

**DRAFT ENVIRONMENTAL  
ASSESSMENT  
AND  
FINDING OF NO SIGNIFICANT IMPACT**

**TYBEE ISLAND SHORE PROTECTION  
PROJECT,  
GEORGIA  
2015 RENOURISHMENT**

**U.S. ARMY CORPS OF ENGINEERS  
SAVANNAH DISTRICT**

**DECEMBER 2013**

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## **FINDING OF NO SIGNIFICANT IMPACT**

### **Name of Action: Tybee Island Shore Protection Project, Georgia 2015 Renourishment**

**1. Project Description:** The U.S. Army Corps of Engineers, Savannah District (Savannah District) is proposing to perform a periodic renourishment to the Tybee Island Shore Protection Project, an authorized Federal project. The project includes placing approximately 1,748,750 cubic yards (c.y.) of material on the beach at Tybee Island within the limits of the Federal project. The exact quantity to be placed and the final project template will be determined based on physical conditions and funds available at the time of construction.

**2. Coordination:** Savannah District will coordinate this project with Federal and State resources agencies and the interested public and issue a Notice of Availability of the draft Environmental Assessment (EA) in order to:

- a. Inform agencies and individuals of the proposed work and the environmental evaluation contained in the draft EA, and
- b. Provide an opportunity for comments on that evaluation and findings.

### **3. Environmental Impacts:**

a. The proposed renourishment is very similar to what has previously been performed at Tybee Island during the first periodic renourishment in 1987 by the Savannah District, the subsequent 1995 work by Georgia Ports Authority (GPA), and the renourishments in 2000 and 2008, also conducted by the Savannah District, in that similar techniques and equipment will be used.

b. All previous renourishments at Tybee Island received required environmental approvals. The U.S. Fish and Wildlife Service (USFWS) is preparing an updated Biological Opinion (BO) to address nesting loggerhead sea turtles and leatherback sea turtles, non-breeding piping plovers, and designated critical habitat for the piping plovers. The Atlantic Sturgeon, a newly-listed species since the last renourishment was performed, will be analyzed in accordance with the Endangered Species Act (ESA) for this renourishment, and an Essential Fish Habitat (EFH) analysis will be submitted to the National Marine Fisheries Service (NMFS). The Savannah District, USFWS, and NMFS concur that if recommendations to minimize take on listed species are implemented as outlined in the USFWS BO and EFH, the renourishment may affect, but is not likely to adversely affect listed species or designated critical habitat.

c. The proposed action is in compliance with all environmental laws. Environmental approvals/requirements are listed in Table 12 of this EA. Unavoidable adverse impacts to benthic communities would occur as a result of the proposed project. Individual organisms within the benthic communities would be lost as a result of the proposed excavation and renourishment activities. However, benthic organisms would be expected to recolonize the borrow area and beach. A layer of sandy sediment will be left at the surface of the borrow area

to encourage recolonization. Special conditions as described in the Final EA will be incorporated into the construction contract and a watch and monitoring program will be implemented to protect threatened and endangered species that may occur in the project area.

d. The high compatibility and low percent fines of the borrow area sediment should reduce turbidity levels during construction. A small turbidity plume is expected at the beach discharge point in association with construction activities. However, this increase is not likely to result in a violation of state water quality standards and should be temporary in nature. Temporary shore-parallel dikes will be constructed in the immediate construction area as needed to control the effluent and maximize the settling of sediments from the discharge before the waters reach the Atlantic Ocean. Significant adverse cumulative impacts to water quality should not occur as a result of this project.

e. No adverse secondary impacts which have a significant probability of occurrence were identified from either the proposed excavation or nourishment operations.

f. Overall, the environmental impacts of implementing the proposed action are expected to be minor in scope and temporary in duration.

**4. Determination:** I have determined that this action does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, the action does not require the preparation of a detailed statement under Section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*). My determination was made considering the following factors discussed in this EA:

a. The proposed action has been designed to minimize impacts and avoid adverse impacts to threatened or endangered species potentially occurring in the project area.

b. No unacceptable adverse cumulative or secondary impacts would result from project implementation.

c. The work has been designed to avoid impacts to any potential cultural resources in the project area.

d. No additional long term adverse impacts to the environment would be associated with the proposed project.

e. No significant impacts on air quality are expected from the proposed project.

f. The proposed action complies with Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations", and does not represent disproportionate high and adverse human health or environmental effects on minority populations and low-income populations in the United States.

g. The proposed action does not involve activities that would pose any disproportionate environmental health risk or safety risk to children in accordance with EO 13045, Protection of Children from Environmental Health Risks and Safety Risks (21 April 1997).

h. No work will be performed before November 1, 2015 or after April 30, 2016, in order to avoid impacts to nesting sea turtles without obtaining approval from Georgia Department of Natural Resources, Coastal Resources Division.

**5. Findings:** The proposed Tybee Island Shore Protection Project 2015 Renourishment would result in no significant adverse environmental impacts and is the alternative that represents sound engineering practices and meets environmental standards.

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Date

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Thomas J. Tickner  
Colonel, U.S. Army  
Commanding

**2015 TYBEE ISLAND SHORE PROTECTION PROJECT  
GEORGIA  
DRAFT ENVIRONMENTAL ASSESSMENT**

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**2015 TYBEE ISLAND SHORE PROTECTION PROJECT  
DRAFT  
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**E.1.00. PURPOSE AND NEED FOR ACTION**

The purpose of this document is to evaluate the environmental impacts of the proposed beach renourishment for the Tybee Island Shore Protection Project on Tybee Island, Georgia. The proposed renourishment is very similar to what has previously been performed at Tybee Island during the first nourishment in 1987, the subsequent 1995 work by Georgia Ports Authority (GPA), and the renourishments in 2000 and 2008 in that similar techniques and equipment will be used.

**E.1.01. BACKGROUND**

Tybee Island is located 17 miles east of Savannah at the mouth of the Savannah River on the Atlantic Ocean. The highly developed island is bordered on the north by the South Channel of the Savannah River, on the east by the Atlantic Ocean, and on the south and west by the Back River and other tidal creeks. Tybee Island has an average width of 0.5 miles and the ground elevation varies from 10 to 18 feet above Mean Lower Low Water (MLLW) and slopes westward to the salt marshes. Figure 1 is a map of the project area.

This authorized 3.5 mile long project was initially constructed in 1974 with a 50-year project life and periodic renourishments to occur every 7 years. The beach was last renourished in 2008 and is scheduled to be renourished again in 2015. In 2015, there will be 9 years left in the project life (i.e. Federal participation). The Savannah District, with the non-Federal sponsor's concurrence, selected to perform the 2015 periodic renourishment for the remaining 9 years of the 50-year project life. The renourishment volume to be placed includes the volume needed to restore the project plus an additional 312,000 cubic yards to account for potential erosion through 2024. The beach template will be slightly modified to include placement of the additional material by extending the berm up to the North terminal groin of the template. This area has been nourished during previous renourishment cycles, but not during the 2008 renourishment. In addition, the berm will be extended seaward up to 50 feet beyond the previously constructed template to account for erosion during the additional 2 years for a 9 year cycle. The same borrow area that was used for the 2008 renourishment, Borrow Area 4, will be used for this final renourishment. Table 3 provides a history of previous beach nourishments.

**Figure 1: Location Map, Tybee Island, Georgia**



(Source: Bing Maps Hybrid 2010)

### **E.1.02. Scope and Authority**

The original Tybee Island Beach Erosion Control Project was authorized in June 1971 by Senate and House resolutions pursuant to Section 201 of the Flood Control Act of 1965 (Public Law 89-298), as presented in House Document No. 92-105, for a life of 10 years. Section 201 provided a procedure for authorization of projects with, at that time, an estimated Federal first cost of construction of less than \$10 million. The authorizing language reads as follows:

*“RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That pursuant to the provisions of Section 201 of Public Law 298, Eighty-ninth Congress, (79 Stat. 1073; 42 U.S.C. 1962d-5) the project providing for beach erosion control on Tybee Island, Georgia, is hereby approved substantially in accordance with the recommendations of the Secretary of the Army and the Chief of Engineers in House Document Numbered 105, Ninety-second Congress, at an estimated cost of \$404,000.”*

The authority for Federal participation in periodic renourishment of beach projects was increased from 10 years to 15 years by Section 156 Water Resources Development Act (WRDA) 1976, which reads as follows:

*"The Secretary of the Army, acting through the Chief of Engineers, is authorized to provide periodic beach nourishment in the case of each water resources development project where such nourishment has been authorized for a limited period for such additional periods as he determines necessary but in no event shall such additional period extend beyond the fifteenth year which begins after the date of initiation of construction of such project."*

Section 934 of WRDA 1986 modified Section 156 of WRDA 1976 by extending the authority for Federal participation in periodic renourishment from 15 years to 50 years and reads as follows:

*"Section 156 of the Water Resources Development Act of 1976 (42 U.S.C. 1962d-5f) is amended by striking out "fifteenth" and inserting in lieu thereof "fiftieth."*

Following the passage of WRDA 1986, Savannah District prepared a “Section 934” report which concluded that the authorized Federal project for Tybee Island was economically feasible under then current policy and economic guidelines, and the project should be extended for the remaining life of 30 years (from 1994). The study was initiated in 1990, completed in October 1994 and approved in June 1995. The project life of the Tybee Island Beach Erosion Control Project began in September 1974, with initiation of construction of the North Terminal Groin, and, therefore, extends through September 2024.

The Federal project was further modified by Section 301 of WRDA 1996, which amended the authorized project as follows:

*“The project for beach erosion control, Tybee Island, Georgia, authorized pursuant to section 201 of the Flood Control Act of 1968 (42 U.S.C. 1962d-5; 79 Stat. 1073-1074) is modified to include as an integral part of the project the portion of Tybee Island located south of the existing south terminal groin between 18<sup>th</sup> and 19<sup>th</sup> Streets, including the east bank of Tybee Creek up to Horse Pen Creek.”*

By letter dated 14 March 1997, Headquarters, U.S. Army Corps of Engineers (HQUSACE) authorized a study to determine if the South Tip Beach and Tybee Creek up to Horse Pen Creek should be added to the authorized Tybee Island Beach Erosion Control project. The “Special Report on South Tip Beach/Tybee Creek” was completed in May 1998 in response to this authority and was approved by HQUSACE in August 1998. The report recommended extending the southern limits of the authorized project for an additional 1,100 feet to provide protection for structures along the South Tip and another 1,800 feet to provide protection to the northern bank of the Back River/Tybee Creek.

### **E.1.03. Project Description**

The authorized project consists of nourishment of 13,200 linear feet of beach between two terminal groins (referred to as Oceanfront Beach); construction of a groin field along 1,100 linear feet of shoreline from the southern terminal groin around the South Tip to the mouth of Tybee Creek (also known as Back River) including periodic nourishment (referred to as South Tip Beach); and construction of a groin field and nourishment of 1,800 linear feet of the eastern bank of Tybee Creek to the city fishing pier (referred to as Back River Beach). The remaining shoreline from the fishing pier to the mouth of Horse Pen Creek, although included in the authorizing language of WRDA 1996, is relatively stable at this time and no hurricane and storm damage protection measures have been constructed in this reach. The existing approved Borrow Area 4 will be used for this renourishment.

The borrow area is 7,000 feet southeast of the southern tip of Tybee Island. This borrow area was used by GPA for the 1994 beach nourishment, and again by the Savannah District for the 2001 and 2008 renourishments. The area was expanded to the north for the 2008 renourishment project.

As proposed, the project will be constructed using a hydraulic cutterhead pipeline dredge and support equipment. A submerged pipeline will extend from the borrow site to the southerly tip of Tybee Island. Shore pipe will be progressively added to perform fill placement along the shorefront or creekfront areas to be renourished. The contractor will not impinge on beach dunes during construction as work will be conducted from the existing beach and newly placed material. Temporary toe dikes will be utilized in a shore parallel direction to control the hydraulic effluent and reduce turbidity. The sand will be placed in the form of varying design templates based upon longshore volumetric fill requirements which reflect beach conditions at the time of construction. Additional beach fill will be strategically placed in areas of

documented highest erosional stress such as the 2nd Street “hot spot”. Figure 2 shows the proposed fill limits and locations.

The proposed sand source for this renourishment is the same borrow area that was used for the 2008 renourishment. However, different locations within the same borrow area will be utilized. The borrow area is located approximately 7,000 feet (1.3 miles) southeast of the southernmost Federal terminal groin. Figure 3 shows the location of the borrow area. The NW facing side of the 2015 borrow location is 3900 ft (long edge toward Tybee). The NE facing side of the 2015 borrow location is ~3160 ft (long edge facing the ocean.) The total area of the proposed 2015 borrow area (dark green hatch) is ~213 acres. Total area of the blue hatched area of 2008 borrow locations is ~256 acres. Total of yellow "original borrow area limits" is ~298 acres.

The USACE 1994 Section 934 report evaluated 26 combinations of alternate berm widths (40 to 70 feet), berm heights (+11.0 to +17.0 feet), and beach slopes. This provided a variety of potentially feasible widths and heights. Five alternate berm widths and heights were selected for detailed evaluation, and costs and benefits were computed for each of the alternatives. The analysis concluded a 40-foot wide berm at elevation +11.0 with 1V:20H slope was the most desirable oceanfront beach template for all nourishments.

In the 1998 Environmental Assessment for South Tip Beach/Tybee Creek, it was concluded that in order to maintain the integrity of the restored beach at Back River between periodic renourishment, advance nourishment would be provided by placing fill material one foot above the beach template, up to elevation 12 feet Mean Low Water (MLW) and providing additional material on the beach slope. A berm elevation of +12 feet MLW and 1V:15H slope was proposed for the Back River/Tybee Creek segment of the proposed renourishment project.

The proposed project template design is based on project performance and erosion rates since the last renourishment project in 2008. Beach fill will primarily be placed in areas included in the previous renourishment in 2008. These areas include the North Beach (North End Groin to Oceanview Court), Second Street area (Oceanview Court to Center Street), Middle Beach (Center Street to 11th Street), South Beach (11th Street to South End Groin), and Back River/Tybee Creek (South Tip Groin Field to Inlet Avenue). Additional fill will be placed between these areas to provide a more stable beach profile and to avoid some of the excessive losses in the 2nd Street “hot spot” from project end losses and offshore losses that resulted from the wide beach constructed at this location during the last renourishment. Constructed beach widths on the Back River Beach vary from 30 feet to 110 feet at +11.22 MLLW. Beach widths on the Oceanfront Beach will vary from a 25-foot width berm, to a berm approximately 350 feet wide at the elevation of +11.22 MLLW. Based on natural angle of repose on the existing beach, and experience with previous placement, a beach slope of 1 vertical on 25 horizontal will be required on the oceanfront beach. The Back River will have an 11.2 foot elevation MLLW and a 1V:15H slope. Figures 4 and 5 show the proposed design template.

Beach fill final placement will be based on physical conditions and funds available at the time of construction. Alternative bid schedules will be used to optimize the quantity of beach fill placed

for the funds available. The proposed project is expected to commence by November 2015, and be completed by April 30, 2016. Federal participation in the Federal project expires in 2024, 9 years after the time of the proposed construction.

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Figure 2: Proposed Fill Limits For 2015 Tybee Beach Renourishment

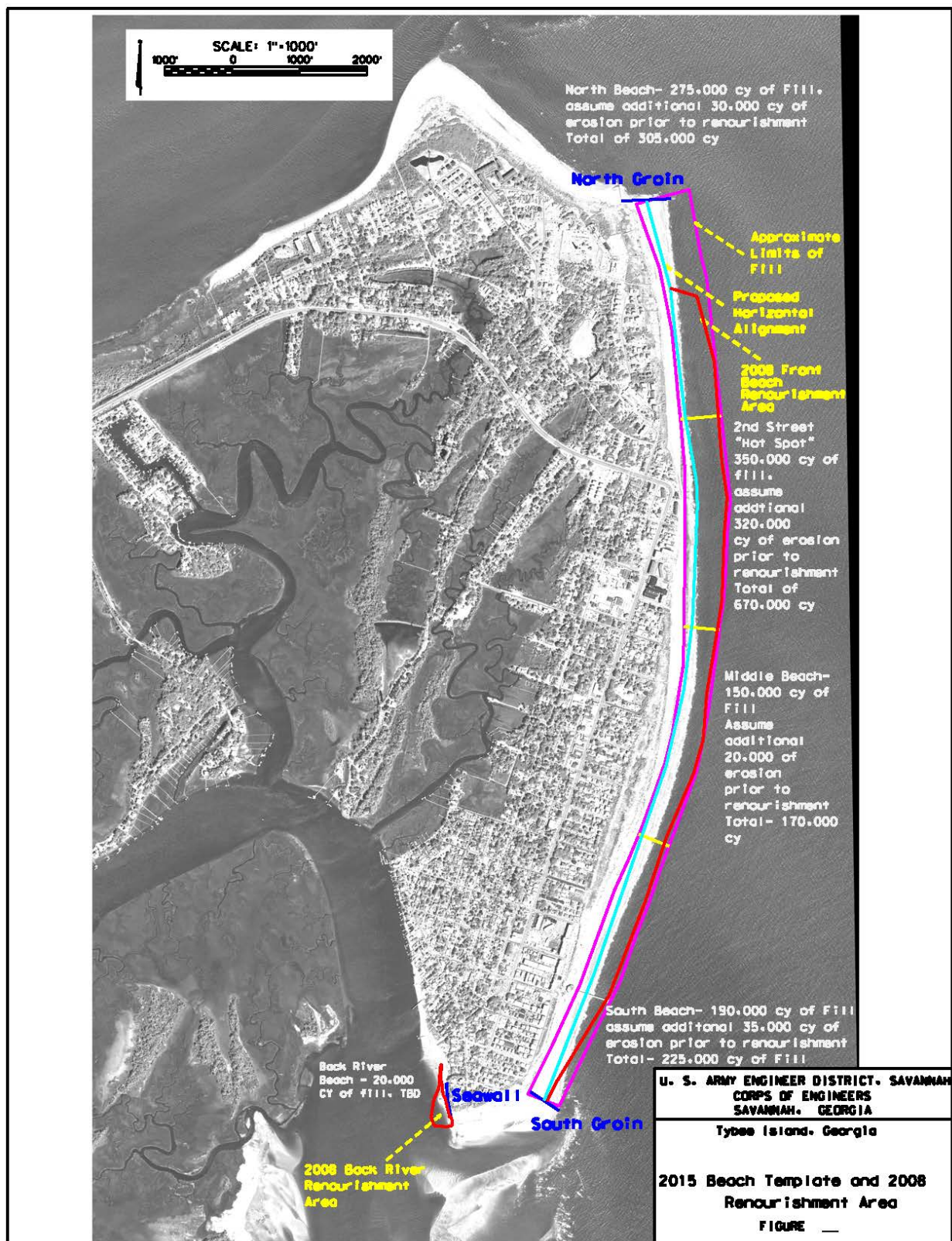
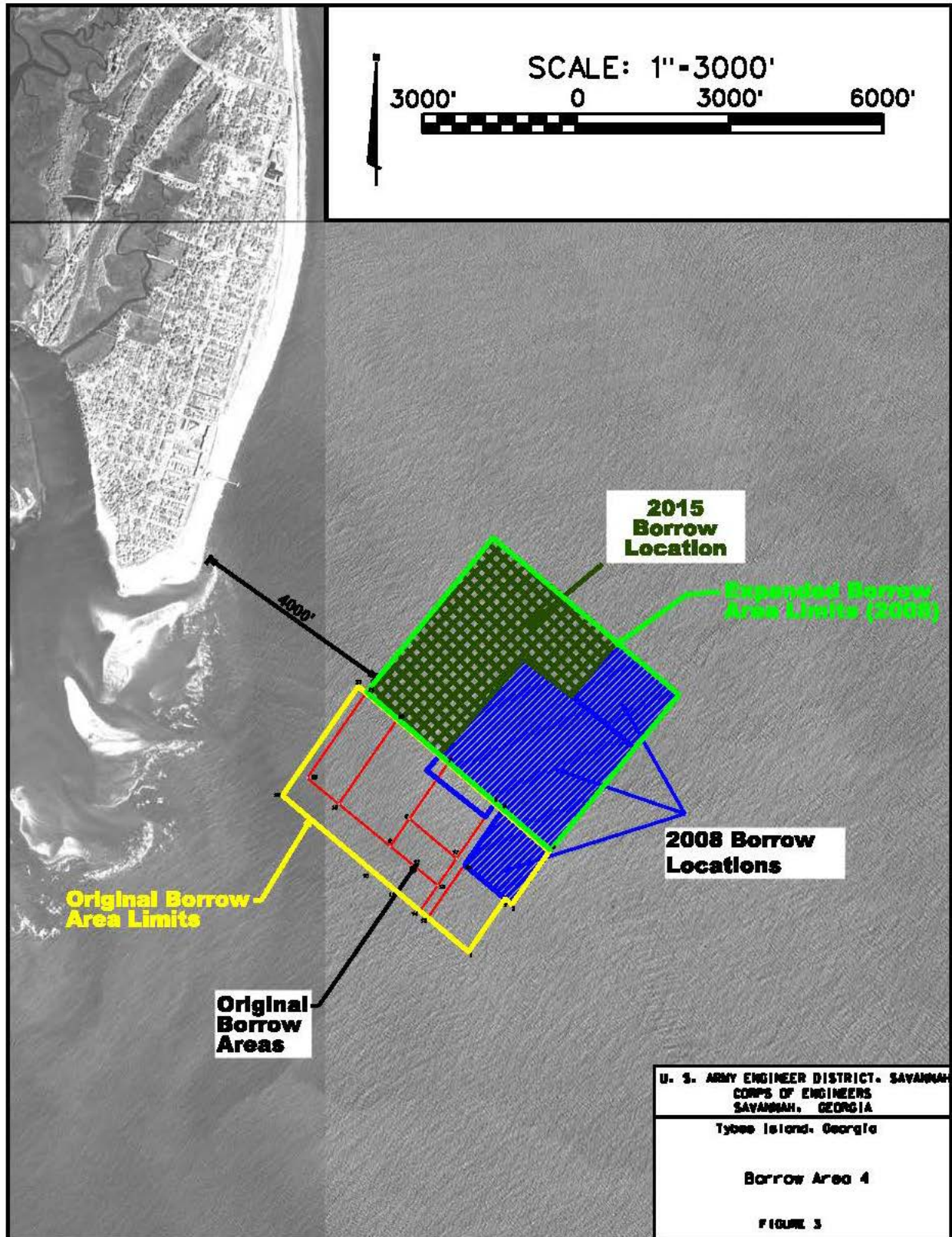




Figure 3: Proposed Borrow Area





## **E.2.00. ALTERNATIVES**

This chapter describes the alternatives and summarizes the environmental consequences for the proposed action including the Without Project Condition.

### **E.2.01. WITHOUT PROJECT CONDITION (NO ACTION)**

This alternative would result in continued erosion to the Tybee Island Shore Protection Project, including potential loss of property and structures. Since December 2008 an average loss of approximately 164,000 cy/yr has occurred on the oceanfront beach. The majority of erosion occurred at the Second Street “hot spot” with a lesser degree of erosion in the vicinity of the Tybrisa Pier. With no renourishment, the beach would continue to erode, with a concomitant loss in storm damage protection and recreational benefits. In addition, if erosion were to be allowed to continue unimpeded, seawall and dune damage would be expected to occur at an accelerated rate.

### **E.2.02. ALTERNATIVE B. BEACH RENOURISHMENT**

The proposed project template design is based on project performance and erosion rates since the last renourishment project in 2008. Beach fill will primarily be placed in areas included in the previous renourishment in 2008. These areas include the Oceanfront North Beach from the north terminal groin to Center Street, the Oceanfront South Beach from 11th Street to the South End Terminal (Federal) Groin, and the Back River Beach from Inlet Avenue to Southernmost end of Groin G-1 in the South Tip Groin Field (Figure 2). Additional fill will be placed between these areas to provide a more stable beach profile and to avoid some of the excessive losses in the 2nd Street “hot spot” from project end losses and offshore losses that resulted from the wide beach constructed at this location during the last renourishment. Constructed beach widths on the Back River Beach vary from 30 feet to 110 feet at +11.22 MLLW. Beach widths on the Oceanfront Beach will vary from a 25 foot width berm, to a berm approximately 350 feet wide at the elevation of +11.22 MLLW. Based on natural angle of repose on the existing beach, and experience with previous placement, a beach slope of 1 vertical (V) on 25 horizontal (H) will be required on the oceanfront beach. The Back River will have an 11.2 foot elevation MLLW and a 1V:15H slope (Figures 4 and 5). The constructed berm width is calculated to protect the authorized template for 9 years.

The recommended fill volume would be for placement of approximately 1,748,750 cubic yards (c.y.) within the limits of the Federal Project. For this alternative, approximately 350,000 c.y. of fill would be placed at the 2nd Street erosional “hot spot”, 150,000 c.y. of material on the Middle Beach, 190,000 c.y. on South Beach and 8,000 c.y. of material on the Back River Beach (Table 1). These volumes represent project requirements to take the project to the end of its 50-year life. Dependant on funding available at the time of construction and uncertainties in renourishment prices, alternate bid schedules may be included for smaller projects to assure the maximum project can be awarded at an acceptable price.

### **E.2.03. RECOMMENDED ALTERNATIVE**

Beach renourishment, Alternative B, is the selected alternative. Based on previous studies and the current condition of the beach it is apparent that taking no action would continue to result in erosion of the beach at Tybee Island. The 1,748,750 c.y. alternative is considered to be the design fill volume required for protection of the total authorized Federal beach template for the next 9 years.

### **E.2.04. FILL VOLUMES**

The next periodic renourishment for the project is scheduled to occur in Fiscal Year (FY) 2015. The actual start date of construction is subject to appropriation of Federal funds. At that time, the volume of material eroded from the beach would be replaced with the amount such that the beach template would be protected until the end of the project life in 2024. Rather than initiating a project to place 2 years of fill on the beach in 2022, an additional 2 years of advance nourishment will be placed on the beach in FY15 to carry the project to the end of the project life in 2024. The fill will be shoreward of the previous berm and in a uniform manner over the beach length to prevent excessive erosion in the fill. The fill volumes shown in Table 1 are in-place volumes, unless stated otherwise. The Back River Groin field consists of 7 groins, the shoreline length of 5 groins is 100 feet, and 2 groins are 50 feet long – designed to extend into the breaker zone and intercept the longshore transport of material in the littoral zone (1998 South Tip Report). Table 1 shows the anticipated design volumes for the 2015 renourishment.

Draft Environmental Assessment  
 Tybee Island Shore Protection Project, Georgia  
 Figure 4: Template Design for Recommended Alternatives  
 2015 Renourishment

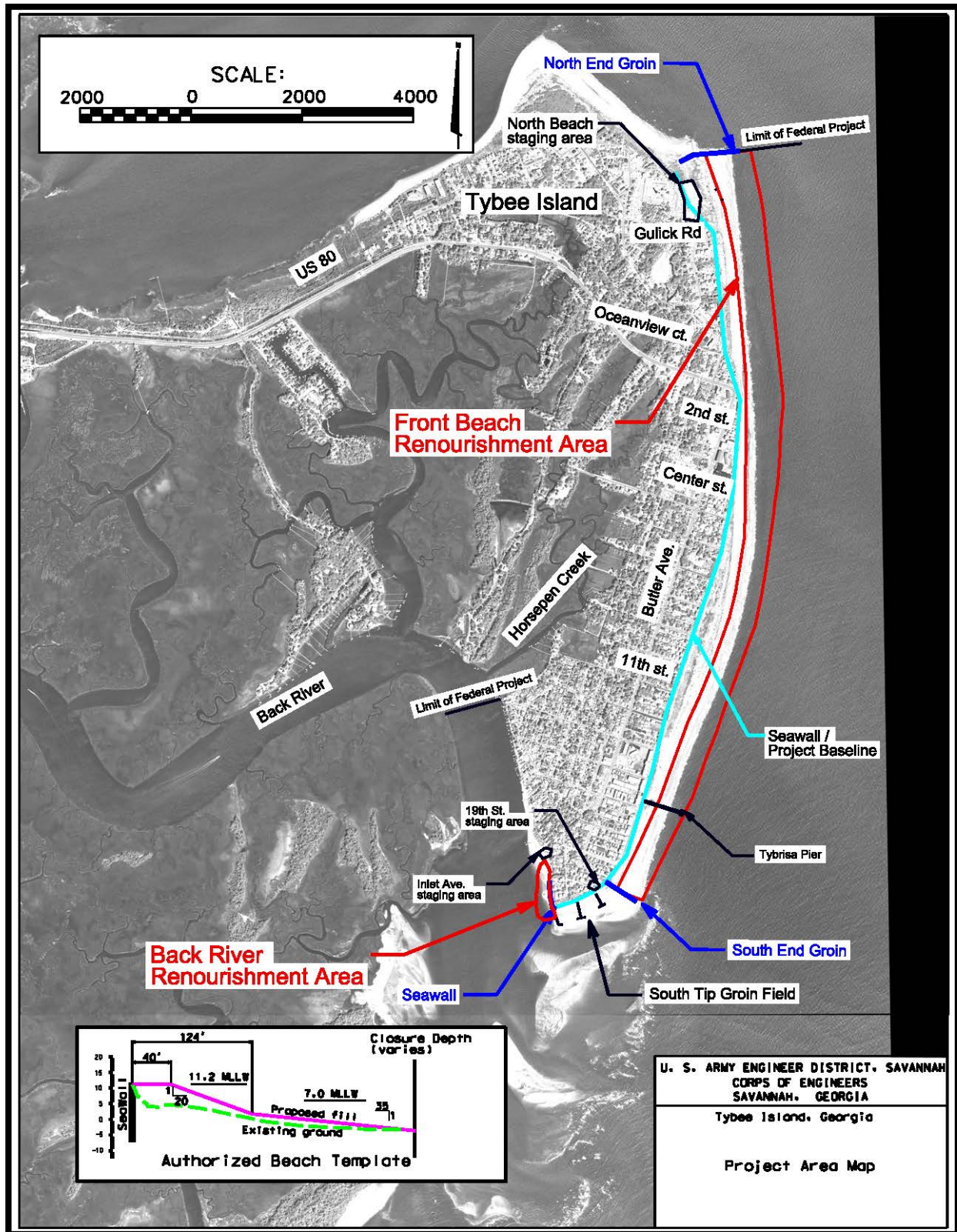
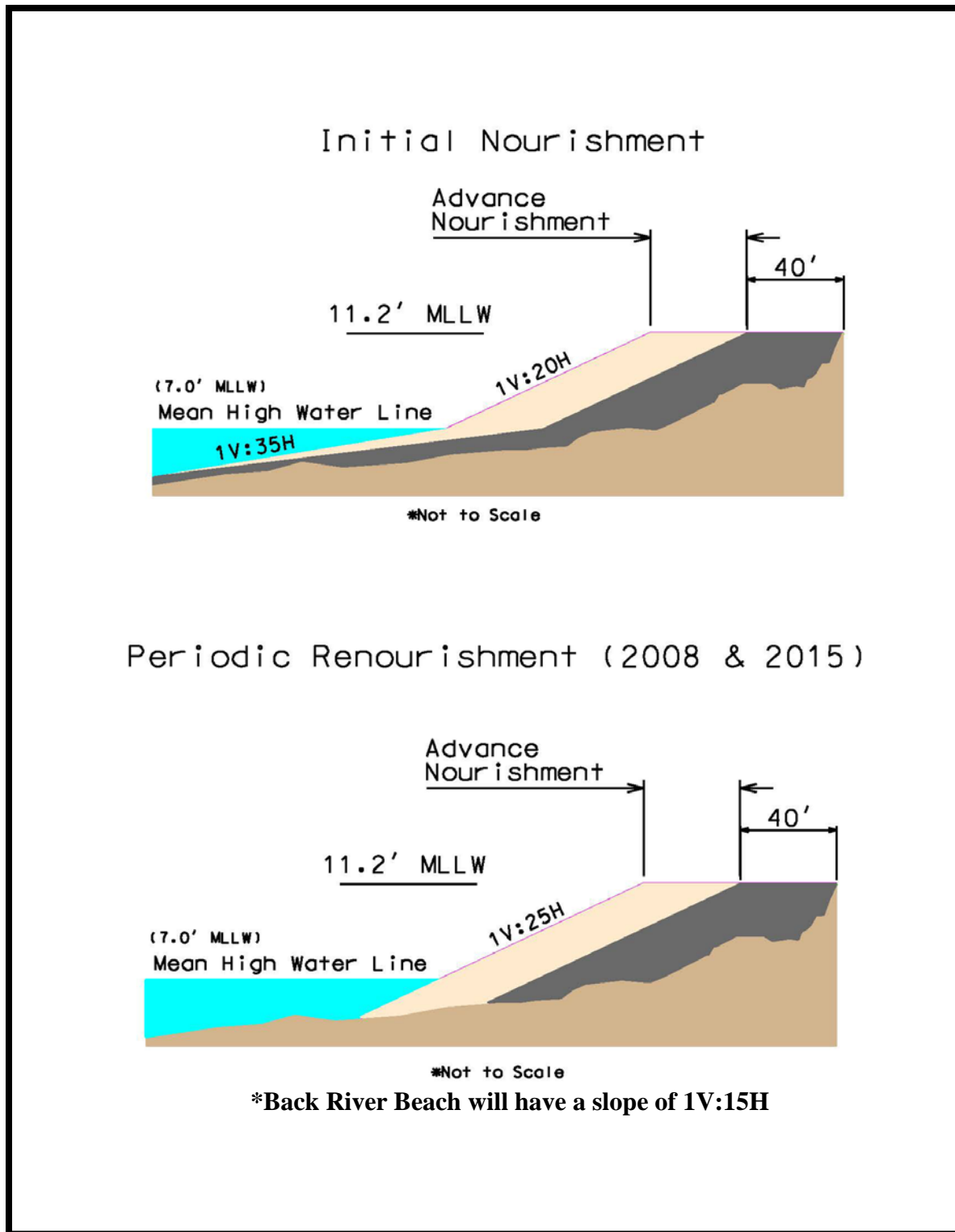


Figure 5: Proposed Template\*



**Table 1.**  
**Quantity to Fill Design Template**  
**(Based On September 2012 Survey for 2015 Renourishment)**

<b>REACH</b>	<b>LOCATION</b>	<b>ANTICIPATED FILL VOLUME*</b>
R1	North Beach (North End Groin to Oceanview Court)	305,000 yd <sup>3</sup>
R2	Second St renourishment area (Oceanview Court to Center Street)	670,000 yd <sup>3</sup>
R3	Middle Beach (Center Street to 11 <sup>th</sup> Street)	170,000 yd <sup>3</sup>
R4	South Beach (11 <sup>th</sup> Street to South End Groin)	225,000 yd <sup>3</sup>
R5	Back River/Tybee Creek (South Tip Groin Field to Inlet Avenue)	29,000 yd <sup>3</sup>
	Total	1,399,000 yd <sup>3</sup>
	Anticipated dredging volume (assuming 20% loss during placement)	1,748,750 yd <sup>3</sup>

\* includes volume to replace erosion since last renourishment, plus erosion anticipated before the 2015 renourishment (156,000 cy per year based on long term erosion rates between 2001 and 2012), and an additional 312,000 yd<sup>3</sup> to cover 2 additional years of fill. The highest density of fill will be placed on the Second Street Beach, in the area with the highest long term erosion rate.

#### **E.2.05. VOLUMETRIC CHANGES**

The September 2012 survey provided by the City of Tybee Island is the most recent beach profile survey for the project area. Recent surveys have substantiated the long term erosion rate, with an average of approximately 164,000 cy/yr erosion on the oceanfront beach between completion of the last renourishment (2008) and September of 2012. The majority of this erosion occurred at the Second Street “hot spot” with a lesser degree of erosion in the vicinity of the Tybrisa Pier.

Erosion on the Back River Beach is concentrated in the area of the seawall. Erosion in this area since the last renourishment was approximately 8,000 c.y. A beach monitoring program would continue in order to document the effectiveness of the beach nourishment and to more accurately predict future renourishment volumes.

#### **E.2.06. BORROW SITE**

Borrow area 3 was the original borrow area used for the 1976 and 1987 beach nourishments and is located 3,200 feet south of the southern tip of the Island. This site was selected prior to the passing of the Coastal Barrier Resources Acts (COBRA) of 1982 and 1990 which are administered by the Department of Interior (DOI) USFWS. Borrow area 4 was first utilized in 1995 by the Georgia Ports Authority for partial beach nourishment. This borrow area was 142 acres and divided into five cells ranking in excavation priority (A,B,C,D,E). During the 1995 nourishment only cell A was used. Prior to the 2000 nourishment borrow area investigations discovered magnetic anomalies in cell A (likely dredging equipment from the 1995 nourishment) making it unsuitable for use in the 2000 project. An extensive study was conducted of the remaining cells and it was determined that the existing borrow area did not contain enough known suitable material to complete the project. Borrow area 4 was expanded in a northwesterly direction toward Tybee, staying outside the COBRA line, and two new areas, cells F (63 acres) and G (39 acres), were approved for inclusion into the now expanded borrow area 4. Complete details on the borrow area history and expansion may be found in the U.S. Army Corps of Engineers May 1998 Special Report on South Tip Beach/Tybee Creek Portion of Tybee Island Beach Erosion Control Project Georgia.

The proposed offshore borrow site is the same site that was used during the 2008 renourishment, borrow area 4. The previously used borrow area lies approximately 1.3 miles (~7,000 feet) southeast of the southernmost Federal terminal groin (Figure 3). Recent cultural resource surveys found no evidence for potentially significant resources in the borrow area (Panamerican Consultants, Inc. 2013).

Sediment compatibility analyses were performed for the previously authorized borrow site located immediately adjacent and south of the proposed expansion area. The geotechnical evaluation demonstrated that the sediment characteristics were typical of ebb tidal shoal and highly compatible with the existing beach sediments of Tybee Island (ATM 1994, Olsen, 2008). A layer of sandy sediment will be left at the surface of the borrow area to encourage recolonization.

Based on the report Entitled "Tybee Island, Georgia Beach Renourishment Project, 2007 Geotechnical Investigation" (Olsen Associates Inc., March 2008) the previously approved borrow area still has high quality material available for nourishment. Within the remaining portions of the borrow area approximately 84% of core samples have less than 1% fines to a depth of -16 feet MLLW. This is considered very high quality beach compatible sediment. The remaining 16% of core samples have between 1% and 4% fine material, with the highest fines content being at 3.5%. This is still considered high quality beach sediment. The average percent shell content is very similar to the existing beach, 9.9 % to -16 feet MLLW as compared to 12.6% on the existing beach.

#### **E.2.07. FUTURE PERIODIC RENOURISHMENTS**

If the project is extended past 2024 a new environmental assessment and a new authorization will be required that addresses continued Federal participation in the project.

#### **E.2.08. SUMMARY OF ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTIONS**

Potential adverse impacts identified for the proposed actions includes impacts to:

- Water quality
- Fishery resources
- Benthic communities
- Endangered and Threatened Species
- Shorebirds, waterfowl and other wildlife
- Recreation
- Aesthetics
- Air Quality

Table 2 shows comparative environmental impacts between the No Action Alternative and the recommended alternative.

**Table 2. Summary of Environmental Consequences 2015 Renourishment**

<b>Environmental Factor</b>	<b>Recommended Alternative</b>	<b>No Action Alternative</b>
<b>Water Quality</b>	Temporary increase in localized turbidity	No impacts
<b>Fisheries</b>	Short-term impacts to surf zone fishes due to increased turbidity and loss of habitat during construction	No impacts
<b>Benthics</b>	Major but short-term effects on benthic communities due to offshore dredging and nearshore placement	No impacts
<b>Endangered and Threatened Species</b>	Minor and short-term if construction occurs in recommended time period and if contract conditions are followed	Loss of habitat due to erosion
<b>Wildlife</b>	Minor effect	Minor effect
<b>Wetlands</b>	No impact	No impact
<b>Cultural Resources</b>	No impact if magnetic anomalies are avoided and protected	No impact
<b>Recreation Benefits</b>	Temporary decrease during renourishment but long term positive benefit	Negative impact due to loss of recreational beach
<b>Aesthetics</b>	Temporary negative effect during construction but long-term positive effect	Negative effect due to loss of beach
<b>Storm Damage Reduction Benefits</b>	Increased protection from storm erosion	Negative effect due to continued beach loss
<b>Erosion Control Benefits</b>	Positive effect due to renourishment	None
<b>Public Safety</b>	Temporary increased risk during renourishment due to dredge/heavy equipment	Increased risk due to erosion (larger waves, change in bathymetry)
<b>Air Quality</b>	Temporary decrease due to equipment discharge	No impact
<b>Vegetation</b>	No impact	Negative effect due to loss of substrate
<b>Energy Requirements and Conservation</b>	Insignificant energy requirements for beach renourishment	No impact
<b>Hazardous Waste</b>	No impact	No impact



#### **E.2.09. SUMMARY OF CONDITIONS TO MINIMIZE POTENTIAL ADVERSE IMPACTS**

To minimize potential adverse impacts to sea turtles and to protect larval and estuarine fishery resources, the District will attempt to schedule the majority of the work between November and 30 April. This construction window will avoid impacts to nesting sea turtles, migratory West Indian manatees, and benefit juvenile life stages of fishery species that are likely present in warmer months. The District will abide by Section 7 of the Endangered Species Act (Act) [16 U.S.C. 1531 *et seq.*] which outlines the procedures for Federal interagency cooperation to conserve Federally listed species and designated critical habitats. Through consultation with the District in 2008, a Biological Opinion (BO) was issued by USFWS to address the project's impacts to non-breeding piping plovers, critical habitat for the piping plover, and nesting loggerhead and leatherback sea turtles. A new BO may be developed for this renourishment. The District will consider any new Reasonable and Prudent Measures and implement measures to minimize take in this proposed renourishment. The 2008 BO concluded the project was not likely to jeopardize the continued existence of the loggerhead or leatherback sea turtles or the piping plover. No adverse modifications were determined for piping plover Critical Habitat Unit GA-1. The following Reasonable and Prudent Measures were recommended and implemented to minimize take of the above listed species:

The USACE included in their proposed action conservation measures to minimize the effects of this action on sea turtles and piping plovers:

1. Construction equipment and materials will be staged and stored in a manner that will minimize impacts to sea turtles and piping plovers to the maximum extent practicable.
2. Existing beach access points will be used for vehicle and equipment beach access to the maximum extent practicable. Existing vegetated habitat at the beach access points must be protected to the maximum extent practicable. The access must be delineated by fence or other suitable material to ensure vehicles and equipment transport stay within the access corridor.
3. Shorebird monitoring will be performed to detect piping plovers or concentrations of other shorebirds once a month for the entire beach and another time during the month on the critical habitat on the north part of the island. This will be done prior to and during the construction activities.

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of nesting and hatchling loggerheads and leatherbacks and non-breeding piping plovers in the proposed areas of dredged material placement and associated activities in the action area.

1. If the beach renourishment project extends into the sea turtle nesting season (beyond April 30), surveys for nesting sea turtles must be conducted daily before work is begun. If nests are constructed in the area of beach renourishment, the eggs must be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

2. Immediately after completion of the beach renourishment project and prior to the next three nesting seasons, beach compaction must be monitored and tilling must be conducted as required to reduce the likelihood of impacting sea turtle nesting and hatching activities, and foraging, roosting and loafing piping plovers. (If tilling is needed, it must only occur above the primary wrack line.)
3. Immediately after completion of the beach renourishment project and prior to the next three nesting seasons, monitoring must be conducted to determine if escarpments are present and escarpments must be leveled to reduce the likelihood of impacting sea turtle nesting and hatching activities.
4. Disturbance to piping plover Critical Habitat GA-1 by the USACE beach nourishment project will be minimized. Surveys for piping plovers must be done within the action area to document the continued use of the Critical Habitat GA-1, as well as, the remaining action area. The amount of pedestrian traffic and unleashed pet occurrences should also be recorded.
5. Lighting associated with the project night work must be minimized to reduce the possibility of disrupting and disorienting nesting and/or hatchling sea turtles and piping plover roosting activities.
6. A survey of all lighting visible from the renourished beach shall be completed using standard techniques for such a survey.
7. The USACE shall ensure that contractors conducting the beach nourishment work fully understand the sea turtle and piping plover protection measures detailed in this incidental take statement.

A new or updated Biological Opinion may be issued for this project during Pre-Construction Engineering and Design (PED) phase to address any changes that may have occurred since the 2008 renourishment.

NMFS provided the following EFH conservation recommendations which were implemented during the 2008 project:

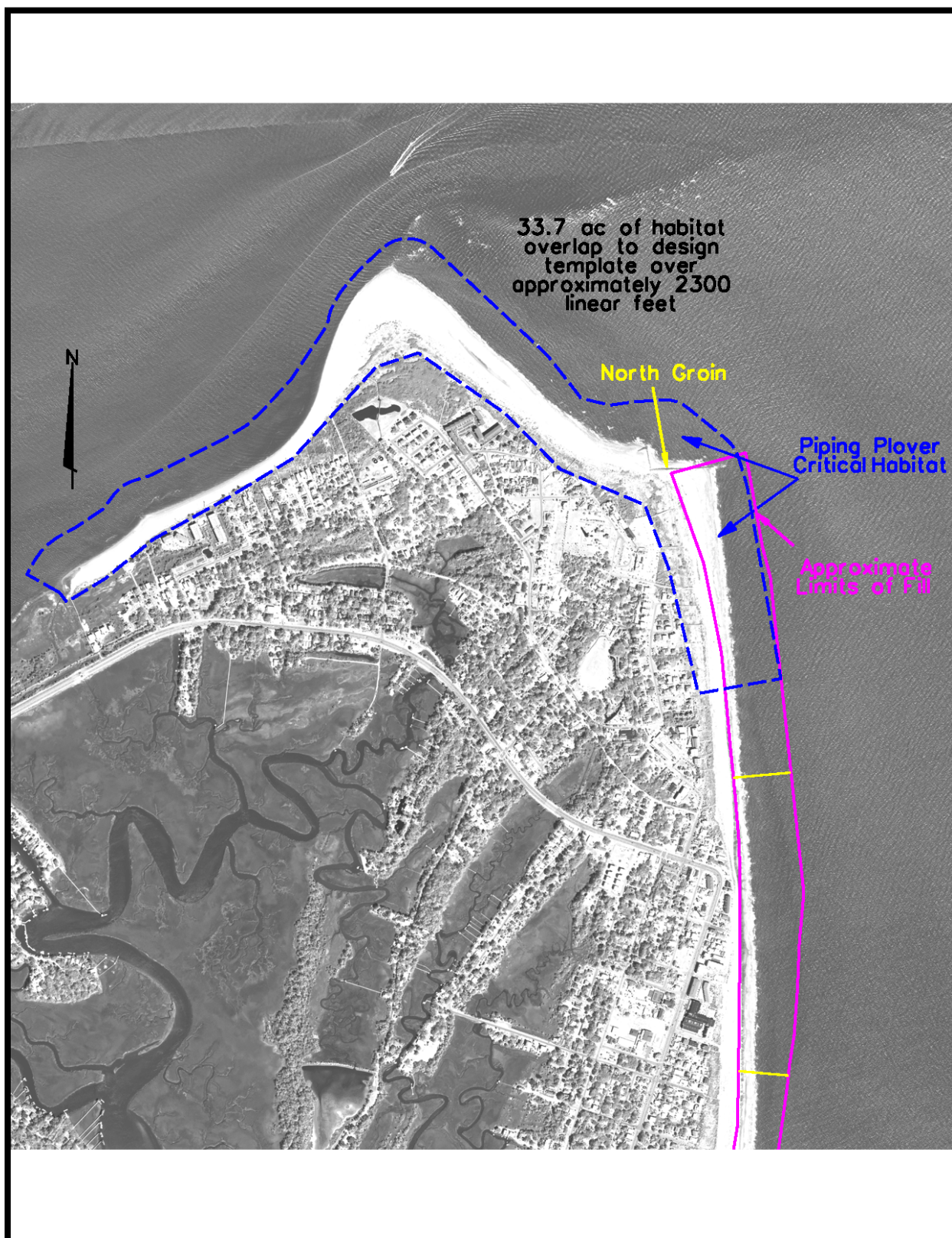
1. The borrow area shall be mined selectively to reduce the amount of silt and shell placed on the beach. A monitoring program shall be implemented to document any changes to sediment texture along the beach and to characterize, relative to reference areas, the abundance and fishery value of infauna within the fill area. The monitoring plans shall be submitted to NMFS for approval prior to construction.
2. Bathymetric surveys shall be conducted immediately after and one year after project completion to demonstrate compliance with dredging depth restrictions and to

demonstrate the borrow areas are filling at rates presumed acceptable for fishery resources.

3. A monitoring program shall be implemented at the borrow area to document filling rates, nature of the material that fills the pit, and the impact the pit has on the use of the sea bottom by fish. The monitoring plans shall be submitted to NMFS for approval prior to construction.

The Atlantic sturgeon is a newly-listed endangered species since the last renourishment in 2008. Conditions to minimize impacts to the sturgeon include time of year restrictions, an endangered species watch plan with trained observers on watch during all times of waterborne construction activities, and employing a cutterhead dredge (which has been shown to have a low likelihood of take). The proposed project will impact critical habitat unit GA-1 for the wintering piping plover by placing a small amount of fill in the area. A watch plan to ensure plovers are not harmed will be utilized. Construction activities will be re-routed or stopped if plovers are in the vicinity of the work area. The USFWS 2008 BO contains recommendations which will be implemented to minimize impacts to the piping plover and reflect any changes from the new BO being developed. The Georgia Department of Natural Resources (GA DNR) requires beach construction to occur outside the sea turtle nesting season (May 1 – October 31). However, nesting data from Tybee indicate the season is generally over by mid-September. The proposed construction timeline for this project is November 2015 through February 2016. Any agreements concerning renourishment during nesting season would include a requirement that appropriate nest relocation procedures be followed, if necessary, to prevent impacts to nesting turtles. In addition, the USFWS has outlined conditions to regulate construction activities during sea turtle nesting season in their 2008 BO (Appendix D). The District will include these conditions in any contract for construction.

**Figure 6: Proposed Template Showing Overlap into Piping Plover Critical Habitat**



The beach will be tilled and monitored for sand compaction and beach profile immediately after construction (2015/2016) and monitored for three years after construction (2016-2018/2019), including the first winter/spring following completion of construction, to determine post-nourishment compaction and need for additional removal of escarpments. Only areas of compaction greater than 500 cone penetrometer index units (cpu), including escarpments greater than 18 inches high by 100 feet long, need to be mechanically tilled or leveled. Escarpments that are not compacted should not be mechanically leveled regardless of their size as they do not present a problem to sea turtles. Compaction testing will be conducted by qualified USACE personnel and GA DNR biologists. After the 2008 renourishment the beach was tilled in March 2009 and March 2010. Compaction testing in March 2011 did not indicate tilling was necessary. Tilling was conducted in April 2012.

The material needed for the proposed alternatives will be excavated from the borrow area and placed on the beach areas by hydraulic cutterhead pipeline dredge. The 1997 National Marine Fisheries Service Biological Opinion on hopper dredging in the southeast found that hopper dredging was much more likely than pipeline dredging to result in adverse impacts to sea turtles and sturgeon. The use of a hydraulic cutterhead pipeline dredge would minimize potential adverse impacts to sea turtles and sturgeon. Conditions to avoid potential adverse impacts to threatened and endangered species that might occur in the general project area will be added to any contract issued for the work. These conditions are explained in detail in Section E4.20.2 of this EA and in Appendix C, Biological Assessment of Threatened and Endangered Species (BATES) and the 2008 Biological Opinion (BO) from USFWS, Appendix D.

### **E.3.00. ENVIRONMENTAL SETTING WITHOUT THE PROJECT**

#### **E.3.01. LOCATION**

Tybee Island is one of a series of barrier islands lying along the Atlantic coast from Florida to North Carolina. The island is located directly south of the Savannah River entrance, about 17 miles east of the city of Savannah, Chatham County, Georgia. It is bounded on the north by the Savannah Harbor, to the east by the Atlantic Ocean, and on the south and west by Tybee Creek and a vast tidal marsh system. The major portion of the land mass above high tide is occupied by the City of Tybee Island. The City of Tybee Island is the only population center on the island with the major portion of its economy primarily oriented toward support facilities which service summer vacationers.

The study area includes the North Beach, Second Street, Middle Beach, South Beach and Back River.

#### **E.3.02. GEOLOGY/PHYSIOGRAPHIC SETTING**

The coastal barrier islands of Georgia are erosional remnants of Pleistocene coastal sand bodies extending from the mainland toward the Atlantic Ocean. Characteristic development includes oceanward frontages of beach dune ridges constructed during the present or Holocene high sea

level stand. The extremely wide, shallow and gently sloping continental shelf, a shortage of sand available for coastal deposition, and the rise in sea level are the major geologic factors controlling deposition on these islands. Periods of seaward growth and periods of erosion are evident and islands experience spit-type migration adjacent to the major tidal inlets rather than landward migration. The ridge and swell topography sometimes supports isolated or perched wetlands within the dune system. Sand, wind, and vegetation interact to form coastal dunes.

Most of the dune areas on Tybee Island have been replaced by sea walls and revetment. Construction of residences, hotels and other businesses has removed much of the natural areas on the island. Dune areas still exist mainly on the central and north end portions of the beach. Dunes were constructed during the 1995 project on the South Tip Beach. There are no dunes on the Back River (USACE, 1998).

### **E.3.03. PHYSICAL FACTORS**

There are basic physical factors that will continue to influence erosion despite the past attempts to reduce or control beach erosion at Tybee Island. Primary influences on the morphology of Tybee Island include tidal fluctuations, tidal currents, proximity of the beach to the Savannah Harbor shipping channel, and nearshore waves.

**E.3.03.1. Winds.** The predominant winds of higher velocity are from the westerly quadrant, while the prevailing winds of greater duration are from the northeasterly quadrant.

**E.3.03.2. Wave and Currents Climate.** Ocean swell and sea data indicate that the duration of both seas and swells of all magnitudes are greatest from the southeast. The wave directions range from northeasterly to southerly.

Waves in Back River are somewhat smaller than those along the front shoreline. They include offshore waves that are refracted around the south end groin and approach the south end shoreline of Back River from south southwesterly direction and wind generated waves occurring during periods of sustained winds from the westerly direction. Tidal currents during maximum ebb and flood tides range from approximately 1.5 to 2 feet per second and generally are swifter in the center of the creek.

**E.3.03.3. Beach Slope.** The Oceanfront Beach has a wide, gently sloping shelf. On the other hand, the Back River shoreline has a steeper grade. The natural beach slope on Back River is typically 1 vertical on 13 horizontal compared to a typical slope of 1 vertical on 20 horizontal in the intertidal zone along the oceanfront beach. Offshore depths drop off rapidly to 20 or 30 feet along the northern end of the Back River area, with a more gradual transition to the south. A design beach slope of 1V:15H will be used for construction and has performed effectively during previous renourishments in this area.

**E.3.03.4. Tides.** The mean tidal range at Tybee Beach is 6.8 feet, and the spring range is 9.0 feet. Tidal records at the Fort Pulaski gage near the mouth of the Savannah River show a



maximum reading of 11.3 feet mean sea level (MSL) during a 1947 hurricane. Waves during the hurricane had an estimated height of 15 feet along the beach at Tybee Island. Tides of 9.5 feet MSL are frequently recorded at the Fort Pulaski gage.

The mean tidal range at Back River entrance is 6.8 feet and the diurnal range is 8.0 feet.

#### **E.3.04. EROSION HISTORY**

Overall longshore transport for Tybee Island is from North to South. At the Second Street Beach there is a nodal point and material is also transported to the north. Material from the beach moves to the offshore bar on the south end of the island and eventually to barrier islands south. There has not been documented shoaling in any navigation channels due to the renourishment.

**E.3.04.1. Oceanfront Area.** Erosion along the front beach has been well documented (Oertel et.al., 1985). Since the area has been spared any major hurricanes during the past 100 years, the major forces dictating the shoreline position have been seasonal storms. Generally, northeasterly storms have caused the most damage, while low pressures storms approaching from the southeast typically have resulted in accretion due to movement of sand from offshore bars onto the beach. The shoreline position varied greatly prior to construction of shore stabilization projects. In efforts to control erosion on the oceanfront, numerous groins and revetments have been constructed as well as a sea wall constructed between 1936 and 1941. This sea wall has a top elevation of 12 feet above MLW. Although the seawall has provided some protection of property, it has also caused additional lowering of the beach profile due to reflected wave action.

**E.3.04.2. South Tip Beach.** After monitoring studies indicated rapid erosion occurring adjacent to the south end of the island following the first Federal renourishment project on Tybee Island between 1974 and 1976, specific studies were undertaken in the inlet to determine the cause (Oertel 1979, Posey and Seyle 1980). A study conducted by the Engineering and Research Development Center (ERDC) found that erosion is occurring on the northern end of the island and accretion on the southern end, with 73% of the erosion to the shoreline and shelf being caused by the Savannah Harbor Shipping Channel and the rest due to natural processes. The project dredging maintains the channel position for navigation safety and efficiency but cuts off the natural sand bypassing mechanism. Construction of jetties and channel dredging generally causes deflation of the ebb shoal and eventual downdrift erosion (ERDC, 2008). Natural erosional processes include the concentration of wave energy at the south end of the island, the seasonal production of wave-induced coastal currents flowing toward the Tybee Inlet throat, and the asymmetrical tidal flow which produces a strong flood dominated channel adjacent to the south end of Tybee Island. This flood dominant channel at the south tip of the island is evident in aerial photographs as well as an ebb dominant channel close to the Little Tybee Island shoreline.

**E.3.04.3. Back River.** Historic aerial photographs of the Back River Beach area show cyclic erosion and accretion cycles similar to that which has been found on the oceanfront. Evidence of previous efforts to control erosion in this area include the seawall which extends approximately

500 feet into the Back River as well as a series of deteriorated wooden groins which were built between 1931 and 1941. Private property owners have attempted to protect the shoreline by placing relatively small stone ranging in size from 6 inches to 18 inches. It is estimated that a one-year storm would cause failure of the rip-rap. Results of the first year monitoring effort after the South Tip Beach field groin construction by the City of Tybee Island, are contained in the report by Erik Olsen, *“Tybee Island, Georgia, 1-Year and 2-Year Shoreline Monitoring Reports, August 1996* and in the interim 18-month monitoring report (April 1997). Approximately 64,000 cy of sand eroded from the Back River Beach during the first 12 months after groin construction. An additional 49,200 c.y. of material was accreted in the groin cells along the South Tip Beach during the same period of time (USACE 1997).

**E.3.04.4. Little Tybee Island.** The direction of longshore transport at the south end of Tybee Island is from the north to the south and the borrow area used for the first nourishment in 1976 was filled with migrating sand prior to beginning the renourishment in 1987. In 1978, the Savannah District conducted a study of the south end of Tybee to determine flow rates through the shoal area (Oertel et.al., 1985). At that time it was determined that the flood dominant channel along the beach and the ebb dominant channel between the shoals and Little Tybee provided the transport mechanism for feeding sediments to the shoal system in the inlet. This condition would also provide sediment for accretion on Little Tybee Island as long as there was a sediment source adjacent to the flood dominant channel. Olsen’s monitoring report (1996) showed that erosion along the northern shoreline of Little Tybee Island has occurred during the monitoring period possibly due to migration of the ebb dominant channel at the mouth of Back River towards the south.

The dynamics of Tybee Inlet transformed the seaward face of Little Tybee Island from a marsh-front shoreline to a sandy beachfront (Erik Olsen memo to Larry Lyons dated September 12, 1997). This large scale morphological change resulted from the landward migration of a major shoal feature and ultimate “welding” of the shoal to the existing shorefront of Little Tybee Island between 1945 and 1961. The process both closed and infilled a relatively significant tidal channel which had existed between the shoal and Little Tybee Island. The location, size and orientation of the main and secondary channels which carry most of the flow between Back River and the Atlantic Ocean changed continually. Flow directionality, both into and out of Back River, is influenced by these features which tend to serve as conduits through the ebb tidal platform. No discernible cause and effect relationship between ongoing shoreline protection projects at Tybee Island and measured shoreline changes at Little Tybee Island has been made or expected (Erik Olsen memo, September 12, 1997). This report concluded that the continued surveying of Little Tybee Island contributed little benefit to the overall monitoring study of Tybee Island. It was recommended at the time to discontinue monitoring of Little Tybee Island in the future (Erik Olsen memo, September 12, 1997). Table 3 lists a chronology of erosion control projects performed on Tybee Island, Georgia.



**Table 3.  
Chronology of Recent Beach Renourishment and Erosion Control Efforts  
Tybee Island, Georgia**

YEAR	ACTION
1975	800-ft North End Terminal Groin constructed – 10.5 tons of armor was used and 2,700 # of under layer stone was used.
1975-1976	Initial nourishment. – Borrow site #3 was utilized. 2,262,100 yd <sup>3</sup> of sand placed on the beach between North End Terminal Groin and 18th Street (13,200 feet long).
1986-1987	600-ft South End Terminal Groin constructed between 18th and 19th St. Rehabilitation of North End Terminal Groin. First renourishment -1,200,000 yd <sup>3</sup> of sand placed from between the groins. 157,000 yd <sup>3</sup> of sand placed on 1,400' of shoreline south of South End Groin. Borrow site #3 was utilized for all of this work.
1993	An estimated 918,000 yd <sup>3</sup> of beach material was placed on beach by Corps and Georgia Ports Authority from Savannah Harbor deepening. The source of sand was the navigation channel.
1994	South Tip Groin Field constructed by Georgia Ports Authority with State funds.
1995	285,000 yd <sup>3</sup> of material placed between South End Groin and 13th Street by Georgia Ports Authority. 50,000 yd <sup>3</sup> of sand placed within South Tip Groin Field by Georgia Ports Authority. Borrow site #4, cell A was the source of sand.
2000	Back River Groin Field constructed, and initial nourishment of Back River and renourishment of South Tip and renourishment of oceanfront. Borrow site #4 was utilized. Back River Groin renourishment quantities are: Armor Stone 4,631 tons, Underlay Stone 619 tons, & Bedding Material 1,847 tons Back River/Tybee Creek Beach 86,319 yd <sup>3</sup> Second Street Beach 1,267,738 yd <sup>3</sup> South Beach 118,654 yd <sup>3</sup> Back River/Tybee Creek/North of Seawall 7,859 yd <sup>3</sup>
2001 - 2004	Monitoring North end groin/start of renourishment area 26,660 yd <sup>3</sup> accretion Second St. renourishment area 369,858 yd <sup>3</sup> erosion Middle Beach 25,954 yd <sup>3</sup> erosion

	South Beach (Tybrisa) renourishment area 92,620 yd <sup>3</sup> erosion South Tip Beach 33,685 yd <sup>3</sup> accretion Back River/Tybee Creek at seawall 24,428 yd <sup>3</sup> erosion Back River/Tybee Cr. north of seawall 27,913 yd <sup>3</sup> accretion Average annual 142,084 yd <sup>3</sup> erosion
2008	Oceanfront Beach Renourishment with material from Borrow Area 4 Back River/Tybee Creek- 39,679 yd <sup>3</sup> Oceanfront Beach- 1,187,469 yd <sup>3</sup> (between Gulick Street and the South End Terminal Groin- 13,200 feet long)

Source: USACE, Savannah District, 2012 Limited Reevaluation Report, Tybee Island, GA, 2015 Renourishment Project.

### **E.3.05. WATER QUALITY**

There are no known pollution sources other than storm water discharges and non-point source pollutants in the general vicinity of Tybee Island. Tybee Island waters are tested by GA DNR Coastal Resources Division (GA DNR-CRD) personnel for enterococcus bacteria once a week from five different locations. If bacteria levels exceed state criteria, then a beach advisory or closing is issued until levels fall below threshold values. In 2012 Tybee Island beaches exceeded bacteria standards 4% of the time at Polk Street with a cumulative advisory status occurring for 6 days (NRDC, 2012). The source of the bacteria remains unknown. However, sediments may serve as a source of stored enterococci from marine invertebrates and plants (Signoretto et. al., 2004, McDonald et. al., 2006).

Georgia's water quality standards consist of two groups of criteria: the general criteria that apply to all waters and the specific criteria based on use. The general criteria include: waters shall be free of materials, oils, and scum, associated with municipal or domestic sewage, industrial waste or any other waste which will settle to form sludge deposits, produce turbidity, color, or odor, or that may otherwise interfere with legitimate water uses; waters shall be free from toxic, corrosive, acidic, and caustic substances in amounts which are harmful to humans, animals, or aquatic life. General criteria also include acute (one time exposure) and chronic (exposure over a period of time) concentrations of metals, as well as maximum allowable concentrations of pollutants such as pesticides and other chemicals.

Specific criteria include bacteria, dissolved oxygen, pH, nutrients, and temperature. Georgia Department of Natural Resources Environmental Protection Division (GA DNR-EPD) is responsible for setting and enforcing water quality standards. The goals of establishing these standards are to "provide enhancement of water quality and prevention of pollution; to protect the public health or welfare in accordance with the public interest for drinking water supplies,

conservation of fish, wildlife, and other beneficial aquatic life, and agricultural, industrial, recreational, and other reasonable and necessary uses and to maintain and improve the biological integrity of the waters of the State.”

Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03(2)(a).

The State of Georgia classifies all waters into categories which have different standards depending on the designated use of the water body. These uses include: (a) Drinking Water Supplies; (b) Recreation; (c) Fishing, Propagation of Fish, Shellfish, Game and Other Aquatic Life; (d) Wild River; (e) Scenic River; and (f) Coastal Fishing. Recreation designation is assigned if the water supports general recreational activities such as water skiing, boating or swimming. The littoral waters of Tybee Island are considered Recreational.

Turbidity, expressed in Nephelometric Turbidity Units (NTU), quantitatively measures the light scattering properties of the water. Turbidity levels at the project area are influenced by the Savannah River on the north, Back River on the south, and by waves and tidal action. However, the properties of the material suspended in the water column that create turbid conditions are not reflected when measuring turbidity. The two reported major sources of turbidity in coastal areas are very fine organic particulate matter, and sand-sized sediments that are re-suspended around the seabed by local waves and currents (Dompe and Haynes 1993). Higher turbidity levels are typically expected around inlet areas, and particularly in estuarine areas, due to high nutrient and entrained sediment levels. Although some colloidal materials remain suspended in the water column upon disturbance, high turbidity episodes usually return to background conditions within several days to several weeks, depending on the duration of the perturbation (storm event or other) and on the amount of suspended fines.

Rule 391-3-6-.03(5)(d) states that all waters shall be free from turbidity which results in a substantial visual contrast in a water body due to a man-made activity. The upstream appearance of a body of water shall be as observed at a point immediately upstream of a turbidity-causing man-made activity. That upstream appearance shall be compared to a point which is located sufficiently downstream from the activity so as to provide an appropriate mixing zone. For land disturbing activities, proper design, installation, and maintenance of best management practices and compliance with issued permits shall constitute compliance with Paragraph 391-3-6-.03(5)(d).

### **E.3.06. FLORA AND FAUNA**

The major wetland habitat types in the project area belong to the marine and estuarine systems (Cowardin et al., 1979). The marine system consists of the open ocean overlaying the continental shelf and its associated high-energy coastline. The sub-systems include: 1) the marine subtidal unconsolidated bottom, which is the sand bottom that is continuously submerged; and 2) the marine intertidal unconsolidated shore, which is the beach area. Estuarine systems consist of deepwater tidal wetlands and adjacent tidal wetlands along Back River and Horse Pen Creek. The estuarine subsystem includes 1) subtidal unconsolidated bottom and

aquatic bed and 2) intertidal streambed, unconsolidated shore and emergent wetlands (USACE, 1998). Vegetation occurring in these areas is limited mostly comprised of drifting seaweeds, marsh grasses, or upland leaf litter.

Faunal resources that occur in the marine subtidal system include recreational fisheries for red drum, spotted sea trout, Atlantic croaker, striped mullet, saltwater catfish, spot, and kingfish. The dominant sea birds include: cormorant, brown pelican, Forster's tern, royal tern, herring gull, laughing gull, and ring-billed gull (Sandifer, 1980). Several dolphins occur in the Atlantic area, but the Atlantic bottle-nosed dolphin is the most common and only resident. Sharks also frequent the nearshore area at Tybee. Common shark species include: bonnet head, Atlantic black tip, sandbar, tiger, nurse and lemon. There has never been a recorded shark fatality at Tybee Island.

The marine intertidal, or beach areas, are inhabited by ghost shrimp, ghost crabs, hermit crabs, coquina clams, burrowing polychaete worms, and other invertebrates (Sandifer et al., 1980). The most important recreational surf fish include striped mullet, kingfish, spot, red drum, black drum, tarpon, and flounder. Approximately 36 species of birds regularly use the marine intertidal habitat (Sandifer et al., 1980). The majority of these birds feed on the beaches.

Macrobenthic invertebrates inhabiting these beach areas range from species used directly by man for food, such as shrimp, crabs, oysters, and clams to other species such as polychaetes, crustaceans, mollusks, and other less well known, but valuable, species which make up the remainder of the food chain. Open water areas are populated by a variety of species of phytoplankton and zooplankton (USACE, 1998).

#### **E.3.07. THREATENED AND ENDANGERED SPECIES**

The right whale, piping plover, manatee, and loggerhead sea turtle are the species most likely to be impacted by the proposed project. Other listed species are not likely to be impacted. The species listed in Table 4 may be found in the general project area and have been classified as threatened or endangered pursuant to the Endangered Species Act of 1973. As such, these species must be protected from adverse impacts that could be expected to cause damage either to the individuals or to habitat that has been found to be critical for the species' survival or recovery. Each of these species are described in detail in the Biological Assessment of Threatened and Endangered Species (BATES), Appendix C with respect to their sightings and habitat in Chatham County, Georgia. The piping plover, loggerhead and leatherback turtles are also described in detail in the 2008 USFWS BO, which is included as Appendix D.

**Table 4.  
Federal Threatened and Endangered Species**

COMMON NAME	SCIENTIFIC NAME	STATUS
Florida manatee	<u>Trichechus manatus latirostris</u>	Endangered
Right whale	<u>Balaena glacialis</u>	Endangered
Sei whale	<u>Balenoptera borealis</u>	Endangered
Blue whale	<u>Balaena musculus</u>	Endangered
Sperm whale	<u>Physeter macrocephalus</u>	Endangered
Finback whale	<u>Balaenoptera physalus</u>	Endangered
Humpback whale	<u>Megaptera novaeangliae</u>	Endangered
Piping plover	<u>Charadrius melodus</u>	Threatened
Wood stork	<u>Mycteria americana</u>	Endangered
Bachman's warbler	<u>Vermivora bachmanii</u>	Endangered
Kirtland's warbler	<u>Dendroica kirtlandii</u>	Endangered
Red-cockaded woodpecker	<u>Picoides borealis</u>	Endangered
Eastern Indigo snake	<u>Drymarion corais couperi</u>	Threatened
Loggerhead turtle	<u>Caretta caretta</u>	Threatened
Leatherback turtle	<u>Dermochelys coriacea</u>	Endangered
Hawksbill turtle	<u>Eretmochelys imbricata</u>	Endangered
Green turtle	<u>Chelonia mydas</u>	Threatened
Kemp's Ridley turtle	<u>Lepidochelys kempii</u>	Endangered
Shortnose sturgeon	<u>Acipenser brevirostrum</u>	Endangered
Atlantic sturgeon	<u>Acipenser oxyrinchus</u>	Endangered
Flatwoods salamander	<u>Ambystoma cingulatum</u>	Endangered
Pondberry	<u>Lindera melissifolia</u>	Endangered

Source: USFWS, Southern Region, 2008

### **E.3.08. BORROW AREA**

Material to be placed on the beach will be obtained from the same borrow area that was used in the 2008 renourishment. All material to be dredged above elevation -16 feet MLW met state standards including color and was highly successful as a source of borrow material. While the most ideal locations were dredged during the 2008 project, the remaining portion of the proposed 2015 borrow area still has high quality material available for renourishment. 84% of core samples have less than 1% fines to a depth of -16 feet MLLW. This is considered very high quality beach compatible sediment. The remaining 16% of core samples have between 1% and 4% fine material, with the highest fines content being at 3.5%. This is still considered high quality beach sediment. Average percent shell content is very similar to the existing beach, 9.9% to -16 feet MLW and 12.6% on the existing beach. Currently there are 3 to 4 million cubic yards of beach quality sand readily available within this borrow area for any future renourishments.

**E.3.08.1. Sediment Characteristics.** On Tybee Island, classification of native sands ranges from well-sorted (poorly graded) along the southern beaches to poorly sorted (well graded) along the more eroded northern beaches. From a geotechnical perspective, the 6th Street beach access appears to delineate the boundary between the north and south beaches – based on available samples. For example, sorting coefficients for samples collected south of the 6th Street beach access range from 0.21 to 0.77 phi (well sorted), while samples taken north of 6th Street have sorting values which range from 0.89 to 1.94 phi (well graded). Sixth Street samples have a sorting coefficient which averages about 1.1 phi (Howard, 2007). The aforementioned south-to-north variations in sorting coefficient and gradation are primarily due to an observed increasing percentage of shell in the native beach, as opposed to a significant variation in sand grain size. In situ shell content would be expected to increase along the north beach shoreline due to its presently over-eroded condition. The percent shell in samples taken north of 6th Street (2nd Street, 2nd Avenue, and Gulick Street) averages about 21.6 percent and varies between 8 and 29 percent. Samples taken south of 6th Street average about 2.6 percent shell and range from 0 to 10.5 percent. The 6th Street samples contain approximately 13 to 17 percent shell. Field observations suggest that in many locations along Tybee Island, a large volume of shell fragments is present and covered with a thin (2- 4”) veneer of clean, sand (Howard, 2007). An extensive geotechnical investigation of grain size distributions on the beach and the borrow area was conducted by Olsen and Associates in 2007-2008. Table 5 displays the sediment characteristics of the borrow area used in the 2008 renourishment and planned for use during the 2015 renourishment. It is important to remember the “native” beach samples are the result of previous renourishments. Copies of the complete 2008 Geotechnical Investigation on Tybee Island, Georgia may be obtained from Olsen and Associates, Inc. Jacksonville, FL.

**Table 5.  
Sediment Characteristics for composite profiles measured above -16 feet, MLW**

Composite Area	Median (phi)	Median (mm)	Percent Fines	Percent Shell (CaCO <sub>3</sub> )	Mean (phi)	Standard Deviation (phi)	Overfill Factor	
							SPM	Dean (1974)
AREA 1	2.30	0.20	0.67	9.2	1.75	1.43	1.17	1.08
AREA 2	2.07	0.24	0.54	10.1	1.73	1.41	1.15	1.06
AREA 3	1.97	0.25	0.51	10.4	1.61	1.42	1.07	1.02
AREAS 1, 2, & 3 AVG.	2.12	0.23	0.57	9.9	1.69	1.42	1.12	1.05
AREA 4	2.04	0.24	0.67	8.0	1.65	1.40	1.09	1.04
Remaining USACE Borrow	2.41	0.19	0.70	8.2	1.95	1.24	1.59	1.24
Entire Study Area	2.13	0.23	0.61	9.0	1.71	1.39	1.14	1.06
2007 Native Average	2.02	0.25	0.05	12.6	1.53	1.31	--	--

**E.3.08.2. Contaminant Testing.** Previous sediment contaminant testing at the borrow area has revealed no issues of concern. Based on the results of previous heavy metals analysis of the offshore borrow site and the heavy metals analysis performed in association with the 2008 proposed borrow site expansion, adverse impacts associated with the potential release of contaminants are not expected during project construction. Four samples from the 1998

sampling event were chosen for comparison due to their proximity to the 2007 sampling set: IYB1, 3, 5 and 7. The other sites included in the 1998 study were used to evaluate the destination of the borrow site material and were not used for comparison in the samples collected during the 2007 study (ANAMAR Environmental Consulting Inc. 2008).

The results from both sampling events compare very well. The samples are primarily sand with most samples well over 90% medium and fine grain sand. In the metals data, Sample IYB1 from 1998 had results that appear to make it an outlier. The results from this sample were excluded in statistical calculations. Barium was not analyzed in the 1998 study, so it is also excluded from the statistical calculations (ANAMAR Environmental Consulting Inc. 2008). The remaining results were entered into a spreadsheet, and the average and standard deviation of the results were calculated based on study and metal. The control levels for each set were calculated by taking the average  $\pm 3 \times$  the standard deviation. The results for each metal are shown in Table 6.

**Table 6.**  
**Results of heavy metal analysis for the expanded borrow site and comparison to the existing borrow site samples (mg/kg)**

	November 1998 study		December 2007 Existing Borrow Site Samples		December 2007 Expanded Borrow Site Samples	
	LCL	UCL	LCL	UCL	LCL	UCL
Arsenic	1.2	3.2	1.2	2.5	-1.5	6.0
Cadmium	-0.01	0.08	0.08	0.21	0.00	0.24
Chromium	1.8	4.2	2.7	2.7	1.7	3.5
Lead	0.7	1.6	-0.3	2.1	0.5	1.2
Mercury	-0.019	0.046	0.001	0.001	0.001	0.001
Selenium	-0.2	0.6	0.3	0.3	0.3	0.3
Silver	0.1	0.1	0.1	0.1	0.1	0.1

LCL = Lower Control Level = Mean - 3 x Standard Deviation

UCL = Upper Control Level = Mean + 3 x Standard Deviation

Source: ANAMAR Environmental Consulting Inc. Technical memo dated January 21, 2008.

Assuming a normal distribution, the LCL and UCL represent a 99% confidence interval of range of values for the metal during a particular study. Negative values are presented, but should be increased to 0 concentration for real-world samples. In all cases, there is overlap between the results, indicating fair to excellent agreement between the two studies (ANAMAR Environmental Consulting Inc. 2008).

Cadmium showed a slight increase in concentrations from 1998 to 2007 in the existing borrow area. The increase is small compared to the method detection limit used in the 2007 study. Mercury and selenium showed a decrease from the initial study to the most recent study, in which all results were below detection. Arsenic showed greater variability in the December 2007

set; however, the results are still comparable to the initial study. All other results have significant overlap. In addition, the average results for the project as a whole were slightly lower in the 2007 study than in the 1998 study. This is an indication that the field sampling modifications did not have a significant impact on the core samples (ANAMAR Environmental Consulting Inc. 2008). Metal levels are below published sediment guidelines (Buchman, 1999).

There is a potential for hydrocarbon spills with dredging and construction equipment associated with implementation of the proposed renourishment project; however, accident and spill prevention plans delineated in the contract specifications should prevent the release of any hazardous or toxic waste (Miller et. al., 2008).

### **E.3.09. COASTAL BARRIER RESOURCES**

The U.S. Congress passed the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 *et seq.*) in 1982 to address problems caused by coastal barrier development. This Act defined a list of undeveloped coastal barriers along the Atlantic and Gulf coasts and was passed to limit federally-subsidized development within a defined Coastal Barrier Resources System (Unit). The CBRA System, Little Tybee Island Unit No.1, is located immediately south of the offshore borrow site at the south end of Tybee Island. The borrow site expansion was developed to avoid impacts to Little Tybee Island Unit No. 1 zone. All offshore dredging activities associated with the beach renourishment project will continue to be setback from the Little Tybee Island CBRA Zone line which extends along the southerly perimeter of the borrow site utilized in 1994 (by the GPA) and 2000 and 2008 (by the Savannah District).

### **E.3.10. ECONOMICS**

A reaffirmation level one economic analysis is being developed as part of the 2013 Limited Reevaluation Report. The fully funded cost of the 2015 renourishment is \$20,437,000 (2013 price levels). The recommended project was based on the amount of material, including losses, to fill the design template anticipating continuance of existing erosional trend. A factor of 20 percent was included for losses to calculate the actual borrow quantity. The cost estimates were calculated for 2013 and then increased by 6.3 percent to escalate the estimate to 2015, the year of the next renourishment assuming the same volume, fill, and distance. The cost of replacing the sand to restore the design profile will be cost-shared between the non-Federal sponsor and the Corps. The cost-sharing participation for renourishment is based on the allowable maximum percentage of federal participation based on length of shoreline, types of shoreline ownership and project purpose and is 60.7 percent federal and 39.3 percent non-federal. Project renourishment benefits were evaluated in the "Special Report on South Tip Beach/Tybee Creek" dated May 1998. The total average annual benefit for Tybee Island is \$8,615,000, consisting of \$7,763,000 in recreation benefits and \$852,000 in storm damage reduction benefits. Since recreational benefits are incidental (no separable construction costs are required to realize recreation outputs), Federal participation in this recreation benefit is warranted. However, since the project is not justified based on storm damage reduction benefits alone, the recreation benefits are limited to an equivalent amount of the storm damage reduction benefits. Hence, benefits for this analysis are



equal to \$1,704,000. The estimated total investment cost of the 2015 renourishment is \$19,242,000 in FY 2013 dollars. The remaining average annual cost is \$1,255,000 in FY 1998 dollars. The benefit-to-cost ratio of the remaining renourishment is 1.36 to 1 (\$1,704,000/\$1,255,000) and is economically justified. The net benefit is \$449,000.

#### **E.3.11. HISTORIC PROPERTIES**

The Area of Potential Effect for historic properties includes the beach face to be renourished, construction access areas, the borrow area, which includes a 300 ft buffer zone, and the view shed surrounding these areas. A number of historic properties are located on Tybee Island. Ft. Screven Historic District (including the Tybee Lighthouse Complex), Tybee Island Back River Historic District, and Tybee Island Strand Cottages Historic District are included in the National Register of Historic Places. Morgan-Ille Cottage, Dutton-Waller Tybee Cottage, J. Herbert and Julia Johnson Raised Tybee Cottage, Mulherin-Righton Raised Tybee Cottage, Pearl S. Bowen Boarding House, Minis-Mikowitz Raised Tybee Cottage, and Berman-Keisker Raised Cottage have been individually determined eligible for inclusion in the National Register of Historic Places. Only the Ft. Screven Historic District is located within the project view shed.

Archaeological remote sensing surveys were conducted to identify and evaluate historic properties in a large offshore area in 2008 (Watts 2008). Diver investigations of 12 anomalies/targets identified during the 2008 survey were conducted in 2013 (Panamerican Consultants, Inc. 2013). All 12 targets were negative for potentially significant cultural resources. A 300 ft buffer zone was also investigated for cultural resources. Remote sensing data indicated an absence of magnetic, sidescan or subbottom targets.

#### **E.3.12. AIR QUALITY**

Ambient air quality along coastal Chatham County is generally good due to prevalent onshore and offshore breezes. The project area is located in an attainment area as determined by the Clean Air Act and the State Implementation Plan.

#### **E.3.13. NOISE**

Ambient noise levels in Chatham County are low to moderate and are typical of recreational environments. The major noise producers include the breaking surf, adjacent commercial and residential areas, and boat and vehicular traffic.

#### **E.3.14. AESTHETIC RESOURCES**

The coastline of Tybee Island possesses visually pleasing attributes including the Atlantic ocean and existing beach and dune systems.

### **E.3.15. RECREATION RESOURCES**

Common water related activities along the Tybee Island coastline include onshore fishing, offshore fishing, recreational diving, sailing, sailboarding, kayaking, body boarding, surfing, personnel water craft, and other activities such as kite surfing. There are two piers located within the project area which provide recreational opportunity for fishing and crabbing: the Tybrisa Pier and Pavilion along the south end of beach and the Tybee Fishing Pier located on the backside of the island along Back River. A third fishing pier, the Lazaretto Creek Fishing Pier, is located on Lazaretto Creek just east of Tybee Island and offers fishing and crabbing from the pier. The inshore recreational fisher is centered primarily in the sounds and major rivers during the warmer months (April to September) and in the rivers and creeks during the colder months (October to March) (USFWS 1993). Surf fishing is limited and generally occurs during warm months (Music and Pafford 1984; Pafford and Nicholson 1989). The most important recreational surf fish include striped mullet, kingfish, spot, red drum, black drum, tarpon, and flounder (USACE 1997). Common fish caught in the offshore area of Tybee Island include Spanish mackerel, King mackerel, cobia, red snapper, gag grouper, amberjack, bluefish, black sea bass, sheepshead, white marlin, blue marlin, tarpon, spotted seatrout, dolphin and red drum (<http://www.tybee.com/tour/fishing.html>, Accessed on December 12, 2012).

### **E.3.16. NAVIGATION**

The waters directly offshore of the Tybee Island Shore Protection Project area are used for recreational boating and recreational fishing. Recreational boat access on Tybee Island is from the Lazaretto Creek Boat Ramp or the Tybee Boat Ramp. Commercial services are available at Tybee Marina located in close proximity to the Tybee Boat ramp. Tybee Island is located directly south of the Savannah River and the Savannah Harbor entrance channel (Figure 1). Savannah Harbor is a major deep-water port with heavy ship traffic.

### **E.3.17. ESSENTIAL FISH HABITAT**

Essential fish habitat (EFH) is defined by the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1802(10)) of 1996 as those waters and substrate necessary for fish spawning, breeding, feeding or growth to maturity. The MSA is the primary law responsible for governing marine fisheries management in U.S. federal waters and aims to promote conservation, reduce bycatch, and rebuild overfished industries. Federal waters consist of the waters extending from the state water boundary to 200 nautical miles. In Georgia the state boundary ends at nautical mile 3. EFH occurring in the project area or vicinity includes oyster reefs, estuarine emergent wetlands, intertidal flats, and marine and estuarine water columns. Oyster reefs and estuarine emergent wetlands are not likely to be impacted due to renourishment activities. Intertidal flats and the water column will experience temporary negative impacts resulting from fill and turbidity during project construction. Intertidal areas will increase in size post-construction and it is expected these areas will recolonize with benthic invertebrates and other species that utilize the flats for foraging or residency.

Fish species of concern occurring in the project area include King mackerel, Spanish mackerel, Bluefish, Gag grouper, Red drum, Shrimp (brown, white, and pink), Cobia, Atlantic sturgeon, Dolphin, Summer Flounder, Spot, and Red snapper. Construction is scheduled to occur during the winter months to avoid impacts to spawning fish, their eggs, or young. Adult fish are highly motile and would be expected to avoid construction activities. Impacts to food sources are expected but the project area is small in comparison with the large amount of available intertidal flats in the vicinity. No EFH critical habitat has been identified in the project area.

#### **E.4.00. ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION**

This section addresses the environmental consequences of the Without Project Condition and those impacts associated with the recommended alternative.

##### **E.4.01. SOCIO-ECONOMIC**

In general, socio-economic losses result from potential beach loss due to storm damages and erosion. If no action is taken, shoreline recession and loss of elevation of the beach berm can potentially undermine the oceanfront structures. Beach loss results in a loss of tourists and revenue to Chatham County and the City of Tybee Island.

Beach renourishment would reduce socio-economic losses by preventing shoreline erosion and protecting structures thereby creating positive impacts to tourism and the local economy.

##### **E.4.02. AESTHETICS**

With the No Action Alternative, the shoreline would continue to erode, resulting in the loss of existing shoreline and reducing the visual aesthetics of the area. The presence of construction equipment would temporarily detract from the aesthetics of the environment. The sand color of the post-construction beach may be different from the sand color of the current beach and may detract from the aesthetic quality of the project area beaches. The sand color was highly compatible with existing beach sediments after the 2008 renourishment. Since the same borrow area is being proposed for this project coloration would be expected to be similar to existing beach sediments.

Beach renourishment would have a positive effect on aesthetics by restoring and protecting the beach profile.

##### **E.4.03. RECREATION**

The No Action Alternative assumes continued erosion and reduction of recreational areas. No offshore recreational impacts are associated with the No Action Alternative.

Beach use would be temporarily restricted over short lengths during project construction for safety reasons, but would resume after construction is completed within each segment. Recreational fishing would be temporarily curtailed by turbidity near the offshore borrow site and beach nourishment site during project construction. Recreational surf fishing within the project area may be affected during the summer following nourishment activities due to short-term changes in the infaunal prey base for surf zone fishes. No long-term adverse effects (greater than 1 year) to recreational fishing are expected. The presence of dredging equipment would create a public safety risk for swimming in the nearshore in the immediate construction area. Recreational boating may be detoured during construction and restricted from the dredging area. These are temporary and short-term effects limited to the period of construction. No long-term effects are anticipated.

Dry beach recreational benefits are the most common incidental benefit produced by a beach nourishment project. These benefits result from an increased capacity for recreational activity by the new beach surface (Miller et. al., 2008). These benefits would also lead to economic stimulus resulting from the ability of more people to utilize the beach by increasing recreational areas.

#### **E.4.04. HISTORIC PROPERTIES**

The No Action Alternative would allow for continued erosion and potentially impact historic properties along the beachfront but would have no impact on resources within the borrow area.

Consultation conducted under Section 106 of the National Historic Preservation Act (NHPA), for previous Tybee Beach renourishment projects has established that placement of sand on this beach face and reuse of previously used access areas (Figure 8) will have no effect on historic properties. Diver investigations of 12 targets that had been previously identified during a 2008 investigation (Watts 2008) were conducted in September 2013 (Panamerican Consultants, Inc. 2013). All targets were negative for cultural resources. A remote sensing survey of the 300 ft buffer zone was also negative for cultural resources. The draft report is in preparation by the contractor. The results of these investigations and a determination of no effect on historic properties will be coordinated with the Georgia State Historic Preservation Office to comply with Section 106 of the NHPA and its implementing regulations, 36 CFR Part 800.

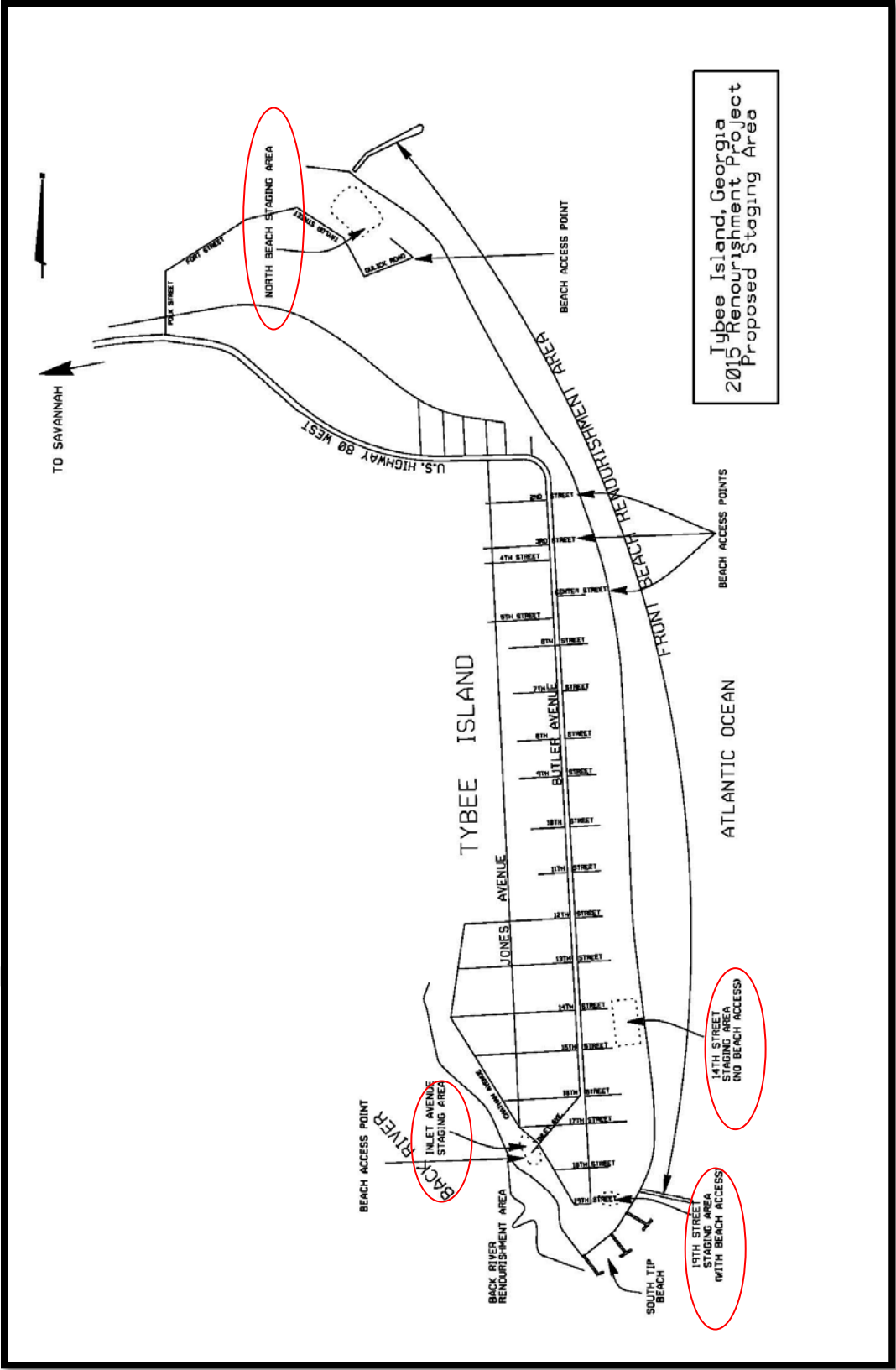


Figure 7: Staging and Access Areas

#### **E.4.05. COASTAL BARRIER ISLAND RESOURCES**

The No Action Alternative would have no significant effect on Little Tybee Island, the only coastal barrier resource within the project area.

The borrow site was developed to avoid impacts to Little Tybee Island Unit No.1; therefore, the proposed project is not expected to significantly impact Little Tybee Island.

#### **E.4.06. FLOODPLAIN VALUES**

The No Action Alternative would have no impact to floodplain values.

The proposed project is not expected to result in any long or short-term adverse impacts associated with occupancy or modification of the base flood plain. The plan is not expected to encourage indirect or direct development in the base flood plain.

#### **E.4.07. AIR QUALITY**

The No Action Alternative would have no impacts to air quality.

The short-term impact from emissions by the dredge and other construction equipment associated with the proposed nourishment project will not significantly impact air quality. Exhaust emissions of the construction equipment, both onshore and offshore, would have a temporary effect on the air quality. No permanent impacts to air quality would occur.

#### **E.4.08. NOISE**

There would be no noise impacts from the No Action Alternative.

Implementation of the beach nourishment project would temporarily raise the noise level in the areas of the dredge and the discharge point on the beach. Construction equipment would be properly maintained to minimize these effects in compliance with local laws.

#### **E.4.09. PUBLIC SAFETY**

The No Action Alternative would assume continued erosion, allowing the surf zone to advance landward, with the potential of negative impacts to public safety and loss of beach structures due to storm damage.

As a public safety measure, beach and water related recreation in the immediate vicinity of the discharge pipe will be prohibited during project construction. Likewise, water related activities near the dredge site will also be prohibited during project construction. Recreational access to these areas will return to pre-construction conditions following completion of the project. Long-

term effects are not anticipated (Miller et. al., 2008). Public safety will also be ensured by compliance with safety manual EM 385-1-1 which contains rigorous protective measures that have been included in the contract plans and specifications.

#### **E.4.10. ENERGY REQUIREMENTS AND CONSERVATION**

The No Action Alternative would have no impacts to energy requirements and conservation but would allow erosion to continue. In the event of a storm, the No Action Alternative may require a greater amount of energy due to on-site preventative measures and post-storm clean-up (USACE 1996). Energy requirements for the proposed beach renourishment project would be confined to fuel for the dredge, labor transportation, and other construction equipment.

#### **E.4.11. NATURAL OR DEPLETABLE RESOURCES**

The beach quality sand obtained from the offshore borrow site is the depletable resource associated with the proposed beach renourishment project. The No Action Alternative will allow the sand in the borrow sites to remain relatively intact, although redistribution will occur with natural cycles and storm events.

The proposed Tybee Island Shore Protection Project will be constructed using a hydraulic cutterhead pipeline dredge, therefore, not all of the proposed borrow site will be excavated. However beach compatible sands will be depleted and it is possible a new borrow area may be needed for any future renourishments.

#### **E.4.12. URBAN QUALITY**

The No Action Alternative would assume continued shoreline erosion and reduction of storm protection, and continued loss of recreational beach area with repercussions to tax revenue and tourism commerce.

No direct permanent impacts related to urban quality are expected as a result of the proposed shore protection project. Construction of the Tybee Island Shore Protection Project would indirectly positively impact urban quality by restoration of lost land due to shoreline recession and an increase in the capacity for recreational beach activity, which would then lead to an increase in tax revenue and tourism commerce. The commercial businesses and residential properties along Tybee Island would benefit from the storm protection afforded by the project and incur less risk of property damage. The presence of construction equipment would temporarily detract from the aesthetics of the environment, thereby possibly temporarily affecting visual aesthetics associated with urban quality (Miller et. al., 2008).

#### **E.4.13. SOLID WASTE**

The No Action Alternative would have no impacts to solid waste.

No impacts related to solid waste are expected as a result of the proposed beach renourishment project. Precautionary measures will be included in the contract specifications for proper disposal of solid wastes. These precautionary measures included proper containment and avoidance of overflow conditions by emptying containers on a regular schedule. Disposal of any solid waste material into ocean waters will not be permitted.

#### **E.4.14. DRINKING WATER**

No municipal or private water supplies are located in or near the project site; therefore, drinking water supplies will not be impacted by the implementation of the proposed project or the No Action Alternative.

#### **E.4.15. WATER QUALITY**

There would be no significant impacts to water quality associated with the No Action Alternative.

The beach fill is expected to exhibit some degree of construction-related turbidity in excess of natural conditions. This turbidity is usually generated by the fines ratio of the pumped sediments suspended within the return effluent. A small turbidity plume is expected at the offshore borrow site and beach discharge point in association with construction activities. Temporary, shore-parallel dikes will be constructed in the immediate construction area as needed to control the effluent and maximize the settling of sediments from the discharge before the waters reach the Atlantic Ocean. Turbidity impacts are expected to be short-term and limited to the period of construction given the low percentage of fine material (less than 1%) within the borrow site sediments. Construction of the proposed Tybee Island Shore Protection Project is expected to last 5 months however, the 2008 renourishment was completed in 3 months. No permanent degradation of water quality will occur. All work performed during construction will be done in a manner so as not to violate applicable water quality standards. Water Quality Certification will be requested from the Georgia Department of Natural Resources. A Section 404(b)(1) evaluation for the proposed project may be found in Appendix A.

#### **E.4.16. WETLANDS**

No impacts to wetlands are expected from either the No Action Alternative or the proposed project.

#### **E.4.17. GROUNDWATER**

No impacts to groundwater are expected from either the No Action Alternative or the proposed project.



#### **E.4.18. FISH AND WILDLIFE RESOURCES**

The No Action Alternative would not impact nearshore softbottom communities, offshore softbottom communities, native species, shorebirds, or fishery resources.

The proposed alternative would have impacts on benthic communities, shorebirds and fishery resources. Impacts are described in detail in the following sections.

**E.4.18.1. Nearshore softbottom communities.** The intertidal areas of sandy beaches are generally populated by small, short-lived organisms with high reproductive potential. Placement of sand at the beach fill site will bury the majority of benthic fauna, resulting in nearly complete mortality of infauna as existing intertidal and shallow subtidal areas are covered and converted to dry beach habitat. Some species may be able to migrate vertically depending upon the thickness of the new sand layer (Mauer et al. 1978; Mauer et al. 1986). Changes in infaunal community structure are anticipated based upon differences in generation time and reproductive strategies of infaunal organisms. Species with pelagic larvae may repopulate newly filled areas at a higher rate than species which rely on adult horizontal migration from adjacent areas. Adults of certain taxa are incapable of vertical movement, and therefore, must rely on horizontal migration. Some polychaete species, which had previously been considered sedentary non-swimmers or were only thought to be in the water column during times of reproduction have been observed swimming in the plankton. This movement has been interpreted as migratory behavior by some researchers (Dean 1978a; 1978b). Several infauna crustacean groups have also been reported to exhibit migratory swimming behavior (Calman 1912; Mills 1967).

To address concerns raised by National Marine Fisheries Service during the 2008 renourishment, the District developed before and after project benthic monitoring of the borrow area and beach in coordination with South Carolina Department of Natural Resources (SCDNR). Results of that monitoring are summarized below:

- The content of fine silts and clays as well as finer silts increased in the borrow area relative to an undredged reference site and remained elevated one year after.
- Infaunal communities changed significantly following dredging but appeared to be a product of seasonal changes more so than dredging.
- Biological communities changed greatest six and twelve months post-dredging, rather than immediately after borrow area dredging.
- The borrow area amphipod community, which normally responds quickly in a negative manner to dredging, exhibited very little change immediately post-dredging but did decrease in the six and twelve month survey.
- Polychaete worm populations increased in the borrow area (an opportunistic species).

The study recommended careful monitoring of the borrow area before utilizing it for future renourishments. As stated above the borrow area still contains 3 to 4 million cubic yards of beach quality sands.

**E.4.18.2. Onshore Macroinvertebrate Communities.** The most dominant species of macroinvertebrates observed on Tybee Island include oysters, mussels, snails, crabs, worms, shrimp, isopods, amphipods, killifish, clams, keyhole urchins, sea stars, and bryozoan species. Two species were selected by SCDNR during their beach monitoring studies, *Ocypode quadrata*, Ghost crab, and *Donax spp.*, Bean clam also known as Coquina or Butterfly clam.

Results of the beach monitoring by SCDNR are summarized below:

- Beach sediment characteristics changed very little after renourishment, supporting the findings that the borrow area sediments used were of a good match to existing beach sediments.
- Little evidence was found that ghost crab populations decreased significantly in the nourished segments compared to un-nourished reference sites.
- Data suggested that adult ghost crabs avoided the areas of active renourishment and successfully recolonized the affected beach system during the study.
- A decline in juvenile ghost crabs was evident across the entire beach system though adult populations remained relatively stable.
- The small size of Tybee Island made it difficult to distinguish significant changes in ghost crab populations.
- Bean clam densities declined during renourishment.
- There was low recruitment of juvenile clams to the renourished areas post-nourishment.
- During 2010 a mass mortality of donax and other infaunal bivalves occurred at beaches along South Carolina and Georgia. This event may have affected bean clam populations on Tybee in addition to or independently of the renourishment.
- Declines in the bean clams may also have affected ghost crab recruitment as the clam is one of the major prey sources.

The Scope of Work for this monitoring is included as Appendix (G) in the 2008 EA. The District will coordinate this EA with other Federal and state agencies to determine if similar monitoring will be appropriate for the 2015 renourishment. Full text electronic reports of both the beach and borrow area monitoring may be obtained by request from the Savannah District. Renourishment will have short-term negative impacts to the onshore macroinvertebrate

communities. These impacts could possibly be lessened using the following conservation recommendations from SCDNR (<http://www.dnr.sc.gov/cwcs/pdf/Coquinaclam.pdf>):

- Periodically conduct assessments of beach invertebrates and their communities to determine their condition.
- Prepare impact models of coastal zone dynamics on build-up and erosion of beaches.
- Work with coastal municipalities and communities to reduce future impacts of development on beach environments.
- Work with appropriate state, local and non-governmental agencies to discourage development on beachfront properties.
- Educate the public about the importance of beach dune habitat and initiate participative projects such as dune vegetation plantings.
- Encourage planned development projects in coastal zones, particularly on barrier islands to reduce associated impacts of development on the long-term health of sandy beach habitats.
- Continue to investigate and document the effects of rising sea levels and global warming on beach habitats.
- Discourage building or repair of seas walls and groins on beaches to allow more natural movement of sand and, ultimately, more natural beach renourishment.
- When feasible, remove dams and reservoirs that block flow of sand and sediment from upland areas to allow for more natural beach renourishment.

The City has conducted many of the recommendations listed above, especially educating the public on the importance of beach ecosystems and planning for reduced developments in the flood plain.

**E.4.18.3. Invasive Species.** The introduction of non-native or invasive species can have detrimental affects on an ecosystem. As defined by executive order 13112 (February 3, 1999) an invasive species is an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasives may be spread through several pathways including ballast water, aquaria release, boat hulls, accidental release from aquaculture or research facilities, bait dumping, and intentional introduction for biological controls. Executive order 13112 charges the Federal government with duties to not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such

actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions. The Georgia Aquatic Nuisance Species Management Plan and may be viewed at <http://www.georgiawildlife.com/sites/>. The plan must be approved by a Federal aquatic nuisance species task force and the Governor's office before implementation occurs. The Georgia Invasive Species Advisory Committee (Committee) has identified 101 aquatic nuisance species that currently exist in Georgia or have a high probability of being introduced. This list includes 28 plant species, 52 animal species (mollusks, amphibians, and crustaceans) and 21 disease-causing organisms.

Invasive species are characterized by high reproduction rates, long life spans, broad diets, and the ability to withstand a wide range of environmental factors. If established they can outcompete native organisms for food and habitat space decreasing biodiversity and spreading disease. Three invasive species have been documented to occur on Tybee Island, the green porcelain crab (*Petrolisthes armatus*), the green mussel (*Perna viridis*) and the titan acorn barnacle (*Megabalanus coccopoma*) (Alan Power, pers. Comm. 2008). The green mussel is a native of the Indo-Pacific region. It was first documented in Tampa Bay, Florida in 1999 with ballast water being the most likely means of introduction (Power et. al. 2004). In 2003 it was recorded in Jacksonville Beach, Florida and in the offshore waters of Brunswick, Georgia (Power et. al. 2004). The first green mussel was found on Tybee in November 2003 (Power et. al. 2004). It is believed the mussel was introduced to Georgia from boats and equipments being transferred between coasts without adequate cleaning of attached organisms and draining of bilge water (Power et. al. 2004). Addressing invasive species as it pertains to the dredging fleet is a National issue that has not yet been resolved. The Asian tiger shrimp (*Penaeus monodon*) is a non-native species introduced through accidental release from aquaculture facilities and have been documented from Georgia to Texas. Three individuals were collected during 2013 near Tybee Island (<http://coastalgadnr.org/tigershrimp>). GADNR is requesting the public report any sightings of this non-native species online or to Todd Mathes, (912) 617-0490.

Best management practices to reduce or prevent the introduction of invasive or aquatic nuisance species include cleaning boat motors and disposing of any visible plants or animals in garbage bins, avoid chopping vegetation with outboard motor propellers, eliminate all water from motors, live wells, and bilges before leaving an area, flushing motors and cleaning strainers, if possible allow drying time of the hull and motor before transporting to another water body, learn what species are native and non-native in an area and report sightings of non-natives to the appropriate agency, and clean upland construction equipment and tools before moving to new locations.

**E.4.18.4. Shorebirds.** The direct placement of sands at the beach renourishment site will result in high mortality of benthic infauna. The majority of infauna loss will be in the shallow waters of the surf zone. During the 2008 renourishment shorebird surveys were conducted from August 2008 through April 2009. Two surveys were conducted each month. One survey was of the entire beach and the other was of the North beach (which includes the Critical Habitat Unit GA-1 for wintering Piping plovers). The entire beach survey was conducted at a low or falling tide while the North beach survey was conducted at a high tide, both surveys recorded number of

pedestrians as well as all bird species present. Tables 8 & 9 present the findings of these surveys.

**Table 8.**  
**SUMMARY RESULTS: ENTIRE BEACH**  
**Mean number of pedestrians, dogs, and bird species**  
**August 2008 - April 2009 (10 surveys)**

<b>SPECIES</b>	<b>MEAN NUMBER OBSERVED</b>	<b>HIGH COUNT</b>	<b>DATE OF HIGH COUNT</b>
Bufflehead	0.10	1	2/12/2008
Hooded Merganser	0.10	1	12/15/2008
Common Loon	0.20	2	12/15/2008
Northern Gannet	1.60	100	1/16/2009
Brown Pelican	84.10	440	9/25/2008
Double-crested Cormorant	2.70	26	1/16/2009
Anhinga	2.30	20	12/10/2008
Great Egret	0.06	3	6/22/2009
Snowy Egret	0.10	1	8/28/2008
Tricolor Heron	0.10	1	8/28/2008
Turkey Vulture	0.40	4	8/28/2008
Peregrine Falcon	0.10	1	11/10/2008
Semipalmated Plover	2.60	9	8/28/2008
Black-bellied Plover	5.30	12	2/12/2009
<b>Piping Plover</b>	<b>0.80</b>	<b>4</b>	<b>12/15/2008</b>
Killdeer	0.10	1	10/22/2008
American Oystercatcher	1.80	14	2/12/2009
Willet (Western)	7.40	66	1/16/2009
Ruddy Turnstone	4.90	21	9/25/2008
Sanderling	61.60	117	11/10/2008
Western Sandpiper	0.10	1	9/25/2008
Spotted Sandpiper	0.40	4	8/28/2008
Dunlin	3.90	35	12/15/2008
Bonaparte's Gull	0.20	2	1/16/2009
Laughing Gull	380.70	1473	9/25/2008
Ring-billed Gull	247.50	779	12/15/2008
Herring Gull	60.50	170	11/10/2008
Lesser Black-backed Gull	1.60	7	9/25/2008
Greater Black-backed	1.00	2	4/30/2009

<b>Table 8. Continued</b>			
<b>SUMMARY RESULTS: ENTIRE BEACH</b>			
Least Tern	2.10	21	8/28/2008
Gull-billed Tern	0.40	3	8/28/2008
Caspian Tern	7.40	61	12/25/2008
Black Tern	0.10	1	8/28/2008
Common Tern	0.40	2	8/28/2008
Forster's Tern	17.90	36	3/26/2009
Royal Tern	207.70	514	9/25/2008
Sandwich Tern	17.70	48	8/28/2008
Black Skimmer	485.40	2219	11/10/2008
Mourning Dove	0.50	3	8/28/2008
Tree Swallow	500.80	5000	10/22/2008
Barn Swallow	0.90	4	4/30/2009
Boat-tailed Grackle	44.70	99	12/15/2008
Northern Mockingbird	0.40	2	4/30/2009
Song Sparrow	0.10	1	4/30/2009
Pedestrians	155.40	374	8/28/2009
Dog	0.10	1	1/22/2009

**Table 9.**  
**SUMMARY RESULTS: UNIT GA-1**  
**Mean number of pedestrians and birds by species**  
**August 2008 - April 2009 (9 surveys)**

<b>SPECIES</b>	<b>MEAN NUMBER OBSERVED</b>	<b>HIGH COUNT</b>	<b>DATE OF HIGH COUNT</b>
Bufflehead	1.22	6	12/18/2008
Common Loon	0.11	1	3/25/2009
Horned Grebe	0.11	1	3/25/2009
Northern Gannet	1.11	3	2/28/2009
Brown Pelican	46.89	190	8/22/2008
Double-crested Cormorant	54.22	446	3/25/2009
Anhinga	1.33	12	10/21/2008
Great Blue Heron	0.11	1	12/20/2008
Great Egret	0.11	1	3/25/2009
Snowy Egret	0.11	1	4/28/2009
Turkey Vulture	0.22	2	1/16/2009

<b>Table 9. Continued</b>			
<b>SUMMARY RESULTS: UNIT GA-1</b>			
Peregrine Falcon	0.11	1	10/21/2008
Semipalmated Plover	5.00	20	9/22/2008
Black-bellied Plover	4.00	6	11/20/2008
<b>Piping Plover</b>	<b>0.44</b>	<b>1</b>	<b>8/22/2008</b>
American Oystercatcher	19.22	40	9/22/2008
Willet (Western)	4.89	11	2/28/2009
Ruddy Turnstone	83.00	787	9/22/2008
Sanderling	237.33	1500	4/28/2009
Western Sandpiper	5.78	52	9/22/2008
Purple Sandpiper	2.11	9	11/20/2008
Spotted Sandpiper	0.22	2	9/22/2008
Dunlin	8.89	12	10/21/2008
Bonaparte's Gull	1.78	15	2/28/2009
Laughing Gull	61.89	282	9/22/2008
Ring-billed Gull	59.44	161	12/18/2008
Herring Gull	18.89	42	9/22/2008
Lesser Black-backed Gull	3.00	17	9/22/2008
Greater Black-backed Gull	0.22	1	9/22/2008
Sooty Tern	0.22	2	8/22/2008
Least Tern	2.22	10	8/22/2008
Caspian Tern	17.67	9	8/22/2008
Common Tern	1.11	10	8/22/2008
Forster's Tern	4.11	18	2/28/2009
Royal Tern	195.67	235	8/22/2008
Sandwich Tern	15.44	83	9/22/2008
Black Skimmer	517.44	1905	11/20/2008
Mourning Dove	0.44	2	9/22/2008
Tree Swallow	6.11	55	2/28/2009
Barn Swallow	0.67	6	4/28/2009
Boat-tailed Grackle	27.78	158	11/20/2008
House Finch	0.11	1	8/22/2008
Pedestrians	8.56	77	4/28/2009

While the surveys did provide useful “snapshot” data they are not sufficiently extensive to perform statistical analysis to identify definitive differences between pre and post-construction conditions. The District will consult with USFWS to determine if these surveys should be replicated or if monitoring during construction will be a more appropriate measure of impacts. Evidence of benthic re-colonization has been observed on areas of the beach where fill was placed. Benthic organisms such as polychaete worms, sea pansies, clams, and other

invertebrates have been observed in these areas and shorebird feeding has also been observed. During construction no bird takes were observed and no bird take reports were filed. No obvious impacts to bird populations using the beach after construction were observed, but sufficient data do not exist to assess post-construction affects to bird populations using the beach. Mean counts before (August, September), during (October, November, December), and after (January, February, March, April) construction are shown in Table 10. Because the three timeframes occurred in different months, potential seasonal differences must be taken into consideration when trying to interpret the results. Ninety percent of the north end surveys (Unit GA-1 + entire beach) found people utilizing Critical Habitat Unit GA-1.

**Table 10.**  
**Critical Habitat Unit GA-1 Mean # of birds by species, before, during, and after construction**

<b>Bird species</b>	<b>Before (2 surveys)</b>	<b>During (3 surveys)</b>	<b>After (4 surveys)</b>
		<b>Mean</b>	
Bufflehead	0	0	0.25
Common Loon	0	0	0.25
Horned Grebe	0	0	0.25
Northern Gannet	0	0	2.5
Brown Pelican	117.5	13	37
Double-crested Cormorant	0	9	115.25
Anhinga	0	4	0
Great Blue Heron	0	0.3	0
Great Egret	0	0	0.25
Turkey Vulture	0	0	0.5
Peregrine Falcon	0	0	0.25
Semipalmated plover	13	0	18.5
Black-bellied Plover	0	2.3	7.25
<b>Piping Plover</b>	<b>.5</b>	<b>0.3</b>	<b>0.5</b>
American Oystercatcher	20	32.3	5
Willet (Western)	2	4.6	6.5
Ruddy Turnstone	36.5	215.6	6.75
Sanderling	50	139	404.75
Western Sandpiper	26	0	0
Purple Sandpiper	0	6	0
Spotted Sandpiper	1	0	0
Dunlin	0	6.6	15
Bonaparte's Gull	0	0	4
Laughing Gull	142	79.6	8.5
Ring-billed Gull	11	89.6	61
Herring Gull	24.5	15.6	11.25
Lesser Black-backed Gull	11	1	0.5
Greater Black-backed Gull	.5	0	7.5
Sooty Tern	1	0	0



<b>Table 10. Continued</b>			
<b>Critical Habitat Unit GA-1 Mean # of birds by species, before, during, and after construction</b>			
Least Tern	10	0	0
Caspian Tern	28	2.3	24
Common Tern	5	0	0
Forster's Tern	.5	2.6	7
Royal Tern	511	41.3	153.75
Sandwich Tern	51	0.6	8.75
Black Skimmer	71.5	1121.3	287.5
Mourning Dove	2	0	0
Barn Swallow	0	0	1.5
Boat-tailed Grackle	0	79.6	2.75
House Finch	.5	0	0

During construction, bird behavior in the construction area varied from avoidance to congregation. No piping plovers were observed near the active construction sites. Several gull species, sanderlings, boat tailed grackles, and at least one willet were observed gathering at the dredge pipe output area presumably to feed on any species coming through the pipe. During tilling operations, all bird species tended to avoid the active construction area.

The beach flats and dunes on the north end of Tybee occasionally attract sea birds to nest. In 2005, a small flock of black skimmers (*Rynchops niger*) nested on Tybee Island (Elfner, 2005). Impacts to nesting black skimmers would be avoided by construction of the Tybee Island shore protection project renourishment segment during the winter months (November through March). If project construction occurs during a portion of the shorebird nesting season (March through April), impacts to nesting shorebirds are unlikely and can be minimized by following appropriate nest monitoring protocol and establishment of buffer areas around/nesting colonies. The recommended setback distance (RS distance) for tern/black skimmer colonies is 180 meters (590 feet). Protection measures for breeding colonies would remain in place until it is determined that all new offspring have fledged. Based upon the construction window and appropriate setback distances, no significant adverse impacts to nesting shorebirds populations are expected to occur during the construction phase of this project.

Increased recreational usage of the beach after completion of beach nourishment may also negatively affect nesting shorebirds by increasing human disturbance on the beach, potentially resulting in abandonment of nesting activities or nest destruction by inadvertent mechanical damage due to the camouflaged nature of nests. Proper monitoring and posting of educational signs may reduce the potential for future adverse impacts to nesting shorebirds. Nesting shorebirds surveys should be conducted every two weeks by the city between April 1 and August 31 during the summer following project construction in the areas of the beach renourishment project which have previously supported nesting colonies. If nesting colonies are observed with the beach renourishment project area, coordination with the Georgia DNR Wildlife Resources Division (WRD) will be required to implement measures to protect breeding colonies. Such

measures commonly involve establishment of the RS distance; and use of signs, posts, high-visibility string, tape, and any other materials necessary to prevent human approach within the RS distance. Based upon these monitoring and protective measures, adverse secondary impacts to nesting bird colonies within the project area are not anticipated (Miller et. al., 2008). GA DNR conducts winter shorebird surveys each year during January. Table 11 below lists the results of these counts for the years 1999-2012. Dominant species include Dunlin, Sanderling, and Ruddy Turnstones.

**Table 11.  
Georgia Department of Natural Resources Annual Winter Shorebird Surveys**

Winter Waterbird Summary 2006-2012	Tybee Island							
	2006	2007	2008	2009	2010	2011	2012	Mean
<b>American Oystercatcher</b>	16	28	27		6	42	42	23.0
<b>American Avocet</b>								0.0
<b>Piping Plover</b>				4			2	0.9
<b>Wilson's Plover</b>								0.0
<b>Semipalmated Plover</b>		100						14.3
<b>Killdeer</b>								0.0
<b>Black-bellied Plover</b>	22	23	45			1	28	17.0
<b>Marbled Godwit</b>								0.0
<b>Whimbrel</b>								0.0
<b>Long-billed Curlew</b>								0.0
<b>Willet</b>	8	6	50	66	29	8	38	29.3
<b>Greater Yellowlegs</b>								0.0
<b>Lesser Yellowlegs</b>								0.0
<b>Yellowlegs Sp.</b>								0.0
<b>Wilson's Snipe</b>								0.0
<b>Dowitcher: Short-billed</b>	1	14	1				114	18.6
<b>Dowitcher: Long-billed</b>								0.0
<b>Dowitcher Sp.</b>	25							3.6
<b>Spotted Sandpiper</b>								0.0
<b>Ruddy Turnstone</b>	266	227	92	15	39	81	93	116.1
<b>Purple Sandpiper</b>	12	9	10		7	15	14	9.6
<b>Red Knot</b>	2	275						39.6
<b>Dunlin</b>	277	69	160		25	2	392	132.1
<b>Sanderling</b>	95	94	35	70	238	13	297	120.3
<b>Western Sandpiper</b>	32	76	101				52	37.3

<b>Least Sandpiper</b>			1				4	0.7
<b>Peeps</b>						6		0.9
<b>Lesser Black-backed Gull</b>	1	1		3	2	3		1.4
<b>Reddish Egret</b>								0.0
<b>Redhead</b>								0.0
<b>Ring-necked Duck</b>								0.0
<b>Greater Scaup</b>	8							1.1
<b>Scaup Sp.</b>	4				8			1.7
<b>Lesser Scaup</b>								0.0
<b>Black Scoter</b>		2						0.3
<b>Scoter Sp.</b>								0.0
<b>White-winged Scoter</b>								0.0
<b>Surf Scoter</b>								0.0
<b>Long-tailed Duck</b>								0.0
<b>Common Eider</b>								0.0
<b>Bald Eagle</b>		1	1					0.3
<b>Peregrine Falcon</b>								0.0
<b>Merlin</b>								0.0
								0.0
<b>Total Number of Shorebirds</b>	756	921	521	155	344	168	1076	563.0

Note: Unpublished GADNR Data, Annual Winterbird survey. Provided by GADNR to Coastal Eco-Group via email dated 2/10/2012.

#### **E.4.19. Essential Fish Habitat Assessment**

The No Action Alternative may have a negative impact on essential fish habitat within the proposed project area due to increased erosion of the nearshore and intertidal flat areas.

Essential fish habitat in the proposed project area includes intertidal flats and marine and estuarine water column. Short term impacts to marine surf zone fishes due to increased turbidity and loss of habitat during construction would occur. These effects are expected to be temporary and minor. Measures will be taken during construction to reduce turbidity through temporary toe dikes. Depending on tide and weather patterns minor upstream turbidity effects could potentially impact estuarine waters. No significant impacts to fish species would be expected. Some minor impacts associated with turbidity increases at the borrow area and on the beach would be expected during dredging and placement. Fish species abundance may be temporarily impacted by decreases in prey abundance due to filling. These impacts are expected to be temporary and minor in nature. By increasing the fill 50 feet wider than the last renourishment the nearshore area (including intertidal and subtidal flats) will experience a greater area of effect. Short-term negative impacts to benthic organisms on the flats are expected but these areas are expected to

recolonize post-construction. A monitoring program may be conducted to determine effects of construction activities on the intertidal/subtidal areas.

#### **E.4.20. THREATENED AND ENDANGERED SPECIES**

##### **E.4.20.1 NO ACTION ALTERNATIVE**

The No Action Alternative would maintain the current condition. Continued shoreline erosion and beach profile deflation may reduce the amount of habitat for threatened and endangered sea turtles, birds, fish, plants and other organisms. Sufficient sand with the right characteristics (i.e. grain size and composition) and in the proper locations is crucial for sea turtles to nest, and for birds to nest and feed (USACE, 2007). Under the No Action Alternative, the level of protection provided by the buffering beach and dunes from incident storms would be substantially reduced, potentially decreasing sea turtle and shorebird nesting success by increasing the likelihood of nest inundation during storms. Critical habitat for the piping plover would also be reduced due to erosion. The No Action Alternative would not negatively affect other listed endangered species found in Chatham County.

##### **E.4.20.2. RECOMMENDED ALTERNATIVE**

A Biological Assessment of Threatened and Endangered Species (BATES) has been prepared to address impacts to Federally listed threatened and endangered species or designated critical habitat (See Appendix C). It contains a thorough review of potential impacts to species listed in Table 4 (section 3.07). This document will be coordinated with the USFWS and NMFS during the public review period. In 2008, the USFWS issued a Biological Opinion to address the project's effects on nesting loggerhead sea turtles and leatherback sea turtles, non-breeding piping plover, and designated critical habitat for the piping plover (Appendix D). The USFWS reserves the right to issue an updated BO during the Pre-Construction Engineering and Design (PED) phase.

The BATES concluded that the project, using hydraulic cutterhead pipeline dredging, may affect but is not likely to adversely impact listed species or result in the destruction or adverse modification of critical habitat, provided conditions to avoid adverse impacts to these species are affixed to the construction contract (see below). These conditions will be included in the 2015 renourishment.

##### *Special Conditions*

- ◆ Invasive Species Prevention Plan. USDA Quarantine Requirements for Cleaning Equipment. USACE and the U.S. Department of Agriculture (USDA) have a compliance agreement requiring measures to prevent the spread of certain plant pests that may be present in the soil (ER 1110-1-5). Major portions of all southeastern states are in a quarantine area for such pests, including the imported fire ant. In addition, adjacent states to the north have

introduced infestations resulting from movement of soil from infested southeastern states. The Contractor shall thoroughly clean all upland construction equipment and tools at the previous job site in a manner that ensures that these implements are free from residual soil, egg deposits from plant pests, noxious weeds, and plant seeds. Equipment shall be cleaned using water under pressure, and hand tools shall be thoroughly cleaned by brushing or other means to remove all soil. In addition, all construction equipment used for this USACE contract shall be thoroughly cleaned by the Contractor before it is removed from this job site. The Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements that may be necessary.

- ◆ Sea turtles, whales and Florida Manatee have been sighted in the general vicinity of the project. The Contractor shall maintain a special watch for these species for the duration of this contract for these animals and any sightings will be reported to the Contracting Officer.
- ◆ Endangered Species Watch Plan. A watch plan (see sample, Attachment E-1) that is adequate to protect endangered species from the impacts of the dredging and associated operations must be approved by the Contracting Officer before any dredging activities take place. The watch plan shall be for the entire period of dredging and transportation of material from the borrow area to the beach project area and shall include the following:
  - 1. Watch plan coordinator's name
  - 2. Names and qualifications of designated observers
  - 3. Name(s) of the person(s) responsible for reporting sightings.
- ◆ The contractor will instruct all personnel associated with the dredging and renourishing of the beach of the potential presence of manatees, whales, sturgeon and sea turtles, and the need to avoid collisions with these species.
- ◆ All personnel associated with the dredging and renourishing of the beach will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, sea turtles, sturgeon and whales which are protected under the Marine Mammal Protection Act of 1972, and/or the Endangered Species Act of 1973. The contractor may be held responsible for any listed species harmed, harassed, or killed as a result of project activities.
- ◆ Siltation or turbidity barriers will be made of material in which manatees cannot become entangled, be properly secured, and be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.
- ◆ All vessels associated with the project will operate at "no wake/idle" speeds at all times while in the immediate area and while in the water where the draft of the vessel provides less than four feet clearance from the bottom. All vessels will follow routes of deep water whenever possible.

- ◆ Extreme care will be taken in lowering equipment or materials, including, but not limited to pipelines, dredging equipment, anchors, etc., below the water surface to the ocean floor; taking any precautions not to harm any manatee(s) that may have entered the project area undetected. All such equipment will be lowered at the lowest possible speed.
- ◆ To prevent a crushing hazard to manatees, if plastic pipeline is used to transport material from the borrow site to the beach the pipeline will be secured to the ocean floor or to a fixed object along its length to prevent movement with the tides or wave action.
- ◆ Dredge lighting must be shielded, or low-sodium, to prevent potential disruption of courtship or nesting by sea turtles during 1 May through 30 August.
- ◆ The contractor agrees that any collision with a manatee, turtle, sturgeon or whale shall be reported immediately to the Corps of Engineers (912-652-5058), the U.S. Fish and Wildlife Service Coastal Suboffice (912-832-8739), the National Oceanic and Atmospheric Administration National Marine Fisheries Service Protected Resources Division (NOAA NMFS PRD (301-427-8400)), and the Georgia Department of Natural Resources (Weekdays: 912-264-7218 or 1-800-241-4113; nights and weekends: 1-800-241-4113). Notification will also be made to the above offices upon locating a dead, injured, or sick endangered or threatened species specimen. Care will be taken in handling dead specimens to preserve biological materials for later analysis of cause of death. Any dead manatee(s) found in the project area must be secured to a stable object to prevent the carcass from being moved by the current before the authorities arrive. The finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed. In the event of injury or mortality of a manatee, all aquatic activity in the project area must cease pending Section 7 consultation under the Endangered Species Act and the Marine Mammal Protection Act between the U.S. Fish and Wildlife Service and the Corps of Engineers.
- ◆ All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.
- ◆ A minimum of two 3-feet by 4-feet temporary manatee awareness construction signs labeled “Manatee Habitat-Idle Speed In Construction Area” shall be installed and maintained at prominent locations within the construction area/docking facility prior to initiation of construction and removed upon completion of the project. One sign shall be placed visible to vessel operators and one shall be visible to water related dredging crews. See Attachment EA-4 Temporary Manatee Awareness Construction Signs.

- ◆ Prior to each renourishment cycle, the District shall coordinate with the USFWS to review sea turtle nest records for Tybee Island and other pertinent data to determine if Section 7 consultation should be reinitiated.
- ◆ The contractor will keep a log detailing sightings, collision, or injury to manatees, sea turtles, whales, or other endangered species which have occurred during the contract period. Following project completion, a report summarizing the above incidents and sightings will be submitted to the U.S. Fish and Wildlife Service, 4980 Wildlife Dr. NE, Townsend, Georgia 31331, to the GA DNR, Nongame Conservation Section, 1 Conservation Way, Brunswick, GA 31520, and to the U.S Army Corps of Engineers, Savannah District, Navigation Section, ATTN: CESAS-OP-SN, 100 W. Oglethorpe Ave., Savannah, Georgia 31401-3640.
- ◆ All temporary project materials will be removed upon completion of the work. No construction debris or trash will be discarded into the water.
- ◆ Shorebird monitoring will be conducted prior to and during construction activities in the vicinity of critical habitat unit GA-1. A 200 foot buffer zone will be established around feeding piping plovers. If necessary, construction activities would be modified to minimize any disturbance to wintering or migratory shorebirds on site. Any construction related activities that could potentially harass feeding piping plovers shall cease while piping plovers are in the buffer zone. If birds settle into designated construction areas such as truck routes, the creation of alternate truck routes would avoid disturbance to the birds. Relocation of the travel corridor shall also be considered if birds appear agitated or disturbed by construction related activities.

#### **E.4.21. PROTECTION OF CHILDREN AND ENVIRONMENTAL JUSTICE**

The EO 13045, Protection of Children from Environmental Health Risks and Safety Risks (21 April 1997), recognizes a growing body of scientific knowledge that demonstrates that children may suffer disproportionately from environmental health risks and safety risks. These risks arise because children's bodily systems are not fully developed; because children eat, drink, and breathe more in proportion to their body weight; because their behavior patterns may make them more susceptible to accidents. Based on these factors, the President directed each Federal agency to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children. The President also directed each Federal agency to ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

The No Action Alternative would allow for continued shoreline erosion and beach profile deflation. This would not disproportionately affect children's safety or environmental health risks.

No changes in demographics, housing, or public services would occur as a result of the beach nourishment project. With respect to the protection of children, the likelihood of disproportionate risk to children is not significant. The proposed project does not involve activities that would pose any disproportionate environmental health risk or safety risk to children.

#### **E.4.22. CUMULATIVE IMPACTS**

Cumulative impact is the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). This cumulative impacts analysis summarizes the impact of such cumulative action by identifying the impacts of the proposed project in terms of related past, present and reasonably foreseeable future actions that are related to the proposed project either geographically or otherwise impacting the same resources. There are no adverse cumulative effects associated with the No Action Alternative (Miller et. al., 2008).

The Tybee Island shore protection project, in addition to past projects and any future actions within the Tybee Island project area vicinity, primarily impacts the beach, nesting sea turtles, nearshore softbottom benthic communities, offshore softbottom communities, and foraging habitat of shorebirds and surf zone fishes. The beach will continue to be maintained as an area suitable for shoreline protection, recreation and wildlife habitat. The proposed offshore borrow site will be depleted of beach-compatible sand as a result of the Tybee Island Shore Protection Project. The proposed project will not impact seagrasses or hardbottom communities.

The Federally-authorized project is based upon a 7-year renourishment cycle. At the time of the proposed project construction, Federal participation would discontinue after 9 years. This last proposed renourishment (with Federal participation) volume and cost will be increased by two-sevenths over that in the 2008 to provide protection through to the end of the project's economic life (2024). This 9-year renourishment cycle will take the place of a third renourishment in 2022. Beach compatible material would continue to be placed in the most eroded portions of the Tybee Island Shore Protection Project.

#### **E.4.23. SUMMARY**

The potential environmental impacts which could result from implementation of the proposed project were identified. Adverse environmental impacts would occur if the proposed project is implemented. That is to be expected with any construction project. The significance of those impacts, as well as development of methods to avoid or reduce the impacts, have been identified in previous sections.

Unavoidable adverse impacts to benthic communities would occur as a result of the dredging and dredged material disposal components of the proposed project. Individual organisms within the



benthic communities would be lost as a result of the proposed excavation and nourishment activities. However, benthic organisms would recolonize these areas after construction.

Turbidity near the borrow area and beaches would temporarily increase on a short-term basis. However, this increase is not likely to result in a violation of state water quality standards.

Conditions to minimize potential adverse impacts to threatened and endangered species that might occur in the general project area will be added to any contract issued for the work.

Impacts to any potentially significant cultural resources in the project area would be avoided or mitigated. Irreversible and irretrievable resource commitments would be made through expenditure of construction funds for the proposed project. No other project activities or impacts would be either irreversible or irretrievable.

Adverse secondary impacts which had a significant probability of occurrence have been identified with the No Action Alternative. With the No Action Alternative, erosion retreat would continue, compromising the seawall stability and loss of property (USACE, 1998).

## **5.00. RELATIONSHIP OF PROJECT TO FEDERAL AND STATE AUTHORITIES**

Table 12 summarizes the status of the compliance of the proposed project with Federal and State environmental laws. In addition to a small amount of increased fill material being placed inside the critical habitat for the Piping Plover (Federally listed as Threatened) the Atlantic sturgeon has been listed as Endangered as of February 6, 2012 and will be addressed in this EA and associated appendices. The District has determined construction of the project is not expected to adversely affect this species. The National Oceanic and Atmospheric Administration and USFWS will have an opportunity to review and comment on the project during the public notice period in December 2013. Previous environmental approvals on past renourishments have demonstrated no adverse affects to a similar endangered species, the Shortnose sturgeon. These two components are the only new anticipated environmental considerations that were not addressed in the previous (2008) nourishment.

**Table 12.  
Compliance with Environmental Regulations**

<b>FEDERAL POLICIES</b>	<b>COMPLIANCE STATUS</b>
Anadromous Fish Conservation Act, 16 U.S.C. 757, et seq.	Draft EA will be coordinated with NMFS for comments.
Archaeological and Historic Preservation Act, as amended, 16 U.S.C. 469, et seq.	Draft EA will be coordinated with GASHPO for concurrence in no effect determination.
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq.	Draft EA will be coordinated with EPA for comments.

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Clean Water Act, as amended (Federal Water Pollution Control Act) 33 U.S.C. 1251, et seq. 404(b)(1)	Draft EA will be coordinated with GADNR-EPD and Water Quality Certification will be requested.
Coastal Barrier Resources Act, as amended, 16 U.S.C. 3501, et seq.	In Compliance. Work would not be within a CBRA unit.
Coastal Zone Management Act, as amended, 16 U.S.C. 1451 et seq.	Draft EA with CZM consistency determination will be coordinated with GADNR-CRD (Coastal Resources Division) for concurrence.
Endangered Species Act, as amended, 16 U.S.C. 1531, et seq. BATES	The District has conducted a Biological Assessment of Threatened and Endangered Species (BATES). The BATES concluded that the project may affect but is not likely to adversely affect listed species provided the special conditions listed in the BATES are included. The BATES will be coordinated with NMFS and USFWS through formal or informal consultation with a request for concurrence.
Environmental Justice E.O. 12898	In compliance. No adverse effects to minorities or low-income populations are anticipated.
Erosion and Sedimentation Control Act	This is a Georgia state law that implements non-point source requirements (for construction sites) of the Federal Clean Water Act. In compliance with the Clean Water Act, the District would coordinate with GADNR - EPD to apply for a Land Disturbing Activity Permit and Buffer Variance, if required.
Estuary Protection Act, 16 U.S.C. 1221, et seq.	In compliance. Estuaries and their resources will be considered during formulation of final alternatives and evaluated through the draft EA.
Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12, et seq.	In compliance. The proposed work should produce additional recreational benefits.
Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661, et seq.	District will coordinate proposed work through USFWS and NMFS and determine whether a report under Section 2(b) of the Act is necessary. If required, project will fund the Service to conduct the review and will consider any comments and recommendations in formulation of the final alternatives.
Fishery Conservation and Management Act of 1976, Public Law 99-659.	In compliance. Project will not impact 200 mile fishery conservation zone as established by the Magnuson Fishery Conservation and Management Act of 1977.
Floodplain Management E.O. 11988	In compliance. Construction would be in the lower estuary such that it would have no impact on the floodplain.
Marine Mammal Protection Act, 15 U.S.C. 1361 et seq.	The draft EA will be coordinated with the Services for comment on potential impacts.

Magnuson-Stevens Act, as amended, Public Law 104-297.	District will conduct an Essential Fish Habitat assessment and coordinate its EFH determination with NMFS.
Marine Protection, Research, and Sanctuaries Act of 1972, 33 U.S.C. 1401, et seq.	Not applicable. No protected areas exist within or close to the project area. Gray's Reef National Marine Sanctuary is approximately 40 miles South of Tybee Island.
Migratory Bird Conservation Act of 1929, 16 U.S.C. 715	District will coordinate the draft EA with USFWS and GADNR for comments. It is expected that the proposed alternatives will be formulated to minimize impacts to migratory birds.
Migratory Bird Treaty Act of July 3, 1918 as amended.	District will coordinate the draft EA with USFWS and GADNR for comments. It is expected that the proposed alternatives will be formulated to minimize impacts to migratory birds.
National Environmental Policy Act of 1969 (NEPA), as amended, 42 U.S.C. 4321, et seq.	A draft EA and draft FONSI will be prepared for the proposed work and coordinated with interested agencies and the public in compliance with NEPA.
National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470f, et seq.	The proposed alternatives will be investigated for potential effect. It is expected that the District's investigation will result in a determination of no effect. The results of the District's investigation will be coordinated with the GA SHPO for concurrence.
Protection of Wetlands E.O. 11990	In compliance. No wetland impacts are expected from the proposed work.

#### **E.6.00. COORDINATION**

Public and Agency coordination is scheduled to begin in December 2013 and will be fully compliant with NEPA regulations. Early informal consultation has already begun with both USFWS and NMFS.

#### **E.7.00. LIST OF PREPARERS**

Ellie Love Covington      USACE Planning Environmental  
Biologist                      6 years

Julie Morgan                USACE Planning Environmental  
Archeologist                17.5 years

## REFERENCES

- ANAMAR Environmental Consulting. 2008 Tybee Island Borrow Area Compatibility Study, November 1998 vs. December 2007. Technical Memo dated January 21, 2008 from Paul Berman to Erik Olsen.
- Buchman, M.F., 1999. NOAA Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Seattle WA, Coastal Protection and Restoration Division, National Oceanic and Atmospheric Administration, 12 pages.
- Calman, W.T. 1912. The Crustacea of the order Cumacea in the collection of the United States National Museum. *Proceedings of the U.S. National Museum* 41: 603-76.
- Calver, James S., 1997. U.S. Army Corps of Engineers, Savannah District. Personal communication.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, Biological Services Program; FWS/OBS-79/31.
- Dean, D. 1978a. Migration of the sandworm *Nereis virens* during winter nights. *Marine Biology* 45: 165-73.
- Dean, D. 1978b. The swimming of bloodworms (*Glycera* spp.) at night with comments on other species. *Marine Biology* 48: 99-104.
- Dompe, P. E. and D. M. Haynes. 1993. Turbidity Data: Hollywood Beach, Florida, January 1990 to April 1992. Coastal & Oceanographic Engineering Department, University of Florida: Gainesville. UF/COEL - 93/002.
- Dorfman, M. and N. Stoner. 2010. Testing the Waters: A Guide to Water Quality at Vacation Beaches, 17th ed.. Natural Resources Defense Council.  
[www.nrdc.org/water/oceans/ttw/titinx.asp](http://www.nrdc.org/water/oceans/ttw/titinx.asp)
- Elfner, Mary D. 2005. Tybee Island Beach Management Plan. Prepared for the City of Tybee Island.
- Gulf South Research Corporation (GSRC). 1999. Tybee Island Sediment Sampling and Analysis. Final Report. Contract No. DACW21-98-D-0019. USACE, Savannah District. April 1999.

- Howard, Steven. 2007. Memorandum regarding sand compatibility for offshore borrow area sediments, Tybee Island, GA from Steven Howard, P.E. Olsen Associates Inc., to Margaret McIntosh, P.G. USACE. 18 pages.
- McDonald, J.L., R.G. Hartel, L.C. Gentit, C.N. Belcher, K.W. Gates, K. Rodgers, J.A. Fisher, K.A. Smith and K.A. Payne. 2006. Identifying Sources of Fecal Contamination Inexpensively with Targeted Sampling and Bacterial Source Tracking. *Journal of Environmental Quality* 35: 889-897.
- Miller, C.L., E.Olsen, M. Lawson, S. Howard, P. Berman, and G. Watts. 2008. Final supplemental environmental assessment Tybee Island Beach Renourishment Project. Prepared for Olsen Associates Inc. by Coastal Eco-Group Inc. Ft. Lauderdale, FL. 151 pp.
- Mills, E.L. 1967. The biology of an ampeliscid amphipod crustacean sibling species pair. *Journal of Fish. Res. Bd Can.* 24: 305-55.
- Music, J. L. and J. M. Pafford. 1984. Population dynamics and life history aspects of major marine sportfishes in Georgia's coastal waters. GDNr, Brunswick, Contribution series 38. 382 pp.
- Oertel, George F., 1979. Study of Water and Sediment Flow Patterns Adjacent to the Erosional Envelope at the South End of Tybee Island, Georgia. U.S. Army Corps of Engineers, Savannah, GA.
- Oertel, George F., Jimmy E. Fowler, and Joan Pope, 1985. History of Erosion and Erosion Control Efforts at Tybee Island, Georgia, Miscellaneous Paper CERC-85-1, U.S. Army Corps of Engineers, Coastal Engineering Research Center.
- Olsen and Associates, 1996. Tybee Island, Georgia, 1-Year Shoreline Monitoring Report, Jacksonville, Fla.
- Olsen and Associates, 1997. Tybee Island, Georgia, 2-Year Shoreline Monitoring Report, Jacksonville, Fla.
- Olsen and Associates, 2008. 2007 Geotechnical Investigation, Tybee Island, GA, Beach Renourishment Project. Jacksonville, Fla.
- Pafford J. M. and N. Nicholson. 1989. Georgia Marine Recreational Fisheries Survey, 1985-1987. Georgia Department of Natural Resources, Brunswick, Contribution Series 45. 157 pp.
- Panamerican Consultants, Inc. 2013. Remote Sensing Survey of 300' Buffer and Diver Identification of Magnetic Anomalies, Tybee Island Beach Erosion Control Project,

- Chatham County, Georgia, 2015 Renourishment (in preparation). Contract No. W912HN-12-D-0016, Delivery Order No. 0019. USACE, Savannah District.
- Posey, Frank H., and F. Wade Seyle, 1980. "Unpredicted Rapid Erosion, Tybee Island, Georgia," Coastal Zone 80, Volume III., pp. 1869-1882, ASCE, New York, NY.
- Power, A.J., R.L. Walker, K. Payne, and D. Hurley. 2004. First Occurrence of the Nonindigenous Green Mussel, *Perna viridis*, (Linnaeus, 1758) in Coastal Georgia, United States. Journal of Shellfish Research 23 (3): 741-744
- Sandifer, P.A., J.V. Miglarese, D.R. Calder, et al. 1980. Ecological characterization of the Sea Island coastal region of South Carolina and Georgia. Vol. III: Biological features of the characterization Area. U.S. Fish and Wildlife Service, Office of Biological Services, Washington, D.C. FWS/OBS-79/42.
- Signoretto, C., G. Burlacchini, M. del Mar Lleo, C. Pruzzo, M. Zampini, L. Pane, G. Franzini, and P. Canepari. 2004. Adhesion of *Enterococcus faecalis* in the nonculturable state to plankton is the main mechanism responsible for the persistence of this bacterium in both lake and seawater. Appl. Environ. Microbiol. 70: 6892-6896.
- South Carolina Department of Natural Resources, Marine Resources Division, Marine Resources Research Institute. 2010. The 2008 Tybee Island Renourishment Project: Physical and Biological Responses of the Borrow Area Habitat to Dredging.
- South Carolina Department of Natural Resources, Marine Resources Division, Marine Resources Research Institute. 2010. The 2008 Tybee Island Renourishment Project: Responses of Sediment Composition and Dominant Macroinvertebrates to Nourishment.
- U.S. Army Corps of Engineers, 1994. "Tybee Island Beach Erosion Control Project-Section 934 Reevaluation Report, March 1994." Revised October 1994.
- U.S. Army Corps of Engineers. 1996. Coast of Florida erosion and storm effects study: region III with final environmental impact statement ACOE Tech. Rep., Jacksonville District. Three volumes and appendices A-1.
- U.S. Army Corps of Engineers (USACE). 1997. Special Report on South Tip Beach/ Tybee Creek portion of Tybee Island Beach Erosion Control Project. Tybee Island, Georgia.
- U.S. Army Corps of Engineers (USACE). 1998. Final Environmental Assessment Tybee Island Oceanfront Beach Second Street Study, Tybee Island, Georgia.
- U.S. Army Corps of Engineers (USACE). 2005. Limited Reevaluation Report Tybee Island, Georgia. 2008 Renourishment. Savannah District.

- U.S. Army Corps of Engineers, Engineer Research and Development Center (USACE-ERDC). 2008. Impact of Savannah Harbor Deep Draft Navigation Project on Tybee Island Shelf and Shoreline. ERDC/CHL TR-08-5.
- U.S. Army Corps of Engineers (USACE). 2008. Final Environmental Assessment Tybee Island, Georgia Shore Protection Project, 2008 Renourishment. Savannah/Mobile District.
- U.S. Army Corps of Engineers (USACE). 2009. Tybee Island, Georgia, 2008 Shore Protection Project Bird Survey Report. Savannah District.
- U.S. Department of the Interior/U.S. Fish and Wildlife Service (USDOI/FWS). 2000. Draft Fish and Wildlife Coordination Act Report, Brunswick County Beaches Project. Ecological Services Raleigh Field Office, Raleigh, NC. 175 pp.
- U.S. Fish and Wildlife Service Southeast Region Atlanta, Georgia. 1993. Fish and wildlife coordination act report, biological opinion, and coastal barrier Resources act consultation for Tybee Island Beach Erosion Control Project Section 934 Reevaluation.
- Watts, Gordon P., Jr.. 2008. *An Archaeological Remote-Sensing Survey and Target Assessment for a Borrow Area Offshore of Tybee Island, Chatham County, Georgia*. Report prepared by Tidewater Atlantic Research, Inc., Washington, NC, for Olsen Associates, Inc., Jacksonville, FL. Report on file at US Army Corps of Engineers, Savannah District, Savannah, Georgia.