

EDISTO BEACH
COASTAL STORM DAMAGE REDUCTION
GENERAL INVESTIGATION STUDY

APPENDIX H
SECTION 404(b)(1) EVALUATION

404(b)(1) Evaluation

Edisto Beach Hurricane and Storm Damage Reduction General Investigation Report

**Edisto Beach, Colleton County
South Carolina**

August 2013

I. PROJECT DESCRIPTION

a. Location and General Description.

The proposed project (see Figures 1 thru 4) was determined after a detailed alternatives analysis documented within the Feasibility Study/Environmental Assessment. The project consists of the following elements: 1) A 15-foot high (elevation), 15-foot wide dune beginning at the northern end of the project (i.e., the southern end of the State Park) and extending southward along the beach for 16,530 feet. This dune would be fronted by a 7-foot high (elevation) berm. The first 7,740 feet of berm length would have a width of 75 feet. The width would then taper to a 50-foot width for the remaining length of the berm. The width of each end of the berm would taper to match the existing beach profile; 2) The dune would then transition into a 14-foot high (elevation), 15-foot wide dune that extends around the end of the island for 5,290 feet. No berm would be constructed in front of this dune because the existing beach profile provides an adequate berm; and 3) Approximately 1,130 ft of total groin lengthening across 23 of the existing groins (see Figure 5 and Table 1). Results of a coastal engineering analysis determined that this minimal amount of lengthening will not have any downdrift impacts as the design is simply to stabilize the proposed berm width. Because the distance between the landward toe of the dune and the seaward edge of the berm for the beach design exceeds the existing condition distance between these same points along certain reaches within the project, the effective length of the groins in these areas will be reduced. Consequently, the length of some groins will need to be increased in order to create beach width necessary to maintain the design cross-section. The proposed groin lengthening is not provided as a means for trapping more sand and increasing beach width or significantly changing the rate of sand bypassing the groins. The renourishment interval for the proposed project has been estimated to occur every 8 years and is triggered by a mobilization threshold of 220,400 cubic yards of sand.

Construction will be by means of either a hydraulic cutterhead dredge or a hopper dredge that will transport the sand through a pipeline. The pipeline will run adjacent to the groins and parallel with the beach. Beach compatible material (sand) from an offshore source will be pumped along the 21,820 linear feet of the project and will be discharged as a

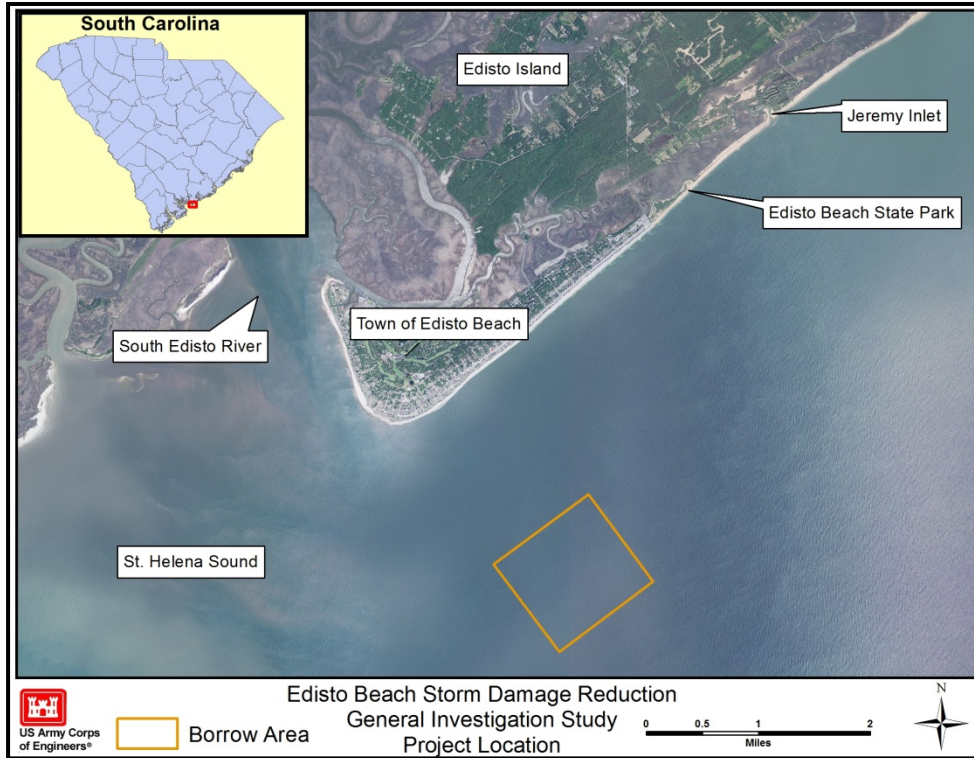


Figure 1. Location of Edisto Beach and proposed borrow site



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



Figure 3. Project footprint along inlet reaches



Figure 4. Project footprint along Atlantic Ocean facing reaches

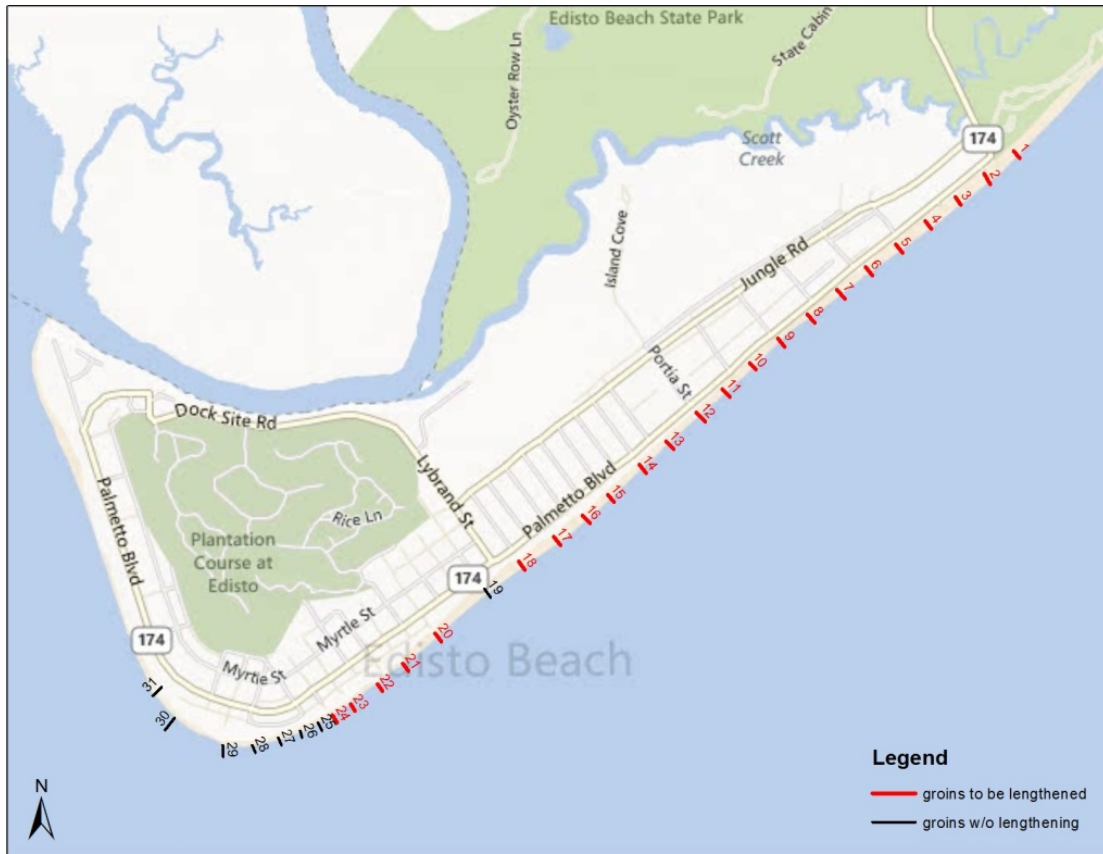


Figure 5. Spatial location of proposed groin lengthenings

Table 1. Proposed groin lengthening dimensions by groin number

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

slurry. During construction, temporary training dikes of sand will be used to contain the discharge and control the fill placement. Fill sections will be graded by land-based equipment, such as bulldozers, the fill placement. Fill sections will be graded by land-based equipment, such as bulldozers, articulated front-end loaders, and other equipment as necessary to achieve the desired beach profile. Equipment will be selected based on whatever generates only minimal and acceptable temporary environmental impacts, as well as whatever proves to be the most advantageous economically. The sand will then be graded, raked, and tilled as necessary in coordination with recommendations and requirements from regulatory agencies. It is anticipated that construction will begin in late-2018 and will require approximately 4 to 5 months for completion. A construction window of November 1 through April 30 will minimize impacts to sea turtles, fish, shellfish, and infauna, and will be utilized whenever possible (see USFWS Construction Windows, Appendix A). The schedule could change due to congressional funding, contractual issues, inclement weather, equipment failure, or other unforeseen difficulties.

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

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

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

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

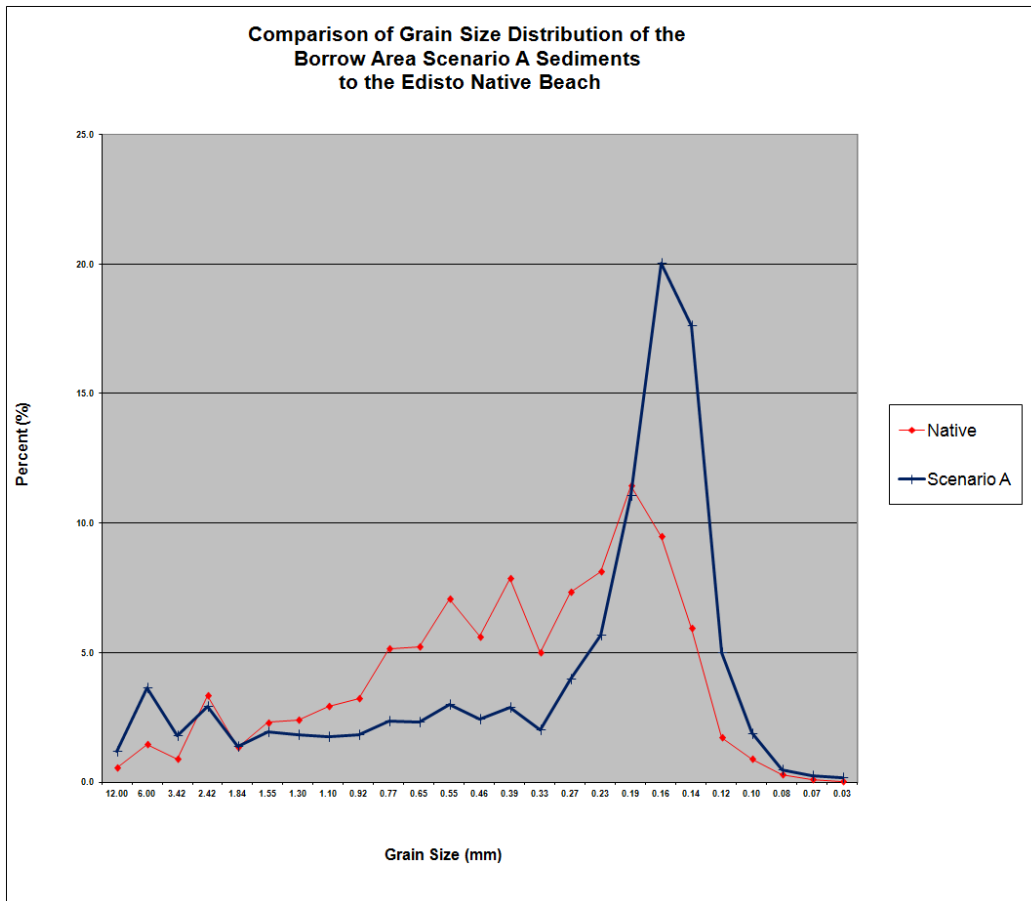


Figure 5. Histogram of native beach sands vs. proposed borrow site

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

b. Authority and Purpose. The Edisto Beach Coastal Storm Damage Reduction GI Feasibility Study is being conducted in response to a resolution adopted on April 22, 1988 by the Committee on Environment and Public Works of the United States Senate:

“Resolved by the Committee on Environment and Public Works of the United States Senate, that the Secretary of the Army in accordance with the provisions of Section 110 of the River and Harbor Act of 1962, is hereby authorized to study, in

cooperation with the State of South Carolina, its political subdivisions and agencies and instrumentalities thereof, the entire Coast of South Carolina in the interests of beach erosion control, hurricane protection and related purposes. Included in this study will be the development of a comprehensive body of knowledge, information, and data on coastal area changes and processes for such entire coast.”

c. General Description and Quantities of the Dredged or Fill Material.

The borrow area for the proposed project occurs on an ebb-tidal shoal located approximately 1.5 miles to 2.5 miles southeast of the southern point of Edisto Beach (Figure 1). The borrow area contains approximately 7.2 million cubic yards of beach compatible sands. Native beach sands were determined based on beach samples collected at 34 stations along Edisto Beach. Each station included four grab samples – one each from the toe of the dune, berm, beach face, and low tide swash zone. Results of this analysis determined that the beach sands have a mean phi size of 1.31, 0.1 % silt/clay mix, and 26.9% visual shell hash. These results compare favorably with the borrow area sands (Table 2).

d. Description of the Proposed Discharge Site(s). The beach compatible material will be placed on the ocean shoreline along Edisto Beach for a length of 21,820 feet, extending from Big Bay Creek at the southern inlet end and moving north to the first groin north of the pavilion, as shown in Figures 2 through 4.

e. Description of Disposal Method. The material will be excavated by either a hydraulic cutter head dredge or a hopper dredge, either of which will transport the sand through a pipeline, as described in Paragraph I.a. above.

II. FACTUAL DETERMINATIONS

a. Physical Substrate Determinations.

(1) Substrate Evaluation and Slope. The elevations of the developed portion of Edisto Beach range from 5 to 14 feet NGVD. The borrow area covers 1.49 nm² and is located between 1.5 and 2.5 miles southeast of the southern point of Edisto Island on an ebb-tidal shoal complex.

(2) Sediment Type. See section I.c. above.

(3) Dredged/Fill Material Movement. The material will be pumped as a slurry and shaped using land based equipment and training dikes. Some material, particularly any fine-grained sediments will be lost in the surf, but the majority of the material will remain on the island.

(4) Physical Effects on Benthos. Benthic organisms in the vicinity of the construction, either dredging or placement, will be impacted by the construction. However, the construction is temporary, and it is expected that organisms will recolonize the disturbed areas following construction activities.

(5) Actions Taken to Minimize Impacts. The amount of material removed from the borrow sites will only be that quantity necessary to accomplish the project, thereby minimizing impacts to the greatest extent possible. Additionally, the project will maintain a one foot vertical buffer in the borrow area which will allow for similar substrate material to remain following the dredging. This practice will allow for a faster recolonization of similar macroinvertebrates to the existing condition. If possible, the project will use a hopper dredge to minimize the impact to the borrow area. Timing and funding constraints may limit this measure.

b. Water Circulation, Fluctuation and Salinity Determinations.

(1) Water.

(a) Salinity. This activity will occur in the open ocean and on an adjacent beach. Construction will have no impact on salinity.

(b) Water Chemistry. Temporary changes in water chemistry related to increased turbidity levels and potential decrease in DO at the construction site may occur. Impacts would be temporary and minimal in nature.

(c) Clarity and Color. The water may become temporarily cloudy at the construction site during construction activity due to increased turbidity levels associated with disturbance of sediments. As noted above, this is expected to return to normal levels shortly after construction ends because the nourishment sand is of similar physical characteristics to the native beach sands.

(d) Odor. Construction activities may result in a release of hydrogen sulfide (rotten egg) odor from the disturbance of sediments. This should be minimal, and will be a temporary impact which would not result in long-term effects.

(e) Taste. Not applicable.

(f) Dissolved Gas Levels. There may be minor impacts to dissolved oxygen levels as a result of increased turbidity levels and from sediment oxygen demand. These would be similar to any dredging project, and the impacts will be localized and temporary.

(g) Nutrients. No impacts to nutrient loading at the dredging site or on the beach are expected to occur.

(h) Eutrophication. Not applicable.

(2) Current Patterns and Circulation.

(a) Current Patterns and Flow. This project will not change present current patterns or flow in or around Edisto Bach. Regarding the groin construction, results of a coastal engineering analysis determined that this minimal amount of lengthening will not have any downdrift impacts as the design is simply to stabilize the proposed berm width. Because the distance between the landward toe of the dune and the seaward edge of the berm for the beach design exceeds the existing condition distance between these same points along certain reaches within the project, the effective length of the groins in these areas will be reduced. Consequently, the length of some groins will need to be increased in order to create beach width necessary to maintain the design cross-section. The proposed groin lengthening is not provided as a means for trapping more sand and increasing beach width or significantly changing the rate of sand bypassing the groins.

(b) Velocity. Not applicable.

(c) Stratification. Not applicable.

(d) Hydrologic Regime. This project will not change the present hydrologic regime.

(3) Normal Water Level Fluctuations. Water level will not change, but the increased beach elevations will provide protection to existing structures on the beach.

(4) Salinity Gradients. Salinity gradients will not change.

(5) Actions That Will Be Taken to Minimize Impacts. Groins are only proposed to be lengthened to a point to help hold the constructed berm profile in place. There are no additional actions needed since there are not measurable impacts to current patterns and circulation.

c. Suspended Particulate/Turbidity Determinations.

(1) Expected Changes in Suspended Particulates and Turbidity Levels in the Vicinity of the Disposal Site. Turbidity will increase during construction/disposal operations, but will return to normal levels when construction is complete.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column.

(a) Light Penetration. During construction, light penetration at the disposal site may diminish slightly due to a temporary increase in turbidity levels. Light penetration will return to normal levels following construction.

(b) Dissolved Oxygen. Dissolved oxygen (DO) levels may decrease during construction at the disposal site as a result of increased turbidity and in oxygen demanding substances. However, this decrease will be minimal due to the dynamic characteristics of the ocean and the ebb-tidal shoal complex that the borrow site is situated on, and DO levels should return to normal conditions immediately following construction.

(c) Toxic Metals and Organics. The borrow sites have been tested for grain size analysis and are predominantly sand and shell. No further testing is required since contaminants would not be associated with the sandy substrates.

(d) Pathogens. Not applicable.

(e) Aesthetics. During construction, there would be an increase in the ambient noise levels, which will return to normal levels following construction. In addition, construction activity on the beach obstructs the visual aesthetic of the ocean, but it is a temporary effect, which will also return to normal immediately following construction. Construction will occur on only one portion of beach at a time so the impacts will be short term and spread out over the project. Additionally, when possible, construction will occur during the winter months (between late fall and early spring) when recreational beach activity will be minimal.

(3) Effects on Biota.

(a) Primary Production & Photosynthesis. Although there will be some turbidity at the construction site, it is not expected that measurable impacts to primary production and photosynthesis will occur since the area of impact is small.

(b) Suspension/Filter Feeders. Temporary impacts would include increased turbidity, which may reduce oxygen levels and impact food intake to organisms at the construction site. However, water clarity and dissolved oxygen concentrations will improve following construction.

(c) **Sight Feeders.** A minimal, temporary disruption due to construction disturbances is possible. A rapid recovery is expected since most sight feeders are transient and can relocate until construction activities are complete.

(4) **Actions taken to Minimize Impacts.** As mentioned above in Section II.(a)(5), a vertical buffer will be included in the borrow area so that the material left after construction in the borrow area is similar to the existing surface material. This should allow for faster recovery by benthic macroinvertebrates.

d. Contaminant Determinations. The borrow sites have been tested for grain size analysis and are predominantly sand and shell. No further testing is required since contaminants would not be associated with the sandy substrates.

e. Aquatic Ecosystem and Organism Determinations.

(1) **Effects on Plankton.** Effects on plankton would be related to turbidity associated with the construction activity. Effects would be minor and temporary in duration.

(2) **Effects on Benthos.** Benthic activity at the construction site would be impacted as bottom sediments are disturbed or placed on the beach. These disturbances will be temporary and recolonization on the beach will occur following construction. Historically, SC beaches have seen rapid recovery (one to six months) of beach sediment characteristics. This will likely be true with the proposed project.

(3) **Effects on Nekton.** Not significant.

(4) **Effects on Aquatic Food Web.** Not significant.

(5) **Effects on Special Aquatic Sites.**

(a) **Sanctuaries and Refuges.** Not applicable.

(b) **Wetlands.** Not applicable.

(c) **Mud Flats.** Not applicable.

(d) **Vegetated Shallows.** Not applicable.

(e) **Coral Reefs.** Not applicable.

(f) **Riffle and Pool Complexes.** Not applicable.

(6) Threatened and Endangered Species. Although there are known threatened or endangered species within the project area, the potential impacts have been addressed in the Biological Assessment (BA) and integrated feasibility study/environmental assessment and coordinated with pertinent state and Federal agencies. Subsequently, unacceptable adverse impacts to threatened or endangered species are not anticipated or expected. Refer to BA for details.

(7) Other Wildlife. A wide variety of wildlife - birds, mammals, reptiles and amphibians - utilize the beach and ocean. Impacts to wildlife in the project area would be associated with the construction activities and the placement on top of existing dunes. Wildlife would be expected to leave the area during construction, but would return when construction is complete. Birds have been known to forage in the renourished areas due to the abundance of invertebrates at those sites. The planting of native beach vegetation along the constructed dune portion of the project would facilitate a relatively quick recovery of this valuable habitat.

(8) Actions to Minimize Impacts. Plans and specs for the project will specify requirements to ensure impacts to the environment are minimized or avoided. The landward construction line was moved seaward in the inlet reach to avoid impacts to rare and valuable maritime forest habitat.

f. Proposed Disposal Site Determinations.

(1) Mixing Zone Determination. Not applicable. The State of South Carolina Department of Health and Environmental Control (SCDHEC) does not recognize mixing zones.

(2) Determination of Compliance with Applicable Water Quality Standards. Section 401 Water Quality Certification for beach nourishment and groin projects has been currently granted without review due to the similarities between projects and the known level of minimal environmental impacts.

(3) Potential Effects on Human Use Characteristics.

(a) Municipal and Private Water Supply. Not applicable.

(b) Recreational and Commercial Fisheries. The presence of the dredge and the pipeline may cause commercial or recreational fisherman and commercial shrimpers to utilize different routes or fishing locations since the pipeline will extend perpendicular to the coast for a distance of up to 2.5 miles. However, this should result in minimal, temporary impacts to the fishery.

(c) Water Related Recreation. Water related recreational activities may be limited on the beach and in the waters adjacent to the beach due to the presence of the pipeline and equipment. These limitations will move along the beach as the construction activity advances.

(d) Aesthetics. The construction activity will have a negative impact on visual and audible aesthetics. However, the activity will move relatively rapidly down the beach, so no one area will endure the aesthetic impacts for long.

(e) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves. Beach and water related recreational activities may be temporarily limited due to the presence of the pipeline and equipment. These limitations will pass through and move along the portion of the beach fronting the park area as the construction activity advances. Edisto Beach State Park is at the north end of the project. This area will benefit by the application of a taper from groin 1 into the park by a distance of 1000 feet. Since the longshore current is predominately north to south, the proposed project will not likely have much more of a positive impact on the State Park.

g. Determination of Secondary and Cumulative Effects on the Aquatic Ecosystem.

Initial negative effects related to this project include those associated with turbidity, impacts to the benthic community, and aesthetics. These effects are considered temporary. Long-term, permanent effects will provide for the restoration of a dune system which will provide storm damage protection for structures on the island as well as nesting habitat for endangered sea turtles as well as shorebirds. The beneficial long term effects outweigh the negative temporary effects associated with the construction activity.

III. FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE.

- a.** No significant adaptations of the guidelines were made relative to this evaluation.
- b.** Alternatives that were considered are included in the 2013 Integrated Feasibility Study/Environmental Assessment.
- c.** The proposed construction described in this evaluation would not cause or contribute to violations of any known applicable state water quality standards, which would result in permanent damage to the ecosystem.
- d.** The proposed project will not violate the Endangered Species Act of 1973.
- e.** The proposed project will not violate any specified protection measures for marine sanctuaries designated by the Marine Protection, Research, and Sanctuaries Act of 1972.

f. The proposed project will not result in significant adverse affects on human health and welfare in regard to municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life states of aquatic life and other wildlife will not be adversely affected. Significant adverse affects on aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic and economic values will not occur.

g. Steps taken to minimize potential adverse impacts of the construction on aquatic ecosystems include limiting construction to the minimum alternative needed to provide the required protection. Also, the landward construction limit was shifted seaward to avoid impacts to maritime forest. Lastly, a one foot vertical buffer was provided in the borrow area which will allow for faster recolonization by benthic macroinvertebrates. Plans and specs will provide guidance and requirements to avoid/minimize impacts to threatened and endangered species and other aquatic and terrestrial life.

h. The State Historic Preservation Office has expressed concern about two potential prehistoric sites found in the proposed borrow site survey. These areas have been afforded a 1,500 foot buffer and will not be impacted by the proposed dredging. There are no other cultural/historic resource impacts. Therefore, the proposed project will not cause unacceptable adverse impacts to any known cultural resources.

i. On the basis of the guidelines, the proposed construction is specified as complying with the requirement of these guidelines, with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects on the aquatic ecosystem.

DATE

John T. Litz, PMP
Lieutenant Colonel, U.S. Army
Commander and District Engineer