LEE COUNTY, FLORIDA
SHORE PROTECTION PROJECT
Gasparilla Island Segment

Final Integrated Section 934 Report and Environmental Assessment

May 2018

US Army Corps of Engineers
Jacksonville District

LEE COUNTY
SOUTHWEST FLORIDA

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FINAL INTEGRATED SECTION 934 REPORT & ENVIRONMENTAL ASSESSMENT

May 2018

LEE COUNTY, FLORIDA SHORE PROTECTION PROJECT

Gasparilla Island Segment

RESPONSIBLE AGENCY: U.S. Army Corps of Engineers (USACE), Jacksonville District

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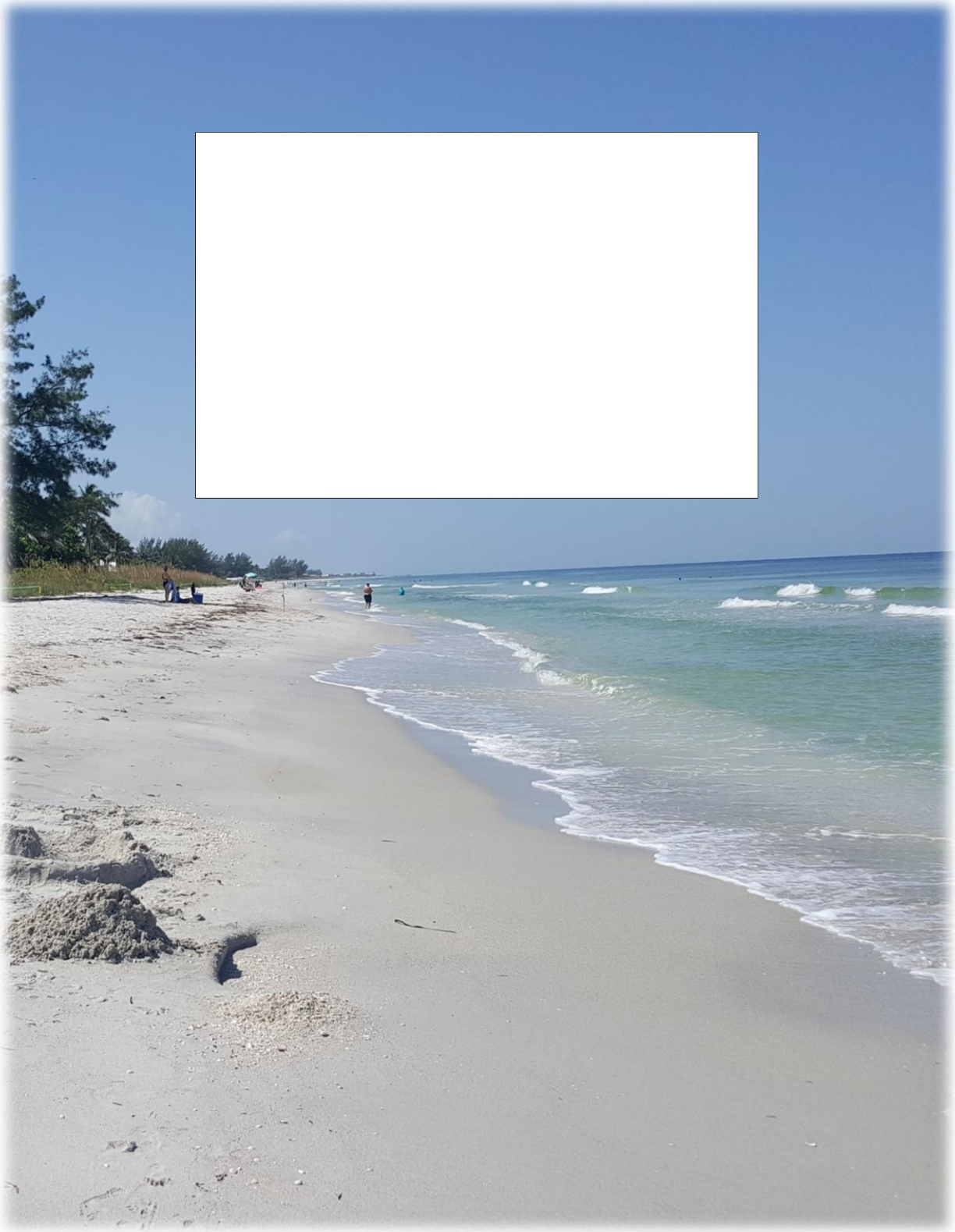

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EXECUTIVE SUMMARY

Introduction

Infrastructure along the Gasparilla Island, Lee County, Florida shoreline, is subject to damage from wave attack, erosion, and inundation caused by coastal storms. It is projected that storms in the study area will continue damaging infrastructure and limiting habitat. This study analyzes the authorized project, and its optimization that addresses these vulnerabilities, as well as incidental opportunities for maintenance of environmental resources and recreation for the Gasparilla Island segment along the Gulf of Mexico shoreline of Lee County, Florida for the 40-year period of analysis from 2016 to 2056.

Purpose and Need

The purpose of the present Section 934 study is to determine if future nourishments of the Gasparilla segment of the Lee County, Florida Shore Protection Project warrant an extension of Federal participation to the year 2056. Federal participation expired in December 2016, ten calendar years after initial construction in 2006. The non-federal sponsor is Lee County, Florida, represented by the Board of County Commissioners.

Study Area

The project is located in Gasparilla Island, Lee County, on the lower Gulf of Mexico coast of Florida, about 90 miles south of the entrance to Tampa Bay. Gasparilla Island is bounded on the north by Gasparilla Pass and on the south by Boca Grande Pass. The Gulf shore of the island is about 6.7 miles in length. The authorized project length is 2.8 miles and spans Florida Department of Environmental Protection (FDEP) reference monuments R10.5 (R11 plus a 1,200 foot long north extending taper) and R24.5 (R24 plus a 600 foot long south extending taper).

Problems and Opportunities

Major property damages result from severe storms, which occasionally sweep across the gulf and cause significant damage. Favorable conditions during periods between storms only partially restore the eroded beaches. Loss of protective beaches and dunes due to shoreline recession threatens infrastructure. Homeowners seeking to protect their property have constructed some shore protection measures, such as seawalls. These structures limit or eliminate the natural interaction where dunes feed sand to the eroded beach during storm events. Limiting this natural protective function makes infrastructure and the environment adjacent to protected properties more susceptible to storm damages. Additional problems include loss of recreational resources and habitat.

Problems within the Gasparilla Island study area include:

1. Storm damages to property and infrastructure due to wave attack, inundation, and erosion
2. Loss of dune and beach habitat
3. Loss of recreational opportunities

Gasparilla project's main opportunity is related to infrastructure protection:

1. Reduce damages to infrastructure: Future without project damages (modeled in Beach-*fx*) estimated at $192,408,000 in present value dollars ($7,991,000 in average annual dollars) (FY18 discount rate of 2.75%)

Incidental opportunities for the Gasparilla project are as follows:

2. Protect/enhance habitat/environmental resources: High-density turtle and shore bird nesting areas; near shore hard bottoms
3. Retain recreation: Area depends on tourism, as well as aesthetic quality for community

Authorized Project

The project boundaries are from monument markers R10.5 to R24.5 and the project length is 2.8 miles. According to the General Reevaluation Report (GRR) (USACE, 2000), the design template is defined as a 20 foot extension of the project baseline, roughly the 1995 mean high water (MHW) line, at +5 ft.-MLW (3.75 ft-NAVD88); a foreshore slope of 1V:15H transitioning to a nearshore slope of 1V:25H from MLW extending out to the intersection with the existing profile; the authorized renourishment interval was determined to be 7 years and the volume of this advanced and return interval nourishment was calculated to be 542,000 cubic yards. The sand source for periodic renourishments is the Boca Grande ebb shoal, located approximately 1.85 miles SW of R25.

Optimization of the Authorized Project (Recommended Plan)

According to Policy Guidance Letter (PGL) Number 22, (USACE, 1991), the purpose of this Section 934 study consists primarily of determining if the authorized project is still economically justified, and developing alternatives (size and timing) for nourishment and recommend the most cost-effective nourishment scheme for the authorized project. As a result of the optimization of the authorized project, the recommended plan is defined as a 20 foot extension of the project baseline, roughly the 1995 MHW line, at +5 ft.-MLW (3.75 ft-NAVD88); a foreshore slope of 1V:15H transitioning to a nearshore slope of 1V:25H from MLW extending out to the intersection with the existing profile; a 60 foot advance/sacrificial berm accounts for an average periodic nourishment interval of 22 years; only two renourishments are expected throughout the remaining 40 year period of analysis; the Boca Grande ebb shoal will be the sand source for future periodic renourishments. The sand source encompasses approximately 425 acres with approximately 3.5 million cubic yards of beach-quality sand available. This volume of material is sufficient to cover the estimated project need of 1,200,000 cubic yards for the next two renourishment events, which will cover the remainder of the extended Federal participation.

Key Social and Environmental Factors

In accordance with prior Federal participation and State permits, both the USACE and the non-Federal sponsor have previously placed beach quality material from the designated offshore borrow site along this shoreline. The recommended plan includes no expansion or increase in volume that would impact hardbottom outside of the authorized project's equilibrium toe of fill.

The beneficial effects of continued sand nourishment along the authorized project area include establishing a larger buffer beach to protect upland infrastructure and populations against storms and wave attack. Sand nourishment also creates additional habitat for beach flora and fauna as well as more space for recreational activities.

Construction operations would produce some adverse effects. These effects would be primarily temporary in nature, and most affected resources would return to pre-construction conditions either immediately after dredging (with respect to resources such as aesthetics and noise) or within one or two years (with respect to sea turtle nesting and ecological resources at the lowest level of the water column - benthic resources). The proposed project would likely provide longer-term benefits to sea turtles increasing available nesting habitat, fish and wildlife resources, aesthetics and recreation.

Cost Estimate and Implementation

Total project cost and cost share breakdown in FY18 price levels are tabulated in Tables ES-1 and ES-2. Total estimated cost for the next two renourishment events (including 26% contingency) is $35,771,000, with a total project first cost (Constant Dollar Basis) of $54,752,000. Periodic nourishments will be cost shared at 64.7% Federal and 35.3% non-Federal.

Table ES-1: Recommended Plan Cost Summary (FY18 Price Levels)

Cost Summary (two renourishment events) (FY18 Price Levels)	
Civil Works Item	**Total Item Cost ($K)**
Beach Replenishment	$21,802
Construction Estimate Totals	$21,802
Real Estate	
- Lands and Damages	$0
- administrative	$428
- Federal Administrative	$21
- Non-Federal Administrative	$407
Planning, Eng. & Design	$5,849
Construction Management	$311
Contingency (26%)	$7,381
PROJECT COST TOTALS	**$35,771**

Table ES-2: Recommended Plan Cost Sharing (FY18 Price Levels)

Summary of Project Cost Sharing (Total Project First Cost) (FY18 Price Levels)					
Initial Construction and 1st renourishment (FY18) (Spent Thru: 1-Oct-2016)					
Item	**Project First Cost**	**Federal Share**	**Federal Cost**	**Non-Federal Share**	**Non-Federal Cost**
Construction	$18,981,000				
Non-Federal Cost				41.3%	$7,839,153
*Non-Fed LERRD Contribution**		0%	$0	100%	$0
Non-Fed Cash Contribution					$7,839,153
Federal Cost		58.7%	$11,141,847		
2nd and 3rd renourishments (FY18)					
Item	**Project First Cost**	**Federal Share**	**Federal Cost**	**Non-Federal Share**	**Non-Federal Cost**
Construction	$35,771,000				
Non-Federal Cost				35.3%	$12,627,163
*Non-Fed LERRD Contribution**		0%	$0	100%	$512,800
Non-Fed Cash Contribution					$12,114,363
Federal Cost		64.7%	$23,143,837		
** Includes Non-Federal Admin costs only (40 years)*					
Initial Construction + Periodic Renourishments (FY18)					
Item	**Project First Cost**	**Federal Share**	**Federal Cost**	**Non-Federal Share**	**Non-Federal Cost**
Total Project Cost Share and Cost (up to 2056)	$54,752,000		$34,285,684		$20,466,316

The average annual costs and average annual total benefits, shown in Table ES-3, of the Recommended Plan in FY18 price levels and 2.75% discount rate, are $941,000 and $1,375,000 respectively. The average annual net benefits for the recommended plan are $434,000 and the benefit cost ratio (BCR) computed at 2.75% is 1.46 to 1.

Table ES-3: Economic Summary of the Recommended Plan

Economic Summary	Primary Storm Damage Reduction Benefits	Primary Storm Damage Reduction + Incidental Recreation Benefits
Price Level	FY18	FY18
FY17 Water Resources Discount Rate	2.75%	2.75%
Average Annual Structure & Contents Damage & Armor Costs Benefits	$1,094,000	$1,094,000
Average Annual Land Loss Benefits	$0	$0
Average Annual Incidental Recreation Benefits	$0	$281,000
Average Annual Total Benefits	$1,094,000	$1,375,000
Average Annual Costs	$941,000	$941,000
Average Annual Net Benefits	$153,000	**$434,000**
Benefit Cost Ratio	1.16	**1.46**

*Note: Annual Costs and Benefits of the Recommended Plan computed at FY18 price level and at the FY18 water resources discount rate (2.75%) in order to provide a valid comparison.

Table ES-4 displays additional benefit and cost information including Operation, Maintenance, Rehabilitation, Repair and Replacement (OMRR&R), and Benefit to Cost ratios at FY18 price levels and 2.75% discount rate.

Table ES-4: Equivalent Annual Cost and Benefits

FY18 Price Level, 2.75% Discount Rate, 40-Year Period of Analysis	
Total Cost (including two renourishments)	$35,771,000
Interest During Construction (IDC)	$0
Total Investment Cost	**$35,771,000**
Average Annual Investment Cost	$909,000
Annual OMRR&R (100% non-federal)	$32,000
Total Average Annual Cost	**$941,000**
Average Annual Storm Damage Reduction Benefits	$1,094,000
Average Annual Recreation Benefits	$ 281,000
Average Annual Total Benefits	**$1,375,000**
Average Annual Net Benefits	**$434,000**
Benefit-Cost Ratio (computed at 2.75%)	**1.46**

Coordination with Agencies and the Public

An initial scoping period for the project was conducted from August 26, 2016 through September 27, 2016. The draft EA and draft Finding of No Significant Impact (FONSI) were made available to the public for a 45-day public comment period from November 22, 2016 to January 6, 2017.

This proposed project has been coordinated with the following agencies: U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), U.S. Environmental Protection Agency (EPA), Florida State Clearinghouse, Florida State Historic Preservation Office (SHPO), and FDEP. The FDEP, Bureau of Beaches and Coastal Systems, National Marine Fisheries Service (NMFS) Habitat Conservation Division, and the Bureau of Ocean and Energy Management (BOEM) have all accepted USACE's invitations to participate as cooperating agencies in this study.

Table ES-5: Pertinent Project Information for the Recommended Plan

Optimization of the Authorized Project Description	The optimization of the authorized project provides restoration and periodic nourishment of 2.8-miles of gulf shoreline between the Florida Department of Environmental Protection (FDEP) reference monuments R10.5 (R11 plus a 1,200 foot long north extending taper) and R24.5 (R24 plus a 600 foot long south extending taper). The nourishment template consists of a 20 foot extension of the project baseline, roughly the 1995 MHW line, at elevation +5 feet above mean low water (MLW) (+3.75 ft-NAVD88) plus a 60 foot berm of advance/sacrificial fill; a foreshore slope of 1V:15H transitioning to a nearshore slope of 1V:25H from MLW extending out to the intersection with the existing profile. A hydraulic dredge will be used to fill the template with sand from the Boca Grande ebb shoal system.
Average # Nourishment Events	Two renourishment events are expected throughout the remaining 40 year period of analysis.
Average Volume of Each Periodic Nourishment	617,000 cubic yards
Average Periodic Nourishment Interval	22 years
Renourishment Construction Duration	approximately 3 months
Total Project Cost (including 26% contingency)	$35,771,000 (FY18 price levels)
Cost sharing	Periodic nourishments: 64.7% Federal / 35.3% non-Federal
Benefit-to-Cost Ratio (BCR) (Computed at FY18 Price level and 2.75% discount rate)	1.46

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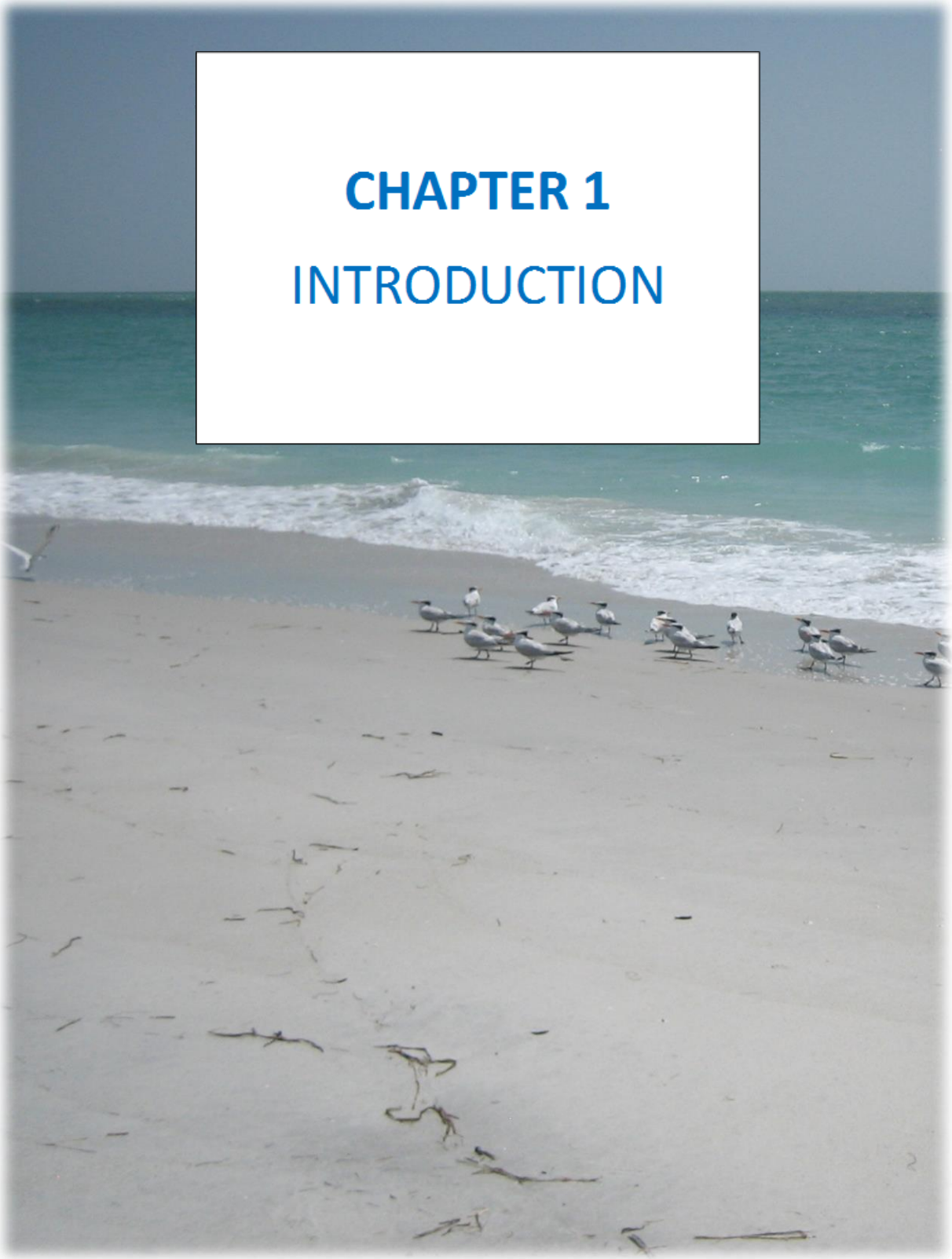

CHAPTER 1

INTRODUCTION

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1 INTRODUCTION

This report evaluates the Federal interest in extending Federal participation in future nourishments of the Gasparilla Segment of the Lee County, Florida, Shore Protection Project (SPP) to the year 2056. This report follows current Federal guidelines and the requirements set forth in ER 1105-2-100 and in Policy Guidance Letter (PGL) Number 22, (USACE, 1991). PGL No. 22, which gives guidance for placement of materials on beaches, states that:

> *a. Federal participation in periodic beach nourishment at existing projects may be extended if it is determined that, based on current evaluation guidelines and policies, the existing project is economically justified. Although no other alternatives are implementable under the authority of Section 934, an analysis of alternatives, similar in scope to an initial appraisal under Section 216 of the 1970 Flood Control Act should be included as part of the Section 934 study.*
>
> *b. The analysis of alternatives may indicate that the NED plan formulated for hurricane and storm damage reduction may be different from the authorized plan. In this case, appropriate future studies should be considered. If additional studies are needed, the recommendation of the section 934 project should include a time limit on the extension of Federal participation in periodic nourishment less than the maximum allowed under the law.*
>
> *c. As the basic decision is to determine if continued Federal participation in the authorized project is justified given current conditions of development and current budgetary priorities, the without project beach profile should approximate pre-project conditions (i.e. conditions that existed just prior to initial project construction). The following two step process is required:*
>
> > *(1) identify (update, no indexing) current benefits of the existing project to determine if continued maintenance of the existing project is economically justified and consistent with current policies; and (2) develop alternatives (size & timing) for nourishment and recommend the most cost-effective nourishment scheme for the authorized project.*
>
> *d. Environmental documentation for section 934 should be limited and focused on the following:*
>
> > *(1) Verify that impacts presented in the original project environmental documentation were accurately and adequately projected. (2) Address the environmental implications of any unanticipated or unforeseen impacts. (3) Address project impacts relative to any changed conditions or requirements (i.e., new endangered species, new environmental legislation, slight modifications or refinements to*

> *the project, etc.). (4) Incorporate documentation of coordination with Federal and state agencies and others. The thrust of the coordination should be to ascertain whether there are significant environmental reasons why the project should not continue and to provide opportunity to identify "new" environmental concerns. In particular, comments from the Fish and Wildlife Service (at a level commensurate with a Planning Aid Report) under the Fish and Wildlife Coordination Act, Environmental Protection Agency, National Marine Fisheries Service, state coastal agency, and state water quality agency should be included.*

The above information could be succinctly presented in the appropriate NEPA documentation as part of the section 934 report.

1.1 FEDERAL PROJECT PURPOSE

Hurricane and Storm Damage Reduction projects. Congress has authorized Federal participation in the cost of restoring and protecting the shores of the United States, its territories and possessions. Under current policy, shore protection projects are designed to reduce damage caused by wind and tide-generated waves and currents along the Nation's ocean coasts, Gulf of Mexico, Great Lakes, and estuary shores. Hurricane protection was added to the erosion control mission in 1956 when Congress authorized cost-shared Federal participation in shore protection and restoration of publicly owned shore areas. Protection of private property is permitted only if such protection is incidental to the protection of public areas, or if the protection of private property would result in public benefits. Federal assistance for periodic nourishment was also authorized on the same basis as new construction, for a period to be specified for each project, when it is determined that it is the most suitable and economical remedial measure. (ER 1105-2-100 section 3-4).

1.2 PROJECT BACKGROUND AND LOCATION

The project is located in Gasparilla Island, Lee County, on the lower Gulf of Mexico coast of Florida, about 90 miles south of the entrance to Tampa Bay. The 44-mile Gulf coastline of the county consists of all, or part of, seven coastal barrier islands and several smaller islands separated from the mainland by shallow tidal lagoons. Gasparilla Island is bounded on the north by Gasparilla Pass and on the south by the Boca Grande Pass. The Gulf shore of the island is about 6.7 miles in length.

The presently authorized Gasparilla Island Segment of the Lee County, Florida Shore Protection Project provides restoration and periodic nourishment of 2.8-miles of gulf shoreline extending south from 15th Street on Gasparilla Island. The project spans Department of Natural Resources (DNR) Monument (also commonly referred to as FDEP R-monuments) R10.5 (R11 plus a 1,200 foot long north extending taper) and R24.5 (R24 plus a 600 foot long south extending taper). The previously authorized design template consists of a 20 foot extension of the project baseline, roughly the 1995 MHW line, at elevation +5 feet (ft.) above MLW (+3.75 ft-NAVD88); a foreshore slope of 1V:15H transitioning to a nearshore slope of 1V:25H from MLW extending out to the intersection with the existing profile; the authorized fill allows

for the 20 foot extension and provides additional material (542,000 cubic yards) to offset erosive losses for seven years between renourishments as established by the 2000 General Reevaluation Report (GRR) (USACE, 2000), revised July 2001, and approved by the Assistant Secretary of the Army for Civil Works (ASA(CW)) in 2004. Sand dredged from a borrow area located about 1.85 miles offshore the southern tip of Gasparilla Island, Lee County, and south of FDEP reference monument R25 and adjacent to Boca Grande Pass has provided the fill for the project in the past. Figure 1-1 shows the project area and limits.

Initial construction of the Gasparilla Island segment was completed as a reimbursable project by the sponsor between December 16, 2006 and April 14, 2007. In February 2013, a Project Information Report (PIR) for impacts sustained by Tropical Storm (T.S.) Debby (June 2012) and Hurricane Isaac (August 2012) resulted in a request for Flood Control and Coastal Emergencies (FCCE) and Construction General (CG) funds. This project was constructed during October through December of 2013. Figure 1-2 shows recent pictures of the Gasparilla Island project area - August 31, 2016.

1.3 PROJECT SPONSOR

Lee County is the non-Federal sponsor for the project. A copy of their support to the project letter, dated April 21, 2017, can be found in the Pertinent Correspondence Appendix (H).

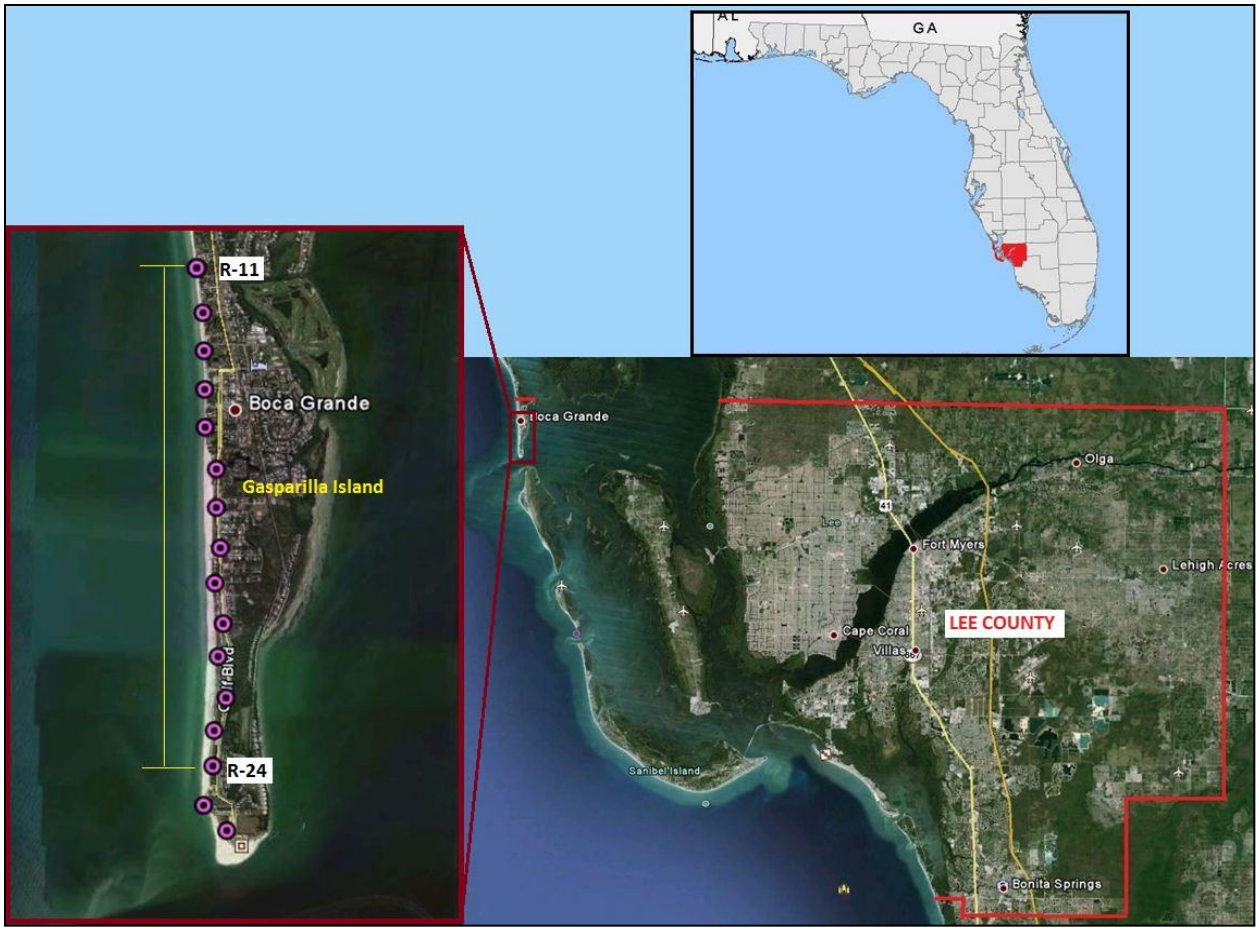

Figure 1-1. Project map with key boundaries and reference points

5th Street; image looking north

5th Street; image looking south

1st Street; image looking north

1st Street; image looking south

Figure 1-2. Gasparilla Island Project Area - August 31, 2016

1.4 STUDY AUTHORITIES

The Lee County, Florida, Beach Erosion Control Project was authorized under Section 201 of the Flood Control Act of 1965 (79 Stat. 1073) and approved by Senate Committee Resolution dated December 17, 1970, and House Committee Resolution dated December 15, 1970. That provision read as follows:

> *Section 201. (a) The Secretary of the Army, acting through the Chief of Engineers, is authorized to construct, operate, and maintain any water resource development project, including single and multiple purpose projects involving, but not limited to, navigation, flood control, and shore protection, if the estimated Federal first cost of constructing such project is less than $10,000,000. No appropriation shall be made to construct, operate, or maintain any such project if such project has not been approved by resolutions adopted by the Committees on Public Works of the Senate and House of Representatives, respectively. For the purpose of securing consideration of such approval the Secretary shall transmit to Congress a report of such proposed project, including all relevant data and all costs.*
>
> *(b) Any water resource development project authorized to be constructed by this section shall be subject to the same requirements of local cooperation as it would be if the estimated Federal first cost of such project were $10,000,000 or more.*

This authority was later amended by Section 131 of the Water Resource Development Act of 1976 (WRDA 1976) which raised the $10 Million dollar project limit to $15 Million. Specifically, that provision stated the following:

> *Sec. 131. (a) The first sentence of section 201(a) of the Flood Control Act of 1965 (Public Law 89-298) is amended by striking out "$10,000,000." and inserting in lieu thereof "$15,000,000."*
>
> *(b) Section 201 (b) of such Act is amended by striking out "$10,000,000" and inserting in lieu thereof "$15,000,000".*

The project was subsequently modified by section 309 of WRDA 2000 to authorize the Secretary to enter into an agreement with the non-Federal interest to carry out the project in accordance with section 206 of the Water Resources Development Act of 1992 (33 U.S.C. 426i–1) if the Secretary determines that the project is technically sound, environmentally acceptable, and economically justified. That provision specifically stated that:

> *SEC. 309. GASPARILLA AND ESTERO ISLANDS, FLORIDA.*
> *The project for shore protection, Gasparilla and Estero Island segments, Lee County, Florida, authorized under section 201 of the Flood Control Act of 1965 (79 Stat. 1073) by Senate Resolution dated December 17, 1970, and by House Resolution dated December 15, 1970, is modified to authorize the Secretary to enter into an agreement with the non-*

> *Federal interest to carry out the project in accordance with section 206 of the Water Resources Development Act of 1992 (33 U.S.C. 426i–1) if the Secretary determines that the project is technically sound, environmentally acceptable, and economically justified.*

Such authority is in accordance with Section 206 of WRDA 1992, allowing for non-federal interests to design and construct the authorized project and for reimbursement of the Federal share of the cost.

The 2000 Lee County, Florida, Shore Protection Project (SPP), Gasparilla and Estero Islands General Reevaluation Report with Environmental Impact Statement reevaluated design and economic justification of the Gasparilla and Estero Island segments confirming 10 year authorization for Federal participation. The Government and the non-Federal Sponsor entered into a Project Cooperation Agreement (PCA) dated April 26, 2006 for construction of the initial fill of the Gasparilla Island Segment a separable element of the Authorized Project pursuant to Section 206 of Water Resources Development Act of 1992.

In 2013, the renourishment of the full construction template was approved, in combination with Flood Control and Coastal Emergency (FCCE) renourishment, in order to maximize cost efficiency by combining dredge mobilization costs and to restore the protective capability and benefits of the project. The Government and the non-Federal Sponsor entered into a Project Partnership Agreement (PPA) dated July 8, 2013 for periodic nourishments, where the Government, subject to receiving funds appropriated by the Congress of the United States and using those funds and funds provided by the non-Federal Sponsor, expeditiously shall perform periodic nourishment of the Project at such times during the authorized periodic nourishment period as the Government, after consultation with the non-Federal Sponsor, determines such placement to be necessary and economically justified, applying those procedures usually applied to Federal projects, in accordance with federal laws, regulations, and policies.

It should be noted that with the enactment of the Water Resources Reform and Development Act of 2014 (WRRDA 2014), Congress repealed Section 206 of WRDA 1992 and replaced such section with Section 1014 from WRRDA 2014. Section 1014 further describes that a savings provision is applied to all existing Section 206 agreements. That savings provision states that:

> *"Nothing in this section may be construed to affect an agreement in effect on the date of enactment of this Act, or an agreement that is finalized between the Corps of Engineers and a non-Federal interest on or before December 31, 2014,"*

Federal participation for cost sharing periodic nourishment expired in December 2016, ten calendar years after the date of initiation of construction in 2006. Section 156 of WRDA 1976 as amended by Section 934 of WRDA 1986 (42 USC § 1962d–5f) (often referred to simply as "Section 934") does authorize the Secretary of the Army to extend the authorized nourishment period up to a total of 50 years from initial construction, potentially allowing Federal participation in the project to be extended to 2056. This decision document is intended to provide the basis for extension of Federal participation of the Lee County, Florida, Shore Protection Project, Gasparilla Island Segment to 2056 in fulfillment of Section 934 of WRDA 1986 (40 years remaining). Table 1-1 shows a timeline for important events in the Gasparilla Island project history.

Table 1-1: Gasparilla Island Project History and Authorities

1965	Section 201 of the 1965 River and Harbor and Flood Control Act authorized this project
1970	The Chief of Engineers report approved.
1986	Section 934 of WRDA 1986 does authorize the Secretary of the Army to extend the authorized nourishment period up to a total of 50 years from initial construction, and will support a new PPA. Approval level for a Section 934 Report is Assistant Secretary of the Army (ASA).
2000	Section 309 of WRDA 2000 modified the original project authority to authorize the Secretary of the Army to enter into an agreement with non-Federal interest for them to carry out the project under Section 206 of WRDA 1992.
	2000 Project General Reevaluation Report (GRR).
2004	Project General Reevaluation Report (GRR) was approved by the ASA(CW)
2006	PCA signed on April 26, 2006 and initial construction of Gasparilla Island project started in December 2006
2007	Initial construction of Gasparilla Island project was completed in April 2007
2012	Tropical Storm Debby & Hurricane Isaac
2013	The effective date of the PPA for periodic nourishments is July 8, 2013 and the first renourishment of the full construction template was completed on October to December 2013 using a combination of Flood Control and Coastal Emergency (FCCE) with Construction General CG funds
2014	Section 1014 of WRRDA 2014 repealed and replaced Section 206 of WRDA 1992
2016	Federal participation for cost sharing in periodic renourishments expired in December 2016
	Section 934 report provides the basis for extension of Federal participation potentially allowing Federal participation in the Gasparilla Island project to be extended to 2056

1.5 STUDY PURPOSE AND NEED

The purpose of the present Section 934 study is to determine if future nourishments of the Gasparilla Segment of the Lee County, Florida, Shore Protection Project warrant an extension of Federal participation in future nourishments to the year 2056. Federal participation expired in December 2016, ten calendar years after initial construction in 2006. The integrated Environmental Assessment (EA) provides a full disclosure environmental impact assessment required in fulfillment of the National Environmental Policy Act (NEPA). Environmental information on the project has been compiled and an Environmental Assessment has been prepared and integrated into this report. The authorization of a time extension by the Secretary of the Army would constitute a new investment decision, which requires approval by the Assistant Secretary of the Army for Civil Works. This report serves as the basis for that decision.

1.6 RELATED DOCUMENTS

Summaries of prior studies relevant to this project are as follows:

a. 1969 - Beach Erosion Control Study, Lee County, Florida: It recommended that a Federal project be adopted for beach erosion control in Lee County, Florida, providing for a protective and recreational beach having a berm 50 feet wide at elevation 4 feet above mean low water along 14,000 feet (2.7 miles) of beach and construction of a revetment and terminal groin at the southern end of Gasparilla Island
b. 1994 - Gasparilla Island Erosion Control Study: The purpose of this study, funded by the Gasparilla Island Conservation and Improvement Association (GICIA), with a donation by the Boca Grande Women's Club, was to evaluate alternatives for stabilizing sand placed on the beach by the U.S. Army Corps of Engineers during maintenance of the Charlotte Harbor Federal Navigation Project at Boca Grande Pass
c. 2000 - Lee County, Florida Shore Protection Project, Gasparilla and Estero Islands: General Reevaluation Report with Environmental Impact Statement (GRR) (Revised July 2001). Modifications to the project were investigated in the interest of reducing total project costs. The design intent was to extend the shoreline 20 feet from the 1995 MHW level position for a period of 7 years; the terminal groin and revetment were not justified. The borrow area for Gasparilla Island was located directly offshore of the southwest portion of the island. Cost sharing was 58.7 percent Federal and 41.3 percent non-federal
d. In 2002, an addendum to the 2000 GRR was completed, recommending 10 years of Federal participation for the Gasparilla segment. Cost and interest rates were updated to 2002 pricing levels and the benefits were recalculated
e. In 2008, an addendum to the 2000 GRR was completed to update the cost apportionment for construction of the Gasparilla Segment. Cost sharing percentages given in the January 2000 GRR were based on public and maintenance access being secured on all gulf front properties for the life of the project. The cost sharing was modified by changing the cost share for 21 properties not granting the required easements to 0% Federal. This reduced the length of shoreline eligible for Federal reimbursement from 8,612 feet in 2000 to 7,978 feet in 2008. Subsequently the cost allocation was modified to 54.4% Federal and 45.6% non-federal

f. 2013 - Project Information Report - rehabilitation effort for the Gasparilla Island Segment, Lee County, Florida Shore Protection Project: Approved the renourishment of the full template in combination with Flood Control and Coastal Emergency (FCCE) renourishment in order to maximize cost efficiency by combining dredge mobilization costs and to restore the protective capability and benefits of the project.

1.7 OTHER FEDERAL PROJECTS NEAR STUDY AREA

Projects near the study area include:

a. Navigation Projects. A Federal navigation project for Charlotte Harbor was completed in 1959. The navigation project provides for an entrance channel 32-feet deep and 300-feet wide, increased to 700-feet wide at the bend, from the Gulf of Mexico to Port Boca Grande, then 10-feet deep and 100-feet wide from deep water at Boca Grande to, and including, a turning basin 200-feet square at the municipal terminal at Punta Gorda about 25-miles northeast. A map of the Federal navigation project for Charlotte Harbor is shown in Figure 1-3. Charlotte Harbor was regularly maintained until 1997. The regular maintenance was performed to allow access for bulk carriers carrying fuel oil to transit to the existing Power Plant. Beginning in 1999, the Power Plant was modified to a natural gas burning plant with no further need for fuel oil to be brought into the Harbor. The USACE has not maintained Charlotte Harbor since the Power Plant changed over to natural gas. The Channel is currently only used regularly by vessels with drafts of 12 feet or less. Charlotte Harbor does not appear to be impacting adjacent shores as is discussed on page 19 of the 2000 General Reevaluation Report for Lee County, Florida, Shore Protection Project, Gasparilla and Estero Islands. The maintenance dredging history for the channel is tabulated in Table 1-2.

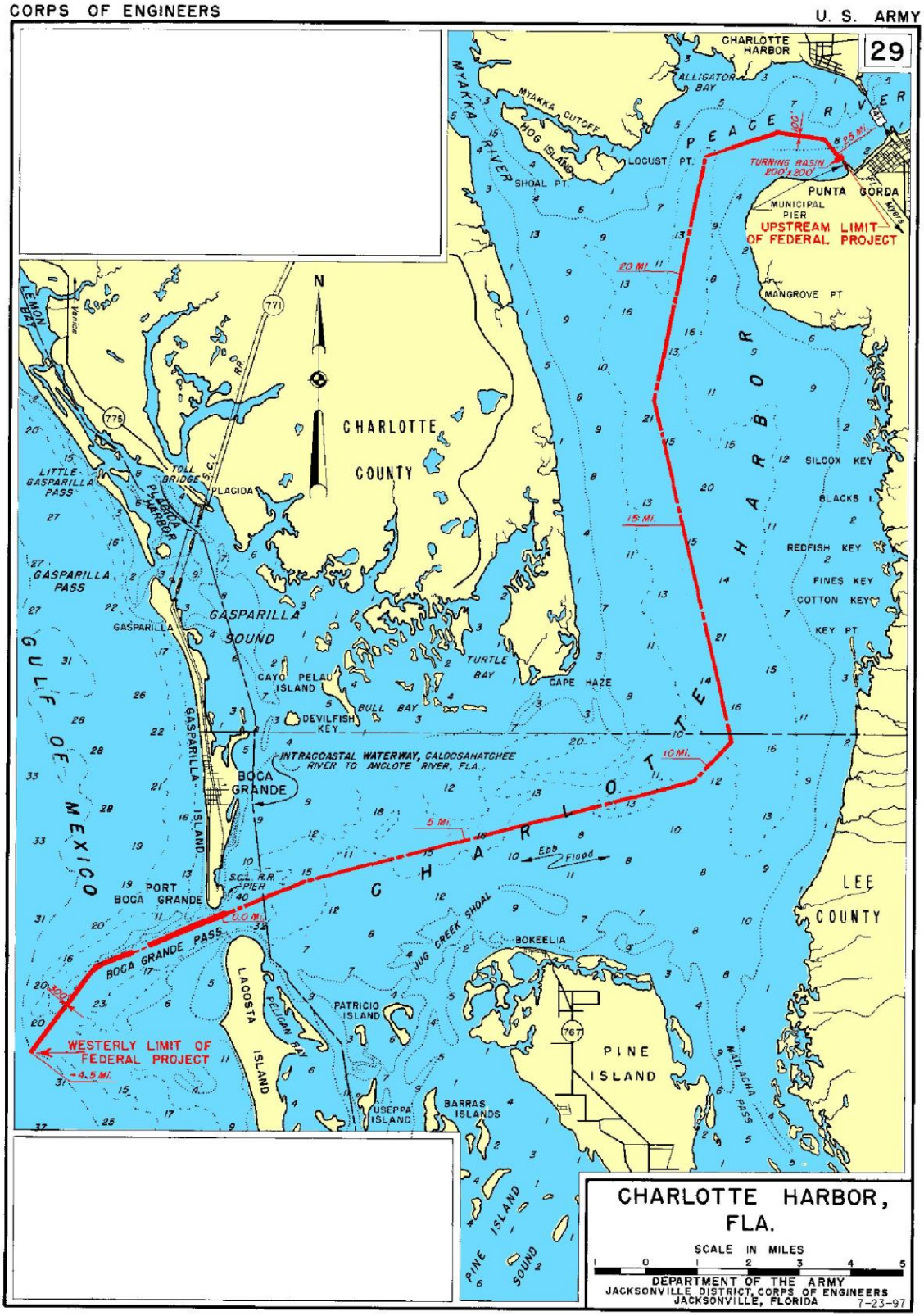

Figure 1-3. Map of the Federal Navigation Project for Charlotte Harbor

Table 1-2: Maintenance Dredging History for Charlotte Harbor

Date of Dredge	Shoaling Location	Quantity (yd3)	Disposal Site
April 1971	-4.5mi to 0.0 mi	129,027	Offshore
July 1973	-4.5mi to 0.0 mi	509,069	Offshore
January 1975	-4.5mi to 0.0 mi	238,186	Offshore
April 1975	-4.5mi to 0.0 mi	47,500	Offshore
August 1976	-4.5mi to 0.0 mi	93,000	Offshore
April 1978	-4.5mi to 0.0 mi	352,361	Offshore
February 1980	-4.5mi to 0.0 mi	238,784	Offshore
September 1981	-4.5mi to 0.0 mi	216,062	Beach (1)
November 1983	-4.5mi to 0.0 mi	227,000	Offshore
August 1985	-4.5mi to 0.0 mi	436,377	Offshore
February 1988	-4.5mi to 0.0 mi	222,500	Offshore
May 1993	-4.5mi to 0.0 mi	438,000	Beach (1)
April 1997	-4.5mi to 0.0 mi	245,600	Beach (1)

(1) This material was disposed of on the gulf shoreline of Gasparilla Island.

b. Beach Erosion Control Projects - Captiva Island Segment. The Lee County project, as referenced in House Document No. 91-395, was authorized under the provisions of Section 201 of the 1965 Flood Control Act by Senate Resolution dated December 17, 1970, and House Resolution dated December 15, 1970. This authority was amended by Section 131 of the Water Resources Development Act (WRDA) of 1976. The authorized project provides for Federal participation in beach erosion control measures for the gulf shoreline of Gasparilla Island, Captiva Island, and Estero Island, in Lee County, Florida. A limited reevaluation (LRR) study of the Captiva segment of the Federal project was completed by the U.S. Army Corps of Engineers and summarized in a report dated October 1987. That report reaffirmed that a protective beach and periodic nourishment was the National Economic Development (NED) Plan. Preconstruction engineering and design (PED) studies for the Captiva Island segment of the beach erosion control project were conducted and a preconstruction report was prepared by the local project sponsor, the Captiva Island Erosion Prevention District. Approval for the non-Federal sponsor to construct the project with subsequent Federal reimbursement, under the provisions of Section 215 of Public Law 90-403, was provided by the ASA (CW) on August 31, 1988. Construction of the Captiva Island segment of the Federal shore protection project by the non-federal project sponsor was completed in May 1989.

1.8 OTHER NON-FEDERAL PROJECTS ADJACENT OR NEAR TO STUDY AREA

Prior corrective action to provide protection from erosion has been primarily limited to the construction of groins, seawalls, and the provision of beach fill by local interests. Historically, approximately 1.6-miles of shoreline have been armored to protect upland structures throughout Gasparilla Island. Private property owners have constructed two sheetmetal groins, 5 timber groins, 13 permeable concrete groins, 22 stone groins, and about 8,200 linear feet of seawalls. Approximately 1,100 linear feet of the seawall is of timber construction, with the remaining 7,100 feet made of concrete. Near the southern end of Gasparilla Island, Lee County constructed nearly 700 linear feet of concrete seawall in an effort to prevent undermining of the county shoreline highway. Rock riprap has been dumped to protect a portion of the county highway, which was damaged during the offshore passage of Hurricane Gladys in October 1968. A temporary timber bulkhead was also erected by the county and 500 cubic yards of backfill was reportedly provided until permanent repairs could be accomplished. As mentioned previously, in 1981, 1993, and 1997, the Federal government, in cooperation with state and county officials, disposed of approximately 899,700 cubic yards of maintenance material on the gulf shoreline of Gasparilla Island near Boca Grande Park. Disposal of this material on the beach was for the purpose of alleviating the erosion problems near the park and to provide recreational enjoyment for tourists and local citizens. This fill created a very substantial beach in front of Boca Grande Park. Over the course of time, however, the shoreline receded back to its initial pre-disposal location.

Other corrective action included construction of a terminal groin at the southern tip of the island in 1982 by Florida Power and Light oil unloading and storage facility. This terminal groin was built to reduce shoaling at the fuel oil transfer mooring.

Existing shoreline armor within the 2.8 mile project area consists of approximately 5,200 feet of concrete seawall. Most of the existing shoreline armor within the project limits can be found in the northern portion of the segment from FDEP monument R11 to just south of R15. Additional armor can be found protecting a residential complex in the vicinity of R18. Engineering Appendix (A) Table A- 12 provides a summary of shoreline armor types throughout the Gasparilla Island segment. Locations can be seen graphically in Figure A-15 of the Engineering Appendix (A).

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2 EXISTING AND FUTURE WITHOUT-PROJECT CONDITIONS

2.1 GENERAL SETTING

This chapter describes conditions as they currently exist, and as they are projected to exist, if Federal participation in periodic renourishments is not extended within the Gasparilla Island segment. Information gathered in this step helps to describe the problems and opportunities and forecast future conditions. The Future Without-Project (FWOP) condition is the most likely condition of the study area without Federal participation in periodic renourishments over the next 40 years.

2.2 PHYSICAL ENVIRONMENT CONDITIONS

Evaluating continued Federal interest in supporting periodic beach nourishment of the Gasparilla segment of the Lee County, Florida, Shore Protection Project requires a thorough understanding of the area's existing conditions. This section summarizes the following key natural forces and storm conditions, such as inlet effects on the downdrift beach in the study area, as well as influences by winds, waves, water levels, currents, tropical storms and hurricanes, and sea level rise.

2.2.1 STUDY REACHES

For planning purposes, study reaches can be considered separable elements. Study reaches can be fairly large and may include Beach-*fx* model reaches. In this case, because this is a Section 934 study, rather than a feasibility study; multiple study reaches have not been developed. The project is already authorized and has been constructed; therefore, only one study reach is considered. The authorized project represents the study reach, and spans from FDEP monuments R11 to R24, as shown in Figure 2-1.

Figure 2-1. Gasparilla Island Project Fill Limits

2.2.2 INLET EFFECTS

EXISTING CONDITIONS

Boca Grande Pass lies immediately to the south of Gasparilla Island and influences the project area. Tidal currents associated with the inlet impact littoral transport of sediment at the southern tip of Gasparilla Island, resulting in the deposition of nearshore sediments within the channel, as well as within a system of shoals, both flood and ebb. However, the tidal currents present within Boca Grande Pass have a velocity strong enough to scour the sediments below the dredge depth. As such, this channel does not often

require maintenance dredging. Therefore, removing sand from the ebb shoal likely has no impact on the maintenance dredging of Boca Grande Pass.

Studies have been conducted that include the dynamics of Boca Grande Pass. Two of the most recent were conducted by Humiston & Moore Engineers (1993, 1994). The purpose of these studies was to evaluate alternatives for stabilizing sand placed on the beach by the US Army Corps of Engineers. The reports show that Boca Grande Pass contributes to erosion of beaches along adjacent shorelines, including Gasparilla Island beaches. The feasibility study completed in 1993 recommended structures be placed at the south end of the island. The 1994 study provides additional design related information. However, to date, no stabilizing feature has been constructed (beyond initiation of the federal project). Figure 2-2 below was created by Humiston and Moore, Lee County's consultant, that designed the original borrow area and completed the initial construction. The bathymetry used to generate this exhibit was prior to the initial dredging of the ebb shoal borrow area in 2007 but the exhibit illustrates the overall size and large extent of Boca Grande Pass and its morphologic features.

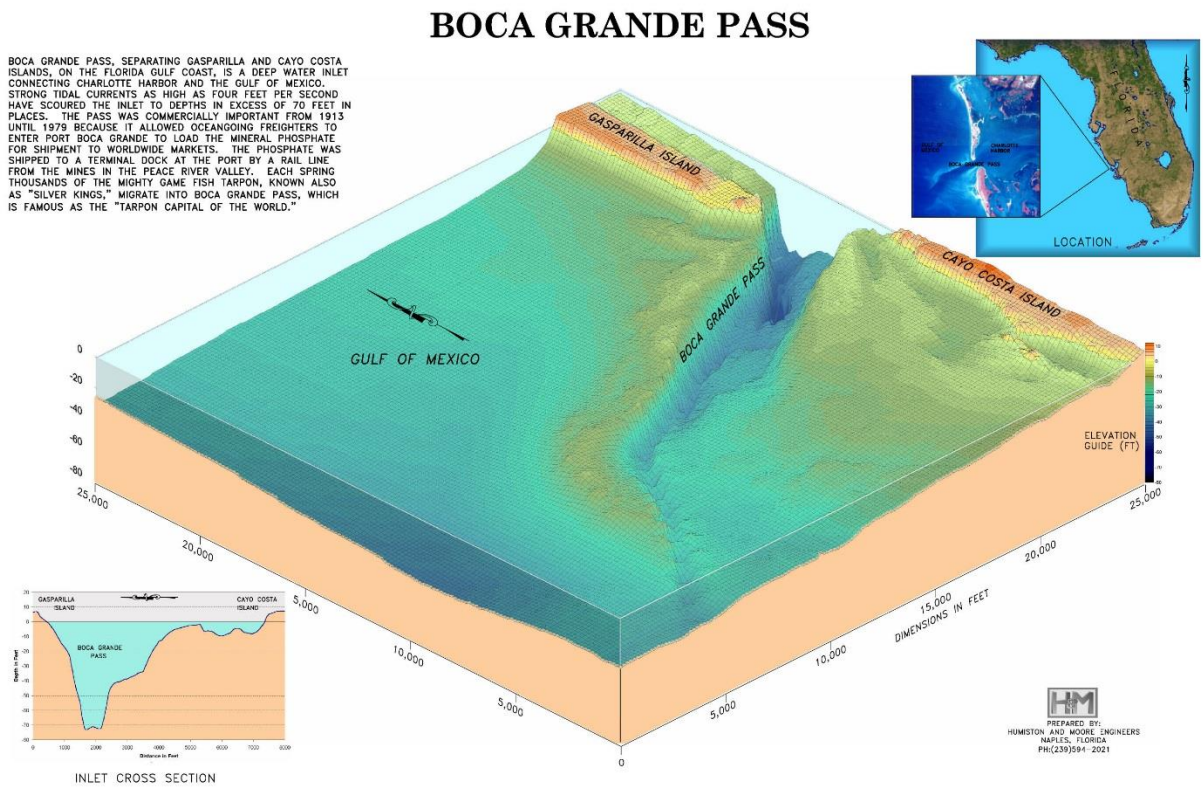


Figure 2-2. Boca Grande Pass (Humiston and Moore Engineers)

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The current natural processes will continue to occur within the inlet and will continue to affect the study area.

2.2.3 SHORELINE CHANGE AND EROSION RATES

EXISTING CONDITIONS

PRE-PROJECT

Changes in mean high water (MHW) position provide a historical view of the behavior of the shoreline. Beach profiles are traditionally gathered by the FDEP, local sponsors, and USACE. Available beach surveys for Gasparilla Island go back as far as 1862; the most recent surveys were completed in 2014. Since the Gasparilla Island Segment of the Lee County, Florida, Shore Protection Project was initially completed in early 2007 and continues to be periodically renourished, surveys between 2007 and the present do not accurately reflect historical background erosion rates. Therefore, only MHW data collected prior to 2007 is included in the historical shoreline evolution analysis.

MHW shoreline positions were measured at each DNR survey monument location (also commonly referred to as FDEP R-monuments), for each survey, along the proper azimuth (265 degrees, measured clockwise from north). Resulting differences in MHW position from R11 to R24 are shown in Table A-9 of the Engineering Appendix (A).

In order to better identify underlying historical trends in the study area, MHW change rates were determined relative to the 2006 shoreline survey (Figure 2-3). Viewed relative to 2006, the shoreline trend becomes clearer. Between 1860 and 1950, the shoreline between R11 and R24 was erosional, with the highest erosion rates occurring at the southern end of the project nearest the inlet; R19 to R24. From the 1957 survey, it can be seen that the southern end of shoreline stabilized, with stabilizing influences as far north as R15. Surveys beginning in 1974 show a complete reversal of trend at the southern end of the study area. The region between R18 to R24 went from being moderately to significantly erosional to being moderately to significantly accretional. A review of the island's history revealed that in the 1940 - 1950 timeframe, a large seawall and revetment was constructed in the vicinity of R25. The seawall, which protrudes seaward to circle property at the southern end of the island, began to act in a groin-like fashion intercepting the north-south sediment migration and stabilizing what had previously been an erosional hotspot.

Since surveys taken prior to the 1970's reflect shoreline change rates that are no longer applicable due to the presence of the seawall at R25, those surveys were not considered in determining rates representative of the project. Examination of the remaining surveys show that some transition in the MHW trends was still occurring as late as 1974. Therefore, the range of shoreline data considered for establishing the historical (Without-Project background) erosion rates was from 1979 to 2006. Table 2-1 provides the final historical MHW change rates. The north end of project is generally erosional, while the south end is accretional.

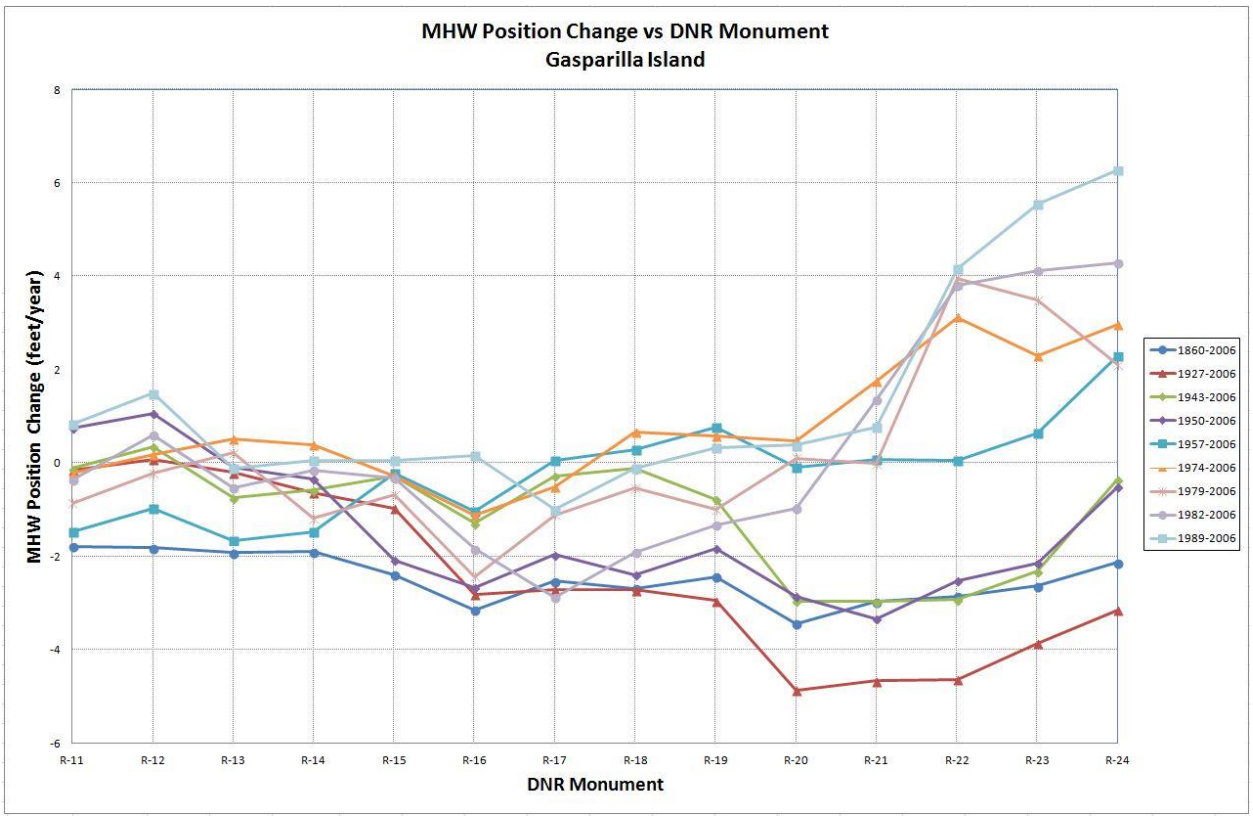


Figure 2-3. Summary of MHW Position Change Rate (feet/year)

Table 2-1: Annual Average Shoreline Rate of Change

Location (DNR Monument)	MHW Rate of Change (1979 – 2006) (feet/year)
R11	-0.9
R12	-0.2
R13	0.2
R14	-1.2
R15	-0.7
R16	-2.4
R17	-1.1
R18	-0.5
R19	-1.0
R20	0.1
R21	0.0
R22	4.0
R23	3.5
R24	2.1

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The shoreline should experience similar rates of erosion and accretion in the Future Without-Project Condition as described in the Existing Conditions section above. However, sea level rise may accelerate coastal erosion rates and increase impacts resulting from erosion.

2.2.4 WIND

EXISTING CONDITIONS

Local winds are the primary means of generating the small-amplitude, short period waves that are an important mechanism of sand transport along the Florida shoreline. Lee County lies at about 26.7° degrees latitude, slightly south of the northern boundary of the tropical trade wind zone. Typical prevailing winds are from the east. Wind data offshore of the project area is available from the USACE Wave Information Study (WIS) Program. WIS hindcast data are generated using the numerical hindcast model WISWAVE (Hubertz, 1992). There are 367 WIS stations along the Gulf of Mexico shoreline. WIS Station 73285 is representative of offshore wind and wave conditions for the project area. Table A-1 presented in the Engineering Appendix (A) provides a summary of wind data from WIS Station 73285, located at latitude 26.75, longitude -82.3, about 2 miles west of the project area. This table contains a summary of average wind speeds and frequency of occurrence broken down into eight 45 degree angle-bands. This table indicates that annual average winds are predominantly from the east. The wind rose presented in Figure A-3 of the Engineering Appendix (A) provides a further breakdown of winds in the project area. Typically, in the vicinity of Gasparilla Island, summer winds are predominantly from the east. In the fall, winds shift to the northeast.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Winds in the future are likely to be similar to existing conditions.

2.2.5 WAVES

EXISTING CONDITIONS

Energy dissipation, which occurs as waves enter the nearshore zone and break, is the principal method of sediment transport. Wave height and period, in combination with tides and storm surge, are the most important factors influencing the behavior of the shoreline. The Gasparilla Island study area is exposed predominantly to short period wind-waves with occasional exposure to longer period open-ocean storm swells from tropical storm events. However, the limited fetch of the Gulf of Mexico basin and relatively extensive shallow shelf fronting the island limits the size and associated period of significant storm waves.

Wave data for this report was obtained from the USACE WIS hindcast database for the Gulf of Mexico. As previously discussed, WIS station 73285 was selected for the study. Given the relatively shallow depth at

this station (16.4 feet), and the smooth depth contours between the station and shoreline, wave conditions at WIS station 73285 are considered to be representative of nearshore wave conditions.

Table A-3 of the Engineering Appendix (A) summarizes the percentage of occurrence and average wave height of the WIS waves by direction. Average wave heights range from 0.5 feet to 1.4 feet, indicating a generally mild wave climate year round. Wave directions are generally from the northwest and southeast quadrants. This can be seen in greater detail in the wave rose presented in Figure A-4 (Engineering Appendix (A)). A seasonal breakdown of wave heights shows that higher wave heights are more frequent in the fall and winter months, October through February, and tend to originate from the northwest quadrant as seen in Table A-4 of the Engineering Appendix (A). Spring and summer waves, March through September, are smaller and originate predominantly from the south to southeast. Locally-generated wind waves with short periods are common throughout the year, where waves with periods lower than 4.0 seconds represent the highest percent of occurrence.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Waves in the future are likely to be similar to existing conditions, taking into account expected sea level rise; an increase in water depth may increase the potential for coastal flooding and allow larger storm waves to attack the shore.

2.2.6 ASTRONOMICAL TIDES

EXISTING CONDITIONS

Tides in the project area are a mixture of diurnal and semi-diurnal types. There are no existing tide stations in the project area. Tidal datums were determined using the NOAA VDatum model. The model was verified using the two closest gulf-side gauges; Venice-8725858 and Naples-8725110. The resulting tidal datums are summarized in Table 2-2. The tide range, i.e., the difference between Mean High Water and Mean Low Water, is 1.33 feet in the project area. Mean tidal ranges of approximately three feet indicate relatively small tidal variations.

Table 2-2: Tidal Datum

Tidal Datum	Elevation (feet) Relative to NAVD88
Mean High Water (MHW)	0.08
North American Vertical Datum (NAVD88)	0.00
Mean Sea Level (MSL)	-0.57
Mean Low Water (MLW)	-1.25
Mean Lower Low Water (MLLW)	-1.69

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Tides in the future are likely to be similar to existing conditions. Taking into account expected sea level rise, an increase in water depth may also increase the potential for coastal flooding and allow larger storm waves to attack the shore.

2.2.7 CURRENTS

EXISTING CONDITIONS

Ocean tidal currents and wave-induced longshore currents may significantly affect sediment transport processes. Tidal currents in the vicinity of the project area occur at Boca Grande pass, the tidal inlet south of Gasparilla Island. Tidal currents at the inlet average approximately 2.2 knots, with ebb currents occasionally reaching maximum velocities of 3 to 4 knots (NOAA, 2015).

The primary nearshore currents in the vicinity of Gasparilla Island are wave-induced longshore currents. These currents are driven by the transformation of obliquely incident waves in the nearshore. The magnitude of the longshore current is generally greatest in the region immediately landward of the point of depth-induced wave breaking and is primarily a function of the local wind and wave climate. For Gasparilla Island, the main longshore current is from north to south. Additional contributions to nearshore currents at the southern end of Gasparilla Island are a result of tidal flows through Boca Grande Pass, which can increase south-directed currents during flood tides or cause local reversals during ebb tides.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Currents in the future are likely to be similar to existing conditions, taking into account expected sea level rise. An increase in water depth may increase the potential for coastal flooding and allow larger storm waves to attack the shore.

2.2.8 STORMS

EXISTING CONDITIONS

The shoreline of Lee County is influenced by tropical systems during the summer and early fall. Unlike shorelines along the east coast of Florida, Gasparilla Island is not significantly influenced by northeaster storm activity which typically occurs in months between fall and early spring. However, during the late fall and winter, wave heights do increase slightly, predominantly coming from the northwest. Although hurricanes typically generate larger waves and storm surge, winter storms may have a greater impact on the shoreline due to their longer duration and higher frequency. Periodic and unpredictable hurricanes and coastal storms, with their intense breaking waves and elevated water levels, can change the width and elevation of beaches and accelerate erosion. After storms pass, gentle waves usually return sediment from the sand bars to the beach, which is restored gradually to its natural shape. While the beach profile

typically recovers from storm energy as described, extreme storm events may cause sediment to leave the beach system entirely, sweeping it into inlets or far offshore into deep water where waves cannot return it to the beach. Therefore, a portion of the shoreline recession caused by intense storms may never fully recover.

Lee County is located in an area of significant storm activity. Figure 2-4 shows the historic tracks of hurricanes and tropical storms from 1858 to 2010 as recorded by the National Hurricane Center (NHC), part of the National Oceanic and Atmospheric Administration, available at http://csc.noaa.gov/hurricanes/#. The shaded circle in the center of this figure indicates a 50-nautical mile radius drawn from the center of the study area and encompassing the entire Lee County shoreline. Based on NHC records, 15 hurricanes and 32 tropical storms have passed within this 50-mile radius over the 153-year period of record. The 50-mile radius was chosen for display purposes in Figure 2-4 because any tropical disturbance passing within this distance, even a weak tropical storm, would be likely to produce some damage along the shoreline. Stronger storms are capable of producing significant damage to the coastline from far greater distances.

In recent years, a number of named storms passing within the 50 mile radius have significantly impacted the project area, including Bonnie (2010), Charley (2004), and Gabrielle (2001). In August 13, 2004, the center of Charley crossed the barrier islands of Cayo Costa and Gasparilla as a Category 4 hurricane with estimated winds of 150 mph (NHC, October 2004). The effects of the storm were felt across the State of Florida and up into the northeast, as Charley moved up the East Coast. In Florida, the storm caused at least 27 deaths and resulted in the evacuation of over 1 million residents and tourists. In Gasparilla Island, damages from these storms, as well as from more distant storms causing indirect impacts, include substantial erosion as well as damage from winds, waves, and elevated water levels. Consultation with the non-Federal sponsor indicated that after Hurricane Charley the Lee County, Florida, Shore protection Project was constructed, restoring the beach and reducing damage risk. Since then, storm damages have been sand losses; however, loss of protective beaches and dunes due to shoreline recession threatens infrastructure.

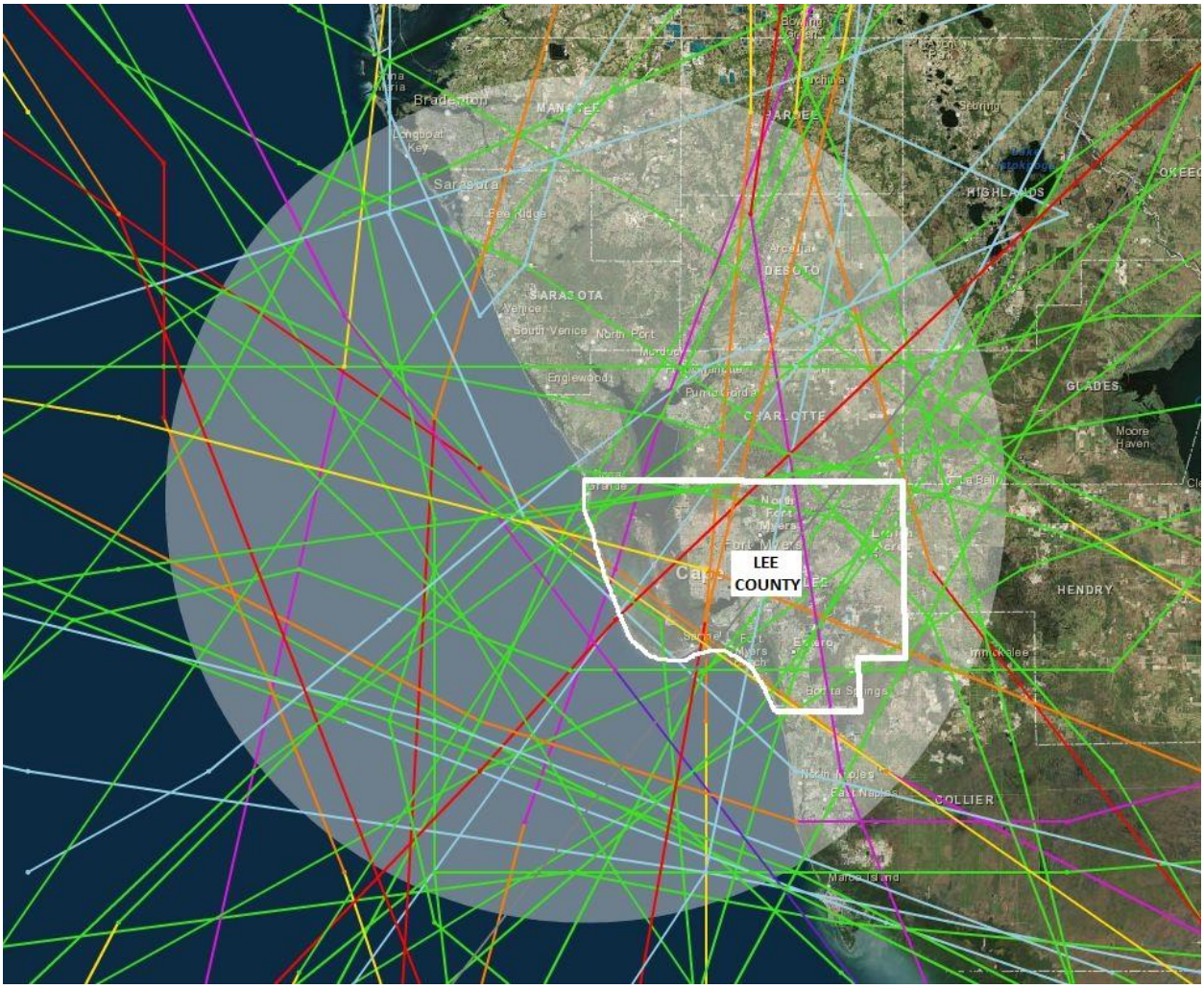


Figure 2-4. Historic Storm Tracks – Hurricanes and Tropical Storms (1858 – 2010, 50 mile radius)

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The Future Without-Project Conditions of storms is similar to the existing conditions described above.

2.2.9 STORM SURGE

EXISTING CONDITIONS

Extremely high wind velocities, coupled with low barometric pressures, such as those experienced in tropical storms, hurricanes, and very strong northeasters, can produce very high and damaging water levels. In addition to wind speed, direction, and duration, storm surge is also influenced by water depth, length of fetch (distance over water), and the frictional characteristics of the nearshore sea bottom. An estimate of storm surge is required for the design of beach fill crest elevations.

The Lee County, Gasparilla Island study area is a relatively low, flat barrier island and is susceptible to overtopping from moderate to extreme storm surges. The Florida Division of Emergency Management (FDEM) provides storm tide zone maps for Florida coastlines (FDEM, 2010). Figure 2-5 shows the FDEM storm tide zone map for southern Gasparilla Island. An examination of this map shows that virtually the entire island would be inundated during even a severe tropical storm or Category 1 hurricane, should the storm make direct landfall at or near Gasparilla Island. The study area and dune system along the western shoreline would be inundated during a Category 2 land-falling hurricane. Note that the existing Federal project does not prevent flooding under these conditions.

Storm surge levels, versus frequency of occurrence, were obtained from data compiled by the University of Florida for the Florida Department of Transportation (FDOT, 2003). Table 2-3 provides peak storm surge heights by return period for Gasparilla Island. The storm surge elevations presented include the effects of astronomical high tide and wave setup.

Table 2-3: Storm Tide Elevations (FDOT Station 2001)

Return Period (Years)	Total Storm Tide Level (Feet, NAVD88)
500	15.4
100	12.5
50	10.7

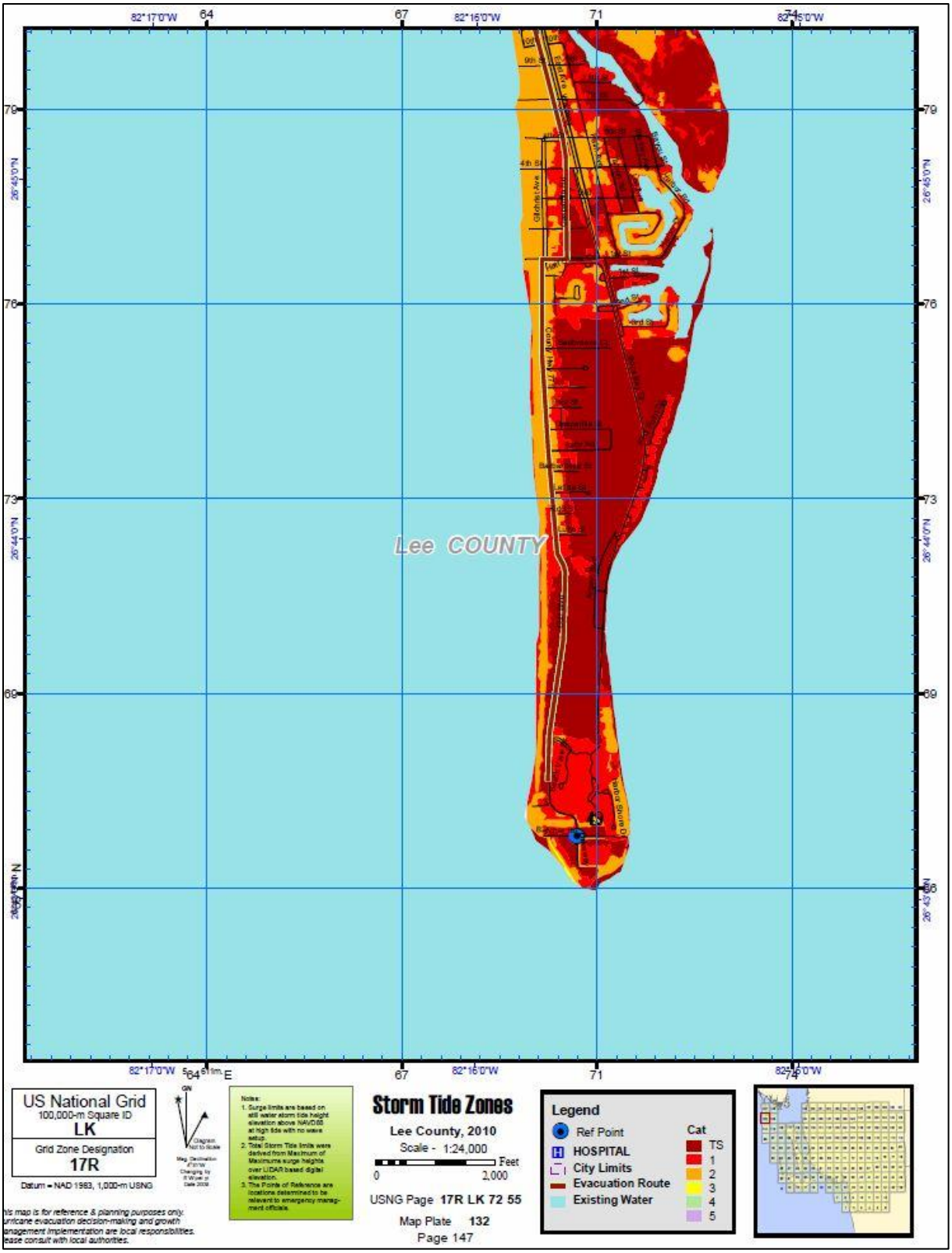


Figure 2-5. Storm Surge Zones, Lee County, Gasparilla Island, Florida, FDEM (2010)

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Storm surge in the future is likely to be similar to existing conditions. Taking into account expected sea level rise, an increase in water depth may increase the potential for coastal flooding and allow larger storm waves to attack the shore.

2.2.10 SEA LEVEL RISE

EXISTING CONDITIONS

2.2.10.1 RELATIVE SEA LEVEL RISE

Relative sea level (RSL) refers to the local elevation of the sea with respect to land, including the lowering or rising of land through geologic processes such as subsidence and glacial rebound. It is anticipated that sea level will rise within the next 100 years.

Local sea level rise accounts for the eustatic change, 1.7mm/year; 0.0056 feet/year, as well as uplift, subsidence, and other effects, and is generally available from the nearest tide gage with a tidal record of at least 40 years. The Gasparilla Island project area is located approximately 25 miles from National Ocean Service (NOS) gage #8725520 at Fort Myers, Florida. The historical sea level rise rate taken from this gage was determined to be 2.4 mm/year or 0.0079 feet/year (http://www.corpsclimate.us/ccaceslcurves.cfm). The local rate of vertical land movement is approximated by subtracting the regional Mean Sea Level (MSL) trend from the local MSL trend. The regional mean sea level trend is assumed to be equal to the eustatic mean sea level trend of 1.7 mm/year. Therefore, at Gasparilla Island, there is approximately 0.70 mm/year of vertical change (vertical shift of approximately -0.70 mm/year).

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

To incorporate the direct and indirect physical effects of projected future Sea Level Change (SLC) on the design, construction, operation, and maintenance of coastal projects, USACE has provided guidance in the form of an Engineering Regulation, ER 1110-2-8162 (USACE, 2013).

Given a project base year of 2016, and 40 years period of analysis (Federal participation in cost sharing end date of 2056), the USACE corpsclimate website produced a table of sea level change rates for each of the three required scenarios: baseline, intermediate, and high sea level rise. Figure 2-6 shows the sea level change rates relative to NAVD88 in two year increments, starting from the base year of 2016 and ending in 2056, the end of the period of analysis. Average intermediate and high sea level rise rates were found to be 0.0157 feet/year and 0.0405 feet/year, respectively. Figure 2-6 also provides a graphic representation of the three levels of projected future sea level change for the life of the project. Sea level rise could be expected by 0.3 feet (baseline), 0.5 feet (intermediate), and 1.6 feet (high) over the next 40 years.

The potential impacts of rising sea level include overtopping of waterside structures, increased shoreline erosion, and flooding of low lying areas. Sea level change scenarios outlined in the preceding paragraph could affect future beach and shoreline behavior in the project area.

Gasparilla Island
8725110, Naples, FL
NOAA's Published Rate: 0.00663 feet/yr
All values are expressed in feet relative to NAVD88

Year	USACE Low	USACE Int	USACE High
2016	-0.5	-0.4	-0.3
2018	-0.5	-0.4	-0.2
2020	-0.5	-0.4	-0.2
2022	-0.4	-0.4	-0.1
2024	-0.4	-0.3	-0.0
2026	-0.4	-0.3	0.0
2028	-0.4	-0.3	0.1
2030	-0.4	-0.3	0.1
2032	-0.4	-0.2	0.2
2034	-0.4	-0.2	0.3
2036	-0.3	-0.2	0.4
2038	-0.3	-0.1	0.4
2040	-0.3	-0.1	0.5
2042	-0.3	-0.1	0.6
2044	-0.3	-0.1	0.7
2046	-0.3	-0.0	0.8
2048	-0.3	0.0	0.9
2050	-0.3	0.0	1.0
2052	-0.2	0.1	1.1
2054	-0.2	0.1	1.2
2056	-0.2	0.1	1.3

Print Table

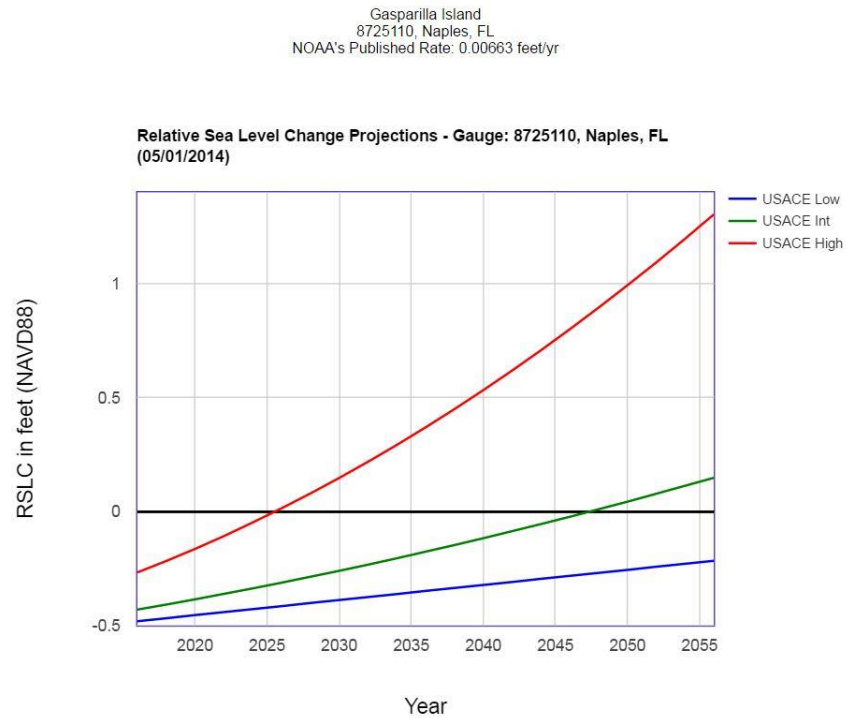


Figure 2-6. Relative Sea Level Change, Gasparilla Island, (http://www.corpsclimate.us/ccaceslcurves.cfm)

2.2.10.2 BEACH RESPONSES TO SEA LEVEL CHANGE

The principal means by which sea level change would manifest itself on an open coast, sandy beach would be through changes to shoreline position and to beach volume. See Engineering Appendix A, 3.6.2.1 and 3.6.2.2 for more information.

2.2.11 PROJECT VULNERABILITY TO SEA LEVEL CHANGE

Upland elevations within the study area (Gulf side of the island) average approximately 5.5 ft-NAVD88. These uplands are fronted by a dune system with an average elevation of 9.0 ft-NAVD88 over a majority of the project area (R-11 to R-24). Elevations on the inland side of the island average approximately 4.0 ft-NAVD88. Although the Inland side of the island is not within the current study area, stakeholders should be aware of increased risk to infrastructure as sea level rises. Based on LIDAR topographic survey data, contoured over the barrier island between R-11 and R-24, key cross-island ground elevations were identified. Table 2-4 provides the key ground elevations according to R-monument and grouped by similar shoreline dimensions.

Table 2-4: Key Elevations Along Cross-island Profiles

R-Monument	Ground Elevations (feet-NAVD88)			
	Average Dune Elevation	Roads	Gulf Side Structures	Inland Side Structures
R-11	10.0	5.0	7.0	5.0
R-12	10.0	5.0	7.0	3.5
R-13	9.0	5.0	6.5	3.0
R-14	9.0	5.0	8.0	4.5
R-15	9.0	5.0	8.0	4.0
R-16	8.5	5.5	7.0	4.5
R-17	8.0	5.5	7.0	4.0
R-18	7.5	5.5	7.0	4.0
R-19	7.5	5.5	5.5	4.0
R-20	9.0	5.0	5.0	3.5
R-21	9.0	4.0	4.0	4.0
R-22	9.0	4.0	4.0	3.0
R-23	10.0	4.0	3.5	6.0
R-24	10.0	4.0	3.5	6.0
Average for Study Area (R-11 to R-24)	**9.0**	**4.9**	**5.9**	**4.2**

Representative profiles, taken in the vicinity of R-15, R-19, and R-24 are show in Figure 2-7 to Figure 2-9. Note that the topographic survey from which the profile was drawn are “bare earth” and do not illustrate vegetation or structures. Each profile shows the variability over the length of the project as well as across the width of the island.

The width of the island varies over the length of the project, from 0.7 miles at the north end of the project site to 0.3 miles at the south end. The inland side of the island is fronted by a combination of heavy vegetation and areas of development. In some regions, however, development extends from seaside to inland side.

A key question when assessing the vulnerability of the study area to shoreline change is when critical thresholds will be crossed. Throughout the study area, the dune crest height represents a critical threshold. The average dune height from Table 2-4 is 9.0 ft-NAVD88. Roads and other infrastructure are located at a lower elevations, approximately 3.0 to 8.0 ft-NAVD88. Since the dune lies between the ocean and infrastructure, the dune height will be the ocean side critical elevation.

The 50-year storm tide elevation for the study area has been determined to be +10.7 ft-NAVD88 (FDOT, 2003). As shown in Table 2-4, the average dune elevation for the project area is 9.0 ft-NAVD88. Therefore, regardless of sea level change rate, this area is already vulnerable to flooding due to storm surge. A 50-year storm tide would be expected to overtop the existing dune system by 1.7 feet.

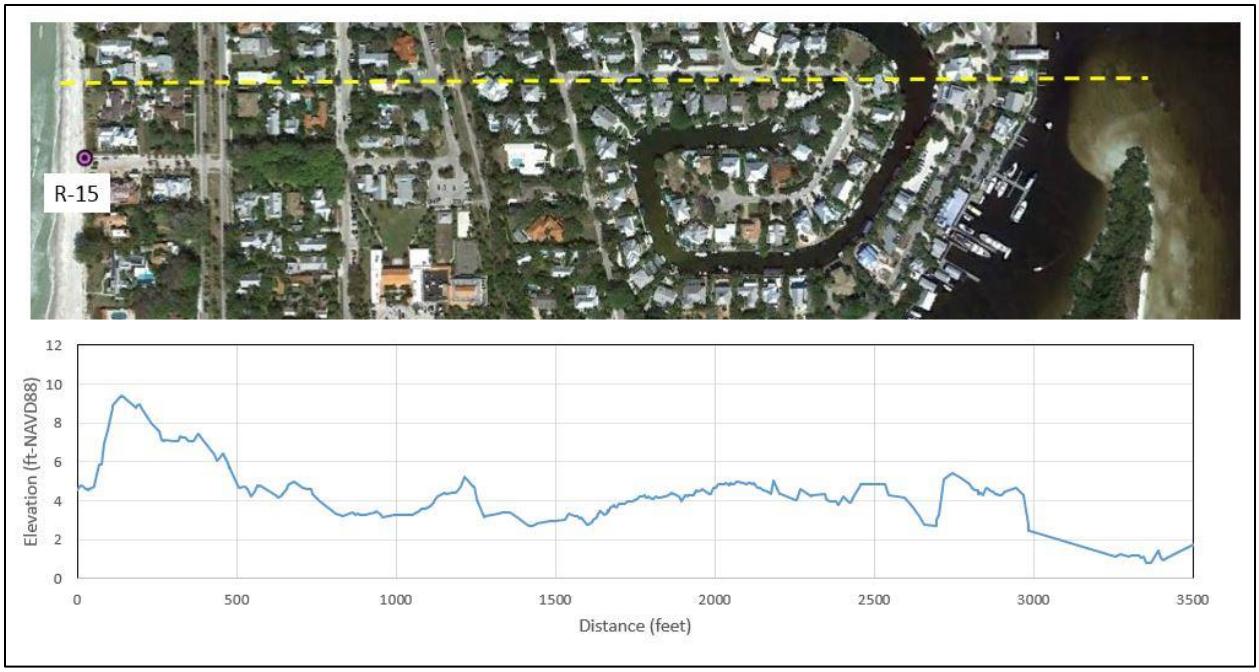


Figure 2-7. Cross-island Profile in the Vicinity of R-15

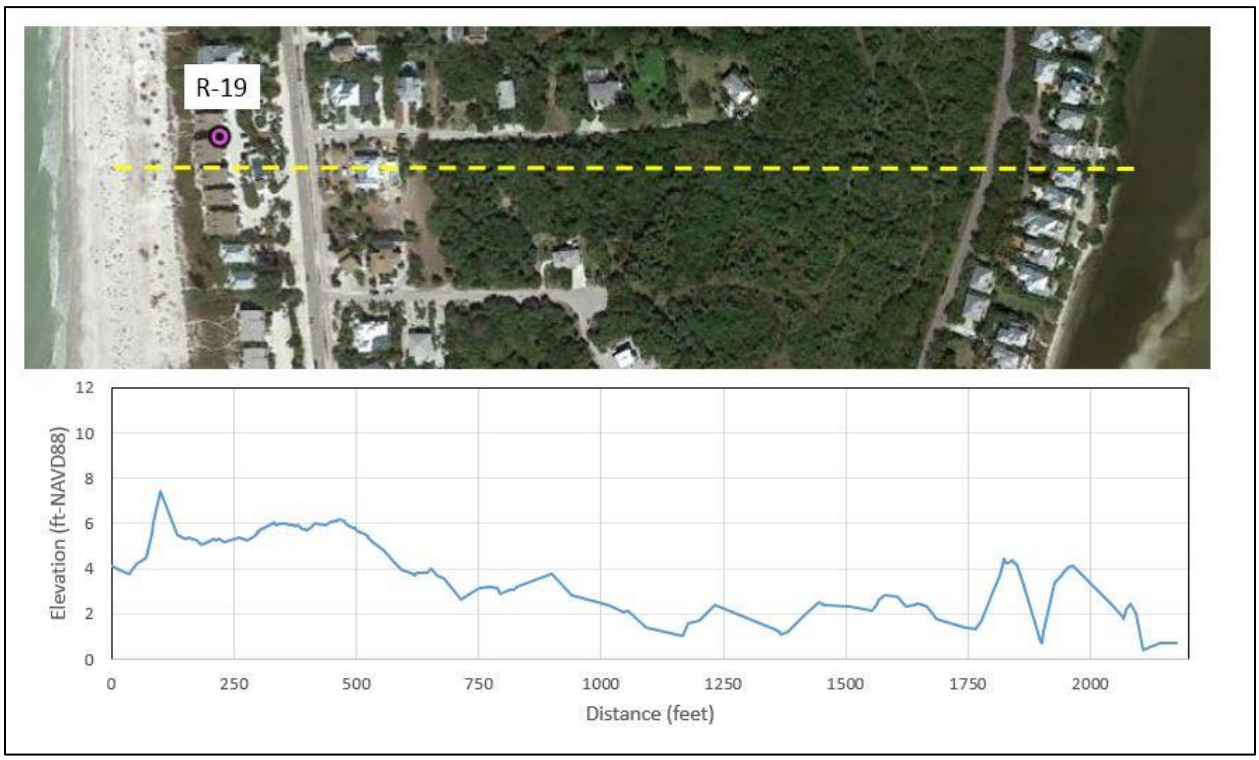


Figure 2-8. Cross-island Profile in the Vicinity of R-19

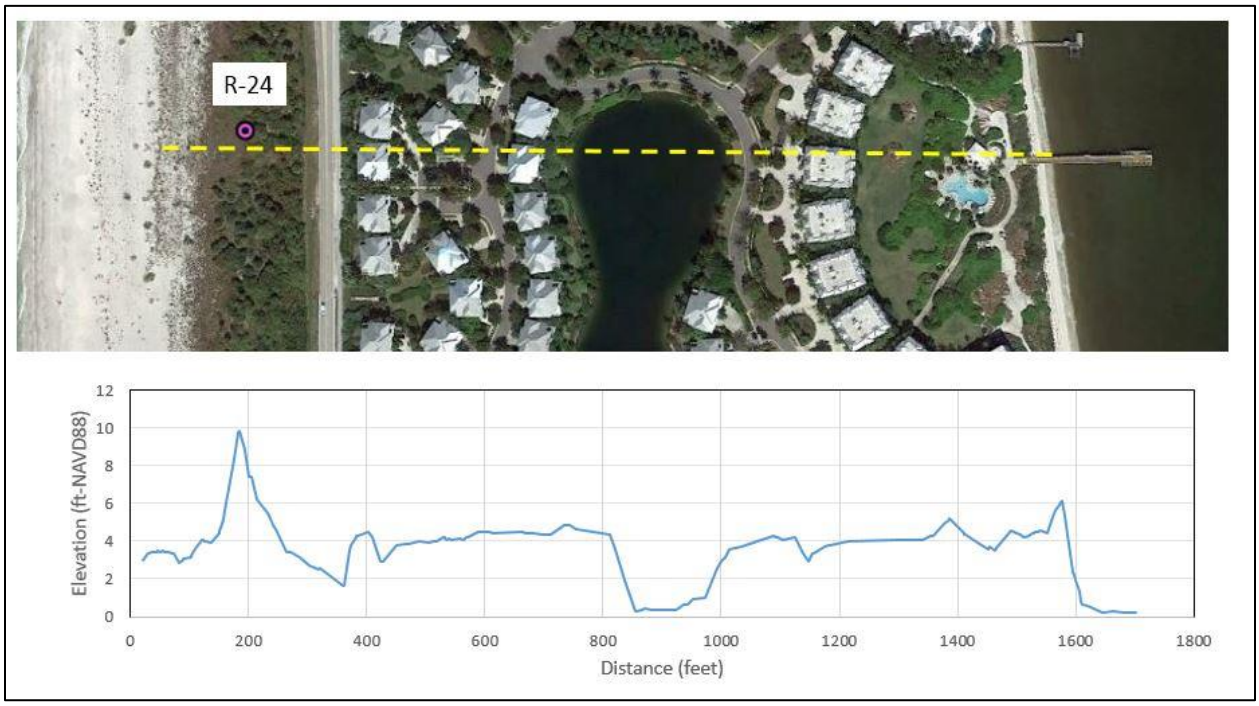


Figure 2-9. Cross-island Profile in the Vicinity of R-24

Traditionally, Coastal Storm Risk Management (CSRM) projects are designed to reduce impacts from erosion, waves, and inundation. However, it is clear that due to the overall elevation of Gasparilla Island and its proximity to the inlet (which allows for flooding from seaside, the inlet adjacent southern tip of the island, and the bay side) neither the existing authorized project nor any of the alternatives developed for this study prevent or reduce inundation due to storm surge overtopping the dune. In truth, there is no feasible alternative that can be developed within the scope of this study that would do so. It should be noted, however, that inundation may also occur due to erosion (breaching of the dune). The risk of erosion induced inundation is significantly reduced by the presence of the existing authorized project.

Although the existing authorized project and project alternatives cannot prevent or reduce impacts due to storm tide inundation, they do prevent and reduce impacts due to both erosion and wave action. Damages due to erosion in particular are significantly reduced. Both storm induced and annual erosion, as well as impacts due to wave action, are effectively addressed at Gasparilla Island.

2.2.11.1 PROJECT ADAPTABILITY

2.2.11.1.1 GENERAL

Sea level change is a growing concern in coastal regions of the United States. It is therefore necessary to ensure that coastal projects are adaptable to changing conditions. Constructing or elevating shoreline structures (seawalls, revetments, groins, etc.), raising dunes, flood proofing infrastructure, and implementing storm warning and evacuation plans are some types of coastal adaptation methods.

2.2.11.1.2 DUNES AND BERMS

For most CSMR projects, the most efficient and (currently) environmentally acceptable means of adapting the project for rising sea levels is to raise the crest elevation of the existing dune. The active portion of the shoreline profile, the berm and foreshore, will adjust naturally with rising tide levels. Despite the natural adjustment, additional material will be required in order to maintain the berm as increased wave energy will intensify erosion. Table A-24 of the Engineering Appendix shows how volume requirements change over the three SLC scenarios. The dune, unlike the rest of the profile, will not adjust naturally. It will also require additional material in order to raise its elevation. Traditionally, the dune acts as a flood barrier between the sea and the upland while the berm acts as a buffer against erosion.

For Gasparilla Island, raising the dune(s) is not an effective means of adapting the project. As discussed previously in Section 2.2.11 (Project Vulnerability to Sea Level Change), the dune at Gasparilla is not a deterrent between the sea and the upland. The low elevation of the island and its exposure to flooding from all sides make it vulnerable to storm surge in a way that would require a comprehensive island wide flood protection system. This would involve the erection of levees, seawalls, and pump stations.

2.2.11.1.3 HARD STRUCTURES

Presently hard structures, specifically seawalls are already present within the Gasparilla project. Although structures can lead to increased erosion of the berm and foreshore due to wave reflection, they are an effective means of protecting upland infrastructure from erosion and direct wave attack. Although environmental and aesthetic concerns are currently balanced with relatively low elevation structures, these concerns may become secondary to the protection of upland infrastructure and the increased risk to human life.

2.2.11.1.4 FLOOD PROOFING

Dune raising and/or the introduction of revetments or seawalls are adaptations that deal directly with barriers that provides the maximum level of protection from inundation, erosion, and wave damage. This approach provides a single continuous barrier between the water and the land.

Flood proofing also relies on barriers. However, flood proofing solutions apply localized barriers (new construction, sealing/waterproofing existing structural elements, and/or raising lower elevation structures) to individual structures. Depending on the density of infrastructure in the upland, flood proofing can be logistically challenging and expensive. Different structure types would require different flood proofing solutions. Because it is assumed that sea levels would be allowed to overtop the dune and flood the general project site, each solution would also require a design that resists failure due to erosive undermining and from direct wave attack. Projects where the density of upland structures is low would have less logistical and cost concerns, but would still require individual specialized design.

In addition to logistics and cost, peripheral damages must also be considered. If the general project site is allowed to be inundated by seas overtopping the dune some “structures” would likely remain highly vulnerable despite flood proofing. These include roads, walkways, boardwalks, utility

posts/boxes/outlets, and other structural features that would be difficult or not cost effective to flood proof individually. Peripheral damages would also include landscaping, park lands, open habitat, and other non-structural, but important community upland features.

It should also be noted that flood proofing predominantly safeguards against direct physical damage to structures. This alternative does not consider potential risks to human life due to flooding in the vicinity of the protected structures. It is recommended that this alternative be combined with a storm warning and evacuation system specifically designed for expected SLC.

2.2.11.1.5 STORM WARNING AND EVACUATION PLANS

Development or improvement of storm warning and evacuation plans is not a standalone alternative. While the development and implementation of site specific storm warning systems and evacuation plans can be costly, there are no traditional benefits by which to offset those costs. Note that traditional benefits depend predominantly on physical damages to property. However, the development and implementation of such storm warning and evacuation plans could have a significant impact on safeguarding human life. Combined with an alternative that produces traditional benefits, this alternative could be justified for a Federal project.

2.2.11.1.6 ASSESSMENT OF POTENTIAL ADAPTATION PATHS

As discussed in previous sections, not all methods of adaptation are equal when applied to combating the impacts SLC. Some are more effective than others and are more complete or acceptable. Table 2-5 provides a qualitative assessment to the potential adaptation paths that could be applied to the Gasparilla Island Section 934 Study.

Table 2-5: Qualitative Assessment of Adaptation Paths

Measure	Effectiveness	Efficiency	Completeness	Acceptability
Dune Raising	Medium	Medium	High	High
Hard Structures	High (assuming adequate elevation, medium, if the structure is non-continuous with gaps)	Medium (The cost of hard structures is relatively high)	High (Medium to Low, if the structure is non-continuous with gaps)	Low (May change if damages outweigh aesthetic concerns. Permitting process can be challenging)
Flood Proofing	Low (limited to certain structure types and only effective for inundation, would not address erosion or wave attack)	Medium (Limited to specific structures. Would not address erosion or wave attack)	Medium (Vulnerable to wave attack and erosion, peripheral damages)	Low (limited benefit, peripheral damages, prohibited in high hazard flood zones)
Storm Warning and Evacuation Plans	Low (When applied only to traditional damages; rating does not include risk to human life)	Low (does not address inundation, wave attack, or erosion)	Medium (Includes Local and State cooperation)	Low (limited benefit unless combined with another alternative)

2.2.12 EXTERNAL VULNERABILITY

ETL 1100-2-1 recommends that systems related to, but existing outside, the study area should also be evaluated for vulnerability to SLC. The purpose of this is to bring attention to the vulnerability of the marsh side of the island for stakeholder knowledge. The southern end of Gasparilla Island has an average elevation that is lower than the ocean side dune system. Therefore, all systems located at the southern end of the island are presently just as vulnerable to storm tide flooding (regardless of sea level change rate) as the ocean side project area.

2.2.13 GEOLOGY

Lee County, in southwest Florida, covers approximately 803 square miles. Its boundaries are formed by Charlotte County on the north, Hendry and Collier Counties on the east, and Collier County on the south. The shoreline of Lee County consists of a series of barrier bars broken by numerous inlets. The shoreline is further characterized by sandy barrier islands backed by shallow bays, marshes, and mangrove areas. The coastal plain in the vicinity of San Carlos Bay and Estero Bay is of low relief and low elevation. The Caloosahatchee, Peace, and Myakka Rivers all drain into the estuary system. The barrier islands of Lee County are believed to have been initially formed around 4,400 years ago and prograded seaward. A reduction in the rate of Holocene sea level rise at that time, combined with a local sand supply and pre-existing topography, helped in the location and formation of the present barrier island chain.

Gasparilla Island lies west of the Charlotte Harbor estuary system and is bound to the north and south by Gasparilla Pass and Boca Grande Pass, respectively. Gasparilla Island is a 6.7 mile long narrow barrier island with a relatively stable northern shoreline and increasing erosion towards the southern end. High

southerly net sediment transport rates along Gasparilla Island result in the well-developed ebb-tidal delta system of the Boca Grande Pass.

2.3 BUILT ENVIRONMENT

2.3.1 EXISTING FEDERAL PROJECT

The Gasparilla Island Segment of the authorized Shore Protection Project for Lee County, Florida provides for initial restoration and periodic nourishment of 2.8 miles of gulf shoreline, from the Department of Natural Resources (DNR) Monument (also commonly referred to as FDEP R-monuments) R10.5 (R11 plus a 1,200 foot long north extending taper) to R24.5 (R24 plus a 600 foot long south extending taper). The project is defined in terms of shoreline extension, over most of the project, the 1995 MHW shoreline position has been adopted as the project baseline.

The authorized project provides for a 20 foot extension of the baseline, roughly the 1995 MHW line, at elevation +5 feet (ft.) above MLW (+3.75 ft-NAVD88); a foreshore slope of 1V:15H transitioning to a nearshore slope of 1V:25H from MLW extending out to the intersection, with the existing profile, and 542,000 cy of sacrificial fill that accounts for an average periodic nourishment interval of 7 years, as established by the 2000 General Reevaluation Report (GRR) (USACE, 2000). Initial construction was completed in 2007. The first renourishment for Gasparilla Island Segment was constructed October through December of 2013. The sand source for Initial construction and 1st renourishment was the Boca Grande ebb shoal, located approximately 1.85 miles southwest of the southern end of Gasparilla Island.

EXISTING CONDITIONS

Prior to authorization of the Gasparilla Island, Lee County, Florida, Shore Protection Project, the Federal government, in cooperation with state and county officials, disposed of approximately 899,700 cubic yards of maintenance material near Boca Grande Park (1981, 1993, and 1997). In August 2000, the "Lee County Shore Protection Project Gasparilla Island Segment: Sand Source Report" by Humiston and Moore Engineers reported the existing beach information; the sediments were classified as clean, poorly-graded, and fine to medium grained quartz sands.

Since 2007, this area has been renourished using sand derived from the Boca Grande ebb shoal. A post-fill sampling report prepared by the USACE on February, 2014, the placed material was described as white, well graded, medium grained sand. As such, the sedimentology analysis reflects the presence of fill in addition to what has accumulated naturally on the beach.

Both data sets indicated that the beach consisted of fine to medium-grained sand. The existing beach sands are poorly sorted, which likely reflects the inclusion of coarse-grained shell fragments, a common occurrence in the nearshore, sub-tidal zone.

2.3.1.1 PROJECT PERFORMANCE

2.3.1.1.1 INITIAL CONSTRUCTION (2007)

Initial construction of the Lee County, Florida, Shore Protection Project, Gasparilla Island Segment was completed as a reimbursable project by the sponsor between December 16, 2006 and April 14, 2007. This resulted in the placement of 1,072,781 cubic yards along 2.8 miles of gulf shoreline, from R10.5 (R11 plus a 1,200 foot long north extending taper) to R24.5 (R24 plus a 600 foot long south extending taper). Boca Grande Pass ebb shoal was utilized as the sand source. The total cost for the initial construction of the authorized Federal project, excluding any betterments added by the local sponsor, was $11.7 million (2005 price level). The design intent was to extend the shoreline 20 feet from the 1995 MHW level position for a period of 7 years (GRR USACE, 2000).

2.3.1.1.2 SHORELINE CHANGES

Physical monitoring after initial construction was performed by USACE. Shoreline measurements are made along the project area and adjacent beach sufficient to calculate project performance in terms of accretion and recession trends at the mean high water (MHW) line. Below in Table 2-6, the shoreline changes are calculated for the 5th year event relative to the pre-construction and post-construction locations. A graphical representation of the shoreline position in reference to the design goal is shown in Figure 2-10 below. Figure 2-11 shows the beach condition after 5 years of initial construction.

Table 2-6: Mean High Water Position Change (R11 to R26) December 2006 to September 2012

DNR (FDEP) Monument	Azimuth	MHW Position Change (feet)	
		Pre to 5 Yr. post Construction (ft.) Dec2006- Sep2012	Post to 5 Yr. post Construction (ft.) May2007- Sep2012
R11	265	31.66	-106.96
R12	265	57.49	-108.70
R13	270	51.14	-138.13
R14	265	31.02	-152.16
R15	265	23.36	-126.69
R16	265	175.77	-45.08
R17	265	138.96	-46.76
R18	265	85.73	-93.78
R19	265	88.00	-96.26
R20	265	161.03	-103.63
R21	270	155.78	-77.46
R22	270	148.49	-65.22
R23	265	115.43	-74.00
R24	275	50.53	-115.24
R24.5	275	-3.68	-139.10
R25	279	-3.26	-47.89
R25.5	255	-28.17	-169.65
R26	230	252.28	161.68
Weighted Average (ft.)		**87.80**	**-90.77**
Average Annual Rate (ft.)		**N/A**	**-16.99**

(+ Number) Indicates seaward advance. (- Number) Indicates landward retreat.

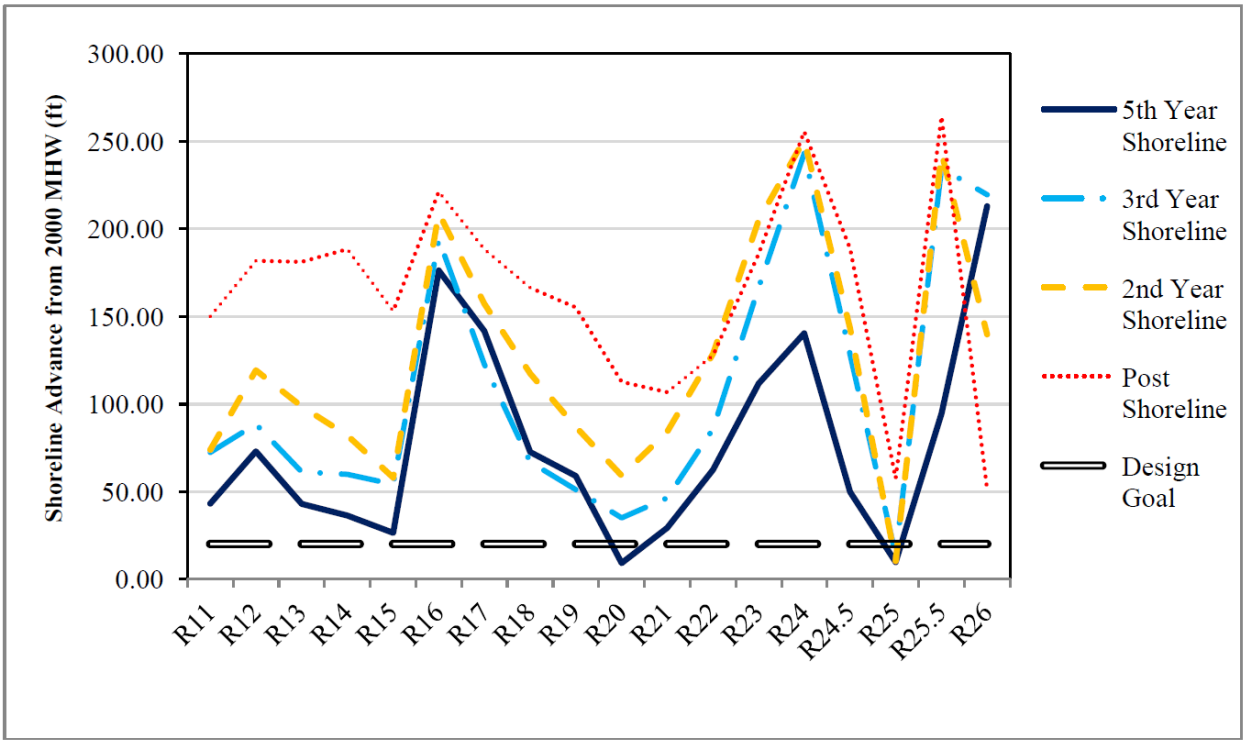


Figure 2-10. Shoreline position in reference to the design goal

Figure 2-11. Aerial Dated 26 Feb 2012

2.3.1.1.3 VOLUMETRIC CHANGES

The project performed within the design expectations. Using the volumes calculated during construction (H&M, 2007), the project entailed placement of approximately 1,073,000 cy. Volumetric measurements for this monitoring event indicate that approximately 467,022 cy of sand were missing from the design template. This implies a retention rate, through September 2012, of approximately 56.5% and annual losses of 87,457 cy. However, these losses are influenced by the impact of Tropical Storm (T.S.) Debby in June 2012. USACE has calculated that T.S. Debby removed an estimated 79,250 cy from the active beach template. Accounting for this event yields a retention rate of 63.9% based on annual losses of 72,600 cy. Additional information can be found in the Gasparilla Island Restoration 5th year post construction monitoring report. Lee County Division of Natural Resources. 2013. Fort Myers.

2.3.1.2 FIRST RENOURISHMENT (2013)

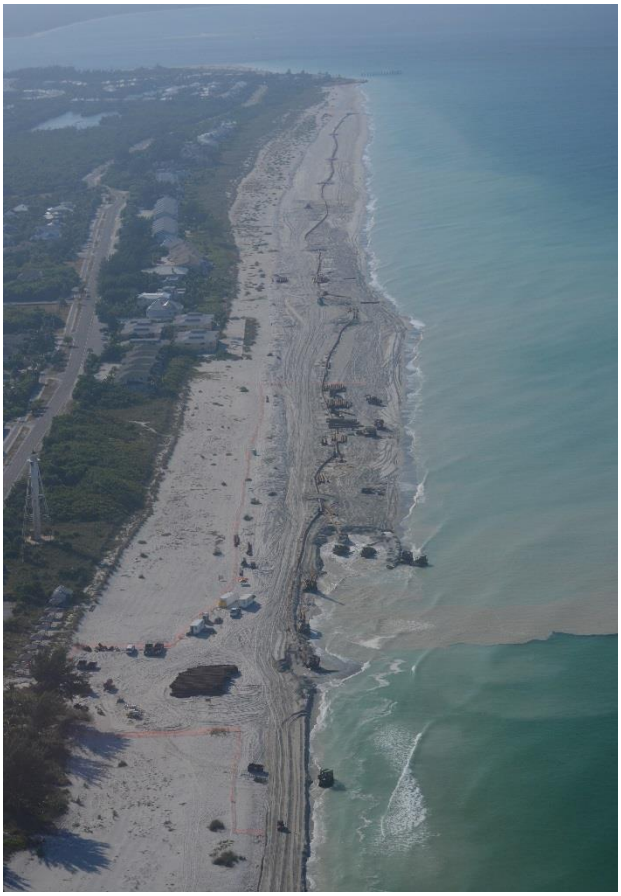
Completion of a rehabilitation effort for the Lee County, Florida, Shore Protection Project, Gasparilla Island Segment, Project Information Report (PIR) (February 2013) for impacts sustained by Tropical Storm (T.S.) Debby (June 2012) and Hurricane Isaac (August 2012) resulted in a request for Flood Control and Coastal Emergencies (FCCE) and Construction General (CG) funds. Beach erosion from these events is shown in Figure 2-12. This project was constructed by the USACE from October to December, 2013. The construction template included a 100-ft wide berm at an elevation of +3.75 ft-NAVD88 (+5.0 ft-NGVD29) between monuments R10.5 to R24.5, including tapers. The sand source was the Boca Grande ebb shoal approximately 1 mile southwest of the southern end of Gasparilla Island. The 2013 renourishment project volume included the 79,250 cubic yards (cy) estimated to have been removed by T.S. Debby which impacted Florida on 23-27 June 2012 plus an additional advanced nourishment volume of 338,000 cy. The total project cost was approximately $9.8 million with 17 % or $ 1.7 million attributed to the FCCE renourishment. The final volume placed according to contract payment during the 2013 Lee County, Gasparilla Segment, SPP renourishment was 457,800 cy.

5th Street; image looking north

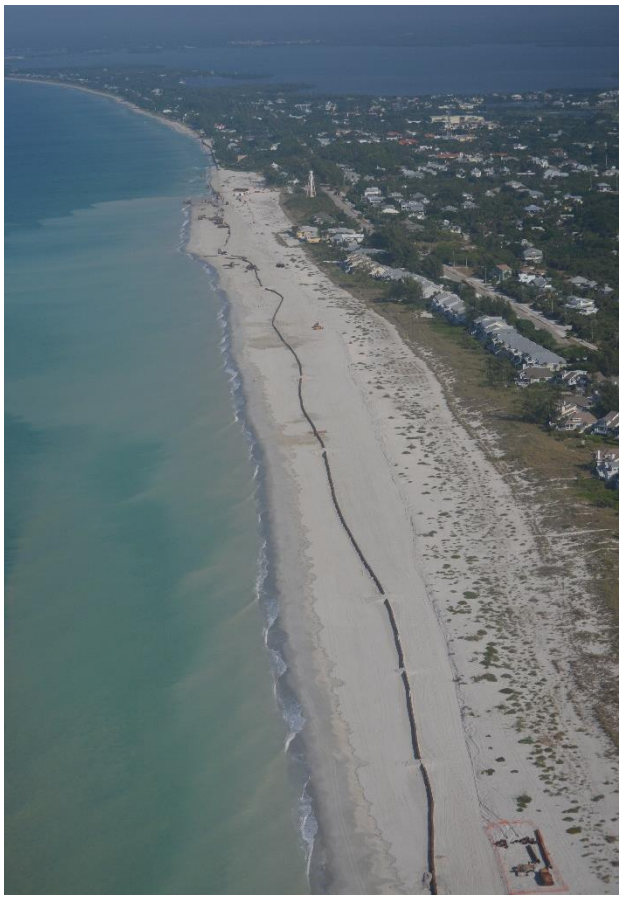
5th Street; image looking south

Figure 2-12. Beach Impacts Sustained by Tropical Storm (T.S.) Debby (June 23-27, 2012)

During the 2013 construction, an adjustment to the fill template along Gasparilla Island was required. The contract volume was based on the May 2013 survey of Gasparilla Island Beach completed during the plans and specifications phase in the spring of 2013, which yielded an estimated 480,000 cubic yards of material required for the full construction template. The preliminary pre-construction survey, before dredging, conducted in October 2013 of Gasparilla Island using 500 foot intervals yielded a substantially lower volume of 341,000 cy of material, resulting in a potential 29% underrun of the contract volume. In order to account for the decrease in contract volume due to natural accretion and recovery of the beach, the contract plans were modified with an additional construction berm width of 30 feet (from 100 to 130 feet) from R19 to R21 and extended the berm width by 10 feet between R10.5 and R15.5. The construction cross-section included the fill required to construct the design cross-section, plus additional fill placed seaward of the design section for advanced nourishment. Approximately 55,000 cy of additional material was added to the project by increasing the berm width. This increase in berm width is considered additional advanced nourishment since it is beyond the 20-foot berm design width. The modified contract volumes were thus 128,000 cy of design berm (less required due to natural accretion), and 338,000 cy of advanced fill, for a total volume of 466,000 cy. Figure 2-13 shows construction pictures from December 2013.



Looking south; Gasparilla Lighthouse and Boca Grande pass



Looking north; Single family residential and multifamily structures

Figure 2-13. First Beach Renourishment Construction – December 2013

2.3.1.2.1 SHORELINE CHANGES

Comparison of the pre-construction survey in May 2013 to the latest monitoring survey in June 2016 reveals that the current average MHW position is 66.2 feet seaward of the pre-construction MHW position across the beach fill area. The cumulative shoreline change following the 2013 pre-construction monitoring survey is reduced towards the south end of the project, likely a result of the structure at the southern end of the project (seawall acting as a groin), the net littoral drift in the area (North to South), or a combination of both. This is supported within Table 2-7, in which the percent remaining is shown to be largest at the southern section of the project, R20 to R24.

Table 2-7: Mean High Water Position Change (R10 to R24) from May 2013 to June 2016

DNR (FDEP) R-Monument	MHW Position Change (feet)	
	Pre to post Construction (ft.) May2013- Feb2014	Pre to 2 Yr. post Construction (ft.) May2013- Jun2016
R10	35.0	28.8
R11	72.1	30.7
R12	86.5	35.1
R13	95.0	34.5
R14	105.5	35.1
R15	106.0	62.4
R16	87.8	52.5
R17	95.3	53.2
R18	106.2	48.6
R19	141.1	86.6
R20	147.0	114.7
R21	157.5	123.2
R22	133.0	125.9
R23	83.7	99.3
R24	55.9	62.8
AVG	**100.5**	**66.2**

2.3.1.2.2 VOLUMETRIC CHANGES

From May 2013 to June 2016, a net volume of 445,200 cy has been retained, of which 132,900 cy is above MHW, and 312,300 cy remains from 0 ft. MHW to -13 ft. MHW. Roughly 87% of the original volume that was placed in 2013 remains, with only 13% eroded as of June 2016. About 71% remains above MHW and 97% remains between MHW and -13ft. Additional information can be found in the Gasparilla Island Shore Protection Project, 2013 beach renourishment - second annual post construction monitoring report. USACE (2016).

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The loss of the protective beach would expose beachfront development and infrastructure (buildings, roads, utilities, and parking lots) to destructive storm waves. Loss or reduction of the shoreline would likely decrease turtle nesting habitat in this area, negatively affect the public, and reduce recreational opportunities.

2.3.2 UPLAND DEVELOPMENT

EXISTING CONDITIONS

The northern area of the project (R11-12) is almost entirely residential, consisting of large, high value single family homes as well as pools, garages, and roads. The central area (R13-20) is a mixture of single family homes, multifamily structures, and some commercial structures, hotels, which include associated structures such as pools, garages, tennis courts, and parking lots. The middle section of the project also includes a public park and the Boca Grande Rear Range Lighthouse (colloquially known as the Gasparilla Lighthouse) at R-17. The proximity of these buildings to the beach makes them potentially vulnerable to erosion, wave, and flood damage. The southern reaches (R21-24) primarily consist of multi-family structures, as well as a few single family homes and a public park. The most southerly reach (R24) has no damageable elements except for roads. Most of the lots in the study have existing coastal armor, which vary considerably in value and construction type. The types of structure are shown in Figure 2-14, types of existing armor structures are shown in Figure 2-15, and a map of the armor locations is provided in Figure 2-16.

Property near 15th Street West, Boca Grande

Property near 32 Gulf Blvd, Boca Grande

130 Gulf Blvd, Boca Grande - Commercial Property

Johann Fust Community Library, Boca Grande

220 Gulf Blvd, Boca Grande - Boca Grande Rear Range Lighthouse (colloquially known as the Gasparilla Lighthouse)

Figure 2-14. Examples of Existing Structures at Gasparilla Island Segment

Figure 2-15. Examples of Existing Armor Structures at Gasparilla Island Segment

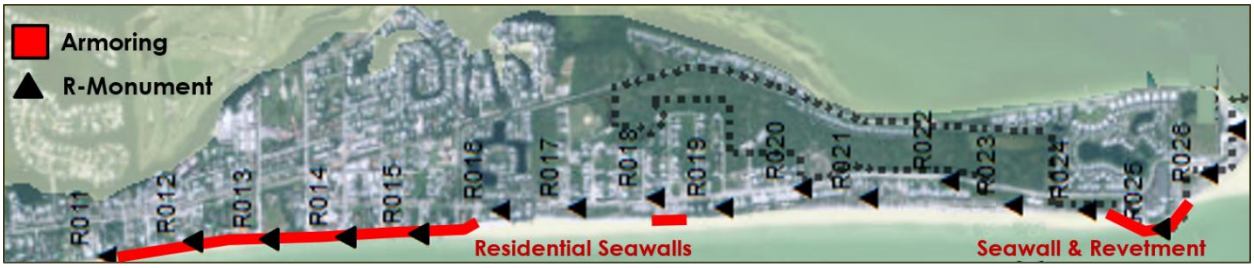


Figure 2-16. Map of Existing Armor in the Study Area

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Upland development in the future is not likely to increase within the study area because this area is already fully developed (outside the park areas). It is possible that additional development could occur over time in some upland areas that are landward of the study area. Any damages and benefits associated with such development would not be captured in the study and would not be relevant for benefit evaluation or plan selection. Storms will continue to occur, making the coastal inventory particularly susceptible to erosion and inundation damage.

2.4 NATURAL ENVIRONMENT

2.4.1 GENERAL ENVIRONMENTAL SETTING

EXISTING CONDITIONS

Lee County is located on the Gulf coast of central Florida. Gasparilla Island is located north of the mouth of the Caloosahatchee River, which empties into the Gulf of Mexico near Sanibel Island. This is a barrier island between Charlotte Harbor and the Gulf of Mexico. The town of Boca Grande is located in the center of the island. Shore front development, primarily single family homes, is almost continuous along the project shoreline except for Gasparilla Island State Recreation Area property (located at R-17) and Gasparilla State Park (located between R-23 and R-24).

The beaches of Lee County are typical of other west central Florida beaches which are subject to the full force of ocean waves. These beaches usually have low species diversity, but populations of individual species are often very large. Species such as coquina clams, ghost crabs, annelid worms, mole crabs, and sand drum are highly specialized to survive in this high energy environment. The most abundant and evident producers on the Gasparilla Island reefs are the epibenthic macroalgae. This algae is fed upon by herbivorous fishes and invertebrates. The exposed rock provides stable substrate for algae, which through photosynthesis produces the basic organic material on which much of the reef's food web is based. Epibenthic macroalgae are large, often dense flora living on the ocean floor. Attached filter feeding organisms also contribute to this organic base.

In addition to the algae which grows on the reefs, fish and motile invertebrates are attracted to the basic structure of the reef. The numerous crevices, holes, and undercut ledges provide refuge from larger predatory fish. The reef also provides a barrier to wave action and currents and substrate for the attachment of demersal adhesive eggs (Mote Marine Laboratory 2000).

The authorized footprint impacts properties landward of the ECL on one public parcel (680 Gulf Blvd, Boca Grande), referred to as Gasparilla State Park and is open to the general public. The State provided the NFS permission to operate the property as part of the project. The Park is located between FDEP monuments R-23 and R-24 along the shoreline. The non-Federal sponsor will certify a temporary work area easement to the United States for construction purposes in the Park. Additional information regarding this parcel

can be found in maps provided in the Real Estate Appendix (E). Figure 2-17 presents a map with the location of the Johann Fust Community Library, Gasparilla Lighthouse (Includes Gasparilla Island State Recreation Area property located at R-17), Gasparilla State Park (located between R-23 and R-24) and the Port Boca Grande Lighthouse Museum (located on the southeastern edge of the island).

Figure 2-17. Map of unique structures located at Gasparilla Island between R11 to R26

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no-action alternative would affect the general environmental setting. Species that utilize the beach environment may decrease in number due to continued erosion of the beach and dune system in the Future Without-Project Condition.

2.4.2 VEGETATION

EXISTING CONDITIONS

Vegetation consisting of morning glory (*Ipomea imperati*), railroad vine (*Ipomea pes-caprae*), and sea oats (*Uniola paniculata*) can be found within the dune system of the beach placement area. Landward of the dunes, the grounds are developed and generally covered with grasses, herbs, and shrubs, and some stands of exotic Australian pine (*Casuarina species*). The surfzone and subtidal zone contains some hardground areas that support species of algae (see Table 2-8). Figure 2-18 shows algal covered hardgrounds. Seagrasses do not occur in the project area. There are no exotic invasive species of vegetation within the borrow area, surfzone, or subtidal zones. As stated on p. 6-11, E.O. 13112, this project would not result in the introduction of invasive vegetation. The borrow area is a sandy borrow area and supports no vegetation. The staging areas for this project are grassed or sandy areas with no natural native vegetation.

Table 2-8: Species of algae observed on the surf zone reef, Gasparilla Island, R10 to R12 (Mote Marine Laboratory 2000)

Algae
Caulerpa racemosa
Caulerpa mexicana
Caulerpa sertularoides
Codium repens
Spatoglossum schroederi
Bryothamnion triquetrum
Eucheuma canthocladum
Gracilaria sp.
Enteromorpha lingulata

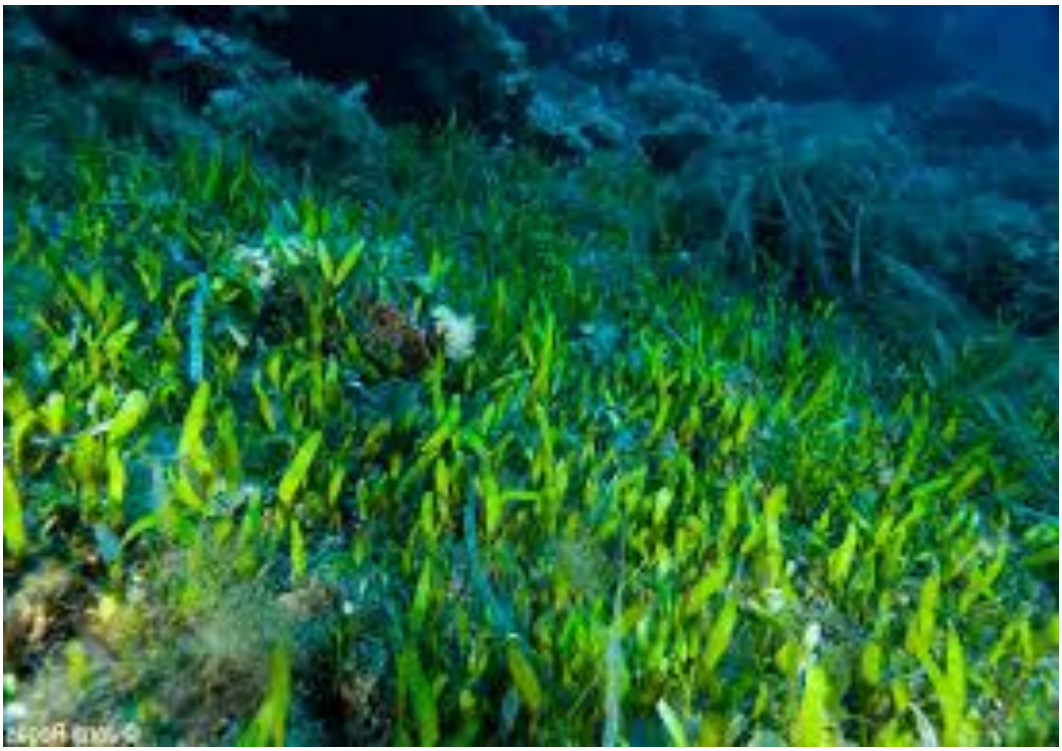


Figure 2-18. Algal Covered Hardgrounds

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no action alternative could affect vegetation within the project area. Continued erosion of the beach would result in the loss of vegetated beach and dune habitats. Additionally, continued erosion could result in more landowners installing alternative armoring measures, such as revetments, to protect their property. These measures could result in negative impacts to the remaining dune system by altering the beach profile and displacing vegetation.

2.4.3 FISH AND WILDLIFE RESOURCES (OTHER THAN THREATENED/ENDANGERED SPECIES)

EXISTING CONDITIONS

2.4.3.1 NEARSHORE SOFT BOTTOM COMMUNITIES

Soft bottom macrobenthic and infaunal communities located within the nearshore portion of the project area experience highly dynamic conditions due to the high energy wave action in the intertidal surf zone. A portion of this environment comprises hardbottom. The existing beach sands are poorly sorted, which likely reflects the inclusion of coarse-grained shell fragments, a common occurrence in the nearshore, sub-tidal zone.

In tropical and subtropical areas, the ghost crab genus Ocypode typically dominates the upper beach area. Mole crabs (*Emerita*), haustoriid amphipods, and bivalves (*Donax*) are numerical dominants in the intertidal area, while polychaetes, other amphipod species, and bivalves increase in abundance in the subtidal nearshore areas (Pearse et al. 1942, Dahl 1952, Spring 1981). Other benthic organisms that are commonly found in these sandy areas include the five notched sand dollar (*Encope emarginata*), Florida fighting conch (*Strombus alatus*), horseshoe crab (*Limulus polyphemus*), lightning whelk (*Busycon contrarium*), beaded starfish (*Astropecten articulatus*), and black urchin (*Diadema sp.*). Figure 2-19 illustrates the pelagic and benthic zones in the ocean.

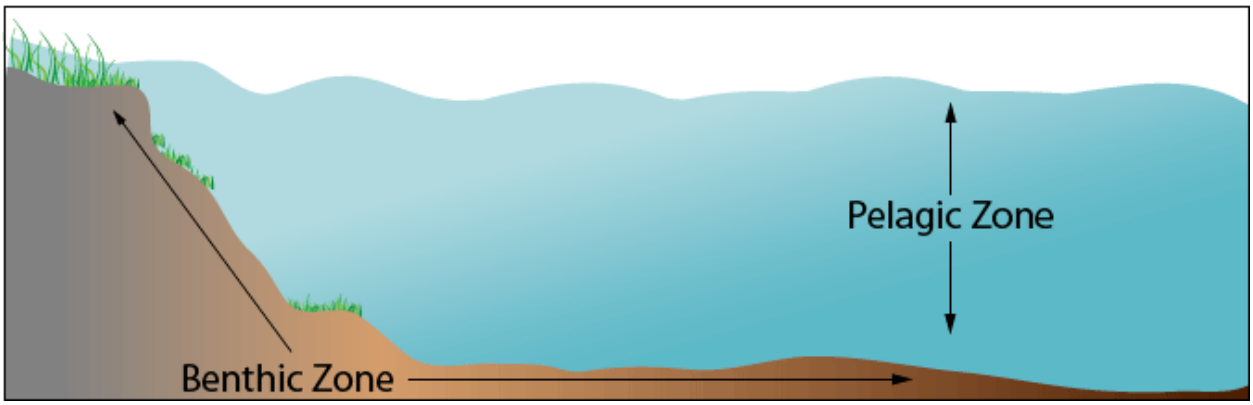


Figure 2-19. Pelagic and Benthic Zones in the Ocean

2.4.3.2 OFFSHORE BORROW AREA SOFT BOTTOM COMMUNITIES

Infaunal organisms present in the soft bottoms offshore are predominantly common invertebrates including crustaceans, echinoderms, mollusks, polychaetous annelids, and interstitial bryozoans. Infaunal populations exhibit both seasonal and spatial variability in distribution and abundance, due to temperature, sediment topography, bathymetry, and sediment composition, including particle size and organic content (Hammer et al. 2005).

2.4.3.3 NEARSHORE HARDBOTTOM FISH ASSEMBLAGES

Reef fishes observed on the reef were low in abundance and diversity. Seven species were seen: the nurse shark (*Ginglymostoma cirratum*), gray snapper (*Lutjanus griseus*), lane snapper (*Lutjanus synagris*), sheepshead (*Archosargus probatocephalus*), belted sand bass (*Serranus subligarus*), white grunt (*Haemulon plumieri*), and slippery dick (*Halichoeres bivittatus*) (USFWS 2000).

Surf zone fish communities are typically dominated by sheepshead (*Archosargus probatocephalus*), grunts (*Haemulon sp.*), and snappers (*Lutganus sp.*). Fish of commercial significance include striped mullet (*Mugil cephalus*), spotted seatrout (*Cynoscion nebulosus*), pompano (*Trachinotus carolinus*), grouper (*Mycteroperca sp. and Epinephelus sp.*), and red snapper (*Lutjanus campechanus*). Important commercial shellfish include pink shrimp (*Penaeus duorarum*), blue crab (*Gallinectes sapidus*), and stone crab (*Menippe mercenaria*). Sportfish commonly fished for in the area include tarpon (*Megallops atlanticus*), snook (*Gentropomus undecimalis*), sheepshead (*Archosargus probatocephalus*), mangrove snapper (*Lutjanus griseus*), and red drum (*Sciaenops ocellatus*).

2.4.3.4 COASTAL PELAGIC FISH

The major coastal pelagic families occurring in inshore and coastal waters of the project area include ladyfish (*Elops saurus*), anchovies (*Engraulidae*), herrings (*Clupeidae*), mackerels (*Scombridae*), jacks (*Carangidae*), mullets (*Mugilidae*), bluefish (*Pomatomus saltatrix*), and cobia (*Rachycentron canadum*). Some species form large schools (e.g. Spanish mackerel (*Scomberomorus maculatus*)), while others (e.g. cobia) travel alone or in smaller groups. Concentrations of anchovies, herrings, and mullets in nearshore areas may attract larger predatory species (particularly bluefish, blue runner (*Caranx crysos*), jack crevalle (*Caranx hippos*), sharks (Lamnidae), and Spanish mackerel). The presence and density of most coastal pelagic fish species depend on water temperature and quality, which vary spatially and seasonally.

2.4.3.5 MIGRATORY BIRDS

A number of seabirds and shorebirds may occur along the beach and offshore project area. The seabirds represent a wide range of species dependent on the resources of the pelagic zone in the Gulf of Mexico. Some seabirds spend significant portions of their life cycle offshore and may occur in the project area, such as the magnificent frigatebird (*Fregata magnificens*), Audubon's shearwater (*P. lherminieri*), masked booby (*Sula dactylatra*), northern gannet (*Morus bassanus*), Wilson's storm-petrel (*Oceanites oceanicus*), and band-rumped storm-petrel (*Oceanodrama castro*)(Kaufman 1996). Gulls, terns, pelicans, and cormorants divide their time more or less equally between offshore and coastal waters (Ehrlich et al. 1988) and may occur in the project area.

The west Florida coast serves as a principal route of the Atlantic Flyway for many migratory landbird species. Many of the birds that breed east of the Allegheny Mountains move southward in fall, through northwestern Florida, crossing the Gulf to the coastal regions of central Mexico where they follow a land route for the remainder of the journey to Cuba or South America (Lincoln *et al.* 1998).

2.4.3.6 MARINE MAMMALS

The marine mammals of the Gulf of Mexico are represented by members of the taxonomic order Cetacea, which is divided into the suborders Mysticeti (i.e., baleen whales) and Odontoceti (i.e., toothed whales), as well as the order Sirenia, which includes the manatee. Within the Gulf of Mexico, there are 28 species of cetaceans (seven mysticete and 21 odontocete species) and one sirenian species, the manatee (Jefferson *et al.* 1992; Davis *et al.* 2000). Bottlenose dolphins (*Tursiops truncatus*) and Atlantic spotted dolphins (*Stenella frontalis*) are common in shallow Gulf waters up to 656 feet (200 m) deep.

2.4.3.7 LAND MAMMALS

Common land mammals that may occur within the dune system or beach placement area include raccoon (*Procyon lotor*) and nine-banded armadillo (*Dasypus novemcinctus*).
(Lee County 2017 http://www.leegov.com/conservation2020/landmanagement/wildlife)

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Species that utilize the beach environment may decrease in number due to continued erosion of the beach and dune system in the Future Without-Project Condition. No changes to fish and wildlife resources that reside below the swash zone would occur in the Future Without-Project Condition.

2.4.4 THREATENED AND ENDANGERED SPECIES

The project area lies within the coastal area of Lee County, Florida. Of the species listed in Table 2-9, the species most likely to occur within the project vicinity are the following federally listed species: five species of sea turtles, manatees, smalltooth sawfish, piping plover, and rufa red knot. There are no species proposed for listing in this project area.

Table 2-9: Federally Threatened and endangered species that may occur in the project area

Common Name	Scientific Name	Status
Sei whale	*Balaenoptrs borealis*	Endangered
Sperm whale	*Physeter macrocephalus catadon*	Endangered
Finback whale	*Balaenopters physalus*	Endangered
Hawksbill turtle	*Eretmochelys imbricate*	Endangered
Kemp's ridley turtle	*Lepidochelys kempii*	Endangered
Green sea turtle	*Chelonia mydas*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened
American crocodile	*Crocodylus acutus*	Threatened
Smalltooth sawfish	*Pristis pectinata*	Endangered
Gulf sturgeon	*Acipenser oxyrhnichus desotoi*	Threatened
Florida manatee	*Trichechus manatus latirostris*	Threatened
Piping plover	*Charadrius melodus*	Threatened
Rufa red knot	*Calidris canutus rufa*	Threatened

2.4.4.1 SEA TURTLES

EXISTING CONDITIONS

Loggerheads (*Caretta caretta*), green turtles (*Chelonia mydas*), and leatherbacks (*Dermochelys coriacea*) nest regularly in Florida. Nesting by the hawksbill turtle (*Eretmochelys imbricata*) and the Kemp's ridley turtle (*Lepidochelys kempii*) in Florida is rare. The majority of reported sea turtle nesting activity in the state of Florida occurs on the east coast (Meyland, Schroeder, and Mosier, 1995). The loggerhead sea turtle accounts for the vast majority of reported sea turtle nesting in Florida. On the Gulf coast, the majority of loggerhead nesting occurs primarily from Sarasota south through Collier counties. Sarasota County has the greatest amount of nesting activity on the west coast of Florida (Meyland, Schroeder, and Mosier, 1995). The loggerhead sea turtle is the species most likely to nest in significant numbers on nesting beaches in Lee County. Sporadic nesting of green sea turtles occurs on Gasparilla Island. Sea turtle nesting for the project area is provided in Figure 2-20. Designated critical habitat for sea turtles does not occur in the project area.

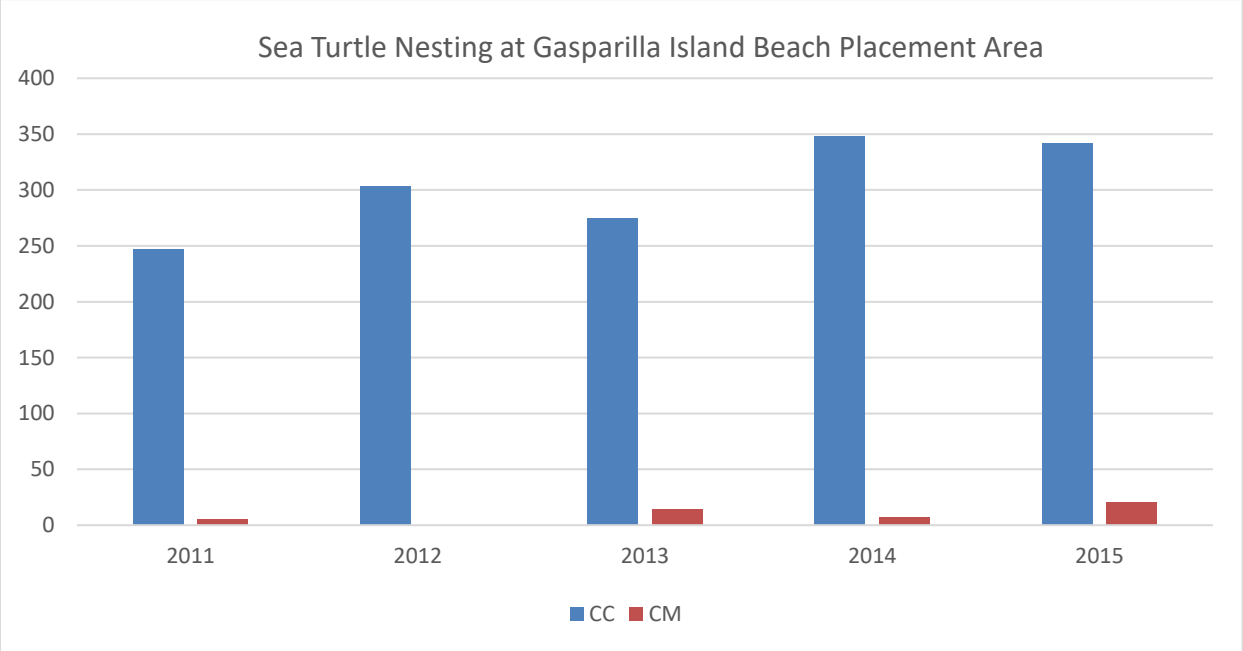


Figure 2-20. Sea turtle nesting data for Gasparilla Island beach placement area for loggerheads (CC) and greens (CM) from 2011 to 2015. Source Florida Fish and Wildlife Conservation Commission

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

In the Future Without-Project Condition, the beach is predicted to continue to erode. This will reduce the shoreline area available for nesting sea turtles. As adjacent shorelines are currently available for nesting, it is unknown whether the overall nesting would be affected. In addition to increased erosion, it is likely that the length of shoreline hardened by structures would increase. This could further decrease the area available for nesting sea turtles due to the fact that the hard structures constructed would likely be

seawalls and revetments, where permittable, that could negatively impact the width of beach available for nesting, if not constructed in conjunction with beach nourishment.

2.4.4.2 WEST INDIAN MANATEE

EXISTING CONDITIONS

The estuarine water around the inlets and bays off Lee County provide year-round habitat for the West Indian manatee (*Trichechus manatus*). The coastline adjacent to the beach placement location is located within designated critical habitat for the manatee.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no-action alternative would not affect the manatee.

2.4.4.3 SMALLTOOTH SAWFISH

EXISTING CONDITIONS

Relatively little is known about the life history and distribution of the smalltooth sawfish (*Pristis pectinata*), but the species occurs most commonly in shallow waters less than 25 m in depth (Adams and Wilson, 1995) and could occur in the nearshore adjacent to the project area beach and in the proposed borrow area. The coastline adjacent to the beach placement location is located within designated critical habitat for the sawfish.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no-action alternative would not affect the smalltooth sawfish.

2.4.4.4 PIPING PLOVER

EXISTING CONDITIONS

The piping plover (*Charadrius melodus*), a state and federally listed species, generally winters in a variety of areas of Florida, including the Gulf coast. Piping plovers migrate south to Florida as early as late July and remain as late as early April (non-breeding season). This small shorebird may be found inland but prefers sandy beaches and tidal mudflats where it forages along the waterline or high up the beach along the wrack line. Piping plovers feed within the intertidal zone on invertebrates such as marine worms, insect larvae, crustaceans, and mollusks (Kaufman 1996). Piping plover foraging and resting habitat may occur within the project area. There is no designated critical habitat for wintering piping plovers in the project area. However, unit FL-22 is located within several miles of the beach placement location.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no-action alternative would result in continuing beach erosion, which would reduce piping plover habitat. Intertidal foraging habitat area would remain relatively constant, although shifting spatially as the beach eroded.

2.4.4.5 RUFA RED KNOT

EXISTING CONDITIONS

The rufa subspecie of the red knot (*Calidris canutus rufa*), listed as threatened, is a small shorebird that can occurs along the Gulf and Atlantic coasts during migration. It is also known to overwinter in low numbers along both coasts. Florida is home to the largest concentration of wintering *rufa* in the United States, with the main concentration occurring in the greater Tampa Bay region (A.C. Schwarzer et al. 2012). In migration and winter, it prefers coastal mudflats, tidal zones, and sometimes open sandy beaches where it feeds on small invertebrates such as small mollusks, marine worms, and crustaceans (Kaufman 1996). Critical Habitat has not been designated for this species. Red knots may occasionally occur within the project's beach placement area.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no-action alternative would result in continuing beach erosion, which would reduce red knot habitat. Intertidal foraging habitat area would remain relatively constant, although shifting spatially as the beach eroded.

2.4.5 ESSENTIAL FISH HABITAT (EFH)

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) requires identification of the habitats needed to create sustainable fisheries and comprehensive fishery management plans with habitat inclusions. The act also requires preparation of an Essential Fish Habitat (EFH) assessment and coordination with National Marine Fisheries Service (NMFS) when EFH impacts occur. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity [16 U.S.C. § 1802(10)]." Waters are defined as aquatic areas and their associated physical, chemical, and biological properties that fish use during each stage of their cycle. Substrate includes "sediment, hardbottom, structures underlying the waters, and associated biological communities". Necessary is defined as "the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem." Fish includes finfishes, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds, whereas "spawning, breeding, feeding, or growth to maturity" covers the complete life cycle of species of interest.

On December 19, 1997, an interim final rule was published in the Federal Register to implement the EFH provisions of the MSFCMA. This rule established guidelines to assist the Regional Fishery Management Councils and the Secretary in the description and identification of EFH in fishery management plans (FMPs), including identification of adverse impacts from both fishing and non-fishing activities on EFH,

and identification of the actions required to conserve and enhance EFH. The intended effect of the rule is to promote the protection, conservation, and enhancement of EFH. The definition of EFH may include habitat for individual species or assemblage of species; whichever is appropriate within each FMP.

Pursuant to the MSFCMA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), the Gulf of Mexico Fisheries Management Council (GMFMC, 1998) has designated marine areas of non-vegetated bottoms, live bottoms (i.e., hardbottoms), and water columns within the study area as EFH. This EA is prepared consistent with the finding between USACE Jacksonville District and the National Marine Fisheries Service (NMFS) Southeast Regional Office regarding the coordination of EFH consultation requirements with NEPA (NMFS, 1999). EFH at the proposed sand source location consists of a marine water column with an unconsolidated sand substrate. Surveys performed for Lee County and by the USACE indicate that Gasparilla shoals has a sandy substrate; refer to Appendix D: Geo-technical Report for more information.

Additionally, the beach placement area is above mean high water line and is not considered EFH. However, as the placed material equilibrates the material may impact nearshore EFH. Section 2.4.5.1 Reef/Hardground discusses the nearshore region and the beneficial habitat provided by the rock outcroppings.

2.4.5.1 REEF/HARDGROUND COMMUNITIES

EXISTING CONDITIONS

In 1993, the Federal government, in cooperation with state and county officials, disposed of approximately 438,000 cubic yards of maintenance material from Boca Grande Pass on the adjacent shoreline of Gasparilla Island. As a result, a small outcrop reef located 400 feet north of FDEP monument R18 was covered with sand; the USACE constructed a 0.6 acre artificial reef to offset habitat losses in this area. Figure 2-21 inset map 2 shows the 0.6 acre mitigation area located approximately 500 feet off the beach and 400 feet north of FDEP monument R18.

Between December 2006 and April 2007, the Gasparilla Island Florida Shore Protection Project was constructed as a reimbursable project by the non-Federal sponsor. The work authorized by permit 0174403-JC entailed placement of 1,072,781 cubic yards of sand on the beaches of Gasparilla Island. The material was dredged from the Boca Grande Pass ebb shoal. Beach placement occurred over 15,000 linear feet, from 17th Street to R-25, and covered 0.9 acres of hardbottom. The rock outcroppings were located in the nearshore region and alternated between being exposed and covered by the localized sediment transport. Figure 2-22 illustrates nearshore rocky habitat at approximately 1,500 feet south from R-10. The limestone substrate provided beneficial habitat for macroalgae and filter feeding organisms when it was exposed. Algae communities are a food source for other sea life such as sea turtles, invertebrates, and other plant eating fish. Overhangs and crevices also provided small fish and invertebrates' locations for avoiding larger predatory animals (Mote 2000).

Mitigation for the initial loss of habitat, due to construction, required the creation of a similar reef structure immediately offshore of the fill area. A minimum of 0.9 acres of limestone was required to be placed in water depths of approximate 7 to 9 ft-NAVD88, approximately 500 feet off the beach. Figure 2-21 inset map 1 shows the impacted hardbottom during initial construction in 2007; located within the surf zone between FDPE monuments R-10 and R-12. Also, Figure 2-21 inset map 1 shows two not affected small natural outcrop reefs, located offshore and north of the construction template equilibrium toe of fill (FDEP monuments R-09 and R-10).

Approximately 48 tons of limestone boulders were placed within the deployment site. Mitigation was constructed from September 15, 2008 to November 21, 2008. The permitted reef site covered 1.4 acres and consisted of six (6) 100 ft. x 100 ft. squares approximately 500 feet offshore in water depths from approximately 9 to 11 ft-NAVD88. Figure 2-23 presents the plan view layout of the reef site with geographical coordinates, and Figure 2-21 inset map 1 shows the mitigation reef after 5 years of construction (2013).

In May 12, 2015, Lee County staff conducted a biological survey of the mitigation reef built in 2008. The results show the reef supports a typical hard-bottom reef community and also is providing smaller organisms' refuge from larger predatory fish. The intent to reproduce a habitat suitable for sustaining a food source for invertebrate herbivores has been achieved. The reef site is comparable by function to the hardbottom buried by the sand placement. Each sampling site had significant cover with diverse groups of reef organisms observed. Grazers are being supplied an organic food base established on the placed limestone. Smaller organisms such as seaweed blenny, belted sandfish, and hermit crabs are also finding refuge in the rock. Diversity at the site continued to increase since the previous survey in 2009; refer to Environmental Appendix (G); Attachment 3, Monitoring Report for more information.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no-action alternative would not affect Essential Fish Habitat.

Figure 2-21. Gasparilla Island Mitigation Map from 2013 Survey

Figure 2-22. Pictures of nearshore rocky habitat approximately 1,500 feet south R-10. Field survey August, 2000

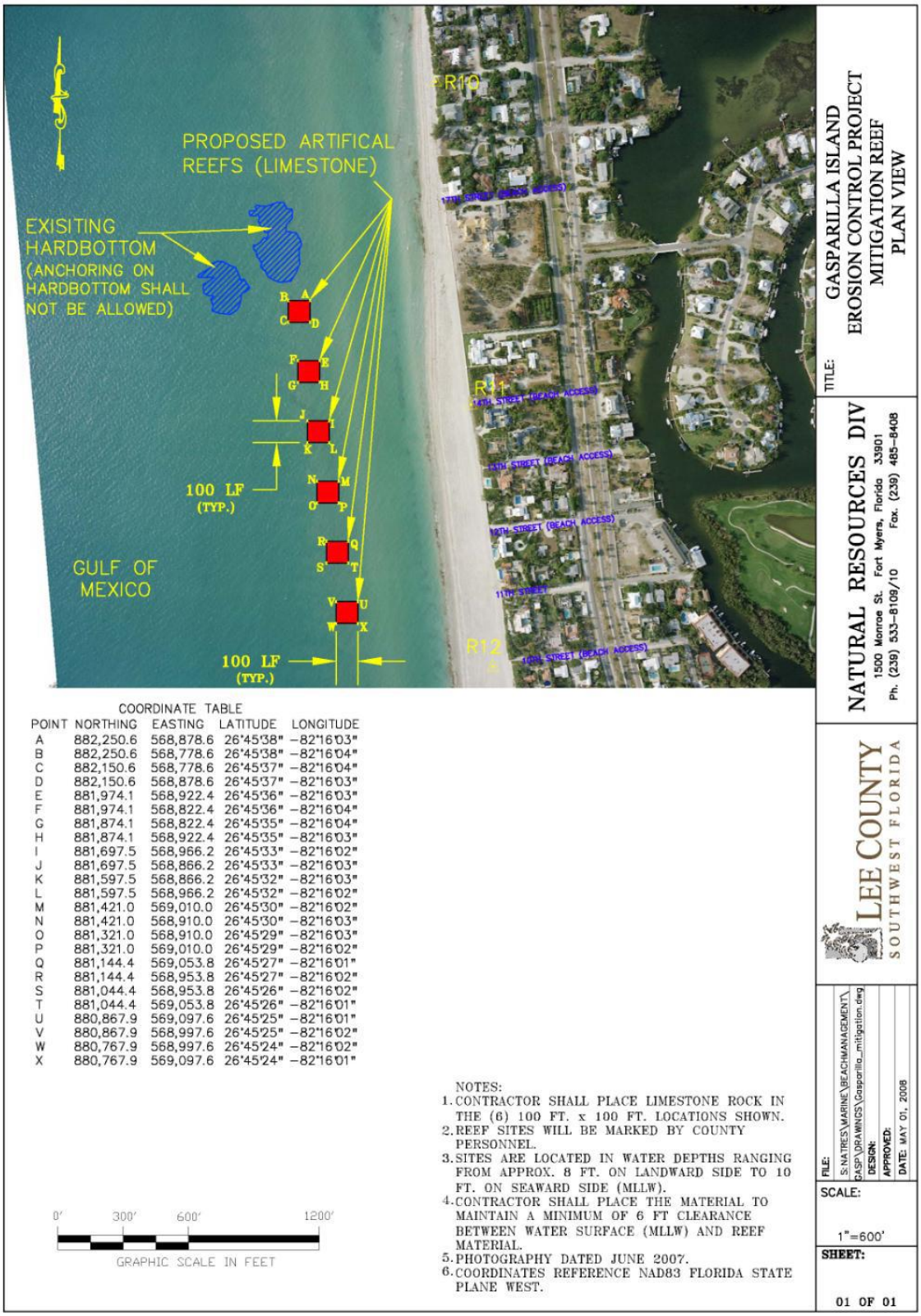


Figure 2-23. Plan View Layout of Mitigation Reef Site

2.4.6 COASTAL BARRIER RESOURCES

EXISTING CONDITIONS

Coastal Barrier Resources Act (CBRA), Public Law 97-348 (96 Stat. 1653; 16 U.S.C. 3501 et seq.), enacted October 18, 1982, designated various undeveloped coastal barrier islands, depicted by specific maps, for inclusion in the Coastal Barrier Resources System. Areas so designated are ineligible for direct or indirect Federal financial assistance that might support development, including flood insurance, except for emergency life-saving activities. The Act includes exceptions for activities such as fish and wildlife research. The Act also excludes National Wildlife Refuges and other, Otherwise Protected Areas, from the system. The project's beach placement area lies within CBRS Unit FL-70P, which is an Otherwise Protected Area (OPA). The Coastal Barrier Improvement Act of 1990 expanded the CBRS and created a new category of lands known as OPAs. OPA designations add a layer of Federal protection to coastal barriers already held for conservation or recreation such as national wildlife refuges, national parks and seashores, state and county parks, and land owned by private groups for conservation or recreational purposes. The Federal government may spend Federal funds on projects within OPAs as long as the funds do not go toward Federal flood insurance (after November 16, 1991). The project will result in the maintenance of a protective beach for the Coastal Barrier Resource System Units associated with the project beach. The project will not encourage additional development, as the area is already fully developed outside the park areas.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no action alternative would result in continued erosion and may also result in more landowners installing alternative armoring measures, such as revetments, to protect their property.

2.4.7 WATER QUALITY

EXISTING CONDITIONS

The waters fronting the project area are classified as Class III by the State of Florida. Class III waters are considered suitable for recreation and the management of fish and wildlife. Turbidity sampling data from the last dredging event in 2013 indicated no exceedances above background.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no-action alternative would not affect water quality.

2.4.8 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

EXISTING CONDITIONS

Preliminary assessment indicated no evidence or knowledge of hazardous, toxic, or radioactive waste (HTRW) on the project lands and included a review of the historical land use of the area. Per coordination with the non-federal sponsor, land use adjacent to the project area has been residential and not industrial. During WW II, this area was not used as a bombing range. Previous projects have not discovered HTRW, however, further HTRW awareness shall be practiced during future construction. The probability of finding World War II related HTRW is remote, but not zero.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no-action alternative would not result in any sources of pollutants occurring in the project area.

2.4.9 AIR QUALITY

EXISTING CONDITIONS

Air quality in Gasparilla Island is good due to the presence of either on or off shore breezes and is in attainment with air quality criteria (http://www.usa.com/boca-grande-fl-air-quality.htm). No permits are required for this project.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no-action alternative would not affect air quality in the project area.

2.4.10 NOISE

EXISTING CONDITIONS

Ambient noise levels in the project area are low to moderate. The major noise producing sources are breaking surf and adjacent residential and resort areas. The sources are expected to continue at their present noise levels.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no-action alternative would not affect the noise levels in the project area.

2.4.11 AESTHETIC RESOURCES

EXISTING CONDITIONS

Gasparilla Island possesses visually pleasing attributes, including the waters and beaches of the Gulf of Mexico. The island is developed along the majority of its length.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The no-action alternative would reduce aesthetics due to loss of beach and natural habitat.

2.4.12 RECREATION RESOURCES

EXISTING CONDITIONS

Most areas along the shore are primarily developed for residential, resort, and tourist accommodation purposes. Development includes shops, motels, hotels, apartments, condominiums, and other service establishments catering, either directly or indirectly, to tourists visiting the area. The beaches of Gasparilla Island have public access and receive moderate use by swimmers and sunbathers. Gasparilla Island possess two public recreation areas: the State recreation area located near FDEP monument R17, approximately midway of the Gasparilla Island segment of the project, and the Gasparilla Island State Park located between R23 and R24. Divers and snorkelers utilize the natural and artificial reefs located offshore of the project.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Loss of beach due to erosion would result in less beach available for recreation along the project area.

2.4.13 CULTURAL RESOURCES AND HISTORIC PROPERTIES

EXISTING CONDITIONS

The Calusa Indians inhabited Gasparilla Island prior to European contact. Spanish records indicate that during the 1500s the Calusa lived in permanent villages on the island and relied primarily on marine resources. Like the Calusa, the first European settlers were predominantly fisherman. Spanish fisheries were located at Boca Grande Pass as early as 1765, and Spanish and Cuban fisherman established fish ranches on the island into the nineteenth century. The Boca Grande Lighthouse Station, located on the southeastern edge of the island, was constructed in 1890. This complex included the lighthouse, assistant keeper's house, the pilot's bachelor quarters, the quarantine doctor's house, and a few residential houses. The village of Boca Grande did not develop substantially until the turn of the twentieth century when the deep water Port of Gasparilla Island was utilized to ship phosphate from nearby mines.

As part of the previously-authorized Federal Project, the Gasparilla shoal borrow area and beach renourishment areas have been utilized and assessed for the presence of cultural resources. A review of the Florida Master Site File (FMSF) indicates that one historical district (the "Journey's End" group of five wood frame houses and a garage) and one historic structure (the Halsted and Emily Lindsley house) listed in the National Register of Historic Places (NRHP) are located within 100 feet of the sand placement area between FDEP Range Monuments R10.5 and R24.5. Additionally, 27 historic structures, 2 historic swimming pools, 1 historic gazebo, 1 historic rose garden, and 1 historic lighthouse are located adjacent to the sand placement area between R10.5 and R24.5. Of these 32 historic resources, only the Boca Grande Rear Range Lighthouse (colloquially known as the Gasparilla Lighthouse located at R-17) has been evaluated as potentially eligible for listing in the NRHP. Three historic structures including the Boca Grande Lighthouse, the Boca Grande Lighthouse Assistant Keeper's House, and the Amory Chapel, are

located just south of the beach placement area but would benefit from sand placement between R10.5 and R24.5. The Boca Grande Lighthouse (colloquially known as the Port Boca Grande Lighthouse Museum) is a house-dwelling lighthouse constructed in 1890. The lighthouse was listed in the NRHP in 1890 and is currently a museum, (Figure 2-24). The Assistant Keeper's house was also built in 1890 but has not been evaluated for listing in the NRHP. The Amory Chapel is a vacant concrete block structure dating from circa 1950 and has not been evaluated for listing in the NRHP. Based on previous consultation with the Florida State Historic Preservation Office (SHPO) in 2013, USACE determined that beach nourishment poses no effect to historic properties adjacent to the sand placement template and benefits historic structures by minimizing the potential of erosion (Appendix G).

Figure 2-24. Port Boca Grande Lighthouse Museum located on the southeastern edge of the island

USACE has undertaken three cultural resource investigations of the Gasparilla shoal borrow area. The first study was conducted by Mid-Atlantic Technology and Environmental Research in 1998. The study produced a report entitled; *Cultural Resource Remote Sensing Survey of Two Borrow Areas, Lee County Shore Protection Project, Lee County Florida*. This survey identified 14 potential targets for future consideration (Florida Division of Historical Resources [DHR] No. 991351). In 2000, a second cultural resources investigation of the Gasparilla borrow area was conducted for USACE by Mid-Atlantic

Technology and Environmental Research, wherein diver identification and evaluation of the 14 potentially significant targets identified in the 1998 survey was undertaken. The results of this investigation are detailed in the report, *Archaeological Diver Identification for Lee County the Shore Protection project, Lee County Florida* (DHR No. 997901). Based on this report, three targets (G-1, G-2/3 and G-5) were identified as shipwrecks. Target G-2/3 was recommended for avoidance and targets G1- and G-5 were determined to be ineligible for inclusion in the NRHP. However, upon USACE review of this report, it was determined that an error existed between the reported location of target G-5 in the original 1998 report and the 2000 study, therefore the determination of eligibility was invalid for target G-5.

An additional survey of the borrow area, not affiliated with the previously-authorized federal project, was performed by Dr. Cozzi in 2005 under a grant from the Florida DHR (Grant #SO553). Dr. Cozzi's study resulted in a reversal of the determination of eligibility for targets G-1 and G-5 as he recorded the sites as 8LL1602 and 8LL2033, respectively. Finally, due to the discrepancies between previous survey and the shift of eligibility status, USACE determined that a third cultural resources investigation of the borrow area was warranted to bring the study up to date, to clarify issues on location and eligibility, and to conduct a sub-bottom analysis to determine if any relic geologic features may be present. Panamerican Consultants, Inc. (PCI), detailed this survey in the 2013 report entitled; *Submerged Cultural Resources Remote Sensing and Diver Identification Survey of the Gasparilla Borrow Area, Lee County, Florida* (DHR No. 2013-03124). As a result of this survey, PCI identified 24 magnetic anomalies, 15 sonar contacts, and 3 sub-bottom features. An underwater diver evaluation of two potentially significant magnetic anomalies, M09 and M10, targets G-1 (8LL1602), G-2/3 (8LL1603), and the reported locations of G-5 (8LL2033) was also conducted. PCI determined that sites 8LL1602 and 8LL2033 were destroyed, site 8LL1603 was found not to be associated with a historic vessel, and the two magnetic anomalies, M09 and M10, did not consist of cultural material; therefore, these resources have been determined ineligible for listing in the NRHP. As a result of the sub-bottom analysis, PCI identified a cluster of three sub-bottom features that may represent a back-bay channel with estuarine sediments. As such, this area contains a high potential for significant cultural resources and avoidance of the feature with a 600-foot buffer was recommended. Figure 2-25 and Figure 2-26 show the location of the Gasparilla Island sand source and the cultural resources avoidance buffer within the Gasparilla borrow area, respectively. Based on this analysis of the Gasparilla Island Florida Shore Protection Project and contingent on maintaining a 600-foot buffer on the sub-bottom feature cluster, USACE determined that the project posed no effect to historic properties prior to the last dredging event in 2013. The SHPO concurred with the determination in a letter to USACE dated August 14, 2013 (DHR File No. 2013-03124) (Pertinent Correspondence Appendix (H)).

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The Future Without-Project Conditions of cultural resource are similar to the existing conditions described above. The no-action alternative would have no effect on cultural resources within the Gasparilla shoal borrow area. The Future Without-Project Conditions would continue to erode Gasparilla Island. Numerous historic structures, one NRHP listed historical district, and two NRHP listed structures, including the Boca Grande Lighthouse (colloquially known as the Port Boca Grande Lighthouse Museum), may be

subject to erosion without the beach renourishment of Gasparilla Island. The no-action alternative may potentially jeopardize these NRHP listed structures.

Figure 2-25. Location of the Gasparilla Island Sand Source (Borrow area).

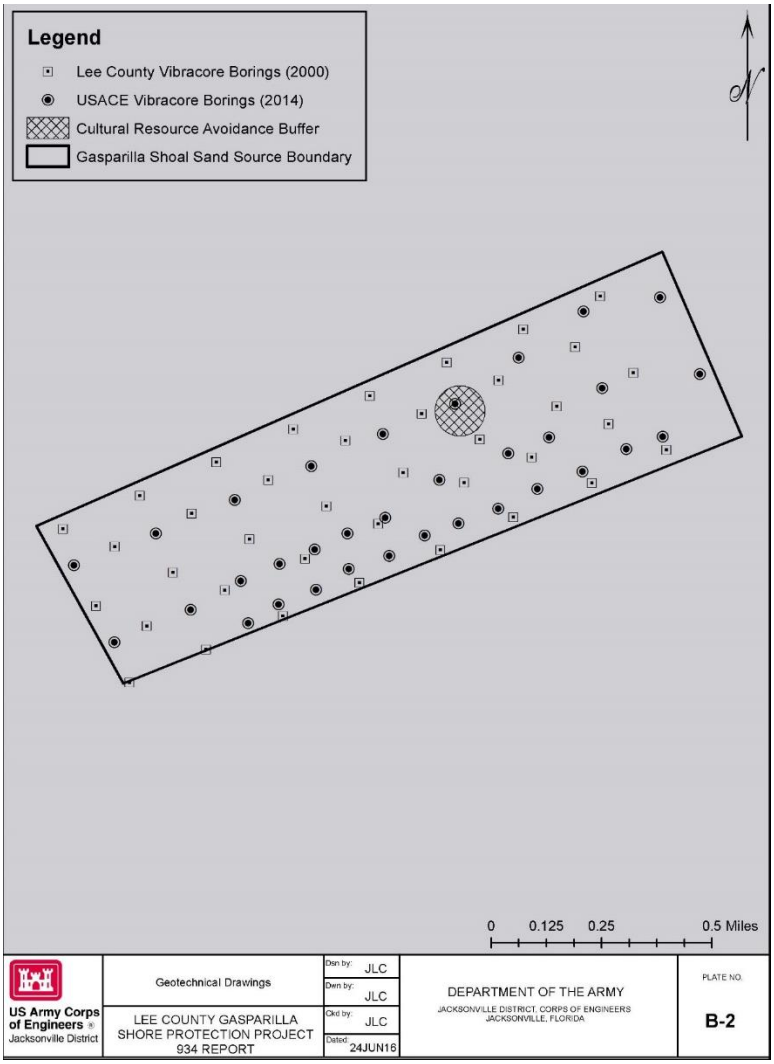


Figure 2-26. Location of the cultural resources avoidance buffer within the Gasparilla Island sand source

2.4.14 NATIVE AMERICANS

EXISTING CONDITIONS

No portion of the proposed project area exists within, or adjacent to, known Native American-owned lands, reservation lands, or Traditional Cultural Properties. However, Native American groups have lived throughout the region in the past and their descendants continue to live within the State of Florida and throughout the United States. Pursuant to Section 106 of the National Historic Preservation Act (NHPA) (54 U.S.C. 306108) obligations regarding USACE Trust Responsibilities to federally-recognized Native American Tribes, and in consideration of the Burial Resources Agreement between USACE and the Seminole Tribe of Florida, prior consultation on the project has not indicated any historic use of the project area. The Seminole Tribe of Florida has previously indicated no objection to dredging and sand placement of the previously-authorized federal project (Pertinent Correspondence Appendix (H)).

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The Future Without-Project conditions of Native American groups are similar to the existing conditions described above. The no-action alternative would have no effect on Native American groups.

2.5 ECONOMIC ENVIRONMENT

EXISTING CONDITIONS

The project area provides extensive opportunities for local recreational activity, vacation, eco-tourism, and seasonal residency, in addition to full-time residency. These activities generate a significant portion of the local economy. Information on the existing economic conditions along the Gasparilla Island segment, Lee County study area coastline was collected for economic modeling purposes using Beach-*fx*. The information on the coastal assets detailed in this section was collected from mapping resources, site visits, and contractors.

2.5.1 BEACH-FX ECONOMIC MODELING APPROACH

Beach-*fx* is an event-driven life-cycle model that estimates damages and associated costs over a 50 year period of analysis based on storm probabilities, tidal cycle, tidal phase, beach morphology and many other factors (Rogers et al., 2009). Damages or losses to developed shorelines include buildings, pools, patios, parking lots, roads, utilities, seawalls, revetments, bulkheads, replacement of lost backfill, etc. Beach-*fx* also provides the capability to estimate the costs of certain future measures undertaken by state and local organizations to protect coastal assets.

2.5.1.1 MODEL REACHES

As mentioned in section 2.2.1, the authorized project represents the study reach; thus, model reaches are the broadest spatial category in this study. For Gasparilla Island segment, the project area consists of a single study reach divided into 14 model reaches. The model reach is a particularly important designation because Beach-*fx* outputs (damages) are reported by reach. The model reaches give the results a spatial distribution. Each model reach is associated with a representative beach profile that describes the cross-shore profile of the reach. While an effort is made to designate model reaches to include a single DNR monument (FDEP R-monument) from which historical survey data can be used to establish a representative profile for that reach, the positioning of the monument within each reach and the length of each reach are variable. In this study, the model reach numbers increase in a southern direction. The most northerly reach is LG-11, the most southerly reach is LG-24. Analysis of additional model reaches beyond the current authorized project extent is beyond the scope of a Section 934 study. The model reach nomenclature has been retained from the engineering analysis, based in part of the FDEP R-monuments. Table A-12 of the Engineering Appendix (A) provides model reach identifiers as well as the FDEP R-monument that falls within the borders of each model reach. Figure 2-27 presents an aerial view of the model reaches (blue color areas).

Figure 2-27. Aerial View of Model Reaches

2.5.1.2 DAMAGE ELEMENTS

A Damage Element (DE) represents any structure where damages can be incurred. This could be a house, commercial property, deck, pool, walkover structure, etc. The Gasparilla Study Area has 282 individual damage elements, including 74 single family residential structures, 72 multifamily structures, 5 commercial/public structures, and numerous other structures including roads, dune walks, gazebos, parking lots, pools, and tennis courts. The public/commercial category includes some unique structures, such as Johann Fust Community Library and the Boca Grande Rear Range Lighthouse (colloquially known as the Gasparilla Lighthouse).

The geospatial location, and footprint of the damage elements, was verified using aerial photography in ArcMap. Real Estate professionals from the USACE Jacksonville district (SAJ) provided updated depreciated replacement costs for all of the damage elements in the summer of 2014. An uncertainty of +/- 12.5% was assigned to these costs based on the real estate assessment, which concluded that 12.5%

represents a reasonable range of uncertainty around the depreciated replacement values. The value of contents was assumed to be 50% of the structure value. Non-habitable structures (e.g., dune walks, bathhouses, pools, etc.) had zero contents value.

2.5.2 STRUCTURE INVENTORY AND CONTENTS VALUES

The economic value of the existing structure inventory represents the depreciated replacement costs of damageable structures, and their associated contents, within the authorized project, which represents the study reach. The damage element inventory includes 282 damageable structures with an overall estimated value of $222 million, not including existing coastal armor such as seawalls and revetments. The structure and content valuations are $151 million and $71 million respectively. Table 2-10 provides the distribution of structure and content values broken down by model reach.

Table 2-10: Structure Distribution by Model Reach

Model Reach	# of Structures	Structure Value	Contents Value	Total Value
LG-11	14	$7,604,452	$3,509,786	$11,114,238
LG-12	43	$28,115,844	$13,459,783	$41,575,627
LG-13	17	$12,192,404	$5,691,846	$17,884,250
LG-14	12	$5,951,985	$2,776,077	$8,728,062
LG-15	38	$27,597,011	$13,554,186	$41,151,197
LG-16	21	$9,480,154	$4,411,235	$13,891,389
LG-17	19	$3,386,736	$1,286,400	$4,673,136
LG-18	7	$1,222,912	$500,000	$1,722,912
LG-19	22	$17,145,106	$8,270,314	$25,415,420
LG-20	25	$6,311,080	$2,744,496	$9,055,576
LG-21	49	$26,876,582	$12,981,250	$39,857,832
LG-22	7	$3,958,564	$1,849,490	$5,808,054
LG-23	5	$706,428	$0	$706,428
LG-24	3	$479,856	$0	$479,856
Total	**282**	**$151,029,114**	**$71,034,863**	**$222,063,977**

*Individual road damage elements are delineated based on the lots; to avoid excessive length each road damage element longer than 600 feet was divided into two elements.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

2.5.3 BEACH-FX MODEL SET-UP

The Economic Appendix (C) and Engineering Appendix (A) provide a complete description of the Beach-*fx* model set-up and use. Data on historic storms, beach survey profiles, and private, commercial, and public structures within the project area is used as input to the Beach-*fx* model. The model is then used to estimate future damages resulting from hurricanes and coastal storms.

The Future Without-Project damages are used as the base condition against which potential alternatives will be compared. The difference between with and without-project damages is used to determine project benefits.

2.5.4 BEACH-FX MODEL ASSUMPTIONS

The base year for the present study is 2016. In order to determine the condition of the project shoreline at the base year, the most eroded pre-project shoreline was adopted from all reliable historical pre-project surveys. Reviewing historical MHW positions and aerial photographs indicated that the 2006 survey, taken prior to the original project placement, provided the most eroded pre-project shoreline. Additional information can be found in the Engineering Appendix (A). Figure 2-28 shows FWOP Shoreline Beach-*fx* analysis assumptions.

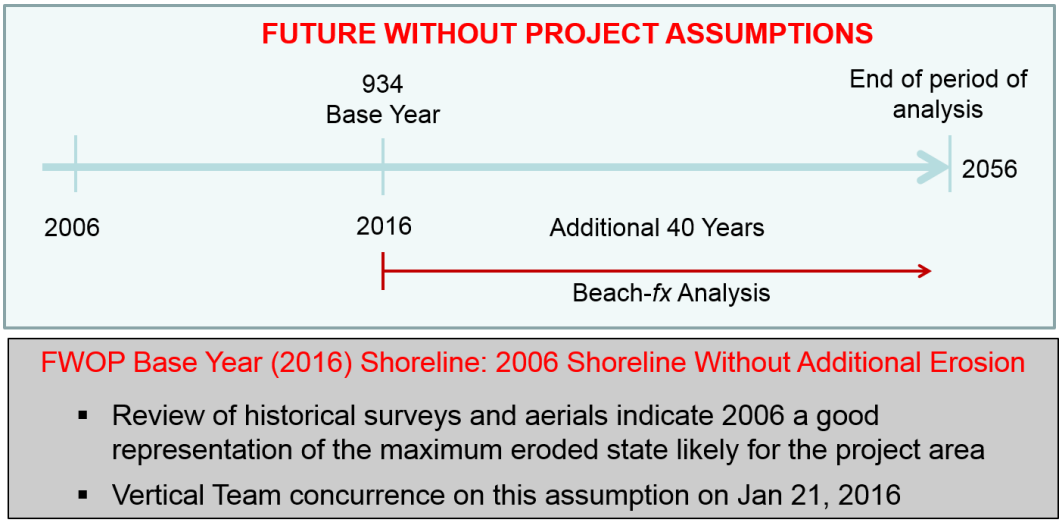


Figure 2-28. FWOP Shoreline Beach-*fx* Analysis Assumptions

- **Start Year:** The year in which the simulation begins is 2015
- **Base Year**: The base year for the present study is 2016 - (2006 Survey, Pre-project)
- **Period of Analysis**: 40 years (2016 to 2056)
- **Discount rate:** The initial assessment of FWOP damages was computed at the FY16 discount rate (3.125%). The alternative screening was updated to the FY17 discount rate (2.875%). Though plan screening was completed at 2.875%, the AAEQ costs and benefits of the Recommended Plan were recomputed at the FY18 discount rate of 2.75% in accordance with the expected Final Report signing date.
- **Planned Nourishment:** As this is the FWOP condition, no planned or periodic nourishments were assumed.
- **Emergency Nourishment:** The size, extent, and timing of locally sponsored "emergency" and "maintenance" fills is too variable to be incorporated into the project analysis. The timing of such fills makes it impossible to say with certainty that such fills will continue in the future, with or without a federal project in place. Additionally the uncertainty in timing as well as in volume and placement location makes it impossible to include in the Beach-*fx* model. For these reasons, emergency/maintenance fills were not included in the analysis, more information can be found in Section 6.5.1 of the Engineering Appendix.

Additional FWOP Economic model assumptions are presented in Section 3.1 of the Economic Appendix (C).

2.5.5 BEACH-FX FUTURE WITHOUT-PROJECT DAMAGE RESULTS

Future without-project (FWOP) damages across the study area range between $28.6 and $407.4 million in present value dollars.

- Structure Damage: Economic losses resulting from the structures situated along the coastline being exposed to wave attack, inundation, and erosion damages. Structure damages account for approximately 62% of the total FWOP damages.
- Contents Damage: The material items housed within the aforementioned structures (usually air conditioned and enclosed) that are potentially subject to damage. Content damages make up approximately 29% of the total FWOP damages.
- Coastal Armor Cost: Beach-*fx* provides the capability to estimate the costs incurred from measures likely to be taken to protect coastal assets and/or prevent erosion in the study area. Based on the existence of coastal armor units throughout the study area, Beach-*fx* was used to estimate the costs of erecting such measures throughout the period of analysis. Armor costs account for approximately 9% of the total FWOP damages.

A breakdown of the type of damage is provided in Table 2-11, and a summary of structure and content damages (by damage element type) including armor is provided in Table 2-12. The two largest categories of damage, by far, are single family homes (54.02%) and multi-family residences (26.38%). Armor damage is about $16 million in present value damage, accounts for approximately 9% of the total FWOP damages.

Table 2-11: Present Value Damages by Category

Category	Present Value Damage (FY16 3.125%)	% of total damage
Structure	$114,942,487	62%
Contents	$53,309,231	29%
Armor	$16,412,795	9%
TOTAL	**$184,664,513**	**100%**

Table 2-12: Present Value Structure and Content Damages by Damage Element Type (including armor) Computed at FY16 (3.125%)

Type	Description	PV Structure Damage	PV Content Damage	PV Total Damage	% of total damage
COMM	Commercial /Public	$1,796,070	$664,510	$2,460,580	1.33%
GARAGE	Garage	$571,276	$27,856	$599,131	0.32%
GAZEBO	Gazebo or pavilion	$570,117	$0	$570,117	0.31%
LIGHTHOUSE	Gasparilla Lighthouse	$595,404	$287,786	$883,190	0.48%
MFR1	Multi-family, one story	$6,294,717	$3,147,358	$9,442,075	5.11%
MFR2	Multi-family, two story	$33,631,986	$15,085,475	$48,717,462	26.38%
MFR3	Multi-family, three story	$280,699	$140,350	$421,049	0.23%
PARKING	Parking Lot	$245,523	$0	$245,523	0.13%
POOL	Pool	$321,114	$0	$321,114	0.17%
ROAD	Road	$4,661,364	$0	$4,661,364	2.52%
SFR1	Single Family Home	$65,790,960	$33,955,897	$99,746,857	54.02%
TENNIS	Tennis court	$105,343	$0	$105,343	0.06%
WALK	Dune walk	$77,915	$0	$77,915	0.04%
ARMOR	Armor Cost			$16,412,795	8.89%
Grand Total		**$114,942,488**	**$53,309,232**	**$184,664,515**	**100.00%**

*Damages computed at FY16 (3.125%)

2.5.5.1 SPATIAL DISTRIBUTION OF DAMAGES

The model reach with the largest proportion of total damage was LG12; $31.5 million in Present Value (PV) damages. Other model reaches with relatively high damages were LG15, $28.1 million, LG19, $29.1 million, and LG21, $26.9 million. The model reaches with the least damage were LG-23 and LG-24 (about $1.4 million and $0 in present value damages, respectively); that is expected, because both reaches have a large undeveloped lot and very few damageable structures. Model Reach LG-23 has one public park and a few roads. Model reach LG-24 has no damageable structures, except for roads. A spatial summary of the Gasparilla FWOP damages by model reach is presented in Table 2-13; Figure 2-29 illustrates the spatial distribution of existing structure value, and FWOP damages by model reach.

Table 2-13: Present Value of Damages by Model Reach (FY16 3.125%)

Model Reach	Present Value Structure Damage	Present Value Contents Damage	Armor Damage	Present Value Total Damage
LG-11	$6,393,591	$3,062,717	$346,144	$9,802,452
LG-12	$20,863,242	$9,863,246	$753,527	$31,480,014
LG-13	$8,823,770	$4,343,363	$280,356	$13,447,488
LG-14	$6,351,933	$1,653,309	$11,802	$8,017,044
LG-15	$18,475,034	$9,597,404	$13,427	$28,085,865
LG-16	$9,399,663	$4,322,441	$1,533,215	$15,255,319
LG-17	$2,038,099	$568,581	$2,679,299	$5,285,980
LG-18	$693,835	$218,796	$0	$912,631
LG-19	$17,857,701	$8,686,121	$2,639,845	$29,183,667
LG-20	$5,458,016	$2,375,003	$3,512,945	$11,345,965
LG-21	$15,521,523	$7,495,285	$3,946,533	$26,963,341
LG-22	$2,393,841	$1,122,965	$609,194	$4,126,001
LG-23	$401,915	$0	$86,508	$488,423
LG-24	$270,324	$0	$0	$270,324
Total	**$114,942,487**	**$53,309,231**	**$16,412,795**	**$184,664,514**

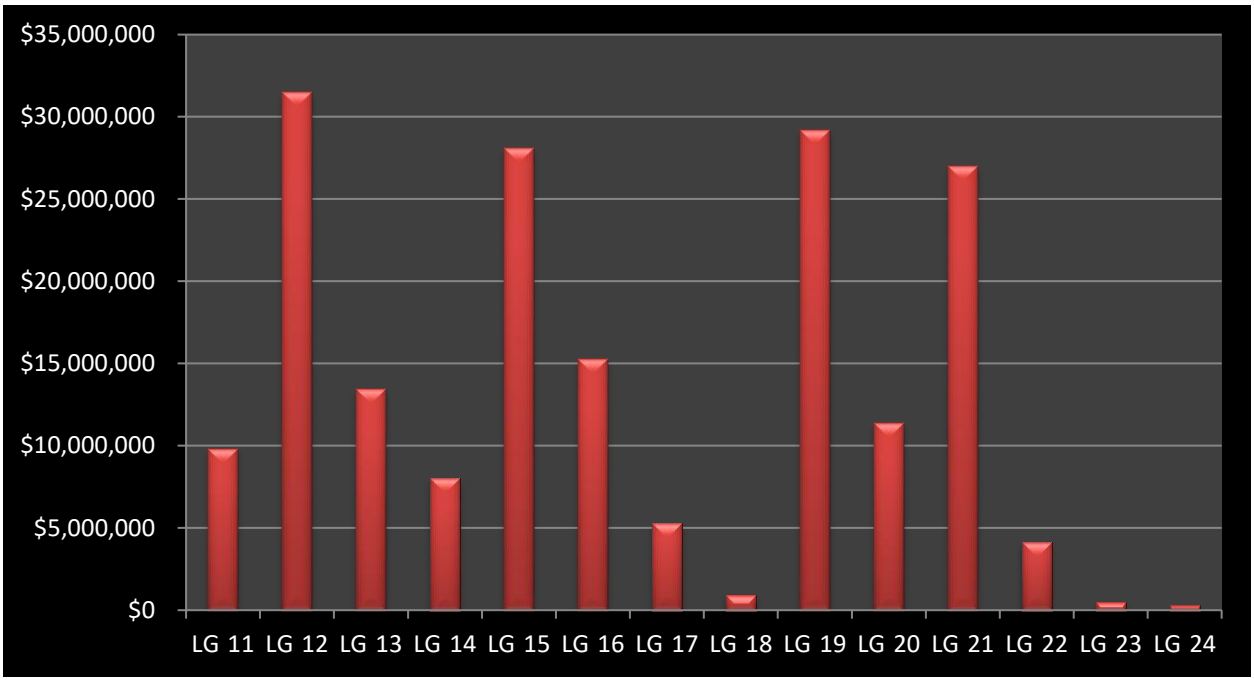


Figure 2-29. Gasparilla FWOP – Spatial Distribution of Damages by Model Reach

2.5.5.2 TEMPORAL DISTRIBUTION OF DAMAGES

The temporal distribution of damages is fairly consistent. There is some variation throughout the life cycle of the simulation, but no dramatic spikes or troughs in the damages. Over time, the damages tend to decrease because new armor construction is triggered on unarmored lots. Once a lot has armor, it is less vulnerable to damage. The armor cost for new armor is reported in the model outputs based on the simulation year in which the model is built.

The distribution of non-present value damages is summarized in Figure 2-30. It should be noted that the Beach-*fx* simulation begins in 2015, but the base year for the study is 2016.

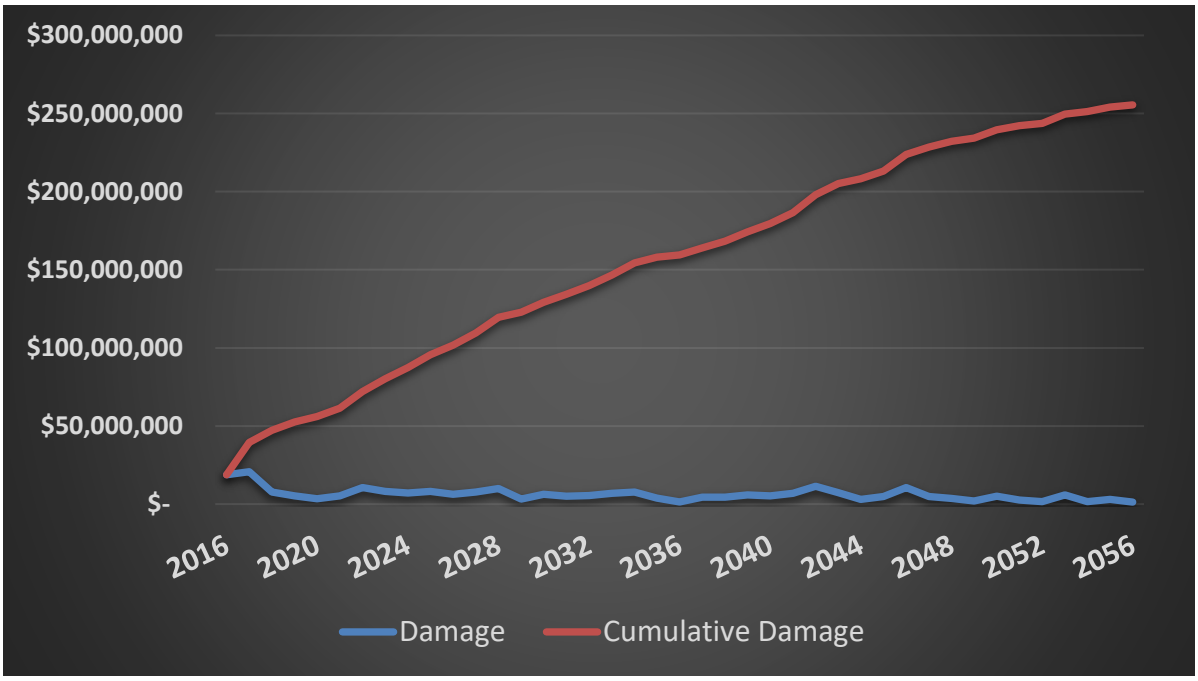


Figure 2-30. Gasparilla FWOP – Non-Present Value Damages over time

2.5.5.3 FWOP DAMAGES BY DAMAGE DRIVING PARAMETER

Within the Beach-*fx* model environment, damage to structures and contents can be caused by three different damage driving parameters: flooding (inundation), wave attack, and erosion. The results of damage to structures and contents are broken out by parameter in Table 2-14. Typically, in Florida, the vast majority of damage is caused by erosion. Gasparilla is somewhat unique in that only 7% of the total damage is caused by erosion. This is largely because the coastline of the study area is heavily armored. Armor in Beach-*fx* prevents erosion damage. Erosion damage can still occur *after* armor fails, but the extent of existing armor drastically reduces the total proportion of erosion damage. However, within Beach-*fx*, armor does not have any effect on wave or inundation damage. Gasparilla is unique; the combination of heavy armor and relatively low dunes makes the coastal inventory particularly susceptible to wave and inundation damage, as was previously discussed in section 2.2.11.

Table 2-14: Present Value of Damages by Damage Driving Parameter

Damage Driver	Present Value Damage	% of Total
Flood (Inundation) Damage	$53,885,394	32%
Wave Damage	$102,150,396	61%
Erosion Damage	$12,215,927	7%
Total	**$168,251,718**	**100%**

2.5.5.4 FWOP DAMAGES IN ALTERNATIVE SEA LEVEL RISE (SLR) SCENARIOS

The FWOP condition was modeled for three sea level rise (SLR) scenarios. ER 1165-2-211 provides both a methodology and a procedure for determining a range of sea level rise estimates based on the local historic sea level rise rate, the construction (base) year of the project, and the design life of the project. The Beach-*fx* results presented above refer to the baseline scenario, which is based on the historic erosion rate. The results associated with the other two SLR scenarios are presented in Table 2-15.

Table 2-15: Simulated FWOP damages in the Sea Level Rise scenarios

	SLR1 (Baseline)	SLR2 (Intermediate)	SLR3 (High)
Structure Damage	$114,942,487	$117,123,720	$121,536,574
Content Damage	$53,309,231	$54,306,088	$56,269,049
Armor Damage	$16,412,795	$16,304,026	$15,617,246
Total Present Value Damage	**$184,664,513**	**$187,733,834**	**$193,422,868**

*Damages computed at FY16 (3.125%)

Damage in the high scenario, SLR3, is only about 5% greater than in the baseline scenario. This result is probably due to the high degree of armoring in the existing condition, as well as the classification of unarmored lots as "armorable in the future." Within Beach-*fx*, coastal armor will prevent the higher erosion damages that are typically associated with accelerated SLR scenarios.

2.5.5.5 FUTURE WITHOUT PROJECT CONDITION CONCLUSION

The Future Without-Project condition simulated here suggests that the study area may be subject to considerable storm damage throughout the period of analysis. In particular, there are five important conclusions:

- Most of the FWOP damage is attributable to direct damage to structures, though content and armor damage are also significant.
- The damages vary considerably over space; different reaches have significantly different types and magnitudes of damage.
- The damages are fairly consistent over time.
- Unlike some coastal areas in Florida, most the damage is not caused by erosion. Due to the combination of heavy armoring throughout much of the study area, and low elevation dunes, most of the damage is caused by inundation and wave attack.
- Damages increase slightly in the accelerated Sea Level Rise scenarios.

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3 PLAN FORMULATION

3.1 PLAN FORMULATION RATIONALE

> *"Four accounts are established in the Principles and Guidelines (P&G 1983) to facilitate the evaluation of management measures and display the effects of alternative plans. The National Economic Development (NED) account displays the plan with the greatest net economic benefit consistent with protecting the nation's environment; the Environmental Quality (EQ) account displays non-monetary effects on ecological, cultural, and aesthetic resources including the positive and adverse effects of alternative plans; the Regional Economic Development (RED) account displays changes in the distribution of regional economic activity (e.g., income and employment); and the Other Social Effects (OSE) account displays plan effects on social aspects such as community impacts, health and safety, displacement, energy conservation, and others. The Federal Principles and Guidelines require that for Coastal Storm Risk Management (CSRM) projects, the NED plan is to be the selected plan unless an exception is granted. The NED plan must also be evaluated in consideration of the Principles and Guidelines criteria of completeness, effectiveness, efficiency, and acceptability".*

Since this is a Section 934 study, the project has been already authorized and constructed. The preliminary plans were formulated by combining management measures in the Lee County, General Reevaluation Report (2000 GRR), and the recommended plan became the authorized project. Also, the planning objectives and constrains chapter on the 2000 GRR describes the guidance provided by the "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" (USWRC, 1983). Therefore, as was described previously in this report, Chapter 1 Introduction, plan formulation was performed based on USACE Guidance for a Section 934 report, ER 1105-2-100 and Policy Guidance Letter (PGL) No. 22.

3.2 SCOPING

According to PGL No. 22, environmental documentation for Section 934 studies should verify the impacts presented in the original project environmental documentation, address the environmental implications of any unanticipated or unforeseen impacts, and address project impacts relative to any changed conditions or requirements. One should coordinate the environmental documentation with the appropriate city, county, state, and Federal agencies.

A public scoping letter was sent on August 29, 2016, which outlined the USACE, Jacksonville District's intent to gather information to prepare an Environmental Assessment (EA), which will update the original Supplemental Environmental Impact Statement prepared for this project in the 2000 GRR. This EA compiles information from a variety of sources, including other National Environmental Policy Act (NEPA) documents prepared for this project and other similar projects in the region, Lee County monitoring reports, and Biological Opinions. Information was obtained from a literature search and coordination with Federal, state, and local resource agencies having expertise in certain areas. The draft EA and draft Finding

of No Significant Impact (FONSI) were made available to the public for a 45-day public comment period from November 22, 2016 to January 6, 2017. Pertinent correspondence associated with this NEPA scoping process is included in Appendix H.

3.3 PROBLEMS AND OPPORTUNITIES

A problem is an existing undesirable condition to be changed. An opportunity is a chance to create a future condition that is desirable. The difference between problems and opportunities is often indistinct, but in both cases a changed future condition is preferred. The purpose of this study is to determine if Federal participation in periodic renourishments is economically justified; therefore, to improve the future condition and to address specific problems and opportunities in the study area. Problems and opportunities to be addressed were identified in several ways. The study team reviewed previous studies by USACE, as well as scoping letter comments received from local residents and stakeholders, to identify current coastal risk related problems affecting the study area.

3.3.1 PROBLEMS

Problems within the Gasparilla Island study area include:

1. Storm damages to property and infrastructure due to wave attack, inundation, and erosion
2. Loss of dune and beach habitat
3. Loss of recreational opportunities

Storm damage to properties in the county has been a problem for a number of years. Major property damages result from severe storms, which occasionally sweep across the gulf and cause significant damage. The natural littoral process only partially restores the eroded beaches during favorable weather conditions. Loss of protective beaches and dunes due to shoreline recession threatens infrastructure. Homeowners seeking to protect their property have constructed some shore protection measures, such as seawalls and revetments. These structures limit or eliminate the natural interaction where dunes feed sand to the eroded beach during storm events. Limiting this natural protective function makes infrastructure and the environment adjacent to protected properties more susceptible to storm damages. Additional problems include loss of recreational resources and habitat.

3.3.2 OPPORTUNITIES

Gasparilla project's main opportunity is related to infrastructure protection:

1. Reduce damages to infrastructure: Future without project damages (modeled in Beach-*fx*) estimated at $192,408,000 in present value dollars ($7,991,000 in average annual dollars) (FY18 discount rate of 2.75%)

Incidental opportunities for the Gasparilla project are as follows:

2. Protect/enhance habitat/environmental resources: High-density turtle and shore bird nesting areas; near shore hard bottoms
3. Retain recreation: Area depends on tourism, as well as aesthetic quality for community

3.4 CONSTRAINTS AND OBJECTIVES

3.4.1 CONSTRAINTS

Based on the 2000 General Reevaluation Report, the original constraints of this project included the minimization of impacts to nearshore hard bottoms. After initial construction in 2007, the impacted hard bottoms were mitigated (0.9 acres) and approved by FDEP. Extending Federal participation in future renourishments won't require additional mitigation if the recommended plan includes no expansion or increase in volume that would impact hardground outside of the currently authorize project's equilibrium toe of fill.

Current Constraints:

1. Any future beach nourishment activities will not impact any nearshore hard bottom
2. Study analysis should comply with ER 1105-2-100 Appendix E, Section IV E-24 g. (2)(b)
3. Avoid conflict with state and Federal regulations, as stated in Federal law, USACE regulations, and Executive Orders

3.4.2 OBJECTIVES

3.4.2.1 FEDERAL OBJECTIVES

The Federal objective, as stated in The Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, established by the U.S. Water Resources Council on March 10, 1983 (P&G), is to contribute to national economic development (NED), consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Contributions to NED are increases in the net value of the national output of goods and services, as expressed in monetary units. Contributions to NED are the direct net economic benefits that accrue in the study area and the rest of the nation. The three basic criteria used in the planning process are: (1) the project must be economically justified and environmentally acceptable, (2) Federal participation is warranted, and (3) the project must meet current Administration budget priorities.

3.4.2.2 PLANNING OBJECTIVES

The overarching goal of this study is to formulate an optimization of the authorized project described in the 2000 GRR to determine if continued Federal participation in periodic beach nourishment within the study area is warranted and economically justified up to 2056. Specific study objectives have been developed to provide a means of determining whether the optimization of the authorized project is capable of solving the study area's problems while taking advantage of the opportunities identified and avoiding the constraints. The planning objectives in the Gasparilla Island study area for the 40-year period of analysis from 2016 to 2056 are:

1. Manage the risk of damages from erosion, flooding caused by storm surge, and wave attack due to coastal storms that impact Gasparilla Island over a 40-year planning horizon (2016 – 2056)
2. Maintain environmental quality in the project area, for human and natural use sea turtle habitat and aesthetics over a 40-year planning horizon (2016 – 2056)
3. Maintain recreational use of beach over a 40-year planning horizon (2016 – 2056); the area depends on heavily on tourism, as well as its aesthetic quality for the local community.

3.4.2.3 FEDERAL ENVIRONMENTAL OBJECTIVES

USACE strives to balance the environmental and developmental needs of the nation in full compliance with the National Environmental Policy Act (NEPA) and other authorities provided by Congress and the Executive Branch. Public participation is encouraged early in the planning process to define environmental problems and to elicit public expression of needs and expectations. Significant environmental resources and values that would likely be impacted, favorably as well as adversely, by an alternative under consideration are identified early in the planning process. All plans are formulated to avoid, to the fullest extent practicable, any adverse impact on significant resources. Significant adverse impacts that cannot be avoided are mitigated as required by Section 906(d) of WRDA 1986.

3.4.2.3.1 ENVIRONMENTAL OPERATING PRINCIPLES

Consistent with NEPA, USACE has reaffirmed its commitment to the environment by formalizing a set of "Environmental Operating Principles" applicable to all its decision making and programs. These principles foster unity of purpose regarding environmental issues and ensure that conservation, environmental preservation, and restoration are considered in all USACE activities. Section 6.6 includes a discussion of USACE Environmental Operating Principles and how the study addresses them.

3.4.2.3.2 CAMPAIGN PLAN OF THE U.S. ARMY CORPS OF ENGINEERS (USACE)

The USACE Campaign Plan goals and objectives are derived, in part, from the Commander's intent, the Army Campaign Plan, and the Office of Management and Budget. The four goals, and their associated objectives, also build on prior strategic planning efforts. Each goal and objective is led by a USACE senior leader who manages and oversees actions to reach the goal and objectives.

The successful achievement of the goals and objectives contained in the Campaign Plan are dependent on actions implemented by the entire USACE team. The implementing actions supporting each goal and objective are contained in the headquarters staff and Major Subordinate Command (MSC) implementation guidance for the Campaign Plan. The four goals of the Campaign Plan are:

Goal 1: Deliver innovative, resilient, and sustainable solutions to the Department of Defense (DoD) and the nation.

Goal 2: Deliver enduring and essential water resource solutions, utilizing effective transformation strategies.

Goal 3: Deliver support that responds to, recovers from, and mitigates disaster impacts to the nation.

Goal 4: Build resilient People, Teams, Systems, and Processes to sustain a diverse culture of collaboration, innovation, and participation to shape and deliver strategic solutions.

These Campaign Plan goals and associated objectives will be addressed through the course of this study.

3.5 OPTIMIZATION OF THE AUTHORIZED PROJECT

The purpose of the Section 934 Report is to investigate and evaluate the feasibility of extending the period of Federal participation in periodic renourishments for the authorized project to a full 50 years. Unlike a regular feasibility study, a full suite of potential alternatives has not been considered. However, planning guidance does have a provision to recommend the most cost-effective nourishment scheme for the authorized Federal project, including a modification of the renourishment interval and advance fill to make it more efficient. Policy Guidance Letter (PGL) Number 22 c., states that:

> *As the basic decision is to determine if continued Federal participation in the authorized project is justified given current conditions of development and current budgetary priorities, the without project beach profile should approximate pre-project conditions (i.e. conditions that existed just prior to initial project construction). The following two step process is required:*
>
> > *(1) identify (update, no indexing) current benefits of the existing project to determine if continued maintenance of the existing project is economically justified and consistent with current policies; and (2) develop alternatives (size & timing) for nourishment and recommend the most cost-effective nourishment scheme for the authorized project.*

3.5.1 FUTURE WITH PROJECT MODELING IN BEACH-FX

In a Section 934 study the Future Without-Project (FWOP) shoreline and the Future With-Project (FWP) shoreline represent two unrelated sets of physical characteristics. The Future Without-Project (FWOP) shoreline is the projected shoreline at the project base year assuming that no Federal project was ever constructed, as was described in Section 2.5.4. The Future With-Project (FWP) shoreline is the projected shoreline at the project base year assuming that the Federal project was constructed and maintained as authorized. Therefore, the Future Without-Project (FWOP) and Future With-Project (FWP) are represented by two separate sets of representative profiles.

The base year of the FWP portion of the analysis is 2016, and the condition of the project shoreline must reflect expected 2016 shoreline dimensions. In 2013 the project was renourished. Because the 2013 post-fill surveys showed that the fill dimensions varied from the authorized construction template, it was determined that the post-fill shoreline could not be used as the basis for a 2016 FWP shoreline representative of the authorized project. Instead, the authorized General Reevaluation Report (GRR) construction template was assigned as the "2013 shoreline". The FWP 2016 shoreline was then developed by applying three years of erosion to this template. See Figure 3-1 for a summary of the FWOP Shoreline Beach-*fx* analysis assumptions. Figure 3-2 shows a generalized cross section view of the project, including

the relative shoreline position of the (GRR) design template, the (GRR) construction template, and the 2016 shoreline position based on the GRR construction template after three years of erosion.

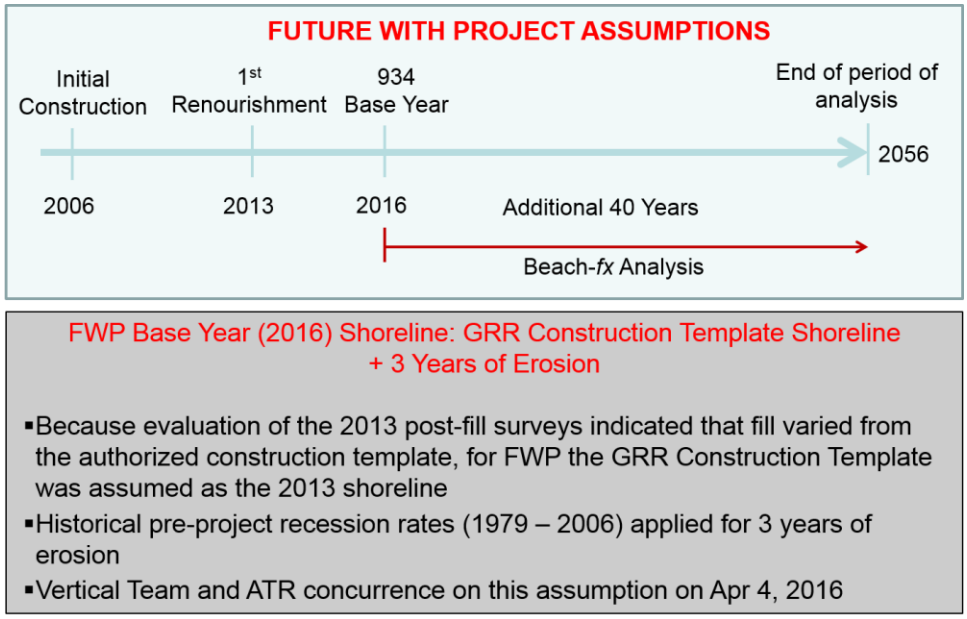


Figure 3-1. FWP Shoreline Beach-*fx* Analysis Assumptions

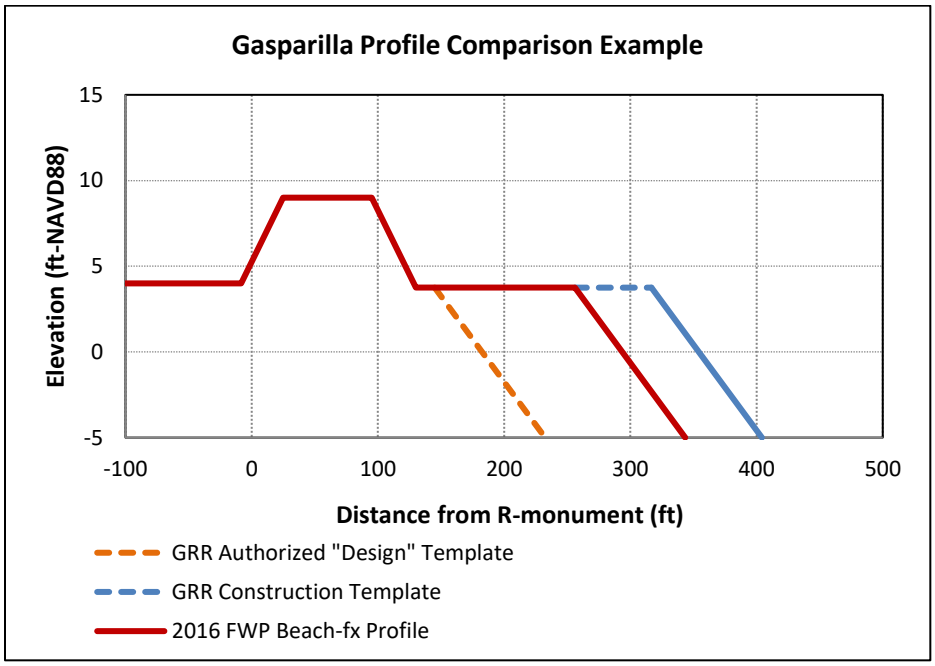


Figure 3-2. Gasparilla Project Profile Comparison

In accordance with Policy Guidance Letter (PGL) Number 22 (c) guidance, Step 1, the Future With-Project (FWP) analysis consists primarily of determining if the authorized project is still economically justified. For Gasparilla Island project, the Beach-*fx* renourishment template must reflect the existing federally

authorized design template, as well as the sacrificial volume that is traditionally referred to as "Advance/Sacrificial Fill". According to the original authorization, the design template is defined as a 20 foot extension of the project baseline (2000 GRR project baseline), roughly the 1995 MHW line, at +5 ft.-MLW (3.75 ft-NAVD88); the authorized renourishment interval was determined to be 7 years and the volume of this advanced and return interval nourishment was calculated to be 542,000 cubic yards. This volume is approximately equivalent to the "60'" nourishment Beach-*fx* template. Table A-21 of the Engineering Appendix (A) provides the authorized berm dimensions (20 foot seaward of the project baseline) as well as the total renourishment template berm dimensions for a number of "advance fill" alternatives. Therefore, under guidance of PGL No. 22 (c) step 1 is required to determine if the authorized design template (20 foot extension of the project baseline) plus the "advance fill" volume currently being placed (equivalent of the 60' advance berm) remains economically justified.

To satisfice Step 2 of Policy Guidance Letter (PGL) Number 22 (c) an optimization of the authorized project was performed developing a total of eight alternatives, related to the advance berm sizes and timing from 20 to 100 feet. This range of alternatives of different advance berm widths were simulated in Beach-*fx*; the nourishment template included a single design berm option (20 foot extension of the project baseline) and a variable sacrificial berm. In order to screen these alternatives prior to Beach-*fx* modeling, rough order of magnitude (ROM) cost estimates were developed for each of the alternatives. The ROM cost estimates were developed using information from similar historical projects; it should be noted that the ROM costs only include mobilization and placement cost estimates. Once the project is optimized in Beach-*fx*, a refined cost estimate can be developed. Of these alternatives, the 60 foot advance berm alternative is the most similar to the existing authorized project. Results show that this alternative generates $909,465 of AAEQ Net Benefits and a benefit-to-cost radio higher than 1.0 based on ROM cost, see Table 3-1. The analysis of this alternative satisfies Step 1 from the PGL Number 22 (c) guidance.

To satisfy Step 2 from PGL Number 22 (c) guidance, Table 3-1 presents alternative size (berm width) and timing (Avg. Renourishment Interval in Years) in order to identify the most cost effective nourishment scheme for the authorized project. As shown in Table 3-1, the 60 foot advance fill berm is the version of the project that maximizes net benefits; however, though the 60 foot advance fill berm is the most similar alternative to the authorized project, the estimated renourishment interval is much less frequent than the authorized interval. Only two renourishment events (on approximate average) are triggered in the simulation, this is because Beach-*fx* only initiates a nourishment event when it is needed; the triggers in the model are based on the condition and position of the shoreline, see the Engineering Appendix (A) for more information.

This study has concluded that the authorized project is economically justified, and the nourishment interval has been optimized. The renourishment template consisting of a 20 foot extension of the project baseline, roughly the 1995 MHW line, plus a 60 foot advance/sacrificial berm becomes the recommended plan.

Table 3-1: Alternative Comparison Using Screening Level Costs

Alternative (Berm Width)	Total # of Beach-fx Iterations	Iterations with at least one Renourishment	Total number of simulated nourishment events over 100 iterations	Average number of nourishment events per iteration	Avg Renourishment Interval (Years)	Avg Total Project Vol (CY)	FWOP iteration.csv AAEQ Damages ($)	FWP iteration.csv Avg AAEQ Damages ($)	% Damage Reduction	Avg AAEQ Total Damage Reduction Project Benefits	Alternative iteration.csv AAEQ Costs ($)	BCR	AAEQ Net Benefits
20' Berm	100	99	832	8.32	5	1,734,257	$8,060,893	$6,754,099	16%	$1,306,793	$1,142,678	1.14	$164,116
30' Berm	100	99	394	3.94	10	994,205	$8,060,893	$6,796,379	16%	$1,264,514	$512,456	2.47	$752,058
40' Berm	100	82	259	2.59	15	848,827	$8,060,893	$6,908,098	14%	$1,152,795	$309,460	3.73	$843,334
50' Berm	100	69	200	2.00	20	776,990	$8,060,893	$6,975,289	13%	$1,085,604	$217,312	5.00	$868,292
60' Berm	**100**	**63**	**179**	**1.79**	**22**	**783,729**	**$8,060,893**	**$6,968,008**	**14%**	**$1,092,885**	**$183,419**	**5.96**	**$909,465**
70' Berm	100	54	164	1.64	24	870,569	$8,060,893	$7,032,619	13%	$1,028,274	$123,435	8.33	$904,838
80' Berm	100	42	145	1.45	28	892,467	$8,060,893	$7,018,163	13%	$1,042,730	$141,971	7.34	$900,759
100' Berm	100	33	134	1.34	30	1,065,612	$8,060,893	$7,067,960	12%	$992,932	$109,785	9.04	$883,148

* Average Annual Costs and Benefits computed at FY17 water resourced discount rate (2.875%)

It should be noted that the initial assessment of FWOP damages were computed at FY16 discount rate (3.125%). Then the alternative screening comparison presented in Table 3-1 was updated using the FY17 discount rate (2.875%).

It should be noted that, compared to the 60 foot plan, the 70 foot plan has similar net benefits and a slightly lower average annual cost. This is largely because the cost comparison provided in Table 3-1 is based on an average over 100 Beach-fx iterations. In both simulations, each of these plans had a number of iterations in which only a single renourishment was triggered. This occurrence (only one renourishment) was slightly more likely with the 70 foot alternative, thus the average annual cost was slightly lower. However, if a fully refined cost estimate (rather than ROM cost) was developed for the 70 foot alternative, it would be assumed that two full nourishments would be needed over the remaining period of analysis (which is the most likely scenario). Therefore, with fully refined costs, the total cost of this alternative would be higher than the 60 foot alternative. Also, the 60 plan is consistent with the authorized project footprint. If a larger plan was selected, additional environmental mitigation would be required, which would significantly increase the cost of the project. For alternatives that are 60 feet or less, no additional mitigation is required. For these reasons, the 60 foot alternative remains the NED Plan.

As noted in the Alternative Comparison table, the relationship between project size and storm damage reduction benefits is not always intuitive. Typically, in HSDR projects the larger alternatives generate more benefits (though not necessarily more net benefits). In this case, the largest benefits are actually observed with the smaller projects. In fact, the highest benefits are predicted for the smallest alternative (the 20 foot alternative). This slightly counterintuitive result is due to the nature of FWOP damage (primarily wave attack and inundation associated storm surge rather than consistent erosion over time) as well as the way renourishments are triggered in the model. With the smaller projects, renourishment events are triggered much more frequently than with the larger projects. In the 20 foot alterative FWP simulation, any potentially damaging storm is likely to trigger a renourishment. However, in the larger alternatives, some storms are large enough to cause damage without actually inducing enough erosion to trigger a renourishment event. Thus, some of the smaller alternatives actually generate more benefits. Of course, these smaller alternatives are much more costly to maintain due to the significantly shorter renoruishment intervals. Therefore, net benefits are maximized with the 60 foot alternative.

3.5.2 DESCRIPTION OF THE RECOMENDED PLAN

The renourishment template consisting of a 20 foot extension of the project baseline, roughly the 1995 MHW line, plus a 60 foot advance fill berm alternative is the Recommended Plan. The economic results presented in this section reflect the costs in the Total Project Cost Summary (TPCS) found in Appendix B – Cost Engineering and Risk Analysis. Therefore the results presented here will differ from the values presented in the previous section.

The Beach-*fx* model results describing the physical performance of the Recommended Plan will not change from the simulation run for the final array of alternatives. These results are independent of the project costs. The physical performance results most relevant to the economic analysis are the nourishment volumes and the timing of nourishment events. The average fill volume (including advance fill) over 100 Beach-*fx* iterations is approximately 617,000 cubic yards; the average expected renourishment interval is 22 years. The model predicts that renourishment is not necessary until approximately 2028; as a result, only two renourishment events are expected throughout the remaining 40 year period of analysis. A detailed description of the Recommended Plan is included in chapter 4.

After optimization of the authorized project, the Recommended Plan is consistent with the planning objectives and the most defensible from an engineering and environmental standpoint; it is the most similar to the authorized project, which has already been constructed, and no new mitigation would be needed. Also, the Recommended Plan met the test of the four criteria described in the P&G:

- Completeness – This criteria is fully met as this alternative could reduce damages while providing an environmentally friendly and public/agency supported solution
- Effectiveness – This criteria is fully met as this alternative meets all planning objectives
- Efficiency – This criteria is fully met since low cost and high benefits of this alternative could allow it to meet planning objectives as an NED or very cost effective plan
- Acceptability - This criteria is fully met since the alternative will likely be supported by public and environmental agencies

Table 3-2 lists alternatives considered in the environmental assessment and summarizes the major features and consequences of the Future Without-Project (FWOP) (No Action Plan); the 20-50' advance berm widths (less than the recommended plan); the Recommended Plan which is the 60' advance berm width; and the 70-100' advance berm widths (greater than the recommended plan).

Table 3-2: Summary of Direct and Indirect Impacts

ALTERNATIVE ENVIRONMENTAL FACTOR	20', 30', 40', 50' Advance Berm Widths (smaller footprint than the Recommended Plan)	60' Berm Width (Recommended Plan)	70', 80', 100' Advance Berm Widths (greater footprint than the Recommended Plan)	No Action Plan
GENERAL ENVIRONMENTAL SETTING (Refer to Sections 2.4.1 and 5.2.1)	Increased protection of infrastructure as well as creation of additional beach habitat. Temporary adverse effects including, but not necessarily limited to sea turtles, benthic resources, aesthetics, and noise. Magnitude and duration would change with each berm width alternative. Benefits to sea turtles would include increasing available nesting habitat and reducing the likelihood of adjacent residents installing hard structures. Effects would be less than the Recommended Plan.	Increased protection of upland infrastructure as well as creation of additional habitat. Temporary adverse effects including, but not necessarily limited to nesting sea turtles, benthic resources, aesthetics, and noise. Benefits to sea turtles would include increasing available nesting habitat and reducing the likelihood of adjacent residents installing hard structures.	Increased protection of upland infrastructure as well as creation of additional beach habitat. Temporary adverse effects including, but not necessarily limited to sea turtles, benthic resources, aesthetics, and noise. Magnitude and duration would change with each berm width alternative. Benefits to sea turtles would include increasing available nesting habitat and reducing the likelihood of adjacent residents installing hard structures. Effects would be greater than the Recommended Plan.	Loss of beach habitat from continuing erosion. (Other factors such as sea level rise would affect the general environmental setting).
VEGETATION (refer to Sections 2.4.2 and 5.2.2)	Reduced erosion and reduced loss of dune vegetation. Magnitude and duration would change with each berm width alternative. Effects would be less than the Recommended Plan.	Reduced erosion and reduced loss of dune vegetation.	Reduced erosion and reduced loss of dune vegetation. Magnitude and duration would change with each berm width alternative. Effects would be greater than the Recommended Plan.	Continued erosion of the beach and dune would result in the loss of vegetation. Additional landowners may install armoring measures which would alter the remaining dune system and displace vegetation.

ALTERNATIVE ENVIRONMENTAL FACTOR	20', 30', 40', 50' Advance Berm Widths (smaller footprint than the Recommended Plan)	60' Berm Width (Recommended Plan)	70', 80', 100' Advance Berm Widths (greater footprint than the Recommended Plan)	No Action Plan
FISH AND WILDLIFE RESOURCES (refer to Sections 2.4.3 and 5.2.3)	Beach placement would temporarily impact fish and wildlife species that utilize the beach placement area. Long-term benefits to fish and wildlife resources are improved habitat for beach users for foraging, and nesting. Effects would be less than the Recommended Plan.	Beach placement would temporarily impact fish and wildlife species that utilize the beach placement area. Long-term benefits to fish and wildlife resources are improved habitat for beach users for foraging and nesting.	Beach placement would temporarily impact fish and wildlife species that utilize the beach placement area. Long-term benefits to fish and wildlife resources are improved habitat for beach users for foraging and nesting. Effects would be greater than the Recommended Plan.	Species that utilize the beach may decrease in number due to erosion. No changes in fish and wildlife resources that occur below the swash zone are anticipated. Benefits to fish and wildlife resources are improved habitat for beach users for foraging and nesting.
SEA TURTLES (refer to Sections 2.4.4.1 and 5.2.4.1)	Dredging and beach placement activities may have temporary adverse effects on sea turtles, but also the project provides longer-term benefits to sea turtles increasing available nesting habitat. Magnitude and duration of beach placement activities would change with each berm width alternative. Protective measures would be implemented. Effects would be less than the Recommended Plan.	Dredging and beach placement activities may have temporary adverse effects on sea turtles, but also the project provides longer-term benefits to sea turtles increasing available nesting habitat. Protective measures would be implemented.	Dredging and beach placement activities may have temporary adverse effects on sea turtles, but also the project provides longer-term benefits to sea turtles increasing available nesting habitat. Magnitude and duration of beach placement activities would change with each berm width alternative. Protective measures would be implemented. Effects would be greater than the Recommended Plan.	Beach erosion would result in less nesting habitat. An increase in armoring would also result in less nesting habitat.

ALTERNATIVE ENVIRONMENTAL FACTOR	20', 30', 40', 50' Advance Berm Widths (smaller footprint than the Recommended Plan)	60' Berm Width (Recommended Plan)	70', 80', 100' Advance Berm Widths (greater footprint than the Recommended Plan)	No Action Plan
MANATEE (refer to Sections 2.4.4.2. and 5.2.4.2)	Dredging operations may affect, but are not likely to adversely affect the manatee. Magnitude and duration would change with each berm width alternative. Protective measures would be implemented. Effects would be less than the Recommended Plan	Dredging operations may affect, but are not likely to adversely affect the manatee. Protective measures would be implemented.	Dredging operations may affect, but are not likely to adversely affect the manatee. Magnitude and duration would change with each berm width alternative. Protective measures would be implemented. Effects would be greater than the Recommended Plan.	No effect.
SMALLTOOTH SAWFISH (refer to Sections 2.4.4.3 and 5.2.4.3)	Dredging operations may affect, but are not likely to adversely affect the sawfish. Magnitude and duration would change with each berm width alternative. Protective measures would be implemented. Effects would be less than the Recommended Plan.	Dredging operations may affect, but are not likely to adversely affect the sawfish. Protective measures would be implemented.	Dredging operations may affect, but are not likely to adversely affect the sawfish. Magnitude and duration would change with each berm width alternative. Protective measures would be implemented. Effects would be greater than the Recommended Plan.	No effect.
PIPING PLOVER AND RUFA RED KNOT (refer to Sections 2.4.4.4, 2.4.4.5 and 5.2.4.4, 5.2.4.5)	Beach placement operations may affect, but are not likely to adversely affect the plover and knot. Magnitude and duration would change with each berm width alternative. Protective measures would be implemented. Effects would be less than the Recommended Plan.	Beach placement operations may affect, but are not likely to adversely affect the plover and knot. Protective measures would be implemented.	Beach placement operations may affect, but are not likely to adversely affect the plover and knot. Magnitude and duration would change with each berm width alternative. Protective measures would be implemented. Effects would be greater than the Recommended Plan.	Beach erosion would result in less habitat for piping plovers and rufa red knots.

ALTERNATIVE ENVIRONMENTAL FACTOR	20', 30', 40', 50' Advance Berm Widths (smaller footprint than the Recommended Plan)	60' Berm Width (Recommended Plan)	70', 80', 100' Advance Berm Widths (greater footprint than the Recommended Plan)	No Action Plan
ESSENTIAL FISH HABITAT (refer to Sections 2.4.5 and 5.2.5)	Dredging and beach placement would directly affect EFH. Magnitude and duration would change with each berm width alternative. Mitigation for previous impacts to hardbottom has been successfully completed. No new mitigation would be necessary for advance berms smaller than the Recommended Plan.	Dredging and beach placement would directly affect EFH. Mitigation for previous impacts to hardbottom has been successfully completed. No new mitigation would be necessary for the Recommended Plan.	Dredging and beach placement would directly affect EFH. Magnitude and duration would change with each berm width alternative. Additional surveys to determine impacts to EFH may be required.	No effect.
COASTAL BARRIER RESOURCES ACT UNITS (OTHERWISE PROTECTED AREA) (refer to Sections 2.4.6 and 5.2.6)	Beach placement would increase beach habitat. The project would not encourage additional development.	Beach placement would increase beach habitat. The project would not encourage additional development.	Beach placement would increase beach habitat. The project would not encourage additional development.	Beach erosion would continue and more landowners may install armoring measures.
WATER QUALITY (refer to Sections 2.4.7 and 5.2.7)	Dredging and beach placement would temporarily impact water quality. Magnitude and duration would change with each berm width alternative. Water quality would be monitored and protection measures implemented. Effects would be less than the Recommended Plan.	Dredging and beach placement would temporarily impact water quality. Water quality would be monitored and protection measures implemented.	Dredging and beach placement would temporarily impact water quality. Magnitude and duration would change with each berm width alternative. Water quality would be monitored and protection measures implemented. Effects would be greater than the Recommended Plan.	No effect.

ALTERNATIVE ENVIRONMENTAL FACTOR	20', 30', 40', 50' Advance Berm Widths (smaller footprint than the Recommended Plan)	60' Berm Width (Recommended Plan)	70', 80', 100' Advance Berm Widths (greater footprint than the Recommended Plan)	No Action Plan
HAZARDOUS, TOXIC, RADIOACTIVE WASTE (HTRW) (refer to Sections 2.4.8 and 5.2.8)	Encountering HTRW would not be anticipated.	Encountering HTRW is not anticipated.	Encountering HTRW would not be anticipated.	No effect.
AIR QUALITY (refer to Sections 2.4.9 and 5.2.9)	Slight increase in air pollution would be predicted.	Slight increase in air pollution is predicted.	Slight increase in air pollution is predicted.	No effect.
NOISE (refer to Sections 2.4.10 and 5.2.10)	Construction noise levels would comply with local regulations. Construction noise would not be anticipated to exceed 55 DBA at noise sensitive areas.	Construction noise levels would comply with local regulations. Construction noise is not anticipated to exceed 55 DBA at noise sensitive areas.	Construction noise levels would comply with local regulations. Construction noise would not be anticipated to exceed 55 DBA at noise sensitive areas.	No effect.
AESTHETICS (refer to Sections 2.4.11 and 5.2.11)	Beach placement would temporarily impact aesthetics, but also the project provides longer-term aesthetic benefits that would include a wider beach scape, reduced erosion, and additional habitat for desirable beach flora (i.e. sea oats).	Beach placement would temporarily impact aesthetics, but also the project provides longer-term aesthetic benefits that would include a wider beach scape, reduced erosion, and additional habitat for desirable beach flora (i.e. sea oats).	Beach placement would temporarily impact aesthetics, but also the project provides longer-term aesthetic benefits that would include a wider beach scape, reduced erosion, and additional habitat for desirable beach flora (i.e. sea oats).	Continued beach erosion would adversely affect aesthetics.

ALTERNATIVE ENVIRONMENTAL FACTOR	20', 30', 40', 50' Advance Berm Widths (smaller footprint than the Recommended Plan)	60' Berm Width (Recommended Plan)	70', 80', 100' Advance Berm Widths (greater footprint than the Recommended Plan)	No Action Plan
RECREATION (refer to Sections 2.4.12 and 5.2.12)	Beach placement would temporarily impact recreation, but also the project provides longer-term recreational benefits that would increase the availability of recreational area.	Beach placement would temporarily impact recreation, but also the project provides longer-term recreational benefits that would increase the availability of recreational area.	Beach placement would temporarily impact recreation, but also the project provides longer-term recreational benefits that would increase the availability of recreational area.	Beach erosion would result in less recreational area.
CULTURAL RESOURCES (refer to Sections 2.4.13 and 5.2.13)	Dredging would not adversely affect cultural resources with protective buffers in place. Beach placement would have no effect.	Dredging would not adversely affect cultural resources with protective buffers in place. Beach placement would have no effect.	Dredging would not adversely affect cultural resources with protective buffers in place. Beach placement would have no effect.	No effect.
NATIVE AMERICANS (refer to Sections 2.4.14 and 5.2.14)	Consultation with Federally recognized tribes is ongoing. No effect is anticipated.	Consultation with Federally recognized tribes is ongoing. No effect is anticipated.	Consultation with Federally recognized tribes is ongoing. No effect is anticipated.	No effect.

3.6 ECONOMIC JUSTIFICATION OF THE RECOMMENDED PLAN

3.6.1 PROJECT BENEFITS

USACE participates in single purpose projects formulated exclusively for hurricane and storm damage reduction, with economic benefits equal to or exceeding the costs, based solely on damage reduction benefits or a combination of damage reduction benefits and recreation benefits. Under current policy, recreation must be incidental in the formulation process and may not be more than fifty percent of the total benefits required for justification. If the criterion for participation is met, then all recreation benefits are included in the benefit to cost analysis. The criterion is met for Gasparilla and all recreation benefits are included.

The alternative screening comparison in Table 3-1 was computed using the FY17 discount rate (2.875%). Then, the fully developed costs and benefits associated with the Recommended Plan (presented later in this section, as well as in the Economic Appendix) were recalculated at the FY18 rate (2.75%)

3.6.1.1 STORM DAMAGE REDUCTION BENEFITS

As shown in Table 3-1, the recommended plan prevents about 14% of the Without-Project damages. This reduction is the source of primary project benefits. The benefits are summarized in Table 3-3.

Table 3-3: Storm Damage Reduction Benefits of the Recommended Plan

Present Value FWOP Damages	$192,407,975
Present Value FWP Damages	$166,072,602
Present Value Damage Reduction Benefits	$26,335,372
Average Annual Equivalent (AAEQ) Damage Reduction Benefits	**$1,093,748**

*Damages and Benefits computed at FY18 (2.75%)

3.6.1.2 LAND LOSS BENEFITS

In the project area all lots are defined as currently armored or armorable in the future. The armor prevents erosion damage to the upland in both the FWOP and FWP conditions. Therefore, land loss benefits do not apply in this study.

3.6.1.3 INCIDENTAL RECREATION BENEFITS

According to ER-1105-2-100, incidental recreation benefits can be calculated in Hurricane and Storm Damage Reduction (HSDR) studies. Recreation benefits are not to be used in plan formulation, but they can constitute up to 50% of the total project benefits needed for economic justification. Section 5.4.3 of the Economics Appendix (C) presents detailed information about recreation benefits methodology.

The total Present Value (PV) of recreation benefits is $6,760,592, or $280,778 in average annual benefits (AAEQ). These recreation benefits will be added as incidental benefits to the Recommended Plan. Recreation benefits were calculated at the FY18 discount rate (2.75%) over a 40 year period of analysis.

3.6.2 PROJECT PERFORMANCE IN THE SEA LEVEL RISE SCENARIOS

USACE guidance requires the analysis of three sea level scenarios. Therefore, it is important to consider the performance of the selected plan in these scenarios. For the recommended plan consisting of a 20 foot extension of the project baseline, roughly the 1995 MHW line, plus a 60 foot advance/sacrificial berm, the SLR Beach-*fx* analysis results are summarized in Table 3-4. The BCRs reported in the table only reflect primary benefits (i.e., recreation benefits are not included).

Table 3-4: Project Performance of the Recommended Plan in the SLR scenarios

	SLR1	SLR2	SLR3
AAEQ FWOP Damage	$7,990,995	$8,253,874	$8,875,602
AAEQ FWP Damage	$6,897,247	$7,022,595	$7,125,171
AAEQ Benefits	$1,093,748	$1,231,279	$1,750,431
AAEQ Cost	$909,414	$1,445,969	$2,355,383
AAEQ Net Benefits	**$184,334**	**($214,690)**	**($604,953)**
BCR	**1.20**	**0.85**	**0.74**

*Note: Annual Costs and Benefits of the Recommended Plan computed at FY18 price level and at the FY18 water resources discount rate (2.75%). SLR comparison is based on more refined costs for mobilization/demobilization and placement costs, and does not include Recreation Benefits

A fully developed cost (i.e., certified) estimate has been developed for the SLR1 scenario (as described in Section 3.6.3), but has not been developed for the other scenarios. However, using more refined Mob/demob and placement cost provides a reasonable proxy for what the costs and net benefits would look like in the accelerated SLR scenarios.

In the increased SLR scenarios, the average rate of erosion increases; thus, in the FWOP, damages increase as the shoreline erodes more quickly. In the FWP condition, the damages are fairly similar in all three SLR scenarios (because the project maintains the shoreline position over time). Even though the FWP damages slightly increase, the benefits increase significantly. Based on screening level costs, the project is economically justified in all three scenarios (net benefits are positive and BCRs are above 1.0). But, as noted in Table 3-4, when using more refined costs the project does *not* appear to be justified on primary benefits alone in the accelerated SLR scenarios. This is because costs increase more significantly than benefits in these scenarios. It should be noted that if incidental recreation benefits are included (as described in Section 5.4.3 of the Economics Appendix), the project would be justified in the Intermediate scenario (SLR2). Therefore, it is reasonable to conclude that the recommended plan would be resilient and adaptable if an intermediate level of accelerated sea level rise actually occurs during the 40 year remaining period of analysis. However, if high levels of accelerated sea level rise are observed, the project will need to be reevaluated.

3.6.3 REFINED COST OF THE RECOMMENDED PLAN

After a plan was selected, a fully refined cost estimate could be developed. The alternative comparison shown in Table 3-1 used screening level costs, which should be considered rough order of magnitude estimates at FY17 price levels. The fully refined cost estimate includes a number of other costs, including Preconstruction, Engineering, and Design (PED), construction management, Lands and Damages and a cost contingency. As a result of these factors, the fully developed cost of the recommended plan is much higher than the screening level estimate. Table 3-5 summarizes the refined costs (FY18 price levels). The estimate assumes two renourishment events, 2028 and 2042. The Cost Appendix (B) provides additional detail.

Table 3-5: Refined Project Costs for the Recommended Plan (FY18 price levels)

Construction Cost (mobilization and placement)	$21,802,000
Lands and Damages	$428,000
Preconstruction, Engineering, and Design (PED)	$5,849,000
Construction Management	$311,000
Subtotal	**$28,390,000**
Contingency	26%
Total Project Cost*	**$35,771,000**

*Costs reflect the total for both renourishment events, computed at FY18.

3.6.3.1 OMRR&R COSTS OF THE PROJECT

In addition to PED and construction management, the annual economic cost of a project includes costs associated with periodic operations, maintenance, repair, replacement, and rehabilitation of the project (OMRR&R). The OMRR&R costs are fully non-Federal, they are considered part of the overall economic cost of the project. For coastal projects, these costs include items like long term environmental monitoring, escarpment removal, dune vegetation, and maintenance of features required for public access. In the case of Gasparilla Island project, the annual OMRR&R cost is estimated to be $32,000 per year.

3.6.3.2 ECONOMIC COST OF THE RECOMMENDED PLAN

The Economic cost of the project must also account for the time value of money. Per planning guidance, the costs and benefits of the NED Plan should be compared in average annual equivalent (AAEQ) terms. It should be noted that, in this case, interest during construction (IDC) is not applicable because the project has already been constructed and is already generating benefits. The total economic cost of the recommended plan is summarized in Table 3-6.

Table 3-6: Economic Costs of the Recommended Plan

Total Cost (Including 2 renourishment events & 26% Contingency)	$35,771,000
Interest During Construction (IDC)	$0
Total Investment Cost	$35,771,000
Present Value of Investment Cost	$21,896,971
AAEQ of Investment Cost	$909,414
Annual OMRR&R	$32,000
Total AAEQ Cost	**$941,414**

*Refined Cost computed at FY18 (2.75%)

3.6.4 ECONOMIC SUMMARY OF RECOMMENDED PROJECT

The net benefits of the recommended plan incorporate both the costs and benefits of the project. Table 3-7 provides a summary. Average Annual costs and benefits have been computed at FY18 price levels and at the FY18 water resources discount rate (2.75%).

Table 3-7: Economic Summary of the Recommended Plan

Total Cost	**$35,771,000**
Interest During Construction (IDC)	$0
Total Investment Cost	$35,771,000
Present Value of Investment Cost	$21,897,000
AAEQ of Investment Cost	$909,000
Annual OMRR&R	$32,000
Total AAEQ Cost	**$941,000**
PV Damage Reduction Benefits	$26,335,000
PV Land Loss Benefits	$0
PV Recreation Benefits	$6,761,000
PV Total Benefits	$33,096,000
AAEQ Total Benefits	**$1,375,000**
AAEQ Net Benefits	**$434,000**
Benefit-to-Cost Ratio (BCR)	**1.46**

*AAEQ Net Benefits computed at FY18 (2.75%)

3.7 INCREMENTAL JUSTIFICATION OF THE RECOMMENDED PLAN

ER 1105-2-100 Appendix E, E-3 c (2) defines a "separable element" as, "any part of a project which has separately assigned benefits and costs, and which can be implemented as a separate action (at a later date or as a separate project)." In this study, the FWOP damages in model reaches LG23 and LG24 are quite low, largely because they each contain so few structures that are subject to damage. Therefore, the benefits in each model reach are minimal. However, the model reaches are used as analytical tools (to capture morphological differences between measured shoreline profiles) for executing the Beach-fx model and interpreting Beach-fx results; they are not intended to serve as potentially separable elements. None of the individual Gasparilla model reaches could be implemented as a separate action; the resulting project would be far too small to be realistically constructible. If the project was divided into smaller increments, a more realistic division might be three increments (each of which could feasibly be constructed on its own). Each increment might be considered a separable element, and could be called a study reach (rather than a model reach). A possible breakdown into three increments (hypothetically called A, B, and C) is provided in Table 3-8. As shown in the table, each of these three hypothetical increments would, in fact, be incrementally justified. A division of this kind would be more consistent with the intent of planning guidance. Beach-fx model reaches are useful analytical tools for increasing data resolution and better replicating physical shoreline response; they were never intended to serve as study reaches for planning purposes.

Table 3-8: Gasparilla Incremental Analysis by constructible separable elements

Study Reach	Model Reaches	Total Length	AAEQ Benefits	AAEQ Costs	AAEQ Net Benefits	BCR
A	LG11: LG15	Approximately 1 mile	$609,400	$291,262	$318,139	2.09
B	LG16: LG20	Approximately 0.9 miles	$429,463	$135,733	$293,730	3.16
C	LG21:LG24	Approximately 0.8 miles	$54,021	$37,792	$16,229	1.43

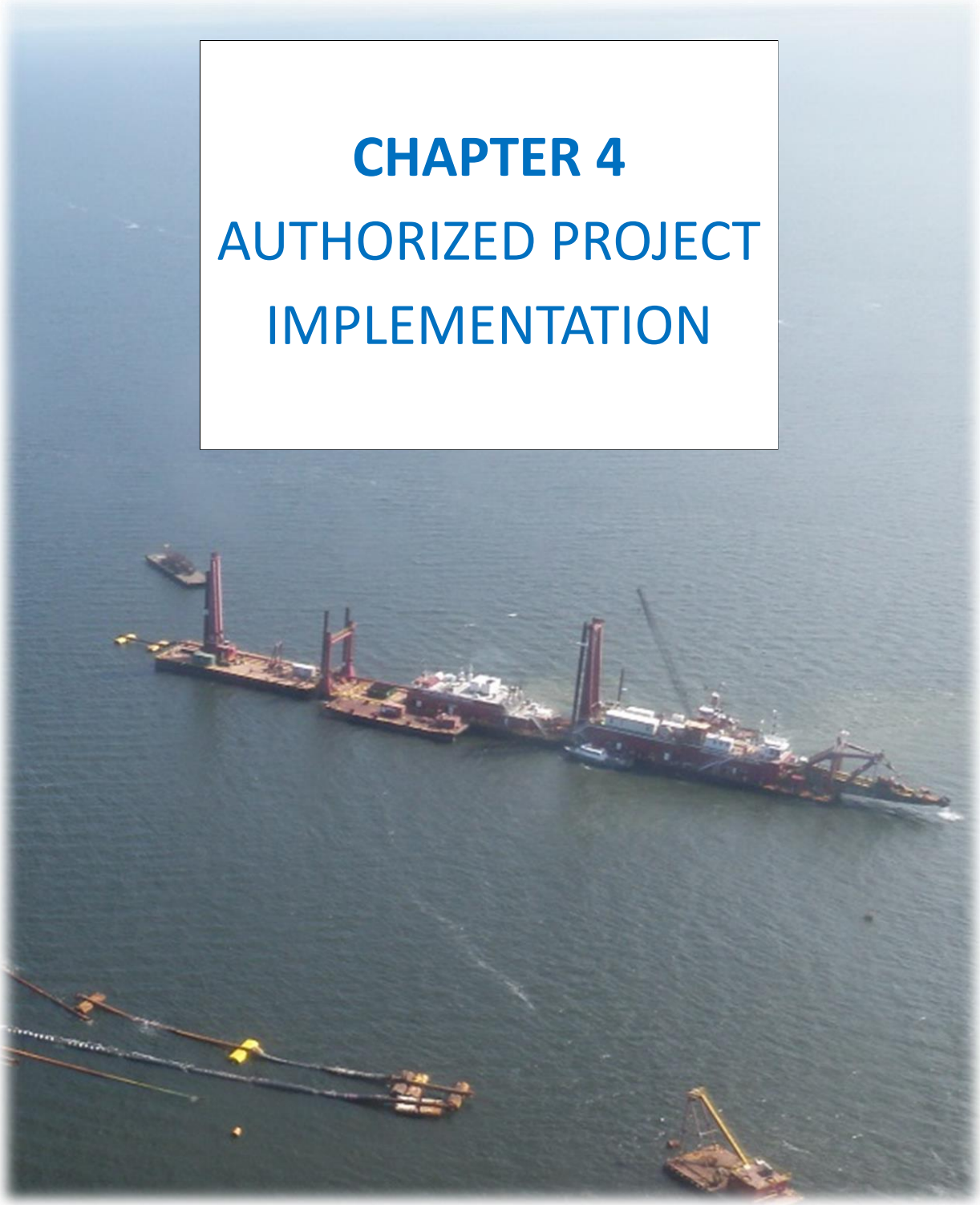
Notes: These incremental benefits and costs were amortized at the FY17 discount rate (2.875%). The costs only reflect placement costs ($ per cubic yard) from the revised cost estimate; they do not include Mobilization and Demobilization costs. The benefits do not reflect recreation benefits; only damage reduction benefits.

Though these more realistically constructible increments are incrementally justified, the Project Delivery Team (PDT) did consider the feasibility of removing Reach LG23 and LG24 from the project. The PDT concluded that there are a number of important reasons to keep those reaches in the project, even though their storm damage reduction benefits are small. Firstly, eliminating LG23 and LG24 will increase post-fill erosional losses throughout the project (shorter projects erode at faster rates). The seawall at R25 will continue to slow the rate of erosion at the southern end of the project, but the existing structure configuration won't prevent sand migrating off the beach and into the inlet shoal system. Without fill, the shoreline between LG23 and the seawall will erode at a faster rate, compared to with project conditions. Material at Gasparilla moves from north to south and then into the shoal. The increased erosion at the southern end, combined with increased project related erosion of the fill itself, will increase the overall rate of sediment transport. Therefore, it is likely to be the case that the Gasparilla project would be neither complete nor as effective without its southernmost reaches.

During an In Progress Review (IPR) meeting held on February 9, 2017, the Vertical Team (VT) gave guidance to the PDT on: a) analysis and identification of a NED plan that differs from what was originally authorized is not within the scope of a Section 934 study, and b) LG23 and LG24 needed to be included in the project for engineering purposes. The cost sharing of those segments was a concern from the HQ review team, and after discussion, the Vertical Team agrees on the full cost sharing (65%Federal, 35%non-federal) based on project past history.

CHAPTER 4

AUTHORIZED PROJECT IMPLEMENTATION



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4 RECOMMENDED PLAN IMPLEMENTATION

The Recommended Plan for the Lee County Gasparilla Island Segment was formulated based on analysis and modeling efforts documented in the 2000 GRR. Updated modeling and economic analysis have confirmed that the 2000 GRR authorized project is still justified. A detailed description of the optimized plan is presented in the following sections.

The Recommended Plan provides restoration and periodic nourishment of 2.8-miles of gulf shoreline between the Florida Department of Environmental Protection (FDEP) reference monuments R10.5 (R11 plus a 1,200 foot long north extending taper) and R24.5 (R24 plus a 600 foot long south extending taper). The design template consists of a 20 foot extension of the project baseline, roughly the 1995 MHW line, at elevation +5 feet above MLW (+3.75 ft-NAVD88); a foreshore slope of 1V:15H transitioning to a nearshore slope of 1V:25H from MLW extending out to the intersection with the existing profile; the average periodic nourishment Interval was determined to be 22 years and the average volume of this advanced and return interval nourishment was calculated to be 617,000 cubic yards, this volume is approximately equivalent to a 60 foot advance berm. Two renourishment events are expected throughout the remaining 40 year period of analysis.

4.1 ENGINEERING DESIGN

4.1.1 PROJECT DESIGN

The design template can be described by three factors; project baseline, dimensions of the berm, and shoreline slopes. The advance fill in Beach-*fx* is represented as a 60 foot berm seaward of the design template. Figure 4-1 shows a generalized cross section view of the design template and advance fill.

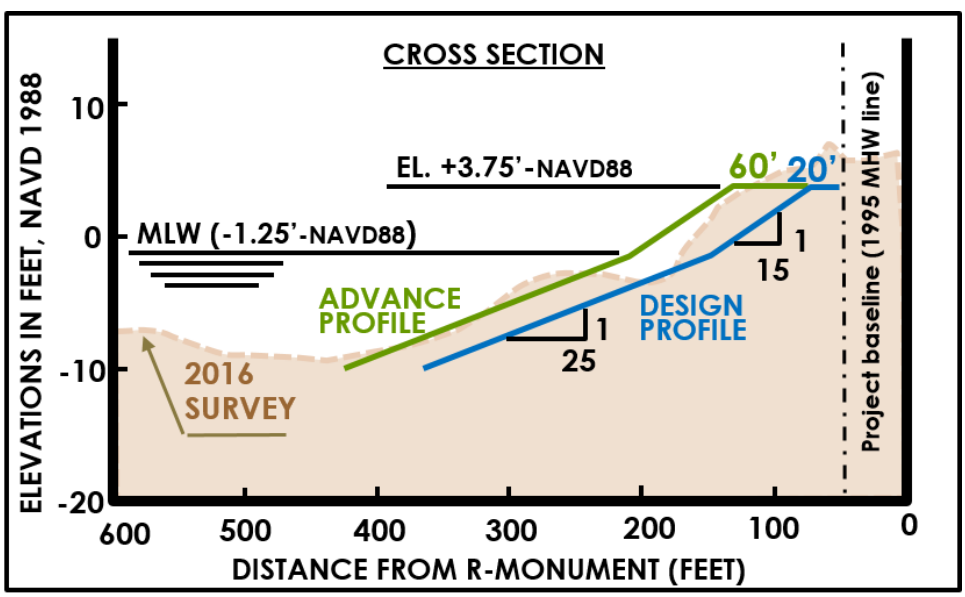

Figure 4-1. Typical Beach Profile

4.1.1.1 PROJECT LENGTH

The authorized project consists of 2.8 miles of shoreline along the south end of Gasparilla Island. The southern limit of the beach fill is located at FDEP monument R24; a 600 foot taper then connects the fill with the existing southern shoreline. The northern limit is defined as FDEP monument R11; a 1,200 foot taper section connects the fill to the existing northern shoreline.

4.1.1.2 PROJECT BASELINE

The baseline over most of the project is coincident with the 1995 MHW shoreline. However, within the region from R15 to R17, an extension of the project baseline was incorporated in the design based on modeled results. This extension, required to straighten a deficit in the shoreline position, consisted of 5 feet at R15, 84 feet at R16, and 14 feet at R17. Table A-23 of the Engineering Appendix (A) defines the location of the established project baseline relative to R-monument.

4.1.1.3 PROJECT BERM

The recommended plan consists of a 20 foot berm extension of the project baseline at +5 ft.-MLW (+3.75 ft-NAVD88); a 60 foot advance fill berm provides additional material to offset erosive losses over an estimated 22 years between renourishments. Note that the 20 foot extension of the baseline does not translate into a 20 foot berm width. Due to the layout of the shoreline and dune system, the authorized extension of the baseline results in actual berm widths ranging from 0 (R11) to 200+ feet (R16).

4.1.1.4 BEACH SLOPES

For Gasparilla Island, the native beach slope was estimated as 1 (vertical) on 15 (horizontal) above MLW and 1 on 25 below MLW. The construction slope was assumed to be 1 on 10. Based on these dimensions, the recommended plan will have the same project footprint as presented in the 2000 GRR (Figure A-48 to Figure A-52 of the Engineering Appendix (A)).

4.1.2 VOLUME REQUIREMENTS AND NOURISHMENT RATE

Table 4-1 provides Beach-*fx* project volumes and renourishment intervals for the recommended plan for each of the three sea level change scenarios. Note that while the average renourishment volume increases from approximately 540,000 cubic yards to approximately 617,000 cubic yards, the average expected renourishment interval increases from 7 to 22 years. It should be emphasized that these are average volumes based on Beach-*fx* modeling.

Table 4-1: Beach-*fx* Advance Volumes and Renourishment Interval

Project Volumes (Over 100 Beach-fx Life-cycle Iterations)				
Sea level change Case	Volume Description	Initial Fill Volume (cubic yards)	Renourishment Interval (years)	Average Volume per Interval (cubic yards)
Base	Min - Max	596,700 – 699,600	15 – 29	601,700 – 676,700
	Average	624,500	22	617,200
Intermediate	Min - Max	597,100 – 727,200	14 – 28	606,100 – 754,700
	Average	633,500	21	665,600
High	Min - Max	598,400 – 726,800	10 - 26	605,100 – 781,200
	Average	643,100	18	655,400

4.1.3 SAND SOURCES

4.1.3.1 BORROW AREA

Based in a Geotechnical analysis, "Boca Grande Pass ebb shoal" is an appropriate source of borrow material for the remainder of the extended Federal participation. The sand source lies in water depths of approximately 6 to 18 feet, centered about 1.85 miles offshore the southern tip of Gasparilla Island, Lee County, and south of FDEP reference monument R25 and adjacent to Boca Grande Pass. Rectangular in shape, the sand source encompasses approximately 425 acres. Figure 4-2 presents the proposed borrow area configuration. The thickness of beach-compatible material ranges from 3 to 15 feet, with an average thickness of approximately 8 feet. Conservative dredge depths and a spring 2016 survey were used to estimate an available volume of approximately 3.5 million cubic yards. This volume of material is sufficient to cover the estimated project need of 1,200,000 cubic yards for two renourishment events in the next 40 years.

A review of the available geotechnical data for the proposed sand source indicates that the material of the existing beach and of Boca Grande ebb shoal sand source is very similar and is composed of poorly graded fine- to medium-grained sand consisting of quartz and shell fragments of light gray color with a mean grain size of 0.47 and 0.37 mm, respectively. In conclusion, the sand source is compatible with the beach placement area and is in compliance with Florida department of Environmental Protection's "Sand Rule" guidelines.

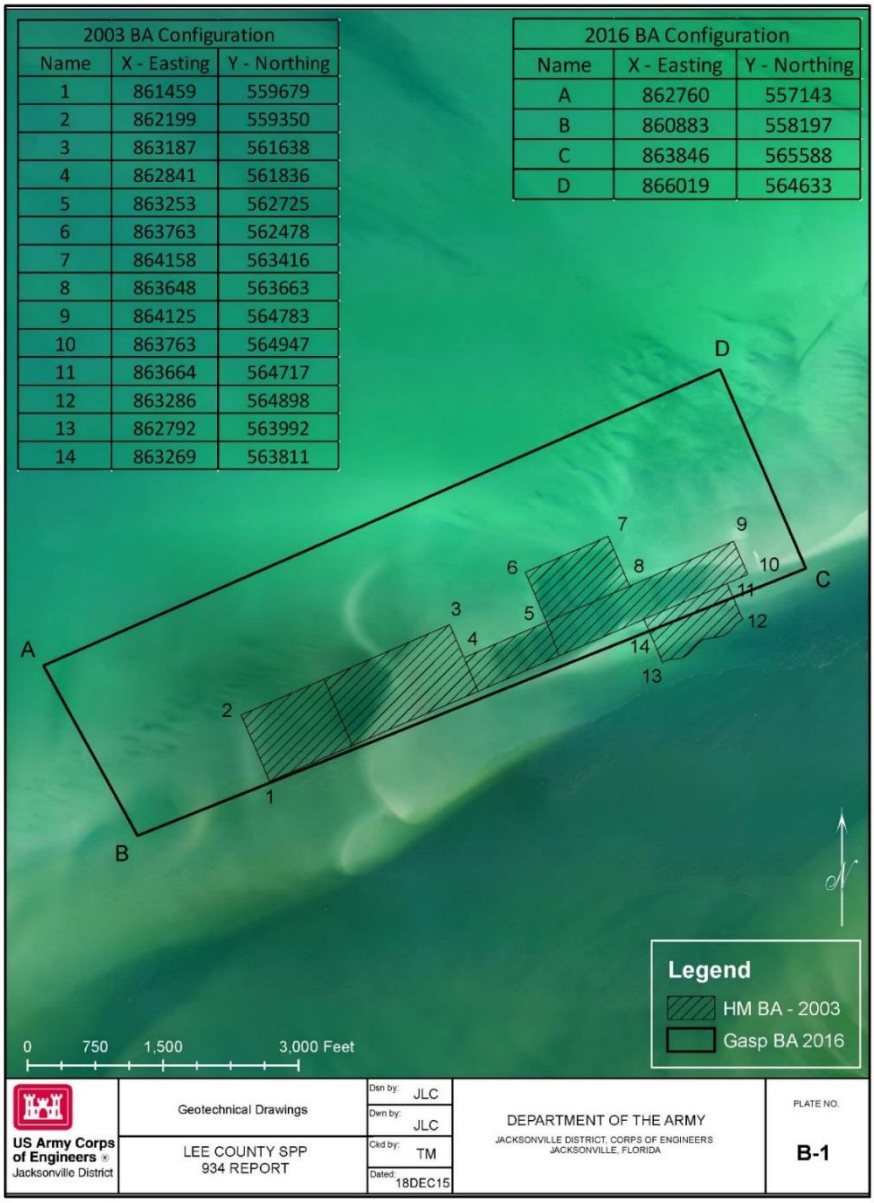

Figure 4-2. Proposed borrow area configuration

4.2 PROJECT CONSTRUCTION

The Recommended Plan includes a 20 foot extension of the project baseline plus a 60 foot berm for sacrificial fill between reference monuments R11 to R24. Tapers of 1200 feet and 600 feet will extend from the northern and southern ends of the berm extension, connecting the extension to the existing shoreline, resulting in a maximum length of placement between R monuments R10.5 and R24.5.

Within the first year or two after placement of the beach fill, the construction profile will be reshaped by waves into an equilibrium profile, causing the berm to retreat to a position more characteristic of the

project design template. It is anticipated that a hydraulic dredge (cutterhead) will accomplish this project, given the potential borrow area location and previous experience. In 2007 and 2013 nourishment events, the project employed a cutterhead dredge to pump out material from the Boca Grande Pass ebb shoal, about 1.85 miles south west of the southern tip of Gasparilla Island, onto the beach area. The next renourishment event should require about three months.

4.3 PROJECT MONITORING

Physical monitoring of the recommended project is necessary to assess project performance and to ensure that project functionality is maintained throughout the additional 40-year period of Federal participation in the project. The monitoring plan will be directed primarily toward accomplishing systematic measurements of the beach profile shape. Profile surveys should provide accurate assessments of dune and beach fill volumes and a basis for assessing post-construction beach fill adjustments, as well as variation in the profile shape due to seasonal changes and storms. Monitoring will play a vital role in determining if project renourishment is necessary. Post construction monitoring activities include topographic and bathymetric surveys of the placement area and adjacent areas on an annual basis for 3 years following construction and then biannually until the next construction event. Other monitoring efforts include bathymetric surveying of the sand source, which will be done as part of the pre-construction engineering and design (PED) phase prior to each nourishment. Measured wind, wave, and water level information will be obtained from the best available existing data sources. This data will be applied in support of previously discussed monitoring efforts. It will also be used to periodically assess the state of sea level rise and to determine if reassessment of the project volumes and/or renourishment intervals is required.

4.4 OPERATION AND MAINTENANCE

The non-Federal sponsor will operate and maintain the project for the project life. The currently authorized Federal participation for periodic renourishments is 10 years from the initial construction (Dec-2006); this document is seeking to extend Federal participation for periodic renourishments an additional 40 years from 2016-2056. Future periodic nourishment is considered construction and will be performed as part of the Federal project. It is estimated that the current operation and maintenance procedures as conducted by the sponsor will continue to be sufficient.

4.4.1 NON-FEDERAL RESPONSIBILITIES FOR OPERATION, MAINTENANCE, REHABILITATION, REPAIR AND REPLACEMENT (OMRR&R)

Based on the size and scope of the Recommended Plan and the cost of similar activities for similar projects, the annual costs for OMRR&R, including beach fill monitoring over 40 years, are estimated to be $31,000 per year.

4.4.1.1 OPERATIONS

This is the non-Federal sponsor's continuing oversight activities to assure that the beach design section provides storm damage reduction and promotes and encourages safe and healthful public enjoyment of

the recreational opportunities provided by the beach fill. Operation activities would include protection of dunes, prevention of encroachments, monitoring of beach design section conditions, provision of lifeguards and beach patrols, and trash collection. Operations are a non-Federal sponsor responsibility and there is no Federal financial participation in operations activities.

4.4.1.2 MAINTENANCE, REPAIR, REPLACEMENT AND REHABILITATION

For a beach fill there is, generally, no meaningful distinction between maintenance, repair, replacement and rehabilitation. A beach fill project is designed to provide a certain level of erosion and storm surge protection to landward facilities through the sacrifice of project fill material. The protection provided depends on the crown elevation and the amount and characteristics of sacrificial sand maintained within the project design section. The project function depends on maintenance of the horizontal and vertical dimensions of the project design section. Preservation of this design section can be achieved through a combination of the following activities which generally describe the non-Federal sponsor responsibility for maintenance, repair, replacement, and rehabilitation under the terms of the project partnership agreement (PPA):

(a) Grading and reshaping the beach and dune using sand within the project design section

(b) Maintenance of dune vegetation, sand fencing and dune cross-overs

4.4.1.3 CONTINUING PROJECT CONSTRUCTION (PERIODIC NOURISHMENT)

The following activities may be classified as continuing project construction and may be shared as periodic nourishment under the terms of the PPA:

(a) Placement of additional sand fill to restore an advanced nourishment berm

(b) Placement of additional sand fill on the project to restore the design section

4.5 MITIGATION

The recommended plan would be consistent with the authorized project template. The proposed design includes no expansion or increase in volume that would impact hardground outside of the approved project's equilibrium toe of fill. Patches of hardground are found offshore in the shallow intertidal zone. However, the proposed beach fill template for periodic renourishments remains identical to that in the authorized project. Based on the equilibrated profile determination and the equivalence of sand grain size characteristics proposed for placement and those previously placed, the present project should have no additional impact on hardground resources lying within the equilibrium toe of fill. After Initial construction in 2007, the project provided mitigation for all such affected resources; Section 2.4.5.1 presents a full description of initial mitigation. No additional mitigation is needed.

4.6 SPONSOR STATEMENT OF FINANCIAL CAPABILITY

Current policy requires a sponsor's self-Certification of its financial capability to pay its cost for the project in accordance with CECW-PC memorandum dated 12 June, 2007, Lean Six Sigma (L6S) Actions to Improve

the Project Cooperation Agreement Process – Non-Federal Sponsor's Self-Certification of Financial Capability (eliminating USACE financial analyses of sponsors). The self-certification is included in the Pertinent Correspondence Appendix (H).

4.7 FEDERAL IMPLEMENTATION RESPONSIBILITIES

USACE is responsible for budgeting for the Federal share of future Federal construction projects. Federal funding is subject to budgetary constraints inherent in the formation of the national civil works budget in a given fiscal year. USACE would perform the necessary preconstruction engineering and design (PED) needed prior to construction. USACE would meet requirements for the use of any Federal lands, at the borrow area, or otherwise, obtain water quality certification, coordinate with the state as required by the CZMA, and construct the project. Cost sharing of PED, initial construction, and periodic nourishment will be in accordance with WRDA 1986, as amended, subject to the availability of appropriations.

4.8 NON-FEDERAL IMPLEMENTATION RESPONSIBILITIES

The non-Federal sponsor for the project will be Lee County. The non-Federal project sponsor would provide an up-front cash contribution for initial construction costs of the proposed project. The amount of the non-federal up-front cash contribution would be based on cost-sharing principles reflecting shoreline use, ownership, and public access in existence at the time of construction. The non-federal sponsor shall provide the entire cost of all material placed on or seaward of private undeveloped lands and developed private lands (which are inaccessible to the public). The non-federal sponsor shall provide lands, easements, and rights-of-way and bear a portion of the administrative costs associated with land requirements. The non-federal project sponsor will be responsible for all costs of operation, maintenance, repair, rehabilitation, and replacement of project features. Section 402 of the 1986 Water Resources Development Act (33 USC 701b-12) as amended by Section 14 of the 1988 Water Resources Development Act, states that "Before construction of any project for local flood protection or any project for hurricane or storm damage reduction, that involves Federal assistance from the Secretary, the non-federal interests shall agree to participate in and comply with applicable Federal floodplain management and flood insurance programs." The non-federal sponsor and communities must be enrolled in, and in compliance with, the National Flood Insurance Program (NFIP) to receive Federal funding for a recommended storm damage reduction project. Lee County is enrolled in, and in compliance with, the NFIP.

4.9 RECOMMENDED PLAN COST SHARING

For the present study a cost share recalculation was completed using Section 103(d) of WRDA 1986 guidelines: costs assigned to developed lands (publicly or privately owned) are cost shared 65% Federal and 35% non-Federal. Undeveloped public lands are cost shared 65% Federal and 35% non-Federal. Lands with exclusively private benefits and lands with insufficient parking and/or public access are 100% non-Federal cost. Shorelines owned by the Federal government are 100% Federal cost. Note that, for the purposes of this report, "developed" indicates the presence of buildings and/or other infrastructure such as street ends or other transportation facilities. If lands are not within ¼ mile of public access and either public parking or a bus stop, then the associated costs will be 100% non-Federal.

The total shoreline length of the project area, based on shorefront length information provided by the Lee County Property Appraiser's office (verified using Google Earth), is estimated to be about 14,960 feet (or approximately 2.8 miles) long.

For the 2007 and 2013 nourishment events, there were twenty-one (21) property owners who were unwilling to grant the required Perpetual Beach Storm Damaged Reduction Easements; In May 2017, the US Army Corps of Engineers, Jacksonville District, Real Estate Division received confirmation via email from the non-Federal sponsor on the closing of five (5) of the twenty-one (21) pending perpetual storm damage reduction easements. The non-Federal sponsor has expressed confidence in obtaining the remaining sixteen (16) outstanding easements prior to the next renourishment event. The non-Federal Sponsor estimated administrative costs of $400,000 (FY17), will cover those costs incurred for verifying ownership of lands, certification of those lands required for project purposes, legal opinions, title insurance, appraisals, condemnations, property analysis and/or other requirements to secure the land interests that will be necessary during the Preconstruction, Engineering and Design (PED) Phase. More information can be found in the Real Estate Appendix (E).

The combined shorefront length of the remaining sixteen (16) properties without Perpetual Beach Storm Damaged Reduction Easements is 768 feet. Because the Real Estate Plan includes the condemnation costs in case that the required easements could not be obtained, the cost sharing associated with these areas is covered 65% Federal, 35% non-Federal.

There are multiple parcels that are publicly or privately owned and not publicly accessible, i.e., they are not located within ¼ mile of public access and public parking. The combined shorefront length of these properties is 596 feet. These properties are not cost-shared, and therefore the costs associated with these areas are covered 100% by the non-Federal sponsor. Figure 4-3 shows a shoreline image for subject area depicting FDEP R-monuments and public access points.

There is one property that is federally owned land with shorefront length of 990 feet; therefore, the costs associated with this area is covered 100% Federal.

The rest of the properties in the study area, totaling an estimated 12,606 feet, are publicly accessible, developed or undeveloped, public or private lands including transportation facilities comprised of street ends, and the cost share for these lands is covered 65% Federal, 35% non-Federal.

Overall, the cost share for the study area is estimated to be 64.7% Federal and 35.3% non-Federal for future nourishment events. A summary is shown in Table 4-2. Additional detail on how percentages were calculated are given in Table 2 of the Public Access and Cost Sharing Agreement Appendix (F).

Figure 4-3. Shoreline image for subject area depicting FDEP R-monuments and public access points

Table 4-2 Cost Sharing Summary for Periodic Nourishment

Land Ownership/Use	Maximum level of Federal participation	Shoreline Front Footage (feet)	% Federal Cost Share x Shoreline Front Footage (feet)	Length of non-Federal Participation
Developed lands (publicly or privately owned) and undeveloped lands (publicly or privately owned) with public access and easements	65%	12,606	8,194	4,412
Developed and undeveloped with pending easements*	65%	768	499	269
Developed and undeveloped with no public access between 1/4 mile	0%	596	0	596
Federal owned	100%	990	990	0
TOTAL		**14,960**	**9,683**	**5,277**
COST SHARE			**64.7%**	**35.3%**

* 16 properties with pending easements are required to grant perpetual easements or be condemned.

4.10 RECOMMENDED PLAN COST ALLOCATION

The estimated project cost for the next two renourishment events, including contingency is $35,771,000, as shown in Table 4-3 (FY18 price levels). For project identification purposes, the estimated costs are categorized under the appropriate CWWBS code and include both construction and non-construction costs. The Cost Appendix (B) provides additional detail including total project first cost (Constant Dollar Basis) of $54,752,000 at the Fiscal Year 2018 price level (October 2017). Table 4-4 presents cost allocation for the recommended plan.

Table 4-3: Total Project Cost (FY18 price levels)

Cost Summary (two renourishment events) (FY18 Price Levels)	
Civil Works Item	**Total Item Cost ($K)**
Beach Replenishment	$21,802
Construction Estimate Totals	$21,802
Real Estate	
- Lands and Damages	$0
- administrative	$428
- Federal Administrative	$21
- Non-Federal Administrative	$407
Planning, Eng. & Design	$5,849
Construction Management	$311
Contingency (26%)	$7,381
PROJECT COST TOTAL	**$35,771**

Table 4-4: Recommended Plan Cost Summary and Cost Sharing (FY18)

Summary of Project Cost Sharing (Total Project First Cost) (FY18 Price Levels)					
Initial Construction and 1st renourishment (FY18) (Spent Thru: 1-Oct-2016)					
Item	**Project First Cost**	**Federal Share**	**Federal Cost**	**Non-Federal Share**	**Non-Federal Cost**
Construction	$18,981,000				
Non-Federal Cost				41.3%	$7,839,153
*Non-Fed LERRD Contribution**		0%	$0	100%	$0
Non-Fed Cash Contribution					$7,839,153
Federal Cost		58.7%	$11,141,847		
2nd and 3rd renourishments (FY18)					
Item	**Project First Cost**	**Federal Share**	**Federal Cost**	**Non-Federal Share**	**Non-Federal Cost**
Construction	$35,771,000				
Non-Federal Cost				35.3%	$12,627,163
*Non-Fed LERRD Contribution**		0%	$0	100%	$512,800
Non-Fed Cash Contribution					$12,114,363
Federal Cost		64.7%	$23,143,837		
** Includes Non-Federal Admin costs only (40 years)*					
Initial Construction + Periodic Renourishments (FY18)					
Item	**Project First Cost**	**Federal Share**	**Federal Cost**	**Non-Federal Share**	**Non-Federal Cost**
Total Project Cost Share and Cost (up to 2056)	$54,752,000		$34,285,684		$20,466,316

4.11VIEW OF NON-FEDERAL SPONSOR

Lee County is the non-federal sponsor (NFS) for the Recommended Plan. They have been an integral part of the Project Delivery Team (PDT) from the conception of the project. At each step of the process, Lee County has contributed to the available information, participated in the formulation, and reviewed the products. Lee County supports the Recommended Plan.

4.12 LANDS, EASEMENTS, RIGHTS-OF-WAY, RELOCATIONS AND DISPOSAL (LERRD) SUMMARY

The following discussion summarizes the Real Estate Appendix (E), which can be referenced for more details.

4.12.1REAL ESTATE REQUIREMENTS

Re-evaluation of the Lee County Property Records identified 196 total parcels landward of the established ECL located within the authorized project boundary containing 2.8 miles beach placement area situated between R-10.5 and 24.5. The non-Federal sponsor has provided certification of lands for perpetual beach storm damaged reduction easements on 117 privately owned parcels, 44 commercially owned parcels and 19 vacant lots owned by the Lee County. The non-Federal sponsor is currently working to obtain the perpetual storm damage reduction easement on the remaining 16 privately owned parcels. Access will be by public roads located throughout the project area. No acquisition will be required for access.

The authorized footprint impacts properties landward of the ECL on one public parcels, referred to as Gasparilla State Park, containing 127.24 acres and is open to the general public. The State provided the non-Federal sponsor permission to operate the property as part of the project. The Park is located at FDEP monument R-24 along the shoreline. The Lee County, non-Federal Sponsor, will certify a temporary work area easement to the United States for construction purposes in the Park.

4.12.2 SUMMARY OF REAL ESTATE COSTS

The estimate of the Federal real estate administrative cost of $21,000 (FY18) is based on the non-Federal sponsor obtaining the perpetual beach storm damaged reduction easements over the 16 outstanding parcels. This figure includes project real estate planning, mapping, review, oversight, monitoring, analysis of real estate requirements and estates.

The non-Federal Sponsor estimated administrative costs of $407,000 (FY18), will cover those costs incurred for verifying ownership of lands, certification of those lands required for project purposes, legal opinions, title insurance, appraisals, condemnations, property analysis and/or other requirements to secure the land interests that will be necessary during the Preconstruction, Engineering and Design (PED) Phase. According to EC 405-1-04, Section V, paragraph 4-44(b), this real estate cost estimate is based on the determination that the value of project lands needed for beach restoration easement purposes are assessed at zero dollars due to the off-setting benefits appraisal methodology. The remaining expense is contained in Federal and non-Federal administrative costs associated with acquisition of approximately 16 perpetual beach storm damage reduction easements. Table 4-5 presents the Real Estate cost.

Table 4-5: Summary of Real Estate Cost (FY17 and FY18)

		FY17		FY18	
		FEDERAL	**NON-FEDERAL**	**FEDERAL**	**NON-FEDERAL**
01B	Lands and damages	$0	$0	$0	$0
01B40	Administrative/condemnation actions	$20,000	$400,000	$21,000	$407,000
	sub-total	**$20,000**	**$400,000**	**$21,000**	**$407,000**
01M00	Contingencies 26%	$5,200	$104,000	$5,400	$105,800
	Total Estimated Real Estate Cost	**$25,200**	**$504,000**	**$26,400**	**$512,800**

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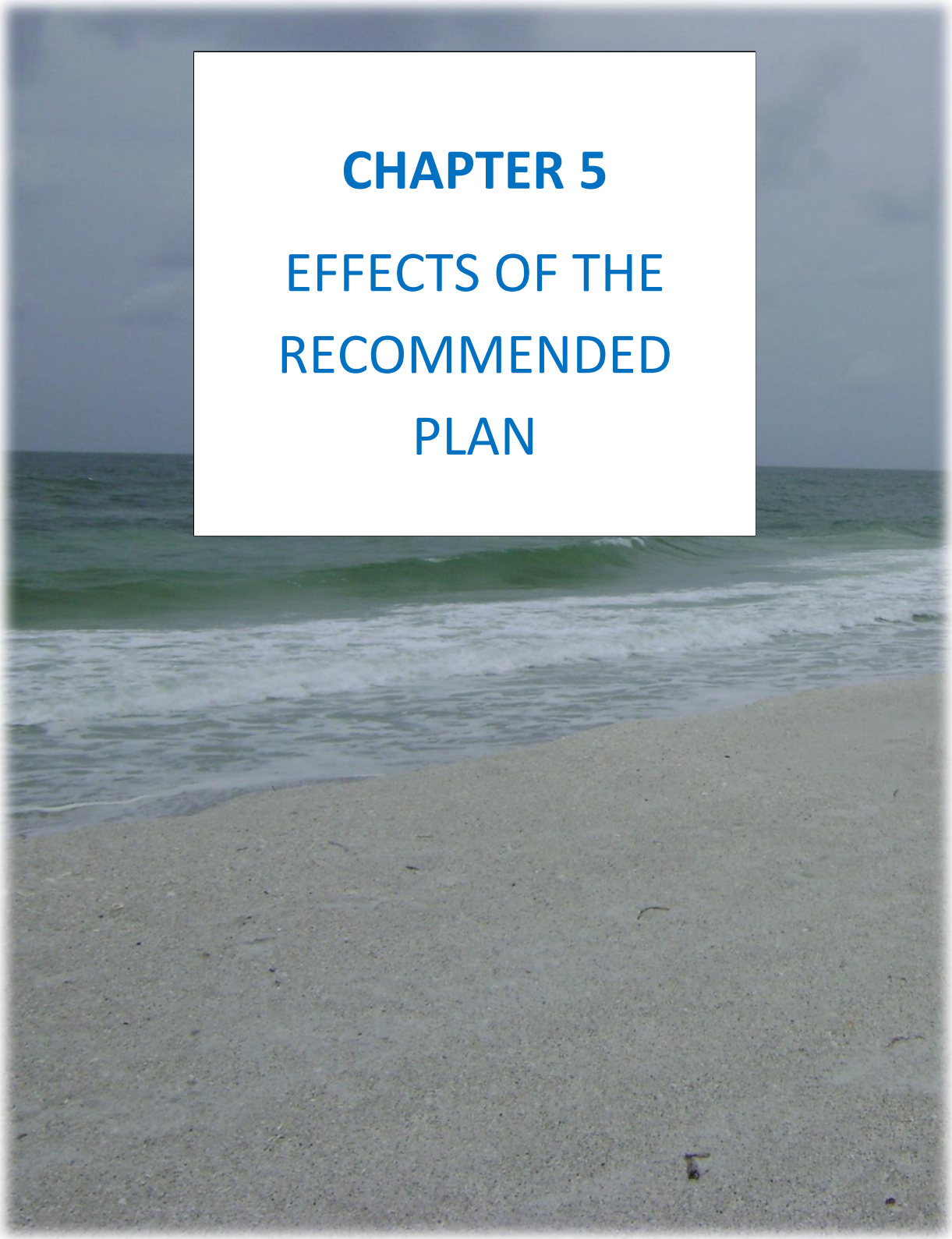

CHAPTER 5

EFFECTS OF THE RECOMMENDED PLAN

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5 EFFECTS OF THE RECOMMENDED PLAN

5.1 PHYSICAL ENVIRONMENT

5.1.1 GEOLOGY

FUTURE WITH-PROJECT CONDITIONS

The effects of the recommended plan includes effects resulting from the use of the offshore sand source identified in Section 4.1.3. The offshore borrow area for the renourishment project is located approximately 1.85 miles southwest of the southern end of Gasparilla Island, in pre-dredging water depths of about -10 feet, NAVD88. The maximum permitted excavation limits in the borrow area used for past nourishment in 2013 were -25.2 feet, NAVD88. The dimensions of the permitted borrow area are approximately 1,200 feet (north-south) by 5,800 feet (east-west).

In general, the borrow area used for the 2013 beach renourishment is performing well due to the in-filling of material observed during the most recent monitoring period; the cumulative change in borrow area volume since the pre-construction monitoring survey (May 2013) is shown in Figure 5-1. In conclusion, as the borrow area, sand source, is in a shoal, it will naturally refill/recharge over time due to longshore transport after sand is removed. The presently permitted sand source contains 1.3 million cubic yards. The sand source can more than support a nourishment event; furthermore, if a nourishment even was followed by a storm event which removed all of the material placed, the project could be completed twice in the same year. Since the sand source recharges, i.e., fills back in after sand is taken, there are no concerns about future sand availability.

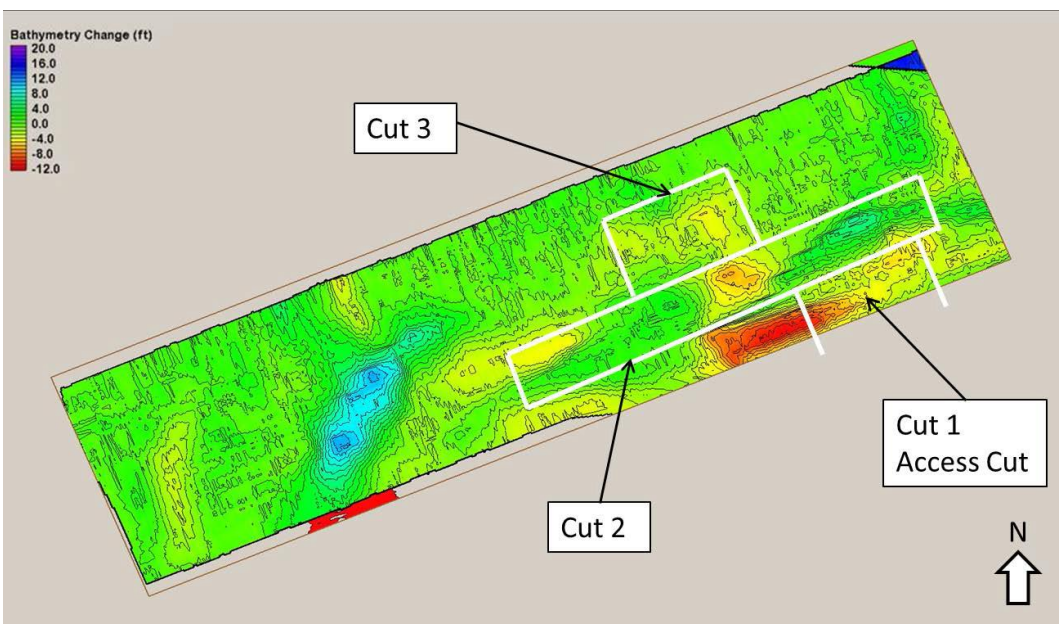

Figure 5-1: Borrow Area Pre-Construction (May 2013) to May 2016 Bathymetry Change

5.2 NATURAL ENVIRONMENT

Section 2.4 provides information on existing conditions and the Future Without-Project Conditions. Table 3.2 provides a summary of direct and indirect effects of the final array of alternatives.

5.2.1 GENERAL ENVIRONMENTAL SETTING

FUTURE WITH-PROJECT CONDITIONS

In accordance with prior Federal authorization and state permits, both USACE and the non-Federal sponsor have previously placed beach quality material from the designated offshore borrow site along this shoreline. The Future With-Project would be consistent with the authorized project template. The proposed design includes no expansion or increase in volume that would impact hardground outside of the approved project's equilibrium toe of fill. The proposed beach fill template for the design and advance nourishment placement remains identical to that in the authorized project. Based on the equilibrated profile determination and the equivalence of sand grain size characteristics proposed for placement and those previously placed, the present project should have no additional impact on hardground resources lying within the equilibrium toe of fill. Previous projects have provided mitigation for all such affected resources.

The beneficial effects of continued sand nourishment along the proposed project area include establishing a larger buffer beach to protect upland infrastructure and populations against storms and flooding. Sand nourishment also creates additional habitat for beach flora and fauna, as well as more space for recreational activities.

The proposed project would likely produce more favorable environmental conditions than exist at present, although construction operations would produce some temporary adverse effects. These effects would be primarily temporary in nature, and most affected resources would return to pre-construction conditions either immediately after dredging, with respect to resources such as aesthetics and noise, or within one or two years, with respect to sea turtle nesting and benthic resources.

The authorized footprint impacts properties landward of the ECL on one public parcels, referred to as Gasparilla State Park and is open to the general public. The State provided the NFS permission to operate the property as part of the project. The Park is located at FDEP monument R-25 along the shoreline. The Lee County, non-Federal sponsor, will certify a temporary work area easement to the United States for construction purposes in the Park. Additional information regarding these parcels can be found in maps provided in the Real Estate Appendix (E). Effects to using the State Park or vacant Lots are described in the following sections:

5.2.2 Vegetation
5.2.3 Fish and Wildlife Resources
5.2.13 Cultural Resource

5.2.2 VEGETATION

FUTURE WITH-PROJECT CONDITIONS

The proposed project may result in minimal short-term impacts to the vegetation that covers the existing dunes in areas where the fill will join with the existing dune face. The proposed nourishment project will temporarily stabilize the beach and dune vegetative communities and prevent further erosion-related losses. The beach fill will furnish additional material to existing dune vegetation so the plants can collect and bind wind-blown and storm-driven sand into dune formations.

There are no anticipated impacts to vegetation. If there are inadvertent impact during construction, then the plant community could be reestablished by planting a mix of native dune species that, depending on nursery availability, may include sea oats (Uniola paniculata), beach sunflower (Helianthus debilis), and railroad vine (Ipomoea pes-caprae). Seeding should occur during the spring months (April through June).

No effects of using the State Park or vacant lots are expected.

5.2.3 FISH AND WILDLIFE RESOURCES (OTHER THAN THREATENED/ENDANGERED SPECIES)

FUTURE WITH-PROJECT CONDITIONS

The proposed project would temporarily impact fish and wildlife species that use the project area. Species with sufficient motility would avoid the project area during construction and return after completion of construction activities. Dredging and beach placement of sand would disrupt organisms living in the dredged sediments and bury those organisms at the beach placement site.

Other potential impacts to fish and wildlife from beach restoration may include:

- Alteration (burial) of exposed nearshore hardbottom and associated epibenthos during and subsequent to nourishment activities. Epibenthos are flora and fauna living on the bottom of the ocean floor.
- Disturbance of the sand bottom habitats and associated macroinfauna of the shoal borrow area and beach fill sites during nourishment activities.
- Turbidity.
- Underwater noise and vibration from dredging activities.
- Construction activities at the beach placement area.

ALTERATION (BURIAL) OF EXPOSED NEARSHORE HARDBOTTOM

Approximately 0.9 acres of exposed nearshore hardbottom habitat within the study area was impacted by prior sand placement activities. The non-federal sponsor provided mitigation to offset these impacts, see section 2.4.5.1. The Future With-Project should have no additional impact on hardground resources lying within the equilibrium toe of fill, and, therefore, would not be mitigated.

DISTURBANCE OF SAND BOTTOM HABITATS

Dredging activities within the shoal borrow area and beach fill sites would continue to impact the demersal and pelagic fish species, macrofaunal invertebrates, and infaunal benthic invertebrates. The potential disturbances to the sand bottom habitats include anchoring of the hopper barge during pump out activities, vibrations caused from the pump out activities, and placement of the pump out and conveyance pipes. Injuries to infaunal invertebrates and any motile macrobenthic invertebrate species would most likely occur during entrainment as part of the dredging and sand pumping operations. Some benthic infaunal invertebrates would survive and recolonize parts of the submerged beach fill area, but any exposed on the new beach berm are not anticipated to survive nourishment activity. Infaunal invertebrates are animals lacking a backbone living in the sediments of the ocean floor.

Greene (2002) summarized a number of studies of benthic invertebrate recovery rates. These studies show that benthic invertebrate communities' recovery can occur in as few as two weeks but often with an assemblage dissimilar to the preconstruction infaunal community composition. Recovery of organisms in soft-sediments typically occurs through larval transport and post-settlement life-stages, juveniles and adults, and varies with the season, habitat, and the species' life history characteristics. Active dredging operations during project activities would displace motile macrobenthic invertebrates and especially demersal and pelagic fish species that use the soft bottom habitats, such as shoal and beach fill areas, unless these groups avoid the dredging areas. Dredging activities would restrict motile macrobenthic invertebrates and demersal/pelagic fishes from feeding on the infauna and flora living in and on the soft bottom habitat.

Numerous studies have examined the impacts to the infaunal communities of borrow areas including, but not limited to, Turbeville and Marsh (1982), Byrnes et al. (2003), Hammer et al. (2005), Byrnes et al. (2004), and Burlas et al. (2001, 2002). Those studies determined that the community composition, diversity, and abundance recovered to pre-dredge condition within two years.

Wilber and Stern (1992) found that while borrow sites may remain in an early successional stage for two to three years, within those years the sites they considered still developed infaunal biomass that provided a food source for fish and macrocrustaceans. In addition, Turbeville and Marsh (1982) examined an offshore dredging operation off Hillsboro Beach in 1972. They determined that although the faunal similarity analysis indicated a qualitative change in the fauna of the borrow area had occurred, the change was not detrimental. They concluded that the offshore dredging operations conducted caused no observable adverse effects in terms of reduced numbers of species, reduced faunal abundance, or reduced species diversity within the borrow area.

The temporal duration of construction would be short. Technical literature suggests that soft bottom infaunal invertebrate assemblages typically recover relatively rapidly; two to three years. While recovery of the infaunal invertebrate assemblage takes place, feeding opportunities would be present in the surrounding areas.

No effects of using the State Park or vacant lots are expected.

TURBIDITY

Several activities during construction are anticipated to affect water quality. The main source of water quality impacts — borrow area dredging and sand placement on the beach face — would produce turbidity at the borrow site and along the shoreline. Even if it does not kill fish, turbidity has been shown to have negative impacts during extreme natural events (Robins 1957). The nearshore hardbottom fish assemblages would most likely avoid any extreme turbidity conditions. Impacts may occur to fishes in planktonic stages of development and to some juveniles related to turbidity. However, past offshore dredging efforts by USACE, while monitored closely, have not produced visible kills of juvenile fishes. Most fishes able to do so would likely avoid the area until the water quality returns to acceptable levels.

Mobile species would move out of the dredge area during dredging activities due to the short-term disruption to the area from the construction activities. Once dredging ceases, the mobile species are anticipated to return to the area and, based on the geotechnical data, are not expected to experience more turbidity after dredging than prior to dredging.

Implementation of proper design and Best Management Practice (BMP) could reduce the magnitude and extent of impact resulting from proposed project activities, which would likely be limited in extent and short in duration.

UNDERWATER NOISE AND VIBRATION FROM DREDGING ACTIVITIES

Noise generated by dredges is low frequency in nature. This low frequency noise tends to carry long distances in the water, but is attenuated the further away from the source. Reported source levels for dredging operations range from 160 to 180 dB re 1 uPa @ 1 m for 1/3 octave bands with peak intensity between 50 and 500 Hz (Greene and Moore 1995). The intensity, periodicity, and spectra of emitted sounds differ greatly among dredge types. In general, the expected short-term sources and levels of underwater noise and vibration generated during a dredging project such as proposed should cause only negligible impacts on marine mammals, fish, and other wildlife present in the project area. Wildlife that may visit the project area during the construction period are likely to move from or avoid disturbance caused by construction activities.

CONSTRUCTION ACTIVITIES AT THE BEACH PLACEMENT AREA

In general, the sources and noise generated during the project construction activities would include temporary sources of noise and could result in short-term, minor, adverse effects to shorebirds and seabirds in the vicinity of both the beach fill and borrow area sites. Shorebirds and seabirds that may visit the project area during the construction period are likely to move from or avoid disturbance caused by construction activities. USACE will include its standard migratory bird protection requirements in the project plans and specifications and will require the contractor to abide by those requirements. Renourishment activities at the beach placement site will be monitored at dawn or dusk daily during the nesting season to protect nesting migratory birds. If nesting activities occur within the construction area,

appropriate buffers will be placed around nests to ensure their protection. Noise generated during the project construction activities would also result in short-term, minor disturbance to the common land mammals in the area, such as raccoon and nine-banded armadillo.

No effects of using the State Park or vacant lots are expected.

LAND MAMMALS

Common land mammals that may occur within the dune system or beach placement area include raccoon (Procyon lotor) and nine-banded armadillo (Dasypus novemcinctus)
(Lee County 2017 http://www.leegov.com/conservation2020/landmanagement/wildlife). These land mammals would be temporarily disturbed by construction activities. These species are expected to resume normal activities once construction is complete.

5.2.4 THREATENED AND ENDANGERED SPECIES

FUTURE WITH-PROJECT CONDITIONS

USACE has determined that the Future With-Project conditions may affect nesting sea turtles. Also, the plan may affect, but is not likely to adversely affect, sea turtles in the water, manatees (or manatee designated critical habitat), smalltooth sawfish (or sawfish designated critical habitat), piping plover, or the rufa red knot. The terms and conditions of the 2003 National Marine Fisheries Service (NMFS) Gulf Regional Biological Opinion (GRBO) and related coordination, which applies to sea turtles in the water and smalltooth sawfish, the 2015 U.S. Fish and Wildlife Service (USFWS) Statewide Programmatic Biological Opinion (PBO), which applies to nesting sea turtles and the manatee, and the 2013 Programmatic Piping Plover Biological Opinion (P3BO) will be followed for these species. The USACE will coordinate with the USFWS on the proposed work pursuant to the PBO and P3BO, and on the red knot. In accordance with the GRBO, no additional coordination with the NMFS is required. The USACE final determination relative to project impacts, as well as the need for protective and mitigation measures, is subject to review by and coordination with USFWS. The GRBO and the P3BO can be reviewed at the following link:

http://www.saj.usace.army.mil/About/Divisions-Offices/Planning/Environmental-Branch/Environmental-Documents/

5.2.4.1 SEA TURTLE NESTING HABITAT

Of the threatened and endangered species found in coastal Lee County, nourishment activities are more likely to impact sea turtles, simply by their ubiquity during nesting season. Escarpments obstructing beach accessibility, altered beach profiles, different sand color characteristics, and increased sand compaction often hinder nesting success the first year after nourishment (USFWS, 2015). Impacts of a nourishment project on sea turtle nesting habitat are typically short-term because natural processes rework a nourished beach in subsequent years. Constant wave and current action reworks the beach, and reduces sand compaction and the frequency of escarpment formation while the sun bleaches darker sand (USFWS 2015).

In summary, within a year following the project construction impacts to sea turtles associated with the project may include:

- Disturbance of nesting female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities
- Behavior modification of nesting females from beach escarpment formation during a nesting season. Example: Behavioral changes could result in false crawls or selection of marginal or unsuitable nesting areas to deposit eggs.
- Destruction, damage, or burial of existing nests during nourishment activities.
- Effects to eggs and hatchlings from changes in the physical and chemical characteristics of the nourished beach. Example: The quality of the placed sand could affect the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest.
- Lighting-induced disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water.
- Alteration (burial) of nearshore exposed hard substrate (feeding grounds to sea turtle juveniles) during and subsequent to nourishment activities.

USFWS biological opinions for similar projects recognize that placement of sand on a critically eroded beach can enhance sea turtle nesting habitat especially if it reduces the chance of additional beach armoring. Also, placed sand must be highly compatible (i.e., grain size, shape, color, etc.) with naturally occurring beach sediments at the recipient site, and compaction and escarpment remediation measures are properly adopted (USFWS 2015). Federal and State requirements for beach nourishment projects usually address avoidance and minimization of potential impacts to nesting turtles and nesting habitat. Conditions may include consideration of:

- Sand quality: a major component of the beach nourishment permitting process is to assure the sand placed on the beach is compatible with the natural beach.
- Timing of construction activities: USFWS has jurisdiction over sea turtles (nesting adults, incubating eggs, and hatching young) on the beach. In Lee County, USFWS requires that the beach placement area be monitored from April 15 through September 19 for sea turtle nesting activity, and nests relocated when necessary. If projects require nighttime construction activities, the USFWS would restrict nighttime construction to specific areas, usually no more than 500 feet in length.
- Pre-nesting season compaction monitoring, mechanical tilling, and grading of the beach: these activities can greatly reduce or eliminate the effects of increased sand compaction and scarp formation. Post-construction compaction monitoring or tilling before nesting season is a state and federal permit requirement after nourishment activities, and for three years after project

completion. State and Federal agencies require tilling the project area beaches if penetrometer testing demonstrates compaction in excess of 500 pounds per square inch at any two adjacent sampling stations or depths. Additionally, leveling of escarpments greater than 18 inches in height and 100 feet in length must occur before nesting season begins.

Because the proposed project would use sand with characteristics very similar to the native beach sand, sand quality is unlikely to have negative effects on sea turtle nesting or hatchling emergence. However, the Future With-Project may still have negative effects on nesting sea turtles resulting from construction-related impacts during and after construction. These impacts could include nesting disturbance, sand compaction, scarp formation, and artificial lighting.

5.2.4.2 INNER SHELF SEA TURTLE HABITAT

Effects associated with the plan including offshore dredging that could potentially affect sea turtles include:

- Vessel traffic
- Entrainment by hopper dredge drag heads
- Alteration (burial) of exposed nearshore hardbottom and associated epibenthos during and subsequent to nourishment activities
- Alteration of exposed nearshore hardbottom and associated epibenthos resulting from the sand delivery pipelines
- Turbidity
- Underwater noise and vibration from dredging activities

<u>VESSEL TRAFFIC</u>

Dredge, dredge support, and construction vessel traffic raises a chance of these vessels colliding with sea turtles. The risk would vary depending upon location, vessel speed, and visibility. Most sea turtles occur within nearshore waters off Lee County and waters of the continental shelf. All life stages (hatchling, juvenile or sub-adult, and adult) may occur within the project area. During the hatching season, researchers believe that hatchling turtles leave their nesting beaches and swim offshore to areas of mass convergence. A moving vessel could have difficulty spotting hatchling and juvenile turtles in these areas, especially when the individuals lie within patches of floating *Sargassum*. Adult turtles are generally visible at the surface during periods of daylight and clear visibility.

To reduce the risk of impacts from dredging and vessel strikes, the project would comply with the “Sea Turtle and Smalltooth Sawfish Construction Conditions” (NMFS 2006b) and “Vessel Strike Avoidance Measures and Reporting for Mariners” issued by NOAA Fisheries, Southeast Region. Operators and crews receive instructions to maintain a vigilant lookout for turtles during offshore transits and maneuvers.

Despite these precautions, turtles could prove very difficult to spot from a moving vessel when resting below the water surface, during nighttime, and during periods of inclement weather. A collision between a sea turtle and a slow moving vessel may occur. Adult, subadult, and perhaps juvenile turtles are often capable of avoiding moving dredge related vessels when these vessels operate within limited areas at slow to relatively slow speeds.

ENTRAINMENT BY HOPPER DREDGE DRAG HEADS

Entrainment within hopper dredge drag heads could injure or kill sea turtles, particularly within areas of soft sediment in ship channels where turtles are known to bury themselves partially when resting (National Research Council Committee on Sea Turtle Conservation 1990). Sea turtles have also been observed to partially bury themselves in soft sediments that have settled into previous dredge borrow pits (Michals 1997p; Keith Spring and David Snyder, personal communication: observations of sea turtles using borrow pits off Hobe Sound, Florida). Numerous methods have been implemented to reduce the number of turtle takes during hopper dredge operations, including special turtle deflecting hopper dredge drag heads, relocation trawling, dredging windows, and the implementation of trained protected species observers during dredging operations (http://el.erdc.usace. army.mil/tessp/pdfs/ 1997SADBO.pdf).

The numerous areas of emergent hard substrate in the general project area represent high quality shelter for turtles. The proposed offshore borrow area presents a lower quality refuge, as it is an area of bare sand, proximal to hardbottom habitat.

NMFS-approved protected species observers would be stationed on hopper dredges, which would come equipped with a sea turtle deflecting drag head deflector within the proposed borrow site (http://el.erdc.usace.army.mil/seaturtles/docs/observercriteria.pdf) during all dredging operations. Even with these measures in place, incidental take(s) of sea turtles during dredging remains a possibility.

ALTERATION (BURIAL) OF EXPOSED NEARSHORE HARDBOTTOM

Approximately 0.9 acres of exposed nearshore hardbottom habitat within the study area was impacted by prior sand placement activities. The non-Federal sponsor provided mitigation to offset these impacts, see section 2.4.5.1. The Future With-Project should have no additional impact on hardground resources lying within the equilibrium toe of fill, and, therefore, would not be mitigated.

TURBIDITY

Several activities during construction would affect water quality. Dredging and sand placement on the beach face would produce turbidity at the borrow site and along the shoreline. The limited extent and short duration of the reduced water clarity and implementation of proper design and Best Management Practices (BMPs) should reduce the magnitude and extent of temporary impacts of project activities. Turbidity generation would cease at the completion of construction. The Environmental Commitments in Section 6.4 describes the turbidity BMPs.

UNDERWATER NOISE AND VIBRATION FROM DREDGING ACTIVITIES

Reported source levels for dredging operations range from 160 to 180 dB re 1 uPa @ 1 m for 1/3 octave bands with peak intensity between 50 and 500 Hz (Greene and Moore 1995). The intensity, periodicity, and spectra of emitted sounds differ greatly among dredge types. Components of underwater sounds produced by each type are influenced by a host of factors including substrate type, geomorphology of the waterway, site-specific hydrodynamic conditions, equipment maintenance status, and skill of the dredge plant operator (Dickerson et al. 2001).

Little is known how turtles may respond to noise from offshore activities. In contrast to marine mammals, relatively little is known about sea turtles' hearing ability or their dependency on sound, passive or active, for survival cues. Only two species, loggerhead and green sea turtles, have undergone any auditory investigations. The anatomy of the sea turtle ear does not lend itself to aerial conduction; rather, it lends itself to sound conduction through bone and water (Békésy 1948, Lenhardt 1982, Lenhardt and Harkins 1983). Auditory testing and behavioral studies show that turtles can detect low frequency sounds (Ridgway et al. 1969, Bartol et al. 1999).

Sea turtles could likely hear low frequency underwater noise from construction activities and possibly experience some disturbance. The main noise sources include vessel engines. The most likely impacts would include short-term behavioral changes such as evasive maneuvers, disruption of activities, or short-term departure from the area.

5.2.4.3 MARINE MAMMALS

Effects associated with the proposed action that could potentially affect listed marine mammals include:

- Vessel traffic
- Turbidity
- Underwater noise and vibration from dredging activities

VESSEL TRAFFIC

Dredge, dredge support, and construction vessel traffic associated with the proposed action raises the chance these vessels could collide with listed marine mammals. The risk would vary depending upon location, vessel speed, and visibility. Florida manatees may occur within the project area. On-board trained and NMFS approved protected species observers would be stationed on dredges during all dredging operations, and dredge support vessel operators and crews would receive instructions to maintain a constant lookout for marine mammals during transits and maneuvers.

Despite these precautions, marine mammals could prove very difficult to spot from a moving vessel when they are resting below the water surface, during nighttime, and during periods of inclement weather. However, these animals are capable of avoiding moving dredge-related vessels, especially when these vessels operate within limited areas at slow to relatively slow speeds.

TURBIDITY

Several activities during construction would affect water quality. Turbidity created by borrow area dredging and sand placement on the beach face represents the primary source of water quality impacts at the borrow site and along the shoreline. Proper implementation of the approved design and construction BMPs should prove effective in reducing the magnitude and extent of impacts resulting from project activities. Turbidity generation would cease at the completion of construction. Due to the limited extent and short duration of reduced water clarity, potential project impacts on marine mammals should be negligible.

UNDERWATER NOISE AND VIBRATION FROM DREDGING ACTIVITIES

Potential effects of the elevated background noise levels caused by operator-generated noise to marine mammals include the following:

- Limiting the detection by the mammals of natural sounds
- Disturbing their normal behavior, resulting in possible displacement from areas
- Causing temporary or permanent reductions in hearing sensitivity

The potential effects depend on the type of marine mammal involved because different marine mammals hear at different frequencies. The levels and types of ambient noise also strongly influence the potential area or zone of influence of an operator-generated sound. An animal's sensitivity to different sounds varies with frequency, and its response to a sound likely depends strongly on the presence and levels of sound in the frequency band or range of frequencies to which it is sensitive (Ports Corporation of Queensland 2005). Although underwater noise can affect marine mammals (Richardson et al. 1995), the project does not involve any high energy sound sources that could cause temporary or permanent auditory damage. In general, the sources and levels of underwater noise and vibration generated during the project should cause only minor impacts on marine mammals. The most likely impacts are temporary behavioral responses such as avoidance or altered diving or swimming behavior.

Manatees have been observed along the coast in the shallow, nearshore waters. Marine mammals would likely avoid areas where a dredge is operating. The project area is an extremely small area when compared to the overall waters used for migration and calving. Standard protective measures would be taken during placement activities to ensure the safety of manatees and other marine mammals. The manatee environmental commitments are located in Section 6.4 of the report.

5.2.4.4 SMALLTOOTH SAWFISH

FUTURE WITH-PROJECT CONDITIONS

Effects associated with the proposed action that may potentially impact smalltooth sawfish include:

- Turbidity

- Underwater noise and vibration from dredging activities
- Entrainment by hopper dredge drag heads

TURBIDITY

Several activities during construction could affect water quality. The main sources of water quality impacts are borrow area dredging and sand placement on the beach face, which would produce turbidity at the borrow site and along the shore. Turbidity could cause temporary impacts to about one acre of hardbottom habitat. Proper implementation of the approved design and construction BMPs should limit the level and extent of construction-related turbidity. Turbidity generation would cease at the completion of construction. Due to the limited extent and short duration of the reduced water clarity, any potential impacts on smalltooth sawfish should be negligible.

UNDERWATER NOISE AND VIBRATION FROM DREDGING ACTIVITIES

In general, the sources and short-term levels of underwater noise and vibration generated during the project should cause only negligible impacts on smalltooth sawfish. Smalltooth sawfish that may visit the project area during the construction period are likely to move from or avoid disturbance caused by construction activities. These temporary avoidance behaviors should cause negligible impacts on smalltooth sawfish.

ENTRAINMENT BY HOPPER DREDGE DRAG HEADS

The smalltooth sawfish normally inhabits shallow waters (10 m or fewer) often near river mouths or in estuarine lagoons over sandy or muddy substrates, but may also occur in deeper waters of the continental shelf at depths greater than 20 meters (NMFS 2006a). Sawfish encounter a small risk of being entrained in the hopper dredge drag head as it extracts sand from the borrow area. To reduce the risk of impacts from dredging and vessel strikes, the project would comply with the “Sea Turtle and Smalltooth Sawfish Construction Conditions” (NOAA Fisheries 2006). Mitigation measures would minimize entrainment risks. Measures would include the use of sea turtle deflecting drag head deflector, which would also help deflect smalltooth sawfish.

Disturbances from ongoing activities could displace smalltooth sawfish that may visit the project area during the construction period. These disturbances could result in temporary movement or avoidance of the area, but the species would likely return when the temporary disturbance ended.

5.2.4.5 PIPING PLOVER AND RED KNOT

FUTURE WITH-PROJECT CONDITIONS

While coastal development has reduced important beach habitat for wintering bird species, beach nourishment can restore beach habitat for many shore birds. However, during the beach renourishment construction phase, some short-term displacement of foraging and resting birds, including piping plovers

and red knots, could occur. During construction activities, displaced species may use habitats with similar characteristics north and south of the project area.

Beach nourishment activities are more likely to affect birds that use the beach for nesting and breeding than birds that use the area for feeding and resting during migration (Greene 2002). Dredges, pipelines, and other equipment along the beach could displace piping plovers, or could cause them to avoid foraging along the shore if they are aurally affected (Peterson et al. 2000). If the sand placed on the beach is too coarse or high in shell content, it can inhibit the birds' ability to extract food particles from the sand (Greene 2002). Fine sediment that reduces water clarity can also decrease the feeding efficiency of birds (Peterson et al. 2000).

Minimal direct impacts to plovers and knots should occur from project construction because motile birds can avoid construction activities. The disposal of sand on the beach may temporarily interrupt foraging and resting activities of shorebirds that use the project beach area. This limited interruption would occur on the immediate area of disposal and last for the duration of construction. A temporary reduction to the prey base for many shorebirds, which includes benthic organisms, would also occur in the project area.

The proposed project may affect, but is not likely to adversely affect the piping plover and rufa red knot. This determination is based on coordination with the non-Federal sponsor and Gasparilla Island State Park. Surveys conducted by State park biologists indicate that neither species has been recorded; however, it is possible that these species may occasionally utilize the beach placement area. The Corps will implement the Conservation Measures listed within the Programmatic Piping Plover Biological Opinion issued by the U.S. Fish and Wildlife Service.

5.2.5 ESSENTIAL FISH HABITAT (EFH)

FUTURE WITH-PROJECT CONDITIONS

Effects associated with the plan that could potentially affect EFH include:

- Alteration (burial) of exposed nearshore hardbottom and associated epibenthos during and subsequent to nourishment activities
- Disturbance of the sand bottom habitats and associated macroinfauna of the shoal borrow area and beach fill sites during nourishment activities
- Modification of the Shoal (Borrow Area)
- Turbidity

ALTERATION (BURIAL) OF EXPOSED NEARSHORE HARDBOTTOM

Approximately 0.9 acres of exposed nearshore hardbottom habitat within the study area was impacted by prior sand placement activities. The non-Federal sponsor provided mitigation to offset these impacts,

see section 2.4.5.1. The Future With-Project should have no additional impact on hardground resources lying within the equilibrium toe of fill, and, therefore, would not be mitigated.

DISTURBANCE OF THE SAND BOTTOM HABITATS

Members of the penaeid shrimp EFH management group use soft bottom habitats contiguous with the surf zone and nearshore hardbottom as forage or shelter habitats. Spiny lobsters use soft bottom habitats contiguous with the nearshore hardbottom as foraging areas. The potential disturbances to the sand bottom habitats include anchoring of the hopper barge during pump out activities, vibrations caused from the pump out activities, and placement of the pump out and conveyance pipes.

MODIFICATION OF THE SHOAL (BORROW AREA)

The plan would continue to alter the local bathymetric profile in the borrow area. Sand shoals include EFH for coastal pelagic species and some highly migratory species, particularly coastal sharks. In addition, offshore sand shoal habitats have been shown to provide fundamental ecological functions for demersal/pelagic fish species and motile macrobenthic invertebrates that include categories of spawning, shelter, or foraging (CSA International et al. 2009). These shoal habitats also function as aggregation areas for small pelagic fishes, important prey for the coastal pelagic fish, dolphin and wahoo, and highly migratory species groups.

Removal of or modification of the shoal feature could impact the EFH for multiple Gulf of Mexico Fishery Management Council (GMFMC) managed species groups that use this feature. The proposed dredging action could conceivably alter the shoal structure and change the fundamental ecological processes within and near this feature. Dibajnia and Nairn (2010) summarized field investigations and modeling studies intended to recommend offshore dredging guidelines to protect and maintain the integrity of ridge and shoal found on the Outer Continental Shelf (OCS). They found that for shoals fewer than 30 meters deep, the shoal they studied reformed itself with the remaining (smaller) volume. They concluded, “There was no indication that there exists a critical threshold for dredging that once crossed, ridge and shoal features may deflate, losing their morphologic integrity.” Additionally, since this is an ebb shoal borrow area, as opposed to a high profile off-shore high relief shoal, no mitigation measures are proposed.

With the appropriate management of dredging operations, impacts of routine dredging operations could be avoided and minimized using best management practices. BMPs would include maintaining a refuge patch in the shoal’s dredging profile design and not excavating below the surrounding area to help minimize shoal impacts. The dredging design avoids and preserves the highest areas of the shoal, as recommended by Diaz et al. (2003) and CSA International et al. (2009a) to retain refuge areas for shoal fauna. The implementation of this mitigative approach to dredging would reduce the potential effects to the demersal/pelagic fish assemblages. In addition, borrow pits are known to attract numerous fishes and have also been known to provide resting places for sea turtles (Spring, K. and D. Snyder, CSA International, personal observations).

In addition, numerous studies have examined the impacts to the infaunal communities of borrow areas including (but not limited to) Turbeville and Marsh (1982), Byrnes et al. (2003), Hammer et al (2005),

Byrnes et al. (2004), and Burlas et al. (2001). Those studies determined that the community composition, diversity, and abundance recovered to pre-dredge conditions within two years.

Wilber and Stern (1992) found that while borrow sites may remain in an early successional stage for two to three years, within those years the sites they considered still developed infaunal biomass that provided a food source for fish and macrocrustaceans. In addition, Turbeville and Marsh (1982) examined an offshore dredging operation off Hillsboro Beach in 1972. They determined that although the faunal similarity analysis indicated that a qualitative change in the fauna of the borrow area had occurred the change was not detrimental. They concluded that the offshore dredging operations conducted caused no observable adverse effects in terms of reduced numbers of species, reduced faunal abundance, or reduced species diversity within the borrow area.

Dredging activities within the shoal borrow area could also entrain multiple GMFMC managed species groups, both fish and invertebrates, including the penaeid shrimp, and spiny lobster group. Therefore, with the potential to permanently alter the shoal structure and change the fundamental ecological processes of the feature as well as the potential impact from the entrainment of managed species, minor to moderate impact from shoal dredging is expected.

TURBIDITY

Several activities during construction are anticipated to affect water quality. The main source of water quality impacts is borrow area dredging and sand placement within the beach fill sites. These activities would produce increased turbidity levels in both areas. Turbidity has been shown to negatively impact and sometimes cause fish mortality during extreme natural events of increased turbidity (Robins 1957). The nearshore reef fish assemblages would most likely avoid any extreme turbidity conditions. The limited dredge and fill extent and short duration of the reduced water clarity, along with implementation of BMPs and proper design are expected to minimize adverse effects.

5.2.6 COASTAL BARRIER RESOURCES

FUTURE WITH-PROJECT CONDITIONS

As is shown in Figure 5-2, this project area lies entirely within an Otherwise Protected Area (OPA) under the Coastal Barrier Resources Act (CBRA) and therefore, is exempt from federal funding restriction except for flood insurance (Reference Section 2.4.6 of report). In accordance with CBRA, the beach nourishment project benefits migratory birds, fish and wildlife by mimicking, enhancing or restoring a natural stabilization system (CBRA Public Law 97-348 (96 Stat. 1653; 16 U.S.C. 3501 et seq.)). Figure 5-3 presents the location of the project's borrow area and the nearby CBRS and OPA units. Review of these maps confirm the CBRS units (FL-70, P-20), the OPA units (FL-70P, P20P) and the sand source do not overlap.

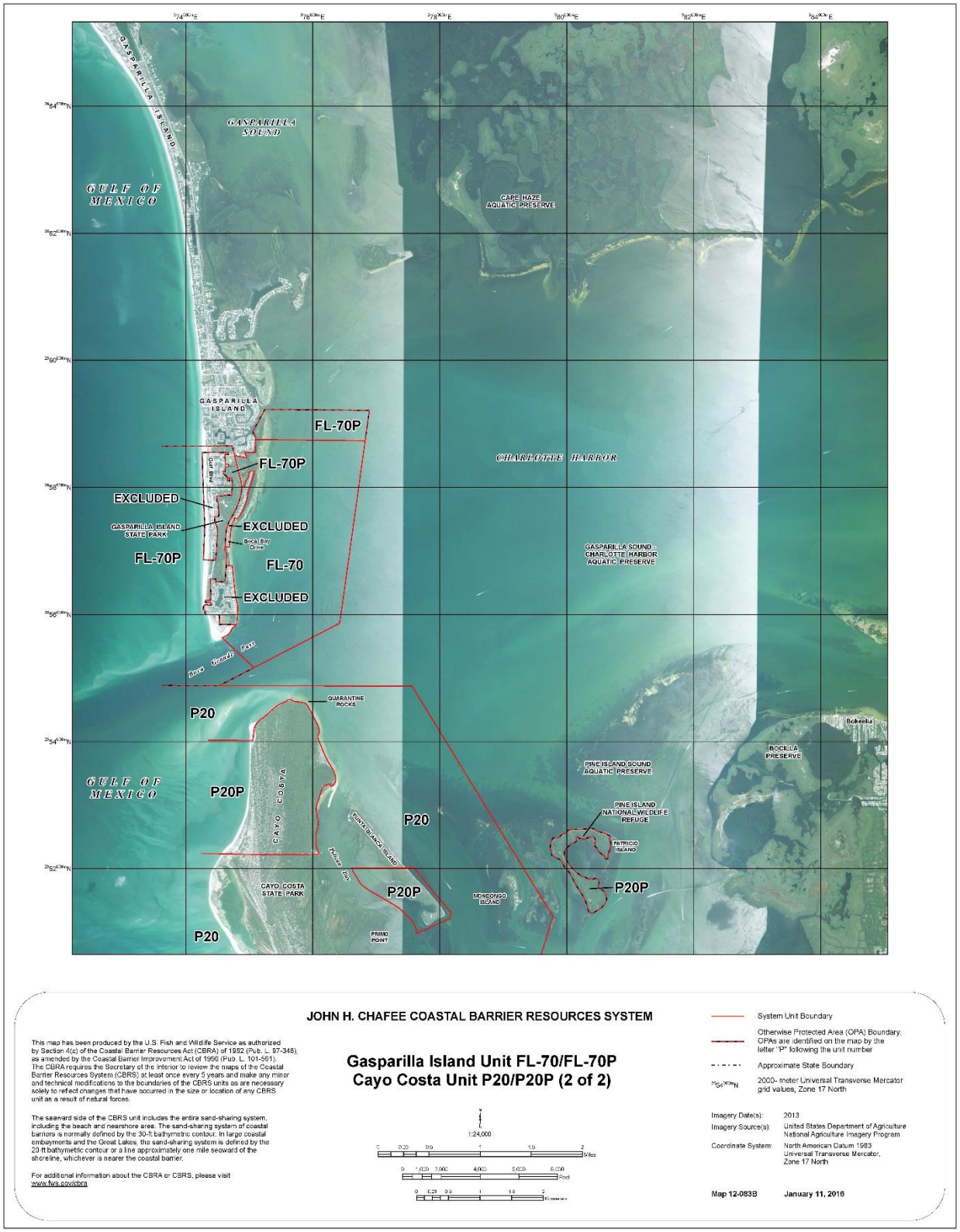

Figure 5-2: Gasparilla Island and Cayo Costa CBRS units

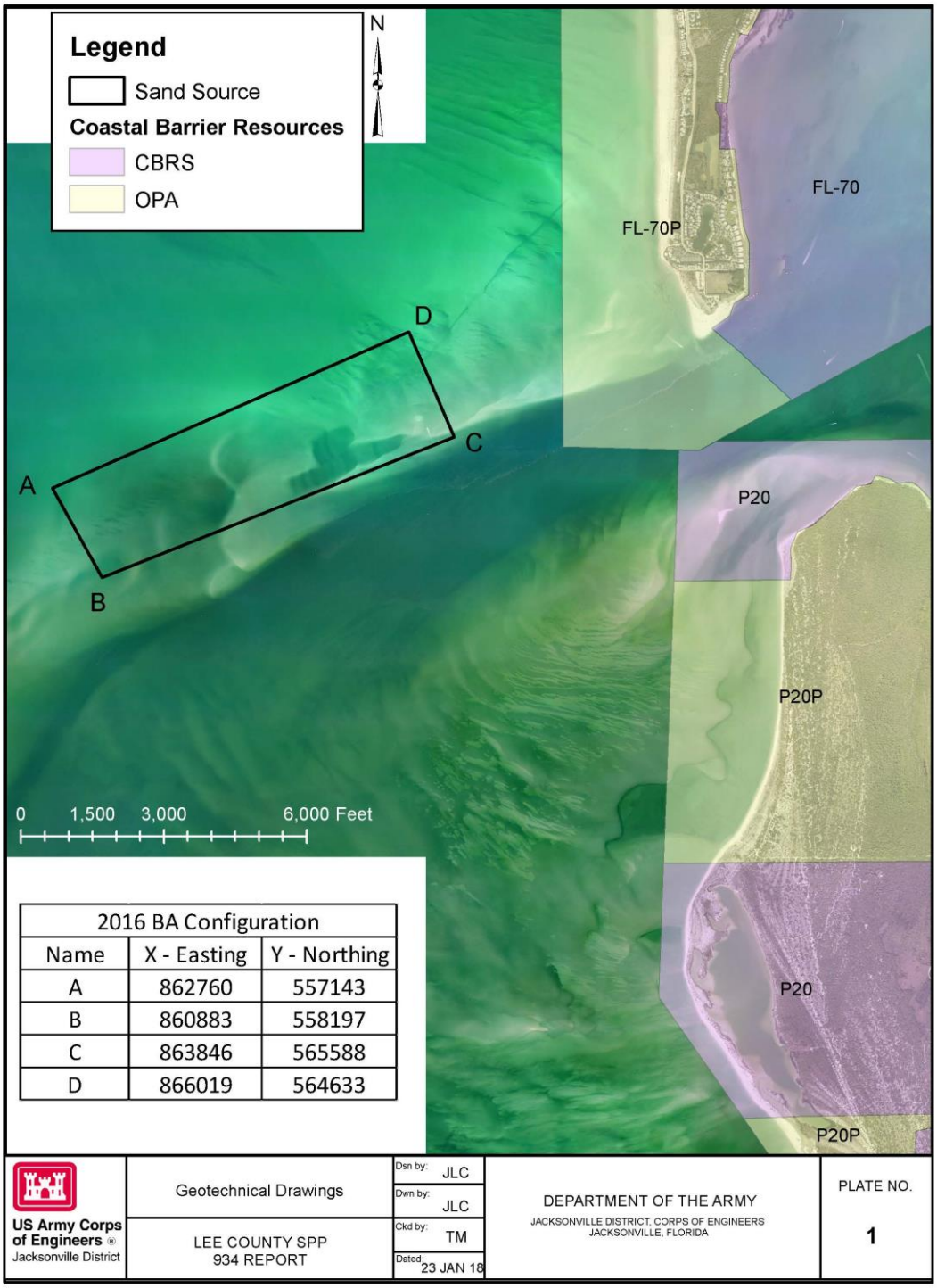

Figure 5-3: Lee County, Gasparilla Island borrow area and CBRS units.

5.2.7 WATER QUALITY

FUTURE WITH-PROJECT CONDITIONS

The proposed action would temporarily impact water quality at the borrow site and in the intertidal swash zone at the sand placement site. Dredging and sand placement activities may temporarily increase turbidity by introducing additional fine material into the water column. The increased fines may increase biological oxygen demand, thus reducing water column oxygen levels. The FDEP rules, however, require the fill material to be very similar to existing beach sand to ensure minimization of turbidity during construction. Dredging and discharges from sand placement may also alter water temperatures in the immediate dredging and sand placement areas.

The FDEP requires intensive monitoring of turbidity at dredging and sand placement locations during project operations. If the monitoring detects turbidity exceeding permitted levels, the construction activity must halt until the contractor takes appropriate steps to reduce the turbidity to acceptable levels and the turbidity returns to those levels. Monitoring results demonstrating project performance are submitted to the FDEP regularly during the construction period. Given the naturally dynamic waters of the Gulf of Mexico, organisms inhabiting the nearshore zone adapt to environmental changes such as moderate increases in turbidity. Fish and other mobile species may temporarily leave the dredging site or surf zone adjacent to the beach placement site if turbidity becomes too great.

5.2.8 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

FUTURE WITH-PROJECT CONDITIONS

The preliminary assessment indicated no evidence of hazardous, toxic or radioactive waste (HTRW) on the project lands. During project construction further HTRW awareness should be practiced. Dredging equipment, staging areas, construction equipment, and other motorized vehicles used during construction have the potential to spill for example, gasoline and lubricating oils. Accident and spill prevention plans provided in contract specifications should help avoid most spills. All motorized vehicles will be maintained and stored offsite the project area and the contractor will take appropriate precautions to avoid accidental spills.

5.2.9 AIR QUALITY

FUTURE WITH-PROJECT CONDITIONS

The proposed project area is in attainment with air quality criteria and would cause minor, temporary effects on air quality because of emissions from the dredge and other construction equipment (http://www.usa.com/boca-grande-fl-air-quality.htm). Ambient sea breezes, prevalent throughout the project area, will help limit these effects. Green House Gas (GHG) emissions would minimally effect global emissions or total United States emissions. This project is in attainment with air quality criteria.

5.2.10 NOISE

FUTURE WITH-PROJECT CONDITIONS

The proposed project would cause a temporary increase in noise, primarily from heavy equipment due to underwater noise and vibration from dredging activities and construction noise.

UNDERWATER NOISE AND VIBRATION FROM DREDGING ACTIVITIES

Dredging noise can affect marine mammals, sea turtles, and fishes. Possible effects of dredging noise can vary depending on a variety of internal and external factors, and can be divided into masking (obscuring of sounds of interest by interfering sounds, generally at similar frequencies), response, discomfort, hearing loss, and injury (MALSF, 2009). Deeper water operations may propagate sound over greater distances than those in confined nearshore areas (Hildebrandt, 2004). In general, the expected short-term sources and levels of underwater noise and vibration generated during a dredging project such as proposed should cause only negligible impacts on marine mammals, fish, and other wildlife present in the project area. Wildlife that may visit the project area during the construction period are likely to move from or avoid disturbance caused by construction activities.

CONSTRUCTION NOISE

In general, the sources and noise generated during the project construction activities would include temporary sources of noise and could result in short-term, minor, adverse effects to shorebirds and seabirds in the vicinity of both the beach fill and borrow area sites. Shorebirds and seabirds that may visit the project area during the construction period are likely to move from or avoid disturbance caused by construction activities.

Dredging to extract sand produces broadband and continuous sound, mainly at lower frequencies. The little available data indicates that dredging is not as noisy as seismic surveys, pile driving, and sonar; however, it is louder than most shipping, operating, offshore wind turbines, and drilling (MALSF, 2009). Noise associated with dredging activities can be placed into five categories:

1. **Collection noise** – The noise generated from the collection of material from the sea-floor; for example, the scraping of the buckets on a bucket ladder dredge or the operation of the drag head. This noise is dependent on the structure of the sea floor and the type of dredge used.
2. **Pump noise** – The noise from the pump driving the suction through the pipe.
3. **Transport noise** – The noise of the material being lifted from the sea floor to the dredge. For trailing suction hopper and cutter suction dredges, this would be the noise of the material as it passes up the suction pipe. For clamshell dredges, it would be the sound of the crane dropping/lifting the bucket.
4. **Deposition noise** – This noise is associated with the placement of the material within the barge or hopper.
5. **Ship/machinery noise** – The noise associated with the dredging ship itself. For stationary dredges, the primary source will be the onboard machinery. Mobile dredges will also have propeller and thruster noise (MALSF, 2009).

Field investigations have been undertaken to characterize underwater sounds typical of bucket, hydraulic cutterhead, and hopper dredging operations (Dickerson et al. 2001). Preliminary findings indicate that cutterhead dredging operations are relatively quiet as compared to other dredging operations in aquatic environments. Hopper dredges produce somewhat more intense sounds similar to those generated by vessels of comparable size. Bucket dredges create a more complex spectrum of sounds, very different than either cutterhead or hopper dredges. Hopper dredge noises consist of a combination of sounds emitted from two relatively continuous sources: engine and propeller noise similar to that of large commercial vessels, and sounds of drag heads moving in contact with the substrate.

Reported source levels for dredging operations range from 160 to 180 dB re 1 uPa @ 1 m for 1/3 octave bands with peak intensity between 50 and 500 Hz (Greene and Moore 1995). The intensity, periodicity, and spectra of emitted sounds differ greatly among dredge types. Components of underwater sounds produced by each type are influenced by a host of factors including substrate type, geomorphology of the waterway, site-specific hydrodynamic conditions, equipment maintenance status, and skill of the dredge plant operator (Dickerson et al. 2001).

Noise generated by the dredge may minimally impact those living near the beaches during project construction, but will likely not be too noticeable over ambient noise of wind and waves. Noise generated on the beaches by equipment placing the dredged material will be relatively low level and will be of a short duration. Construction equipment such as booster pumps will be properly maintained to minimize effects of noise. Once dredging and beach placement have concluded, noise levels will return to normal for the beach area. Since the increases to the current level of noise as a result of this project will be localized and minor, there will only be a temporary impact associated with the project and no expectation of adverse effects to the environment as a result of construction-related noise.

Hopper dredge sounds consist of a combination of sounds emitted from two relatively continuous sources: engine and propeller noise similar to that of large commercial vessels, and sounds of drag heads moving in contact with the substrate (Clarke et al. 2003; Thomsen et al. 2009). Noise levels are not sufficient to cause hearing loss or other auditory damage to marine mammals (Richardson et al. 1995). However, some observations in the vicinity of dredging operations and other industrial activities have documented avoidance behavior while, in other cases, animals seem to develop a tolerance for the industrial noise (Malme et al. 1983; Richardson et al. 1995). The main concern would be that dredging noise could cause avoidance of the dredging area during North Atlantic right whale migrations (Hammer et al. 2005).

UNDERWATER NOISE AND VIBRATION FROM DREDGING ACTIVITIES EFFECTS ON SEA TURTLES

Little is known how turtles may respond to noise from offshore activities. In contrast to marine mammals, relatively little is known about sea turtles' hearing ability or their dependency on sound, passive or active, for survival cues. Only two species, loggerhead and green sea turtles, have undergone any auditory investigations. The anatomy of the sea turtle ear does not lend itself to aerial conduction; rather, it lends itself to sound conduction through bone and water (Békésy 1948, Lenhardt 1982, Lenhardt and Harkins

1983). Auditory testing and behavioral studies show that turtles can detect low frequency sounds (Ridgway et al. 1969, Bartol et al. 1999).

Sea turtles could likely hear low frequency underwater noise from construction activities and possibly experience some disturbance. The main noise sources include vessel engines. The most likely impacts would include short-term behavioral changes such as evasive maneuvers, disruption of activities, or short-term departure from the area.

5.2.11 AESTHETIC RESOURCES

FUTURE WITH-PROJECT CONDITIONS

During construction, aesthetic qualities of the project beach will be minimally diminished with the operation of construction equipment and with construction activities. In the longer term, the renourishment of the beach in accordance with the design considerations will result in significantly improved aesthetic quality after completion of the project. During construction, short-term construction impacts will include turbidity in the immediate vicinity of the dredge and discharge point on the beach, construction equipment on the beach along with their associated audio impacts, pipeline placement on the beach, and fill containment berms. For safety reasons, access to certain parts of the beach will be temporarily restricted. No other adverse impacts to aesthetics are expected from nourishment of the project beach. The placed and the existing beach sand are expected to eventually blend so that the net result will not detract from the long-term aesthetic appearance of the beach.

5.2.12 RECREATION RESOURCES

FUTURE WITH-PROJECT CONDITIONS

Once completed, the project would provide a larger beach for active and passive recreational activities.

For a short time, the construction process would minimally limit surfing opportunities, especially near the dredge discharge point along the beach. The proposed project will not significantly impact recreational fisheries activities except during dredging operations. During construction, there will be minimal short-term construction impacts including turbidity in the immediate vicinity of the dredge. Fishermen will be unable to access the area immediately around the dredge while it remains on site. No other adverse impacts are anticipated.

Ambient sources of noise within the project area are recreational activities (boating and fishing), commercial vessels transiting up and down the coast and natural sounds from the physical and biological environment. Because Gasparilla Island has many seasonal residents and tourists, many more residents are present in the winter months, which results in more boating traffic during the winter tourist season. These sources are expected to remain at their present noise levels.

Ambient noise around the project area is typical to that experienced in recreational environments. Noise levels range from low to moderate based on the density of development and recreational usage. He major noise producing sources include breaking surf, beach and nearshore water activities, adjacent residential and commercial areas, and boat traffic. These sources are expected to remain at their present noise levels.

5.2.13 CULTURAL RESOURCES AND HISTORIC PROPERTIES

As discussed in the Section 2: Existing Conditions and Future Without-Project Conditions portion of this document, substantial cultural resources work and investigations have been conducted throughout various portions of the project area. In letters dated August 25, 2016, this project has been coordinated with the Florida SHPO, the Seminole Tribe of Florida, and the Miccosukee Tribe of Indians of Florida in accordance with Section 106 of the NHPA, as amended (54 U.S.C 306108) and its implementing regulations (36 CFR part 800) and consideration given under the NEPA (Appendix G).

No effects of using the State Park or vacant lots are expected.

FUTURE WITH-PROJECT CONDITIONS

The proposed project would see shoreline impacts occurring between FDEP Range Monuments R10.5 and R24.5. Due to the nature of the previously-authorized project, this portion of the shoreline has been periodically renourished with no effect to cultural resources. Additionally, sand placement will benefit those historic structures that are eligible or potentially eligible for listing in the NRHP by minimizing the potential of erosion. As discussed in Section 2, the SHPO has reviewed USACE's previous determination of no effect to historic properties prior to the last dredging event in 2013 and concurred with the determination in a letter dated August 14, 2013 (Pertinent Correspondence Appendix (H)).

Based on remote sensing surveys and diver evaluations conducted between 1998 and 2013, no previously identified cultural resources or magnetic anomalies eligible for listing in the NRHP are located within the proposed offshore borrow location. However, a cluster of deeply buried sub-bottom features that may represent a back-bay channel with estuarine sediments was identified as a result of sub-bottom analysis of the borrow area. This cluster represents an area with a high potential for significant prehistoric cultural resources. Due to the depth of the feature, diver evaluation of the area was precluded and avoidance of the feature with a 600-foot buffer was recommended to avoid effects on the potentially significant resource. In a letter to the SHPO, the USACE determined that no historic properties would be affected by dredging contingent upon the preservation of the feature with a 600-foot buffer where no dredging activities will be permitted. The SHPO concurred with the determination in a letter dated August 14, 2013 (Pertinent Correspondence Appendix (H)).

During implementation of the project, USACE will continue to protect the sub-bottom feature cluster by maintaining the 600-foot buffer previously implemented during dredging. Buffer coordinates will be provided during contract of the dredge project to be avoided as an "Environmental Sensitive Area". USACE maintains an inadvertent discovery policy such that should previously unknown artifacts or cultural resource manifestations be encountered during construction, work would cease in the immediate vicinity of the resource. A determination of significance would be made, and further consultation with the SHPO,

and others that may be interested in the project area would be conducted to determine the best course of action. Contingent upon maintaining the 600-foot buffer, USACE has determined that the proposed shore protection project will have no effect on historic properties listed or eligible for listing in the NRHP within both the borrow area and the sand placement area. As a result of consultation, the Florida SHPO has concurred with the determination of no effect to historic properties in a letter dated September 29, 2016 (Pertinent Correspondence Appendix (H)).

No effects of using the State Park or vacant lots are expected.

5.2.14 NATIVE AMERICANS

FUTURE WITH-PROJECT CONDITIONS

As part of the development of this project, the proposed action has been coordinated with the appropriate federally-recognized tribes within the immediate area of potential effect. As discussed in Chapter 2, there are no known Native American properties within the project area and the project should not pose any effect to Native Americans. Consultation with the Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida has been undertaken (Pertinent Correspondence Appendix (H)). As a result of this consultation both Tribes have declined to provide comment on the proposed action.

5.2.15 PUBLIC SAFETY

FUTURE WITH-PROJECT CONDITIONS

The proposed project would provide for an increase in public safety because of increased storm protection from the widened beach. Dredging and beach restoration construction operations, however, would minimally and temporarily decrease public safety due to operation of the dredge and large earthmoving equipment.

Dredging operations and beach restoration mandate rigid application of safety and health requirements. Dredging with deep draft equipment, operating in relatively shallow water, requires extreme skill to stay within safe operating tolerances. Additionally, heavy equipment and transport operators must employ the same extreme caution on the beach, where the public may not truly appreciate the inherent danger. Accordingly, the project sponsors require contractors to submit extensive health, safety, and accident prevention plans to protect the onsite personnel, public, and environment.

5.2.16 NATURAL OR DEPLETABLE RESOURCES

FUTURE WITH-PROJECT CONDITIONS

Removing sand from the borrow area would deplete the sand from the borrow area. Conservative dredge depths and a spring 2016 survey were used to estimate an available volume of approximately 3.5 million cubic yards. This volume of material is sufficient to cover the estimated project need of 1,200,000 cubic

yards for the next two nourishment, which will cover the remainder of the project life. Over a long period, the excavated borrow area may at least partially refill with sand.

5.2.17 ENERGY REQUIREMENTS AND CONSERVATION

FUTURE WITH-PROJECT CONDITIONS

Energy requirements for the proposed alternative would be limited to the fuel for the dredging and pumping equipment, labor transportation, and construction equipment associated with beach placement. The use of sand from the proposed borrow areas would require less energy expenditure than obtaining sand from any other distant source.

5.2.18 INDIRECT IMPACTS

FUTURE WITH-PROJECT CONDITIONS

The proposed project should not result in adverse indirect effects. Beach nourishment may result in indirect impacts such as formation of scarps, sand migration over time, and long-term changes in sand composition. Because a large portion of the beachfront is already developed, the project will not likely cause significant additional development to occur.

Appropriate post-nourishment management (also required by state and federal permits) will ensure scarp knockdown occurs. Continuing careful conduct of future projects will ensure that future nourishment projects will not result in indirect impacts.

5.2.19 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

5.2.19.1 IRREVERSIBLE

FUTURE WITH-PROJECT CONDITIONS

For the proposed action, the fossil fuels for construction and public funds represent an irreversible commitment of resources, defined as forever losing the ability to use and/or enjoy the resource. The use of sand from offshore borrow areas would also irreversibly commit those sand resources to this project and preclude their use for future nourishment projects.

5.2.19.2 IRRETRIEVABLE

FUTURE WITH-PROJECT CONDITIONS

Temporary reductions of benthic communities, aesthetics, recreational opportunities, water quality, and air quality represent irretrievable commitments of resources, defined as opportunities lost for a period to use or enjoy the resource, as they presently exist, for the proposed action.

5.2.20 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

FUTURE WITH-PROJECT CONDITIONS

Unavoidable adverse environmental impacts resulting from the proposed action include a temporary loss of beach habitat, a localized increase in turbidity levels, a temporary reduction in sea turtle nesting, and a temporary loss of benthic communities in the beach/surf zone and borrow area. Section 5.2.26 on Cumulative Impacts discusses the Hard Bottom Protection Plan that will be required by the Construction Contractor prior to project construction.

5.2.21 LOCAL SHORT-TERM USES AND MAINTENANCE/ENHANCEMENT OF LONG-TERM PRODUCTIVITY

FUTURE WITH-PROJECT CONDITIONS

Shoreline protection using beach quality material with periodic nourishment is an ongoing effort. Beach nourishment projects have a temporary and short-term impact on local offshore and nearshore biological resources. Most motile organisms (fishes, crabs, and some sand dwelling organisms) within the borrow area and nearshore zone should be able to escape these areas during construction. Some less-motile individuals that are unable to escape from construction will be lost, but are expected to recolonize after project completion. Short-term reductions in primary productivity and reproductive and feeding success of invertebrate species and fish are expected. The sustainability of these populations should not be negatively affected given the minority scale of impacts relative to the remaining resource and provided the creation of suitable replacement habitat as associated with the project's mitigation reef.

5.2.22 COMPATIBILITY WITH FEDERAL, STATE, AND LOCAL OBJECTIVES

FUTURE WITH-PROJECT CONDITIONS

The Federal objective is to contribute to national economic development consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Federal planning concerns other than economic include environmental protection and enhancement, human safety, social wellbeing, and cultural and historical resources. Federal, State and County objectives include (1) the reduction of expected storm damages through beach nourishment and other project alternatives; (2) maintaining beaches as suitable recreational areas; (3) maintaining suitable beach habitat for nesting sea turtles, invertebrate species, and shorebirds; (4) maintaining commerce associated with beach recreation in Lee County, and (5) avoidance or minimization of adverse impacts to sensitive environmental marine resources, including habitat associated with the nearshore rock hardgrounds along the project area. The proposed project activity is consistent with Federal and Local objectives and with the Florida Coastal Management Program.

5.2.23 UNCERTAIN, UNIQUE, OR UNKNOWN RISKS

FUTURE WITH-PROJECT CONDITIONS

There are no uncertain, unique or unknown risks associated with the proposed project.

5.2.24 PRECEDENT AND PRINCIPLE FOR FUTURE ACTIONS.

The proposed activities are consistent with, and/or adaptions of, prior permitted activities conducted by the USACE and Lee County. These include prior beach nourishment and periodic nourishment along the same beach placement area.

5.2.25 CUMULATIVE IMPACTS

FUTURE WITH-PROJECT CONDITIONS

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). Table 5-1 summarizes the impact of such cumulative actions by identifying the past, present, and reasonably foreseeable future condition of the various selected resources which are directly or indirectly impacted by the proposed action and its alternatives. The table also illustrates the with-project and without-project condition (the difference being the incremental impact of the project). Also illustrated is the future condition with any reasonable alternatives (or range of alternatives). The time boundary condition for this analysis has been set from pre-development to 2016. The space boundary condition has been set for Lee County and adjacent waters.

PAST PROJECTS

In the past, prior corrective action to provide protection from erosion has been primarily limited to the construction of groins, seawalls, and the provision of beach fill by local interests. Historically, approximately 1.6-miles of shoreline have been armored to protect upland structures throughout Gasparilla Island. Private property owners have constructed two sheetmetal groins, 5 timber groins, 13 permeable concrete groins, 22 stone groins, and about 8,200 linear feet of seawalls. Approximately 1,100 linear feet of the seawall is of timber construction, with the remaining 7,100 feet made of concrete. Near the southern end of Gasparilla Island, Lee County constructed nearly 700 linear feet of concrete seawall in an effort to prevent undermining of the county shoreline highway. Rock riprap has been dumped to protect a portion of the county highway, which was damaged during the offshore passage of Hurricane Gladys in October 1968. A temporary timber bulkhead was also erected by the county and 500 cubic yards of backfill was reportedly provided until permanent repairs could be accomplished. As mentioned previously, in 1981, 1993, and 1997, the Federal government, in cooperation with state and county officials, disposed of approximately 899,700 cubic yards of maintenance material on the gulf shoreline of Gasparilla Island near Boca Grande Park. Disposal of this material on the beach was for the purpose of

alleviating the erosion problems near the park and to provide recreational enjoyment for tourists and local citizens. This fill created a very substantial beach in front of Boca Grande Park. Over the course of time, however, the shoreline receded back to its initial pre-disposal location.

Other corrective action included construction of a terminal groin at the southern tip of the island in 1982 by Florida Power and Light oil unloading and storage facility. This terminal groin was built to reduce shoaling at the fuel oil transfer mooring.

A Federal navigation project located near the study area includes Charlotte Harbor which was completed in 1959. The navigation project provides for an entrance channel 32-feet deep and 300-feet wide, increased to 700-feet wide at the bend, from the Gulf of Mexico to Port Boca Grande, then 10-feet deep and 100-feet wide from deep water at Boca Grande to, and including, a turning basin 200-feet square at the municipal terminal at Punta Gorda about 25-miles northeast. Charlotte Harbor was regularly maintained until 1997. The Channel is currently only used regularly by vessels with drafts of 12 feet or less. Charlotte Harbor does not appear to be impacting adjacent shores as is discussed on page 19 of the 2000 General Reevaluation Report for Lee County, Florida, Shore Protection Project, Gasparilla and Estero Islands.

The Lee County Beach Erosion Control Project provided for Federal participation in beach erosion control measures for the gulf shoreline of Gasparilla Island, Captiva Island, and Estero Island. Construction of the Captiva Island segment of the Federal shore protection project was completed in May 1989. Initial construction of the Gasparilla Island segment was completed as a reimbursable project by the sponsor between December 16, 2006 and April 14, 2007, and the first renourishment was constructed during October through December of 2013.

PRESENT PROJECTS

Existing shoreline armor within the 2.8 mile project area consists of approximately 5,200 feet of concrete seawall. Most of the existing shoreline armor within the project limits can be found in the northern portion of the segment from FDEP monument R11 to just south of R15. Additional armor can be found protecting a residential complex in the vicinity of R18.

The Gasparilla Island Segment of the authorized Shore Protection Project for Lee County, Florida provides for initial restoration and periodic nourishment of 2.8 miles of gulf shoreline, from the Department of Natural Resources (DNR) Monument (also commonly referred to as FDEP R-monuments) R10.5 (R11 plus a 1,200 foot long north extending taper) to R24.5 (R24 plus a 600 foot long south extending taper). The authorized project provides for a 20 foot extension of the baseline, roughly the 1995 MHW line, at elevation +5 feet (ft.) above MLW (+3.75 ft-NAVD88); a foreshore slope of 1V:15H transitioning to a nearshore slope of 1V:25H from MLW extending out to the intersection, with the existing profile, and 542,000 cy of sacrificial fill that accounts for an average periodic nourishment interval of 7 years, as established by the 2000 General Reevaluation Report (GRR) (USACE, 2000). Initial construction was completed in 2007. The first renourishment for Gasparilla Island Segment was constructed October through December of 2013. The sand source for Initial construction and 1st renourishment was the Boca Grande ebb shoal, located approximately 1.85 miles southwest of the southern end of Gasparilla Island.

FUTURE PROJECT

The Recommended Plan for the Lee County, Florida Shore Protection Project, Gasparilla Island Segment, Section 934 study will extend Federal participation in periodic renourishments on 2.8 miles of shoreline, from R10.5 (R11 plus a 1,200 foot long north extending taper) to R24.5 (R24 plus a 600 foot long south extending taper). The recommended beach template is defined as a 20 foot extension of the project baseline, roughly the 1995 MHW line, at +5 ft.-MLW (3.75 ft-NAVD88); a foreshore slope of 1V:15H transitioning to a nearshore slope of 1V:25H from MLW extending out to the intersection with the existing profile; a 60 foot advance/sacrificial berm accounts for an average periodic nourishment interval of 22 years; only two renourishments are expected throughout the remaining 40 year period of analysis; the Boca Grande ebb shoal will be the sand source for future periodic renourishments. The sand source encompasses approximately 425 acres with approximately 3.5 million cubic yards of beach-quality sand available. This volume of material is sufficient to cover the estimated project need of 1,200,000 cubic yards for the next two renourishment events, which will cover the remainder of the project period of analysis. The next beach renourishments for this project would occur in 2028 and 2042. There are no other beach nourishment projects proposed for this area. Based on previous nourishment surveys the various resources which are directly or indirectly impacted would re-establish between nourishment cycles.

Subsequently, a hardbottom Protection Plan will be required by the Construction contractor prior to project construction. This plan will be reviewed by USACE to ensure no impacts or total avoidance to existing hardbottoms will occur during construction. The Hardbottom Protection Plan shall indicate how bounce dives and side scan sonar will be conducted of any of the pipeline routes and associated work areas proposed to be used for this project and prior to fill operations. This also includes the anchoring areas of the borrow area and offloading areas. The Plan shall also indicate the contingency procedures if a leak is visually detected and remediation steps if impacts to hardgrounds occur. Acceptance by the Contracting Officer of the Hardground/Reef Protection Plan will not relieve the Contractor of responsibility of protection of the marine hardbottom. The Contractor may be required to revise and resubmit plan. Lastly, the Plan shall list all the names, qualifications, and responsibilities of personnel involved with enforcing and conducting the Plan. The Plan will be provided to Florida Department of Environmental Protection and National Marine Fisheries Service.

Additionally, nearshore submerged bottom protection measures will be implemented. The Contractor shall not intentionally drag equipment along the nearshore sandy bottom during pumpout equipment relocation procedures. Certified scientific divers shall assist in the identification of any hardbottom/reef community prior to excavation. Scientific divers shall also assist in the placement of any submerged pipelines to ensure that submerged pipelines are not placed over any significant hardbottom/reef areas. If pipeline leaks, mis-dumps, or spillage occurs, then scientific divers shall be used to verify the condition of nearby hardground areas.

Table 5-1: Summary of Cumulative Impacts

	Past	Present (existing condition)	Future With-Project	No-Action Alternative
General Environmental Setting (Beach Placement Area)	Beach quality sand from the borrow area has been previously placed within the proposed beach template.	The beach placement area continues to erode and is vulnerable to storm effects.	Beach nourishment using sand from the proposed borrow area would be required to meet State and Federal acceptance criteria to ensure compatibility with the native beach.	The Federally authorized project would no longer be constructed, and the beach would continue to erode.
Protected Species and Habitats Threatened and Endangered Species (nesting sea turtles, manatee, smalltooth sawfish, piping plover, red knot); Essential Fish Habitat (i.e., water column, hardbottoms [rock habitat], wetlands, etc.); Migratory Birds; Other Wildlife Resources	Populations were significantly greater prior to human development. Declines are attributed to loss or degradation of habitat as well as other human related factors.	Education and enforcement of relevant laws have resulted in some population increases (i.e., nesting sea turtles, manatees). Habitat has also improved in some cases due to land conservation, pollution abatement, and regulatory practices.	Habitat alteration due to climate change effects (i.e., sea level rise), continued loss or degradation of habitat due to development, and other human related factors will pose significant future challenges in protecting these species and their habitats. The proposed beach nourishment would be performed in compliance with all applicable laws, and would help provide habitat for coastal species. Mitigation has offset previous impacts to hardbottom habitat.	Habitat alteration due to climate change effects (i.e., sea level rise), continued loss or degradation of habitat due to development, and other human related factors will pose future significant challenges in protecting these species. The Federally authorized project would no longer be constructed. Loss of beach habitat may adversely impact species that utilize this area (i.e., nesting sea turtles)
Cultural, Historic, and Archaeological Resources	Cultural resources have been degraded or lost due to development, private collecting, and other factors. Prior beach placement had no effect on cultural resources.	Education and enforcement of relevant laws have helped conserve cultural resources.	The borrow area has been surveyed and areas to be avoided have been identified. Beach placement would have no effect on cultural resources. The project would not contribute to the loss or degradation of cultural resources.	The no-action alternative would not affect cultural resources.
Water Quality	Prior to Federal and State laws being enacted and enforced, water quality had significantly declined due to human related factors (i.e., turbidity caused by upland runoff, septic tank leachate, etc.).	Present day water quality has significantly improved due to local, State, and Federal pollution abatement programs.	Placement of beach quality sand from the borrow area may result in some temporary turbidity. However, this should not exceed background levels and would not result or contribute to long-term water quality impacts. All work would be performed in compliance with State Water Quality Certification/permit.	The no-action alternative would not affect water quality.
Aesthetics	Urban development along the shoreline has affected the aesthetics of the area.	The shoreline is primarily built out. The beach remains narrow and vulnerable to erosion.	Beach nourishment would reduce the risk of damage to shoreline infrastructure and should generally improve the appearance of the beach.	The no-action alternative would reduce aesthetics due to loss of beach and natural habitat.

Recreation	Opportunities for beach recreation have been affected by shoreline development as well as storm induced erosion.	Numerous beach access routes have been established. However, opportunities for recreation are at risk due to erosion, or loss of beach area.	Beach nourishment would preserve and protect many recreational opportunities. Construction would temporarily affect recreation.	Loss of beach associated with erosion would result in less beach available for recreation along the project area.
Hazardous, Toxic, and Radioactive Waste (HTRW)	There are no known HTRW locations in the project area.	There are no known HTRW locations in the project area.	There should be no risk of encountering HTRW during construction.	The no-action alternative would not result in any sources of pollutants occurring in the project area.
Air Quality	Prior to Federal and State laws being enacted and enforced, air quality may have declined.	Present day air quality has significantly improved due to local, State, and Federal pollution abatement programs. The area remains in attainment with air quality criteria.	Beach nourishment may result in additional temporary and minor impacts to air quality but these would not be permanent.	The no-action alternative would not affect air quality in the project area.
Noise	Noise levels have likely remained unchanged for some time due the urbanized environment.	Noise levels continue to be typical for this urbanized project area.	Beach nourishment would result in additional temporary and minor noise.	The no-action alternative would not affect the noise levels in the project area.
Energy Requirements and Conservation	Past beach nourishment in the project area requires insignificant uses of energy.	Beach nourishment or dune construction continues to require insignificant uses of energy.	Beach nourishment would result in an insignificant increase in the use of energy (fuel).	The no-action alternative would not significantly affect energy consumption.
Natural or Depletable Resources	Past beach nourishment projects in the project area utilized sand from the ebb shoal, which is a naturally accreting resource.	Present day beach nourishment in the project area will utilize sand from the ebb shoal, which is a naturally accreting resource.	The continued use of sand from existing borrow sites would cause depletion of this natural resource; however, the ebb shoal naturally accretes and has sufficient sand to support the project life.	The no-action alternative would not affect natural or depletable resources, and the ebb shoal would continue to grow and may encroach on the Boca Grande Pass navigation channel.
Native Americans	There are no Native American lands in the project area.	There are no Native American lands in the project area.	There are no Native American lands in the project area.	The no-action alternative would have no effect on Native American groups.

CHAPTER 6

ENVIRONMENTAL COMPLIANCE

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6 ENVIRONMENTAL COMPLIANCE

This chapter discusses the status of coordination and compliance of the Recommended Plan with environmental requirements. Additionally, the Recommended Plan's applicability to the USACE environmental operating principles is addressed. This report documents the effects of this project and serves as the Environmental Assessment (EA). It was made available for public review and comment for a 45-day period from November 22, 2016 to January 6, 2017. The public coordination and environmental assessment complies with the intent of the National Environmental Policy Act (NEPA). The project is in compliance with the National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321, *et seq*. P.L. 91-190

6.1 SCOPING AND ISSUES

Scoping letters for the previously authorized Gasparilla Segment of the Lee County Shore Protection Project were sent on August 12, 1996 to Federal, State, county, other local authorities, and other known interested parties and organizations. A Notice of Intent (NOI) to prepare a Draft Environmental Impact Statement (DEIS) appeared in the Federal Register on November 10, 1998. The NOI was mailed to interested and affected parties by letter dated March 10, 1999. A Notice of Availability (NOA) of the DEIS was sent to interested parties on August 31, 1999. A notice also appeared in the Federal Register on September 17, 1999.

Additional scoping letters were sent on August 29, 2016 as part of the current Section 934 report. A Notice of Availability (NOA) of the draft Environmental Assessment and draft Finding of No Significant Impact (FONSI) were sent to interested stakeholders (see scoping letter and Draft FONSI in Pertinent Correspondence Appendix (H)). The draft document was also available on USACE's website at http://www.saj.usace.army.mil/About/DivisionsOffices/Planning/EnvironmentalBranch/EnvironmentalDocuments during public review.

6.2 LIST OF RECIPIENTS

The mailing list for the scoping letter dated August 29, 2016 and the NOA of the draft document can be found in Appendix G, Attachment 4.

6.3 COMMENTS RECEIVED AND RESPONSE

Comments received in response to the scoping letter dated August 29, 2016 are summarized below. All comment letters and emails received can be found in Pertinent Correspondence Appendix (H).

PUBLIC COMMENTS

All public comments expressed support for continued beach nourishment.

NATIONAL MARINE FISHERIES SERVICE

Responses to Esential Fish Habitat (EFH) Conservation Recommendations

1. National Marine Fisheries Service (NMFS) Recommendation: Figure 6-1 depicts the project map with key boundaries and reference points, as well as the Gasparilla Borrow Area (GBA); is the GBA is the only source of sediment to be used to renourish Gasparilla Island Segment from FDEP Markers R-11 through R-24, or are there additional sediment borrow areas proposed? Further, have benthic surveys been conducted to assess presence/absence of habitats within proposed pipeline routes from the GBA to sediment discharge points on Gasparilla Island?

USACE RESPONSE:

The GBA is the only source of sediment to be used for the project. No pipeline route has been determined at this time. However, the Corps requires that the construction contractor provide a Hardbottom Protection Plan (HPP) prior to project construction. This plan will be reviewed by the U.S. Army Corps of Engineers (USACE) to ensure that existing hardbottom communities are avoided during construction to ensure that there are no adverse effects. The HPP shall indicate how bounce dives and side scan sonar will be conducted of any of the pipeline routes and associated work areas proposed to be used and prior to fill operations. Anchoring areas at the borrow site and offloading areas will also be subject to the same protocols in the HPP. The HPP shall also indicate the contingency procedures if a leak is visually detected and remediation steps if impacts to hardbottoms occur. Acceptance by the USACE Contracting Officer of the HPP will not relieve the construction contractor of responsibility of protection of the marine hardbottom. The contractor may be required to revise and resubmit the plan after USACE technical review. Lastly, the HPP shall list all the names, qualifications, and responsibilities of personnel involved with enforcing and conducting the HPP. The HPP will be provided to Florida Department of Environmental Protection and NMFS.

Additionally, nearshore submerged bottom protection measures will be implemented. The contractor shall not intentionally drag equipment along the nearshore sandy bottom during pumpout equipment relocation procedures. Certified scientific divers shall assist in the identification of any hardbottom community prior to excavation. Scientific divers shall also assist in the placement of any submerged pipelines to ensure that submerged pipelines are not placed over any significant hardbottom/reef areas. If pipeline leaks, mis-dumps, or spillage occurs, then scientific divers shall be used to verify the condition of nearby hardground areas.

2. NMFS Recommendation: Pages 2-43 and 2-44: Information indicates previous similar renourishment activities conducted in the project area during the 2006 - 2007 event resulted in unavoidable impacts to approximately 0.9-acre of nearshore hardbottom habitat. Compensatory mitigation for these unavoidable impacts included the construction of 1.4 acres of limestone boulders comprised of six, 100-foot by 100-foot squares located approximately 500 feet offshore of Gasparilla Island in water depths of approximately 10 to 12 feet. Do the currently proposed activities include baseline and post-project monitoring of these mitigation sites to determine whether proposed renourishment activities would result in adverse impacts to these habitats following completion of the project?

USACE RESPONSE:

The non-Federal sponsor has provided mitigation for impacts to hardbottom habitat resulting from the initial beach placement. Subsequent placement activities have occurred within the permitted beach template resulting in no additional impacts. The project's fill template has not changed providing further assurance that no additional hardbottom impacts are expected.

Section 2.4.5.2 Reef/Hardbottom Mitigation states that Lee County staff conducted a biological survey of the mitigation reef on May 12, 2015. The mitigation reef structure is providing similar habitat as the impacted hardbottom buried in the nearshore region.

3. National Marine Fisheries Service (NMFS) Recommendation: Page 2-45: Figure 2-21 depicts the plan view of the six individual previously constructed hardbottom mitigation reefs; there are two existing hardbottom areas located immediately north and northwest of the six mitigation reefs. Are these "existing hardbottom" areas those areas which were originally impacted during the 2006-2007 renourishment activities? If not, what is the location of the hardbottom areas which were impacted in 2006-2007 renourishment activities which required mitigation? Further, will proposed pipeline routes from the GBA to sediment discharge points on Gasparilla Island avoid these existing hardbottom and mitigation reefs, and if so, what is the minimum distance setback proposed between these hardbottoms and pipeline alignment?

USACE RESPONSE:

Attached is a map (Figure 6-1) showing the hard bottom impact, beach fill limits, and mitigation for the project area. The location of the hardbottom areas which were impacted in 2006-2007 are the solid green areas located close to the monuments R10.5, R11 and R 11.5.

Please refer to our response for comment #1.

Figure 6-1. Gasparilla Island Mitigation Map from 2013 Survey

6.4 ENVIRONMENTAL COMMITMENTS

The USACE shall comply with all terms and conditions of the biological opinions issued by the USFWS and NMFS, as well as the State permit, including but not limited to the following:

SEA TURTLES

- The permittee shall instruct all personnel associated with the project of the potential presence of the species and need to avoid collisions with sea turtles. All construction personnel are responsible for observing water-related activities for the presence of sea turtles.

- The contractor shall advise all personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles, which are protected under the Endangered Species Act of 1973.

- Siltation barriers shall be made of material in which a sea turtle cannot become entangled, be properly secured, and be regularly monitored to avoid entrapment. Barriers may not block sea turtle entry or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.

- All vessels associated with the construction project shall operate at "no wake/idle" speeds as all times while in the construction area and while in water depths where the draft of the vessels provides less than a four-foot clearance from the bottom. All vessels would preferentially follow deep-water routes (e.g., marked channels) whenever possible.

- If a sea turtle is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle. Operation of any mechanical construction equipment shall cease immediately if a sea turtle is seen within a 50-foot radius of the equipment. Activities may not resume until the protected species has departed the project area on its own volition.

- Any collision with and/or injury to a sea turtle shall be reported immediately to the National Marine Fisheries Service Protected Resources Division (1-727-824-5312) and the local authorized sea turtle stranding/rescue organization.

MANATEES

- All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.

- All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

- Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.

- 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 shut down 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.

- Any collision with or injury to a manatee shall be reported immediately to the FWC Hotline at 1-888-404-FWCC. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-7313336) for north Florida or Vero Beach (1-772-562-3909) for south Florida.

- Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Awareness signs that have already been approved for this use by the Florida Fish and Wildlife Conservation Commission (FWC) must be used (see MyFWC.com). One sign, which reads *Caution: Boaters* must be posted. A second sign measuring at least 8"/2" by"11" explaining the requirements for "Idle Speed/No Wake" and the shutdown of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities.

SMALLTOOTH SAWFISH

- The permittee shall instruct all personnel associated with the project of the potential presence of the species and need to avoid collisions with smalltooth sawfish. All construction personnel are responsible for observing water related activities for the presence of smalltooth sawfish.

- The contractor shall advise all personnel that there are civil and criminal penalties for harming, harassing, or killing smalltooth sawfish, which are protected under the Endangered Species Act of 1973.

- Siltation barriers shall be made of material in which a smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid entrapment. Barriers may not block smalltooth sawfish from entrance to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.

- All vessels associated with the construction project shall operate at “No Wake/Idle” speeds as all times while in the construction area and while in water depths where the draft of the vessels provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

- If a smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a smalltooth sawfish is seen within a 50foot radius of the equipment. Activities may not resume until the protected species has departed the project area on its own volition.

- Any collision with and/or injury to a smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

TURBIDITY

- The Contractor shall monitor water quality (turbidity) at the dredging and beach placement sites, as required by the Joint Coastal Permit (JCP) issued to the local sponsor under the Clean Water Act. The 401 Water Quality Certification is part of the Joint Coastal Permit and its issuance is the necessary State of Florida authorization for this type of project. The Florida State Clearing House conditional concurrence document for the Florida Coastal Management Program is located in Appendix G. If turbidity values at the dredging site exceed permitted values, the Contractor shall suspend all dredging activities. Dredging shall not continue until water quality meets state standards.

In addition the USACE commits to the following:

- Migratory birds (adult birds, eggs and chicks) shall be protected during construction activities.
- In the event that cultural resources are discovered (i.e., at new or expanded upland quarries), then protective measures shall be utilized.
- Air emissions such as vehicular exhaust and dust shall be controlled.
- The contracting officer would notify the contractor in writing of any observed noncompliance with Federal, state, or local laws or regulations, permits and other elements of the contractor's Environmental Protection Plan.
- The contractor would train his personnel in all phases of environmental protection.

An oil spill prevention plan shall be required.

CULTURAL RESOURCES

- Potentially significant sub-bottom features will be avoided with a 600-foot buffer. The buffer will be designated as an "Environmentally Sensitive Area" on the contract drawings or other documents.

The Contractor shall install protection for these resources and shall be responsible for their preservation during the contract's duration. The Contractor shall not distribute maps or other information on these resource locations except for distribution among the Contractor's staff with a "need to know" technical responsibility for protecting the resources.

If, during construction activities, the Contractor observes items that may have historic or archeological value, such observations shall be reported immediately to the appropriate USACE staff may be notified and a determination for what, if any, additional action is needed. Examples of historic, archeological and cultural resources are bones, remains, artifacts, shell, midden, charcoal or other deposits, rocks or coral, evidences of agricultural or other human activity, alignments, and constructed features. The Contractor shall cease all activities that may result in the destruction of these resources and shall prevent his employees from further removing, or otherwise damaging, such resources. Work in the immediate vicinity of the discovery would not continue until the appropriate USACE staff make a determination of significance after further consultation with the SHPO and others that may be interested in the project area.

6.5 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) of 1969

Environmental information on the project has been compiled and an Environmental Assessment has been prepared and integrated into this report. A scoping letter dated August 29, 2016 was mailed out to all Federal, State, and local agencies and all adjacent homeowners. A Notice of Availability for the draft EA and draft FONSI was coordinated with interested stakeholders for review and comment. The project is in full compliance with the National Environmental Policy Act. It was circulated to appropriate local, State, and Federal agencies, as well as interested academic institutions and citizens, prior to finalization in accordance with NEPA. Comments received from these sources were addressed in the Final Environmental Assessment.

ENDANGERED SPECIES ACT of 1973

This project falls under the scope of the November 19, 2003 Gulf Regional Biological Opinion (as amended) for federally listed marine species. No additional coordination is required with NOAA Fisheries for these species. USACE has determined that the sand placement activities associated with this project fall within the scope of the USFWS SPBO (2011), as amended in 2015, and the P3BO (2013). Pursuant to the USFWS SPBO (2011) and P3BO (2013) USACE has completed coordination with USFWS as of February 2, 2017. The decision document has been attached to the Pertinent Correspondence Appendix (H). Additionally USACE has completed consultation on the Rufa Red Knot. This project shall be in full compliance with the Endangered Species Act.

FISH & WILDLIFE COORDINATION ACT of 1958

A Coordination Act Report dated February 2000 was prepared for the previously authorized Gasparilla Segment of the Lee County Shore Protection Project. Additional coordination with the USFWS in accordance with this ACT was conducted through the NEPA scoping process and the Endangered Species Act. This project has been fully coordinated with respect to and will remain in full compliance with the

Fish and Wildlife Coordination Act of 1958. The memorandum dated January 24, 2017 from Fish and Wildlife Service has been attached into the Pertinent Correspondence Appendix (H).

NATIONAL HISTORIC PRESERVATION ACT of 1966

The Proposed Action shall be in compliance with Section 106 of the National Historic Preservation Act, as amended (54 U.S.C. 306108). As part of the requirements and consultation process contained within the National Historic Preservation Act implementing regulations of 36 CFR part 800, this project is also in compliance, through ongoing consultation, with the Archaeological and Historic Preservation Act, as amended (PL93- 29), Archeological Resources Protection Act (PL96-95), American Indian Religious Freedom Act (PL 95- 341), Native American Graves Protection and Repatriation Act (NAGPRA), Executive Order 11593, 13007, and 13175, the Presidential Memo of 1994 on Government to Government Relations and appropriate Florida Statutes. Consultation with the Florida SHPO, the Miccosukee Tribe of Indians of Florida, and the Seminole Tribe of Florida was initiated in letters dated August 25, 2016. The Florida SHPO has concurred with the determination of no effect to historic properties in a letter dated September 29, 2016 which is attached to the Pertinent Correspondence Appendix (H). Both the Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida have declined to comment on the proposed action. The proposed action is in compliance with the goals of this Act.

CLEAN WATER ACT of 1972

A Section 401 water quality certification (State permit) application will be submitted to the FDEP, and USACE will obtain this certification prior to construction. All state water quality requirements would be met. A Section 404(b) evaluation is included in this report as Appendix G, Attachment 1. The project shall be in full compliance with this Act.

CLEAN AIR ACT of 1972

No air quality permits would be required for this project.

COASTAL ZONE MANAGEMENT ACT of 1972

A Federal consistency concurrence in accordance with 15CFR930 Subpart C is included in this report as Appendix G, Attachment 2. This concurrence states that "*at this stage, the proposed federal activities are consistent with the Florida Coastal Management Program (FCMP) and should not compromise state water quality standards. To ensure the project's continued consistency with the FCMP, the concerns identified by our reviewing agencies must be addressed prior to project implementation. The state's continued concurrence will be based on the activities' compliance with FCMP authorities, including federal and state monitoring of the activities to ensure their continued conformance, and the adequate resolution of issues identified during this and subsequent regulatory reviews. The state's final concurrence of the project's consistency with the FCMP and water quality certification will be determined during the environmental permitting process, in accordance with Section 373.428, Florida Statutes*."

FARMLAND PROTECTION POLICY ACT of 1981

No prime or unique farmland would be impacted by implementation of this project. This act is not applicable.

WILD AND SCENIC RIVER ACT of 1968

No designated Wild and Scenic River reaches would be affected by project-related activities. This act is not applicable.

MARINE MAMMAL PROTECTION ACT of 1972

Incorporation of the safeguards used to protect threatened or endangered species during dredging and disposal operations will also protect any marine mammals in the area, therefore, this project shall comply with the Marine Mammal Protection Act of 1972.

ESTUARY PROTECTION ACT of 1968

No designated estuary would be affected by project activities. This act is not applicable.

SUBMERGED LANDS ACT of 1953

The project would occur on submerged lands within of the State of Florida. The project shall be coordinated with the State and complies with the Submerged Lands Act of 1953.

COASTAL BARRIER RESOURCES ACT and COASTAL BARRIER IMPROVEMENT ACT of 1990

The Coastal Barrier Resources Act (CBRA) and the Coastal Barrier Improvement Act of 1990 (CBIA) limit Federally subsidized development within the CBRA Units to limit the loss of human life by discouraging development in high risk areas, to reduce wasteful expenditures of Federal resources, and to protect the natural resources associated with coastal barriers. CBRA provides development goals for undeveloped coastal property held in public ownership, including wildlife refuges, parks, and other lands set aside for conservation ("otherwise protected areas," or OPAs). These public lands are excluded from most of the CBRA restrictions, although they are prohibited from receiving Federal Flood Insurance for new structures. This project complies with the Coastal Barrier Resource Act and Coastal Barrier Improvement Act of 1990.

RIVERS AND HARBORS ACT of 1899

The proposed work would temporarily obstruct navigable waters of the United States. A Notice of Availability was issued on November 22, 2016 for the draft Integrated Section 934 Report and Environmental Assessment. The project is in full compliance with the Rivers and Harbors Act.

ANADROMOUS FISH CONSERVATION ACT

Anadromous fish species would not be affected. The project shall be coordinated with NMFS and complies with the Anadromous Fish Conservation Act.

MIGRATORY BIRD TREATY ACT and MIGRATORY BIRD CONSERVATION ACT

Migratory birds would be minimally affected by dredging at the proposed sand source locations. The USACE will include our standard migratory bird protection requirements in the project plans and specifications and will require the Contractor to abide by those requirements. Renourishment activities at the beach placement site will be monitored at dawn or dusk daily during the nesting season to protect

nesting migratory birds. If nesting activities occur within the construction area, appropriate buffers will be placed around nests to ensure their protection. The project shall be in compliance with these Acts.

MARINE PROTECTION, RESEARCH and SANCTUARIES ACT (OCEAN DUMPING ACT)

The term "dumping" as defined in the Marine Protection, Research and Sanctuaries Act does not apply to the disposal of material for beach nourishment or to the placement of material for a purpose other than disposal (i.e., placement of rock material as an artificial reef or the construction of artificial reefs as mitigation). Therefore, the Marine Protection, Research and Sanctuaries Act does not apply to this project. The disposal activities addressed in this EA have been evaluated under Section 404 of the Clean Water Act (see Appendix G, Attachment 1).

MAGNUSON-STEVENS FISHERY CONSERVATION and MANAGEMENT ACT

Pursuant to the 1999 Finding between USACE and NMFS, USACE's Notice of Availability of this draft EA initiated USACE's consultation under the Magnuson-Stevens Fishery Conservation and Management Act. The project has been coordinated with NMFS and is in full compliance with the Act. The letter dated January 27, 2017 is included in the Pertinent Documents Appendix (H).

EXECUTIVE ORDER (EO) 11990, PROTECTION of WETLANDS

No wetlands would be affected by project activities. This project complies with the goals of this Executive Order 11990.

E.O 11988, FLOOD PLAIN MANAGEMENT

No activities associated with this project will take place within a riparian, lacustrine, or estuarine floodplain; therefore, this project complies with the goals of Executive Order 11988.

E.O. 12898, ENVIRONMENTAL JUSTICE

On February 11, 1994, the President of the United States issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. The Executive Order mandates that each federal agency make environmental justice part of the agency mission and to address, as appropriate, disproportionately high and adverse human health or environmental effects of the programs and policies on minority and low-income populations.

Any potential adverse effects of the proposed action would be more likely to affect those of higher socioeconomic status, such as large watercraft owners or those living in the coastal area surrounding the project. The beneficial effect of a wider, more sustainable beach would benefit all members of the public who visit the beach. The storm damage reduction benefits are primarily benefitting the landowners in this area. There are no disproportionate adverse impacts to minority or low income populations resulting from the implementation of the project.

E.O. 13089, CORAL REEF PROTECTION

The EO refers to "those species, habitats, and other natural resources associated with coral reefs." There are no coral reefs in the project area. This EO does not apply.

E.O. 13112, INVASIVE SPECIES

The proposed activity does not include actions that would introduce invasive species.

E.O. 13045, PROTECTION of CHILDREN

On April 21, 1997, the President of the United States issued Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. The Executive Order mandates that each Federal agency make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

As the proposed action does not affect children disproportionately from other members of the population, the proposed action would not increase any environmental health or safety risks to children.

E.O. 13186, MIGRATORY BIRDS

This Executive Order requires, among other things, a Memorandum of Understanding (MOU) between the Federal Agency and the U.S. Fish and Wildlife Service concerning migratory birds. Neither the Department of Defense MOU nor the USACE' Draft MOU clearly address migratory birds on lands not owned or controlled by the USACE. Current policy for USACE civil works projects is that real estate interest are provided by the non-Federal sponsor. Control and ownership remains with the non-Federal sponsor in order for them to fulfill their O&M responsibilities for the project. Measures to avoid the destruction of migratory birds and their eggs or hatchlings shall be implemented.

6.6 ENVIRONMENTAL OPERATING PRINCIPLES

1. Foster sustainability as a way of life throughout the organization.

    The recommended plan prioritizes the use of material from the shoal complex that is already in the sediment system. This prevents the need from dredging offshore, previously undisturbed sediments.

2. Proactively consider environmental consequences of all USACE activities and act accordingly.

    The integration of the EA into the Section 934 study requires all members of the Project Delivery Team to acknowledge the impact that the proposed project will have on the environment. This helps to ensure the project is designed with the environment in mind.

3. Create mutually supporting economic and environmentally sustainable solutions.

    The use of the shoal complex in the recommended plan bypass sand to the beach that has been removed from the system by littoral transport processes, which inherently incorporate outcomes that are economically and environmentally preferable.

4. Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.

This document includes all information necessary to document how the project meets USACE's corporate responsibility and accountability requirements for actions that may impact human and natural environments.

5. Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.

The project biologist is involved throughout the study process to ensure that environmental considerations are taken into account for the life of the project.

6. Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.

The entire Project Delivery Team understands the need to consider the environment during its decision-making process.

7. Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

The actions taken to involve the public, resource agencies, and Non-governmental Organizations (NGO) who may be interested in the project are outlined in Sections 6.1 to 6.6.

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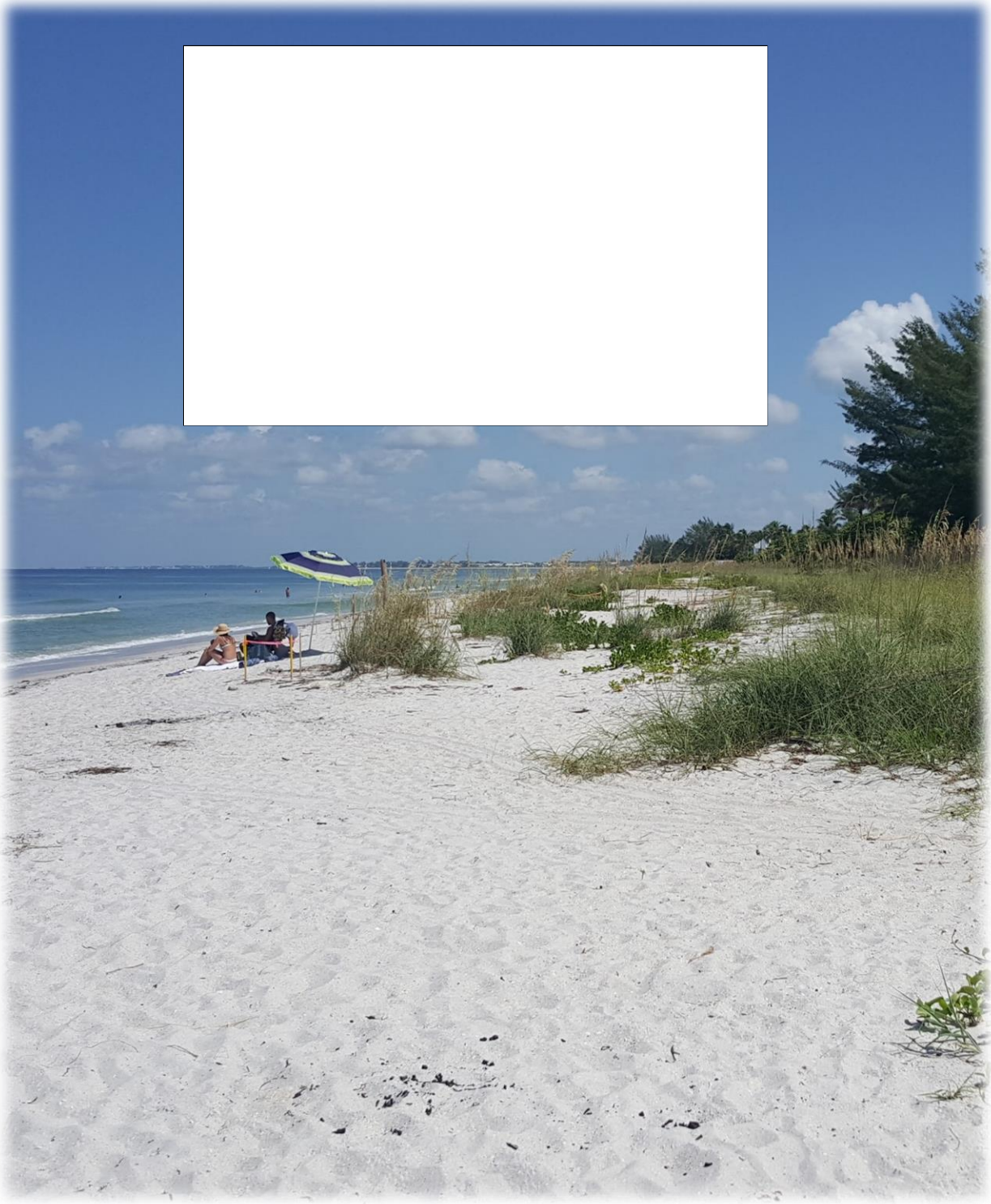

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7 RECOMMENDATIONS

I have given consideration to all significant aspects in the overall public interest including engineering feasibility, economic, social, cost and risk analysis, and environmental effects. The Recommended Plan described in this final report provides the optimization of the authorized project in the study area that can be developed with the framework of the formulation concepts. I recommend extending Federal participation in periodic renourishments of the Lee County, Florida Shore Protection Project, Gasparilla Island Segment up to 2056, with such modification as in the discretion of the Commander, Headquarters, U.S. Army Corps of Engineers (HQUSACE), may be advisable.

The optimized project, shown in Figure 7-1, is the Recommended Plan for the Gasparilla Island Segment study reach. The project length is 2.8 miles and spans Florida Department of Environmental Protection (FDEP) reference monuments R10.5 (R11 plus a 1,200 foot long north extending taper) and R24.5 (R24 plus a 600 foot long south extending taper). The recommended beach template is defined as a 20 foot extension of the project baseline, roughly the 1995 MHW line, at +5 ft.-MLW (3.75 ft-NAVD88); a foreshore slope of 1V:15H transitioning to a nearshore slope of 1V:25H from MLW extending out to the intersection with the existing profile; a 60 foot advance/sacrificial berm accounts for an average periodic nourishment interval of 22 years; only two renourishments are expected throughout the remaining 40 year period of analysis; the Boca Grande ebb shoal will be the sand source for future periodic renourishments. The sand source encompasses approximately 425 acres with approximately 3.5 million cubic yards of beach-quality sand available. This volume of material is sufficient to cover the estimated project need of 1,200,000 cubic yards for the next two renourishment events, which will cover the remainder of the project period of analysis.

Total estimated cost for the next two renourishment events (including 26% contingency) is $35,771,000 (FY18), with a total project first cost (Constant Dollar Basis) of $54,752,000 (FY18). Periodic nourishments will be cost shared at 64.7% Federal and 35.3% non-Federal. The average annual net benefits for the Recommended Plan are $434,000 and benefit cost ratio (BCR) (FY18 rate 2.75%) is 1.46 to 1.

The Recommended Plan will reduce coastal risk and damage to infrastructure with Federal participation in periodic renourishments until 2056. In addition to the NED benefits associated with reducing damages to infrastructure, the Recommended Plan will also have non-monetary benefits for environmental quality and other social effects.

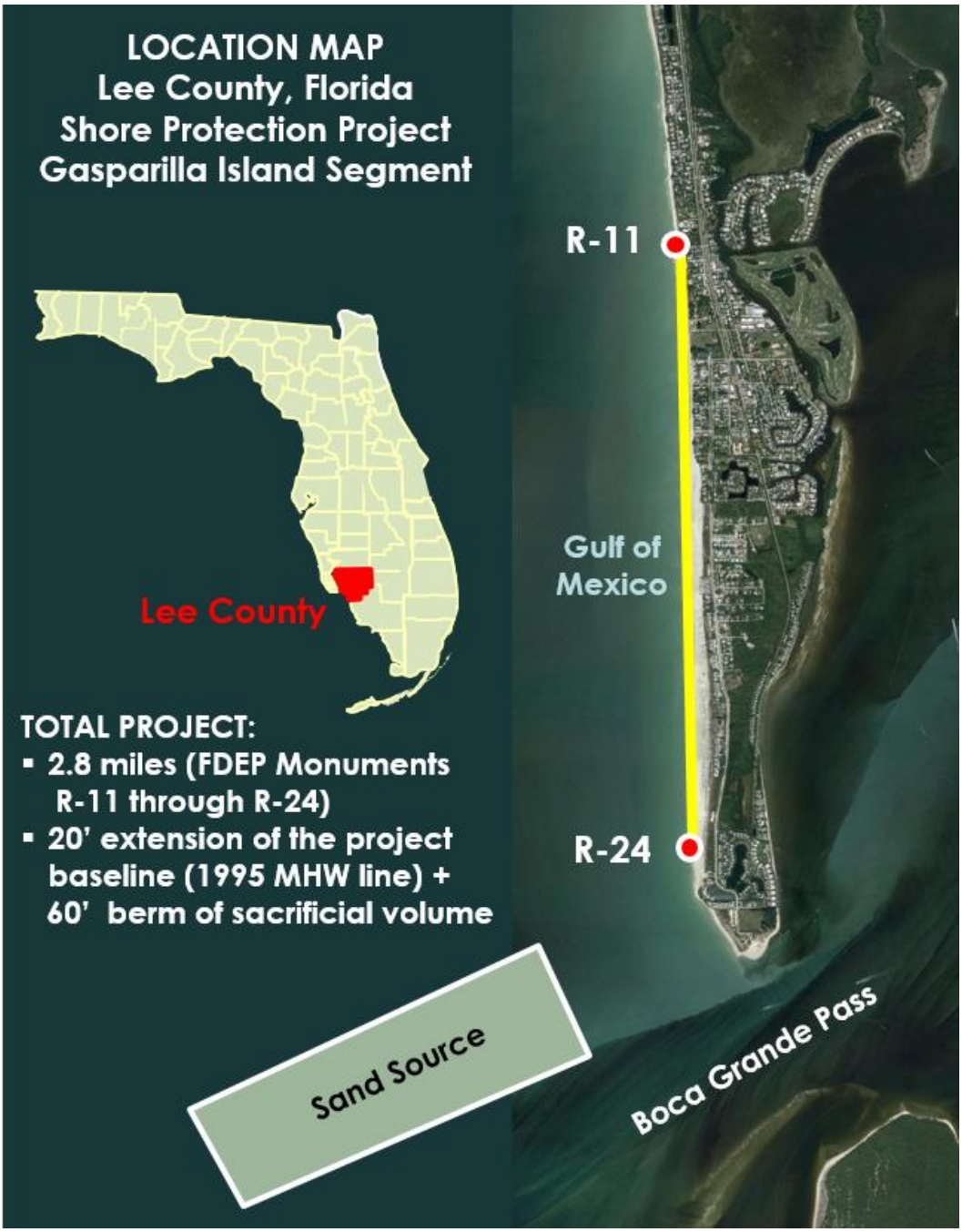


Figure 7-1: Recommended Plan

7.1 ITEMS OF LOCAL COOPERATION

Recommendations for provision of Federal participation in the Recommended Plan described in this report would require the project sponsor to enter into a written Project Partnership Agreement (PPA), as required by Section 221 of Public Law 91-611, as amended, to provide local cooperation satisfactory to the Secretary of the Army. Such local cooperation shall include:

a. Provide a minimum of 35 percent of initial project costs assigned to coastal and storm damage reduction, plus 100 percent of initial project costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits, and 50 percent of periodic nourishment costs assigned to coastal and storm damage reduction, plus 100 percent of periodic nourishment costs assigned to protecting undeveloped private lands and other private shores which do provide public benefits, and as further defined below:

(1) Provide, during design, 35 percent of design costs allocated to coastal and storm damage reduction in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

(2) Provide all lands, easements, rights-of-way, including suitable borrow areas, and perform or assure performance of all relocations, including utility relocations, as determined by the Federal government to be necessary for the initial construction, periodic nourishment or operation and maintenance of the project;

(3) Provide, during construction, any additional amounts necessary to make its total contribution equal to 35 percent of initial project costs assigned to coastal and storm damage reduction plus 100 percent of initial project costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits;

b. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function;

c. Inform affected interests, at least yearly, of the extent of protection afforded by the flood risk management features; participate in and comply with applicable federal floodplain management and flood insurance programs; comply with Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12); and publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with protection levels provided by the flood risk management features;

d. Operate, maintain, repair, replace, and rehabilitate the completed project, or function portion of the project, at no cost to the Federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and state laws and regulations and any specific directions prescribed by the Federal government;

e. For so long as the project remains authorized, ensure continued conditions of public ownership and use of the shore upon which the amount of Federal participation is based;

f. Provide and maintain necessary access roads, parking areas, and other public use facilities, open and available to all on equal terms;

g. Annually and after storm events, perform surveillance of the beach to determine losses of nourishment material from the project design section and provide the results of such surveillance to the Federal government;

h. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;

i. Hold and save the United States free from all damages arising from the initial construction, periodic nourishment, operation, maintenance, repair, replacement, and rehabilitation of the project, except for damages due to the fault or negligence of the United States or its contractors;

j. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence are required, to the extent and in such detail as will properly reflect total cost of the project, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;

k. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal government determines to be necessary for the initial construction, periodic nourishment, operation and maintenance of the project;

l. Assume, as between the Federal government and the non-Federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way required for the initial construction, periodic nourishment, or operation and maintenance of the project;

m. Agree, as between the Federal government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and, to

the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the project in a manner that will not cause liability to arise under CERCLA;

n. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, (42 U.S.C. 1962d-5b) and Section 101(e) of the WRDA 86, Public Law 99-662, as amended, (33 U.S.C. 2211(e)) which provide that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

o. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. 4601-4655) and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way necessary for construction, operation, and maintenance of the project including those necessary for relocations, the borrowing of material, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

p. Comply with all applicable Federal and state laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c)); and

q. Not use funds from other Federal programs, including any non-federal contribution required as a matching share therefore, to meet any of the non-Federal sponsor's obligations for the project unless the Federal agency providing the funds verifies in writing that such funds are authorized to be used to carry out the project.

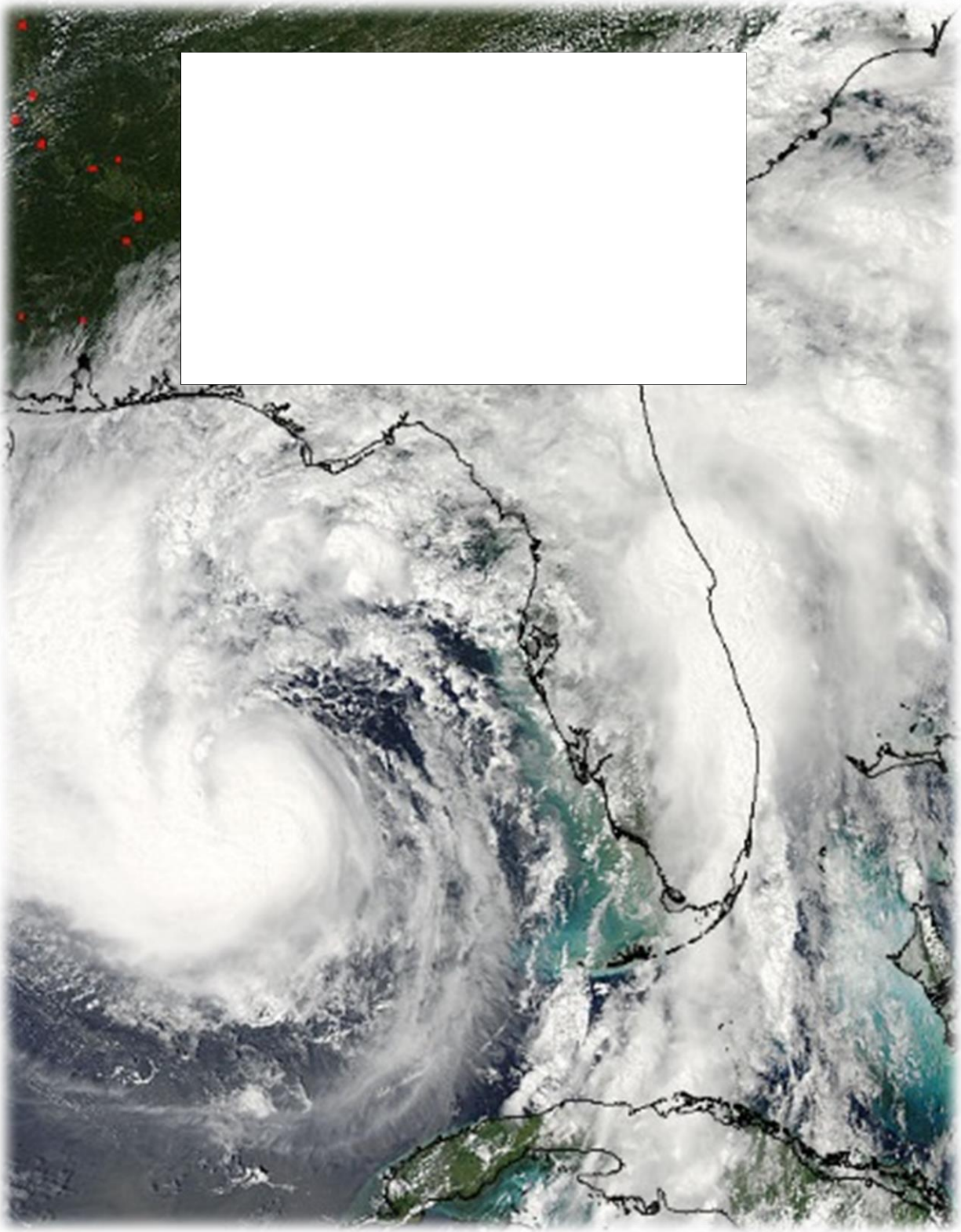
7.2 DISCLAIMER

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to higher authority as proposals for project modification and/or implementation funding. The recommendations herein for provision of a coastal storm risk management project for Lee County, Florida do not include any provisions for work which would result in any new Federal expenditures or financial assistance prohibited by the Coastal Barrier Resources Act (Public Law 97-348); nor were funds obligated in past years for this project for purposes prohibited by this act.

7.3 CERTIFICATION OF PUBLIC ACCESSIBILITY

As part of the obligations established in the project partnership agreement (PPA) for the Lee County, Florida, Shore Protection Project, the non-Federal sponsor shall assure continued conditions of public ownership and public use of the shore upon which Federal participation is based during the economic life of the project. The non-Federal sponsor shall also provide and maintain necessary access roads, parking areas, and other public use facilities, open and available to all on equal terms. In the determination of the Federal interest in cost sharing, Federal participation was limited to areas where public beach access and adequate parking are available. For shoreline reaches farther than ¼ mile from public access with adequate parking, Federal participation was not provided. The maximum Federal participation allowable for each land use category is applied for cost sharing. I therefore conclude that there is reasonable public availability of the project beaches in all areas where Federal participation is provided.

Jason A. Kirk, P.E.
Colonel, U. S. Army
District Commander



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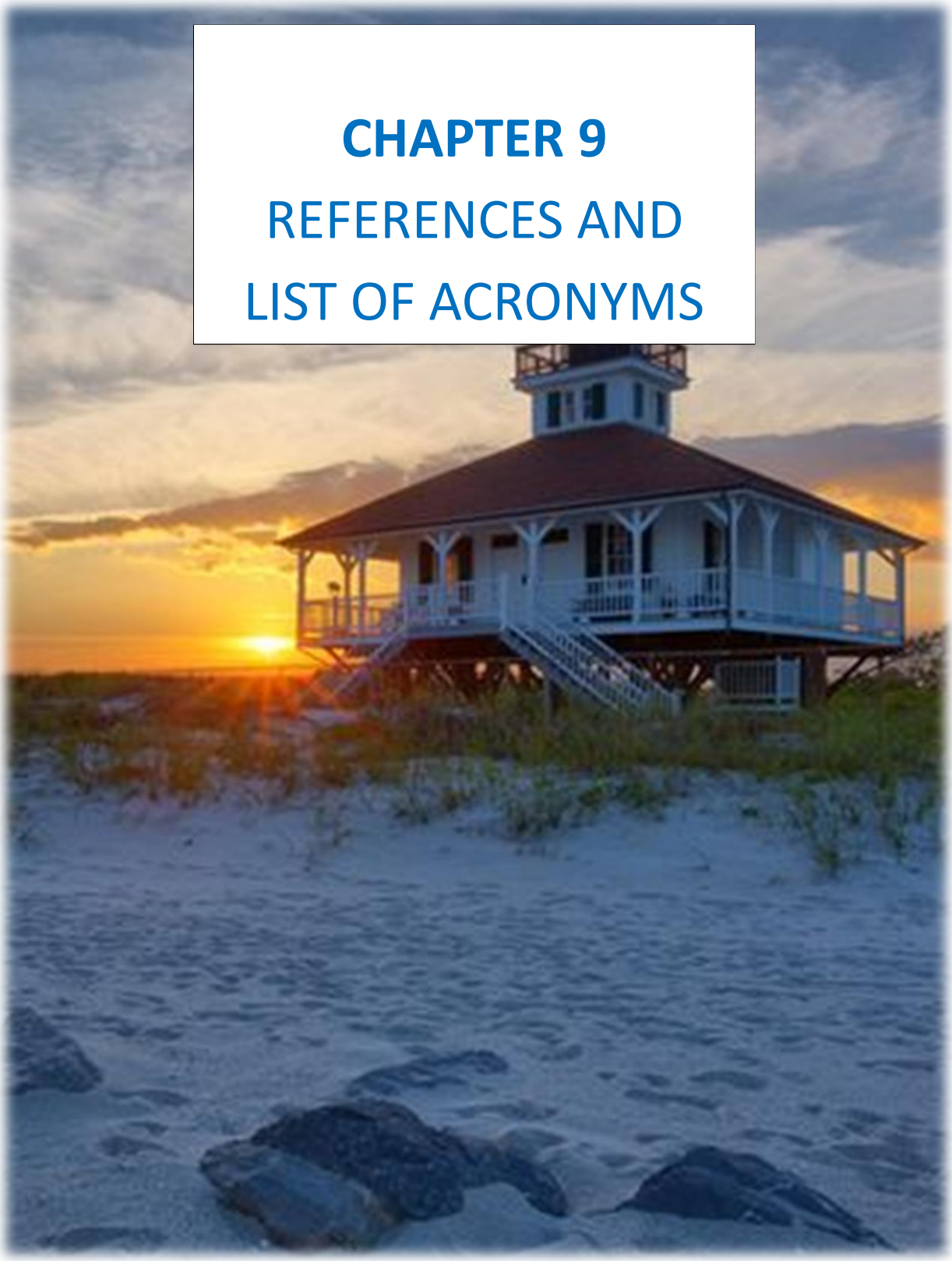

CHAPTER 9

REFERENCES AND LIST OF ACRONYMS

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9 REFERENCES AND LIST OF ACRONYMS

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9.2 LIST OF ACRONYMS

AAEQ: Average Annual Equivalent

ASA(CW): Assistant Secretary of the Army for Civil Works

BCR: Benefit-cost ratio

BMP: Best Management Practices

CBIA: Coastal Barrier Improvement Act

CBRA: Coastal Barrier Resources Act

CBRS: Coastal Barrier Resources System

CFR: Code of Federal Regulations

CG: Construction General

CSRA: Cost and Schedule Risk Analysis

CSRM: Coastal Storm Risk Management

cy: cubic yards

DEIS: Draft Environmental Impact Statement

DNR: Department of Natural Resources

DoD: Department of Defense

EA: Environmental Assessment

ECL: Erosion Control Line

EFH: Essential Fish Habitat

EIS: Environmental Impact Statement

FCCE: Flood Control and Coastal Emergencies

FDEM: Florida Division of Emergency Management

FDEP: Florida Department of Environmental Protection

FDOT: Florida Department of Transportation

FMP: Fishery Management Plan

FONSI: Finding of No Significant Impact

FWC: Florida Fish and Wildlife Conservation Commission

FWOP: Future Without-Project

FWP: Future With-Project

FY: Fiscal Year

GHG: Green House Gas

GICIA: Gasparilla Island Conservation and Improvement Association

GMFMC: Gulf of Mexico Fisheries Management Council

GRBO: Gulf Regional Biological Opinion

GRR: General Reevaluation Report

HSDR: Hurricane and Storm Damage Reduction

HTRW: Hazardous, Toxic or Radioactive Waste

IDC: Interest During Construction

IPR: In Progress review

LERRD: Lands, Easements, Rights-of-Way, Relocations and Disposal

LRR: Limited Reevaluation Report

m: meters

MCACES - Micro-Computer Aided Cost Estimating System

MHW: Mean High Water

MLW: Mean Low Water

MLLW: Mean Lower Low Water

MOU: Memorandum of Understanding

MSC: Major Subordinate Command

MSFCMA: Magnuson-Stevens Fishery Conservation and Management Act

MSL: Mean Sea Level

NAGPRA: Native American Graves Protection and Repatriation Act

NAVD88: North American Vertical Datum of 1988

NED: National Economic Development

NEPA: National Environmental Policy Act

NGO: Non-governmental Organizations

NHC: National Hurricane Center

NHPA: National Historic Preservation Act

NGVD29: National Geodetic Vertical Datum of 1929

NMFS: National Marine Fisheries Service

NOA: Notice of Availability

NOAA: National Oceanic Atmospheric Administration

NOI: Notice of Intent

NOS: National Ocean Service

NRHP: National Register of Historic Places

OCS: Outer Continental Shelf

OMRR&R: Operation, Maintenance, Rehabilitation, Repair and Replacement

OPA: Other Protected Areas

PBO: Programmatic Biological Opinion

P3BO: Programmatic Piping Plover Biological Opinion

PCA: Project Cooperation Agreement

PDT: Project Delivery Team

PED: Preconstruction Engineering and Design

PGL: Policy Guidance Letter

PIR: Project Information Report

PPA: Project Partnership Agreement

PV: Present Value

ROM: Rough Order of Magnitude

RSL: Relative sea level

SHPO: State Historic Preservation Office

SLC: Sea Level Change

SPBO: Statewide Programmatic Biological Opinion

SPP: Shore Protection Project

TCM: Travel Cost Method

T.S.: Tropical Storm

TSP: Tentatively Selected Plan

UDV: Unit Day Value

USACE: United States Army Corps of Engineers

USC: United State Code

USFWS: United States Fish and Wildlife Service

VT: Vertical Team

WIS: Wave Information Study

WRDA: Water Resources Development Act

WRRDA: Water Resources Reform and Development Act