocracoke)

Impact Area		Available Habitat			% Impacts	
Existing & Proposed	Potential	Shoreline Length	Offshore Extent	Area	Existing & Proposed	Potential
511 ac. (0.8 mi^2)	1,956 ac. (3.1 mi^2)	320 mi.	5 mi.	1,024,000 ac. (1,600 mi^2)	0.05%	0.2%

9b. Beach Areas

The impacts of beach disposal on North Carolina beaches are considered to be similar to those described in Section 8.0 of the EIS. The degree of cumulative impact would increase proportionally with the total length of beach impacted. The most likely

projects to increase the length of North Carolina beach disposal are beach nourishment projects.

As shown in Table J-4 below, the North Carolina ocean beaches (320 miles) can be divided up based on the potential that a beach nourishment project will be proposed for them. The Coastal Area Management Act (CAMA) applies to all 20 North Carolina Coastal Counties. Proper beach nourishment or disposal or local maintenance as described above is generally regulated under CAMA or USACE permitting authorities alone, and for this analysis, are labeled CAMA regulated. Approximately 37 percent of North Carolina beaches are in this category.

Table J-4: North Carolina Beach Classifications

Classification	Percentage of Total
Coastal Barrier Resource System	19
Developed and/or CAMA Regulated	37
National Park Lands	40
State Park Lands	4

Other North Carolina ocean beach areas are unlikely to be considered for beach disposal. The Coastal Barrier Resources Act (CBRA) of 1982 (PL 97-348) and the Coastal Barrier Improvement Act of 1990 (PL 101-591) restrict federal expenditures in those areas comprising the Coastal Barrier Resources System (CBRS). These are beaches within the CBRS (19 percent), or beaches that are owned and managed by either the State (4 percent) or Federal Government (40 percent), primarily as National or State Parks, or developed and/or regulated by CAMA (37 percent).

The large majority of existing or projected disposal and nourishment projects described below are federal, with less than two percent of the activities conducted by private groups. While most CBRS lands are undeveloped because no federal funds may be expended in those areas, local maintenance activities could be expected in any developed portions. For example, North Topsail Beach is located within CBRS lands, but individual landowners still repair dunes by beach scraping. Federal and state parks allow highly restricted disposal under special use permits and conduct disposal only as required to protect resources, such as at Pea Island. Only about 10 percent (on National/Federal and State Parks) of all existing or projected disposal/nourishment in North Carolina are on beaches within this category. Of that number, 8 percent are potential nourishment projects in the early planning stages, which are highly speculative but included for worst-case analysis.

This analysis quantifies these impacts in terms of the percent of North Carolina beach affected on an annual and total basis by sand disposal for maintenance of federal navigation channels, and existing, proposed, or potential beach nourishment projects. Activities of others are also considered.

Statewide Impacts

The following analysis of statewide impacts were determined based on cumulative impact analyses conducted for the Morehead City Harbor 933 in 2003 and Dare County Beaches (Bodie Island) FEIS in 2000. Areas that were proposed for construction at the time of those analyses but have been constructed are now listed as existing projects. Table J-5 displays the percentages of North Carolina beaches that may have future nourishment or disposal activities.

Existing Federal Disposal Activities:
Average/year – 8 miles or 3 percent of total NC ocean beach (320 miles).
Minimum for any year – 4 miles or 1 percent of total NC ocean beach.
Total beach affected is 22 miles or 7 percent of total NC ocean beach.

Existing Local Disposal Activities, Sections 1135 and 933:
One-time events with no maintenance, constructed since 2000 assessment. Local Bogue Banks Permit – 17 miles, Wilmington Harbor – 14 miles, 1135 – 2 miles.
Total beach affected is 33 miles or 10 percent of total NC ocean beach.

Existing Beach Nourishment:
Average of 3 miles per year (USACE project only) or 1 percent of NC ocean beach.
Minimum of 0 miles (possibility that no beach nourishment occurs in any given year).
Total beach affected is 18 miles or 5 percent of total NC ocean beach.

Proposed Beach Nourishment:
(These numbers are highly speculative and subject to change. Includes best guess for projects that are in early study phases, i.e., study requested but not funded, and reconnaissance).
Average per year of 17 miles or 5 percent of NC ocean beach.
Minimum of 0 miles (possibility that no beach nourishment occurs in any given year).
Maximum per year of 85 miles or 27 percent of total NC ocean beach.
Inclusion of Onslow Beach (1 mile) and Kitty Hawk North (2.2 miles) – Total beach affected 88.2 miles or 28 percent of NC ocean beach.

Cumulative Impacts (Disposal and Nourishment projects existing and future).
Average annual impact from existing disposal and nourishment 11 miles, 3 percent of NC beaches.
Maximum annual impact (worst case) from existing beach disposal and nourishment activities 49 miles, 15 percent of NC ocean beach.
Average annual impact from existing disposal and nourishment projects and proposed projects 59 miles, 18 percent of NC ocean beach.

Maximum impact (worst case) from existing disposal and nourishment and potential beach nourishment 122 miles, or 38 percent of NC ocean beach.

Table J-5: North Carolina Beaches – Potential for Nourishment or Disposal

Potential	Percentage of Total
Beach Disposal or Nourishment Likely (excluding activities on parkland)	33
Future Undetermined	5
Protected Beaches, Nourishment Restricted or Limited	62

It is interesting to note that approximately 5 percent of the North Carolina ocean beach is not regulated beyond the CAMA and USACE guidelines (for example Hutaff Island located north of Rich Inlet), and is not proposed for beach nourishment or disposal. The future of this and comparable areas is undetermined. Due to extreme development pressure however, such areas are likely to be developed in the future unless additional protection is provided at a state or federal level.

As shown on Figure J-3, beach disposal/nourishment activities are relatively limited however these activities could potentially increase to 122 miles as early as 2015. Table J-6 displays the percentages of North Carolina beach sand placement under such a scenario.

Figure J-3 Projected Miles of Beach Nourishment and Disposal

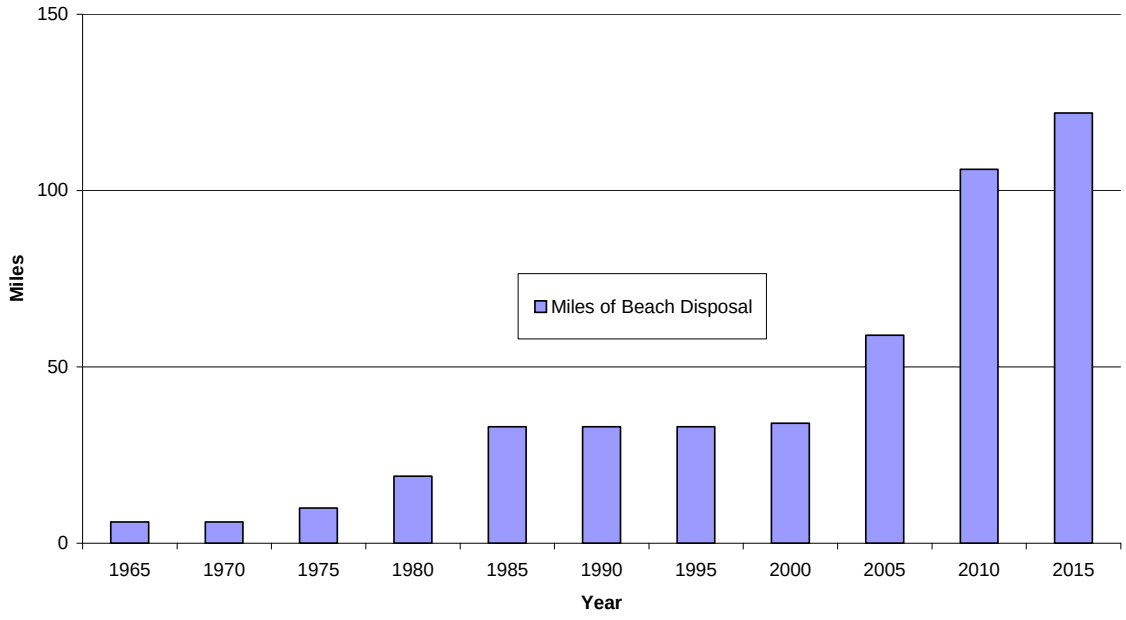


Table J-6: North Carolina Existing and Proposed Sand Placement

Action	Percentage of Total
Federal Disposal	2
Federal Nourishment + Disposal	28
Permitted Nourishment	11
Protected Beaches, Nourishment Restricted or Limited	59

Project Level Impacts
(4.7-mile study area)

The approximately 4.7-mile study area consists of Topsail Beach from the northern city limit with Surf City and traveling southwest to the Piping Plover critical habitat at New Topsail Inlet.

a. Existing Local Maintenance:

- Under existing conditions, the entire study area (4.7 miles) is expected to experience frequent local maintenance, including beach scraping and bulldozing, etc.

b. Existing Disposal Activities:

- Portions of the 4.7-mile study area receive dredged material on an 8 to 10 year cycle.
- The placement of nourishment material along the 4.7-mile study area is not expected to affect the current disposal schedule.

c. Existing Beach Nourishment:

- None.

d. Proposed Beach Nourishment:

- The entire 4.7-mile study area is proposed for beach nourishment.

e. Cumulative Impacts:

- Approximately 1.6 miles of the areas proposed for sand deposition within the 4.7-mile study area have had previous beach disposal.

- It is possible that the proposed action will impact beach invertebrates in areas that have not fully recovered from past sand deposition, extending recovery time.

Vicinity Impacts
50 miles north and south of the project (104.7 total miles)

a. Local Maintenance:

- Under existing conditions approximately 42 miles or 40 percent of beaches within the project vicinity are developed and are expected to experience frequent local maintenance (i.e., beach scraping, beach nourishment/disposal, etc.).

b. Disposal Activities:

- 42 miles or 40 percent of the ocean beach in the project vicinity are currently or have been used for beach disposal of dredged material.

c. Existing Beach Nourishment:

- About 16 miles or 15 percent of the ocean beach in the project vicinity has been nourished by local interests or the COE.

d. Proposed Beach Renourishment:

- 52 miles or 50 percent of ocean beaches in the project vicinity are under study.

e. Cumulative Impacts:

- With all proposed and existing disposal and nourishment impacts, potentially 67 miles (64 percent) of ocean beach in the project vicinity may have a federal beach nourishment project within the reasonably foreseeable future.

Conclusion

Relatively small portions of North Carolina beaches (approximately 12 percent) are presently affected by these activities. With the proposed action, the impact area would not increase significantly since portions of the areas proposed for fill have previously had sand deposition. On a statewide scale, the existing and approved disposal sites are well distributed in northern, central and southern parts of the state with undeveloped protected beaches (i.e., National/Federal and State Parks and Estuarine Reserves) in between. It is unlikely that cumulative impacts from space crowded perturbation are occurring or will occur due to the construction of this project. The analysis suggests that the potential impact area from the proposed and existing actions is small relative to the area of available similar habitat on a vicinity and statewide basis. Also, for some species, such as sea turtles and seabeach amaranth, beach projects provide habitat or improve existing habitat by replacing beach material lost to erosion.

All areas are expected to recover invertebrates, which should continue to be available as food resources.

10. Actions to Reduce Cumulative Impacts

Section 4.00 of Appendix I, Biological Assessment, Endangered Species includes environmental commitments proposed to minimize project impacts. These actions will also reduce any cumulative impacts related to beach nourishment and offshore borrow activities.

11. Monitoring

As discussed in Section 4.00 of Appendix I, Biological Assessment, Endangered Species, monitoring for select species would be conducted as a component of the proposed project. On-shore monitoring would include surveys for sea turtle nesting activity and seabeach amaranth presence. Off-shore monitoring would include observation for presence of marine mammals and West Indian manatee during dredging operations. Several of the incrementally larger beach projects considered in this assessment including Wilmington Harbor, Bogue Banks (local nourishment project) and Dare County Beaches have significant monitoring components that will address beach impact on northern, central and southern North Carolina beaches. Dare County Beaches project also has a significant offshore borrow area monitoring component for both pre- and post-borrow activities.

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