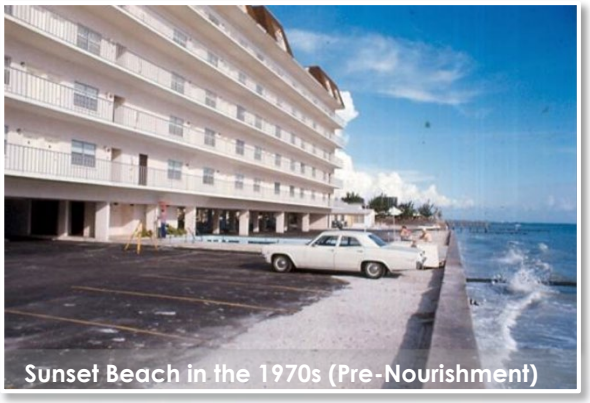
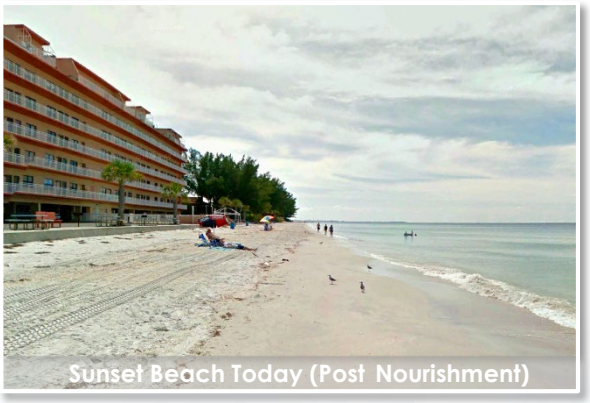
US Army Corps of Engineers ®
Jacksonville District

PINELLAS COUNTY, FLORIDA
COASTAL STORM RISK MANAGEMENT STUDY

TREASURE ISLAND AND LONG KEY SEGMENTS

Draft Integrated Feasibility Report and Environmental Assessment


Sunset Beach in the 1970s (Pre-Nourishment)


Sunset Beach Today (Post Nourishment)

August 2020

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Using this Document

Report Navigation: To ease navigation through the report, bookmarks are provided in the Adobe document to allow the reader to quickly move to specific sections or graphics. In addition, a Table of Contents is provided at the beginning of the report, along with a detailed Index at the end of the report. This report is compliant with Section 508 of the Rehabilitation Act, which requires Federal agencies' electronic and information technology to be accessible to people with disabilities.

Organization of this report meets the requirements provided in Appendix G of ER 1105-2-100 (30 June 2004), documenting the iterative U.S. Army Corps of Engineers (USACE) Plan Formulation Process. The planning process consists of six major steps:

(1) Specification of problems and opportunities

(2) Inventory, forecast, and analysis of existing conditions within the study area

(3) Formulation of alternative plans

(4) Evaluation of the effects of the alternative plans

(5) Comparison of the alternative plans

(6) Selection of the recommended plan based upon the comparison of the alternative plans.

Steps may be repeated as problems become better understood and new information becomes available.

Steps 1 and 2 are discussed in Chapters 1-2, and provide the foundation for developing alternative plans and the selection of a recommended plan as outlined in Chapter 3.

Each chapter and summary graphic, as well as the executive summary, describes plan development as it progresses through the four integrated environments that shape a coastal storm risk management (CSRM) project: the built environment (upland development, etc.); the natural environment (species of concern and their habitat); the physical environment (currents, tides, sea level rise, etc.), and the economic environment (vulnerability of built environment to damages). Concerns relative to plan formulation and National Environmental Policy Act (NEPA) review are summarized and encapsulated in the discussions of these four main environments.

The recommended format of an Environmental Assessment (EA) is provided in 40 CFR 1502.10 and has been integrated into this Feasibility Report. The basic table of contents for the report outlines how the EA format has been integrated into the planning process to develop a tentatively selected plan that meets the requirements of both USACE Plan Formulation Policy and NEPA.

Note that sections pertinent to the NEPA analysis are denoted with an asterisk.

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ACRONYM LIST

AAEQ	Average Annual Equivalent
BCR	Benefit-Cost Ratio
BEC	Beach Erosion Control
CSRM	Coastal Storm Risk Management
CWA	Clean Water Act
cy	cubic yard
CZMA	Coastal Zone Management Act
ESA	Endangered Species Act
FDEP	Florida Department of Environmental Protection
FFWCC	Florida Fish and Wildlife Conservation Commission
FWOP	Future Without-Project Condition
FWP	Future With Project Condition
IMP	Inlet Management Plan
MHWL	Mean High Water Line
MLLW	Mean Lower Low Water
NED	National Economic Development
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
P&G	Principles and Guidelines
ROM	Rough Order of Magnitude
RSM	Regional Sediment Management
SLC	Sea Level Change
SLR	Sea Level Rise
SPP	Shore Protection Project
TSP	Tentatively Selected Plan
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WRDA	Water Resources Development Act

EXECUTIVE SUMMARY

INTRODUCTION

Infrastructure along the Pinellas County, FL shoreline is subject to damage from waves, erosion, and inundation caused by coastal storms, making them vulnerable. This study investigates alternatives for a plan that addresses these vulnerabilities, as well as provides incidental opportunities for habitat restoration and recreation for Treasure Island and Long Key along the Gulf Coast shorelines of Pinellas County, Florida.

PURPOSE AND NEED

This report is an interim response to the study authority. The study authority for this project is Section 216 of the Flood Control Act of 1970, Public Law 91-611 (33 U.S.C. 549a), which authorizes the Secretary of the Army to review the operation of projects for which construction has been completed and which were constructed in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to significantly changed physical or economic conditions, and to recommend to Congress on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest. The existing Federal Pinellas County, Florida Beach Erosion Control (BEC) project was conducted in response to resolutions adopted by the Committee on Public Works of the House of Representatives on June 19, 1963, and by the Committee on Public Works of the United States Senate on November 27, 1963, in accordance with Section 110 of the River and Harbor Act, approved October 23, 1962. This study was funded by the Bipartisan Budget Act of 2018, Public Law 115-123.

This single purpose Coastal Storm Risk Management (CSRM) study focuses on the wave, erosion, and inundation problems that threaten structures and infrastructure along two barrier islands, Treasure Island and Long Key, fronting the Gulf of Mexico in Pinellas County, Florida. The non-Federal sponsor is Pinellas County, Florida.

STUDY SCOPING AND THE FOCUSED STUDY AREA

The study authority for the existing BEC project included all of Pinellas County, FL. Following initial study scoping, the Gulf-fronting shorelines of Treasure Island and Long Key were identified as having the most critical need for a study to identify the need for continued future Federal participation in a coastal storm risk management project. The focused study area includes 7.4 miles of Pinellas County shoreline between Florida Department of Environmental Protection (FDEP) range monuments (R) R-126 to R-143 (Treasure Island; 3.4 miles) and R-144 to R-166 (Long Key; 4.0 miles). R-monuments refer to FDEP survey monuments used for geographic reference.

For planning purposes, these two islands are divided into seven reaches based on erosion rates and other geomorphic features. The boundaries of the subject reaches are illustrated on Figure 1-1 along with the project limits of the existing Pinellas County, FL BEC project for reference.

PROBLEMS AND OPPORTUNITIES

Existing problems in the study area include:

- Storm damages due to erosion, inundation, and waves threaten infrastructure
- Erosion causes loss of natural habitat
- Shoreline erosion threatens recreational opportunities

Opportunities are positive conditions in the study area that may result from implementation of a Federal project such as:

- Reduce economic loss due to coastal storm damages
- Maintain coastal habitat and the character of coastal beach communities and other cultural resources
- Maintain existing recreation (beach and nearshore)
- Support the local economy and tourism industry through the maintenance of stable beaches and healthy coastal ecosystems
- Implement a regional approach to sediment management by utilizing material from nearby navigation inlets as a sand source
- Increase community understanding of coastal resilience

PLANNING PROCESS AND THE TENTATIVELY SELECTED PLAN

It has been determined that there is continued Federal interest in a project along the shorelines of Treasure Island and Long Key, Pinellas County, Florida, based on the Tentatively Selected Plan (TSP) identified using the U.S. Army Corps of Engineers (USACE) Planning Process.

Management Measures and Alternative Development

Management measures are specific structural or nonstructural actions that would take place at geographical locations within the project areas. A number of structural and non-structural management measures were considered to address problems and to realize the opportunities listed above. Non-structural measures initially considered included No-Action, revisions to the Coastal Construction Control Line policies, imposing a Moratorium on Construction, establishing a No-Growth Program, Relocation/Elevation of Structures, Flood Proofing of Structures, Buyout and Land Acquisition, and increasing Public Awareness and Communication. Structural management measures initially considered included Submerged Artificial Reefs, Revetments, Sand-Covered Soft Structures, Beach Nourishment (including both berm and dune features), Jetty Improvements, Groins, Seawalls and Floodwalls, Nearshore Placement, and Offshore Breakwaters.

During the plan formulation process, management measures were screened against the four Federal accounts, planning objectives, and constraints using a qualitative assessment in a matrix. Following Preliminary Screening, the following management measures were carried forward and combined into the Preliminary Array of Alternatives: No Action, Relocation/Elevation of Structures, Buyout/Land Acquisition,

Public Awareness and Communication, Beach Nourishment (including berm and dune features), Jetty Improvements, Groins, and Seawalls/Floodwalls. Further screening using Rough Order of Magnitude (ROM) costs, technical analysis of previous hydrodynamic and sediment transport modeling and non-Federal studies, and Beach-fx modeling results of the Future Without-Project condition resulted in the screening of additional measures. The Final Array of Alternatives include two non-structural and one structural measure carried forward to the final modeling stage of the "With-Project" condition in Beach-fx. Numerous combinations of beach nourishment project dimensions, which were modeled in Beach-fx during final screening to optimize the berm and dune configuration that maximized net benefits. The screening process is described in detail in Chapter 3 of the main report.

Screening of the Final Array of Alternatives

An alternative plan is a set of one or more management measures functioning in tandem to address project objectives. Following preliminary and secondary screening, the team carried forward the No Action and the Beach Nourishment alternatives for final screening using Beach-fx. The maximum dune features modeled included a possible 20-foot extension in width and a dune height to elevation +10 feet NAVD88. The average berm height in the area is approximately +4.5 feet NAVD88; therefore, the +10 foot NAVD88 dune would create a dune that is approximately 5.5 feet higher than the berm at its maximum height throughout the project area. Dune raising, dune widening, and a combination of dune raising and widening were all modeled with possible berm extensions of 0 feet, 30 feet, and 100 feet. In total, the final array of alternatives included 21 alternatives that were modeled to narrow the array to those combinations with the highest net benefits.

All of the alternatives described above were modeled in Beach-fx using full (100 iteration) life-cycle simulations to calculate benefits and costs, resulting in the information in Table ES-1. These plans were evaluated using FY2021 price levels and the FY2020 Federal water resources discount rate of 2.75%. The evaluation covered the span of a 50-year period of analysis with a base year of 2027. Benefit values in this table do not include those derived from land loss estimations and incidental recreation benefits. It is important to note that this table represents costs and benefits estimated during the alternative evaluation process based on best available information at that time. At this time, the alternatives below represent the range of alternatives that together comprise the Tentatively Selected Plan (TSP). There is not a locally preferred plan at this time, but a locally preferred plan could be pursued.

Table ES-0-1. AAEQ Damages for Final Array of Alternatives (Screening-Level Costs).

Alternative Name	**Description**	**Avg AAEQ Cost**	**Net-Benefits (AAEQ $)**	**BCR**
S_TI_E_DWDH_0ft_6INT	Dune elevation to +10ft. NAVD88 and dune widening 20ft. with no berm extension (6 yr. renourishment interval) – SUNSET BEACH ONLY	1,505,000	$1,839,000	2.22
S_TI_E_DWDH_30ft_6INT	Dune elevation to +10ft. NAVD88 and dune widening 20ft. with a 30ft. berm extension (6	1,954,000	$1,202,000	1.62

	yr. renourishment interval) - SUNSET BEACH ONLY			
S_TI_E_DH_100ft_8INT	Dune elevation to +10ft. NAVD88 with a 100ft. berm extension (8 yr. renourishment interval) SUNSET BEACH ONLY	2,132,000	$1,229,000	1.58
TI_E_DWDH_0ft_6INT	Dune elevation to +10ft. NAVD88 and dune widening 20ft. with a 30ft. berm extension (6 yr. renourishment interval) – SUNSHINE AND SUNSET BEACHES	2,665,000	$740,000	1.28
TI_Ends_60ft	60ft. berm extension (6 yr. renourishment interval) – SUNSHINE AND SUNSET BEACHES	2,895,000	$597,000	1.21
LK_E_DWDH_0ft_6INT	Dune elevation to +10ft. NAVD88 and dune widening 20ft. with no berm extension (6 yr. renourishment interval) UPHAM AND PASS-A-GRILLE BEACHES	$1,473,000	($315,000)	0.79
LK_U_DWDH_0ft_6INT	Dune elevation to +10ft. NAVD88 and dune widening 20ft. with no berm extension (6 yr. renourishment interval) UPHAM BEACH ONLY	$870,000	($361,000)	0.59
LK_U_DWDH_30ft_6INT	Dune elevation to +10ft. NAVD88 and dune widening 20ft. with 30ft. berm extension (6 yr. renourishment interval) UPHAM BEACH ONLY	$960,000	($699,000)	0.27
LK_U_DW_100ft_6INT	Dune widening 20ft. with 100ft. berm extension (6 yr. renourishment interval) UPHAM BEACH ONLY	$1,849,000	($1,445,000)	0.22
LK_E_DWDH_30ft_6INT	Dune elevation to +10ft. NAVD88 and dune widening 20ft. with 30ft. berm extension (6 yr. renourishment interval) UPHAM AND PASS-A-GRILLE BEACHES	$1,627,000	($448,000)	0.72

The TSP includes periodic beach nourishment, including dune and berm features, at the north and/or south ends of Treasure Island (R-126 to R-129 and R-136 to R-143) and Long Key (R-144 to R-147 and R-160 to R-166). The maximum dimensions include:

- A berm extension of up to 100 ft. seaward from the dune toe; and
- A dune with a height of up to +10 ft. NAVD88 and a width that could extend the entire equilibrated beach profile up to 20 ft. seaward.

Some key details of the TSP design continue to be refined, including the estimated periodic nourishment interval, the estimated volumes required for periodic nourishment, the landward location of the beach nourishment template, and the estimated project cost. Periodic nourishment of the improved beach, which would be provided when needed, would restore the beach to desired dimensions. Sediment transport along these islands links the geomorphic response of the shorelines; therefore, periodic nourishment for any other areas where erosion might develop would also be provided when needed.

Table ES-0-2. Pertinent Project Information. Costs and benefits shown here are for the minimum template.

Tentatively Selected Plan (TSP) Description	
Average # Nourishment Events	1 initial construction event, approximately 7 renourishment events
Average Volume of Initial Construction	328,600 cubic yards (minimum) to 1,431,850 cubic yards (maximum)
Average Volume of Each Periodic Nourishment	902,750 cubic yards (minimum) to 1,008,000 cubic yards (maximum)
Average Periodic Nourishment Interval	approximately 6 years
Initial Construction Duration	approximately 4-6 months per event
TSP Total Project Cost (including contingency) (October 1, 2020 (FY21) Price Level)	$211,089,000
TSP Total Project Benefits (AAEQ $)	$5,294,018
Cost Sharing Initial Construction	65% Federal / 35% non-Federal
Periodic Nourishments	50% Federal / 50% non-Federal
Benefit-to-Cost Ratio (BCR)	1.23 (October 1, 2020 (FY21) Price Level and FY20 2.75% discount rate) for the minimum template

The total cost of initial project construction is estimated to be between $211,089,000 (minimum template) and $285,155,000 (maximum template). Initial construction is estimated at $13.5 million for the minimum template ($51.7 million for the maximum template). Future renourishment costs are estimated at $26.9 million per nourishment for the minimum template ($28.7 million for the maximum template), with periodic nourishment expected at approximately 6 year intervals.

Sea Level Rise (SLR)

The TSP has increasing returns with SLR, and is a robust option when considering risk and uncertainty associated with the current rates of sea level rise in the study area. The TSP remains an efficient and effective plan for any of the three possible SLR scenarios.

Environmental Considerations

The proposed project is currently being coordinated with state and Federal agencies and will be compliant with applicable Federal statutes and regulations at the time when it becomes a final report. Sand has been placed at the proposed locations in the past as part of the existing Pinellas County, FL BEC project. Most of the locations associated with the proposed sand sources have also been dredged in the past for either shore protection or navigation purposes. No hardbottom resources are located at either the beach placement or sand source locations. Since the proposed TSP berm is smaller than the berm associated

with the existing project, hardbottom mitigation would not be required during construction of the project resulting from the TSP.

The beneficial effects of beach nourishment in the proposed project area include establishing a larger buffer beach to protect upland infrastructure against storms and flooding, providing additional habitat for beach flora and fauna, and increasing beach space for recreational activities. There is no designated critical habitat for any Federally-protected species in the focused study area. The proposed project would likely produce more favorable environmental conditions than would exist without a project, although construction operations would produce temporary adverse effects. The 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).

Coordination with Agencies and the Public

An initial scoping period for the study was conducted from October 30, 2018 through November 29, 2018. The Florida Department of Environmental Protection and the National Marine Fisheries Service accepted USACE's invitations to participate as cooperating agencies in this study. Stakeholders associated with the study include the City of Treasure Island, the City of St. Petersburg Beach, Federal environmental agencies, state and local agencies, and non-governmental organizations (NGO).

Virtual meetings are scheduled with stakeholders and the public during the public comment period to brief these entities on the TSP and to provide these groups with the information they need to effectively review and comment on the draft report.

Residual Risk

The Tentatively Selected Plan does not have a specific design level. In other words, the project is not designed to fully withstand a certain category of hurricane or a certain frequency storm event. The proposed project would greatly reduce, but not completely eliminate, future coastal storm risk and damages over the 50 year period of analysis. Results from Beach-fx modeling indicate that the TSP will reduce FWOP damages.

CHAPTER 1: INTRODUCTION

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1 INTRODUCTION*

1.1 STUDY PURPOSE AND NEED*

Congress has authorized Federal participation in restoring and protecting the shores of the United States, its territories, and its possessions. Under current policy, shore protection projects are designed to reduce damages caused by wind-generated and tide-generated waves and currents along the Nation's ocean coasts, Gulf of Mexico, the 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. 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.

The Federal government's purpose for this study is to review existing project performance, evaluate coastal storm risk management measures, and formulate alternatives to recommend a plan for coastal storm risk management to include incidental opportunities for maintaining environmental resources and recreational opportunities. This study uses the USACE plan formulation process to develop management measures and alternative plans that meet the planning objectives and avoid planning constraints while being technically sound, environmentally acceptable, and economically justified. Alternatives considered are described in detail in Chapter 3.

This report integrates the components of the Environmental Assessment prepared pursuant to the National Environmental Policy Act of 1969 (NEPA). Section headings denoted with an asterisk identify information typically included in a NEPA analysis.

1.2 STUDY BACKGROUND AND LOCATION*

Infrastructure along the Pinellas County shoreline is subject to damages from waves, erosion, and storm surge caused by coastal storms. The impacts of these damage mechanisms is expected to be compounded by sea level change. The majority of the coastal areas in Pinellas County are highly developed and vulnerable to coastal storm damages along both the Gulf of Mexico and back bay shorelines (including both Boca Ciega Bay and Tampa Bay). All 42 miles of the Pinellas County shoreline are authorized for study in the interest of hurricane protection, storm damage reduction, beach erosion control, and other related purposes. Development along Pinellas County barrier islands occurs primarily on four barrier islands: Clearwater Beach Island, Sand Key, Treasure Island, and Long Key (see Figure 1-1).

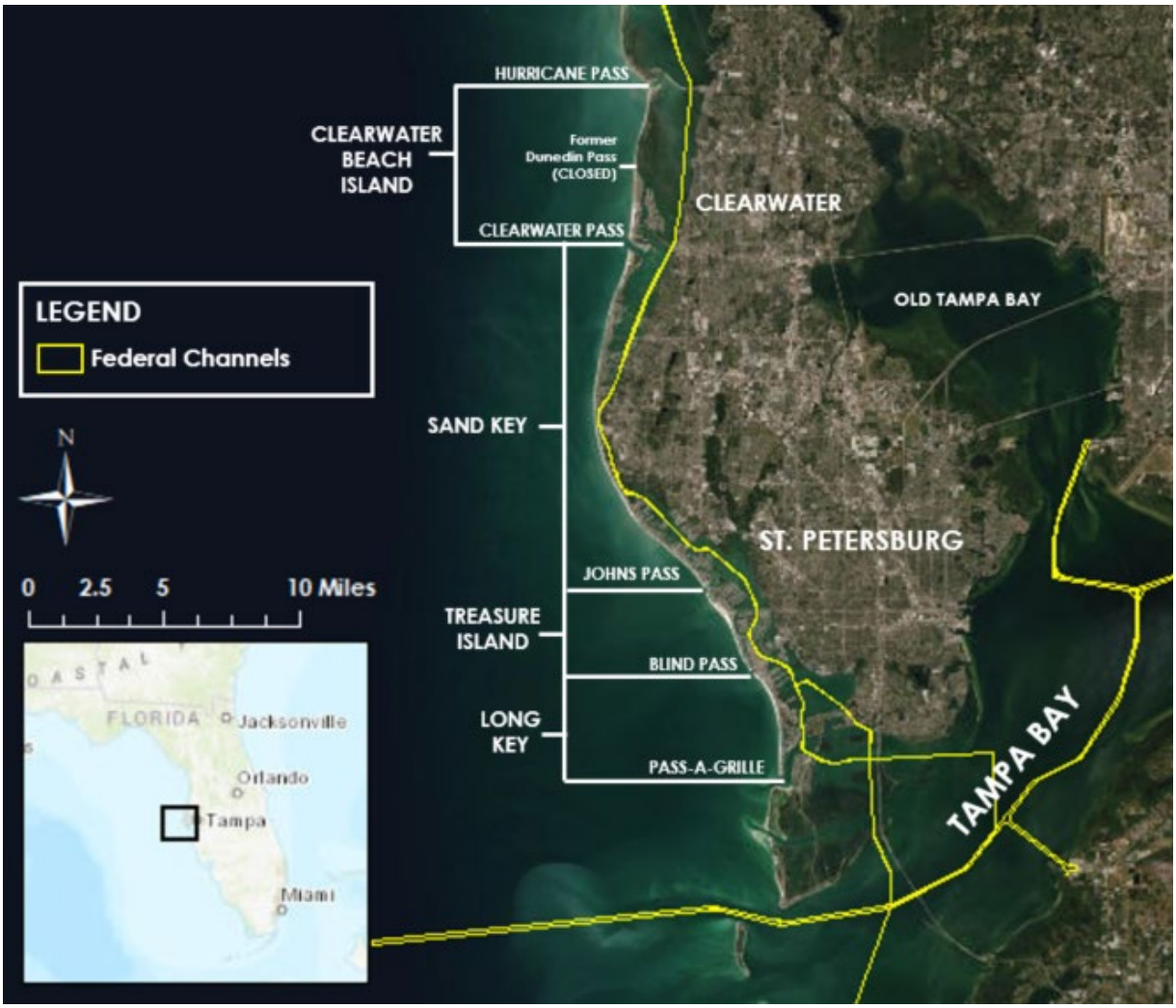


Figure 1-1. Map of the Pinellas County, FL study area.

1.3 STUDY SPONSOR

The non-Federal sponsor is Pinellas County, Florida.

1.4 STUDY AUTHORITY*

Section 216 of the Flood Control Act of 1970 (Public Law 91-611, 33 U.S.C. 549a) authorizes the Secretary of the Army, acting through the Chief of Engineers, to review the operation of projects for which construction has been completed and which were constructed in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to significantly changed physical or economic conditions, and to recommend to Congress on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.

Title IV, Division B of the Bipartisan Budget Act of 2018 (Public Law 115-123), enacted February 9, 2018, authorizes the Government to conduct this study at full Federal expense to the extent that appropriations provided under the Investigations heading of the Act are available and used for such purpose.

For this study, the Section 216 authority outlined above is being used to review the operation of the existing Federal Beach Erosion Control (BEC) project, Pinellas County, Florida, also referred to at times as the Pinellas County Shore Protection Project. The existing Pinellas County BEC project was conducted in response to the following resolutions adopted in June 19, 1963, and November 27, 1963, respectively:

> *Resolved by the Committee on Public Works of the House of Representatives, United States, in accordance with Section 110 of the River and Harbor Act, approved October 23, 1962, that the Secretary of the Army be and is hereby requested to cause to be made, under the direction of the Chief of Engineers, a survey of the shores of Pinellas County, Florida, and such adjacent shores as may be necessary in the interest of beach erosion control, hurricane protection, and related purposes.*
>
> *Resolved by the Committee on Public Works of the United States Senate, that in accordance with Section 110 of the River and Harbor Act, approved October 23, 1962, the Secretary of the Army be and is hereby requested to cause to be made, under the direction of the Chief of Engineers, a survey of the shores of the Gulf Coast of Pinellas County, Florida, from Big Pass south to Pass-a-Grille, and such adjacent shores as may be necessary in the interest of beach erosion control and related purposes.*

1.5 PINELLAS COUNTY, FLORIDA BEACH EROSION CONTROL PROJECT

The purpose of the study authorized in 1963 was to define the beach erosion problems in Pinellas County, to review the 1954 authorized plan and cost-sharing arrangements, and to determine remedial measures required and the amount of Federal participation warranted. The study found that erosion and lowering of the beach profile occurred along parts of the Pinellas County Gulf shoreline, and that considerable amounts of erosion damages had occurred. It recommended authorization of a protective and recreational beach having a berm 40 feet wide at elevation 6 feet above mean low water, for periodic nourishment of the restored beaches as needed, for advance nourishment at Long Key, and for a 600-foot stone revetment at Long Key.

The 1966 USACE, Jacksonville District, Chief of Engineer's Report on Pinellas County, Florida, was published as House Document No. 519, 89th Congress, 2nd Session. Congress authorized the plan and appropriated $116,000 in funds for initial construction in the River and Harbor Act of 1966 (Public Law 89-789).

1.5.1 Project Description

The following plan of improvement was recommended in the 1966 Chief of Engineers report:

Clearwater Beach Island: 5,000 linear feet of beach restoration and 3,300 linear feet of revetment adjacent to Clearwater Pass.

Sand Key: 49,000 linear feet of beach restoration.

Treasure Island: 9,200 feet of beach restoration.

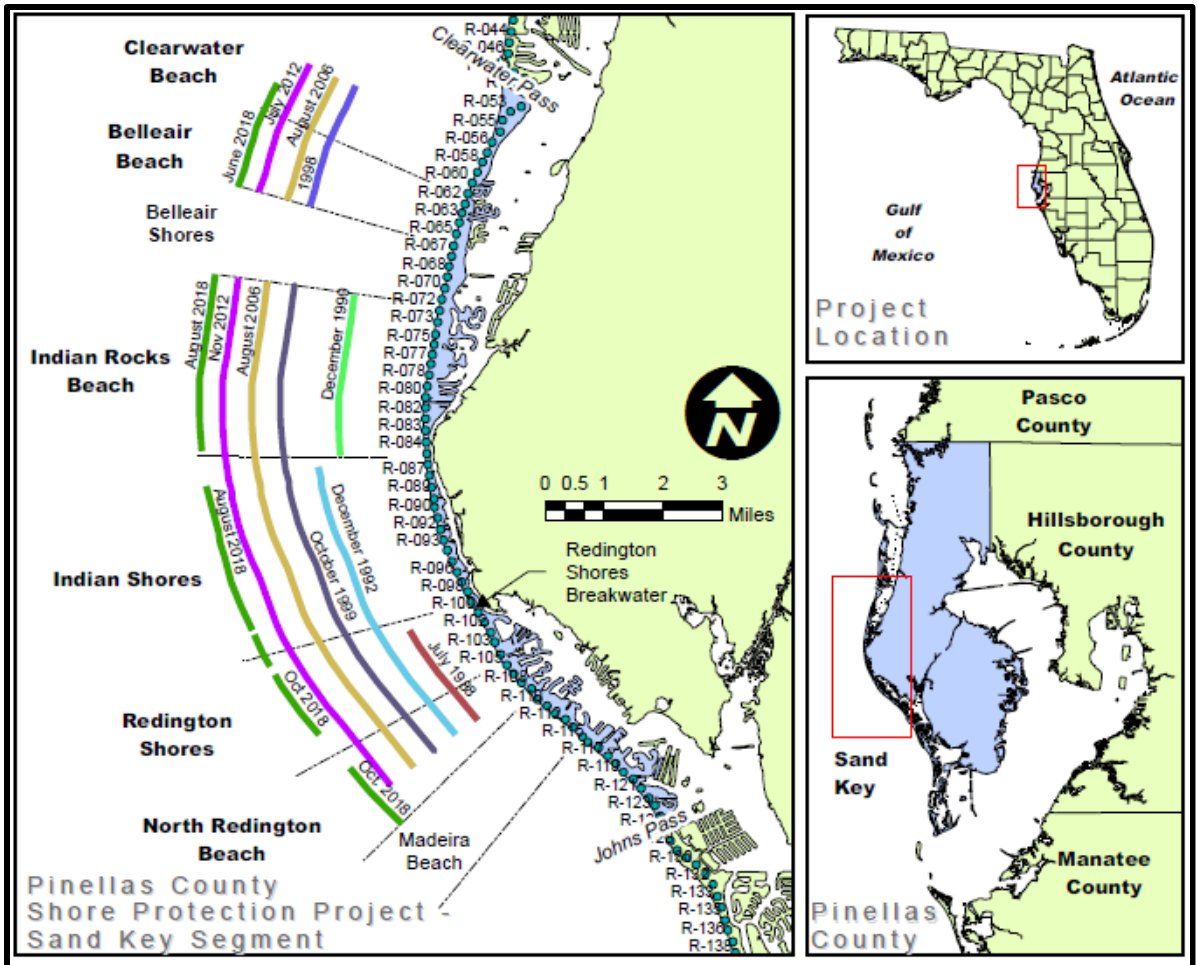
Long Key: 5,600 feet of nourishment Long Key and 600 feet of revetment to protect a publicly-owned hotel.

The four parts of the project were to be constructed together or independently of each other as four separate usable parts. Periodic nourishment of the remaining shores of the study area was recommended as needed, and a revetment at the southerly end of Clearwater Beach Island was recommended for construction by local interests entirely at their expense.

1.5.2 Construction History

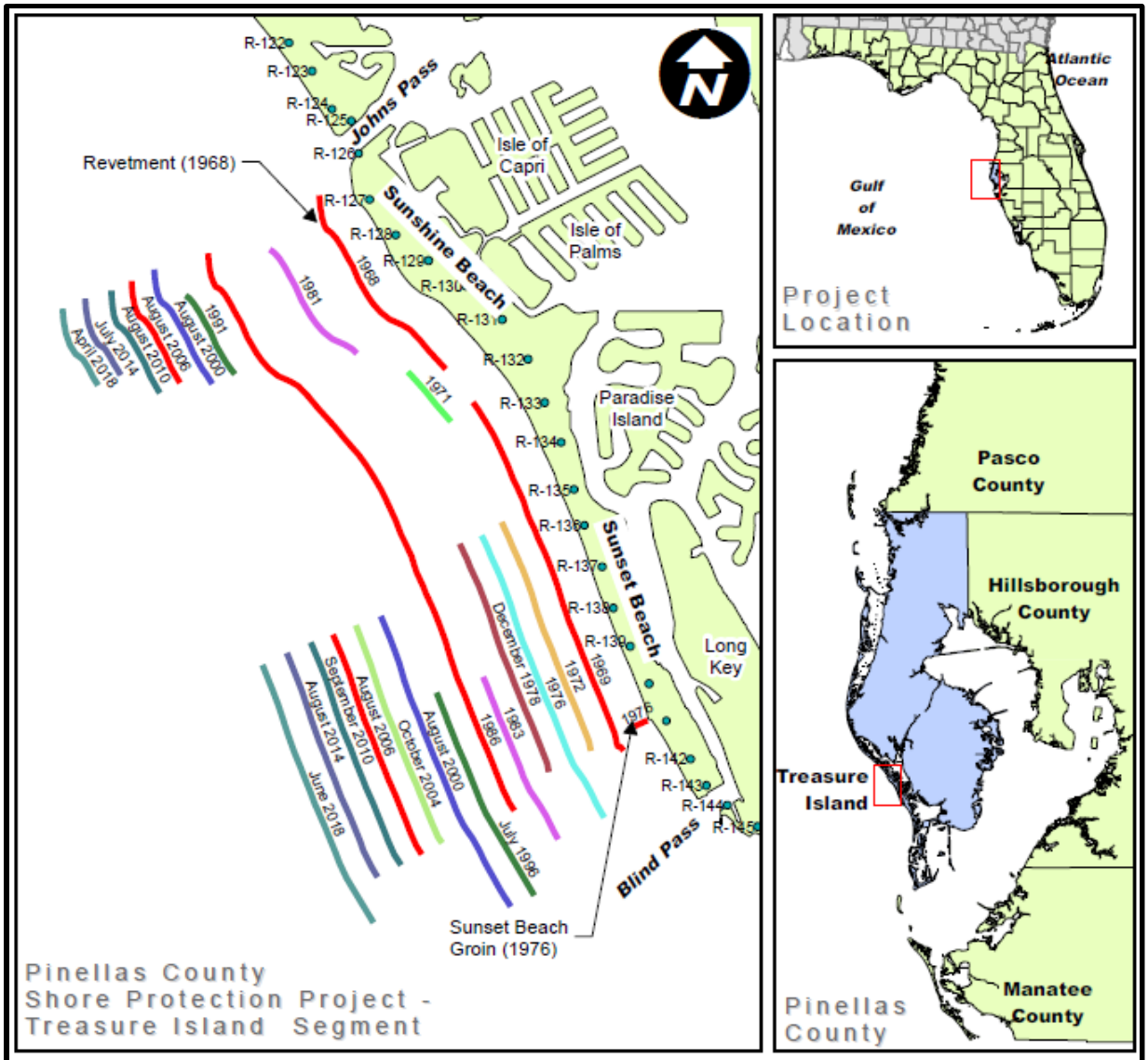
Treasure Island was the first segment constructed, with initial constructed beginning in 1969. Long Key was initially constructed beginning in 1980, and Sand Key was initially constructed in three phases between 1988 and 1992. The beach restoration and revetment at Clearwater Beach Island were never constructed. As the entire shorelines of all three islands were authorized for periodic nourishment as needed, the locations of nourishment along the Pinellas County shorelines have varied over the years since initial construction. Figures 1-2, 1-3, and 1-4 depict the locations and dates of the nourishment events at Sand Key, Treasure Island, and Long Key.

The sand source locations are included in the tables below each set of figures. Other than Egmont Shoal, all offshore sand sources used for past renourishment events are depleted and are no longer available for future renourishments for any of these segments. Egmont Shoal, along with the passes adjacent to the authorized segments, are anticipated to provide sufficient future sediment for the remaining periods of Federal participation for the Pinellas County, FL BEC project.



Construction Completion Date	Event Type	Location		Volume (CY)	Activity/ Borrow Source	Length (miles)
		Name	R-mon			
1985	Redington Shores Breakwater	Redington Shores	R101	n/a	Breakwater	n/a
1987	North Jetty Reconstruction	Madeira Beach	R127	n/a	Jetty Construction	n/a
Jul-88	Sand Key Restoration Phase I	North Redington Beach	R99 to R107	300,000	Johns Pass Ebb Shoal	1.5
Dec-90	Sand Key Restoration Phase II	Indian Rocks Beach	R72 to R85	1,300,000	Eastern Egmont Shoal	2.6
Dec-92	Sand Key Restoration Phase III	Redington Shores	R85 to R107	850,000	Eastern Egmont Shoal	4.2
1998	Restoration	Clearwater Beach/ Belleair Beach	R56 to R66	2,612,166	Eastern Egmont Shoal	1.9
Oct-99	2nd Nourisment	Indian Rocks Beach/ Indian Shores/ Redington Shores/ North Redington Beach	R71 to R107			6.9
Aug-06	1st Nourishment	Clearwater Beach/ Belleair Beach	R56 to R66	1,700,000	Eastern Egmont Shoal	1.9
	3rd Nourishment	Indian Rocks Beach/ Indian Shores/ Redington Shores/ North Redington Beach	R71 to R107			6.9
Nov. 2012	2nd Nourisment	Clearwater Beach/ Belleair Beach	R56 to R66	600,000	Borrow Area L	1.9
	4th Nourishment	Indian Rocks Beach/ Indian Shores/ Redington Shores/ North Redington Beach	R71 to R107	650,000		6.9
Jul-18	3rd Nourishment	Clearwater Beach/ Belleair Beach	R56 to R66	519,995	Eastern Egmont Shoal	1.6
Sep-18	5th Nourishment	Indian Rocks Beach	R71 to R84A	488,333		2.5
Sep-18		Indian Shores - North	R87A to R97	157,533		1.8
Oct-18		Indian Shores - South	R97A to R99	53,490		0.5
Oct-18		Redington Shores	R99 to R103	29,594		0.7
Oct-18		North Redington Beach	R105 to R107	44,513		0.6
Oct-18	MHW Berm Restortation	Truck Haul	R107 to R108A	6,400		0.1

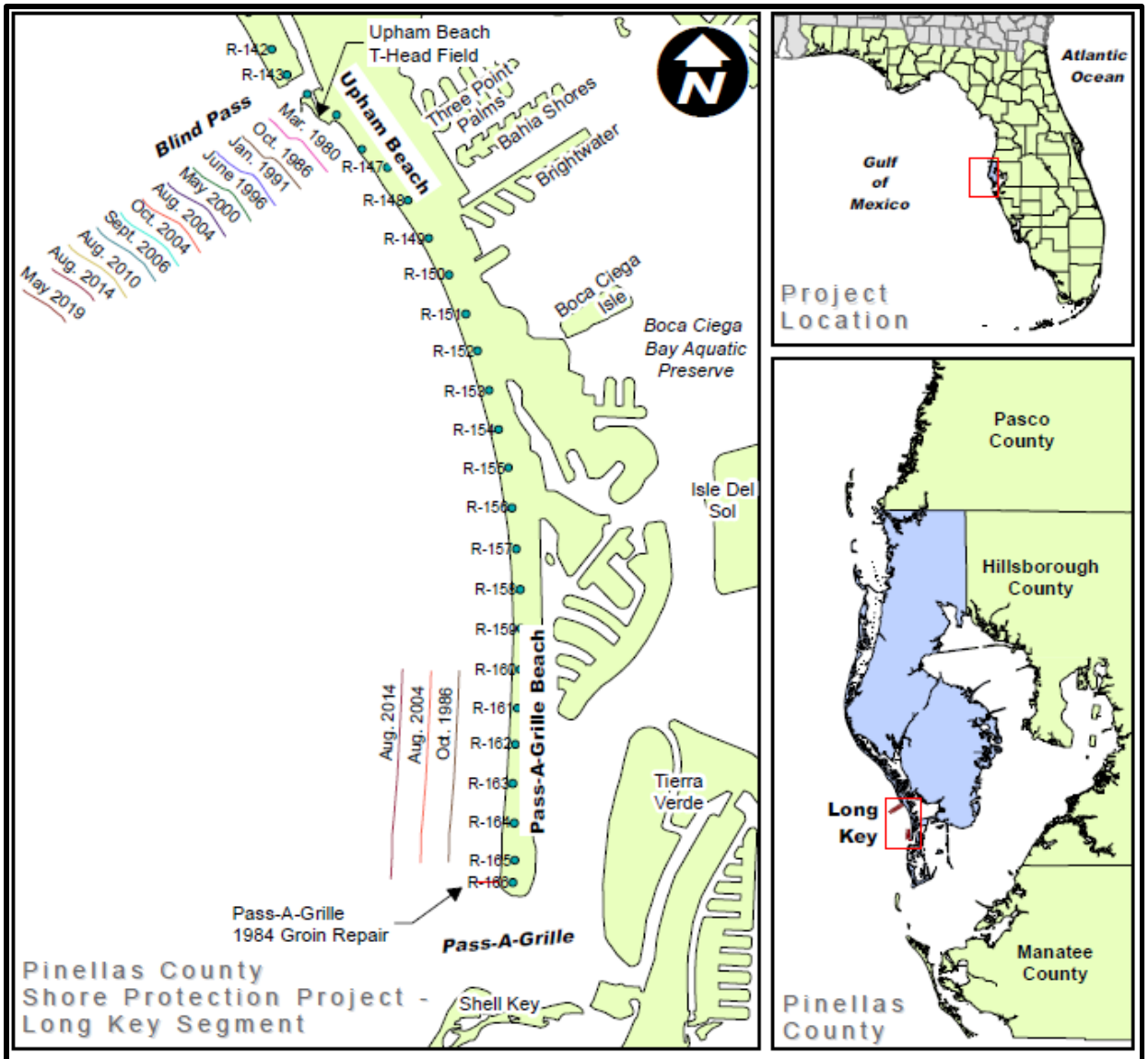
Figure 1-2. Sand Key Segment Construction History.



Construction Completion Date	Event Type	Location (R-mon)	Volume (CY)	Borrow
1968	Revetment Construction	Sunshine Beach (R125-R131)	n/a	n/a
1969	Initial Restoration	Sunset Beach (R132-R141)	790,000	Blind Pass & Parallel Offshore BA
1971	1st Nourishment	Mid Beach (R131-R132)	75,000	Offshore from R127-R130
1972	2nd Nourishment	Sunset Beach (R141-R142)	155,000	Blind Pass
1976	Groin Construction	Sunset Beach (R141)	n/a	n/a
1978	3rd Nourishment	Sunset Beach (R135-R142)	380,000	Offshore BA
Dec-78	4th Nourishment	Sunset Beach (R135-R142)	32,000	Blind Pass
1981	5th Nourishment	Sunshine Beach (R127-R130)	53,500	John's Pass
1983	5th Nourishment	Sunset Beach (R138-R142)	220,000	Blind Pass
Oct-86	Emergency	Treasure Island (R129-R141)	550,000	Pass-a-Grille shoals
1991	6th Nourishment	Sunshine Beach (R127-R129)	56,000	John's Pass

Construction Completion Date	Event Type	Location (R-mon)	Volume (CY)	Borrow
Jul-96	6th Nourishment	Sunset Beach (R138-R144)	51,300	West Egmont Shoal
Aug-00	7th Nourishment	Sunshine Beach (R125-R129)	40,000	John's and Blind Passes
		Sunset Beach (R138-R144)	348,722	John's and Blind Passes
Sept. 2004	8th Nourishment	Sunset Beach (R138-R141)	225,000	Pass-a-Grille Shoals
Aug-06	Emergency	Sunshine Beach (R125-R128)	77,970	West Egmont Shoal
		Sunset Beach (R138-R141)	106,302	
Oct-10	9th Nourishment	Sunshine Beach (R125-R128)	127,260	John's Pass, Attachment Lobe, Blind Pass
		Sunset Beach (R138-R141)	125,423	
Aug-14	10th Nourishment	Sunshine Beach (R125-R128)	66,692	East Egmont Shoal
		Sunset Beach (R138-R141)	232,407	
Apr-18	11th Nourishment	Sunshine Beach (R125.5-R128)	35,671	John's Pass
Jun-18		Sunset Beach (R136A- R142)	238,981	Johns Pass (R136A -R138.3) East Egmont Shoal (Berm.)

Figure 1-3. Treasure Island Construction History.



Construction Completion Date	Event Type	Location (R-mon)	Volume (CY)	Borrow Source
Mar-80	Initial Restoration	Upham Beach (R144-R146)	253,760	Blind Pass
1984	Groin Rehabilitation	Pass a Grille (R166)	n/a	n/a
Oct-86	1st Nourishment	Upham Beach (R144-R146)	96,712	Pass a Grille's Ebb Shoal
	Initial Restoration	Pass a Grille (R160 R165)	73,000	
Jan-91	2nd Nourishment	Upham Beach (R144-R146)	229,950	Pass a Grille's Ebb Shoal
Jun-96	3rd Nourishment	Upham Beach (R144-R146)	252,950	West Egmont Shoal
May 2000[1]	4th Nourishment	Upham Beach (R144-R146)	358,900	John & Blind Pass
Aug-04	5th Nourishment	Upham Beach (R144-R146)	366,092	Pass a Grille's Ebb Shoal
	2nd Nourishment	Pass a Grille (R160 R165)	147,000	

1. Oil discovered in Blind Pass associated with tanker spill within Tampa Harbor

Construction Completion Date	Event Type	Location (R-mon)	Volume (CY)	Borrow Source
May-06[2]	Temporary T-Head Groin Field	Upham Beach (R144-R146)	n/a	n/a - -
Oct-04	Emergency	Upham Beach (R144-R146)	41,670	Pass a Grille's Ebb Shoal
Sep-06	Emergency	Upham Beach (R144-R146)	104,636	West Egmont Shoal
2010	6th Nourishment	Upham Beach (R144-R146)	159,572	Blind Pass
Aug-14	7th Nourishment	Upham Beach (R144-R146)	160,545	East Egmont Shoal
	3rd Nourishment	Pass a Grille (R160 R166)	140,053	
Oct-18[3]	Permanent T-Head Groin Field	Upham Beach (R144-R146)	n/a	n/a
May-19	8th Nourishment	Upham Beach (R144-R146)	150,854	Blind Pass

2. Construction begin to installed five (5) Temporary Geotextile T-Heads began with 2004 project and completed in May 2006.
3. Construction began on July 2017 to remove all the temporary Geotubes and install four (4) permanent T-Heads on April 2019

Figure 1-4. Long Key Construction History.

Following authorization, the Federal government participates in coastal projects for a period of 50 years from the date of initial construction. Since the three segments of the Pinellas County, FL BEC project were initially constructed in different years, Federal participation will expire in different years for each segment. See Figure 1-4 for a timeline of the existing Federal participation in Pinellas County under the 1966 authorization.

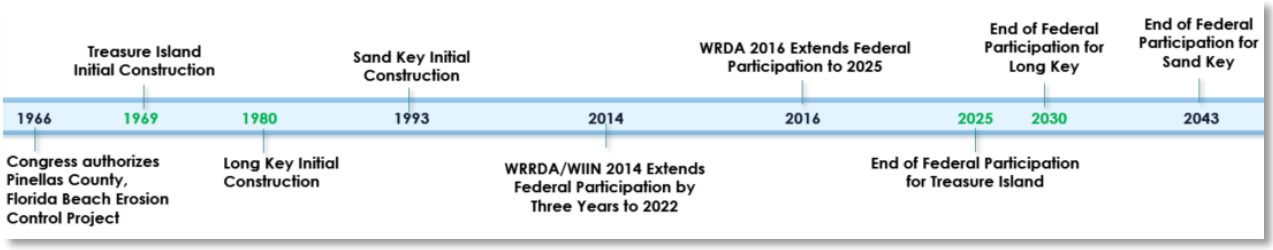


Figure 1-5. Timeline of Federal participation in the existing beach erosion control project in Pinellas County, FL.

1.1 SCOPING*

The current study authority, Section 216 of the Flood Control Act of 1970 (Public Law 91-611, 33 U.S.C. 549a), provides for the review of projects that have been constructed in the interest of flood control to identify whether modifications are appropriate. The project under review is the Pinellas County, Florida Beach Erosion Control (BEC) project, which was authorized in 1966.

The study authority for the existing BEC project included all of Pinellas County, FL. As discussed previously, the protective and recreational beach at Clearwater Beach Island was never constructed. In addition, this area is generally accretional, and infrastructure is not threatened by coastal storm damages. For these reasons, the need for Federal participation in a coastal storm risk management project for the Clearwater Beach Island was determined to be unnecessary during study scoping. Therefore, Clearwater Beach Island was screened from the review conducted in the current study. The current study effort is not intended to alter the existing authorization for the Clearwater Beach Island segment.

Initial construction at Sand Key did not occur until 1993; therefore, Federal participation in the Sand Key segment of the Pinellas County, FL BEC extends through 2043. The local sponsor is satisfied with the existing project at Sand Key, which is successful at reducing risk from coastal storms in this segment. Due to the considerable amount of time remaining in the existing authorization and to the success of the existing project at Sand Key, it is not evaluated in the current study. The current study effort is not intended to alter the existing authorization for the Sand Key segment.

The period of Federal participation for the Treasure Island and Long Key segments will expire in 2025 and 2030, respectively. The problems outlined in Sections 1.1 and further discussed in Section 3.3 continue to exist in these areas. Therefore, the current study focuses on solutions for these two segments of the existing Pinellas County, FL BEC project.

While back bay flooding has increasingly become a concern throughout the project area due to the low-lying elevations of these barrier islands, local interests are planning for future sea level rise. The survey scale of this study identified the potential for future, widespread flooding concerns in the project area during the 50-year period of analysis. However, flooding is limited to nuisance flooding in isolated streets in the project area at this time, and is not anticipated to be a widespread problem for 10 to 20 years. Due to the limited budget available for the current study and the timeframe in which impacts are anticipated to occur, hydrologic modeling to develop alternatives that encompassed back bay solutions was not conducted. A future, comprehensive study of back bay flooding risks to the project area is recommended.

1.1.1 Agency and Public Feedback

USACE, Jacksonville District, mailed a public scoping letter on October 30, 2018, which outlined the intent to gather information evaluating the feasibility of providing coastal storm risk management measures to the Pinellas County shoreline. The letter included the segments of Sand Key, Treasure Island, and Long Key, and discussed that USACE would consider both structural and non-structural alternatives to reduce the risk of damage to infrastructure resulting from coastal storms. A scoping meeting was held on November 15, 2018, in Pinellas Park, Florida, to provide information on the study and to solicit comments from local, state, and government personnel and from the public.

Responses to the Scoping Notice were limited to those provided from the Environmental Protection Agency (EPA). These included technical comments and recommendations to be addressed in the report related to wetlands, water quality, groundwater, drinking water, transportation infrastructure noise, air quality, environmental justice, recreation, socioeconomic, and Green infrastructure (see Appendix H – Pertinent Correspondence). USACE considered these comments during the drafting of this report, and the appropriate assessments are included in the applicable sections of the report.

Feedback from the Scoping Meeting held on November 15, 2018, was that the public is generally satisfied with the existing Federal beach nourishment project. They prefer a wide beach berm. While there is some appreciation for the storm damage protection benefits of a dune feature, some condominium associations express significant concern that dunes will impede their views of the shoreline and diminish their property values. Business owners indicated that patrons prefer unobstructed views of the shoreline and dislike walking over dunes to reach the water, and there was general concern that a dune feature would negatively impact visitation and revenues. Concerns were also expressed that a dune feature would quickly erode, and that a scarped dune face would negatively impact sea turtle nesting and the safety of those recreating on the beach in front of it. Nuisance flooding along isolated streets was also discussed to be a problem in Long Key, but widespread back bay flooding was not perceived to be an imminent threat to coastal infrastructure.

This draft report will be made available to the public for review, and any comments received as a result of that review will be summarized here in the Final Report.

1.1.2 Focused Study Area

The focused study area resulting from the study scoping process included the Gulf-fronting shorelines of Treasure Island and Long Key. Three inlets bound these two islands: Johns Pass, Blind Pass, and Pass-a-Grille. Johns Pass and Pass-a-Grille are Federal navigation channels.

Figure 1-6. Map of the Focused Study Area. The FDEP Reference Monuments bounding the islands are also shown.

1.2 PLANNING REACHES

The shorelines of Treasure Island and Long Key were divided into seven reaches for planning purposes based on geographic features, economic considerations, and historical sand placement.

The seven reaches in the study area comprise 7.47 miles and include, from north to south:

- Sunshine Beach (Treasure Island; 0.62 mile)

- Boca Ciega (Treasure Island; 1.66 miles)
- Sunset Beach (Treasure Island; 1.16 miles)
- Upham Beach (Long Key; 0.54 mile)
- St. Pete Beach North (Long Key; 1.55 miles)
- St. Pete Beach South (Long Key; 0.94 mile)
- Pass-a-Grille Beach (Long Key; 1.00 mile)

R-monuments refer to Florida Department of Environmental Protection (FDEP) survey monuments used for geographic reference. The boundaries of all of the subject reaches and the FDEP reference monuments are illustrated in Figure 1-5.

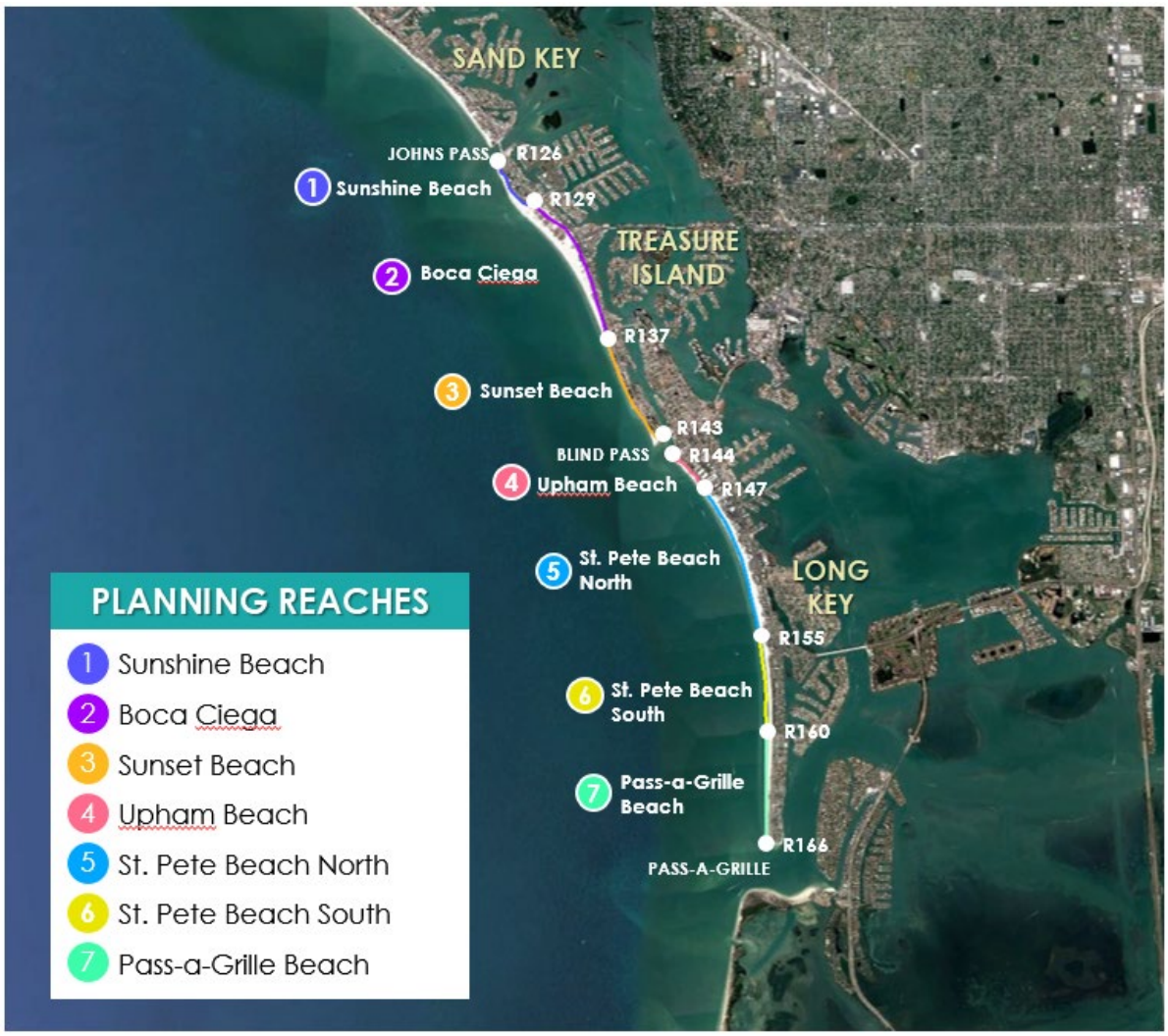


Figure 1-7. Location of the seven Planning Reaches in the Focused Study Area.

1.3 RELATED DOCUMENTS*

Documents and reports relevant to the current study are listed below (Note: this list is not all-encompassing). This report builds upon previous NEPA analyses conducted for the existing Pinellas County, FL BEC. These documents, included in the list below, are incorporated by reference.

1966. Report of the Chief of Engineers, Department of the Army for Pinellas County Beach Erosion Control Study, Pinellas County, Florida, with Report of the Board of Engineers for Rivers and Harbors (14 September 1966). The initial study of the Pinellas County, Florida shoreline was requested by resolutions of the committees on Public Works, U.S. Senate and House of Representatives, adopted on November 27, 1963 and June 19, 1963, respectively. The study was referred to the Committee on Public Works on October 10, 1966, and investigated the following plans:

Initial restoration and periodic nourishment. Nourishment for 5,000 linear feet on Clearwater Beach Island and some revetment, for 49,000 linear feet of Sand Key, for 9,200 linear feet of shore on Treasure Island, and for nourishment only for the southerly 5,600-foot reach on Long Key with a limited amount of revetment. The three beach restoration designs considered for each of the islands are:

(1) A 40-foot level berm at elevation 6, mean low water - Design I.
(2) A 40-foot level berm at elevation 8, mean low water - Design II.
(3) A 60-foot level berm at elevation 4, mean low water - Design III.

Extensions of jetties or anchor groins. Consideration was given to extending the jetties at the southern ends of the islands in the study area. It was determined that extensions were not required or necessarily desirable for beach erosion control purposes, except possibly at Pass-a-Grille Pass at the southerly limit of the study area. Estimated first and annual costs of extending the Pass-a-Grille jetty were not justified by the approximated advance of the accretion fillet that would be expected from that extension.
Groins. There are numerous groins and groin fields throughout the study area. Provision of additional groins would not generally solve the problem. However, it should be noted that the existing groins would prove beneficial in retaining the considered beach fill and reducing future nourishment requirements.
Revetment. In addition to the two areas where revetments are now needed, that form of protection was considered for other parts of the study area. However, local interests indicated that protection alone was not sufficient and that an adequate restored beach was needed for the economy of the entire area.
Hurricane-protective measures. Measures to prevent hurricane tidal flooding from the gulfside were considered. However, due to the low natural elevations and development along the barrier islands and due to the exposure of those islands to severe flooding from the bayside, such measures were not considered feasible.

The Recommended Plan was for a protective and recreational beach having a 40 ft. berm at elevation 6 ft. MLW, for periodic nourishment of the restored beaches as needed, for advance nourishment at Long Key, and for a stone revetment at Long Key. Periodic nourishment of the remaining shores of the study area was also recommended if necessary and justified.

1968. General and Detail Design Memorandum, Pinellas County, Florida, Beach Erosion Control Project, Treasure Island Beach Restoration (July 1968). This report presents the detailed planning for the restoration of 9,200 feet of beach at Treasure Island, Florida. It was authorized by the River and Harbor Act of 1962, Public Law 87-874, approved on October 23, 1962. The original sand source for this portion of Treasure Island was located adjacent to the nourished berm.

1971. Study Report to Determine Behavior of Project Fill for Beach Erosion Control, Treasure Island, Florida, by the Coastal and Oceanographic Department of the University of Florida (December 1971). The purpose of this study was to determine the rate of erosion losses from the project fill by comparison of previous surveys and to survey the borrow areas to determine if any accretion had occurred. Surveys were carried out October, 1970 and April, 1971 by the USACE and compared with previous survey data.

1975. Detailed Design Memorandum, Pinellas County, Florida, Beach Erosion Control Project, Third Periodic Nourishment and Groins, Treasure Island (April 1975). This report presents the detailed planning for the authorized nourishment of 7,600 feet of beach on the Gulf shore of Treasure Island, Florida. The report also establishes the need and presents the justification and detailed planning for groins to reduce excessive erosion losses from the south end of the project.

1978. General and Detailed Design Memorandum Addendum, Pinellas County, Florida, Beach Erosion Control Project (Long Key; September 1978). This report is an Addendum to the 1969 General and Detailed Design Memorandum (G&DDM). It consists of an authorized project for beach renourishment, as needed, along the Gulf shoreline of Long Key.

1982. General Design Memorandum and Environmental Assessment (1982). This GDR and EA is an addendum to the 1969 General and Detailed Design Memorandum (G&DDM). It summarizes the plan for nourishing the southernmost 4,200 feet of Treasure Island, for extending the north groin of Blind Pass per the 1969 G&DDM, and for rehabilitating the north groin of Pass-A-Grille.

1984. Beach Erosion Control Project Review Study and Environmental Impact Statement for Pinellas County, Florida. USACE (July 1984; revised December 1984). This EIS recommends authorization of improvements for beach erosion control on seven barrier islands. The specific barrier islands involved are Honeymoon Island, Caladesi Island, Clearwater Beach Island, Sand Key, Treasure Island, Long Key, and Mullet Key. The plan provides for restoration of 9.1 miles of beach on three of the seven affected islands and for periodic nourishment of beaches on all the islands, having a combined nourishment length of 35.1 miles. Beach restoration and nourishment material would be from offshore borrow areas.

1994. Limited Report and Environmental Summary for Pinellas County, Florida Beach Erosion Control Project. USACE. April 1994 (Revised August 1994). The purpose of this report was to update and reevaluate the authorized Pinellas County, Florida Beach Erosion Control project to determine the advisability of extending Federal participation in periodic nourishment. This is a supplemental report to the Beach Erosion Control Project Review Study Feasibility Report and Environmental Impact Statement for Pinellas County, Florida dated July 1984 (Revised December 1984). This Limited Re-evaluation Report provides current project benefits and costs and serves as the basis for a decision by the Assistant Secretary of the Army for Civil Works for approval and authorization of project modifications stated in the 1986 Water Resources Development Act (Public Law 99-662), Title V, Section 501(b).

1997. Pinellas County Florida Beach Erosion Control Project 1st Renourishment Sand Key Segment Design Memorandum with Environmental Assessment. USACE (November 1996; revised March 1997). This report summarizes the detailed planning and engineering for construction of the first renourishment of the beach erosion control project at Sand Key, Pinellas County, Florida. The Sand Key segment of the Pinellas County, Florida Beach Erosion Control Project is authorized for initial beach restoration and advance nourishment along 9.3 miles of shoreline and periodic nourishment as needed along the entire shoreline of the island. The recommended plan described within this document provides for beach restoration of 8.7 miles of Sand Key shoreline. This includes, for Reaches 1, 2, and 3, the first time renourishment of Redington Shores/North Redington Beach, Indian Rocks Beach, and Indian Shores, and for Reach 4, a protective beach berm with advance nourishment along Belleair Beach and advance nourishment along Clearwater Beach. The Egmont Channel shoal, located about 22 miles south of the project area is the borrow area for initial and future nourishments of the project area.

2000. Design Memorandum with Environmental Assessment, Pinellas County, Florida Beach Erosion Control Project, Northern Treasure Island. USACE (April 2000). This report addresses the northern-most 2,200 feet of Treasure Island where the tidal influences of a Federal navigation project at Johns Pass makes it virtually impossible to maintain a beach profile that would adequately provide authorized storm damage protection to development in that area. The recommended Northern Treasure Island Project includes the construction of a sand tight 375 foot terminal groin intersecting the existing revetment at its southward Gulf turning point approximately 200 feet southwest of DEP Monument R-126 in combination with the placement of sufficient periodic nourishment. The terminal groin would have a continuous structure height of 6 feet above Mean Low Water. Periodic nourishment is that required to maintain the 1991 shoreline position between scheduled renourishment periods and thus, provides the authorized level of shore protection. The beach renourishment considers an authorized elevation of 6 feet above Mean Low Water, a foreshore slope of 1V:20H transitioning to a nearshore slope of 1V:100H extending out to the intersection with the existing profile. The borrow area for initial construction is the Johns Pass Ebb Shoal Borrow Area. The work would be performed utilizing a pipeline dredge. Upon completion on the modifications recommended herein, the northern-most reach would be renourished as part of the overall project for Treasure Island. The sand source for this periodic renourishment (of the total project) would be the Egmont Key Borrow Area, authorized borrow area for the Pinellas County Beach Erosion Control Project.

2003. Final Environmental Assessment, Alternative Sand Source Utilization for the Pinellas County Beach Erosion Control Project, Pinellas County, Florida. Prepared by Dial Cordy and Associates Inc. for USACE, Jacksonville District. This EA considers sand sources closer to the project areas than those that were previously authorized for periodic renourishment. Sand sources considered in this EA include nine offshore areas and four ebb tidal shoals (including Johns Pass, Blind Pass, Pass-a-Grille North, and Pass-a-Grille South) as potential borrow areas for future nourishment events. These sources were intended to be used in lieu of or in addition to Egmont Shoal.

2009. Final Environmental Assessment, Beach Restoration Project, Treasure Island and Long Key, Pinellas County, Florida. USACE. The goal of this project was to restore the historical recreational carrying capacity and tourism amenities of the Treasure Island and Long Key shorelines with sand from the scheduled

maintenance dredging activities at John's Pass and Blind Pass. The objectives were to dredge portions of the ebb shoals west of John's Pass and Blind Pass and to use the sand from the dredging activities to nourish the beaches of Treasure Island and Long Key. Accomplishment of these objectives will ensure the protection of existing upland properties from shoreline erosion associated with typical (seasonal) wave conditions and high frequency storm events, and the maintenance of the John's Pass and Blind Pass channels for safe navigation.

2011. Final Supplemental Environmental Assessment, Supplemental Sand Source for Sand Key Beach Renourishment, Pinellas County Beach Erosion Control Project, Pinellas County, Florida. USACE. The purpose of the project was to use Borrow Area L, an alternative offshore borrow area, to renourish Sand Key beaches with beach-quality sand. It was not the intent of this project to replace or supersede the existing authorization for renourishment of Sand Key using sand from the Egmont Channel Shoal borrow area.

2017. Final Supplemental Environmental Assessment, Beach Erosion Control, Pinellas County, Florida. USACE (August 2017). This document assesses the environmental effects of dredging beach compatible sand from the Egmont Shoal (just north of the Tampa Harbor Federal Navigation Channel and east of Mullet Key) or the following inlets and their associated ebb shoals: Clearwater Pass, Johns Pass, Blind Pass, and Pass-a-Grille. The sand will be placed along the shorelines of Pinellas County to protect upland infrastructure and to restore beach habitats.

2017. Blind Pass – Inlet Management Plan. Florida Department of Environmental Protection, Division of Water Resource Management (March 2017). Recommended sand bypassing from the Blind Pass entrance channel borrow area to the adjacent gulf-fronting beaches both to the north and to the south of the inlet within designated critically eroded areas between FDEP Reference Monuments R136 and R148. The initial target quantities are recommended as 31,000 cubic yards per year to the south of the inlet and 12,000 cubic yards per year to the north.

2018. John's Pass Inlet Management Plan. Florida Department of Environmental Protection, Division of Water Resource Management (January 2018). Recommended sand bypassing from John's Pass navigation channel, channel side borrow area, and ebb shoal borrow areas to adjacent critically eroded gulf-fronting beaches to the south of the inlet (first priority given to R126 to R130, and second priority given to R135 to R143) in the quantity of 21,000 cy per year.

2019. Pass-a-Grille Inlet Management Plan. Florida Department of Environmental Protection, Division of Water Resource Management (January 2019). This plan recommended sand bypassing from the Pass-a-Grille navigation channel and ebb shoal to the adjacent gulf-fronting beaches to the north of the inlet, Pass-a-Grille Beach, between FDEP Reference Monuments R160 and R166. The initial target inlet sand bypassing quantity to Pass-a-Grille Beach is 14,000 cubic yards per year, with additional sediment up to an annualized quantity of 50,000 cubic yards per year from the Pass-a-Grille ebb shoals for beach nourishment projects on Sand Key, Treasure Island, and Long Key.

1.4 RELATED EROSION CONTROL AND NAVIGATION PROJECTS

This discussion is specific to the focused study area of Treasure Island and Long Key.

1.4.1 Federal Coastal Storm Risk Management Projects

Federal projects to combat beach erosion or coastal storm damage in the project area include the Pinellas County, Florida, BEC project (previously discussed in Section 1.5), and the Manatee County Shore Protection Project to the south of Tampa Harbor. A Feasibility Study was prepared to assess coastal storm damage at Egmont Key, but it was not pursued due to lack of Federal interest in the project.

1.4.2 Navigation Projects and Existing Structures

There are several Federally-authorized navigation channels in the project area. The largest project is the deep draft Tampa Harbor Federal Navigation Project, which typically requires annual maintenance dredging. When the dredged materials are beach-compatible sand, they are typically placed on Egmont Key to the south of the Federal channel.

Federally-authorized shallow-draft inlets in the project area include Clearwater Pass, Johns Pass, and Pass-a-Grille. Clearwater Pass is approximately 14 miles north of Treasure Island, and beach-compatible dredged sediments are typically placed in the nearshore or on the beach at Clearwater Beach. In addition, the Gulf Intracoastal Waterway (GIWW) traverses the bayside of the project area between the barrier islands and the mainland. This channel is authorized at nine feet Mean Lower Low Water (MLLW), and was constructed between 1960 and 1967. There are two shallow-draft Federal navigation channels in the focused study area: Johns Pass and Pass-a-Grille. These inlets are adjacent to the focused study area, and they are sources of beach-compatible sediments that have historically been placed on the beaches of Treasure Island and Long Key. There is a long history of inlet management measures and structural components in the focused study area. The following discussion outlines the measures taken in the focused study area in approximate chronological order.

1920s-1950s. A bridge was constructed across Johns Pass in 1926. A small, 90-foot jetty was constructed in 1937 on the south side of Blind Pass to prevent southward inlet migration. This structure was extended landward in the 1950s.

1960s. Local interests constructed 56 timber groins at Sunset Beach in 1960, but they were only partially successful at mitigating shoreline erosion. In 1961, a 460-foot curved jetty was constructed on the north side of Johns Pass. In 1962, USACE constructed a 425-foot jetty on the north side of Blind Pass. The Blind Pass channel was dredged in 1964, and material was placed on Sunset Beach. Johns Pass and Pass-a-Grille Federal navigation projects were authorized by Section 107 of the 1964 River and Harbor Act, which lead to the completion of the first navigation improvements at both Johns Pass and Pass-a-Grille in 1966. The 1966 construction included a 920-foot long revetment along the south shoreline of Johns Pass and a jetty at the northern shoreline of Pass-a-Grille.

1970s. A breakwater was constructed on the south side of Blind Pass in 1974. Two king-pile groins were constructed at Upham Beach in 1975. USACE extended the northern jetty of Blind Pass in 1976 to form a terminal groin at the south end of Sunset Beach.

1980s-1990s. The northern jetty of Blind Pass was extended again in 1983. The jetty at the south end of Pass-a-Grille Beach was reconstructed in 1984, and a fishing platform was constructed along its crest. In 1986, the southern jetty at Blind Pass was extended, but it was not connected to the breakwater at that time. The north jetty at Johns Pass was reconstructed in 1987.

2000-2010s. In 2000, a southern jetty was constructed at Johns Pass to mitigate chronic erosion at Sunshine Beach. Five sand-filled geotextile T-groins were installed at Upham Beach in 2006, and the south jetty was connected to the breakwater at that time. While these geotextile T-groins were monitored and determined to be successful at increasing the nourishment interval between sand placements, they were ultimately replaced with more permanent boulder mound groins of similar design dimensions in 2018.

CHAPTER 2:

EXISTING AND FUTURE WITHOUT PROJECT CONDITIONS

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2 EXISTING AND FUTURE WITHOUT PROJECT CONDITIONS*

This chapter describes conditions as they currently exist and as they are projected to exist if a project is not implemented. Information gathered in this step helps to describe the problems and opportunities, and to forecast future conditions. The Future Without-Project (FWOP) condition is the most likely condition of the study area without construction of a Federal project. For the purposes of this study, the start year for the 50 year period of analysis of the study was identified as 2027.

2.1 GENERAL SETTING*

The project area is on the coast of the Gulf of Mexico in Pinellas County, Florida. Pinellas County has a subtropical climate with an average annual rainfall of 53 inches (134 centimeters (cm)) per year. Damaging storms with winds up to hurricane strength can occur throughout the year. Seven elongated, low-profile barrier islands or keys roughly parallel the mainland. The beaches along these barrier islands are subject to very dynamic conditions and are eroding at varying rates by waves, winds, and currents. Damaging storms with winds up to hurricane strength can occur throughout the year.

The Pinellas County study area is exposed predominantly to short period wind-waves with occasional exposure to longer period open-ocean storm swells (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. Average wave heights range from 0.8 feet to 1.9 feet, indicating a generally mild wave climate year round. Wave directions are generally from the northwest and south quadrants. The alongshore current created by waves breaking at an angle to the shore is the main current that affects the surf zone. Alongshore currents are responsible for predominantly southerly sand transport along the coast of Pinellas County.

The Treasure Island segment measures approximately 3.4 miles, and the island varies in width from less than 500 feet to more than 1,500 feet. The Long Key segment includes approximately 4.0 miles of shoreline, and the island width varies between 700 feet and 2,000 feet. A low-relief dune system backs much of the shoreline, varying in height from 5 to 10 feet relative to the North American Vertical Datum of 1988 (NAVD88).

2.2 PHYSICAL ENVIRONMENT (CONDITIONS)*

The study area consists of an open sandy coast subject to frequent storm events. Adjacent properties to the shoreline can be categorized as urban and include residential, commercial, and recreational properties. Many factors influence the coastal processes characteristic to the Pinellas County, Florida shoreline. Natural factors include winds, tides, currents, waves, storm effects, and sea level rise. Human-related (anthropogenic) factors include the existing Pinellas County, Florida Beach Erosion Control project, navigation projects, and development. The role of each of these factors and their contribution to beach erosion in Pinellas County are briefly described in the following paragraphs. Detailed information on the physical characteristics and coastal processes in the study area are found in the Engineering Appendix.

In the vicinity of Treasure Island and Long Key, waves are influenced by wind direction, and wind direction in this region is more often from the east in the spring, summer, and early fall (March to September) with a shift to the northeast in late fall and winter (October to January). Offshore wind speeds on average are between 10 mph in the summer months to 16 mph in the winter. Average wave heights range from 0.8 feet in the summer months to 1.8 feet in fall and winter. The spring tidal range is approximately 2.2 feet with a mean tide range of approximately 1.5 feet.

Sediment transport at both Treasure Island and Long Key is significantly influenced by inlets adjacent to the project area in addition to alongshore currents created by breaking waves. Johns Pass lies immediately to the north of Treasure Island, Blind Pass separates Treasure Island and Long Key, and Pass-a-Grille Inlet lies immediately to the south of Long Key. Tidal currents associated with each inlet impact littoral transport of sediment at the northern and southern tips of both barrier islands leading to high rates of erosion in those areas and resulting in the deposition of nearshore sediments within the inlet channels. Alongshore currents move sand predominantly to the south, but transport due to tidal currents typically dominates. A detailed description of Johns Pass, Blind Pass, and Pass-a-Grille Inlet, including dredge histories and sediment budgets for adjacent beaches are provided in their respective inlet management plans (FDEP, 2018; FDEP, 2019; FDEP, 2019).

2.2.1 Natural Factors

2.2.1.1 Winds

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. Predominant winds are from the east. Seasonally, winds are generally from the dominant easterly direction and are mild in nature during spring and summer months. Stronger winds from northeasters do occur between December and March. Although impacted by the Florida land mass, these winds maintain a predominantly northeasterly direction. During summer and fall months, the area may be impacted by the passage of tropical storms that can generate devastating winds, waves, and storm surge, which can cause direct damage to coastal structures and infrastructure.

Future Without-Project Conditions (No Action Alternative)

Wind effects on the project area into the future are anticipated to be similar to the existing conditions.

2.2.1.2 Waves

Existing Conditions

The Pinellas County study area is exposed predominantly to short period wind-waves with occasional exposure to longer period open-ocean storm swells (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. The wave energy dissipation that occurs as waves enter the nearshore zone and break is a principal driver for sediment transport (although tidal driven ebb and flood

currents contribute significantly to higher erosion rates along beaches adjacent to the inlets as well). Wave height, period, and direction, in combination with tides and storm surge, are the most important factors influencing the behavior of the beach and dune system. The study area is exposed to both short period wind-waves and longer period open-ocean swells originating predominantly from the northwest during fall and winter months and from the south during spring and summer months. The Engineering Appendix provides additional detail on waves.

Future Without-Project Conditions (No Action Alternative)

Wave impacts on the project area into the future are anticipated to be similar to the existing conditions.

2.2.1.3 Shoreline Change and Erosion Rates

Existing Conditions

Shoreline erosion and accretion rates vary considerably in the study area due to complex inlet effects at the ends of the islands. Erosion rates reach a maximum of almost 43 feet per year at Sunset Beach, while the centers of the island are slightly accretional at a rate of approximately one foot per year. Detailed information in the Engineering Appendix outlines the methods used to calculate shoreline change in the focused study area.

Future Without-Project Conditions (No Action Alternative)

Sea level rise may increase the rate of shoreline change and erosion rates in the study area in the future. Without a project, dunes at the heavily developed northern and southern portions of Treasure Island and Long Key are likely to erode and eventually be eliminated (along with the associated dune vegetation).

2.2.1.4 Astronomical Tides

Existing Conditions

Astronomical tides are created by the gravitational pull of the moon and sun and are well understood and predictable in magnitude and timing. The National Oceanic and Atmospheric Administration (NOAA) regularly publishes tide tables for selected locations along the coastlines of the United States and selected locations around the world. These tables provide times of high and low tides, as well as predicted tidal amplitudes. The tide range in the focused study area is 1.45 feet at Treasure Island and 1.55 feet at Long Key. Tidal datums are summarized in the Engineering Appendix.

Future Without-Project Conditions (No Action Alternative)

Astronomical tide ranges are expected to be similar to existing conditions in the future, though mean sea level is likely to increase as sea level rises.

2.2.1.5 Storm Surge

Existing Conditions

Storm surge is defined as the rise of the ocean surface above its astronomical tide level due to physical forces. Surges occur primarily as a result of atmospheric pressure gradients and surface stresses created by wind blowing over a water surface. Strong onshore winds pile up water near the shoreline, resulting

in elevated water levels along the coastal region and inland waterways. In addition, the lower atmospheric pressure which accompanies storms also contributes to a rise in water surface elevation. 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, damaging water levels. Water level (with storm surge) time series are critical for input into shoreline response and coastal storm risk modeling applications. An increase in water depth may increase the potential for coastal flooding and allow larger storm waves to attack the shore.

The dune system along the Treasure Island segment of the study area has an average elevation range of approximately +5 ft-NAVD88 to +9 ft-NAVD88. Along Long Key, the average elevation range is approximately +7 ft-NAVD88 to +10 ft-NAVD88. Both project segments are susceptible to overtopping from extreme storm surges.

Future Without-Project Conditions (No Action Alternative)

Storm surges are likely to be similar to existing or potentially increase in height and frequency with sea level rise in the future.

2.2.2 Human Factors

Multiple projects constructed by USACE and local interests have affected the project area. These include inlet stabilization, beach nourishment, the construction of groins, and dredging for navigation. The region also experienced intense development during the second half of the twentieth century. Engineering projects and coastal development have significantly affected natural processes in the study area.

2.2.2.1 Infrastructure

Existing Conditions

The Treasure Island and Long Key shorelines are densely developed, which has exacerbated the effects of coastal erosion in this area. It is projected that storm induced erosion, inundation, and wave attack damage infrastructure, limit habitat, and jeopardize storm evacuation and relief efforts. Without a Federal project, it is likely that the sponsor and private homeowners would take steps to combat erosion and loss of property. When this occurs, these efforts may not be coordinated in a holistic fashion to incorporate regional concerns such as sediment movement and environmental/habitat considerations. Individual structures along a shoreline often protect one property while causing accelerated erosion to adjacent, unarmored properties, and cut off the vital exchange of sand from dunes to the beach during storm events. By accelerating erosion and cutting off the dunes, the structures also negatively impact habitat of species such as nesting sea turtles.

Future Without-Project Conditions (No Action Alternative)

The Treasure Island and Long Key beaches are important to the economy and to the lifestyle of Pinellas County residents. It is anticipated that infrastructure in the focused study area will remain similar to existing conditions or potentially increase in density into the future.

2.2.2.2 State of Florida Coastal Policies

Existing Conditions

The State Florida's Coastal Zone Management Program (CZMP) was established under the Florida Coastal Management Act (Chapter 380.20, Fla. Stat. [2019]) and approved by the National Oceanic and Atmospheric Administration's (NOAA) Office for Coastal Management through the Florida State Comprehensive Planning Act of 1972 (Sections 186.001-186.031 and 186.801-186.901, Fla. Stat. [2019]), local governments are also given the opportunity to determine whether these activities are consistent with their goals and policies. The FDEP is the lead state agency for the implementation of the state's CZMP.

The Dennis L. Jones Beach and Shore Preservation Act (Sections 161.011-161.242 and 161.25-161.45, Fla. Stat. [2019]) is Florida's primary statute for developing and implementing the state's strategic beach management plan, regulating coastal construction seaward of the mean high water line, and regulating activities seaward of the coastal construction control lines. The act, administered by the FDEP, was first passed in 1965 and has since been significantly amended. The objective of this Act is to preserve and protect Florida's sandy beaches and adjacent beach and dune systems. The FDEP strives to accomplish this objective with the following programs: Coastal Construction Control Lines, Joint Coastal Permit Program, Erosion Setbacks, Coastal Building Zone, Erosion Control Program, Erosion Control Line, and Inlet Management.

Future Without-Project Conditions (No Action Alternative)

For planning purposes, it is anticipated that state coastal policies will be similar to the existing policies in the future.

2.2.2.3 Local Comprehensive Planning

Existing Conditions

The Community Planning Act (Sections 163.2511-163.3253, Fla. Stat. [2019]) requires that all local governments prepare, adopt, and implement comprehensive plans that address community growth and development needs. It requires that local, regional, and state comprehensive plans be consistent with each other and requires coastal counties and cities to include a "coastal management element" in their local plans. This section of the plan must be based on an inventory of the beach/dune system and existing coastal land use. Local governments must also address disaster mitigation and redevelopment, designation of coastal high-hazard areas, beach protection, and shoreline use.

The Coastal Management Element of the Pinellas County Comprehensive Plan consists of four goals:

1. Pinellas County will protect human life, private property, and public investment from the effects of hurricanes and other natural disasters.
2. Pinellas County shall conserve, maintain, and restore coastal beach and dune systems to balance the benefits to storm protection, recreation, and the economy with their function as a natural resource.

3. Adequate public facilities shall be available to serve the development and redevelopment proposed in the future land use and quality communities element for the unincorporated coastal planning area.
4. Land use designations and decisions in the coastal planning area shall be consistent with the future land use and quality communities' element of this comprehensive plan and compatible with protection of the county's natural and historic resources, reflecting the need for long-term sustainability, continued economic vitality, and consideration for the vulnerability of the county's coastal location.

Future Without-Project Conditions (No Action Alternative)

For planning purposes, it is anticipated that local comprehensive planning would be similar to the existing conditions in the future.

2.2.2.4 Inlet Effects

Existing Conditions

The stabilized inlets adjacent to Treasure Island and Long Key significantly influence littoral transport of sediment at the northern and southern tips of these islands, leading to high rates of erosion in those areas and resulting in the deposition of nearshore sediments within the inlet channels. A detailed description of Johns Pass, Blind Pass, and Pass-a-Grille Inlet, including dredge histories and sediment budgets for adjacent beaches, are available in the inlet management plans published by the Florida Department of Environmental Protection (FDEP, 2018; FDEP, 2017; and FDEP, 2019, respectively).

Additional information on inlet sands is provided in Section 4.1.

*Future Without-Project Conditions (No Action Alternative)**

The existing conditions of the inlets in the focused study area are anticipated to continue in the future without a project.

2.3 NATURAL (GENERAL) ENVIRONMENT*

The beaches of Treasure Island and Sand Key are typical of other west central Florida beaches which are subject to the full force of ocean waves and are eroding at varying rates by natural forces. 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.

2.3.1 Vegetation

Existing Conditions

The study area is along the Gulf of Mexico coastline in Pinellas County, Florida. The Pinellas County climate is subtropical, with typical shoreline habitat consisting of a primary dune and low elevation fore-dunes. According to the Florida Land Use, Cover, and Forms Classification System (FLUCFCS; FDOT 1985), the vegetation communities at the study area are classified as Shrub and Brushland (FLUCFCS 320) and Coastal

Scrub (FLUCFCS 322). Along these low elevation dunes, sea oats (*Uniola paniculata*), sea grape, and dune sunflower (*Helianthus debilis*) tend to be the dominant vegetation. The higher elevation dunes include additional vegetation such as cabbage palm (*Sabal palmetto*) and sea grapes (*Coccoloba uvifera)* along portions of the beach. Additional dune vegetation may consist of sea oats (*Uniola paniculata*), dune grass (*Ammophila breviligulata*), sea rocket (*Cakile edentu*la), cacti (Opuntia compressa), croton (Croton puntatus), pennywort (Hydrocotyle bonariensis), beach elder (Iva imbricate), sea purslane (Susuviam portulacustrum), wild bean (Strophostyles helvola), and morning glory (Ipomea purpurescens). During construction, USACE requires the construction contractor to report sightings of invasive and nuisance species not identified and documented in the pre-construction condition within 24 hours. Additionally, within 30 calendar days following completion of work, the contractor will provide a report with photographs verifying equipment brought on site was cleaned. Outside of the construction period, the City of Treasure Island and the City of St. Pete Beach conduct some invasive species management as funding allows to control the most problematic species, including Brazilian pepper.

Future Without-Project Conditions (No Action Alternative)

Without the proposed project, the dune will continue to erode and eventually be eliminated (along with the associated dune vegetation) in the developed portions of the shoreline. Salt marsh vegetation will remain unchanged in the Future Without-Project Condition.

2.3.2 Fish and Wildlife Resources (Other Than Threatened and Endangered Species)

Coastal shoreline habitats can have low species diversity due to the harshness of the environmental conditions. However, animals that are able to successfully adapt to these dynamic conditions on coastal shorelines are faced with very little competition from other organisms. Receding waves tend to wash amphipods (shrimp-like crustaceans) and isopods (small crustaceans such as woodlice) out of their burrows and suspend these organisms in the water column where they serve as an important food source for a variety of nearshore fish.

2.3.2.1 Migratory Birds

Existing Conditions

More than 70 species of birds have been observed in the Gulf of Mexico and the coastal regions of southwest Florida during studies from 1996 to 2005 (Davis *et al.* 2000; Russell 2005). Bird species observed in the Gulf are predominantly trans-migrant shorebirds, wading birds, and waterfowl. Federal regulatory protection of most birds falls under the Migratory Bird Treaty Act (MBTA; 16 U.S.C. §§703-712) and the Endangered Species Act (ESA; 16 U.S.C. §1531 et seq.). Birds protected under the MBTA include members of the seabird guild, which represents a wide range of species dependent on the resources of the pelagic zone in the Gulf of Mexico. Much of their time is spent in or over water and they are capable of staying far from land for long periods. Most of these birds have adaptive salt glands that allow them to regulate the salt content in their blood (Ehrlich *et al.* 1988). Most species in this guild are colonial nesters that leave the nest to venture far from natal areas. Some seabirds spend significant portions of their life cycle offshore and may occur in the project area, such as the magnificent frigatebird (*Fregata magnificens*), greater shearwater (*Puffinus gravis*), sooty shearwater (*P. grisseus*), Audubon's shearwater

(*P. lherminieri*), manx shearwater (*P. puffiinus*), masked booby (*Sula dactylatra*), northern gannet (*Morus bassanus*), Wilson's storm-petrel (*Oceanites oceanicus*), and band-rumped storm-petrel (*Oceanodrama castro*). Gulls and 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 study area.

The west Florida coast serves as a principal route of the Atlantic Flyway for more than 60 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). Many of the migrants that could pass through the project area are unlikely to stop except to rest on a dredge or boat during migration. Under this condition, all are protected by the MBTA.

Shorebirds nest in the focused study area in significant numbers. These nesting shorebirds lay their eggs in bare sand or shelly areas. Shorebirds sighted in the study area include the black-bellied plover (*Pluvialis squatarola*), Wilson's plover (*Charadrius wilsonia*), sanderling (*Calidris alba*), willet (*Tringa semipalmata*), dunlin (*Calidris alpine*), short-billed dowitcher (*Limnodromus gniseus*), marbled godwit (*Limosa fedoa*), ruddy turnstone (*Arenaria interpres*), black skimmer (*Ranchops niger*) and American oystercatcher (*Haematopus palliates*; eBird 2020). Most of these species breed at locations north of the study area (from northern Florida to the Arctic). On beaches, most shorebirds feed on marine worms, insects, mollusks, and crustaceans in tidal sand and mud flats (Sibley 2000; Ehrlich et at 1988; Audubon, undated).

Additionally, while Pinellas County does not have a funded program in place for monitoring shorebirds there are volunteers, such as the Audubon Society, that will rope off areas of important shorebird nesting habitat in the study area.

Future Without-Project Conditions (No Action Alternative)

The diversity and abundance of shorebirds in the project area is not expected to change in the future; however, erosion of the beach and dune system would limit the available foraging and roosting habitat for shorebirds and seabirds. The use of the sand source locations by migratory birds would not change in the future.

2.3.2.2 Fish Resources

Existing Conditions

The fish species most frequently observed while diving in the study area were sheepshead *(Archosargus probatocephalus)*, gag grouper *(Mycteroperca microlepus)*, and sand perch *(Diplectrum formosum)*. Grey snapper *(Lutjanus griseus)* and spottail pinfish *(Diplodus holbrooki)* were also frequently seen (CPE 2004). Other species observed included belted sand fish *(Serranus subligarius)*, black seabass *(Centropristis striata)*, hogfish *(Lachnolaimus maximus)*, lined seahorse *(Hippocampus erectus)*, and snook *(Centropomus undecimalis)*.

Typical beach fauna in the proposed study area includes the mole crab (*Emerita talpoida*), surf clam (*Donax variabilis*) and ghost crab (*Ocypode quadrata*). These and other beach infauna provide food for a

wide variety of shorebirds such as plovers (*Charadrius spp.),* willets *(Catoptrophorous semipalmatus*), and ruddy turnstones (*Arenaria interpres*). Drift algae and *Sargassum* stranded on the beach may support large numbers of insects and other invertebrate life. Beyond the beach, polychaetes, gastropods, portunid crabs, and burrowing shrimp are the most abundant fauna in shallow, softbottom habitats. As depth increases, these habitats are dominated by amphipods, polychaetes, and bivalves (*Donax* sp., *Tellina* sp.) (Dial Cordy 2002). The benthic communities that occur within the borrow areas are dominated by soft bottom organisms including lugworms and mollusks. Mobile fauna includes sand dollars, sea stars, and urchins (Dial Cordy 2009).

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 as a result of lack of resources. These species may relocate to adjacent beaches in the Future Without-Project Conditions. Species habitat within the swash zone would continue to decrease due to continued erosion from potential increases in turbidity in the Future Without-Project Conditions. No changes to fish and wildlife resources that reside below the swash zone are expected to occur in the Future Without-Project Condition. In addition to increased erosion, hard structures such as seawalls and revetments (where permittable) would likely be constructed to protect private interests, and they could negatively impact the width of beach available for bird if not constructed in conjunction with beach nourishment. Without the created beach birds would not have habitat as it would be eroded.

2.3.3 Threatened and Endangered Species

Threatened and endangered species protected under the Endangered Species Act (ESA) that may occur in the focused study area and potentially be affected by the proposed work are found in Table 2-1.

Table 2-1. ESA listed species within the study area.

Common Name	Scientific Name	ESA Status
Loggerhead Turtle	*Caretta caretta*	Threatened
Green Turtle	*Chelonia mydas*	Threatened
Kemp's Ridley Turtle	*Lepidochelys kempii*	Endangered
Hawksbill Turtle	*Eretmochelys imbricata*	Endangered
Leatherback Turtle	*Dermochelys coriacea*	Endangered
Florida Manatee	*Trichechus manatus latirostris*	Threatened
Piping Plover (wintering)	*Charadrius melodus*	Threatened
Red Knot (wintering)	*Calidris canutus rufa*	Threatened
Gulf Sturgeon	*Acipenser oxyrhynchus desotoi*	Threatened
Smalltooth Sawfish	*Pristis pectinata*	Endangered

Species listed in Table 2-1 covered under the 2007 Gulf Regional Biological Opinion (2003; Amended 9 January 2007) are the identified sea turtles, the Gulf Sturgeon and Smalltooth Sawfish.

2.3.3.1 Sea Turtles

Existing Conditions

Loggerhead (*Caretta caretta*), green (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii*), and hawksbill (*Eretmochelys imbricata*) turtles occur in and around Pinellas County (Meylan *et al*. 1998). The leatherback (*Dermochelys coriacea*) turtle is also reported to occur in waters offshore of Pinellas County (USFWS 2010). Most sea turtles in the Tampa Bay area are loggerheads (Meylan *et al*. 1998). The loggerhead and green are federally listed as threatened; the other turtle species are listed as endangered.

The study area is actively managed for sea turtle conservation efforts by Pinellas County. This includes marking nests per FWC requirements, documenting false crawls, and conducting lighting surveys annually. Additionally, the USFWS SPBO requires 3 years of post-construction monitoring of the study area for daily sea turtle surveys, artificial lighting surveys, escarpment monitoring, and sand compaction measurements.

Loggerheads regularly nest on Pinellas County beaches (Table 2-2). Greens, Kemp's ridleys, and hawksbills are infrequent nesters on county beaches as well. The U.S. Fish and Wildlife Service (USFWS) designated terrestrial critical habitat for the loggerhead turtle in 2014. There is no loggerhead terrestrial critical habitat located in the study area.

Table 2-2. Sea turtle nests by species for the Pinellas County shoreline from 2007 to 2019. Data is courtesy of the FWC/FWRI Statewide Nesting Beach Survey Program Database as of January 24, 2020.

Year	County	Loggerhead Nest	Green Turtle Nest	Leatherback Nest	Hawksbill Nest	Kemp's Ridley Nest
2007	Pinellas	78	0	0	0	1
2008	Pinellas	196	0	0	0	0
2009	Pinellas	212	0	0	0	0
2010	Pinellas	153	1	0	0	0
2011	Pinellas	159	0	0	0	2
2012	Pinellas	316	0	0	0	0
2013	Pinellas	385	1	0	0	0
2014	Pinellas	363	0	0	0	0
2015	Pinellas	420	0	0	0	1
2016	Pinellas	498	0	0	0	3

2017	Pinellas	667	0	0	0	0
2018	Pinellas	549	0	0	0	1
2019	Pinellas	667	0	0	0	2

National Marine Fisheries Service (NMFS) designated marine critical habitat for the loggerhead turtle in 2014. There is no loggerhead marine critical habitat located in the study area.

Future Without-Project Conditions (No Action Alternative)

In the Future Without-Project Condition, it is projected that the beach will continue to erode. This will reduce the shoreline area available for nesting sea turtles and bird habitat. It is unknown whether the overall nesting would be affected along the southern Gulf Coast, though negative effects to nesting could be expected with decreased available habitat within the project area. In addition to increased erosion, hard structures such as seawalls and revetments (where permittable) would likely be constructed to protect private interests, and they could negatively impact the width of beach available for nesting if not constructed in conjunction with beach nourishment. Without the created beach sea turtles would not have habitat as it would be eroded.

2.3.3.2 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; Würsig, Jefferson, and Schmidly, 2000]. All mammals in the study area are protected by the Marine Mammal Protection Act.

2.3.3.2.1 Whales

Existing Conditions

The NMSF estimated a 2015 northern Gulf of Mexico sperm whale population of 763, with a minimum of 560, with insufficient data to determine a trend for the northern Gulf of Mexico sperm whale stock (NMSF 2015). The baleen whales are considered rare or extralimital in the Gulf (Würsig *et al.* 2000). According to the Gulf Regional Biological Opinion, amended 19 November 2003, sperm whales (Physeter macrocephalus) occur in the Gulf of Mexico but are rare in inshore waters. Baleen whales are also deep water species. Therefore, these whales will not be impacted by the offshore shoal, inlets or along the beach of the study area.

Future Without-Project Conditions (No Action Alternative)

The Future Without-Project Conditions for whales are not expected to be different from the Existing Conditions described above.

2.3.3.2.2 West Indian Manatee

Existing Conditions

The Florida manatee (*Trichechus manatus latirostris*) is known to occur in the study vicinity and is considered a federally protected species. There is an Important Manatee Area designated at Pass-a-Grille Inlet and in the backbay areas east of Treasure Island and Long Key (Figure 2-2). The purpose of Important Manatee Area designations is to restrict the speed and operation of vessels where necessary to protect manatees from harmful collisions with vessels and from harassment. The closest manatee critical habitat is located in the Manatee River, near the south bank of the mouth of Tampa Bay, approximately 20 miles from the project area.

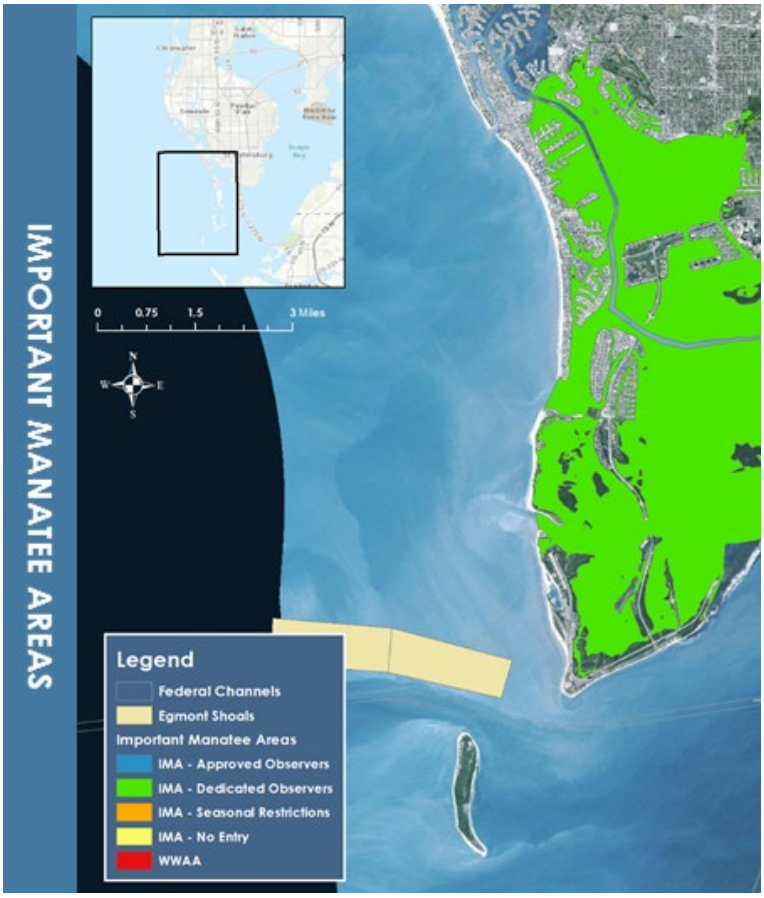


Figure 2-1. Important Manatee Areas in the Project Vicinity.

Future Without-Project Conditions (No Action Alternative)

The Future Without-Project Conditions for the West Indian manatee are not expected to be different from the Existing Conditions described above.

2.3.3.3 Piping Plover

Existing Conditions

The piping plover (*Charadrius melodus*) is a small shorebird about 6 to 7 inches in length. The piping plover is designated as threatened species under the ESA, and regularly overwinter in Florida between November and April, including the Gulf Coast beaches. The piping plover prefers to forage in coastal habitats that include sand flats adjacent to inlets or passes, sandy mud flats along prograding spits (areas where the land rises with respect to the water level), ephemeral pools, and overwash areas. These substrate types have a richer infauna than the foreshore of high energy beaches and often attract large numbers of shorebirds.

While piping plover designated critical habitat is located to the north and to the south of the project area, there is no designated critical habitat within the focused study area as well as no nesting.

Future Without-Project Conditions (No Action Alternative)

The FWOP condition would result in continuing beach erosion, which may eventually result in a hardened shoreline to protect infrastructure. This would adversely affect piping plover and red knot habitat as these species compete for the remaining beach area with humans. Intertidal foraging habitat area would remain relatively constant, although it would shift spatially as the beach eroded

2.3.3.4 Rufa Red Knot

Existing Conditions

The *rufa* red knot (*Calidris canutus rufa*) is a medium-sized shorebird about 9 to 11 inches in length. The *rufa* red knot is designated as threatened species under the ESA, and also regularly overwinter in Florida between November and April, including the Gulf Coast beaches. The *rufa* red knot also forages in coastal habitats that include sand flats adjacent to inlets or passes, sandy mud flats along prograding spits ephemeral pools, and overwash areas. The Gulf Coast of Florida, and Pinellas County in particular, is one of the most important wintering sites for the *rufa* subspecies of the red knot (*Calidris canutus rufa*). The red knot nests in the summers in Canada and the Great Lakes region, and winters in South America. Some individuals overwinter along the Gulf Coast between November and April, and others use it as a stopover location to build their energy stores for the remainder of the migration to points further south.

The red knot was listed as a threatened species under the ESA in 2014. Although critical habitat has not yet been designated for the species, the study area contains suitable habitat for the red knot. Data from the eBird database indicate that they are most often found along the Pinellas County beaches from mid-July through the fall months, but can occur with regularity through the winter until mid-May (Sullivan *et al.,* 2009; see Figure 2-3 and Figure 2-4).

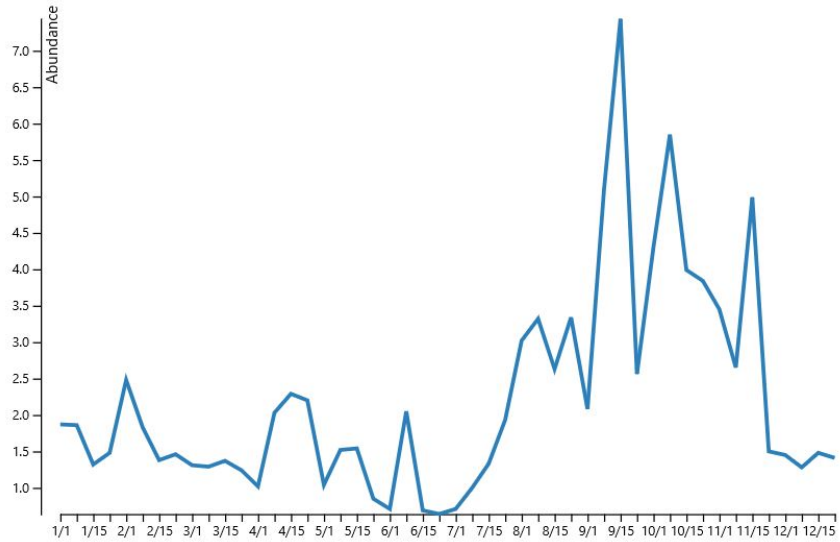


Figure 2-2. *Rufa* red knot abundance in Pinellas County (1900-2020). Abundance is the average number of birds reported on all checklists within a specified data range and region. Image provided by eBird (www.ebird.org) and created March 21, 2020.

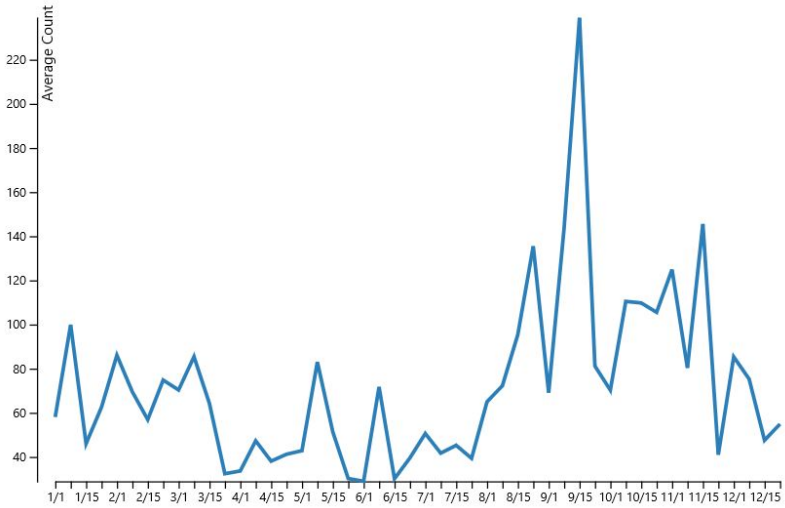


Figure 2-3. Average *rufa* red knot counts in Pinellas County by week from 1900-2020. "Average Count" is the average number of birds seen on eBird checklists with a positive observation for the species within a specified date range and region. Image provided by eBird (www.ebird.org) and created March 21, 2020.

Future Without-Project Conditions (No Action Alternative)

The FWOP for the *rufa* red knot would be similar to that of the piping plover discussed above.

2.3.3.5 Gulf Sturgeon

Existing Conditions

The Gulf sturgeon (*Acipenser oxyrinchus desotoi*) is a geographically distinct subspecies of the Atlantic sturgeon (*Acipenser oxyrinchus).* The Gulf sturgeon is anadromous and inhabits Gulf of Mexico watersheds. During the warm months, sturgeon live in coastal rivers from Louisiana to Florida; in cooler months, sturgeon are found in the Gulf of Mexico, bays, and estuaries. Sub-adults and adults spend approximately eight to nine months of each year in rivers and three to four months during the winter in estuaries or the Gulf of Mexico. Sturgeon younger than two years old may remain year-round in rivers and estuaries and not enter Gulf waters (USFWS and GSMFC 1995). Mud bottoms, sand bottoms, and seagrass areas appear to be important habitats for this species.

Gulf sturgeon may not be sexually mature until 8 or 12 years of age for females and seven to nine years old for males. Adult sturgeon spawn during the spring in freshwater and migrate to marine and estuarine waters in the fall. Spawning may only occur in specific rivers. Sturgeon are bottom feeders and typically feed on macroinvertebrates, including brachiopods, mollusks, worms, and crustaceans. Sturgeon do not appear to forage in the rivers and only feed in estuaries and the Gulf of Mexico (NOAA 2010). Gulf sturgeon critical habitat is located between the eastern portion of Lake Pontchartrain in Louisiana and Suwanee Sound in Florida. This study area is not within the critical habitat designated for Gulf sturgeon. Gulf sturgeon have been reported sporadically in Pinellas County and nearby areas; however, this is the southern limits of their typical habitat. In 1992, a Gulf sturgeon was caught one mile west of Redington Beach on Sand Key. In 1987, a female sturgeon was caught in Tampa Bay near Pinellas Point (USFWS and GSMFC 1995).

Future Without-Project Conditions (No Action Alternative)

The Future Without-Project Conditions for the Gulf sturgeon are not expected to be different from the Existing Conditions described above.

2.3.3.6 Smalltooth Sawfish

Existing Conditions

The smalltooth sawfish (*Pristis pectinata*) is currently listed as endangered under the ESA by NMFS (50 CFR Part 224). In 2003, it was the first marine fish species in U.S. waters added to the ESA listing (Ocean Conservancy 2009). Although smalltooth sawfish once ranged throughout U.S. coastal waters along the southeastern Atlantic and northern Gulf of Mexico, its known primary range is now reduced to the coastal waters near Everglades National Park and the Charlotte Harbor Estuary in extreme southern Florida.

Scientists with the University of Florida have concluded that the sawfish population has declined by as much as 99% over the past 30 years and is in danger of extinction (Ocean Conservancy fact sheet 2009). The primary contributor for the decline of the smalltooth sawfish population has been bycatch from commercial and recreational fisheries. Other threats include entanglement in fishing lines, degraded water quality, reduction of critical habitat, disturbance by divers, and removal of their “saws” (NMFS 2009).

Smalltooth sawfish typically inhabit shallow waters (depths up to 20 feet) near the mouths of rivers in estuarine lagoons over sandy or muddy substrates; likewise, they may also be found in deeper waters (greater than 50 feet) along continental shelf (Carlson et al, 2006). Shallow coastal waters, such as bays and estuaries having depths less than 4 feet, provide an important nursery area for juvenile smalltooth sawfish (Carlson et al, 2006). The only breeding areas still known to exist are located in southwest Florida. Historically, Charlotte Harbor through Dry Tortugas has always harbored the largest numbers of smallthooth sawfish, along with the Ten Thousand Islands of the Everglades (Carlson et al, 2006). These areas serve as the last stronghold for the species. Maintenance and protection of habitat is an important component of the smalltooth sawfish recovery plan (NMFS 2009). Key habitat features, especially for juvenile individuals, consist of shallow, warm water with proximity to mangroves and estuarine conditions.

Similar to sharks and rays, smalltooth sawfish belong to a group of fish known as elasmobranches, as their skeletons are composed of cartilage, and are considered modified rays having a body shape and gill slits also found on sharks (NMFS 2009). They are long-lived, and slow to mature (up to 10 years). Adults can grow to be quite large; the longest recorded length is 24.7 feet, although the average length is around 18 feet (FLMNH website 2012). Females bear live young after about one year of gestation, and the litters reportedly range from 15 to 20 pups which are born during the warmer summer months in shallow, protected waters (FLMNH 2012). Their diet consists of macroinvertebrates, crustaceans, and fishes such as herrings and mullets. The saw is used to disturb surficial sediments in search of benthic invertebrates or to impale prey fishes on the rostral teeth (FLMNH 2012).

The Gulf of Mexico Regional Biological Opinion (GRBO), amended 19 November 2003 determined that "because there has never been a reported take of a small tooth sawfish by a hopper dredge, such take is unlikely to occur because of smalltooth sawfishes' affinity for shallow, estuarine systems." The current GRBO, amended 9 January 2007, does not authorize any takes of the federally listed smalltooth sawfish.

Future Without-Project Conditions (No Action Alternative)

The Future Without-Project Conditions for the Smalltooth Sawfish are not expected to be different from the Existing Conditions described above.

2.3.4 Essential Fish Habitat (EFH)

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA; 16 U.S.C. §801 et seq.) outlines the Secretary of Commerce and Fishery Management Council authority and responsibilities for the protection of essential fish habitat (EFH). The Act specifies that each Federal agency shall consult with the Secretary with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat identified under this Act. EFH is defined in the Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." 50 C.F.R. Part 600, Subpart J establishes 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 effects from both fishing and non-fishing activities on EFH, and identification of actions required to conserve and enhance EFH. The regulation promotes the protection, conservation, and enhancement of EFH. The definition of EFH may

include habitat for individual species or an assemblage of species; whichever is appropriate within each FMP.

The Gulf of Mexico Fisheries Management Council (GMFMC, 1998) has designated marine areas of unconsolidated substrate, hard bottoms, and water columns within the study area as EFH. The majority of the study area is unconsolidated substrates. Egmont Shoal is a lateral shoal associated with Tampa Bay, and has bottom sediments composed of sand and shell hash. Sedimentary habitats, such as sand shoals, support a variety of invertebrates and demersal fishes, and are common to this region. Invertebrate species using the shoals include infaunal and epifaunal species represented primarily by annelid worms, gastropods, bivalves, crustaceans, and echinoderms. Demersal feeding fishes prey on most of these species.

Pursuant to the MSFCMA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-297), the Integrated Feasibility Report and Environmental Assessment is prepared consistent with the Finding between USACE Jacksonville District and NMFS Southeast Regional Office regarding the coordination of EFH consultation requirements with NEPA (NMFS, 1999 (revised 2000)). The Corps EFH assessment can be found in Section 4.2.4.

Previous documents have analyzed the effects of dredging and beach placement on EFH in the study area (see Section 1.8 for a complete list). These analyses are incorporated by reference.

Existing Conditions

Managed Species

The study area is designated as EFH for 31 species or species groups (see Table 2-3). The managed species include coral and four species of crustaceans from the *Shrimp Fishery Management Plan*, the *Stone Crab Fishery Management Plan,* and the *Spiny Lobster Fishery Management Plan,* as well as 27 species of fishes from the *Red Drum*, *Reef Fish*, *Coastal Migratory*, and *Highly Migratory Fishery Management Plans*.

Table 2-3. Summary of managed species in Pinellas County.

Species	Scientific Name	Young of Year or Neonate	Juveniles	Adults
Coral Species		X	X	X
Shrimp Fishery				
brown shrimp	*Farfantepenaeus aztecus*	X	X	X
pink shrimp	*F. duorarum*	X	X	X
Stone Crab Fishery				
Florida stone crab	*Menippe mercenaria*	X	X	X
Spiny Lobster Fishery				
spiny lobster	*Panulirus argus*	X	X	X
Red Drum Fishery				
red drum	*Sciaenops ocellatus*	X	X	X
Reef Fish Fishery				

Species	Scientific Name	Young of Year or Neonate	Juveniles	Adults
gag grouper	*Mycteroperca microlepis*	X	X	X
gray snapper	*Lutjanus griseus*	X	X	X
gray triggerfish	*Balistes capriscus*	X	X	X
greater amberjack	*Seriola dumerili*	X	X	X
lane snapper	*L. synagris*	X	X	X
lesser amberjack	*S. fasciata*	X	X	X
red grouper	*Epinephelus morio*	X	X	X
red snapper	*L. campechanus*	X	X	X
scamp grouper	*M. phenax*	X	X	X
yellowtail snapper	*Ocyurus chrysurus*	X	X	X
Coastal Migratory Pelagic Fishery				
bluefish	*Pomatomus saltatrix*			X
dolphin	*Coryphaena hippurus*			X
cobia	*Rachycentron canadum*	X	X	X
king mackerel	*Scomberomorus cavalla*	X	X	X
little tunny	*Euthynnus alletteratus*	X	X	X
Spanish mackerel	*S. maculatus*	X	X	X
Highly Migratory Pelagic Fishery				
blacknose shark	*Carcharinus acronotus*			X
blacktip shark	*C. limbatus*	X	X	X
bonnethead shark	*Sphyrna tiburo*		X	
bull shark	*C. leucas*	X	X	X
great hammerhead shark	*S. mokarran*			X
lemon shark	*Negaprion brevirostris*		X	X
sandbar shark	*C. plumbeus*	X	X	X
spinner shark	*C. brevipinna*	X		
nurse shark	*Ginglymostoma cirratum*		X	X
tiger shark	*Galeocerdo cuvieri*		X	

In reference to Table 2-3, those species that are benthic/demersal and feed on infauna or epifauna that may possibly occur at the borrow sites are the shrimp, crab, lobster and the red drum. The pelagic fish species do not make focused use of borrow areas and, therefore, would not be expected to be impacted by the use of the study's borrow areas. Additionally, the reef fish species would not be expected to be impacted by the use of the borrow areas since there are no hardbottoms which is where they would tend to congregate for food.

According to the 2003 Dial Cordy Pinellas County EFH assessment, the reef fish are popular sport fishes among recreational fishers, but not as popular commercially where they are harvested using handlines, bottom longlines, and in some cases traps and trawls. Some Florida fishers feel that amberjack are being exposed to too much fishing pressure, especially owing to their attraction to reefs which make them an easy target for overfishing (Manooch and Potts, 1997a). However, as of 1997 there is no evidence of overfishing in either the Gulf of Mexico or southeast Florida (Manooch and Potts, 1997b).

Habitat Areas of Particular Concern

No Habitat Areas of Particular Concern are located within or near the study area.

Hardbottoms

Hardbottoms provide substrate for benthic organisms, crevices where organisms can seek protection, and foraging habitat for a number of aquatic species. Hardbottoms can be of various types, artificial or natural, such as reefs, with high and/or low relief, and can be of any shape. Nearshore hardbottoms are most prevalent in the northern portion of Pinellas County, and are limited in extent in the focused study area of Treasure Island and Long Key.

While this area is north of the focused study area, there are hardbottoms present in the nearshore waters of Sand Key that generally consist of mixed benthic communities of epifaunal organisms such as algae, sponges, octocorals, stony corals, hydroids, anemones, barnacles, bryozoans, decapods crustaceans, and gastropods. Many of these organisms are attached directly to the substrate. Sidescan sonar surveys of Indian Shores, the majority of Indian Rocks Beach, Redington Shores, and North Redington Beach were conducted in 1991, 1993, and 1995-1996 following the initial construction there. Estimates from the 1991 and 1993 sidescan sonar surveys indicated extensive hardbottom presence inside the anticipated equilibrium toe-of-fill for the first nourishment of this area; however, subsequent field verification and comparison with the updated surveys conducted in 1995-1996 indicated that there was an error in the interpretation of the surveys. The studies concluded that there were high relief hardbottoms at the southern end of that project at R-104 (relief up to 3½ and 4 feet). In the vicinity of Indian Rocks Beach at R-83, the divers verified the medium relief hardbottoms with relief up to 2½ feet. This suggested that these areas recruited well after previous nourishments. Using the corrected estimates derived from the sidescan sonar survey performed in September 1996, estimated hardbottoms within the toe-of-equilibrium along the previously nourished portion of Sand Key prior to the second nourishment was approximately 7.9 acres, which included 0.1 acres for areas of new construction at Indian Rocks Beach and 7.8 acres for areas that had been previously constructed. The 1995-1996 sidescan sonar surveys also showed scattered hardbottoms in the Clearwater Beach and Belleair Beach portions of the project area. Subsequent groundtruthing efforts conducted by USACE and FDEP biologists did not observe hardbottom communities during field surveys in these areas. The field biologists concluded that these areas comprised ephemeral hardbottoms with one foot of relief or less, and mitigation was not required. Surveys were also performed in 2002 for Clearwater Beach and Bellair Beach by Dial Cordy and Associates, Inc., that confirmed the 1995-1996 survey data.

The 2002 surveys included resources surveys of Johns Pass, Blind Pass, Pass-A-Grille north, Pass-A-Grille south, and Egmont Shoal (see Figure 2-4 and Figure 2-5). No hardbottoms or seagrasses were documented within these ebb shoal areas. All areas consisted of large shallow areas of sand. In the Johns Pass, Blind Pass, and the Pass-A-Grille survey areas, portions of the shoals were exposed during low tide events at the time the resource surveys were conducted; however, these shoals are persistently submerged at this time except for an area that is shoaling in the southern portion of the Pass-a-Grille ebb shoal.

A more recent benthic resources survey of Johns Pass and Blind Pass conducted in 2009 did not identify any hardbottoms communities. A 2014 pipeline corridor survey conducted by Atkins North America, Inc. for Weeks Marine, Inc. identified a barge frame with corals and other hardbottoms resources offshore of the Upham Beach (Long Key) area, and a pleasure vessel void of hardbottoms or seagrass resources within the Sunshine Beach (Treasure Island) pipeline corridor during diver resources investigations. Adverse effects to these two vessels will be avoided by maintaining a 300-foot buffer surrounding each resource, which would also protect any hardbottoms resources present. More information is provided in the description of Cultural Resources, Section 2.4.13.

The 2014 survey also evaluated the presence of hardbottoms in the nearshore of Treasure Island and Long Key to identify pipeline corridors for Sunshine Beach, Sunset Beach, Upham Beach, and Pass-a-Grille. No hardbottoms were identified at the proposed pipeline corridor locations for Sunshine Beach, Sunset Beach, or Pass-a-Grille; however, patchy ephemeral, low-relief hardbottoms were identified offshore of the Upham Beach survey area.

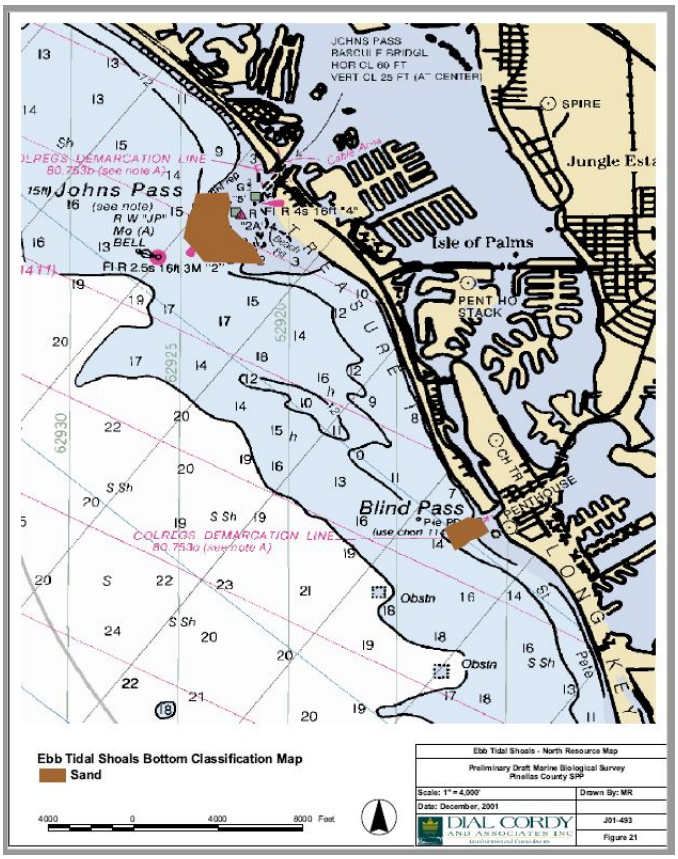


Figure 2-4. Resource map of Johns Pass and Blind Pass showing sandy bottoms; no hardbottom resources were located (Dial Cordy 2002).

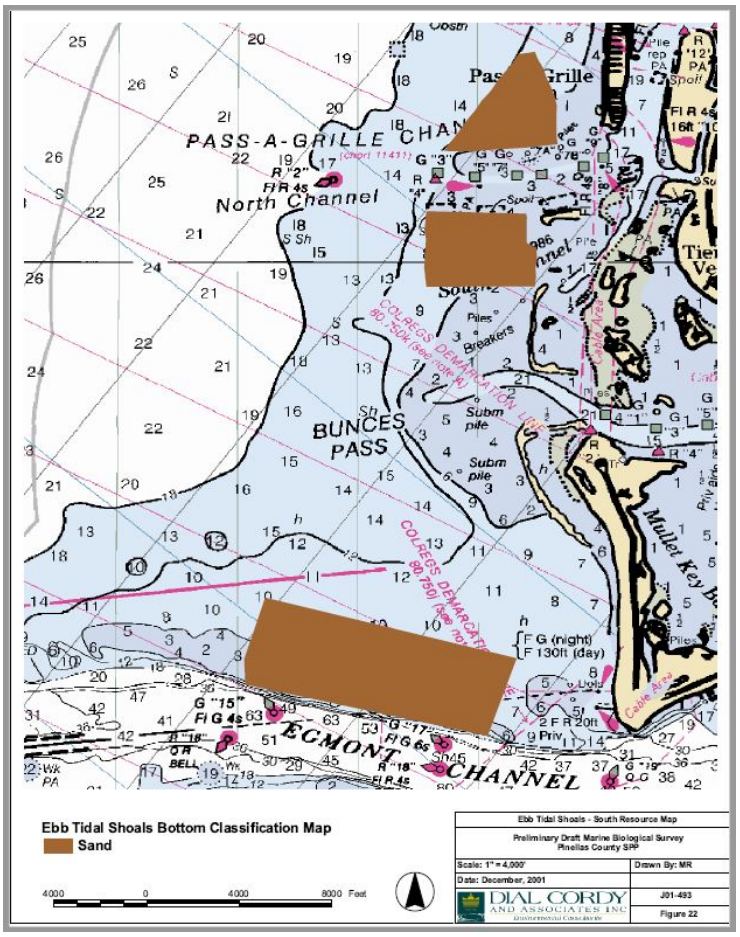


Figure 2-5. Resource survey map of Pass-A-Grille and Egmont Shoal showing sandy bottoms; no hardbottom resources were located (Dial Cordy 2002).

Seagrasses

Shoal grass (*Halodule wrightii*) was identified in the Gulf Intracoastal Waterway (GIWW), east of the Blind Pass entrance, during the 2009 benthic resource survey. The location of the seagrasses was in shallow water (<1 m) landward of the current channel side slopes. No seagrasses were documented along channel side slopes or within the channels in the 2009 survey. Seagrasses are more likely to be present in sheltered locations inside the mouths of the inlets, and updated surveys may be necessary prior to construction depending on the dredge locations to identify the current extent.

The nearshore and ebb shoal environments are typically dynamic and do not support seagrass growth. Seagrasses have not been identified in these areas in past surveys. Figure 2-6 is a Treasure Island and Long Key Study Area Location Map showing no seagrass.

Future Without-Project Conditions (No Action Alternative)

The presence of EFH in the study area listed in Table 2-3 are not likely to be altered from the existing conditions if the proposed project were not constructed. However any nearby hardbottoms could be uncovered due to continued erosion of the beach if the project were not constructed.

2.3.5 Coastal Barrier Resources

The Coastal Barrier Resources Act (CBRA) of 1982 (16 U.S.C. §3501 *et. seq.*) and the Coastal Barrier Improvement Act (CBIA) of 1990 (PL 101-591) 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. CBIA 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.

Existing Conditions

The study area includes two CBRS Units and two Otherwise Protected Areas (Figure 2-18):

- Reefs Unit, P24/P24P (CBRS Unit)
- Sand Key Unit FL-85P (CBRS Unit)
- Mullet Key P24P (Otherwise Protected Area)
- Sand Key Unit FL-85P (Otherwise Protected Area)

The shoreline of Shell Key across the Pass-A-Grill Inlet south from Long Key is within CBRS Unit P24. The Egmont Shoal sediment source is located within the Mullet Key P24P Otherwise Protected Area.

Figure 2-6. Coastal Barrier Resource System Units in the study area.

Future Without-Project Conditions (No Action Alternative)

The Future Without-Project Condition related to Coastal Barrier Resources in the study area are the same as described in the Existing Conditions section.

2.3.6 Water Quality

The State of Florida lists the majority of the waters in the study area as Class III, which is suitable for recreation and the propagation and management of fish and wildlife. Portions of the study area are located within the Pinellas County Aquatic Preserve, which is state-designated as an Outstanding Florida Water (OFW) (OFW; Figure 2-19). An OFW is a water designated worthy of special protection because of its natural attributes and this designation is intended to protect existing good water quality. OFW's are managed by the state or federal government (FDEP, 2020).

The study area is the west facing Gulf of Mexico shoreline with sandy beach, high energy wind and wave environment, a high salinity surf zone and no anoxic pits. According to the 2002 Marine Resource Survey conducted by Dial Cordy, borrow areas for this study exist in water depths from seven to ten meters. Anoxic conditions are not created in the study area due to the high wave energy environment. Additionally, the Gulf of Mexico has a relatively extensive shallow shelf fronting the island limits.

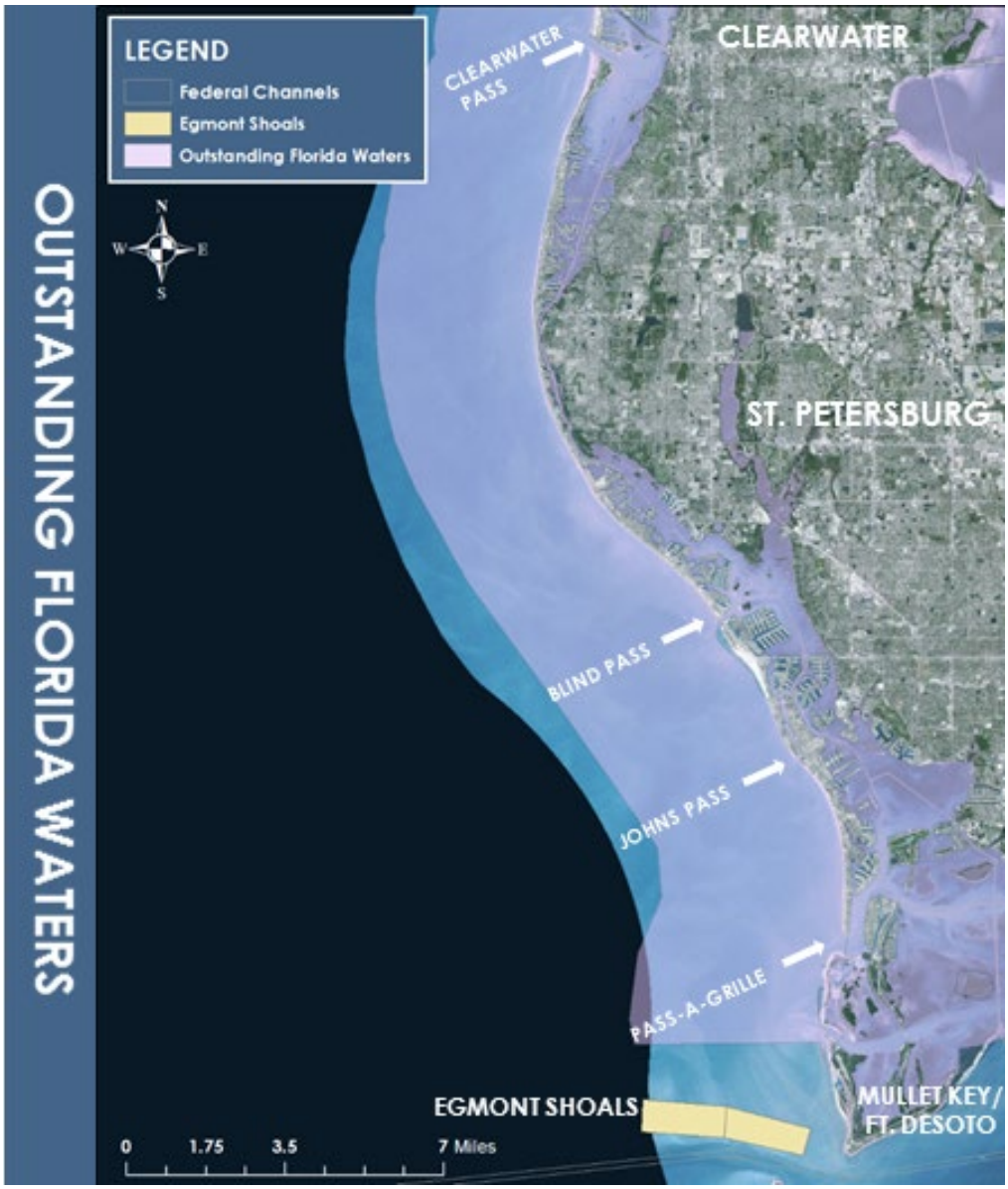


Figure 2-7. Location of OFWs in the study area.

Existing Conditions

The study area is a sandy, high energy coastline. The beach is predominantly poorly graded, fine-grained quartz sand. Due to the high energy conditions found along the study area, sand is continuously re-

suspended in the water column with each breaking wave. This re-suspension of sediment results in generally highly turbid conditions in the nearshore region of the study area. The majority of the coastal waters in the area of the authorized work are designated by the State of Florida as Class III, which are classified as being suitable for recreation and for the propagation of fish and wildlife. Portions of the study area located within the Pinellas County Aquatic Preserve, which is state-designated as an Outstanding Florida Water (OFW). The Florida Department of Environmental Protection (FDEP) regulates water quality in Florida, and requires stringent water quality monitoring during dredging and beach fill operations.

Future Without-Project Conditions (No Action Alternative)

Continued erosion of the OFW and water quality standards would likely be negatively affected from the Existing Conditions in the Future Without-Project Conditions.

2.3.7 Hazardous, Toxic, and Radioactive Waste

Existing Conditions

The coastline within the study area is located adjacent to predominantly residential, commercial, and recreational areas. The study area contains high-energy littoral zones and the materials used for nourishment contain particles with large grain sizes that do not normally absorb contaminants.

In 1993, a collision of tanker barges resulted in the discharge of approximately 330,000 gallons of #6 fuel oil and 32,000 gallons of Jet A, diesel, and gasoline oil into lower Tampa Bay. Some of the fuel oil sank and formed mats on submerged sediments in Blind Pass. The National Oceanic and Atmospheric Administration (NOAA) conducted a study to characterize the spatial distribution of petroleum hydrocarbons within and just outside Blind Pass. The levels of hydrocarbons found in the sediments during this study were below the levels considered by NOAA and FDEP to be hazardous according to their informal sediment quality guidelines. No other sources of pollutants or contaminants have been identified within the construction or disposal areas (Featherstone, 2008).

Future Without-Project Conditions (No Action Alternative)

The presence/absence of hazardous or toxic wastes in the study area is not likely to change from the Existing Conditions in the Future Without-Project Conditions.

2.3.8 Air Quality

Existing Conditions

Air quality in the study area is good due to the presence of either on or off shore breezes. A review of USEPA data indicates that the study area is in attainment status for all of the criteria pollutants.

Future Without-Project Conditions (No Action Alternative)

The air quality in the study area is not likely to change from the Existing Conditions in the Future Without-Project Conditions.

2.3.9 Noise

Existing Conditions

Ambient noise levels in the study area are low to moderate. The major noise producing sources are breaking surf and adjacent residential and resort areas.

Future Without-Project Conditions (No Action Alternative)

While the area may experience a slight decrease in tourist activity, noise levels in the study area are not likely to change significantly from the Existing Conditions in the Future Without-Project Conditions.

2.3.10 Aesthetic Resources

Existing Conditions

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

Future Without-Project Conditions (No Action Alternative)

The aesthetics of the study area are anticipated to decline in the Future Without-Project Condition due to increased erosion and the continued narrowing of the beach.

2.3.11 Recreation Resources

Existing Conditions

The study area possesses visually pleasing attributes, including the waters and beaches of the Gulf of Mexico. Recreational uses of the study area are for swimming, fishing, surfing, sun bathing, scuba diving, and boating.

Future Without-Project Conditions (No Action Alternative)

The recreational usage of the study area are anticipated to decline in the Future Without-Project Condition due to increased erosion and the continued narrowing of the beach, which will make it less suitable for recreating.

2.3.12 Navigation

Existing Conditions

The three inlets adjacent to the focused study area are all navigable, with both Johns Pass and Pass-a-Grille being Federally-authorized navigation channels. The Tampa Harbor Federal Navigation Project is located just south of the study area. Egmont shoal is located north of the Tampa Harbor entrance channel. Harbor vessels, along with thousands of commercial and recreational vessels, pass through the Tampa Harbor channel adjacent to Egmont Shoal. Many of these vessels travel over Egmont Shoal to points north of Tampa Harbor. In addition, there are numerous marinas and boat launch facilities that are utilized year round on the bay sides of both Treasure Island and Long Key.

Shoaling can be an issue in the channels as sediment is transported from northern beaches and is trapped in the inlet systems. All three inlets and their associated shoals have been used as sediment sources for beach nourishment projects at Treasure Island and Long Key as part of the existing authorized Pinellas County, FL BEC project.

Future Without-Project Conditions (No Action Alternative)

As the Johns Pass and Pass-a-Grille are considered to be shallow-draft inlets, they are not high priorities for maintenance dredging. They are currently dredged on an occasional basis as part of the existing Federal Pinellas County Beach Erosion Control project for sediment to place on Treasure Island and Long Key beaches. In the Future Without-Project Condition, these inlets are less likely to be dredged and their ebb shoals would accrete sand and potentially impede navigation.

2.3.13 Cultural Resources and Historic Properties

Existing Conditions

The coastal areas of Pinellas County, including the nearby Tampa Bay, have been subject to nearly five centuries of European seafaring activity, and have accommodated prehistoric occupation supporting a rich diversity of cultures and environmentally adaptive settlement for over 10,000 years. This dynamic history is manifest in the material culture represented by the plethora of submerged and terrestrial archaeological sites that have already been discovered, or have yet to be discovered in the county. These cultural resources include shipwrecks, prehistoric camps and villages, historical buildings and residences, and other anthropogenic modifications in the cultural landscape and environment that constitute the archaeological record of this coastal region of Florida.

The earliest prehistoric inhabitants in the area were Paleo-Indian hunters and gatherers. These were the earliest populations to inhabit the Americas from the terminal Pleistocene epoch to the early Holocene. These peoples were known to share a pan-hemispheric cultural system, exhibiting remarkable similarities in cultural traits with other groups of this period that appear throughout North and South America. The Paleo-Indians thrived in a climate significantly cooler and drier than the present. They are characterized as consisting of highly mobile bands of large-game hunters utilizing lanceolate projectiles ranging from skillfully fluted to unfluted varieties. The subsistence strategy of the Paleo-Indian Period gave way to new Archaic Period strategies that were increasingly dependent on agriculture. The Archaic traditions eventually developed into the unique cultural affiliations identified temporally as Orange, Manasota, Weeden Island, and Safety Harbor.

The earliest recorded historic maritime activity in the vicinity of Pinellas County dates to 1528 when Panfilio de Narvaez, the sixth governor of *La Florida*, landed near present day Tampa Bay. Upon learning the presence of *Apalachee*, a village identified by the local indigenous population to be adorned with gold, he and 400 men set out to find the place. After searching for eight years, only the notable Cabeza de Vaca and three other men survived the treacherous Narvaez expedition. The following decade, Hernando de Soto formed another exploration, arriving in the Tampa Bay area, and marching across the Southeast with similar outcome. Other expeditions in the vicinity were missionary and treasure-seeking endeavors, but

none met with success. In 1763, the Spanish relinquished control of Florida to the British in a settlement following the Seven Years War. The Spanish again regained control after the British lost the Revolutionary War in 1783 before finally ceding Florida to the United States in 1819. Fort Harrison, named for President William Henry Harrison, was constructed in the Clearwater area in 1841.

Throughout the past, many shipwrecks that have been known to have been lost in the vicinity of Pinellas County. Considering the extensive, maritime-related history of the Tampa Bay region, much attention has been given to the archaeological and historical resources of the coastal areas. Archival research and cultural resource surveys have been conducted off the Pinellas County shoreline, portions of the Intracoastal Waterway (IWW), and within several coastal inlets. The majority of the surveys were conducted for USACE-related projects.

Among the earliest submerged cultural resources investigations conducted along the coastal area of Pinellas County was a study performed by Espey, Huston & Associates, Inc. (EHA) for the Pinellas County Board of Commissioners' Department of Public Works. This investigation was documented in their report (Gearhart 1998) entitled: *Marine Magnetometer Survey of a Proposed Sand Borrow Site and Sand Transfer Site, Indian Rocks Beach Nourishment Project, Pinellas County, Florida.* In 1988, EHA conducted a magnetometer survey of proposed sand borrow and sand transfer sites, located on the north edge of Egmont Channel and 2.5 miles west of Mullet Key, and a sand transfer site, located three miles due west of Range Monument R-86, Indian Rocks Beach, both proposed for nourishing the beach at Indian Rocks, Pinellas County, Florida. The survey identified 47 anomalies in the borrow area and nine anomalies in the sand transfer area, 38 of which EPA recommended as potentially significant. No historic shipwrecks were identified in the vicinity of the sand transfer area; although two historic vessels, the *Mary Jane* (1863) and the *Hester* (1911), were reported as historically lost in the general vicinity near Clearwater. Anomalies identified in the borrow area were estimated to represent up to 23 historic vessels, possibly originating from 10 historic seafaring vessels known to have operated in the vicinity of the borrow area from as early as 1819 to 1925 (Gearhart 1988).

In 2004, Pan-American Consultants, Inc. (PCI), under contract to USACE, investigated 34 potentially significant targets of the 47 previously identified by EHA in the Egmont Shoal borrow area and recorded two historically significant shipwreck sites. PCI's report (Krivor 2005) entitled: *Diver Evaluations of 34 Targets in the Egmont Shoals Borrow Area, Pinellas County, Florida,* was conducted in the aftermath of damages resulting from hurricanes in 2004. Of the 34 anomalies investigated by PCI, 26 were either identified as modern debris, were no longer extant at their original coordinates, or were too small and isolated to warrant additional investigation. The remaining eight anomalies were recommended for avoidance. Two of the anomalies are historic shipwrecks eligible for inclusion in the National Register of Historic Places (NRHP); one is the USS *Narcissus* Civil War Union tugboat, and another is an ocean-going sailing vessel. A third anomaly was identified as the remains of a modern shrimp trawler. The western portion of Egmont Shoal was dedicated as a State Historic Archaeological Preserve in 2015.

Johns Pass has been used for both commercial and recreational maritime navigation as early as 1848, which provides for the potential presence of historic watercraft. A cultural resource investigation

conducted in 1999 discovered seven magnetic anomalies that were determined to be modern debris and not of historic significance by the Florida Department of State, Division of Historical Resources (Hall 2000a).

Blind Pass has been migrating to the south since the opening of Johns Pass in 1848. Blind Pass is open to recreational boat traffic and as a result, is a potential source for cultural resources. A diver identification and evaluation study was conducted at Blind Pass in 1999 (Hall 2000b). The results of this survey showed no evidence of cultural resources.

A cultural resource study was conducted in April 2009 for USACE within the Johns Pass and Blind Pass proposed borrow areas (Burns 2009). A total of 521 magnetic anomalies, four side scan sonar anomalies, and no sub-bottom profile anomalies were found in the Johns Pass and Blind Pass borrow area surveys. None of the anomalies exhibited characteristics of submerged cultural resources.

Future Without-Project Conditions (No Action Alternative)

A search of the Florida Master Site File (FMSF) identified several hundred historic structures, one resource group (Pass-A-Grille Historic District), and three archaeological sites (including the Morton Embree site, the Long Key Mound and Pine Key Mound)on the landward side of the existing shoreline. Continued erosion will eventually threaten these cultural resources identified within the Project area. As the shoreline recedes without a project, resources will either be destroyed or hard structures will need to be constructed for their protection. As noted above, increased hardening is detrimental to the environment as a whole. Thus, continued shoreline erosion will create a cumulative negative effect on the cultural and historic resources.

2.3.14 Native Americans

Existing Conditions

No portion of the proposed action is located 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. §306101 et seq.) 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. Consultation with Native American tribes having ancestral ties to this region, including the Seminole Tribe of Florida, the Seminole Nation of Oklahoma, the Thlopthlocco Tribal Town, and the Miccosukee Tribe of Indians of Florida was initiated by letter on 10, April, 2019 and is ongoing. Consultation with the Muscogee (Creek) Nation was initiated on July 24th, 2019 and is ongoing.

Future Without-Project Conditions (No Action Alternative)

Selection of the No Action Alternative would have no effect on Native American groups. As discussed above, all portions of the project have been consulted upon with the interested, Federally recognized tribes living in the region.

2.4 SEA LEVEL CHANGE

Existing Conditions

It is anticipated that the global mean sea level will rise within the next 100 years. To incorporate the direct and indirect physical effects of projected future sea level change on design, construction, operation, and maintenance of coastal projects, the U.S. Army Corps of Engineers (USACE) has provided guidance in the form of Engineering Regulation, ER 1100-2-8162 and Engineering Technical Letter, ETL 1100-2-1. Three estimates are required by the guidance, a Baseline (or "Low") estimate, which is based on historic sea level rise and represents the minimum expected sea level change, an Intermediate estimate, and a High estimate representing the maximum expected sea level change.

The three sea level change scenarios were developed based on historical sea level change observations taken from the closest gage to the study area at St. Petersburg, Florida, where the observed average rate of SLC has been is 2.36 mm/year (0.67 ft/yr) between 1947 and 2006 (https://tidesandcurrents.noaa.gov/publications/Technical_Report_NOS_CO-OPS_065.pdf). Applying the USCE SLC curve calculator, the 2.36 mm/yr rate is equivalent to a change of 0.67 feet between 1992 and 2078 or a change of 0.38 feet over 50-year Planning Horizon (2027 to 2078). The USACE Intermediate rate was determined to be 5.64 mm/year (0.0185 feet/year). The USACE High rate was determined to be 16.03 mm/year (0.0526 feet/year). These result in an Intermediate and High change in sea level between the project start year (2027) and the end of the project life (2078) of 0.94 feet and 2.68 feet, respectively.

Given a project base year of 2028, a table of sea level change rates was produced for each of the three required scenarios through the 50-year planning horizon and up to the year 2128. Additional details on sea level change are provided in the Engineering Appendix.

Figure 2-6 provides a graphic representation of the three levels of projected future sea level change over a 100 year period. The project area can expect to see sea level rise 0.4 to 2.8 feet above its current position within the 50-year planning horizon as predicted by the low and high sea level change rates, respectively.

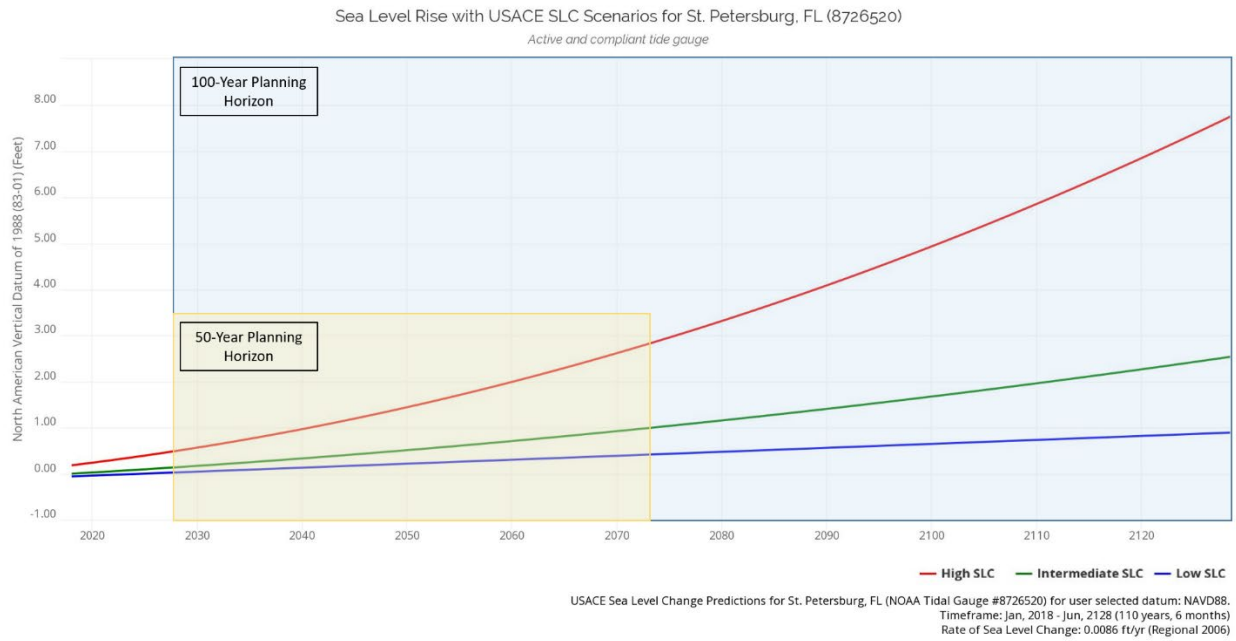


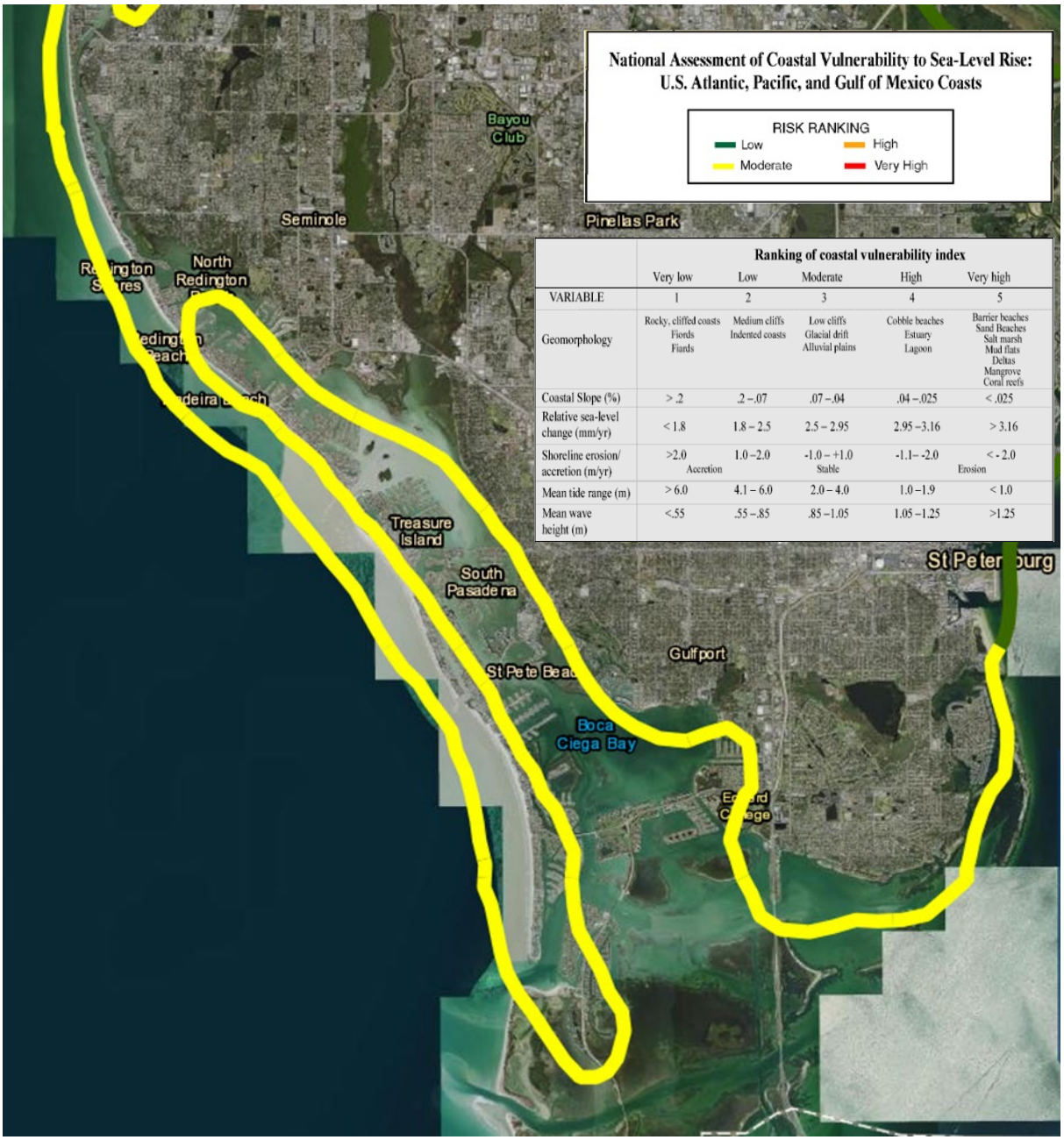
Figure 2-8. USACE sea level change predictions for the St. Petersburg, FL tidal gauge. The 50-year and 100-year planning horizons are highlighted for reference.

2.4.1 Incorporation of ER 1100-2-8162 and ETL 1100-2-1: Guidance for Sea Level Change

The Sea-Level Change (SLC) Engineering Pamphlet (EP) 1100-2-1 supporting ER 1100-2-8162, suggests a tiered analysis to determine the risk of potential SLC and resulting incorporation into the plan formulation process. Incorporation of potential SLC into the USACE Planning process will require active focus on risk-based scoping to define pertinent needs, opportunities, and the appropriate level of detail for conducting investigations. In particular, close attention is needed at the beginning of each study in order to screen planning/scoping decisions. The tiered analysis for SLC is incorporated into the 6-step planning process used in this report (discussed in Section 3.1). Mean Sea Level (MSL) is used as an elevation reference in this section of the report as it is generally more intuitive for readers when describing changes to existing water elevations.

2.4.1.1 USGS Coastal Vulnerability Index (CVI)

The existing Coastal Vulnerability Index (CVI) developed by the United States Geological Survey (USGS) is a useful indicator of a project area's natural vulnerability to SLC. The USGS used six input parameters to assess the CVI for geographic areas along the nation's shoreline. Parameters used include geomorphology, coastal slope, relative SLC, shoreline erosion/accretion, mean tide range, and mean wave height (USGS 2000). Population and infrastructure type, or density, are not parameters used in the assessment. Figure 2-9 shows the CVI for the study area is rated as moderate based on the area being part of an erosional barrier island surrounded by sandy beaches and salt marsh.



	Ranking of coastal vulnerability index				
	Very low	Low	Moderate	High	Very high
VARIABLE	1	2	3	4	5
Geomorphology	Rocky, cliffed coasts Fiords Fiards	Medium cliffs Indented coasts	Low cliffs Glacial drift Alluvial plains	Cobble beaches Estuary Lagoon	Barrier beaches Sand Beaches Salt marsh Mud flats Deltas Mangrove Coral reefs
Coastal Slope (%)	> .2	.2 – .07	.07 – .04	.04 – .025	< .025
Relative sea-level change (mm/yr)	< 1.8	1.8 – 2.5	2.5 – 2.95	2.95 – 3.16	> 3.16
Shoreline erosion/ accretion (m/yr)	>2.0 Accretion	1.0 – 2.0	-1.0 – +1.0 Stable	-1.1 – -2.0	< - 2.0 Erosion
Mean tide range (m)	> 6.0	4.1 – 6.0	2.0 – 4.0	1.0 – 1.9	< 1.0
Mean wave height (m)	<.55	.55 – .85	.85 – 1.05	1.05 – 1.25	>1.25

Figure 2-9. USGS Coastal Vulnerability Index.

2.4.1.2 SLC Vulnerability Assessment

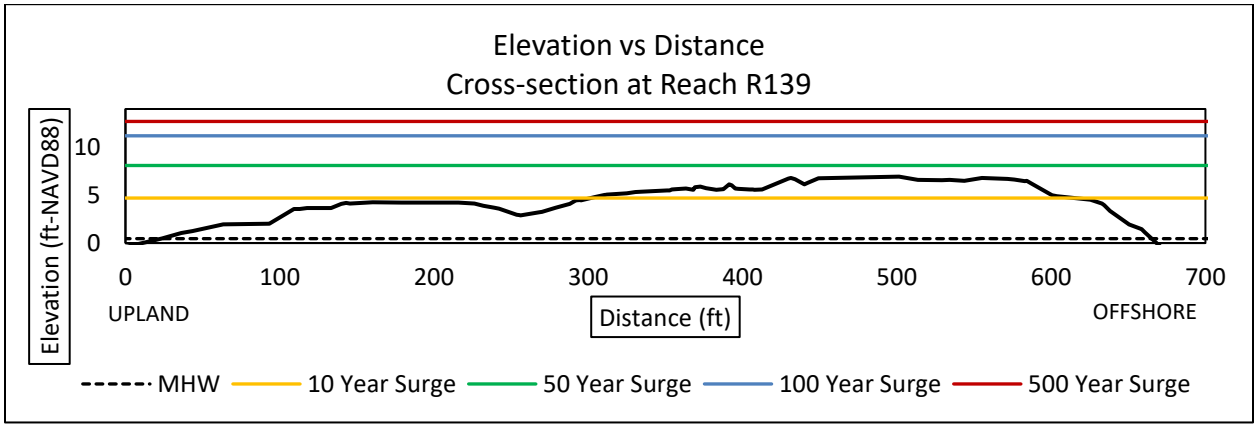
Elevations within the study area (Gulf side of both islands) are higher than the bay side. Elevations range from 5 to 10 ft NAVD88 along the shoreline with elevations ranging 3 to 7 ft. NAVD88 on the bay side. Although the bay side of the island is not within the current study area, stakeholders should be aware of increased risk to infrastructure as sea level rises. A future study on potential solutions to flooding from the back bay would be appropriate as infrastructure becomes more imminently threatened.

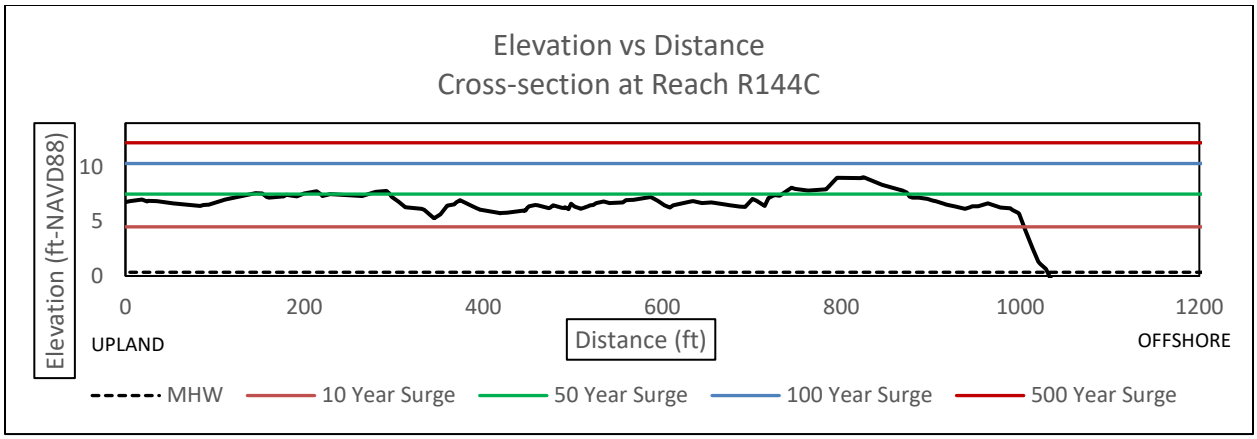
Cross-island profiles were taken periodically throughout the study area, shown in Table 2-5 below. As reflected in the table, the profiles of the island slope downward from the dune to the bay side of the island. Elevations between these profiles may differ slightly from those provided; however, these cross-island profiles represent the general topography in the focused study area.

Table 2-4: Elevations along cross-island profiles.

	GROUND ELEVATIONS IN FEET (NAVD88)*		
R-Monument of Profile	**Dune**	**Upland**	**Gulf Blvd**
R-128	8	5	5
R-132	5	5	5
R-136	9	6	7
R-141	9	5	n/a
R-148	7	6	6
R-153	7	6	6
R-158	10	5	4
R-164	6	9	7
*The difference between NAVD88 and MSL on the ocean side is 0.37 ft (NOAA Vertical Datum)			

A key question when assessing the vulnerability of the study area to SLC is when critical thresholds will be crossed, if at all, by future sea levels. Throughout the study area, dune crest height represents a critical threshold. The average dune height from Table 2-5 is 7.6 feet (NAVD88), and upland infrastructure on the bay side of the island, including Gulf Blvd, is located lower on average at approximately 5.4 feet (NAVD88). Since the dune lies between the ocean and this infrastructure, the dune height (7.6 feet) is used as the critical elevation. Figures 2-9 and 2-9 show representative cross-sections of Treasure Island and Long Key. Cross-sections for each reach along both islands (showing existing land elevations and current FEMA return interval surge levels) are included in the Engineering Appendix.





Figures 2-10 and 2-11. Representative cross-sections along Treasure Island and Long Key.

The 2%-annual-exceedance-probability storm tide elevation in the study area is given as 5.15 ft MSL (http://corpsmapu.usace.army.mil/rccinfo/slc/slcc_calc.html), or 4.7 ft NAVD88. Water elevations during such storm events could reach the top of the dunes (7.6 feet) in some areas within the project (R-132). This estimate does not take erosion of the dune height into consideration, which would occur over time. At the end of 50 years, sea level may increase by 3.2 feet under the high SLC scenario, bringing the 2%-annual-exceedance-probability storm tide elevation to 7.9 feet NAVD88.

2.4.1.3 NOAA Sea Level Rise Viewer

The National Oceanic and Atmospheric Administration (NOAA) has developed an interactive tool to analyze the effects of sea level change along the coastline of the United States and territories. This tool, the Sea Level Rise Viewer, helps to "visualize community-level impacts from coastal flooding and sea level rise up to 10 feet above average high tides." Water levels in this tool are relative to the local Mean Higher High Water datum, and shows the effects of this tide level with incremental change in sea level on the coastal areas. Three feet of sea level rise was used in this tool from the analysis previously presented, as sea level may increase by 3.2 feet under the high SLC scenario.

Figure 2-12. Treasure Island (left) and Long Key (right) showing approximate inundation with 3 ft. of sea level rise.

2.4.1.3.1 Social Vulnerability

The University of South Carolina's Hazards and Vulnerability Research Institute developed the Social Vulnerability Index (SoVI) to measure the social vulnerability of U.S. counties to environmental hazards. The SoVI is based on population attributes such as age and poverty from Census 2010 and the built environment. By looking at the intersection of potential sea level rise and vulnerable Census tracts, one can get an idea of how vulnerable populations might be affected by sea level rise. The focused study area of Treasure Island and Long Key has a low to moderate social vulnerability rating. Areas with moderate social vulnerability ratings, such as the bayside regions of both islands, are more likely to be affected by rising sea levels than areas rated as low social vulnerability. Figure 2-16 shows the locations of potential sea level rise in relation to vulnerable populations with 3 ft. of sea level rise.

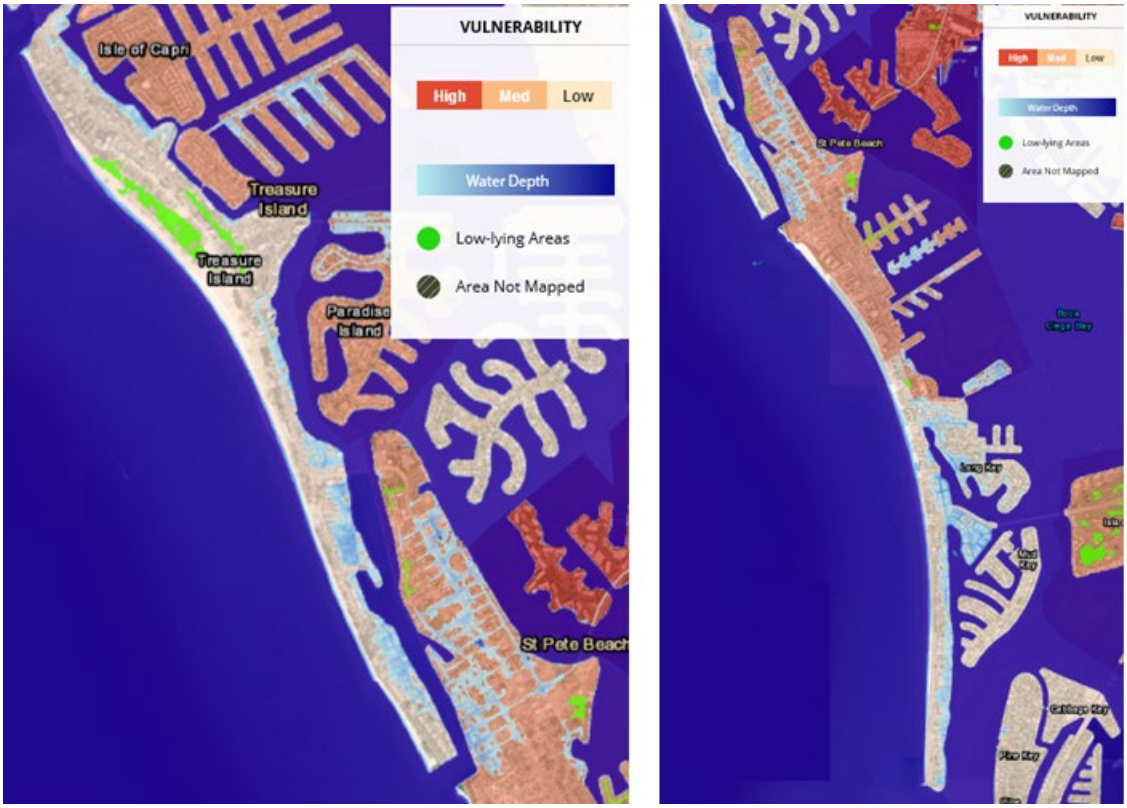


Figure 2-13. Social vulnerability in Treasure Island (left) and Long Key (right). Values were obtained using the NOAA social vulnerability index.

2.4.1.3.2 High Tide Flooding

Today's flood can be seen as tomorrow's high tide, as sea level rise will cause increased frequency and longer duration flooding events. Figure 2-14 displays the areas currently subject to recurrent flooding. The figures show that the berm along the study area is considered a shallow coastal flooding area. These data were obtained from NOAA's Sea Level Rise Viewer (available online at https://coast.noaa.gov/slr/)

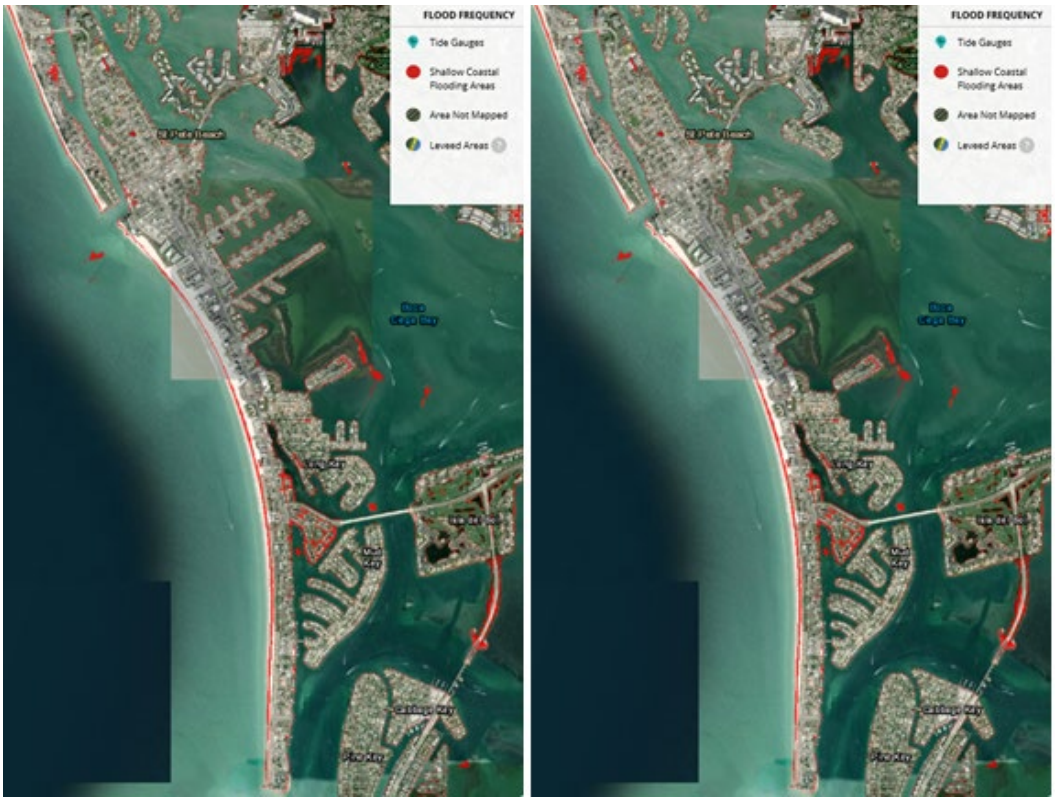


Figure 2-14. Current extent of nuisance or high tide flooding in Treasure Island (left) and Long Key (right).

2.5 SEDIMENT RESOURCES

Existing Conditions

Treasure Island and Long Key are barrier islands on Florida's Gulf coast separated through Blind Pass Inlet. The barrier islands are sand bodies formed parallel to the coast line approximately 5000 years ago. By nature, gulf coasts barrier island beaches have a very low profile and the wet beach has a shallow gradient and extends thousands of feet into the Gulf of Mexico.

The beaches along Treasure Island and Long Key were characterized through a comprehensive sampling program in April 2012. Beach samples were collected at the toe of dune, berm, mid-tide, -3 ft., -5 ft., -10 ft., -15 ft, and -20ft. below Mean Sea Level as shown in Figure 2-8. Sampling profile lines were approximately 3,000 to 4,000 feet apart and located at the following FDEP Range monuments: R-128, R-131, R-135, R-139, R-144, R-146, R-150, R-154, R-158, and R-163.

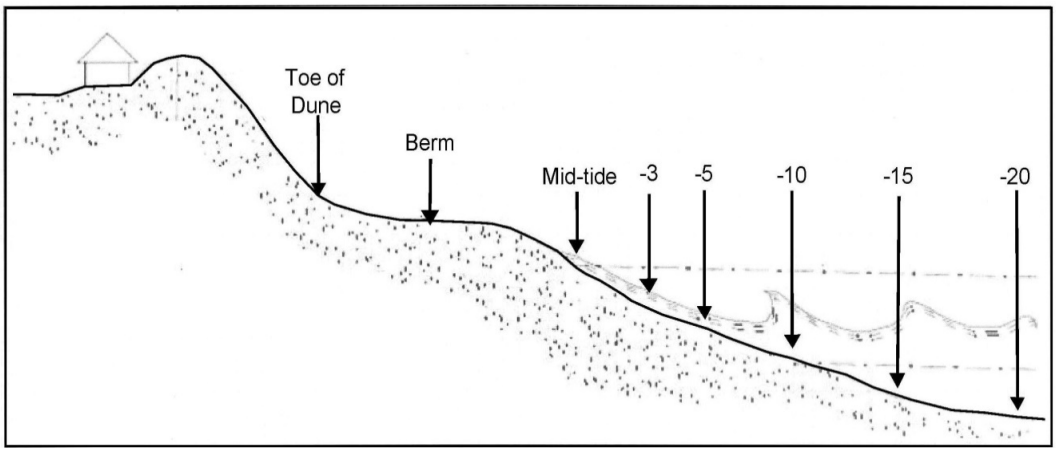


Figure 2-15. Beach Transect with Beach Sampling Locations.

Pinellas County beaches have a lower profile than that shown in Figure 2-15, and in many locations, buildings and roads were constructed on top of the original dune. Therefore, most profile lines did not have a dune, and no dune sample could be collected.

A representative arithmetic composite sample was calculated using the samples. The grain-size data of the composite samples for the Treasure Island/Long Key beaches are summarized in Table 2-5.

Table 2-5: Treasure Island –Long Key Beach Grain-size.

Composite	Mean (mm)	Sorting (phi)	Silt %	CaCo3 %	Munsell Color
Sunshine Beach	0.23	1.32	1.0	18	2.5Y 8/1
Boca Ciega Beach	0.29	1.49	1.2	29	2.5Y 8/1
Sunset Beach	0.25	1.56	1.1	24	2.5Y 8/1
Upham Beach	0.28	1.73	1.0	8	2.5Y 8/1
North St. Pete Beach	0.22	1.39	1.1	21	2.5Y 8/1
South St. Pete Beach	0.20	1.41	1.3	23	2.5Y 8/1
Pass-a-Grille Beach	0.32	1.75	0.8	57	2.5Y 8/1
Treasure Island Long Key Beaches	**0.28**	**1.16**	**1.0**	**24**	**2.5Y 8/1**

The composite sample of all beaches classified the Treasure Island –Long Key beach sediments as clean, poorly-graded, fine-grained quartz sand (SP) with a mean grain size 0.28 mm, and a standard deviation of 1.16 phi. The average percentage of fines passing the #230 sieve is 1.0 %. The average carbonate content is 24 %. The typical moist Munsell Color is 2.5YR 8/1 (white).

The inlet complexes accumulate sediment from the beaches as the beaches erode due to alongshore sediment transport. Therefore, the inlet channels, ebb shoals, and flood shoals contain sediment that is

similar to that found on the adjacent beaches. Johns Pass, Blind Pass, and Pass-a-Grille traps sediment transported via alongshore processes, and are generally accretional. Table 2-7 provides the available sediment in each of the inlet complexes (including the channels and the ebb shoals) based on the FDEP's Inlet Management Plans for these three inlets. See the Geotechnical Appendix for additional information on the sediment characteristics.

Table 2-6. Recharge rates of the shallow draft inlets in the study area (FDEP 2018; FDEP 2019a; FDEP 2019b).

	Volume (cy)	Recharge Rate (years)	50 Year Volume (cy)
Johns Pass	152,000	6	1,333,333
Blind Pass	200,000	6	1,750,000
Pass a Grille	212,000	4	2,650,000

*Future Without-Project Conditions (No Action Alternative)**

The material characteristics of the native beach with future without-project conditions are similar to the existing conditions described above.

Without a project, the channel and shoals of Johns Pass, Blind Pass, and Pass-a-Grille will continue to trap sand, and the water depths in the areas will decrease, compromising navigability of the Federal navigation projects. These Federal navigation channels receive Operation and Maintenance (O&M) funds for dredging, but only infrequently due to their "shallow draft" status. Federal funding priority is instead given to "deep draft" channels serving ports handling the nation's majority of shipped freight, such as Tampa Harbor and St. Petersburg Harbor. Beach quality sediment from Tampa Harbor is typically placed south of the channel on Egmont Key to protect historically significant features on the island. Shoaling at the shallow draft inlets adjacent to Treasure Island and Long Key would continue into the future without a project.

2.6 EFFECTS OF OTHER CSRM AND NAVIGATION PROJECTS

Existing Conditions

The islands of Treasure Island and Long Key are surrounded by the shallow draft inlets of Johns Pass, Blind Pass, and Pass-a-Grille Inlet. These inlets are stabilized with a combination of sand-trap groins and jetties that significantly affect sediment transport on the ends of both islands. The inlets act as sediment sinks, and all three have developed ebb and flood shoals. Throughout this report all of these accretional areas, including the shoals and inlet channels, are referred to as the, "shoal complexes." All three inlets have historically been dredged to maintain navigable depths, and the material is beneficially placed on the downdrift (and occasionally updrift) shorelines. The Engineering Appendix includes a comprehensive history of on the effects of adjacent projects.

Future Without-Project Conditions (No Action Alternative)

The Future Without-Project Conditions of other CSRM and navigation projects are similar to the existing conditions described above. However, the existing Pinellas County Beach Erosion Control project, Sand Key Segment, expires in 2043. Without a subsequent authorized project at Sand Key, the volume of sediment transported to Treasure Island and Long Key beaches may diminish.

2.7 ECONOMIC CONSIDERATIONS AND BEACH-FX

USACE uses the Beach-fx model to assess the potential future conditions in the project area if a Federal project were not undertaken (also referred to as the Future Without-Project Condition, or FWOP). Beach-fx is an event-driven, life-cycle model that estimates damages and associated costs over a period of analysis based on storm probabilities, tidal cycle, tidal phase, beach morphology, and many other factors. Information on the existing economic conditions along the Pinellas County coastline in the focused study area was collected for economic modeling purposes using Beach-fx. Damages to developed shorelines include damages to buildings, pools, patios, parking lots, roads, utilities, seawalls, revetments, bulkheads, etc., which are all classified as "damage elements." The information on the coastal assets detailed in this section was collected from mapping resources, site visits, and contractors.

2.7.1 Value of Damage Elements

Economists, real estate specialists, and engineers have collected and compiled detailed information on damage elements within the study area including:

- 153 single family residences
- 771 multi-family residences
- 148 commercial structures
- 80 dune walkovers
- Roads (SR 699)

In total, attribute information for 1,306 damage elements was populated for economic modeling using Beach-fx. The proximity of these damage elements to the beach makes them potentially vulnerable to erosion, wave attack, and inundation. A summary of the damage elements is provided in Table 2-7.

Table 2-7. Summary of damage elements in the Beach-fx model for the study.

Damage Element Types	Descrition	Treasure Island	Long Key	Total	% of Total
COM1	Commercial: Retail	2	3	5	0.38%
COM8	Commercial: Restaurant	7	13	20	1.53%
COM-HT-MS	Commercial: Hotel, Multi-story (3-7 stories)	0	3	3	0.23%
COM-HT-HR	Commercial: Hotel, High Rise (8+ stories)	60	31	91	6.97%
COM-SS	General Commercial	17	12	29	2.22%
GROC	Commerical: Grocery Store	1	1	2	0.15%
MFR1	Mult-family residential, one story (aparment or condo)	110	260	370	28.33%
MFR2	Mult-family residential, two-story (aparment or condo)	52	25	77	5.90%
MFR3	Mult-family residential, three-story (aparment or condo)	154	170	324	24.81%
PUB-SS	Public Property	0	5	5	0.38%
ROAD	Road Segment	72	75	147	11.26%
SFR1	Single Family Home, one-story	43	27	70	5.36%
SFR2	Single Family Home, two-story	62	21	83	6.36%
WALK	Dune walkover	27	53	80	6.13%
Total		**607**	**699**	**1306**	**100.00%**

Beach-fx handles economic considerations at the damage element level. These considerations include extent of damage, cost to rebuild, and time to rebuild. The construction and foundation type of each damage element was gathered from the Pinellas County property appraiser and visual observations by Jacksonville district (SAJ) staff. The geospatial location and footprint of the damage elements was verified using aerial photography in ESRI ArcMap. First floor elevations of all the damage elements in the study area were surveyed. Real Estate professionals from SAJ provided updated depreciated replacement costs for all of the damage elements, and an uncertainty of +/- 12.5% was assigned to these costs based on the real estate assessment. The value of contents was assumed to be 50% of the structure value for all habitable structures per ER 1105-2-100. Non-habitable structures, such as dune walks, had a content value of zero.

The economic value of the existing structure inventory represents the depreciated replacement costs of damageable structures and their associated contents within the study area along the coastline. The damage element inventory includes 1,306 damageable structures with an overall estimated value of over $2.7 billion, with structure and content valuations of $1,864,844,049 and $860,316,663, respectively. The Economics Appendix provides the distribution of structure and content values broken down by Beach-fx model reach.

*Future Without-Project Conditions (No Action Alternative)**

Treasure Island and Long Key have high real estate values due to their proximity to the St. Petersburg and Tampa metropolitan areas. In the Future Without-Project Condition, it is expected that buildings will be updated or replaced with higher value structures that maximize the allowable densities per local zoning regulations as they age. However, the study keeps the future structure inventory and values the same as in the existing condition. This approach neglects any increase in value due to future development. Due to the uncertainty involved in projections of future development, using the existing inventory is

considered conservative for Florida, where coastal development has historically increased in density and value.

2.7.2 Beach-fx Model Assumptions

The Economic Appendix provides a complete description of the Beach-fx model set-up and use. Data on historic storms, beach survey profiles, and structure information within the project area are used as inputs 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 are compared. The difference between with and without-project damages are used to determine project benefits.

- **Start Year:** The year in which the model simulation begins. For this study, the start year is 2027.
- **Base Year:** The year in which a federal project would be constructed and benefits would begin accruing. For this study, the base year is assumed to be 2028.
- **Period of Analysis:** 50 years (2028 through 2077)
- **Discount Rate:** 2.75% FY2020 Federal Water Resources Discount Rate
- **Damage Functions:** Damage functions used in the Beach-fx model were those developed by USACE for the North Atlantic Coastal Comprehensive Study (NACCS; January 2015). For non-residential assets, the damage functions used were developed by the USACE Institute for Water Resources (IWR).
- **Coastal Armor:** Beach-fx allows for assumptions surrounding coastal armoring (e.g. revetments and seawalls). A user can define the different types of armoring applied to individual damage elements as well as a distance trigger, applied at the lot level, which will prompt construction of said armor. In Florida, strict environmental permitting is required by the FDEP with regards to armoring. Beach-fx is set up to account for both existing armor and the potential future armor, as described below:
    - Existing armor set at the lot level will protect the damage elements in that lot from erosion damage until failure is triggered. If the armor fails, structures will be subject to erosion damages until the armor is rebuilt. Coastal armoring, as simulated by Beach-fx, does not prevent inundation or wave attack (although both inundation and wave attack can cause armor failure).
    - For lots without armor, state permit requirements for armor construction determine if a lot is able to be protected by armor when erosion reaches the seaward edge of the lot. Based on the presence of vulnerable development in the study area, most lots in this study are assumed to be armorable in the future. However, there are exceptions; for example, lots containing only dune walks would not be realistically armored in the future.

  It should be noted that the armoring assumptions described in the FWOP conditions refer to armor that would be implemented and funded by individual property owners.
- **Number of Times Rebuilding Allowed:** The maximum number of structure rebuilds can be specified for damage elements. Based on the assumed likeliness that certain types of damage elements will

eventually stop being rebuilt by property owners, the following are the number of times that rebuilding is allowed for certain types of damage elements over the 50-year period of analysis:

  - Dune Walks: an average of once every other year (25 times)
  - All Other Damage Elements: an average of once per year (50 times)

- **Future Value of Structures:** The future structure inventory and values are the same as the existing condition. This conservative approach helps ensure that benefits are not being overstated based on speculative future development.

More information about Beach-fx assumptions and the modeling approach is provided in the Engineering and Economics Appendices (Appendices A and C).

2.7.3 Future Without-Project Damage Results

Over 100 iterations (simulated life-cycles) in Beach-fx, the estimated future without-project condition damages for the high SLC scenario in Treasure Island range between $28.6 and $407.4 M in present value dollars ($1.06 M and $15.09 in average annual dollars), with an average of $62.2 M in present value dollars. The future without-project condition damages in Long Key range between $34.8 and $249.1 M in present value dollars ($1.14 M and $9.23 M in average annual dollars), with an average of $91.4 M 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 56% of the 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 27% 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. Armor costs account for approximately 17% of the total FWOP damages.

Table 2-8 provides a summary of the Future Without-Project damages for both Treasure Island and Long Key based on the model output files. Greater detail on the composition of the average FWOP damages by category and damage element type is located in the Economics Appendix.

Table 2-8. Summary of the damages in Future Without-Project Condition in both present value dollars and in average annual equivalent dollars (AAEQ $).

	Treasure Island (AAEQ $)	Long Key (AAEQ $)	Total (AAEQ $)	Treasure Island (PV $)	Long Key (PV $)	Total (PV $)	% of Grand Total
Structure Damage	$2,309,000	$2,005,000	$4,313,000	$62,327,000	$54,120,000	$116,446,000	56%
Contents Damage	$1,178,000	$944,000	$2,122,000	$31,808,000	$25,479,000	$57,287,000	27%
Armor Damage	$624,000	$658,000	$1,282,000	$16,841,000	$17,776,000	$34,617,000	17%
Total	**$4,111,000**	**$3,607,000**	**$7,717,000**	**$110,976,000**	**$97,375,000**	**$208,350,000**	100%

2.7.3.1 Spatial Distribution of Without-Project Damages

There is a great deal of variability in the amount of damages amongst the Beach-fx reaches. This is explained by the large number of variables, all of which the Beach-*fx* model takes into account. Examples of variation between the reaches result from the following:

- Density and amount of development
- Typical size and value of structures
- The type, first floor elevation, and foundation type of structures
- Typical distance between structures and mean-high water
- Size, shape and location of the dunes and coastal morphology
- Rate of erosion for each reach
- Amount and type of coastal armoring present
- Timing that property owners construct coastal armoring in the future.

Figure 2-12 illustrates the spatial distribution of background erosion rate, existing structure value, and FWOP damages and costs by model reach. A spatial summary of the FWOP damages by Study Reach is presented in Figure 2-13.

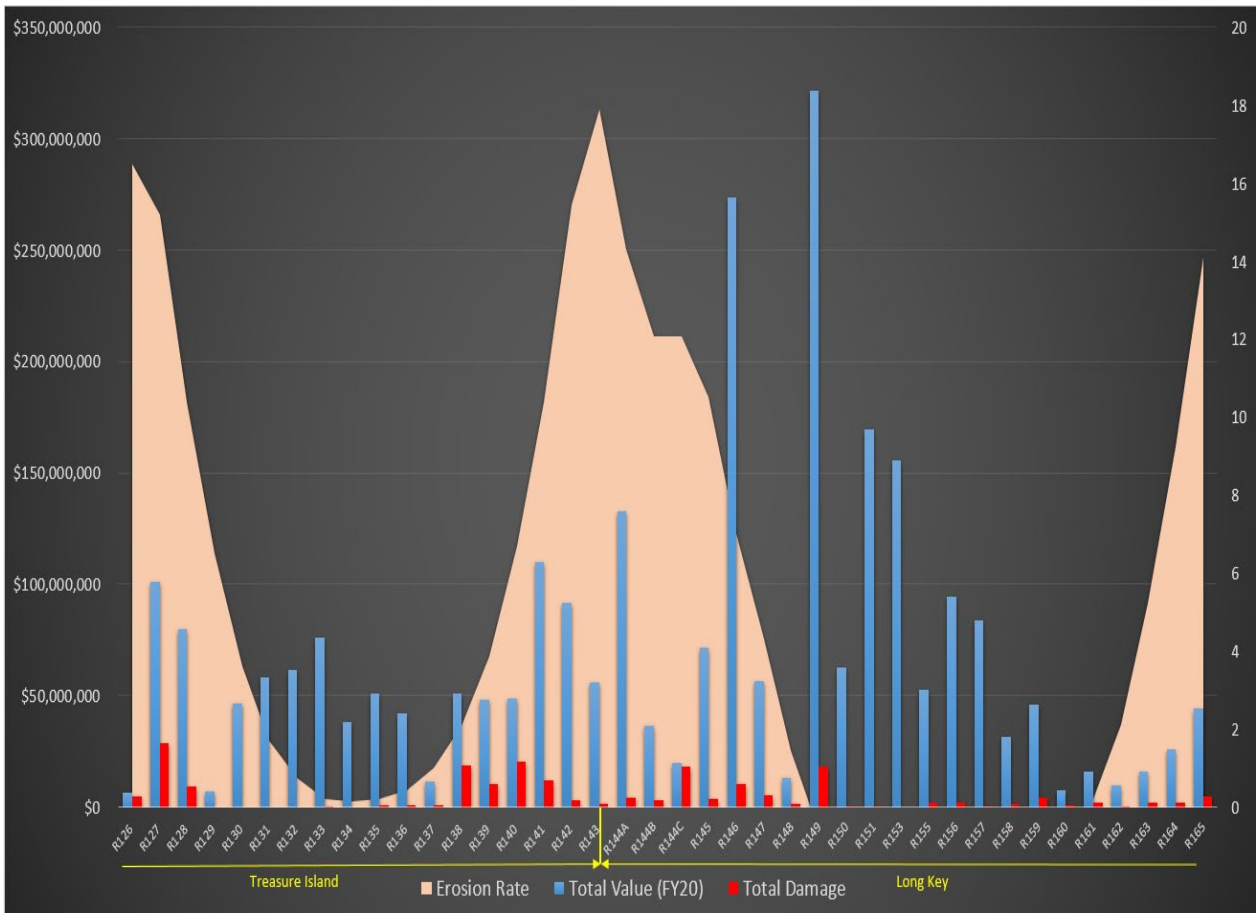


Figure 2-16. Summary of the value, present value damages, and background erosion rates by model reach. Note that the model reaches, identified by R-number below, do not necessarily correspond exactly to the FDEP reference monuments referred to elsewhere in this document.

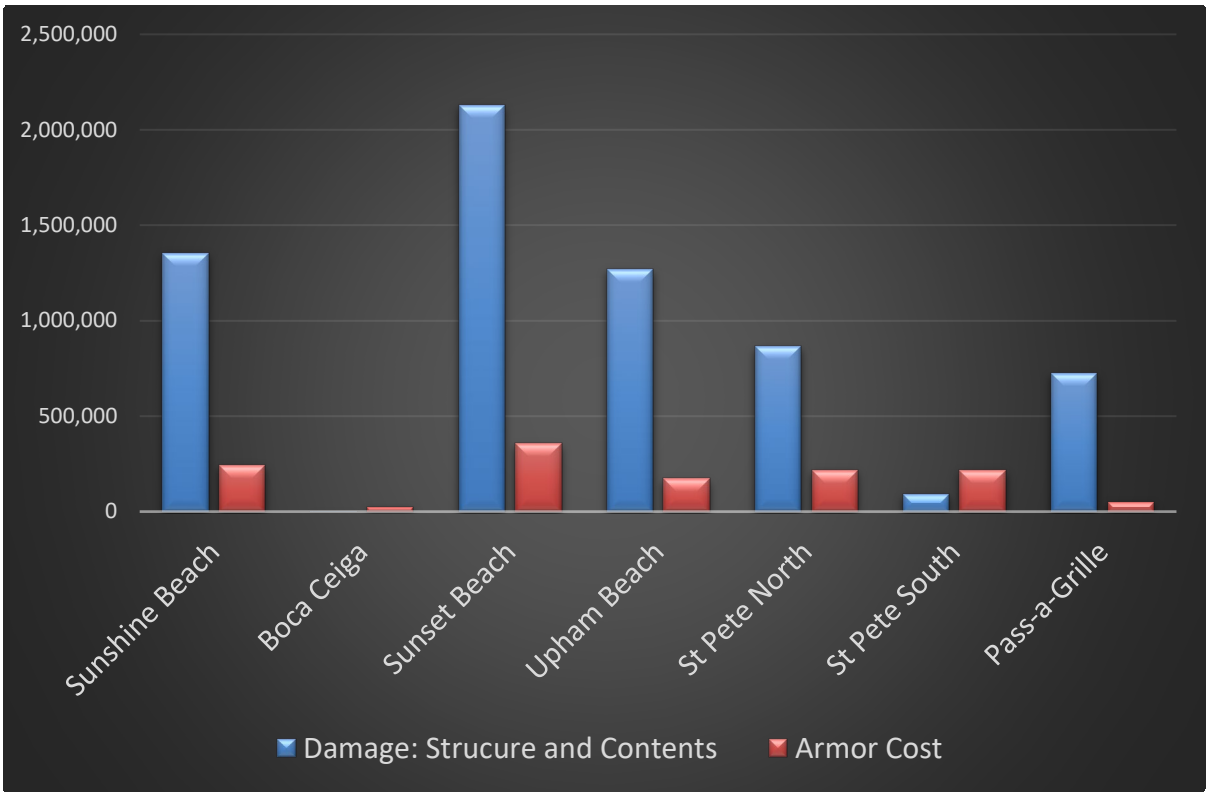


Figure 2-17. Summary of damages by planning reach in average annual equivalent dollars ($ AAEQ).

2.7.3.2 Damage Distribution by Damage Driving Parameter

Most of the FWOP damages and costs are attributable to wave attack. The distribution of damages by driving parameter is as follows:

- Erosion: 11%
- Inundation: 35%
- Wave Attack: 54%

Given that most of the shoreline in the study area is classified as either currently armored or amorable in the future, this results make sense. As it is simulated in Beach-fx, armor is generally effective in terms of preventing erosion damage; however, it does not prevent inundation or wave attack damage. More information about the nature of estimated FWOP damages is provided in the Economics Appendix.

2.7.3.3 Temporal Distribution of Damages

In addition to understanding the spatial distribution of damages, it is important to understand how and why damages vary over time.

In Treasure Island, damages remain relatively low in the first five years of the period of analysis while there is still some sand remaining in the system. After erosion has taken its toll on the northern and southern ends of the study area, damages become increasingly high and erratic, demonstrating the

increased vulnerability of the study area to storm impacts. The middle part of the island (Boca Ciega) receives minimal damage, even in the High SLR scenario. Despite the effects of discounting, present-value damages in Sunset and Sunshine in the late years are relatively high until the final year of analysis, though the average timing of damage is slightly later for Sunset Beach as it is for Sunshine Beach. Table 2-11 demonstrates this effect graphically.

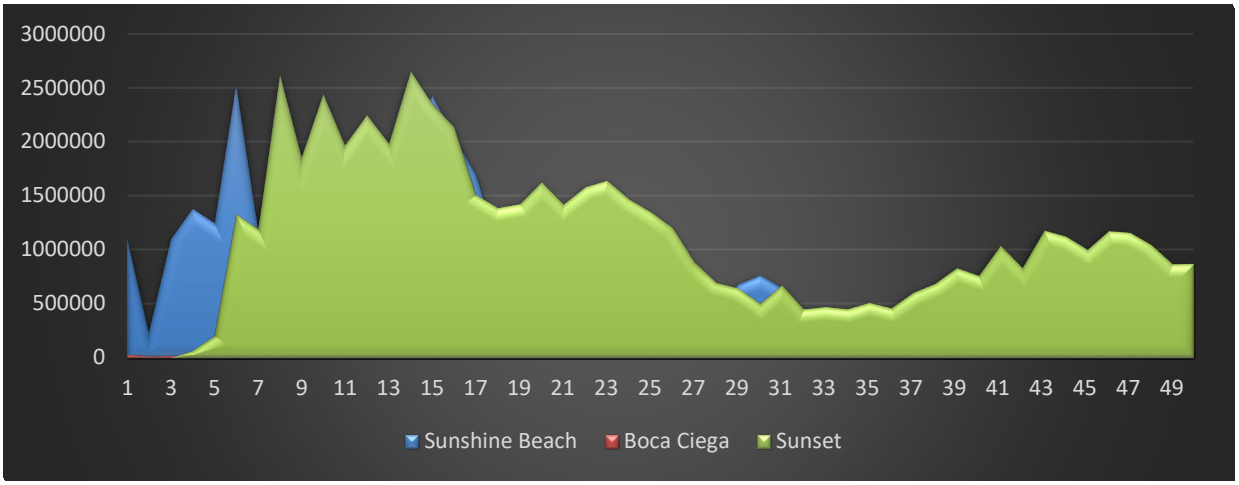


Figure 2-18. Summary of FWOP damages at Treasure Island over the 50-year period of analysis by planning reach in present value dollars (PV $).

The temporal distribution of damages in Long Key is somewhat different. The two planning reaches that accumulate the most damage, Upham Beach and Pass-a-Grille, do receive some damage early in the simulation (years one through ten). Pass-a-Grille receives most of its damage early, rather than late in the simulation, probably due to new armor construction in the model that prevents erosion damages in later years. Both Upham Beach and St. Pete Beach North experience a significant spike in damage very late in the simulation, likely due the heavily eroded state of the shoreline in those years. St. Pete Beach South receives minimal damage throughout the simulation. Table 2-12 shows the temporal distribution of damages at Long Key.

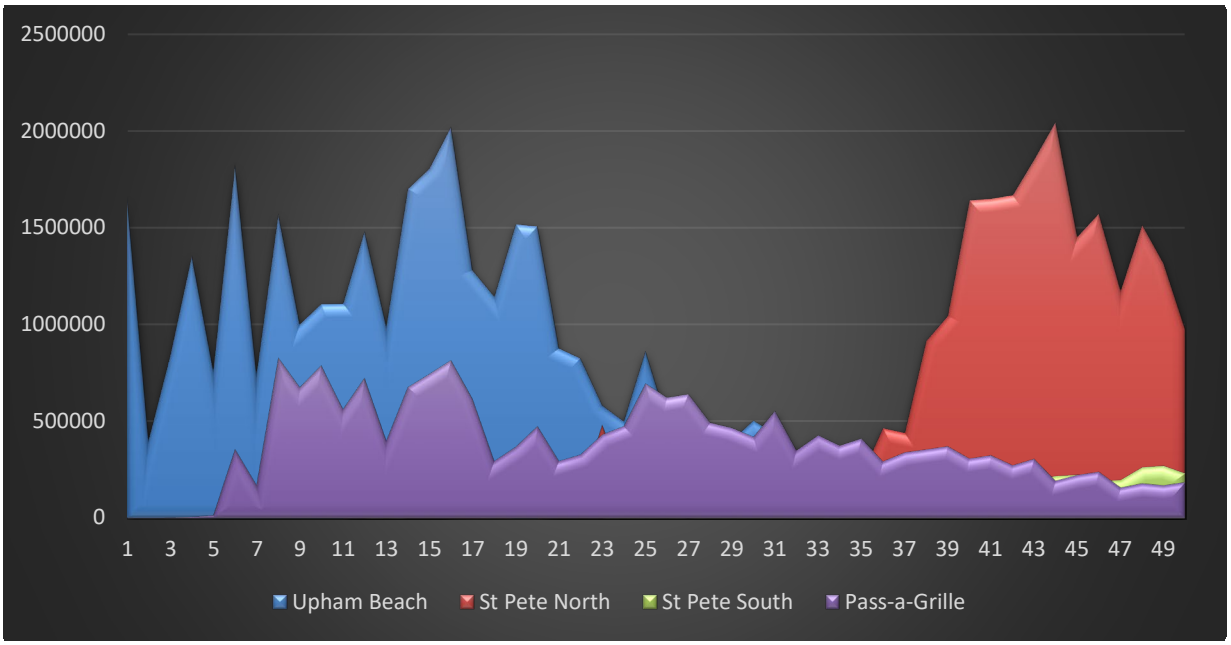
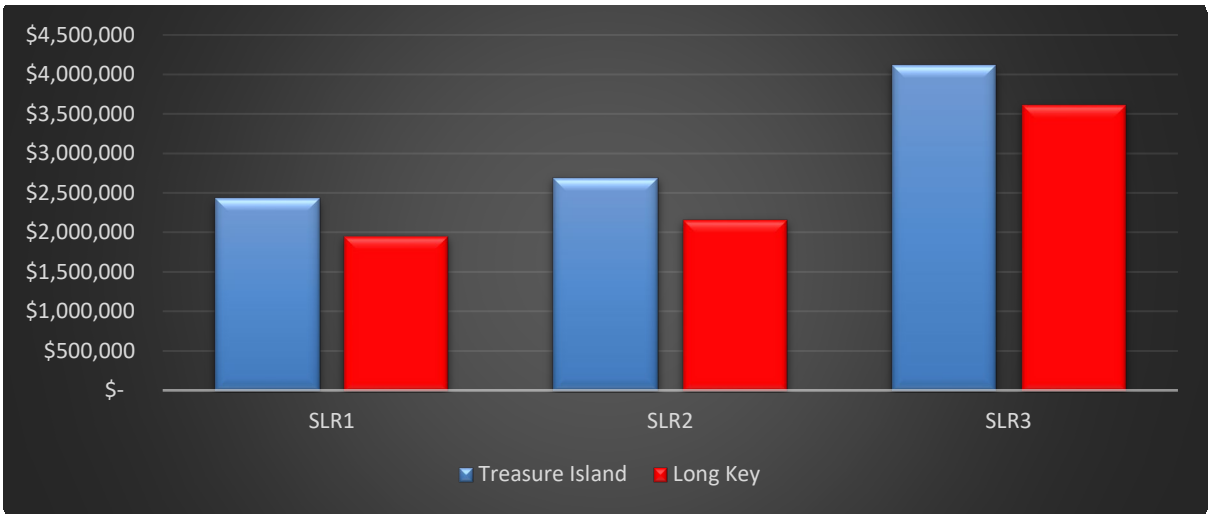


Table 2-9. Summary of FWOP damages at Long Key over the 50-year period of analysis by planning reach in present value dollars (PV $).

2.7.3.4 FWOP Damages in Alternative Sea Level Rise (SLR) scenarios

Evaluating sea-level rise (SLR) is a vital component in the planning process to ensure alternatives are selected based on risk-informed analysis. To incorporate risk into the analysis, the FWOP must be run assuming three distinct future rates of SLR. EC 1165-2-211 provides both a methodology and a procedure for determining a range of SLR estimates based on the local historic rate, the construction (base) year of the project, and the design life of the project. In Pinellas County, the average baseline (SLR1), intermediate (SLR2), and high (SLR3) rates were found to be 0.00774 feet/year, 0.0163 feet/year, and 0.0439 feet/year, respectively. The Beach-fx results that are presented above refer strictly to SLR3. The results comparing the SLR scenarios are presented here.

Table 2-10. Total FWOP damages by SLR scenario expressed in average annual equivalent dollars (AAEQ $) for both Treasure Island and Long Key.



The SLR results are intuitive in the sense that one would expect damages to be positively correlated with water levels (i.e. as water levels increase throughout the period of analysis, so do damages). However, the magnitude of the effect is important to note. Damages barely diverge between SLR1 and SLR2, but begin to rapidly increase when analyzing the high sea-level rise scenario. More information about the SLC change results is provided in the Economics Appendix.

2.7.4 Future Without-Project Condition Summary

The following points summarize the FWOP conditions:

- Damages to the asset inventory are largely driven by wave attack and inundation in all SLC scenarios.
- The overwhelming majority of the damage is structural in nature. Multi-family structures account for the majority of structure and content damages. Armor costs make up between 15 and 25 percent of damages in the FWOP scenario.
- Coastal storm risk is heavily concentrated in the planning reaches that represent the termini of the two islands: Sunshine Beach, Sunset Beach, Upham Beach, and Pass-a-Grille Beach. Risk is highest in the southern terminus of Treasure Island (Sunset Beach) and the northern terminus of Long Key (Upham Beach). The middle reaches of each island have less damage, particularly Boca Ciega on Treasure Island and St Pete Beach North on Long Key, where the estimated damages are minimal.
- The potential impacts in the high SLC scenario are significantly higher than those in the base and intermediate SLC scenarios.

- The coastal armoring assumption prevents most of the erosion damages that could potentially occur to the asset inventory, but this armoring is estimated to come at a large cost (between 15-25 percent of total damages in Long Key and Treasure Island, respectively). A project that avoids or defers this cost could be potentially beneficial.

2.8 TRANSPORTATION

Existing Conditions

Roadway flooding currently occurs in some locations in the study area, especially in low-lying areas and locations on the bayside of the islands. Flooding causes residents to move their vehicles to higher ground or parking garages, and travelers may be required to use alternate routes. State Road 699 is the primary evacuation route through the study area. In some cases, the road is at risk of flooding during coastal storms. However, it does not typically experience flooding or wave attached as a result of coastal storms with the existing authorized project in place.

Future Without-Project Conditions (No Action Alternative)

Without a project in place, SR 699 could be damaged in portions of the study area. While not the primary driver of damage in the FWOP condition, some road damage is expected to occur on both islands, particularly in the High SLR scenario. As discussed in Section 2.7, it is assumed that local and private entities would take actions to protect roads and private property in the FWOP scenario. FWOP Beach-fx modeling for this study suggests that armoring would be required in this area to protect the roadway. If the road were damaged, hurricane evacuation, emergency response, and storm recovery operations could be jeopardized. Compromising such operations could have life safety consequences.

2.9 PUBLIC ACCESS AND PARKING

Existing Conditions

Federal participation in coastal storm risk management projects involving placement of sand is limited to shorelines open to public use. Guidance is provided in Engineering Regulation (ER) 1105-2-100 and ER 1165-2-130. Cost sharing for any recommended plan is based on shoreline ownership, use, and the availability of public access.

The Treasure Island segment of the project (R126-R143) contains public access points with parking at many street ends. Along Sunshine Beach's approximately 0.6 mile of beach, there are six access points with parking spaces totaling 54 spaces. Boca Ciega reach has 10 beach access points and includes over 300 parking spaces along the 1.6 mile stretch of shoreline. Sunset Beach includes 1.2 miles of beach, and has eight access points with 145 parking spaces available to the public.

The Long Key segment of the project (R144-R166) contains sufficient public parking and beach access in the reaches proposed for beach placement and dune construction. Upham Beach includes Upham Beach Park, which is located along approximately 780 feet of shoreline and has sufficient metered parking along Beach Plaza. Several street ends provide beach access along the St. Pete Beach North and St. Pete Beach

South reaches, but parking in these reaches is limited other than at the St. Pete Municipal Beach Access Lot, located at Gulf Blvd. and 46th Avenue. Pass-a-Grille Beach has beach access via dune walkovers at every street end, with diagonal public parking along Gulf Way for the entire reach.

Figure 2-19. Location of beach access points and public parking spaces or lots in the project area.

Future Without-Project Conditions (No Action ALTERNATIVE)

Public access and parking are not expected to change between the existing and future without-project conditions.

CHAPTER 3

PLAN FORMULATION

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3 PLAN FORMULATION

3.1 PLAN FORMULATION RATIONALE

Plan formulation is the process of developing alternative plans that meet the project-specific objectives while avoiding constraints. USACE uses a six-step planning process for all civil works projects: The first step of plan formulation involves identifying all potential management measures for the given problems. A management measure is a structural or nonstructural action that can be implemented at a specific geographic site to address one or more planning objectives.

An alternative plan is a set of one or more management measures functioning to address one or more objectives. Sometimes a plan consists of only one measure, but more often it is a combination of measures. Different alternative plans can consist of different measures, or they can combine the same measures in different ways, such as different dimensions, quantities, materials, locations or implementation time frames. As the study evolves, favorable plans are reformulated to devise the most efficient, effective, complete, and acceptable plan.

Plan formulation was conducted with a focus on achieving the federal objective of water and related land resources project planning, which 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. Plan formulation also considers all effects, beneficial or adverse, to each of the four evaluation accounts identified in the 1983 *Economic and Environmental Principles and Guidelines for Water and Related Land Resource Implementation Studies* (Principles and Guidelines) which are National Economic Development, Environmental Quality, Regional Economic Development, and Other Social Effects.

3.2 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 feasibility study is to develop an implementable and acceptable plan to improve the future condition and 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 and other agencies and groups, as well as comments received from the sponsor and during the scoping meeting on November 15, 2018, to identify current coastal risk related problems affecting the study area.

3.2.1 Problems

Problems within the study area include:

- Storm damages due to erosion, inundation, and waves threaten infrastructure
- Erosion causes loss of natural habitat
- Shoreline erosion threatens recreational opportunities

Erosion, wave attack, and inundation are all problems in the study area, or potential problems in the absence of the existing beach erosion control project. Erosion includes both long-term and storm induced erosion. As erosion causes the loss of the protective beach and dunes, wave attack and inundation threaten infrastructure. Persistent erosion in the absence of the existing beach erosion control project would also reduce the habitat available for shorebirds and sea turtles, and it would threaten recreational opportunities. The study area experiences some natural recovery in the short-term, but the long-term trend is erosional.

A Federal beach nourishment project for the purposes of beach erosion control and shore protection has existed in the project area in the late 1960s and early 1970s, protecting homes and businesses. When the existing Federal project reaches the end of its period of Federal participation, the project area is expected to remain in an erosive state where properties are susceptible to storm damages and individual property owners will likely seek to protect their property using erosion control measures such as seawalls on a property by property basis. As 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.

Sea level change will continue to exacerbate the potential for erosion, inundation, and wave damages in the study area.

3.2.2 Opportunities

Opportunities exist to:

- Reduce economic loss due to coastal storm damages
- Maintain coastal habitat and the character of coastal beach communities and other cultural resources
- Maintain existing recreation (beach and nearshore)
- Support the local economy and tourism industry through the maintenance of stable beaches and healthy coastal ecosystems
- Implement a regional approach to sediment management by utilizing material from nearby navigation inlets as a sand source
- Increase community understanding of coastal resilience

There is an opportunity to reduce storm damage to infrastructure by implementing measures which control development in the project area and/or by engineering features which protect infrastructure. These are “management measures” and will be discussed in detail later in this chapter. There is also the opportunity to maintain recreational opportunities that the current beach and dune systems provide in all reaches such as beach access, surfing, fishing, and wildlife viewing.

Coincident with some management measures like beach nourishment and dune creation are opportunities to protect and enhance habitat for sea turtles, etc., as well as protecting or enhancing the beach/dune interaction. In areas where infrastructure has prevented landward migration of coastal

beaches and dunes, engineered beaches provide habitat for protected species such as sea turtles and shorebirds that utilize these habitats for nesting and foraging. Management measures requiring sand for construction provide an opportunity to implement a Regional Sediment Management (RSM) strategy where maintenance of inlets can be combined with a Federal Coastal Storm Risk Management (CSRM) project to realize significant cost savings to the Federal government and to the non-federal project sponsors. While Tampa and St. Petersburg Harbors do not contain sufficient beach quality sediment and they are too distant from the focused study area to be economically viable, there is significant material available in the three inlets adjacent to Treasure Island and Long Key. The Florida Department of Environmental Protection (FDEP) issued inlet management plans for the inlets in the project area: Johns Pass, Blind Pass, and Pass-a-Grille. These plans identify the portion of beach-compatible sand that could be dredged from the inlets, as well as the proportion of sand from each that should be placed on beaches adjacent to the inlets.

3.3 OBJECTIVES

3.3.1 Federal Objectives

The Federal objective as stated in the Principles and Guidelines (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, 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.

As the Federal objective is to maximize net benefits to the nation, it does not seek to identify specific targets within objectives. For example, targeting a pre-defined storm frequency (1% annual-exceedance-probability) relative to the storm damage reduction objective would be inappropriate. Rather, the planning process includes the formulation of alternative plans to maximize benefits relative to costs. The Federal objective to maximize net benefits would supersede any project-specific target output.

3.3.1.1 Planning Objectives

The planning objectives are statements of the study purpose. Planning objectives are more specific than the Federal and non-Federal objectives, and they reflect the problems and opportunities in the study area. An objective is developed to address each of the identified problems and opportunities while being consistent with the study authority and the U.S. Army Corps of Engineers (USACE) mission of coastal storm risk management. Planning objectives represent desired positive changes. All of the objectives focus on activity within the seven reaches of the study. The planning objectives are:

1. Reduce coastal storm damage to structures and infrastructure for the 50-year planning horizon.
2. Maintain environmental quality for human and natural use through the 50-year planning horizon.
3. Maintain existing recreation (beach and nearshore) for economic benefit over the 50-year planning horizon.

The goal of the feasibility study is to develop a range of alternative plans that balance the objectives and avoid conflicts or, where necessary, demonstrate the trade-offs between conflicting objectives, enabling decisions to be made. While the project purpose is for coastal storm risk management, including other objectives such as maintaining environmental quality and recreation allow for the consideration of these during plan formulation. However, the plan that is selected must maximize NED benefits based on storm damage protection.

3.3.1.2 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 FY18-22 USACE Campaign Plan are:

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

Goal 2 – Deliver Integrated Water Resource Solutions: Deliver enduring and essential water resource solutions using effective strategies.

Goal 3 – Reduce Disaster Risks: Deliver support that responds to, recovers from, and mitigates disaster impacts to the nation while ensuring sustainable operations.

Goal 4 – Prepare for Tomorrow: 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 feasibility study.

3.4 CONSTRAINTS

3.4.1 Planning Constraints

A constraint is a restriction that limits the extent of the planning process; it is a statement of effects that alternative plans should avoid. Identifying constraints avoids undesirable changes between without and with project future conditions.

The planning constraints for this study are:

1. Protect the integrity of the coastal ecosystem (including sediment quality) for protected species.

2. Avoid/minimize effects to water quality.
3. Maintain protection of coastal cultural resources and historic properties.

3.4.2 Local Constraints

Local and state laws, such as Florida State statutes, are not a constraint to NED formulation. However, they may be considered in the selection of a Locally Preferred Plan (LPP).

3.5 ENVIRONMENTAL OPERATING PRINCIPLES

The USACE Environmental Operating Principles (EOPs) were developed to ensure that USACE missions include totally integrated sustainable environmental practices. The EOPs provided corporate direction to ensure the workforce recognized USACE's role in, and responsibility for, sustainable use, stewardship, and restoration of natural resources across the Nation and through the international reach of its support missions.

Since the EOPs were introduced in 2002, they have instilled environmental stewardship across business practices from recycling and reduced energy use at USACE and customer facilities, to a fuller consideration of the environmental impacts of USACE actions and meaningful collaboration within the larger environmental community.

The USACE Environmental Operating Principles are:

1. Foster sustainability as a way of life throughout the organization.
2. Proactively consider environmental consequences of all USACE activities and act accordingly.
3. Create mutually supporting economic and environmentally sustainable solutions.
4. Continue to meet our corporate responsibility and accountability under the law for activities undertaken by USACE, which 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.
6. Leverage scientific, economic, and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner.
7. Employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

Sustainability can only be achieved by the combined efforts of Federal agencies, tribal, state5 and local governments, and the private sector each doing its part and backed by the citizens of the world. These principles help USACE define its role in that endeavor.

3.6 P&G ACCOUNTS

Four accounts, making up the Federal objectives, are established 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), to facilitate the evaluation of management measures and display the effects of alternative plans:

1. National Economic Development (NED): The NED account describes the plan with the greatest net economic benefit consistent with protecting the nation's environment.

2. Environmental Quality (EQ): The EQ account displays non-monetary effects on ecological, cultural, and aesthetic resources including the positive and adverse effects of alternative plans. Resources under consideration are identified early in the planning process. The environmental impacts and benefits of each management measure, and of the alternatives developed, were fully considered during plan formulation. The existing conditions of the study area are described in Chapter 2, along with the Future Without Project Condition (No Action Alternative). Environmental effects of the management measures evaluated during preliminary screening are summarized in Table 3-1, and Chapter 5 describes the Environmental Effects of the Final Array of Alternatives. Although a separate EQ analysis was not conducted as the EQ account did not drive the plan selection for this project, these effects were fully considered during plan formulation. All plans are formulated to avoid to the fullest extent practicable any adverse impact. Chapter 4 describes the environmental impacts of the alternatives that were carried forward, and Chapter 6 includes a summary of the Tentatively Selected Plan's compliance with Federal statutes and regulations. This report includes all required components of an Environmental Assessment pursuant to NEPA regulations.

3. Regional Economic Development (RED): The RED account displays changes in the distribution of regional economic activity (e.g., income and employment). The RED is not the primary account considered in plan selection; however, the results can be useful for the sponsor and local stakeholders. Discussion of the RED results can be found in Appendix C.

4. Other Social Effects (OSE): The OSE account includes the plan's effects on social aspects such as community impacts, health and safety, displacement, energy conservation and others. The effects of each alternative on these considerations is discussed as appropriate in this Chapter. Risks to life safety are also evaluated under this account, especially as related to hurricanes and other significant storm events. As reflected in Table 3-1, structural measures could minimally improve life safety risk as a result of protecting hurricane evacuation routes. However, this analysis assumes that the majority of the population evacuates damage prone areas in adequate time to effectively reduce life safety risk. An OSE evaluation was completed on the final array in order to help the team compare alternatives and ensure social effects were considered during screening. This evaluation was conducted using the Institute for Water Resources' handbook for Applying Other Social Effects in Alternatives Analysis (2013).

The Federal *Principles and Guidelines* require that the NED plan is selected for Coastal Storm Risk Management (CSRM) projects 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. Completeness is satisfied by ensuring that the alternatives include all activities to implement the plan. Effectiveness is determined by how the alternatives address the project problems. Efficiency is indicated by the cost effectiveness of a plan, which will be determined through the cost and

benefit analysis. Acceptability is determined by evaluating the plan against local, state, and Federal law and policy, environmental constraints, and public willingness to support the plan. Each alternative plan is formulated in consideration of these four criteria.

3.7 SCREENING PROCESS

The planning process is an iterative process. Management measures are developed and screened based on various criteria. For the current study, the study team developed a list of management measures that could be appropriate for the study area. These measures were screened based on the planning study objectives described in Section 3.3 and the P&G accounts described in Section 3.5. The screened measures carried forward were then combined into a Preliminary Array of Alternatives. Using the Beach-fx model to analyze the future scenario without a project, alternatives were reviewed to determine whether they were likely to reduce damages in the future. The Rough Order of Magnitude (ROM) costs for the Preliminary Array of Alternatives was also considered, and alternatives that were significantly more expensive than the anticipated future damages without a project were eliminated from further consideration. This Secondary Screening led to the Focused Array of Alternatives. The Beach-fx model was used to conduct final screening of the Focused Array of Alternatives and to optimize and inform range associated with the Tentatively Selected Plan (TSP). Figure 3-1 provides a flow chart showing the screening process to develop and select the TSP.

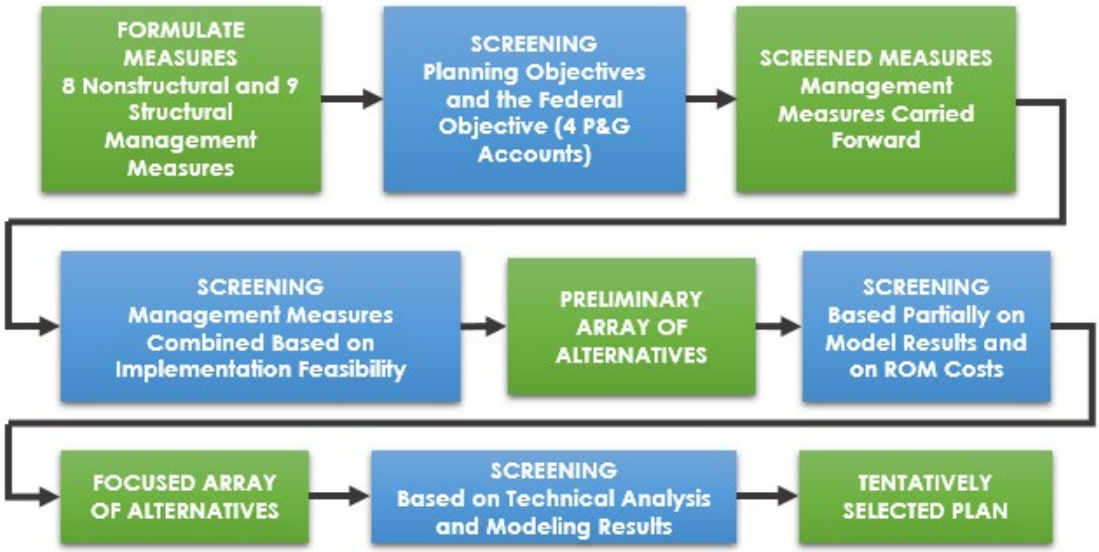

Figure 3-1. Flow chart showing the process of formulating alternatives from management measures and the methods used to screen measures and alternatives throughout this process.

3.8 SUMMARY OF MANAGEMENT MEASURES

Management measures are specific structural or nonstructural actions that would take place at geographical locations within the project areas. There are three general categories of nonstructural

measures: 1) Land Management; 2) Acquisition and Relocation; and 3) Building Retrofits (Elevating and Flood-proofing). Structural measures are those that change the movement of the water with relation to buildings and infrastructure, and can be both soft structural measures (e.g., beach fill) or hard structural measures (e.g., groins).

Management measures were selected to accomplish at least one planning objective. Both nonstructural (NS) and structural (S) measures are included. Several of the structural measures are also considered to be Natural and Nature-Based Features (NNBF) in compliance with Section 1184 of the Water Resources Development Act of 2016. These include S-1: Submerged Artificial Reefs, S-4: Beach Nourishment, and S-9: Breakwaters. All possible measures are considered, including those beyond USACE's authority to implement.

NS-1: No-Action. The no-action plan is the continuation of existing conditions. Although this measure does not address any specific problems, it will provide a comparison to other measures. Information to describe this measure was collected during the inventory of existing conditions. The rate of shoreline change and current adjacent beach fill and sand bypassing operations will be assumed to continue over the 50-year period of analysis. Present structures and replacement costs will be used into the future.

NEPA requires the inclusion of the No-Action Plan.

NS-2: Coastal Construction Control Line. A coastal construction control line (CCCL) that does not prohibit construction, but does provide stringent structural restrictions, has already been established by the State of Florida for all of the Pinellas County study area. This management measure provides for potential changes to the CCCL or building regulations that could be implemented by the State of Florida. Such changes could include moving the CCCL landward, increasing the setback for construction, or increasing the standards for construction to reduce storm damages. The erosion of the shoreline would continue at the present rate, unabated by this measure.

NS-3: Moratorium on Construction. This management measure would not permit new construction in the area vulnerable to storm damages within the study area. As properties are damaged, reconstruction would not be permitted. The erosion of the shoreline would continue at the present rate, unabated by this measure. Although not a congressionally authorized activity, this measure could be implemented by state or local governments.

NS-4: Establish a No-Growth Program. This management measure would allow for existing structures and limited reconstruction following storm damage, but would not allow for an increased number of structures within the area vulnerable to storm damages adjacent to the study area. The erosion of the shoreline would continue at the present rate, unabated by this measure. Although not a congressionally authorized activity, this measure could be implemented by state or local governments.

NS-5: Relocation or Elevation of Structures. Relocation involves identifying structures vulnerable to storm damage in the study area, and where feasible, such structures would be moved further landward on their parcels to escape the vulnerable area. Asset elevation involves raising the assets in place so that the structure sees a reduction in frequency and/or depth of flooding during high-water events. Elevation can

be done on fill, foundation walls, piers, piles, posts, or columns. Selection of proper elevation method depends on flood characteristics such as flood depth or velocity. The relocation or elevation of structures measure would allow the area to continue to erode and the land in this area would be lost.

NS-6: Flood Proofing of Structures. Flood proofing of existing structures and regulation of flood plain and shorefront development are management measures that state and local governments could implement. This measure would require changes to the building codes to further minimize flood damages associated with coastal storms. New construction and substantial reconstruction would be improved by new building code regulations. Existing structures could be improved through incentives and aid programs.

NS-7: Buyout and Land Acquisition. Buyout/Land Acquisition involves purchase and elimination of flood damageable structures, allowing for inhabitants to relocate to locations away from flood hazards. This measure is the most dependable method of protection and provides the benefit of use of the evacuated floodplain. For this study, Buyout/Land Acquisition would either allow the shoreline to erode in the study area with a loss of land, or it could be implemented in combination with structural measures to manage erosion. Structures within the area vulnerable to storm damage would be identified for acquisition. These structures would be demolished and natural areas would be restored. Such parcels would become public property and would reduce the number of structures vulnerable to storm damages.

NS-8: Public Awareness and Communication. This measure involves engaging the public and providing information about the Federal project, the functions of the beach, and their role in protecting the beach system and habitat. It could include components such as providing information about beaches and coastal systems on county and local websites; installing educational posters at beach access points; creating public service announcements; and distributing educational brochures to homeowners.

S-1: Submerged Artificial Reefs. This management measure would use the "perched beach concept" to limit the amount of underwater beach fill and retain the dry beach for a longer period. Such construction would limit cross-shore losses of fill material. This would be accomplished by placement of a submerged artificial reef in shallow water with beach fill material placed "perched" behind the reef structure. This measure may reduce initial nourishment (fill) quantities, reduce renourishment requirements, and offer mitigation for potential nearshore environmental impacts. The submerged artificial reef would be constructed out of large size rock with a foundation material to avoid subsidence. Typically, a structure perpendicular to the shore is constructed downdrift of the reef to stabilize fill. The beach fill material would come from offshore and/or in combinations of other sources such as navigation dredging, upland disposal areas, etc.

S-2: Revetments. Revetments have been placed on similar beaches to protect critically damaged or eroding areas. This measure would involve placement of large rock designed to withstand the wave environment along the existing dune line. The engineered structure would start at the elevation of the bluff, to tie into existing elevations, and have a sloped profile. The structure would be imbedded under the beach elevation to a depth below expected scour and future erosion. In-place materials from the excavation would be used for backfill behind the structure. Along the shoreline, the revetment should be

continuous to avoid erosional features at gaps and should include tie back features at the ends. Existing armor can either be incorporated into the structure, or demolished to provide a seamless structure.

S-3: Sand-Covered Soft Structure. This management measure includes construction of a dune composed of geotextile sand-filled forms (typically tubes or bags) and covered with sand. This forms a sand dune with a structured core. Sand depth over the geotextile core would be maintained to an adequate depth to allow the dune to function as habitat and not inhibit sea turtle nesting.

S-4: Beach Nourishment. This management measure includes initial construction of a beach fill and future renourishments at regular intervals. Beach-compatible sediments would be placed on the beach and graded to match the engineered profile. Dunes are an important component of a healthy beach system to help the beach remain stable and accommodate stress from unpredictable storms and extreme conditions of wind, wave, and elevated sea surfaces. During storms, dunes maintain a sand repository that provides sacrificial sand before structures would be damaged. Where appropriate, dunes would be incorporated into the beach nourishment template. Proper vegetation on dunes increases sand erosion resistance by binding the sand together via extensive root masses penetrating deep into the sand. Further, such vegetation promotes dune growth through its sand trapping action when significant wind action transports substantial quantities of sand. When dune features are incorporated into beach nourishment, it would be standard practice to vegetate them.

Renourishment of the beach would be undertaken periodically to maintain the recreational and erosion control features within design dimensions. Dimensions of the beach fill would be based on economic optimization of benefits provided with consideration to cost, as well as the potential environmental impacts. Beach nourishment material is anticipated to be available in adequate quantities from navigation channels, inlet ebb shoals, and Egmont Shoal.

S-5: Jetty Improvements. Stabilized inlets can have a significant effect on adjacent shorelines due to the disruption of sediment transport processes in the vicinity of the inlet. The inlets in the project area are all currently stabilized with jetties of varying dimensions. This measure would assess the effectiveness of the existing jetties to determine whether improvements could be made to these structures to benefit adjacent shorelines. See Section 1.9 for a discussion of the existing jetties in the focused study area of Treasure Island and Long Key.

S-6: Groins. While there are several groins existing in the project area, consideration of additional groins in problem areas would help hold a beach in front of existing development and prevent further losses of land. The construction of groins would have to be supplemented with nourishment so that adjacent beaches would not be starved of sand. For this reason, groins are considered a method to help hold the fill in place and to reduce periodic nourishment requirements. The groins would be constructed of large size rock, designed to interlock together and with a foundation such to avoid subsidence. The groins would be placed perpendicular to the shoreline and would extend from above the mean high water line out into shallow water. The length, orientation, and head of the structure (T-head or not) would be designed based on wave conditions, storms and sediment transport. The beach fill material would come

from offshore and/or in combinations of other sources such as navigation dredging, upland disposal areas, etc.

S-7: Seawall/Floodwall. The construction of seawalls or improvements to and maintenance of the existing bulkheads/seawalls would provide a significant degree of protection. The seawalls would be constructed at the landward edge of the existing dune line in areas where erosion is not a primary concern to protect against flooding from overwash in low-lying areas.

S-8: Nearshore Placement. Dredged material would be placed in the nearshore to dissipate wave energy, nourish the active profile, or placed as a combination of both. This method allows placement in water depths 15 feet and deeper. This management measure assumes that a portion of the sand placed in shallow water will move towards the beach under normal wave conditions. Following construction, the sand bar will migrate towards the beach, attach to the beach, and shape into the normal equilibrium profile of the beach (thus adding material and enlarging the beach). The dredged material would come from navigational channels, inlet ebb and flood shoals, or Egmont Shoal.

S-9: Breakwaters. The construction of offshore breakwaters is considered as a management measure to stabilize the existing beach. Such structures reduce the amount of wave energy reaching the shoreline behind them. As a result, the rate of annual erosion could decrease. The breakwaters would be constructed of large size rock with foundation materials to prevent subsidence. The breakwaters would be trapezoidal in profile and would be placed parallel to the shoreline in shallow water. The breakwaters would be constructed in segments separated from each other to prevent infilling between the existing beach and the breakwaters. The elevation and length of each breakwater segment and the distance between segments would be designed using the wave and sediment transport characteristics of the reach.

3.9 PRELIMINARY SCREENING OF MANAGEMENT MEASURES

During preliminary screening, management measures are evaluated by how they will individually meet planning objectives given the identified planning constraints during a 50-year planning horizon within each geographic location/planning reach. Each measure is evaluated to identify how it meets planning objectives and constraints within each planning reach. In addition, the overall effects of implementing each measure are evaluated, not just the shorter-term effects experienced during the construction of the measures. This is especially relevant for beach nourishment, which typically includes periodic renourishment (or reconstruction) of the beach over 50 years.

The management measures were evaluated and rated in Table 3-1 for their potential to accomplish planning objectives given project constraints: 0 = does not meet criteria, 1 = partially meets criteria, and 2 = fully meets criteria. If the total rating equals a number greater than 8, the measure partially meets, at least, over half of the objectives and constraints and is carried forward for further analysis. If the total rating is equal to or less than 8, the measure is not considered further. The final total rating should not be inferred to be a ranking of measures against each another. A measure's rating is only an indication of how likely it is to meet objectives given constraints, and therefore whether it was carried forward or not.

The No Action alternative was carried forward regardless of its score in accordance with the National Environmental Policy Act (NEPA).

During preliminary screening, costs and benefits were not yet developed to identify an NED plan. Therefore, all measures were given a "1" rating in the matrix under the NED account in Table 3-1, which effectively negates the weight of this account. An estimation of each measure's potential performance under the NED account is provided.

Table 3-1. Preliminary screening matrix.

PRELIMINARY SCREENING

Non-Structural Measures (NS)

	MANAGEMENT MEASURES	Planning Objectives			Project Constraints	Federal Objectives					
		Reduce Storm Damage to Infrastructure	Maintain Environmental Quality	Maintain Existing Recreation (Beach & Nearshore)	Consistent with Federal Laws	National Economic Development (NED)	Environmental Quality	Other Social Effects	Regional Economic Development (RED)	Total	Measure Carried Forward (Yes/No)
NS-1	No-Action	No improvement	Measures taken to protect upland structures at the individual property scale are not likely to protect nesting habitat for shorebirds and sea turtles.	No impact to nearshore recreation. Loss of beach recreation.	Consistent with Federal laws	No project cost. No damages prevented.	Possible loss of beach/dune habitat. Loss of turtle nesting habitat due to decreased beach/dune width and private shore protection measures. No impact to bottom habitats. Minimal change to other factors. No impacts to benthic habitats.	Small life safety risk due to hurricane evac. route damage. Moderate risk to loss of public facilities (parking, beach access, bathrooms). Negative effect on community cohesion due to perceived inequality. Impacts to recreation.	Loss of property value & tax value. Loss of other revenue related to existing beach as long term erosion continues.		
		0	0	1	2	0	1	0	0	4	Yes
NS-2	Coastal Construction Control Line	Increasing construction standards could decrease damage to future construction	Measures taken to protect upland structures at the individual property scale are not likely to protect nesting habitat for shorebirds and sea turtles.	No impact to nearshore recreation. Loss of beach recreation.	Changes to State law would be necessary.	Minimal to no cost. No impact to current construction. Minimal damages prevented to future construction.	Possible loss of beach/dune habitat. Loss of turtle nesting habitat due to decreased beach/dune width and private shore protection measures. No impact to bottom habitats. Minimal change to other factors.	Increased requirements/restrictions on future construction are typically unfavorable.	Loss of property value & tax value. Loss of other revenue related to existing beach as long term erosion continues.		
		1	0	1	1	1	1	0	0	5	No
NS-3	Moratorium on Construction	No improvement to damage of current construction but elimination of damage to future construction	Measures taken to protect upland structures at the individual property scale are not likely to protect nesting	No impact to nearshore recreation. Loss of beach recreation.	Changes to local law would be necessary.	Minimal to no cost. No impact to current construction. Elimination of damages to future construction.	Possible loss of beach/dune habitat. Loss of turtle nesting habitat due to decreased beach/dune width and private shore protection measures.	Moderate risk to loss of public facilities (parking, beach access, bathrooms). Negative effect on community cohesion due to perceived inequality	Loss of property value & tax value. Loss of other revenue related to existing beach as long term erosion continues.		

			habitat for shorebirds and sea turtles.				Minimal change to other factors.				
		1	0	1	1	1	1	0	0	5	No
NS-4	Establish a No-Growth Program	No improvement to damage of current construction but elimination of damage to future construction	Measures taken to protect upland structures at the individual property scale are not likely to protect nesting habitat for shorebirds and sea turtles.	No impact to nearshore recreation. Loss of beach recreation.	Changes to local law would be necessary.	Minimal to no cost. No impact to current construction. Elimination of damages to future construction.	Possible loss of beach/dune habitat. Loss of turtle nesting habitat due to decreased beach/dune width and private shore protection measures. Minimal change to other factors.	Moderate risk to loss of public facilities (parking, beach access, bathrooms). Negative effect on community cohesion due to perceived inequality.	Loss of property value & tax value. Loss of other revenue related to existing beach as long term erosion continues.		
		1	0	1	1	1	1	0	0	5	No
NS-5	Relocation or Elevation of Structures	Relocating damageable elements would reduce damages.	Relocation could reduce private shore protection measures and maintain beach/dune interaction.	No impact to nearshore recreation. Eventual narrowing of beach could cause loss of beach recreation.	Supported by fed., state, local law.	Selective implementation may be justified.	Eventual narrowing of beach/dune system could eventually limit or eliminate habitat. No impact to nearshore habitat. Minimal change to other factors.	Some risk of loss of public facilities (parking, beach access, bathrooms). Negative effect on community cohesion due to perceived inequality. Potential reduction of recreational habitat.	Loss of property value & tax value as beach erodes. Loss of other revenue related to existing beach as long term erosion continues.		
		1	1	1	2	1	1	1	1	9	Yes
NS-6	Flood Proofing of Structures	Increasing construction standards could decrease damage to future construction	Measures taken to protect upland structures at the individual property scale are not likely to protect nesting habitat for shorebirds and sea turtles.	No impact to nearshore recreation. Loss of beach recreation.	Changes to State law would be necessary.	Minimal to no cost. No impact to current construction. Minimal damages prevented to future construction.	Possible loss of beach/dune habitat. Loss of turtle nesting habitat due to decreased beach/dune width and private shore protection measures. Minimal change to other factors.	Decreased impact to residents from flood impacts; Increased requirements/restrictions on future construction are typically unfavorable.	Loss of property value & tax value. Loss of other revenue related to existing beach as long term erosion continues.		
		1	0	1	1	1	1	1	0	6	No
NS-7	Buyout and Land Acquisition	Removing damageable elements and conversion of property to natural area would maximize storm damage reduction.	As the entire island is densely developed, the benefit to Environmental Quality would be temporary as the beach continues to erode	No impact to recreation. Temporary loss of beach recreational until structures are demolished and removed.	Supported by fed., state, local law.	Costs would likely significantly outweigh benefits.	Creation of natural area/habitat would improve environment. Cohesive program necessary to maintain environmental quality.	Moderate risk to loss of public facilities if parkland were created. Negative effect on community cohesion due to perceived inequality	Minimal increase with creation of parkland and eco-tourism benefits.		

			landward. Land acquisition would need to be cohesive to maintain EQ.								
		2	1	2	2	1	1	1	1	11	Yes
NS-8	Public Awareness and Communication	Would not inherently reduce storm damages	Engages the public in understanding the functions of the beach; supports the protection of habitat.	Maintains recreation by promoting (although does not further it)	Consistent with Federal laws.	Minimal to no cost, but corresponding minimal benefit.	Educational component supports environmental goals through engaging all beach users in protecting the resource.	Increased understanding of beach habitats and the effects of development on them. Awareness of the use of taxpayer dollars.	Minimal cost, but corresponding minimal benefit.		
		0	2	2	2	1	2	1	2	12	Yes

Structural Measures (S)

	MANAGEMENT MEASURES	Planning Objectives			Project Constraints	Federal Objectives					
		Reduce Storm Damage to Infrastructure	Maintain Environmental Quality	Maintain Existing Recreation (Beach & Nearshore)	Consistent with Federal Laws	National Economic Development (NED)	Environmental Quality	Other Social Effects	Regional Economic Development (RED)	Total	Measure Carried Forward (Yes/No)
S-1	Submerged Artificial Multi-Purpose Reefs	Limited location where additional structures would provide additional infrastructure protection over existing structures.	In combination with beach nourishment, beach habitat would be maintained for nesting sea turtles and shorebirds. Could create an obstacle for nesting or hatchling turtles. Reefs would increase habitat for fish species.	In combination with beach nourishment, beach recreation would be maintained. Reef construction could maintain or improve nearshore recreation such as surfing, fishing, and diving.	Supported by fed., state, local law.	Selective construction may be justified.	Reef has potential as nearshore habitat. Empirical evidence indicates potential negative effects to benthic invertebrates and nearshore habitat from beach nourishment are periodic, with habitat recovering within one year. Could create an obstacle for nesting or hatchling turtles.	Improved life safety risk due to hurricane evac. route protection. Protection of public facilities (parking, beach access, bathrooms). May receive more support from environmental agencies.	No change.		
		1	1	1	2	1	1	1	0	8	No

S-2	Revetments	Would maximize storm damage reduction where constructed. However, adjacent properties could be made more vulnerable due to erosive effects of structures.	Construction would eliminate beach/dune interaction. Interaction on properties adjacent to construction could be negatively affected.	Sloped construction causes revetments to take up more beach width than seawalls. Loss of beach recreation fronting structures.	Likely inconsistent with state CZMP.	Selective construction may be justified.	Negative effects to sea turtle nesting habitat and wildlife habitat. Negative impacts to benthic habitats.	Impacts to beach aesthetics and recreation. Potential safety impacts if beach users walk on structures. May limit access to the water.	No change.		
		1	0	1	0	1	0	1	0	4	No
S-3	Sand Covered Soft Structure	Would improve storm damage reduction.	Beach/dune interaction may not be maintained; potential impact to nesting turtles if structures are uncovered	Existing beach may not be maintained; public perception of geotubes low.	Supported by fed., local law. May not be permittable by state.	Benefits likely to outweigh cost.	Environmental quality is highly dependent on maintaining sand coverage of structure. Without adequate coverage dune habitat and sea turtle nesting could be negatively impacted. Agencies do not support. No impact to nearshore habitat.	Likely supported by homeowners but little support from others.	Minimal increase to RED through improvement of tourism/beach economy. Protection of property value & tax value.		
		1	0	1	1	1	0	1	1	6	No
S-4	Beach Nourishment	Nourishment along erosional areas would feed island centers and maximize storm damage reduction.	Beach/dune interaction would be maintained or improved.	Beach recreation would be maintained. Nearshore recreation such as surfing and fishing could be impacted (negatively or positively) for a period of time after initial nourishment and periodic renourishments.	Supported by fed., state, local law.	Beach-fx modeling would need justify cost.	Empirical evidence indicate temporary (~1 year) negative effects to benthic invertebrates and sea turtle nesting habitat. Dune creation improves habitat for nesting sea turtles and shorebirds. Temporary impacts to benthic habitats of dredge locations.	Protection of public facilities (parking, beach access, bathrooms). Supported by majority of community. Maintains beach aesthetics for property owners and tourists. Navigation benefits if inlet channels are used as borrow source.	Moderate increase to RED through improvement of tourism/beach economy. Protection of property value & tax value.		
		2	2	1	2	1	1	2	2	13	Yes
S-5	Jetty Improvements	Could reduce erosional hotspots and improve storm damage reduction	Beach/dune interaction would be maintained	Beach recreation could be maintained. Nearshore recreation could be impacted for	May not be permittable by state due to downdrift effects.	Selective construction may be justified.	No significant change to environmental quality due to the presence of jetties currently to stabilize these inlets. Potentially some impact	Could improve navigation of the inlets, making it easier for recreational and commercial boaters to access back bay areas.	Moderate increase to RED through improvement of tourism/beach economy. Protection of		

				a period of time during and after improvements			to habitat if there is an increase in jetty length or width.		property value & tax value.		
		1	2	1	1	1	1	1	2	10	Yes
S-6	Groins	In combination with beach nourishment, groins could be used at hotspots to stabilize fill and maximize storm damage reduction.	Beach/dune interaction would be maintained.	In combination with beach nourishment, beach recreation would be maintained. Nearshore recreation such as surfing and fishing could be impacted (negatively or positively) for a period of time after initial nourishment and periodic renourishments. Periodic renourishments should be reduced due to stabilization effects of groins.	May not be permittable by state due to downdrift effects.	Selective construction may be justified.	Periodic renourishments could be reduced due to stabilizing effect of groins. Emperical evidence indicate potential negative effects to benthic invertebrates and nearshore habitat from beach nourishment are periodic, with habitat recovering within one year. Positive impact to sea turtle nesting habitat. Possible entrapment hazard for hatchling sea turtles.	Improved life safety risk due to hurricane evac. route protection. Protection of public facilities (parking, beach access, bathrooms). Supported by majority of community.	Moderate increase to RED through improvement of tourism/beach economy. Protection of property value & tax value.		
		2	2	1	1	1	1	1	2	11	Yes
S-7	Seawall/Floodwall	Would maximize storm damage reduction where constructed. However, adjacent properties could be made more vulnerable due to erosive effects of structures.	Would not impact environmental quality if sand were maintainted in front of wall. Seawalls only for flood protection.	Potential loss of beach recreation fronting structures. Steepening of profile and/or wave reflection may effect nearshore recreation such as surfing.	Likely inconsistent with state CZMP. Resource agencies may prefer seawalls to revetments due to smaller construction footprint.	Selective construction may be justified.	Minimal to no impacts to shorebird or sea turtle habitat if constructed in the non-erosive island centers in combination with beach nourishment.	Property owners may support due to flood protection, but wall could block viewshed.	Potential increase in RED due to reduced flood damages		
		2	1	1	1	1	2	1	1	10	Yes

S-8	Nearshore Placement	Could provide moderate storm damage reduction dependent on migration of fill.	Beach/dune interaction would be maintained; volume of sand required to provide benefits could impede access to/from beaches by nesting and hatchling sea turtles	Beach recreation could be maintained or improved dependent on fill migration. Nearshore recreation such as surfing and fishing could be impacted (negatively or positively) for a period of time after initial placement and future periodic placements	Supported by fed., local law. Volume of sand needed to provide significant benefit may create state permit issues due to varied fill migration.	Benefits likely to outweigh cost.	Empirical evidence indicates potential negative effects to benthic invertebrates and nearshore habitat are periodic, with habitat recovering within one year. Volume of sand needed to provide significant benefits could have negative impact to sea turtle nesting habitat dependent on migration of fill.	Minimal improvement to life safety risk due to lack of hurricane evacuation route protection. Minimal protection of public facilities (parking, beach access, bathrooms) and minimal benefit to recreation.	Minimal protection of property value & tax value.		
		1	1	1	1	1	0	1	1	7	No
S-9	Breakwaters	As a stand-alone measure, emergent breakwaters could improve storm damage reduction.	Beach/dune interaction would be maintained, but emergent features could impede access to beaches by nesting and hatchling turtles	Beach recreation could be maintained. Nearshore recreation such as surfing could be negatively impacted.	May not be permittable by state due to downdrift effects.	As a stand-alone measure, cost of breakwater construction throughout the project area would likely be in excess of benefits.	Potential negative impacts to sea turtle nesting activities and hatchling entrapment.	Minimal improvement to life safety risk due to hurricane evac. route protection. Minimal protection of public facilities (parking, beach access, bathrooms).	Minimal protection of property value & tax value.		
		1	1	1	1	1	1	1	1	8	No

Measure carried forward for further analysis
Measure eliminated
2 - Fully meets objective
1 - Partially meets objective
0 - Does not meet objective

3.9.1 Preliminary Measures Carried Forward

The measures carried forward from the preliminary screening analysis summarized in Table 3-1 were further discussed with the Project Development Team, the sponsor, and other stakeholders. The following paragraphs discuss measures carried forward and their potential for development into alternatives during this stage of screening.

NS-1: No Action. NEPA and USACE policy require that measures be compared to what would happen if no action were taken. Therefore, the No Action measure was carried forward area-wide.

NS-5: Relocation/Elevation of Structures. This measure was carried forward from the preliminary screening for further analysis using Beach-fx modeling to identify its cost-effectiveness. Structures that experience repetitive damage from storm events over the 50-year period of analysis will be identified in the model results to determine whether relocation or elevation of these structures would be appropriate. Relocation/Elevation of Structures could be done in conjunction with beach nourishment.

NS-7: Buyout/Land Acquisition. This measure was carried forward from the preliminary screening for further analysis using Beach-fx modeling to identify its cost-effectiveness. Similar to the Relocation/Elevation of Structures measure, structures and assets that experience repetitive damage from storm events over the 50-year period of analysis will be identified in the model results to determine whether buyout and/or land acquisition of these structures would be appropriate. This measure would be most practical for structures that were eroding ahead of the remaining structures along the shoreline. The removal of these types of structures often allows the interval between nourishments to be extended.

NS-8: Public Awareness and Communication. At a relatively low cost, this measure would increase the effectiveness of any measures ultimately implemented and is carried forward to secondary screening.

S-4: Beach Nourishment. This is the most common type of structural measure constructed for large storm damage reduction projects in Florida. The Florida coastline is typically composed of straight sand beaches periodically interrupted by inlets and other man-made structures, but with few natural obstructions. This creates an environment where sediment transport patterns span large areas, and transport is easily interrupted by hard structures. Constructing a beach system with natural storm damage reduction and habitat functions typically serves as the most effective and environmentally sound solution. The study area has had a successful beach nourishment project in place since the late 1960s, and this measure is proven to work for the sediment system in this area. As dunes are an integral component of the existing beach/dune system throughout the majority of the study area, they are included in this measure. Dunes protect against elevated water levels resulting from storm surge and are also a “reservoir” of sand, feeding the beach during erosive events. Where appropriate, this measure includes nourishing the existing dune or creating a dune where one does not currently exist. The nourished dune would be vegetated to stabilize the sand and encourage natural dune growth.

S-5: Jetty Improvements. Due to the intense effect on sediment transport obvious from the high erosion rates immediately south of Johns Pass and Blind Pass, the potential for improvements to the existing jetties was carried forward as a management measure to reduce erosion at Sunshine Beach and Upham Beach. Improvements to the jetties on the north sides of Blind Pass and Pass-a-Grille could also prevent the loss of sediment from Pass-a-Grille Beach to reduce the erosion there.

S-6: Groins. Groins are typically constructed to stabilize a sandy beach in isolated sections of shoreline with high erosion rates (hot spots). Constructing groins on long, straight sections of sandy beach, such as along the Sunset Beach and Pass-a-Grille Beach reaches, can hold sand in place. However, erosion sometimes occurs to adjacent beaches downdrift of the groins due to the disruption to localized sand transport. Understanding that there are existing groins in the project area, the consideration of additional groins to complement the existing groins was carried forward to secondary screening.

S-7: Seawalls/Floodwalls. Feedback from the non-Federal sponsor suggested that the infrastructure along Boca Ciega and St. Pete Beach North reaches experienced occasional flooding from overwash during large storm events. Although there are very wide beaches at these reaches, the elevations of these beaches are low and strong waves could cause flooding where erosion and wave attack are not an issue. Seawalls were screened from reaches with high background erosion rates due to their impacts to sea turtle and shorebird nesting and to their effects on adjacent properties. Potential inclusion of seawalls or floodwalls in locations with low or no observable background erosion, such as the Boca Ciega and St. Pete Beach North reaches, was carried forward to secondary screening.

3.9.2 Preliminary Array of Alternatives

Measures used singularly or in combination with others create alternatives, and varying scales of each create additional alternatives. For example, an alternative may be implementable for a portion of a reach, but not for an entire reach. Several alternatives of merit have resulted from combinations of management measures. These alternatives will undergo further analysis.

Alternatives for Sunshine Beach and Upham Beach
NS-1: No Action
NS-5: Relocation/Elevation of Structures
NS-7: Buyout/Land Acquisition
NS-8: Public Awareness and Communication
S-4: Beach Nourishment
S-5: Jetty Improvements (southern shorelines of Johns Pass and Blind Pass)

Alternatives for Boca Ciega and St. Pete Beach North
NS-1: No Action
NS-5: Relocation/Elevation of Structures
NS-7: Buyout/Land Acquisition
NS-8: Public Awareness and Communication

S-4: Beach Nourishment
S-7: Seawalls/Floodwalls

<u>Alternatives for Sunset Beach, St. Pete Beach South, and Pass-a-Grille Beach</u>
NS-1: No Action
NS-5: Relocation/Elevation of Structures
NS-7: Buyout/Land Acquisition
NS-8: Public Awareness and Communication
S-4: Beach Nourishment
S-5: Jetty Improvements (northern shorelines of Blind Pass and Pass-a-Grille)
S-6: Groins

These measures carried forward following preliminary screening are shown by the geographical locations where they continue to be considered based on the assumptions and limitations outlined above. These measures, when combined together, form the alternatives proposed for each reach to be carried forward to Secondary Screening, and are considered the Preliminary Array of Alternatives. Any combination of the measures shown for each reach could be utilized.

Figure 3-2. Preliminary Array of Alternatives shown by geographical location.

3.10 SECONDARY SCREENING

During secondary screening, Beach-fx modeling results were used in combination with ROM cost estimates to further screen alternatives. ROM cost estimates were developed for the remaining measures using costs from similar historical projects that were brought to present value (PV) based on maintenance assumptions over 50 years. The FWOP model results provide an estimate of the damages anticipated over the 50-year period of analysis if no project were implemented (see Section 2.7 for additional information on Beach-fx FWOP results). Using the FWOP damages as a proxy for potential project benefits, these ROM costs were compared to the FWOP damages to provide an estimate of whether the cost of the measure would exceed the benefits. The average damages (by Beach-fx model reach) in the FWOP condition were compared to the measures carried forward from preliminary screening and graphed to show where they are concentrated in the focused study area. This comparison was conducted on a per linear foot basis, because some reach length varies considerably. Damages by reach (per linear foot) were compared to ROM costs (per linear foot). Model reaches were used, rather than Planning Reach, to provide higher resolution and more detail. In areas where the costs per linear foot clearly exceed the damages (i.e., potential damage reduction benefits), the measure was screened out and eliminated from further consideration. But, in locations where damages exceed ROM costs, the feasibility of the measure was investigated further.

The first part of the Secondary Screening focuses on structural measures and nourishment measures. The second part (described further below) focuses on non-structural measures. In order to provide context for the screening comparisons, the spatial distribution of estimated FWOP damage is described in Figure 3-3. The damages per linear foot compared to ROM costs for structural and nourishment measures is provided in Figure 3-4. It should be noted that the distribution of damage looks quite different between the two figures; this is due to variability in Reach length. For example, the unusual looking spike in R-145C is due the combination of relatively high damage (<$18 million in PV damage over 50 years) and a very short length (~170 linear feet) compared to other reaches. The highest damage overall was observed in

R-127 (~$29 million), but that because the reach is so much longer (~1,400 linear feet) it does not standout on a linear foot basis.

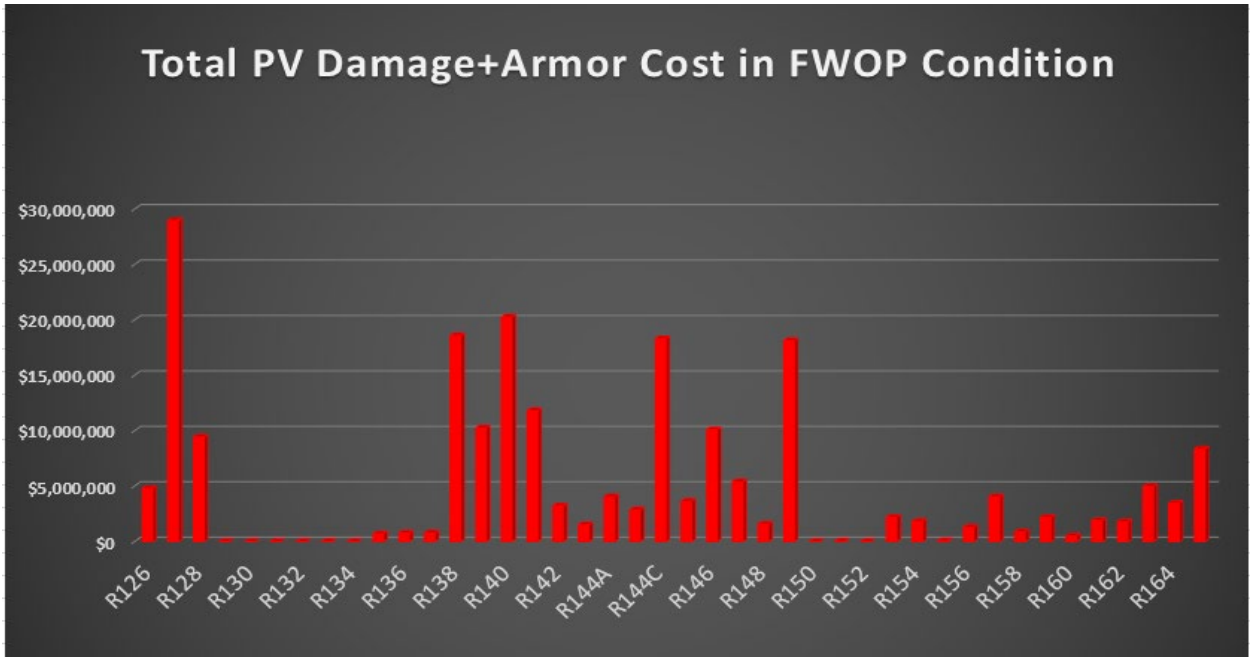

Figure 3-3. Spatial distribution of damages over Beach-fx Model Reaches.

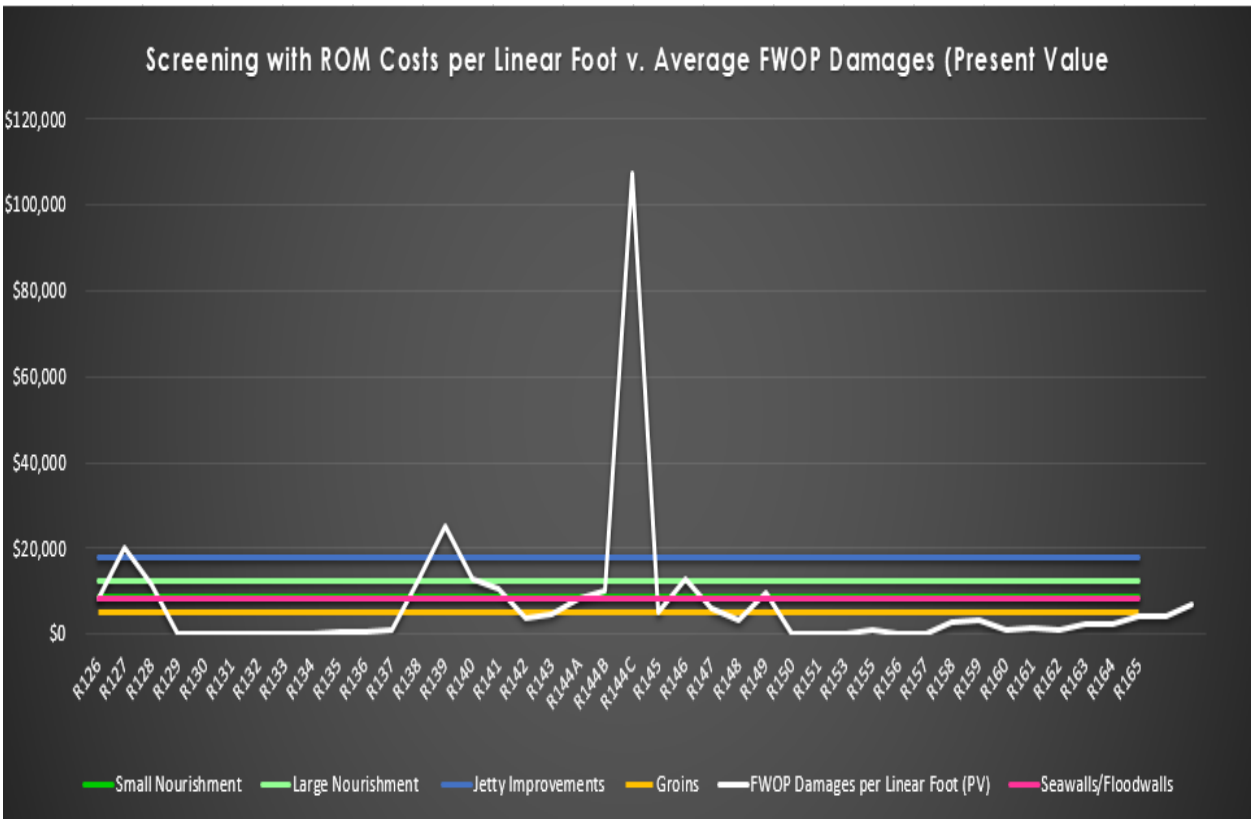

Figure 3-4. Graph of the ROM costs compared to the average FWOP damages per linear foot in present values along Beach-fx reaches (structural and nourishment measures only).

In the FWOP condition, little to no damages were observed in the Boca Ciega and St. Pete Beach North reaches. Since no flooding is likely to occur in these reaches in the 50-year period of analysis, S-7: Seawalls/Floodwalls was not pursued as an alternatives for these reaches. S-4: Beach Nourishment, S-5: Jetty Improvements, and S-6: Groins were determined to have the potential for being economically justified based on the results of the FWOP modeling and the ROM costs for these measures. As shown in the Figure, there are at least some locations where the damages per linear foot exceed ROM costs per linear foot for all three measures (and therefore there potentially could be economically justified). Both islands have portions of the shoreline with high enough damages to potentially justify nourishment, groins, or jetties.

3.10.1 Non-Structural Measures

The Planning Guidance Notebook and other planning guidance requires serious consideration of non-structural measures including buyout/relocation, relocation, elevation, and flood proofing. Structures that make good candidates for non-structural measures are structures with relatively low first floor elevations that are subject to large amounts of repetitive damage and/or total rebuilds. Individual

structures that represent a relatively high proportion of total damage may also be good candidates. In order to be consistent with other planning studies, four distinct non-structural measures were considered:

Property Buyout: Buyout/Acquisition involves purchase and elimination of flood damageable structures, allowing for inhabitants to relocate to locations away from flood hazards. This measure is the most dependable method of protection and provides the benefit of use of the evacuated floodplain.

Asset Raising: Asset elevation involves raising the assets in place so that the structure sees a reduction in frequency and/or depth of flooding during high-water events. Elevation can be done on fill, foundation walls, piers, piles, posts or columns. Selection of proper elevation method depends on flood characteristics such as flood depth or velocity.

Dry Flood Proofing: Dry Flood Proofing involves sealing building walls with waterproofing compounds, impermeable sheeting, or other materials to prevent the entry of floodwaters into damageable structures. Dry flood proofing is applicable in areas of shallow, low velocity flooding.

Wet Proofing: Wet flood proofing measures allows floodwater to enter the structure, vulnerable items such as utilities appliances and furnaces are waterproofed or elevated to higher locations. Allowing floodwater to enter the structure equalizes the hydrostatic forces inside and outside of the structure, reducing the risk of structural damage.

The same screening process used for structural measures and nourishment measures was applied to non-structural measures. ROM costs for Raising and both types of flood proofing were taken from the South Atlantic Comprehensive Coastal Study (SACCS) Measures and Cost Library (MCL). Buyout costs were based on the methodology used in other Florida CSRM studies, which assumes at least a 15% market factor should be applied to the depreciated replacement values used in the Beach-fx model. A visual summary of this screening process is provided in Figure 3-5. It should be noted that because the measures are different, the vertical scale of this figure is somewhat different than the previous ROM screening.

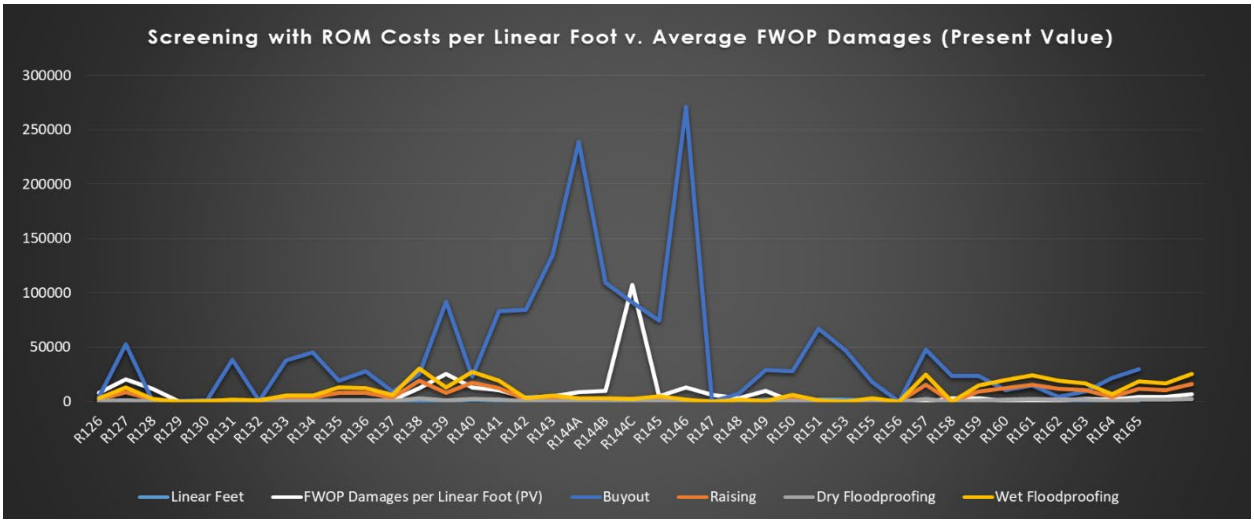

Figure 3-5. Graph of the ROM costs compared to the average FWOP damages per linear foot in present values along Beach-fx reaches (structural and nourishment measures only).

One initial conclusion from this screening is that dry flood proofing, being relatively low cost, looks as if it could be economically feasible across much of the study area. However, further investigation into this measure suggests it would not be an effective solution on either Treasure Island or Long Key. As described in the SACCS MCL, "Dry flood proofing is applicable in areas of shallow, low velocity flooding." While there is inundation damage in the FWOP condition, it is inundation associated with storm surge and storm induced flooding. It is not the kind gradual, shallow flooding that sometime occurs in riverine settings. Therefore, dry flood proofing is not expected to effective or an efficient form of damage reduction.

The other non-structural measures are generally cost prohibitive in most areas (ROM costs exceed damages), but there are a few locations where dry flooding proofing and/or Raising might be economically feasible. For example, in R-144C the FWOP damage per linear foot exceeds the ROM costs for non-structural measures. However, further investigation at this location indicates that neither Raising nor wet flood proofing would actually be feasible. The only valid candidate structure in this reach is a multi-story multi-family condominium that is already raised; the first floor is a parking lot so that contents and structures subject to damage do really start until the second flood. As a result, the property is essentially wet flood proofed as well, because this structure is designed to let water flow underneath it during major storms. The property is still subject to erosion damage as well armor damage/cost in the FWOP condition. But, it is not a good candidate for non-structural measures.

With a few exceptions such as the one noted above, preliminary analyses in early Beach-fx model runs indicated that the costs of buyout and wet flood proofing far exceeded the benefits throughout the vast majority of the study area; therefore, these measures were not included in final Beach-fx modeling. Some of the reasons that caused these measures not to be economically justified included:

1.) Damages and benefits are based on depreciated replacement values, whereas the non-structural ROM costs shown in Figure 3-3 are based on market values. Market values are typically higher than depreciated replacement values, and this effect is magnified on barrier islands in Florida where market values can be 100% or even 200% greater than depreciated replacement values. Therefore, the costs of non-structural measures can exceed the damages and benefits associated with any particular structure by a significant extent.
2.) In addition to direct physical costs, non-structural measures usually have other costs as well, including significant administrative/coordination costs and compensation for the owners. For some non-structural measures, additional physical costs often exist as well (demolition of existing properties after buyout, for example).
3.) Rebuilds are limited in the Beach-fx analysis. Though repetitive damages do occur to some structures, the model is designed to limit the number of rebuilds; this is intended to avoid excessive repetitive damage over time. Due to the relatively high cost of non-structural measures (on a per structure basis), considerable repetitive damages in the FWOP are often necessary to justify these measures.
4.) Repetitive damages are discounted in the future. The repetitive damages that do occur tend to occur fairly far in the future (i.e., they gradually accrue over time), while the costs are assumed to accrue in or near the base year. From an economic standpoint, this often makes the costs (in Present Value terms) higher than the present value benefits.
5.) Many of the structures subject to significant storm damage in the FWOP conditions are already elevated, or their first floors are limited to parking. It is generally impractical to relocate or elevate a high rise hotel or condominium complex. Roads and dunewalks are likely already elevated, and could not be relocated without losing their economic value.

From a risk and uncertainty standpoint, the risks associated with non-structural measures are usually much higher than nourishment alternatives. While numerous nourishment projects throughout Florida (including the existing Pinellas County project) have a long established history of successful implementation and effective storm damage reduction over time, the same cannot be said for non-structural measures (in the context of CSRM). The level of uncertainty (both in terms of cost and practical feasibility) associated with non-structural alternatives would be higher than it is around the various nourishment alternatives. Principles of Risk Informed Planning suggest that that risk and uncertainty should be a consideration during plan formulation and alternative evaluation. Throughout the study area, non-structural risk reduction measures including education efforts, maintenance of evacuation route signage, zoning codes, and setback requirements were carried forward as elements of any complete systematic package of risk reduction measures. Many of these additional nonstructural efforts could be pursued by Pinellas County, the City of Treasure Island, and the City of St. Pete Beach.

3.10.2 Focused Array of Alternatives

Following secondary screening, alternatives were developed using the combination of management measures carried forward for each planning reach. These alternatives now form plans that would be implemented for the entire project area. Note that the management measure "Public Awareness and Communication" was carried forward in combination with all alternatives listed below.

Alternative 1: No Action
Alternative 2: Beach Nourishment
Alternative 3: Beach Nourishment with Jetty Improvements
Alternative 4: Beach Nourishment with Groins
Alternative 5: Beach Nourishment with Seawalls/Floodwalls

The alternatives described above are the "base alternative," but they can be expanded by varying the scale and combination of the measures included in the alternatives to identify an alternative that maximizes the project benefits. For example, a variety of berm widths, dune widths, and dune heights would be examined to determine the scale of this alternative that is most appropriate for each reach, balancing the alternative's cost with the benefits the alternative provides.

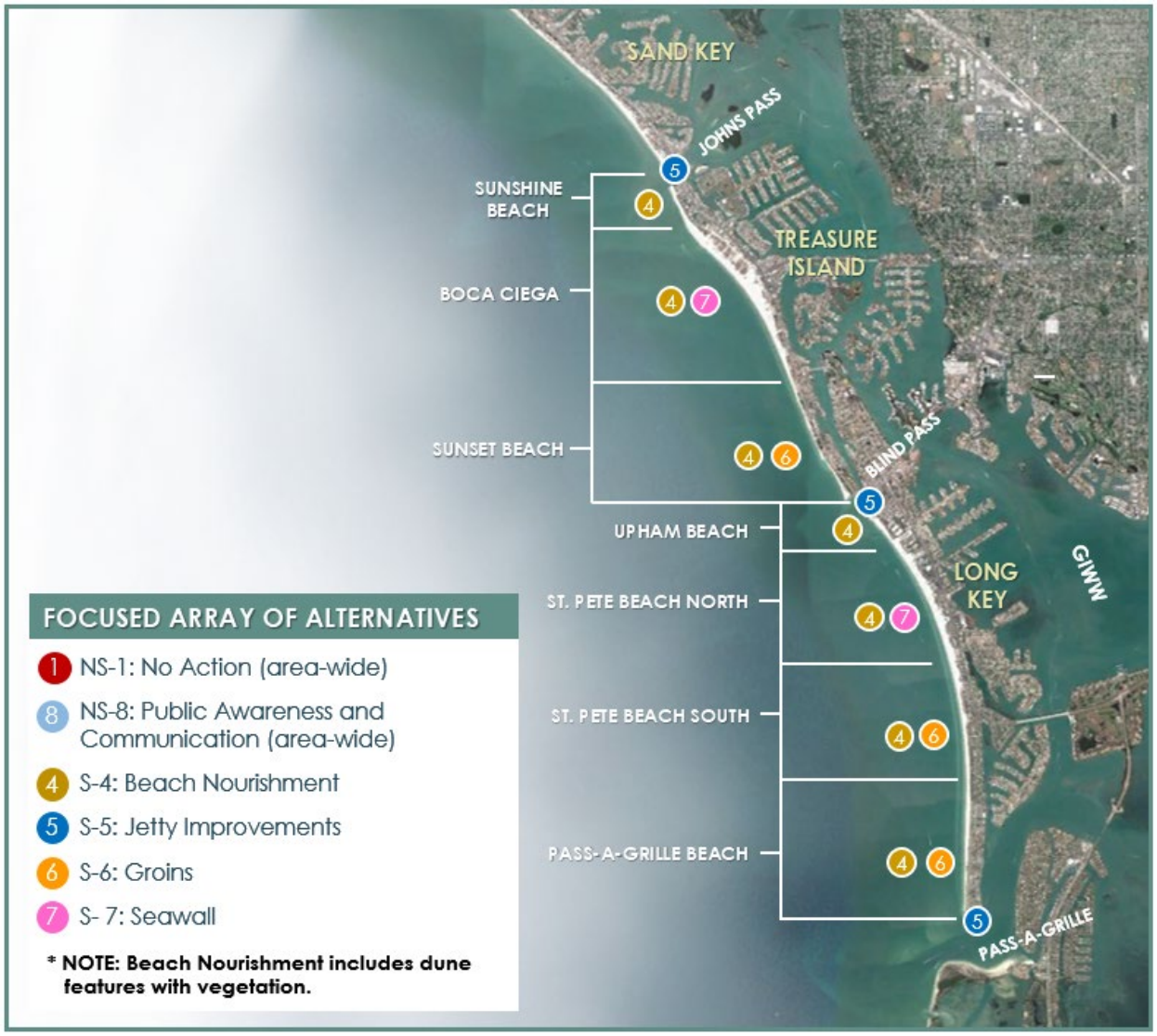

Figure 3-6. Focused array of alternatives by geographic area/planning reach.

3.11 FINAL SCREENING

The results of the Beach-fx FWOP modeling were reviewed to identify the damage drivers in each location, and alternatives were screened based on whether they solved the problems that were anticipated to occur throughout the 50 year period of analysis. Non-Federal studies were utilized as appropriate where they contained information and data that were relevant to the study. Finally, alternatives were considered based on their ability to meet the four Principles and Guidelines (P&G) screening criteria of Completeness, Effectiveness, Efficiency, and Acceptability.

3.11.1 Alternative 1: No Action

Pursuant to the requirements of the National Environmental Policy Act, the No Action alternative was carried forward as an alternative.

3.11.2 Alternative 2: Beach Nourishment

This alternative includes initial construction of a beach fill and future re-nourishments at regular intervals. Preliminary engineering design work and economic analysis suggested that the plan for beach nourishment would have the following characteristics:

- Maintaining the existing dune feature and extending the berm feature from the existing seaward toe of the dune.
- Construction such that the berm will extend approximately 20 to 100 feet seaward from its existing location and the berm elevation will as closely as possible match the elevation of the existing berm elevation.
- Periodic re-construction of the berm extension.

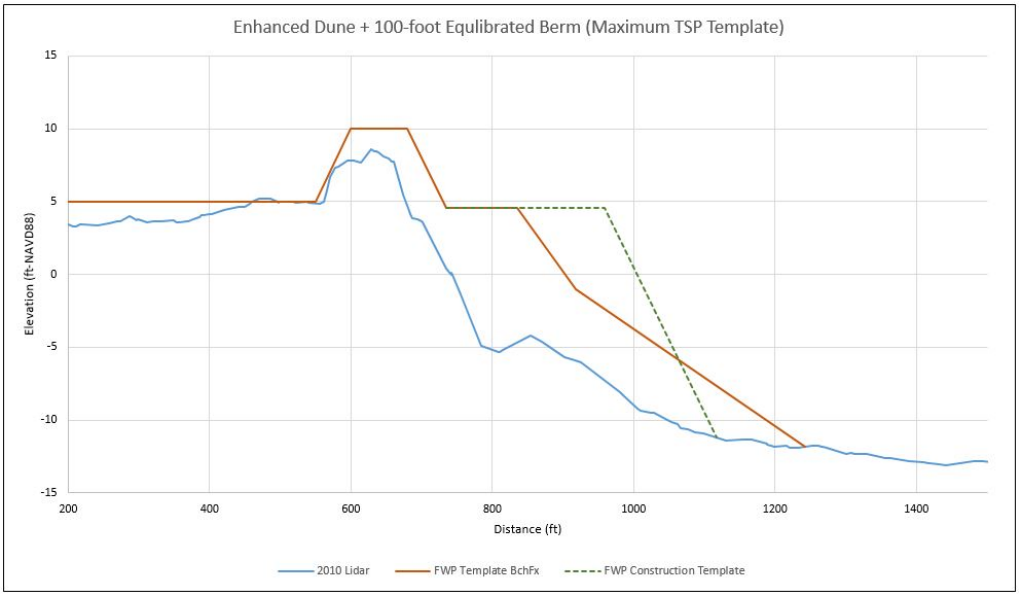

Figure 3-7. Conceptual Cross-shore Profile and Construction Berm for TSP Dune with 100-foot Berm.

Dune features may be incorporated into a beach nourishment alternative. Constructed dunes would be vegetated as a best management practice to stabilize the sand. Preliminary engineering design work concluded that the most feasible plan for dunes and vegetation would have the following characteristics:

- Extension from the existing seaward face of the dune.

- Construction such that the dune and beach profile out to the depth of closure will extend approximately 10 to 20 feet seaward from its existing location.
- Construction of a sufficient berm feature to ensure the dune extends seaward from its existing location above the water line to account for the volume of material needed to fill the submerged portion of the dune profile extension.
- Periodic re-construction of the dune height increase and profile extension.

The top elevation of a dune feature would be a maximum of 10 ft. NAVD88. Dune features could also include an extension of the width of the dune up to 20 ft. seaward. The current elevation of the beach in the project area is approximately 4.5 ft. NAVD88, and existing dunes vary in height from approximately 0 ft. to 5 ft. in height (4.5 ft. to 9.5 ft. NAVD88). Dune widths currently extend up to several hundred feet. The front slope of constructed dunes are a function of the material grain size and construction equipment. The dimensions of dune and berm features will vary depending on location as shown in Figure 3-5. See the Engineering Appendix for additional information on the existing dunes and proposed dune design.

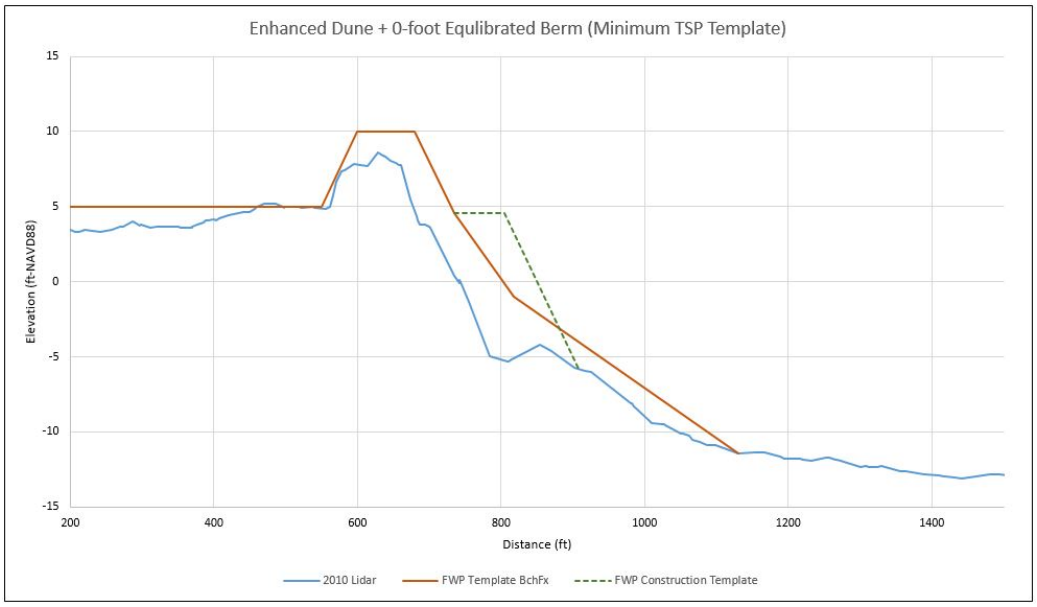

Figure 3-8: Conceptual profile of a dune enhancement.

Finally, Alternative 2: Beach Nourishment adequately meets the four Principles and Guidelines (P&G) screening criteria of completeness, effectiveness, efficiency, and acceptability.

3.11.3 Alternative 3: Beach Nourishment with Jetty Improvements

Evaluation of jetties at the three inlets adjacent to the project area (Johns Pass, Blind Pass, and Pass-a-Grille) requires the application of a sediment transport model such as the USACE Coastal Modeling System (CMS). The PDT conducted a technical analysis of previous modeling and conclusions prepared as part of

the most recent FDEP Inlet Management Plans (IMPs) for Johns Pass, Blind Pass, and Pass-a-Grille (2017, 2018, and 2019, respectively). All three IMPs were developed for the FDEP by the University of South Florida Coastal Research Laboratory (USF-CRL) using extensive CMS modeling.

The Johns Pass and Blind Pass IMPs both included alternatives that involved modification of the existing jetties at both inlets. Two separate alternatives were analyzed for improvements of the jetties at Johns Pass: 1) extending the south jetty by 230 feet; and 2) extending both the northern and southern jetties by 230 feet. Extending on the southern jetty (option 1) was determined to have minimal influence on the hydrodynamics and morphodynamics of the inlet and adjacent beaches. Therefore, its cost is justified by its minimal benefits. Extending both jetties at Johns Pass showed modest accretion of the beaches immediately adjacent to John's Pass due to the impoundment of sand by the extended jetties. The modeling results indicated that the extended jetties had little influence on the wave field of Johns Pass, but they had a significant influence on the flow field seaward of the jetties. The jetty extensions created a longer channel for ebb flow, which resulted in an ebb jet that extended farther seaward. The enhanced ebb flow jet may temporarily influence sand bypassing around the ebb shoal. However, the impoundment of sand at Sunshine Beach could potentially have negative impacts on beaches farther to the south of the inlet. An analysis of the CMS modeling indicates that extending both jetties at Johns Pass would not be recommended due to the uncertainties associated with the beaches down-drift of the impoundment fillet.

Similar to Johns Pass, CMS modeling was conducted to investigate the alternative of extending both the northern and the southern jetties at Blind Pass by 230 feet. Jetty extensions at Blind Pass had minimal influence on the hydrodynamics and morphodynamics of the inlet and adjacent beaches. Therefore, jetty improvements at Blind Pass are not recommended as an inlet management option.

The Pass-a-Grille IMP discussed the existing north jetty (adjacent to Long Key), but there was no cause to evaluate modification of the jetty as a measure to control erosion to adjacent beaches based on baseline CMS modeling. The PDT reviewed the CMS data included in the IMP, and agreed that modifications to the jetty at Pass-a-Grille were not likely to provide enough project benefits to justify the high cost of construction.

The alternative did not adequately meet the efficiency criterion and only partially meets the effectiveness criterion of the four Principles and Guidelines (P&G) screening criteria:

Effectiveness: The alternative partially meets this criteria. While improvements may reduce erosion in some areas, they could have a negative impact on others.

Efficiency: The alternative is not efficient based on the costs of jetty improvements compared to the cost of other measures to mitigate erosion adjacent to the inlets.

3.11.4 Alternative 4: Beach Nourishment with Groins

Groins are already present within the project area at Sunset Beach and Upham Beach. While the introduction of groins has slowed erosion at the north end of Long Key, surveys taken since their construction suggest that they have not offset local inlet effects enough to prevent continued extensive sand loss. Based on 1) the omission of groins as a potential counter measure to inlet effects in the IMPs; 2) performance of the existing groins; 3) the high cost of groin construction and maintenance; 4) potential negative impacts to sea turtle nesting habitat; and 4) early Beach-fx modeling results that indicated that project benefits are maximized by the fortification of dunes and are not significantly influenced by the presence or width of the berm near the inlets, groins were omitted from further consideration.

Further, Alternative 4 does not meet the efficiency or acceptability criteria of the four P&G screening criteria:

Efficiency: The alternative is not efficient based on the costs of groins compared to the cost of other measures to mitigate erosion.

Acceptability: The alternative would impact sea turtle nesting habitat by blocking access to the beach berm by nesting turtles and impeding access to the shoreline by hatchlings.

3.11.5 Alternative 5: Beach Nourishment with Seawalls/floodwalls

The center portions of both Treasure Island and Long Key are accretional beaches. While they have extremely wide berms, the berms are relatively low and flat. Scoping indicated that flooding from wave runup during large storm events may cause flooding in these areas. While seawalls were screened from erosional beaches due to environmental concerns, they would not have the same environmental impact on a non-erosive or accretional beach. Therefore, they were carried forward as an alternative for the centers of the islands.

The FWOP Beach-fx modeling did not identify any flood damages to the center portions of the island that would benefit from a low seawall or flood wall in this area. Since dunes would provide similar benefits to prevent flooding in these areas should flooding became a problem during the 50-year period of analysis, the incorporation of seawalls and floodwalls would not provide any additional measure of protection and could increase project costs without providing appreciable benefits. Therefore, this alternative was eliminated from further consideration.

In consideration of the P&G screening criteria, Alternative 5 does not meet the efficiency criterion of the four P&G screening criteria:

Efficiency: The alternative is not efficient based on the costs of the seawall compared to the cost of dune features alone to mitigate flood and storm surge impacts.

3.12 FUTURE WITH PROJECT MODELING IN BEACH-FX

Various scales of the remaining alternative, Alternative 2: Beach Nourishment, were developed to create the Final Array of Alternatives for optimization using Beach-fx. The alternatives included combinations of 0 or 20 foot dune and profile extensions (dunes and vegetation), dune height increases of up to an elevation of 10 foot NAVD88 (dunes and vegetation), and berm extensions in 10 foot increments from 0 to 130 feet (beach nourishment). Beach-fx was required to be set up separately for Treasure Island and Long Key due to the complex shore processes in each location. The Final Array of Alternatives was expanded to encompass various scales of beach nourishment and dune enhancement for the reaches identified as most likely to benefit from these measures based on the FWOP modeling results. Initial screening runs limited to 10-30 iterations were performed on the alternatives shown in Figure 3-7 to narrow the array to those combinations with the highest net benefits.

Primary Template Dimensions			Treasure Island				Long Key			
Berm Width (ft)	Dune Elevation (ft-NAVD88)	Dune Width (ft)	Alternative ID	Estimated Full Template Volume (cy)			Alternative ID	Estimated Full Template Volume (cy)		
				Sunrise Beach	Sunset Beach	Total TI		Upham Beach	Pass-a-Grille	Total LK
Berm Only										
20	Existing	Existing	TI_Ends_20ft	40,952	78,425	119,377	LK_Ends_20ft	36,241	78,280	114,521
30	Existing	Existing	TI_Ends_30ft	61,428	117,637	179,066	LK_Ends_30ft	54,361	117,420	171,781
40	Existing	Existing	TI_Ends_40ft	81,904	156,850	238,754	LK_Ends_40ft	72,481	156,560	229,041
50	Existing	Existing	TI_Ends_50ft	102,380	196,062	298,443	LK_Ends_50ft	90,602	195,700	286,302
60	Existing	Existing	TI_Ends_60ft	122,856	235,275	358,131	LK_Ends_60ft	108,722	234,840	343,562
70	Existing	Existing	TI_Ends_70ft	143,332	274,487	417,820	LK_Ends_70ft	126,843	273,980	400,823
80	Existing	Existing	TI_Ends_80ft	163,808	313,700	477,508	LK_Ends_80ft	144,963	313,120	458,083
90	Existing	Existing	TI_Ends_90ft	184,284	352,912	537,197	LK_Ends_90ft	163,083	352,260	515,343
100	Existing	Existing	TI_Ends_100ft	204,760	392,125	596,885	LK_Ends_100ft	181,204	391,400	572,604
110	Existing	Existing	TI_Ends_110ft	225,236	431,337	656,574	LK_Ends_110ft	199,324	430,540	629,864
120	Existing	Existing	TI_Ends_120ft	245,712	470,550	716,262	LK_Ends_120ft	217,444	469,680	687,124
130	Existing	Existing	TI_Ends_130ft	266,188	509,762	775,951	LK_Ends_130ft	235,565	508,820	744,385
Dune Raising										
0	10	Existing	TI_Ends_DH_0ft	36,296	67,037	103,333	LK_Ends_DH_0ft	75,185	59,148	134,333
30	10	Existing	TI_Ends_DH_30ft	97,724	184,674	282,399	LK_Ends_DH_30ft	129,546	176,568	306,114
100	10	Existing	TI_E_DH_100ft	241,056	459,162	700,218	LK_E_DH_100ft	256,389	450,548	706,937
Dune Widening										
0	Existing	Existing + 20	TI_Ends_DW_0ft	82,770	203,476	286,246	LK_Ends_DW_0ft	85,167	66,744	151,911
30	Existing	Existing + 20	TI_Ends_DW_30ft	144,198	321,113	465,311	LK_Ends_DW_30ft	139,528	184,164	323,692
100	Existing	Existing + 20	TI_E_DW_100ft	287,530	595,600	883,131	LK_E_DW_100ft	266,370	458,144	724,515
Dune Raising + Widening										
0	10	Existing + 20	TI_E_DWDH_0ft	119,066	270,513	389,579	LK_E_DWDH_0ft	160,352	125,893	286,244
30	10	Existing + 20	TI_E_DWDH_30ft	241,923	505,788	747,710	LK_E_DWDH_30ft	269,074	360,733	629,807
100	10	Existing + 20	TI_E_DWDH_100ft	528,587	1,054,762	1,583,349	LK_E_DWDH_100ft	522,759	908,693	1,431,452

Figure 3-9. The Final Array of Alternatives. Note the nomenclature in the Alternative IDs refer to the study segment (e.g., Treasure Island = TI), the dune measure incorporated into the alternative (e.g., DW indicates that it includes the dune widening measure), and the berm width (e.g., 0ft indicates no berm extension while 100ft indicates a 100 foot berm extension).

Initial results indicated that no alternative from the array shown in Figure 3-8 resulted in a Benefit to Cost ratio (BCR) greater than one. Furthermore, the original plan was to use an offshore sand source located at Egmont Shoal East. This source is located approximately 10 miles from the study area. Due to the high cost of mobilizing equipment from this sand source, alternatives using this source resulted in low BCRs. The FDEP's Inlet Management Plans for Johns Pass, Blind Pass, and Pass-a-Grille were released between 2018 and 2019, and they recommended that portions of the sediment trapped in these inlet complexes

be placed on the adjacent shorelines. Formulation of further alternatives then focused on using the adjacent inlet/shoal complexes as the sand sources. Due to the close proximity of these sources to the sand placement locations, the net benefits for all alternatives improved significantly. As shown in Table 3-2, the project is economically justified when constructed independently.

Table 3-2 shows all alternative combinations that resulted in the best performance (benefits relative to cost). These combinations were carried forward to full (100 iteration) simulations in Beach-fx. Though these results suggest a BCR of less than one on Long Key, the BCRs of several alternatives exceed 0.5 and would likely be justified with recreation benefits included. More information on Beach-fx inputs and results for alternative formulation is provided in the Economics Appendix.

Treasure Island and Long Key are not separable elements. The two islands are connected by Blind Pass, which has a substantial effect on the coastal process of both the south end of Treasure Island and the north end of Long Key. Similarly, the north end of Treasure Island acts of a feeder beach for southern reaches, and placement at Upham Beach likewise stabilizes downdrift beaches. These two islands are considered to be part of a comprehensive system.

Table 3-2. Results summary of Beach-fx Future With-Project Modeling.

Alternative Name	Average Volume	Avg AAEQ Cost	Avg FWP Damage (AAEQ $)	FWOP Damage (AAEQ $)	Damage Reduction Benefits (AAEQ $)	Avg Land Loss Benefits (AAEQ $)	Avg Total Benefits (AAEQ $)	Net-Benefits (AAEQ $)	BCR
AAEQ Damages for Final Array of Alternatives (AAEQ $), Treasure Island									
S_TI_E_DWDH_0ft_6INT	446,000	1,505,000	778,000	4,111,000	3,332,000	$12,000	$3,344,000	$1,839,000	2.22
S_TI_E_DWDH_30ft_6INT	483,000	1,954,000	965,000	4,111,000	3,146,000	$10,000	$3,156,000	$1,202,000	1.62
S_TI_E_DH_100ft_8INT	411,000	2,132,000	760,000	4,111,000	3,351,000	$10,000	$3,361,000	$1,229,000	1.58
TI_E_DWDH_0ft_6INT	409,000	2,665,000	728,000	4,111,000	3,383,000	$22,000	$3,405,000	$740,000	1.28
TI_Ends_60ft	486,000	2,895,000	641,000	4,111,000	3,470,000	$22,000	$3,492,000	$597,000	1.21
AAEQ Damages for Final Array of Alternatives (AAEQ $), Long Key									
LK_E_DWDH_0ft_6INT	382,000	$1,473,000	$2,474,000	$3,607,000	$1,132,000	$26,000	$1,158,000	($315,000)	0.79
LK_U_DWDH_0ft_6INT	483,000	$870,000	$3,114,000	$3,607,000	$493,000	$16,000	$509,000	($361,000)	0.59
LK_U_DWDH_30ft_6INT	411,000	$960,000	$3,362,000	$3,607,000	$245,000	$16,000	$261,000	($699,000)	0.27
LK_U_DW_100ft_6INT	409,000	$1,849,000	$3,217,000	$3,607,000	$390,000	$14,000	$404,000	($1,445,000)	0.22
K_E_DWDH_30ft_6INT	486,000	$1,627,000	$2,452,000	$3,607,000	$1,155,000	$24,000	$1,179,000	($448,000)	0.72

CHAPTER 4

TENTATIVELY SELECTED PLAN

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4 TENTATIVELY SELECTED PLAN

The Tentatively Selected Plan (TSP) is Alternative 2, periodic beach nourishment, including dune and berm features, at the north and/or south ends of Treasure Island (R-126 to R-129 and R-136 to R-143) and Long Key (R-144 to R-147 and R-160 to R-166). The maximum dimensions include:

- A berm extension of up to 100 ft. seaward from the dune toe; and
- A dune with a height of up to +10 ft. NAVD88 and a width that could extend the entire equilibrated beach profile up to 20 ft. seaward.

Some key details of the TSP design that continue to be refined include the estimated periodic nourishment interval, the estimated volumes required for periodic nourishment, the landward location of the beach nourishment template, and the estimated project cost. Periodic nourishment of the improved beach, which would be provided when needed, would restore the beach to desired dimensions. Sediment transport along these islands links the geomorphic response of the shorelines; therefore, periodic nourishment for any other areas where erosion might develop would also be provided when needed.

This TSP provides a partial response to the study authority and is the NED plan for the Gulf-facing shorelines of the focused study area. Additional efforts to address broader coastal storm risk management in other areas of Pinellas County could also be pursued under this authority in the future. Typically, the NED plan becomes the TSP unless the non-federal sponsor opts to pursue a Locally Preferred Plan (LPP) that differs from the NED plan. An LPP is subject to requirements described in ER 1105-2-100. The option of selecting an LPP was coordinated with the local sponsor, and the sponsor may choose to pursue an LPP following the public comment period. At this time, the NED plan (Alternative 2, described in Section 3) is currently the Tentatively Selected Plan (TSP).

Figure 4-1. Tentatively Selected Plan. Periodic nourishment along the entire shoreline is authorized as needed pending additional economic justification in areas not identified for initial construction.

Although still being refined, the average initial construction volume over 100 iterations is between 330,000 and 1,432,000 cubic yards (cy). The average volume of all re-nourishments over 100 iterations is between 648,000 and 1,008,000 cubic yards (cy). It is important to note that the volumes and damages discussed throughout the report are estimates. Monitoring and data assessment, including a periodic assessment of sea level rise trends in relation to the project, will be crucial for adaptively managing the residual risks in the study area.

Traditionally, in CSRM studies, a fixed re-nourishment interval is defined and optimized for 50 year period of Federal participation. In Beach-fx, rather than having a fixed renourishment interval, renourishment

events are triggered when specific criteria are met. The average time interval between nourishment events over 100 iterations was set to be between five and seven years to correspond with the recharge rate of the inlet complexes. In reality, this interval could vary significantly depending on erosion and storm events. More information about the re-nourishment triggers is provided in the Engineering Appendix. Ultimately, planning based on life-cycle modeling results in plans that are more resilient and adaptable. Life-cycle modeling allows planners to design projects while recognizing the inherent uncertainty that exists when future events are simulated.

This is currently the NED plan. If the study area were expanded, this portion of the NED plan would be designed at this scale for these areas along the coastline of the Focused Study Area.

4.1 SAND SOURCES

This study strives to incorporate a Regional Sediment Management (RSM) approach of utilizing navigation projects near the study area to satisfy the sand needs in the project area. Three navigation projects are present within the study area: Johns Pass and Pass-a-Grille Inlet (both Federally-authorized navigation inlets), and Blind Pass (a non-Federal inlet). Additionally, Egmont Shoal is an off-shore sand source just north of the Tampa Harbor Federal Navigation Channel.

While maintenance material from the Tampa Harbor Federal Navigation Channel was considered as a sediment source, it was considered to be too far from the placement area, the sediment is not suitable for beach placement, and it is currently placed on or in the nearshore region of the historically important Egmont Key when available as a beneficial, least-cost placement option.

The sand sources for the project are briefly described below and depicted in Figure 4-2. Detailed descriptions of the sand sources together with boring locations maps, boring logs, gradation graphs, and granularmetric reports are included in the Geotechnical Appendix.

JOHNS PASS: Johns Pass is a Federally-authorized navigation channel. Due to the erosional impact of the inlet on Sunshine Beach down drift, material is typically placed there as part of the previously authorized and whenever maintenance dredging of the channel has occurred. Johns Pass is a permitted borrow area for Treasure Island Beaches since 2010. The Johns Pass borrow area consists of the Johns Pass federal channel with a design depth of 10 feet MLLW plus two feet overdepth, the channel side borrow area, and the ebb shoal borrow area.

BLIND PASS: Blind Pass is non-federal man-made channel existent at this location separates the islands of Treasure Island and Long Key. The Blind pass channel and adjacent areas are permitted as sand sources to nourish Sunshine beach to the north of the inlet and Upham Beach to the south of the inlet. The borrow area has multiple dredged cuts with dredge depths between -10 and -18 feet MLLW.

PASS-A-GRILLE: The Pass-a-Grille Channel is a federally authorized channel and has a design depth of -10 feet MLLW plus two (2) feet allowable overdepth and is 150 feet wide. The Pass-A-Grille Channel together with an approximately 150 feet wide area parallel to the channel was dredged the last time in 2004. The dredged material was used to nourish Pass-a-Grille beach directly north of the channel.

Additionally, the Pass-a-Grille ebb shoal area has an excess growth of 50,000 cy annually which could also be utilized as sand source (Wang et al. 2018).

EGMONT SHOAL EAST: Egmont Shoal East is located west of Fort De Soto State Park and north of the Tampa Harbor Federal Navigation Channel and is historically used as a sediment source for Treasure Island and Long Key, and continues to be used for the Sand Key Segment of the existing authorized Pinellas County, FL Beach Erosion Control project.

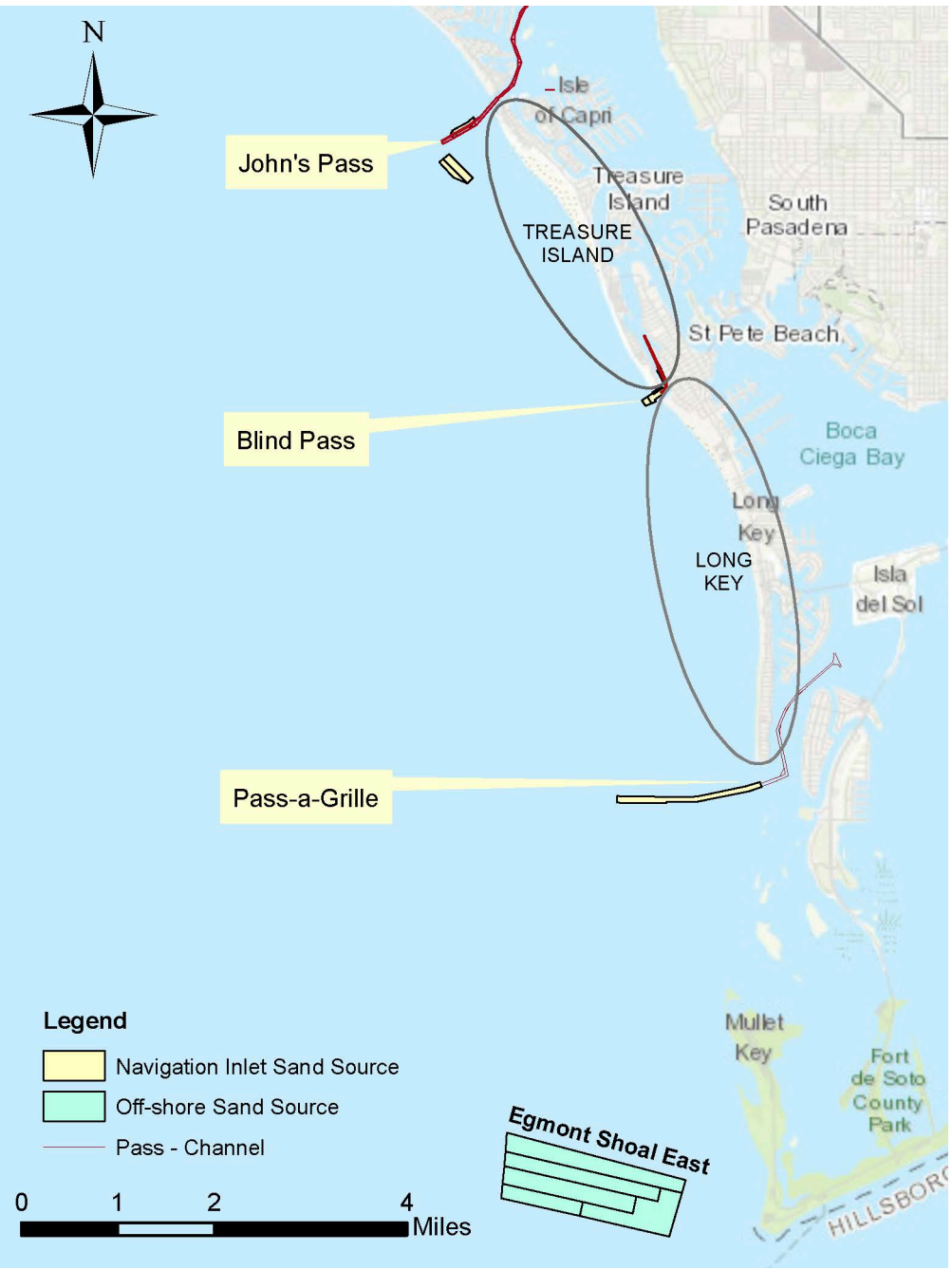

Figure 4-2. Overview of sand sources.

4.1.1 Compatibility of Sand Sources with the Beaches

The sand sources for Treasure Island and Long Key were characterized through comprehensive geotechnical investigations as presented in the Geotechnical Appendix. The sand source sediments are classified as poorly to moderately well sorted, fine-grained quartz sand with a mean grain size of 0.16 to 0.33 mm, and a standard deviation of 0.56 to 1.92 phi. The average percentage of fines passing the #230 sieve ranges from 0.9 to 2.0%. The carbonate content ranges from 9.6 to 26.7%. The typical moist Munsell Color Value is 2.5Y 7/1 and 10Y 8/1. The arithmetic composite sample granularmetric parameters of the sand sources and the Treasure Island and Long Key beaches are summarized in Table 4-1.

The sand source sediments are compatible with the existing Treasure Island and Long Key beaches. The material of the existing beach and of the sand sources are very similar and composed of fine-grained sand consisting of quartz and shell fragments with a grain size of 0.16 and 0.33mm, respectively. The composite gradation graphs of the navigation inlet sand sources together with the composite of Treasure Island and Long Key beaches are shown on Figure 4-3. The composite gradation graphs of the off-shore borrow area Egmont Shoal East together with the composite Treasure Island and Long Key beaches are shown on Figure 4-4.

All sand sources meet the requirements of the Florida Administrative Code 62B-41.007(2) were utilized and permitted as sand sources for Treasure Island Long Key beaches before.

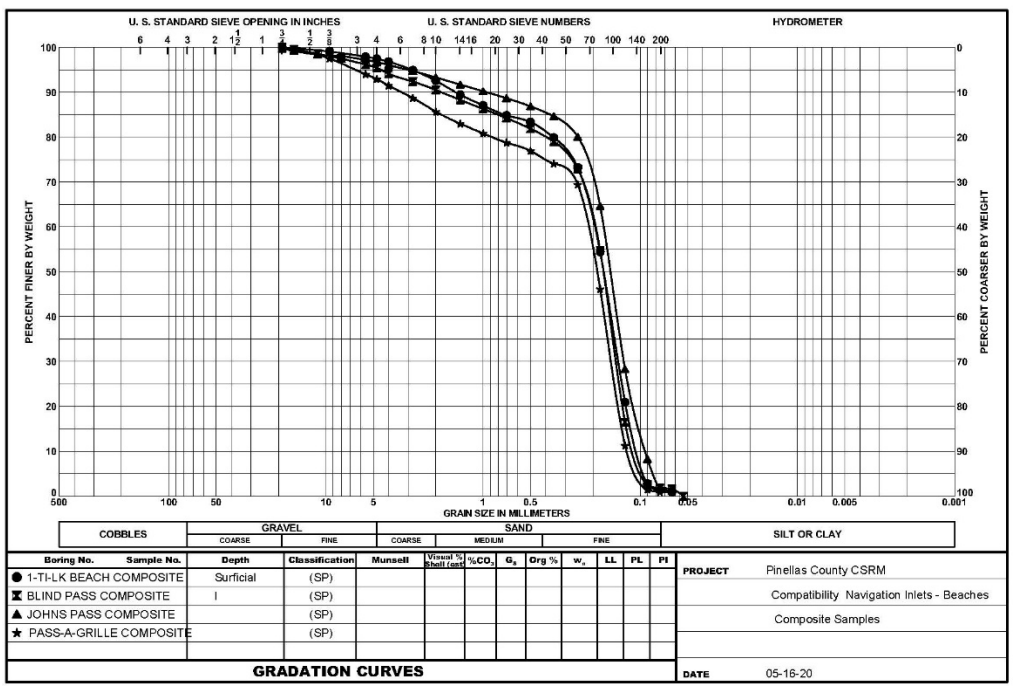

Figure 4-3. Composite Samples Gradation Curves of TI-LK Beaches and Inlet Sand Sources.

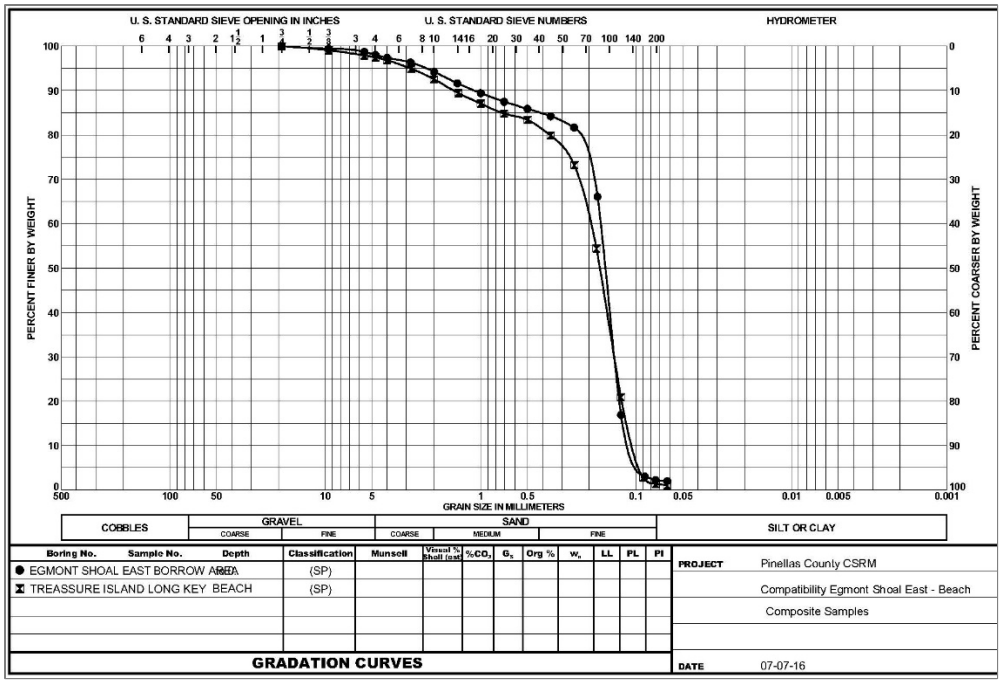

Figure 4-4. Composite Samples Gradation Curves of TI-LK Beaches and Egmont Shoal East.

Table 4-1: Grain Size Summary Sand Sources.

Composite	Mean (mm)	Sorting (phi)	Silt %	CaCo3 %	Munsell Color
Blind Pass Channel	0.29	1.79	1.3	26.8	10Y 8/1
John's Pass Channel	0.24	0.73	0.9	17.5	10Y 8/1
Johns Pass Ebb Shoal BA	0.16	0.56	1.7	9.6	2.5Y 8/1
Pass-a-Grille Channel	0.33	1.92	0.9	26.0	2.5Y 7/1
Egmont Shoal	0.22	1.38	2.0	20.7	2.5Y 7/1
TI/LK Beaches	0.28	1.16	1.0	24	2.5Y 8/1

4.1.2 Sand Source Volumes

The navigation inlet sand sources are renewable sand sources. The FDEP inlet management plans (FDEP 2018; FDEP 2019a; FDEP 2019b) included infill rates and recharge cycles and volumes for each of the dredge templates. The navigation inlet sand sources can provide a total of 5,750,000 cy sand over the 50-year life of the project (see Table 5-2). Additionally, the never dredged Pass-a-Grille ebb shoal has an excess growth of 50,000 cy annually that could also be utilized as a sand source, and provide 2,500,000 cy over the 50-year life of the project (Wang et al. 2018).

Table 4-2. Estimated sand volume from the inlet complexes.

Sand Source Options	Volume (cuyd)	Recharge Cycle (years)	50-year volume (cuyd)
Johns Pass Navigation Channel, Channel Side Borrow Area, and Ebb Shoal Borrow Area	152,000	6	1,333,333
Blind Pass Navigation Channel Borrow Area	200,000	6	1,750,000
Pass-a-Grille Navigation Channel with Marginal Linear Shoals (2004 Dredge Template)	212,000	4	2,650,000
Total Sand Source Volume for 50-years			**5,730,000**

During the Beach-fx modeling, the volumes and intervals were held to ensure that sufficient material was available in the pass to meet the needs of the project (see additional information on this topic in the Engineering Appendix). Therefore, the inlet complexes have sufficient material for constructing the TSP over a 50 year period.

Egmont Shoal East is a permitted sand source for the existing Federal Pinellas County Beach Erosion Control project, and it has a total volume of 15,000,000 cy. Egmont Shoal is generally considered to be a renewable sediment source, but sediments may not recover within the timeframes associated with this project. However, the significant volume available there is more than sufficient to meet the needs of this project and the remaining needs of the existing Pinellas County, FL BEC project through their 50-year periods of Federal participation (see Section 5.3, Natural and Depletable Resources, for additional information). Using material from Egmont Shoal preserves material in the inlets and their associated ebb and flood shoals, which could be useful in the future for an unexpected renourishment following a storm event.

4.2 TSP COSTS

As noted elsewhere in the report and in the economics appendix, alternatives were compared using preliminary costs as computed by the Beach-fx model outputs and based on the input assumptions used in the FWP simulations. These assumptions include $2.5 million in mobilization/demobilization costs per mobilization event on each island, and $15.30 per cubic yard in placement costs.

Once the TSP is selected, a more detailed cost estimate can be developed; however, this TSP summary is based on a total project cost summary (TPCS) that is more detailed than the preliminary costs used in alternative comparison. The TPCS assumes of a six year renourishment interval, which allows for eight nourishment events over 50 years (initial construction and seven renourishments) for both islands. The estimated economic cost of the project (used for calculating the BCR and net benefits) is defined in Table 4-5. More information about the cost estimate is provided in the cost appendix.

Table 4-5. Economic costs of the project for the minimum volume requirements.

Total First Cost of Project	$211,089,000

Interest During Construction	$52,536
Total Economic Cost	$211,141,536
Present Value Cost	$120,959,472
AAEQ* Cost	$4,480,450
Annual OMRR&R	$30,000
Total AAEQ* Cost	**$4,510,450**

* AAEQ refers to Average Annual Equivalent.

4.3 TSP COST SHARING

The current cost share estimates are based on policy guidance provided by ER 1105-2-100, Appendix E, and ER 1165-2-130. The Water Resources Development Act (WRDA) of 1999 (PL 106-53, Section 215) changed the cost sharing policy previously provided by WRDA 1986 (33 U.S.C. § 2213[d]) by setting a maximum Federal share of periodic nourishment to 50% for projects authorized for construction after December 31, 1999. Since there is adequate public parking and beach access as described in Section 2, the anticipated cost share is 65% Federal for initial construction and 50% for periodic renourishment.

4.4 ECONOMIC BENEFITS OF THE TSP

The proposed Pinellas County tentatively selected plan generates several different types of benefits, including primary CSRM benefits, land loss reduction benefits, and incidental recreation benefits. Each is described below. The benefits are summarized in Table 4-4, in average annual terms.

4.4.1 Coastal Storm Damage Reduction Benefits

Storm damage reduction benefits (including reduction in direct damage to structures, contents, and armor) of the NED plan total $2,856,000 in average annual equivalent dollars.

4.4.2 Land Loss Benefits

In outlining the process and procedures to be used in the evaluation of coastal storm risk management projects, ER-1105-2-100 mentions the inclusion of land loss due to erosion, stating that such damages should be computed as the market value of the average annual area expected to be lost. Prevention of land loss is a component of primary storm damage reduction benefits.

Following the guidance provided, land loss benefits of a storm damage reduction project are calculated using: (1) the square footage of the land lost each year, and (2) the market value of land in the project footprint. The Economics Appendix provides detail on how the square footage of land loss each year was calculated. As the second component of the land loss benefits calculation, ER 1105-2-100 instructs that nearshore land values be used to estimate the value of land lost. The Jacksonville District Real Estate Department estimated a nearshore land value of $90.00 per square foot for the study area based on previous CSRM studies of nearby Florida coastlines; however, this value will be updated during the optimization modeling.

Using the analysis technique described, the total present value of land loss benefits over the 50 year project life is estimated at $38,000 in average annual equivalent (AAEQ) terms. This is a relatively low value, which is partially due to the extensive armor construction assumed to occur in the FWOP results that prevent the large land losses. This precludes the ability of a project to preserve lost upland.

4.4.3 Recreational Benefits

According to ER-1105-2-100, incidental recreation benefits can be calculated for Coastal Storm Risk Management (CSRM) projects. Recreation benefits cannot be used to justify projects, but they can constitute up to 50% of total project benefits used for economic justification.

Additionally, ER-1105-2-100 specifies that benefits arising from recreation opportunities created by a project be measured in terms of willingness to pay. As described in the Economics Appendix, the unit day value (UVD) method was used to calculate the incidental recreation benefit provided by the TSP resulting in an estimated total present value of recreation benefits of $1,128,000 in average annual terms.

4.4.4 Summary of Economic Benefits of the NED Plan

Table 4-4 provides a summary of the benefits of NED Plan separated into the benefit types described above expressed in average annual equivalent terms.

Table 4-3: Summary of the Economic Benefits of the TSP (minimum volume).

Land Loss Benefits (AAEQ $)	$38,000
Total Project Benefits (AAEQ $)	**$5,294,018**

Table 4-4 provides an economic summary of the NED Plan expressed in average annual equivalent terms for the minimum volume TSP. Further optimization (using sensitivity analyses and modeling results) will be used to refine the TSP. Currently, the smallest version of the plan appears to be the project configuration that maximizes net benefits, and is therefore the NED Plan.

Table 4-4. Economic summary of the NED Plan (minimum volume).

	Without Incidental Recreation Benefits	With Incidental Recreation Benefits
Total Cost of Project		$211,089,000
Present Value Cost	$115,802,263	$115,802,263
AAEQ* Cost	$4,289,422	$4,289,422
Annual OMRR&R	$30,000	$30,000
Total AAEQ* Cost	**$4,319,422**	**$4,319,422**

AAEQ Damage Reduction Benefits	$4,128,018	$4,128,018
AAEQ Land Loss Benefits	$38,000	$38,000
AAEQ Recreation Benefits		$1,128,000
AAEQ Total Benefits	**$4,166,018**	**$5,294,018**
AAEQ Net Benefits	**-$153,404**	**$974,596**
Benefit-Cost Ratio (BCR)	**0.96**	**1.23**

The total Benefit-to-Cost Ratio (BCR) including CSRM, land loss, and incidental recreation benefits for the TSP is equal to 1.23. It should be noted that this BCR is based on draft cost information. The data in this table are subject to change as the project is optimized and costs are further refined.

4.5 SEA LEVEL CHANGE CONSIDERATIONS

An important question about the TSP is its performance under different Sea Level Change (SLC) scenarios. Based on the Beach-fx model results of the Future Without-Project condition, there was a significant spike in damages between the intermediate and the high scenarios. Pinellas County implemented recommendations that projects with a 50-year or longer lifespan use the high SLC scenario for planning purposes. As a conservative measure to reduce risk, the study formulated plans based on the high SLC scenario. However, all three SLC scenarios were considered during this process. Table 4-4 shows the average BCRs and net benefits of the TSP under the three SLC scenarios described in Section 2.4.

Table 4-5: Average PV Benefits and Costs for the TSP in different SLR scenarios.

SLR Scenario	Alternative Name	Avg AAEQ Cost	Avg FWP Damage (AAEQ $)	Avg FWOP Damage (AAEQ $)	Damage Reduction Benefits (AAEQ $)	Avg Land Loss Benefits (AAEQ $)	Avg Total Benefits (AAEQ $)	Net Benefits (AAEQ $)	BCR
SLR1	S_TI_E_DWDH_0ft_6INT and LK_E_DWDH_0ft_6INT	$2,978,000	$1,931,000	$4,918,000	$2,987,000	$86,000	$3,073,000	$95,000	1.03
SLR2	S_TI_E_DWDH_0ft_6INT and LK_E_DWDH_0ft_6INT	$3,132,000	$2,070,000	$5,134,000	$3,064,000	$140,000	$3,204,000	$72,000	1.02
SLR3	S_TI_E_DWDH_0ft_6INT and LK_E_DWDH_0ft_6INT	$4,289,000	$3,589,000	$7,718,000	$4,129,000	$38,000	$4,167,000	-$122,000	0.97

Values based on 100 iteration model runs using preliminary plan formulation cost estimates. Values are given in Average Annual Equivalent Dollars (AAEQ $).

As shown in Table 4-4, though the average benefits of the project increase in the SLR scenarios, the average costs also increase. The costs increase because erosion is greater and therefore more volume is required over time to maintain the project benefits. Thus, the project performance (in terms of the benefit-cost ratio) is relatively constant throughout the SLC scenarios. It should be noted that Table 4-5 does not include Recreation benefits. With recreation benefits included, the TPS is economically justified in the High SLC scenario as well. Also, now that TSP has been selected, further optimization should allow for improved project performance slight increases in net benefits. Optimization could include small changes to the volume and timing of the project or other design refinements. Overall, these results suggest that the TSP is an effective and efficient in all three simulated SLR scenarios.

As a measure to reduce risk from coastal storm damages, beach nourishment is naturally adaptable to SLC. It relies on regular renourishment events that are required regardless of the level of SLC that is experienced over the life of the project. Renourishment volumes can be increased to account for increased erosion over what was modeled or other impacts resulting from more frequent and/or intense storm events in the project area.

Most of the volumes described in this report and appendixes are based on the High SLC scenario, which is a conservative assumption. Beach-fx results suggests that the volume necessary for the project would increase slightly between the Low and Intermediate scenario, and more significantly between the Intermediate and High (differences which drive the differences in cost between the three scenarios). Expected volume needs increase by approximately 5% between the Low and Intermediate, and approximately 14% between the Intermediate and High.

4.6 TSP RESILIENCE

Engineering Construction Bulletin (ECB) 2018-2*, Implementation of Resilience Principles in the Engineering & Construction Community of Practice*, provides the policy and guidance for applying the USACE principles of resilience – Prepare, Absorb, Recover, and Adapt (PARA). In general, USACE defines resilience as the ability to anticipate, prepare for, and adapt to changing conditions; in addition, it is the ability to withstand, respond to, and recover from disruptions. ECB 2018-2 reflects this general definition and supports the application of a more project-specific definition of resilience as the capacity of a component, unit, or system to withstand occasional large overloads (for a definite duration of time) that cause minimal permanent deformation, damage, or cumulative degradation and then recover (within a specified time) its original state and function after the overloading event.

Table 4-6: Applicability of PARA Principles to Beach Nourishment.

ECB 2018-2 PARA Principles	**PARA Principles relative to beach nourishment projects**
The Prepare principle should be used to consider measures that reduce risks or costs under loading conditions beyond those required by technical standards	Risks and costs are considered when developing the TSP; for beach and dune projects, initial project construction and periodic nourishments are planned to manage coastal risk over the period of Federal participation.

The Absorb principle should be used to identify cost effective measures to limit damage to, or loss of function of, a project component or system due to both acute and chronic loading conditions, including conditions beyond those used for the design. This principle can also be used as an opportunity to consider adding system component robustness, redundancy, and increased reliability.	Beach and dune systems absorb the impacts of erosion, inundation, and wave attack to reduce impacts to valuable upland infrastructure.
The Recover principle should be used to identify cost effective measures that allow for rapid repair or function restoration of a project component or system.	Periodic nourishments and natural recovery of the beach system following storms recover the functionality of the dune and beach system. The integrated nature of dunes and berms is an essential component of beach system recovery.
The Adapt principle should be used to identify cost effective modifications to a project component or system that will maintain or improve future performance based on lessons learned from a specific loading condition or loadings associated with changed conditions.	Since beach and dune projects are constructed of sand and are "soft" features, the project design can be adapted for future periodic nourishment as the beach system evolves and project monitoring improves the understanding of a project's performance.

The 2016 Resilience Initiative Roadmap establishes that resilience thinking will be implemented USACE-wide through the application of the PARA principles and in support of risk-informed decision making. To apply resilience thinking at the project or system level, an evaluation should be performed using the PARA principles during pre-construction designs, engineering during construction designs, and/or during repair/rehabilitation designs as frequently as needed based on engineering judgment and reflective of project complexity and assessed risk.

Table 4-7. Applicability of ECB 2018-2, Project Specific Resilience Definition, to Beach Nourishment.

ECB 2018-2 Project Specific Definition of Resilience	Resilience relative to beach nourishment projects
*Capacity of a **component, unit, or system** to withstand occasional **large overloads** (for a definite duration of time) that cause **minimal permanent deformation, damage, or cumulative degradation** and then essentially recover (within a specified time) its **original state and function** after the overloading event.*	
component, unit, or system	Project components include design template dimensions and advanced fill volume. The beach system includes dunes, dry beach berm, submerged profiles, and sand bars.
large overloads	Large (low frequency) tropical and subtropical storm events.
minimal permanent deformation, damage, or cumulative degradation	Impacts from large storm events causing significant erosion to the project's advanced fill and design template which reduce a project's ability to reduce storm damage.

original state and function	The fully constructed project design template and advanced fill dimensions which function to reduce coastal storm over the period of Federal participation.

Dunes are integral components of a beach system and play a critical role in reducing damages. Observations of how dunes have performed during recent storm events as well as research conducted by ERDC and others have led to an improved understanding of the how the dune and beach berm function as one interconnected system and the role that dunes play in storm response and overall beach morphology. It is now understood that dunes not only reduce storm surge flooding, but they contribute to and supplement the erosion damage reduction provided by berms. Additionally, the established root systems of vegetated dunes better withstand erosion than dunes consisting of sand alone. When the beach is actively eroded during storms, sand removed from the dunes is deposited onto the beach berm, serving to renourish the beach with an immediate natural sand source. They also serve as the ultimate line of defense against storm surge inundation by acting as a natural buffer to protect inland infrastructure. In addition to being integral to a beach's storm damage reduction function, dunes provide important habitat for many plants and animals. The below excerpt from New Jersey Sea Grant Consortium Dune Manual describes how dunes and beaches evolve in response to small and large magnitude storms.

"Coastal sand dunes act as reservoirs of sand that help the beach maintain its equilibrium and preserve the ability of the beach to respond naturally to storm events. Beaches evolve during a storm by taking on a more dissipative state that causes waves to break farther offshore, reducing the wave energy near the shoreline. During this transition, the beach slope is reduced and one or more sand bars may form. The bars are formed as sand is transported offshore during the peak of the storm and is deposited near the region of most intense wave breaking. During smaller storms, the waves don't reach the base of the dune, and the erosion is limited to the beach face (berm) itself. The dunes only become active during moderate to large storms when the dissipation created by the bars is insufficient to prevent the waves from attacking the base of the dune. As a dune erodes, it releases a portion of its built-up reservoir of sand into the littoral system, where it contributes to bar formation and the development of a more dissipative profile, ultimately reducing damage to inland infrastructure. Larger dunes can withstand more wave activity and therefore provide more protection to areas behind them. In the simplest terms, the sand stored in a dune buys time and provides protection from severe storms." – 2016 New Jersey Sea Grant Consortium Dune Manual.

Figure 4-5 illustrates the interaction between the dune, berm, and submerged profile during large storm events and demonstrates the current understanding of the role that dunes play in storm response and overall beach morphology and contribute to erosion control.

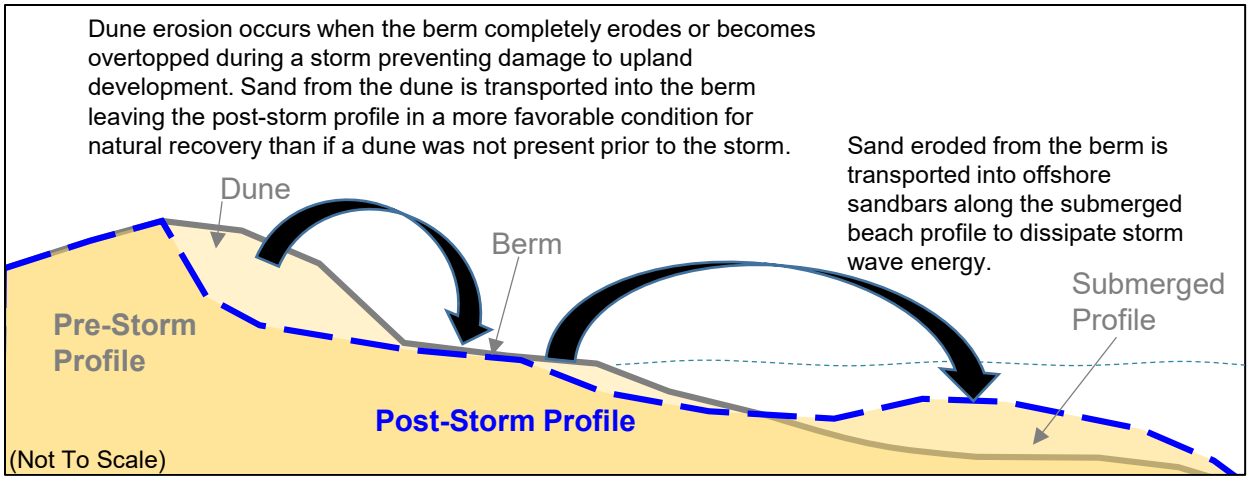

Figure 4-5. Beach Profile Storm Response.

4.7 RISK AND UNCERTAINTY

ER 1100-2-101 recognizes that no project or action that is proposed, evaluated, adopted, and implemented, can completely eliminate or mitigate flood risks. It continues that "the information used to estimate flood risk, formulate and evaluate plans, and determine the results of the analyses is uncertain. Therefore, this guidance outlines the process for assessing, communicating, and managing the risks inherent to the planning process."

As an event-based, Monte Carlo life-cycle simulation, Beach-fx fully incorporates risk and uncertainty to evaluate plans under many future scenarios. The Monte-Carlo simulation capability within Beach-fx allows the user to account for uncertainty based in variability in the model results. Each Beach-fx iteration represents a distinct life cycle, with its own simulated storms and unique estimated damages. The distribution of damages and benefits (over the various iterations) can be compared to estimated costs, which provides a picture of uncertainty with regard to net benefits. Uncertainty in the costs is accounted for in the cost-schedule risk assessment and is represented by the contingency (30% in this case). Generally, greater uncertainty leads to a higher contingency.

An analysis of the net benefits generated by the TSP indicates some risk that the costs ultimately could exceed the benefits (i.e., BCR <1). A visual depiction of the benefits (by iteration) relative to cost is provided in Figure 4-6 and Figure 4-7.

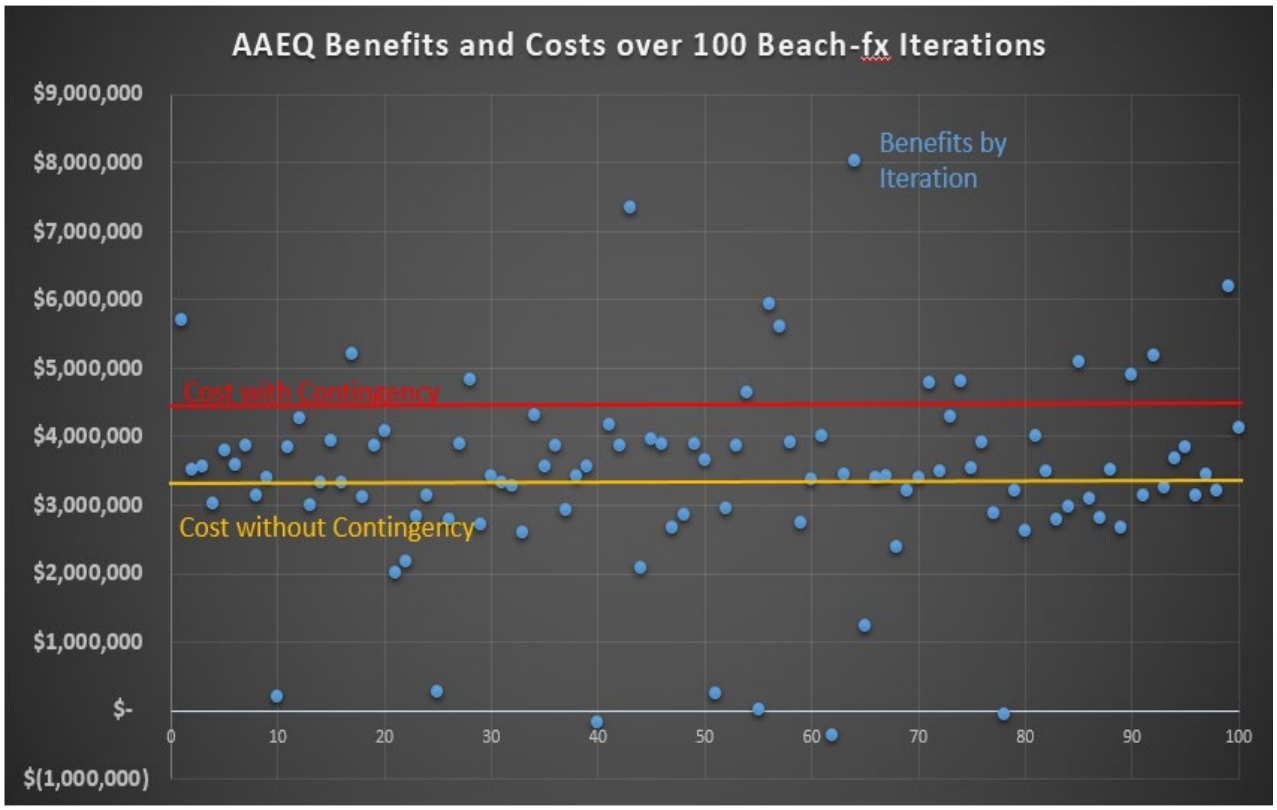

Figure 4-6. Benefits by Beach-fx Iteration, compared to estimated costs.

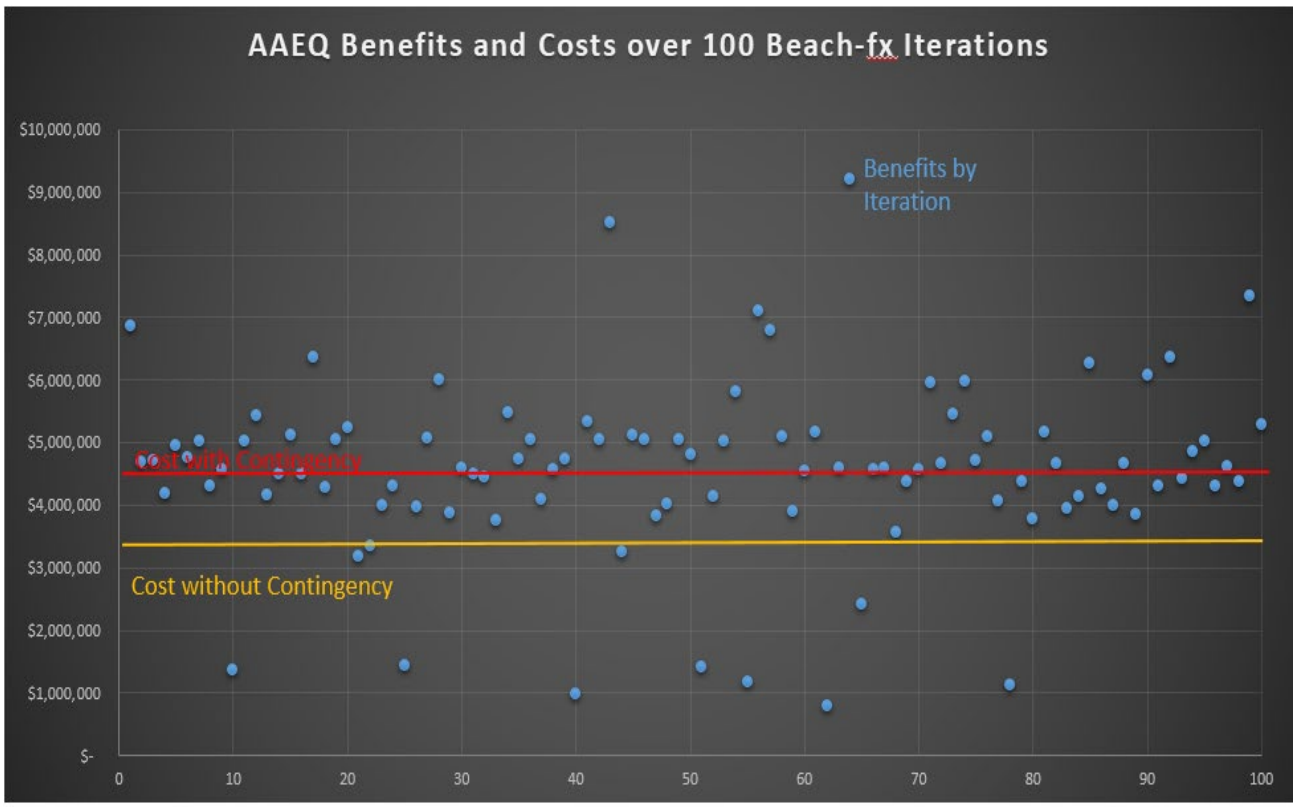

Figure 4-7. Benefits by Beach-fx Iteration, with Land Loss and Recreation benefits added, compared to estimated costs.

In terms of direct damage reduction benefits (structures, contents, and armor) it is actually more likely that costs would exceed benefits. However, when all the benefits are included (recreation and land loss), there is 90% probability (90 out of 100 iterations) that benefits will exceed non-contingency costs and 64% probability that it will exceed costs when including contingency. So, while there is some risk that the project will not ultimately generate positive net benefits over the 50 year period of analysis, it is more likely it that will. It should be noted that these charts are based on the High SLC scenario; project performance with regard to net benefits is slightly better in the other scenarios. Also, further optimization of the TSP is expected to increase net benefits somewhat during development of the final report.

A Cost Schedule Risk Analysis (CSRA) will be completed to address the risks to project implementation and construction (see the Cost Engineering Appendix for additional information). Based on the results of the analysis, the Jacksonville District will identify a recommended contingency value. This contingency will include risks related to costs for the effect of schedule delay on overall project cost. The project team does not anticipate any high risks associated with this project, and the remaining risks are anticipated to be typical of civil works projects (such as those related to quantity estimates or unforeseen environmental risks). Risks will continue to be assessed and managed in the design and construction phases of the project.

4.7.1 Residual Risk

The Tentatively Selected Plan does not have a specific design level. In other words, the project is not designed to fully withstand a certain category of hurricane or a certain frequency storm event. The proposed project would greatly reduce, but not completely eliminate, future coastal storm risk and damages over the 50 year period of analysis. Results from Beach-fx modeling indicate that the TSP will reduce FWOP damages.

In addition to the residual risk for erosion, inundation, and wave attack damages within the study area, additional residual risks exist in the vicinity of the project including the following:

- Structures and infrastructure on the backside of the barrier island on which the project area is located, although outside of the project area, is susceptible to impacts from storm surge and sea level rise in the future.
- Structures and infrastructure within the project area would continue to be subject to damage from hurricane winds and windblown debris. Even new construction is not immune to damage, especially from these processes.
- Structures and infrastructure within the project area would continue to be subject to damage from rainfall.
- The project purpose is coastal storm risk management, and the Tentatively Selected Plan is not designed to prevent loss of life. Public safety risks can be reduced by actions taken at the local, state, and Federal levels, including established procedures for evacuating prior to significant storm events.

CHAPTER 5: ENVIRONMENTAL EFFECTS

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5 ENVIRONMENTAL EFFECTS*

This chapter describes the environmental effects of the measures that were included in the Focused Array of Alternatives described in Section 3.9.1 other than the No Action alternative:

Alternative 1: No Action
Alternative 2: Beach Nourishment (TSP)
Alternative 3: Beach Nourishment with Jetty Improvements
Alternative 4: Beach Nourishment with Groins
Alternative 5: Beach Nourishment with Seawalls/Floodwalls

Alternative 1: No Action is described in Section 2, where it is also referred to as the "Future Without-Project Condition" or FWOP. The Tentatively Selected Plan, as described in Chapter 4, is Alternative 2: Beach Nourishment. The remaining alternatives all include beach nourishment as a component; therefore, effects of beach nourishment will not be repeated for each alternative unless the effects differ. Dune and berm features are described separately to identify differences in the effects between these two components of the beach system.

5.1 GENERAL ENVIRONMENTAL EFFECTS*

The environmental effects associated with the study area are primarily temporary in nature, and most affected resources would return to pre-construction conditions either immediately after construction (with respect to resources such as aesthetics and noise) or within one or two years (with respect to resources such sea turtle nesting and benthic resources). However, dredging inlets and altering the shoreline has the potential to change how sediment transport occurs regionally.

Dredging the passes or Egmont Shoal will require mobilizing dredges to the region, mobilizing heavy equipment onto the beach, and staging dredge pipe both on the beach and in nearshore waters. Once the beach pipe is delivered to the work area, it will be assembled on the beach using specially equipped dozers. Dredging the passes will involve bringing pipe over the existing jetty structure and placing it along the edge of the jetty to the beach. Once the upland pipe is in position, the in-water pipe segments will be sunk through use of a collar and weights or anchors. Only a small portion of the pipe would remain afloat to allow the dredge to move up and down along the dredging limits. This would have a minimal impact to the bottom due to the close proximity of the passes to the designated placement areas. Historically dredging Egmont Shoal, contractors have used pipeline cutter suction dredges where dredged sandy sediments were placed into a scow and towed to dedicated pipeline corridors. The corridors range in distance from one-half mile to one mile offshore, and material is offloaded using a spider barge with a mounted hydraulic offloader. The hydraulic offloader reslurries the captured sandy sediment back into a pipeline and pipes it to the beach. The beaches are graded with excavators and bulldozers to the engineered templates. As necessary, the bulldozers or personnel with hand rakes can be used to grade the access route smooth to an aesthetically pleasing appearance.

Although still being refined, the average initial construction volume for the beach nourishment over 100 iterations is between 330,000 and 1,432,000 cubic yards (cy). The average volume of all re-nourishments over 100 iterations is between 648,000 and 1,008,000 cy. Beach nourishment intervals are approximately six years. The analysis below is based on obtaining sediment for both beach and dune features from either the inlet complexes (Johns Pass, Blind Pass, and Pass-a-Grille) or from Egmont Shoal. Any differences in the effects of obtaining material from these sediment sources are called out where applicable.

Groin construction would typically occur from the beach, and the groins would be covered with sand following initial construction. Jetty expansions or improvements could be either shore-based or water-based depending on the location of the work. Seawall construction would be entirely land-based. Specific details regarding construction methodologies would be developed more fully during project engineering and design.

5.2 NATURAL (GENERAL) ENVIRONMENT*

This section is the scientific and analytic basis for the comparisons of the alternatives. The following section includes anticipated changes to the existing environment including direct, indirect, and cumulative effects as a result of the Focused Array of Alternatives, or the potential "Future With-Project Conditions." Note that the effects described for Alternative 2: Beach Nourishment are also applicable to Alternatives 3, 4, and 5, and will not be repeated for these alternatives.

5.2.1 Vegetation

5.2.1.1 Alternative 2: Beach Nourishment (TSP)

Berm Features

Sand placement will temporarily eliminate beach wrack and other shoreline vegetation used as habitat for shorebirds and benthic invertebrates; however, this typically is reestablished within weeks or months following construction. Sediment placed on the berm contributes to the formation of a healthy dune system over time, and study reaches where sand is placed should see an increase in dune vegetation as the dune system is reestablished through the addition of sediment to the beach system.

Dune Restoration/Enhancement

Dunes currently present in the project area with no vegetation planted will need to be stabilized with vegetation. Vegetation would be planted after placement of the dune material, as needed. The presence of dunes is essential if a beach is to remain stable and able to accommodate the stress from unpredictable storms and extreme conditions of wind, wave, and elevated sea surfaces. Dunes maintain a sand repository that, during storms, provides sacrificial sand before structures would be damaged. The dune system provides a measure of public safety and property protection. Raising the height of the dune, widening the dune, and filling in the gaps in the dune system would have a largely beneficial impact. Proper vegetation on dunes increases sand-erosion resistance by binding the sand together via extensive root masses penetrating deep into the sand. Further, such vegetation promotes dune growth through its sand-trapping action when significant wind action transports substantial quantities of sand. This measure

would include placement of beach-compatible material upland, offshore, or other sources, in a dune feature adjacent to any existing dune. Dunes currently present in the project area with no vegetation planted will need to be stabilized with vegetation. Vegetation would be planted after placement of the dune material, as needed.

5.2.1.2 Alternative 3: Beach Nourishment with Jetty Improvements

Jetty improvements that consisted of sand tightening through the addition of rock material to the existing jetties could temporarily impact adjacent dune vegetation; however, this vegetation would be restored following construction. Jetty expansions would not impact vegetation.

5.2.1.3 Alternative 4: Beach Nourishment with Groins

Groin construction would not impact vegetation over the effects described for beach nourishment, as shoreline vegetation would be impacted with sand placement on the beach regardless of whether it was constructed in combination with groins.

5.2.1.4 Alternative 5: Beach Nourishment with Seawalls/Floodwalls

Temporary impacts to dune vegetation could occur during construction of the seawall or floodwall, but would be restored following construction. Permanent loss of dunes and associated vegetation could occur in small areas if the seawall could not be built landward of existing dunes.

5.2.2 Fish and Wildlife Resources (Other Than Threatened and Endangered Species)

5.2.2.1 Alternative 2: Beach Nourishment (TSP)

Dredging sand may attract seabirds to both the dredge and the placement areas. Activities such as oil exploration have been shown to attract large numbers of seabirds, possibly because of an increase in food availability as bottom sediments are stirred up by drilling, potentially resulting in an algal bloom, and attracting species preyed on by seabirds (Tasker et al. 1986; Herron Baird 1990). Similar processes may occur during the initial stages of sand dredging. In addition, some species groups, notably gulls, are attracted by increases in shipping activity, especially at the low speeds associated with dredging (Garthe and Hüppop 1999; Skov and Durinck 2001; Christensen et al. 2003). Vision has been shown to be an important component in the foraging activity of a number of seabird species (Essink 1999; Garthe et al. 2000; Gaston 2004; Thaxter et al. 2010). As a result, water clarity may play an important role in the foraging success of these, and other, species. Changes to water clarity resulting from the re-suspension of sediments during dredging operations would negatively affect the foraging capabilities of some species. However, turbidity would only be located in the vicinity of the dredging and placement operations. In addition, the impact of increases in turbidity is likely to be dependent (both in scale and spatial extent) on initial background levels (Cook 2010). Water quality would quickly return to pre-dredging conditions upon completion of construction. These impacts would occur whether sand were dredged from the passes or from Egmont Shoal. Other than these effects, migratory birds would be minimally affected by dredging activities. Impacts to fish and wildlife species other than those protected under the Endangered Species Act (ESA) would be similar regardless of sediment source (inlet complexes or Egmont Shoal).

Berm Features

Beach placement is 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). If construction occurs during the summer months, USACE would implement its migratory bird protection measures that include daily surveys for shorebird nesting activities. If nests were found, a buffer zone of at least 200 feet would be established around each nest. No significant adverse impacts to migratory birds are anticipated with the migratory bird protection measures in effect. Some opportunistic foraging during placement is expected by both fish and bird species. Other wildlife utilizing the dredging and placement sites would be temporarily displaced during construction.

Although benthic organisms would be temporarily impacted at the beach placement site and at the sand source locations (including both the Shoal Complex and the offshore sand source locations), recovery of the benthic community is expected to occur with normal seasonal recruitment patterns documented for the project area. Benthic organisms likely to be affected during dredging are epifaunal organisms such as algae, sponges, hydroids, anemones, barnacles, bryozoans, decapods crustaceans, and gastropods.

Dune Restoration/Enhancement

Raising the height of the dune, widening the dune, and filling in the gaps in the dune system would have a largely beneficial impact on wildlife resources. There would be a temporary impact to the existing dune system during construction until vegetation becomes fully established. Benthic organisms would be temporarily displaced, and vegetation would be removed. In one to two years, vegetation should fully establish on the dune system to provide habitat and food for many species of wildlife, including small mammals, crustaceans, nesting shorebirds, and migratory bird species.

5.2.2.2 Alternative 3: Beach Nourishment with Jetty Improvements

Permanent impacts to the seafloor where jetties are expanded would occur, including the loss of benthic species in these areas. Temporary impacts to species and water quality in the nearshore due to disturbance from construction equipment would occur during construction. Marine flora and fauna may colonize the new rock material, providing some foraging habitat and shelter.

5.2.2.3 Alternative 4: Beach Nourishment with Groins

Effects of groins would be similar to those discussed for jetty improvements.

5.2.2.4 Alternative 5: Beach Nourishment with Seawalls/Floodwalls

Seawall or floodwall construction would temporarily displace shorebirds and other species utilizing the dune during construction. Permanent impacts to small portions of dune habitat would occur if the seawall could not be located landward of the dune system.

5.2.3 Threatened and Endangered Species

Impacts to individual species are described below, and the effects of each alternative are summarized at the end of this section.

5.2.3.1 Sea Turtles

All four action alternatives propose to place sand on the beach; therefore, USACE has determined that any of these may affect nesting sea turtles.

5.2.3.1.1 Alternative 2: Beach Nourishment (TSP)

Berm Features

Typically, nesting outcomes for sea turtles are adversely impacted during the first one to two years following beach placement, but they return to pre-construction conditions after the placed sediment equilibrates and the shoreline returns to a more natural slope. The construction of a wider beach ensures that sufficient beach habitat is available for female turtles to nest following the initial one to two year equilibration period, and nests are less likely to be washed out during large storm events. There are a number of potential effects to nesting sea turtles that may occur if there are changes in the beach sediment characteristics following nourishment. Scarp development could hinder turtles from accessing suitable nesting habitat. Sand compaction could make excavating a nest difficult, and changes in sand color or sand chemistry could affect the viability and sex ratio of a clutch (Mrosovsky and Provancha, 1989; Hays *et al*., 2001; Wood and Bjorndal, 2000).

Hatchling egress from the water's edge to open water and nesting female transit back and forth between the open water and the nesting beach during nesting season could be hindered by the presence of the dredge and pipeline. However, the construction phase would typically only last three to five months, and would occur approximately every six years (erosion due to storms could require more frequent events). The daily construction activity would occur within only a small area at a time. To minimize potential effects to nesting and hatchling sea turtles, geotechnical surveys were conducted to identify sand that is suitable for placement at this site. The sand grain size and color must meet specific criteria to prevent compaction and to help ensure its acceptability by nesting turtles. Post-construction surveys will monitor for the presence of scarps, and tilling will be conducted if scarps or compaction occur. With the inclusion of these measures to survey, monitor, and mitigate possible sediment effects associated with the project, the effects outlined above are unlikely to occur. The project is anticipated to adversely affect nesting sea turtles, but will not jeopardize the existence of the species, and would fall within the scope of the USFWS Statewide Programmatic Biological Opinion (SPBO; USFWS, 2015). The study is being coordinated with USFWS, and will complete coordination prior to finalizing the NEPA process.

Dune Restoration/Enhancement

Healthy dune systems benefit sea turtles in several ways. The break in slope associated at the base of the dune is an important cue for green turtles to identify an appropriate nesting site. Raising dune elevations helps to block artificial light, and dune vegetation provides a natural light screen to protect nesting and hatchling sea turtles. While dunes are important to sea turtles as part of the beach system, they could cause an impact if constructed in a highly erosional areas. If the dune becomes scarped due to high background erosion rates, they could create a barrier that would prevent turtles from accessing upper portions of the beach where nests would be safe from high tides and storm surges.

Dredging Operations

If a hopper dredge is used for the dredging operations, potential effects to sea turtles could occur. Dredging may adversely affect sea turtles due to entrainment, foraging and resting habitat disturbance, noise disruption, and injury from dredges and support vessels. To minimize the risk to sea turtles in the water during dredging operations, standard sea turtle protection conditions will be implemented such as draghead deflectors, inflow screens, and monitoring of the operation. No significant hardbottoms or seagrass resources were located within the boundaries of the sand source locations that would serve as an attractant for sea turtles.

The National Marine Fisheries Service's (NMFS) Gulf of Mexico Regional Biological Opinion (GRBO) provides for incidental take (lethal and injurious) of sea turtles in the water during these types of dredging operations, and construction of this project is not expected to exceed the take allotted by the GRBO. The project will adhere to all turtle safety precautions outlined in the GRBO, and will implement the NMFS Sea Turtle Construction Conditions during construction. If a cutter dredge is used during dredging operations, it is expected to have minimal or no risk to sea turtles in the water.

5.2.3.1.2 Alternative 3: Beach Nourishment with Jetty Improvements

Temporary impacts to sea turtles would occur during jetty construction due to the presence of equipment in the water. Protections measures would be implemented to ensure that no turtles enter the project area. Sea turtles would also be affected by the short-term impacts to water clarity. In the long term, jetties can act as attractants to turtles that forage on them. While the jetty may provide foraging habitat, the proximity of the jetties to the navigation channels could place turtles at risk of boat strikes.

5.2.3.1.3 Alternative 4: Beach Nourishment with Groins

Effects during construction would be similar to those anticipated to be associated with jetty improvements. Longer term effects include the potential for additional foraging habitat; however, groins block nesting sea turtles from accessing the beach and can entrap hatchling turtles as they make their way back to the ocean.

5.2.3.1.4 Alternative 5: Beach Nourishment with Seawalls/Floodwalls

Seawalls negatively impact the adjacent shoreline when constructed along eroding shorelines. For the reaches where seawalls/floodwalls are proposed for this study (the non-erosive/accretional reaches in the centers of Treasure Island and Long Key), no negative effects are anticipated as a result of shoreline erosion in front of a constructed seawall or floodwall. Seawalls in these areas may provide a benefit of blocking artificial light from adjacent infrastructure.

5.2.3.2 Whales

Sperm whales and Baleen whales are deepwater species, and it is unlikely they will be impacted by the project or in water near Egmont Shoal, the inlets, or along the beach of the study area. Therefore, USACE believes the TSP may affect, but is not likely to adversely affect the sperm whales and baleen whales. In

addition, they are also unlikely to be impacted by the construction or expansion of the jetties, groins, or seawalls/floodwalls.

5.2.3.3 Florida Manatee

5.2.3.3.1 Alternative 2: Beach Nourishment (TSP)

Manatees typically use nearshore waters for migration, and their movements may be affected by the presence of the construction equipment during both dredging and placement operations. USACE and its contractors will abide by the Standard Manatee Conditions for In-Water Work (FFWCC, 2011) to ensure no adverse effects to any manatee that may venture into the project area during construction activities. By incorporation of this protocol, USACE believes that TSP may affect, but is not likely to adversely affect, the Florida manatee.

5.2.3.3.2 Alternatives 3, 4, and 5

Incremental effects on the manatee during jetty or groin construction activities over the stand-alone effects of beach nourishment would be mitigated through the use of the above measures. There would be no additional effects to the manatee as a result of seawall construction in the reaches proposed.

5.2.3.4 Piping Plover

5.2.3.4.1 Alternative 2: Beach Nourishment (TSP)

USACE determined that there are no identified Optimal Piping Plover Areas in the study area as defined in the USFWS Piping Plover Programmatic Biological Opinion (P^3BO; May 22, 2013). Therefore, USACE has determined that the TSP may affect, but is not likely to adversely affect the continued existence of the piping plover. USACE has determined that the minimization measures in the P^3BO are applicable to the study, and is requesting concurrence from USFWS. As there is no piping plover critical habitat in the project area, the TSP will not adversely modify critical habitat for the piping plover.

5.2.3.4.2 Alternatives 3, 4, and 5

Since jetties already exist in the areas where expansion or improvements are proposed, the additional long-term impact to plovers as a result of shoreline modification are minimal. Permanent impacts to the benthic habitat in the location of any groin features are expected; however, the groins would be constructed of rock that would provide an alternative source of forage. Short-term impacts to foraging and roosting opportunities are expected during construction for both jetty and groin alternatives. In the reaches proposed, seawalls are not anticipated to affect piping plover due to their location landward of the wide dune and berm features.

5.2.3.5 Rufa Red Knot

5.2.3.5.1 Alternative 2: Beach Nourishment (TSP)

Although USFWS has not designated critical habitat for the rufa red knot, Pinellas County is known to provide important habitat for this species. The Final Rule listing the rufa red knot, published December 11, 2014, notes that "beach nourishment can be beneficial or detrimental to red knot habitat, though any negative effects are mostly considered to be short-term (79 FR 73707)." USACE has determined that the proposed action may affect, but not likely to adversely affect this species. USACE will implement the minimization measures outlined in the USFWS Piping Plover Programmatic Biological Opinion (P^3BO; May 22, 2013), and is requesting concurrence from USFWS.

5.2.3.5.2 Alternatives 3, 4, and 5

Impacts to the rufa red knot resulting from the construction of jetties, groins, or seawalls are anticipated to be similar to those anticipated for the piping plover.

5.2.3.6 Gulf Sturgeon

5.2.3.6.1 Alternative 2: Beach Nourishment (TSP)

USACE determined that the TSP may affect the Gulf sturgeon if a hopper dredge is used during construction. The study area is not within the critical habitat designated for Gulf sturgeon, nor is it within their primary range. If a hopper dredge is used for the dredging operations, terms and conditions of the GRBO will be implemented to minimize effects to this species.

5.2.3.6.2 Alternatives 3, 4, and 5

There would be no additional effects to the Gulf sturgeon over those anticipated for beach nourishment with the incorporation of jetty improvements, groins, or seawalls into the project.

5.2.3.7 Smalltooth Sawfish

5.2.3.7.1 Alternative 2: Beach Nourishment (TSP)

Although smalltooth sawfish habitat and juvenile sawfish nursery habitat are located in shallow waters near the mouths of rivers in estuarine lagoons, the focused study area is north of the primary habitat used by smalltooth sawfish. However, smalltooth sawfish are known to occasionally occur in the Tampa Bay area. Due to the potential presence of smalltooth sawfish in the focused study area, USACE has determined that the TSP may affect, but is not likely to adversely affect, the smalltooth sawfish. The study will implement the NMFS Smalltooth Sawfish Construction Conditions during project construction.

5.2.3.7.2 Alternatives 3, 4, and 5

Jetty and groin construction have additional potential to harm smalltooth sawfish over dredging and placement operations alone due to the preference for sawfish to inhabit shallow water habitats; however, the likelihood of impacting sawfish during project construction is minimal. The NMFS Smalltooth Sawfish Construction Conditions would be implemented during construction, which would further minimize the potential for harm. Seawall construction would have no effect on smalltooth sawfish.

5.2.4 Essential Fish Habitat (EFH)

The description of the TSP is located in Chapter 4. Section 2.3.4 describes the "existing conditions" of EFH, federally managed fisheries, and associate species such as major prey species, including affected life history stages. The following subsections describe the individual and cumulative effects of the proposed action(s) and alternatives on EFH, federally managed fisheries, and associate species such as major prey species, including affected life history stages.

5.2.4.1 Alternative 2: Beach Nourishment (TSP)

Dredging Operations and Berm Placement

Marine areas of unconsolidated substrate, hardbottoms, and water columns within the study area have been designated as EFH. The water column is used for foraging, spawning, and migration. Effects to the water column may have localized effects on marine species. Injury or entrainment due to dredging would most likely affect demersal species (those living close to the sea floor) and less mobile species, such as shellfish. Dredging may temporarily affect feeding success of managed species and their prey due to turbidity and loss of benthic organisms; however, adjacent similar habitat is available for feeding. Other potential adverse effects include: behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; changes to soft bottom bathymetry in the borrow area during dredging; and temporary loss of prey items and foraging habitat.

The thicknesses removed from the passes and adjacent ebb shoals is approximately 1-8 feet, and the thickness removed from Egmont Shoal is approximately 8-14 feet. Each portion of Egmont Shoal is only anticipated to be dredged once. EFH species likely to be impacted by dredging activities in the study area are those identified in Table 2-3 in Section 2.3.4.

Non-motile infaunal invertebrates that inhabit the dredge areas will unavoidably be lost during dredging. Species of motile epifaunal invertebrates also inhabit the proposed sand source locations. Motile organisms such as fish and crabs should be able to escape the area during construction. Species that are not able to escape the construction area are expected to recolonize after project completion from adjacent similar habitat.

Water quality concerns are of particular importance in the maintenance of this habitat. During dredging, resuspended materials may interfere with the diversity and concentration of phytoplankton and zooplankton, and therefore could affect foraging success and patterns of schooling fishes and other grazers that comprise prey for managed species. Foraging patterns would be expected to return to normal at the end of dredging activities.

Effects to benthic infaunal and epifaunal communities would be considered relatively minimal when examined on a spatial scale. Infaunal communities in particular have very high reproductive potential and recruitment. Adjacent areas that have not been impacted would most likely be the primary source of recruitment to the impacted areas. Studies have shown a relatively short recovery time for infaunal communities following dredging. Succession of post-dredging infaunal communities should begin within

days following dredging. This initial settlement usually consists of pelagic larval recruits settling within the impact area. Later recruitment from adjacent non-impacted areas will be more gradual and involves species which are less opportunistic. It is highly likely that infaunal communities would most likely be re-established within one to two years after dredging ends (Vivan, Domenico, and Almeida, 2009).

Short-term effects of dredging and construction would affect populations of benthic organisms that serve as prey for EFH species and migratory species traveling through the area. Noise from the dredging activities may also cause fishes to move from the area. These temporary impacts may also alter the paths of migratory fishes and baitfish. Although this foraging and migratory habitat would not be available to these species, this effect would be minimal due to the relatively small size of the area involved in construction when compared to the total area available for foraging in the adjacent areas. These effects should not be significant and fishes should move back into the area shortly following the dredging activity.

Other impacts to EFH species within the area would include impact to larval fishes in the water column. These larval fishes may become entrained in the dredge during construction. The majority of larval fishes encountered would depend on the season and location of suction devices. In particular, those species that occur near the lower portions of the water column may be the most affected (Hammer and Zimmerman, 1979). However, given the very high reproductive capacity of these species, the small area in which the dredge would be used and the relatively short period of time that construction would occur, impacts to larval fishes should be very minor.

Although there are no hardbottoms in the study area, surveys will be conducted along any proposed pipeline corridors just prior to mobilizing the pipeline to ensure corridors are situated in a manner that avoids any impact to nearshore hardbottom communities.

No direct effects to seagrasses are anticipated to occur since all occurrences of seagrasses are outside of the study area. Seagrass beds are temporally and spatially ephemeral. In areas such as Blind Pass where seagrasses have been known to occur, pre-construction seagrass surveys will be conducted to document the extent of beds immediately before construction.

Species managed by NMFS that are common within the project area can be found in Table 2-3. USACE has determined that the proposed action would not have a substantial adverse impact on EFH or Federally-managed fisheries along the Gulf Coast of Florida. In addition, it is important to note that the dredging area encompasses a fraction of the entire water body, and similar habitat occurs immediately adjacent to the proposed sand sources. EFH coordination for the proposed action with NMFS will be initiated concurrent with noticing of this draft NEPA document.

Dune Restoration/Enhancement

While there are no direct effects to EFH resulting from the construction of dune features in association with beach nourishment, dune restorations/enhancement would lessen the frequency of nourishments and benefit EFH through fewer dredging/placement events.

5.2.4.2 Alternative 3: Beach Nourishment with Jetty Improvements

Jetty expansion activities would temporarily impact EFH during construction due to localized disturbance, increases in turbidity, and possible crushing of prey organisms, but the impacts would not be significant on an incremental scale over those described for beach nourishment alone. There would be permanent impacts to the seafloor in the location where the jetties are expanded. Jetty improvements could provide habitat for epi-benthic or infaunal organisms.

5.2.4.3 Alternative 4: Beach Nourishment with Groins

Similar to jetty improvements, groin construction would temporarily impact EFH due to localized disturbance, increases in turbidity, and possible crushing of prey organisms, but the impacts would not be significant on an incremental scale over those described for beach nourishment alone. There would be permanent impacts to the seafloor in the location where the groins are placed, but groins could provide habitat for epi-benthic or infaunal organisms.

5.2.4.4 Alternative 5: Beach Nourishment with Seawalls/Floodwalls

Seawalls or floodwalls constructed in the proposed reaches landward of the existing or constructed dunes would not have an impact on EFH over that of a stand-alone beach nourishment alternative.

5.2.5 Coastal Barrier Resources

None of the alternatives in the Focused Array include the construction of structures that would require Federal flood insurance; therefore, Federal expenditures for the proposed project are not restricted in Coastal Barrier Resource System Units FL-85P or P24P (see Section 2.3.5 for additional information). While Egmont Shoal is located in Mullet Key, P24P (an Otherwise Protected Area), dredging is not prohibited in Otherwise Protected Areas.

The focused study area is already heavily developed; therefore, the measures proposed as part of the focused array to address coastal storm risk management in the project area are not likely to encourage additional development. Raising the height of the dune, widening the dune, and filling in the gaps in the dune system would have a beneficial impact by strengthening the natural protective features of the barrier systems for coastal storm damage protection. Jetties and groins alter local sediment transport processes, which does impact the natural movement of sediment. However, these measures are proposed in conjunction with beach nourishment to stabilize an eroding shoreline. Seawalls and/or floodwalls would be constructed landward of the dune in close proximity to existing structures, and would not further disrupt natural processes in the reaches proposed.

5.2.6 Water Quality

5.2.6.1 Alternative 2: Beach Nourishment (TSP)

Dredging Operations and Berm Features

Construction operations would produce temporary minor changes in water quality at both the dredge site and in the nearshore region of the placement site. Turbidity levels would be elevated above normal during

operations within the mixing zone. Visible plumes at the water surface are expected in the immediate vicinity of the operation. Elevated turbidity levels are expected to dissipate rapidly, returning to background levels in a short period. The USACE contractor would implement a spill contingency plan for hazardous, toxic, or petroleum material. No long-term adverse impact on water quality is expected to occur. Construction operations would be in compliance with the FDEP water quality certification to ensure compliance with Section 401 of the Clean Water Act.

Additionally, 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. USACE ensures that sediments placed on the beach are 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.

USACE will conduct intensive monitoring of turbidity at dredging and sand placement locations during project operations. If the monitoring detects turbidity exceeding established levels, the construction activity will be halted until the contractor takes appropriate steps to reduce the turbidity to acceptable levels and the turbidity returns to those levels. 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.

Dune Restoration/Enhancement

In areas where only a dune is constructed (with no corresponding berm feature), the impacts to water quality would be less. Some turbidity in the nearshore would still be expected. Otherwise, impacts to water quality as a result of dune restoration and enhancement would not be noticeably increased over those anticipated as a result of berm construction.

5.2.6.2 Alternatives 3, 4, and 5

Jetty expansion and groin construction activities would temporarily impact water quality during construction due to localized disturbance and increases in turbidity similar to those described for dredging operations and berm construction. The impacts would not be significant on an incremental scale over those described for beach nourishment alone. No additional impacts over those anticipated with beach nourishment are anticipated associated with the construction of seawalls or floodwalls in the proposed reaches.

5.2.7 Hazardous, Toxic, and Radioactive Waste

Although there is a 1993 documented oil spill in the vicinity of Blind Pass, surveys following the spill have not documented the presence of any contamination in this area. Dredging is not anticipated to encounter contaminants in any of the sand source locations.

Accidental spills and releases of waste/fuel, although remote, are possible. USACE will implement measures to prevent oil, fuel, or other hazardous substances from entering the air or water. All wastes and refuse generated by project construction would be removed and properly disposed. The USACE contractor will implement a spill contingency plan for hazardous, toxic, or petroleum material. Compliance with USEPA Vessel General Permits would be ensured, as applicable.

Impacts are anticipated to be the same for all four action alternatives.

5.2.8 Air Quality

The study is exempt from the Clean Air Act (CAA) conformity requirements because it is located in a Federal attainment area (FAC 62-204.340 (1-4)). The State of Florida does not regulate emissions from off-road equipment or marine vessels (FDEP, 2012); however, it can be assumed that insignificant emissions will be produced by the dredge and construction equipment during construction activities.

Impacts are anticipated to be the same for all four action alternatives.

5.2.9 Noise

5.2.9.1 Alternative 2: Beach Nourishment (TSP)

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).

Dredging to extract sand produces broadband and continuous sound, mainly at lower frequencies. The little available data indicate 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 and pumped through a pipeline to the beach. 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 dragheads moving in contact with the substrate. 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 on 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 drop back to background levels for the beach area. Since the increases to the current level of noise as a result of this study will be localized and minor, there will only be a temporary reduction in aesthetics and no expectation of adverse effects to the environment as a result of construction-related noise.

Noise during construction activities will likely be minor and short term with minimal impacts to fish and wildlife 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.

5.2.9.2 Alternatives 3, 4, and 5

Noise impacts resulting from jetty or groin construction would be similar to those described for dredging, but more localized in nature. Noise from the equipment, such as cranes, would be expected as they place the rocks. Water-based work would also generate noise from the tugboat used to move the barge. For seawall construction, noise typical of that generated by construction equipment such as concrete pourers and bulldozers would be expected for the duration of construction.

5.2.10 Aesthetic Resources

5.2.10.1 Alternative 2: Beach Nourishment (TSP)

Dredging associated with both berm and dune features would temporarily adversely impact the aesthetics of the dredge sites due to the presence of dredge equipment during construction.

Berm Features

The aesthetics of the beach placement area would be temporarily adversely impacted during construction due to the presence of construction equipment on the beach. In addition, the slope and appearance of the beach can take up to several months to equilibrate to match the pre-existing conditions. In the longer term, the beach aesthetics will be improved over the previously eroded shoreline.

Dune Restoration/Enhancement

Dunes are a critical component of the beach system. Constructed dunes can take one to two years to gain a more "natural" appearance. While dunes are typically considered an improvement to the aesthetic resources of the area, they can block views of the shoreline that are considered to be desirable.

5.2.10.2 Alternative 3: Beach Nourishment with Jetty Improvements

Jetty improvements or expansions would have temporary adverse aesthetic impacts due to the presence of construction equipment and the impacts to the staging area. As there are existing jetties in these locations, the improvement or expansions would not significantly change the aesthetics of the sites.

5.2.10.3 Alternative 4: Beach Nourishment with Groins

Temporary adverse aesthetic impacts would occur during groin construction due to the presence of construction equipment and the impacts to the staging area. In the long-term, there would be a more permanent change to the aesthetics of the shoreline that are typically considered to be adverse. The groins would initially be covered with sand, but would become exposed as the beach erodes.

5.2.10.4 Alternative 5: Beach Nourishment with Seawalls/Floodwalls

The proposed seawalls/floodwalls would be t-head concrete structures similar to those that currently exist along the sidewalk in Pass-a-Grille reach. These structures would not be high enough to visually block the viewshed, but would prevent access to the beach except for a designated access points.

5.2.11 Recreation Resources

5.2.11.1 Alternative 2: Beach Nourishment (TSP)

Berm Features

The recreational resources in the project area such as sunbathing, walking, surfing, and other recreational activities common in beach environments would be temporarily impacted during construction due to the construction equipment located on the beach. Temporary impacts to the area used to stage the shore-

based equipment would also occur. However, the long-term recreational resources of the area would be generally improved due to the beach habitat that would be maintained.

Dune Restoration/Enhancement

Dune features would be located on the beach berm profile, limiting the available space for activities that occur on the berm (sunbathing, volleyball, etc.).

5.2.11.2 Alternative 3: Beach Nourishment with Jetty Improvements

Jetty improvements would not have an appreciable impact to recreation resources over those achieved solely through beach nourishment.

5.2.11.3 Alternative 4: Beach Nourishment with Groins

Groins would decrease the available beach berm available for recreating, and could cause an impediment for those enjoying swimming, kayaking, and water-based activities in the nearshore region.

5.2.11.4 Alternative 5: Beach Nourishment with Seawalls/Floodwalls

Seawalls/floodwalls would not have an appreciable impact to recreation resources over those achieved solely through beach nourishment.

5.2.12 Navigation

5.2.12.1 Alternative 2: Beach Nourishment (TSP)

USACE dredged the eastern portion of Egmont Shoal in 2014 and 2018 with no noted impacts or additional shoaling in the entrance channel of the Tampa Harbor Federal Navigation Project. Therefore, no adverse impacts are expected as a result of dredging Egmont Shoal. Navigation in the passes would be improved when material is obtained from the inlet complexes. Maintenance dredging of the passes improves the navigability of the passes through the removal of shoaled material that poses an impediment to vessel traffic. Material placed on the beach from the passes or Egmont Shoal will erode over time, and some of the eroded sand will be transported into the passes and accumulate as shoals. Impacts to navigation are the same regardless of whether the sediment is placed on the berm or in the dune.

5.2.12.2 Alternative 3: Beach Nourishment with Jetty Improvements

Jetty improvements could serve to both reduce erosional impacts of the inlet and reduce the need for navigation dredging by preventing material from accumulating in the channel. This would have a beneficial effect on navigation in the three inlets in the focused study area.

5.2.12.3 Alternative 4: Beach Nourishment with Groins

Groins constructed in the project area could impact nearshore navigation of small vessels such as kayaks and jet skis, but should not significantly affect these activities as they generally occur further offshore and these small vessels can easily navigate around the groins.

5.2.12.4 Alternative 5: Beach Nourishment with Seawalls/Floodwalls

No adverse effects to navigation are expected as a result of the construction of seawalls.

5.2.13 Cultural Resources and Historic Properties

5.2.13.1 Alternative 2: Beach Nourishment (TSP)

Dredging Operations and Berm Features

The effects to cultural resources associated with the study area are primarily temporary in nature, and most affected resources would return to pre-construction conditions either immediately after construction (with respect to resources such as varying sediment deposition). The TSP includes shoreline sand placement occurring on beaches of Treasure Island and Long Key. Previous placement of sediment along eroded sections of the Pinellas County shoreline were considered to be a protective measure, preventing erosion and degradation of any known and unknown cultural resources or historic properties. Four EAs (1997, 2003, 2009, 2013) were conducted for the proposed beach nourishment of the existing Federally-authorized Pinellas County Beach Erosion Control Project. A 2017 Finding of No Significant Impact (FONSI) incorporated these EAs. The scope of the FONSI included the use of dredged sand from Egmont Shoal and placement on Treasure Island from FDEP Reference Monuments R-126 to R-128 and R-136 to R-141. On Long Key, the FONSI included placement from R-144 to R-148 and from R-160 to R-165.

The alternatives described in this EA that include beach nourishment and dune enhancement would dredge material from a combination of sand sources based on the availability of material. The sand sources include Egmont Shoal, Johns Pass, Blind Pass, and Pass-a-Grille Inlet. Sand could be obtained from both the navigational channels and from the ebb shoals of the inlets. As part of the analysis of the potential project impacts, the USACE established the area of potential effect (APE) for Section 106 review to be the footprint of the possible sand borrow areas and the placement area. Potential impacts were identified from direct disturbance by dredging and placement, and potential alteration of viewsheds. During the identification of potential historic properties, two resources were identified. Initially identified as side scan sonar targets, a sunken barge was documented in the Upham pipeline corridor and a sunken pleasure vessel was documented within the Sunshine pipeline corridor during diver resources investigations conducted by Atkins, North America, Inc. for Weeks Marine, Inc. The USACE determined adverse effects to these vessels will be avoided by maintaining a 300-foot buffer surrounding each resource. In a letter dated to August 3, 2017 the Florida State Historic Preservation Officer (SHPO) concurred with the USACE determination that maintenance dredging of the Federal channels in the APE would have no effect to cultural resources or cultural resources listed or eligible for listing in the NRHP.

The analysis below is based on obtaining sediment for both beach and dune features from either the previously-reviewed inlet complexes (Johns Pass, Blind Pass, and Pass-a-Grille) or from Egmont Shoal. Any differences in the effects of obtaining material from these sediment sources on cultural resources are called out where applicable.

<u>Egmont Shoal (Sand Source)</u>

In anticipation for use as a borrow source, USACE first conducted cultural resource surveys of Egmont Shoal in 1989 (DHR File No. 892562). Subsequent investigations including diver investigations in the western

portion of the shoal established buffers to prevent adverse effects to historic properties. On the eastern half, diver investigations indicated that no known significant targets were present. The design of the eastern portion of Egmont Shoal is specifically designed at this time to avoid disturbance of the Underwater Archaeological Preserve containing the USS *Narcissus*.

Egmont Shoal has repeatedly been used as a sand source for beach nourishment projects. Egmont Shoal was last utilized as a sand source in 2017. This shoal had previously been used in the 2013 renourishment of Treasure Island and the 2006 renourishment of Treasure Island and Long Key. In 2017, USACE determined the use of this shoal as a borrow area would not affect historic properties. The SHPO concurred by letter on August 3, 2017. The SHPO previously concurred with findings of no effect to historic properties on July 13, 2009 and September 12, 2006

The USACE has determined the use of the eastern portion of the Egmont Shoal sand source for the recommended alternative will have no effect on cultural resources or historic properties. The repeated use of this shoal have not encountered any cultural materials. Based on survey and the buffers established by USACE, SHPO concurred with the USACE's previous determinations of no effect for use of the eastern half of Egmont Shoal sand source by letter dated April 4, 2003 and August 4, 2003, July 3, 2013, and August 3, 2017.

<u>Johns Pass, Blind Pass, and Pass-a-Grille (Sand Source)</u>

USACE has previously conducted efforts to identify historic properties and resolve potential adverse effects in the Johns Pass APE. As part of efforts to identify historic properties in advance of proposed dredging in 1999, the USACE contracted with Mid-Atlantic Technology and Environmental Research, Inc. (M-AT/ER) to conduct a literature search and remote sensing survey of the ebb tide shoal in Johns Pass. The resulting report (Hall 2000d) identifies 15 magnetic anomalies. None of the magnetic anomalies had an associated acoustic signature in side scan sonar. Seven targets were evaluated as potentially significant. Based on this report, USACE determined eight of the targets required no additional research, but seven of the targets would require avoidance or additional research to determine if they were historic properties. In a letter dated August 7, 2001, the SHPO concurred with USACE's determination. M-AT/ER conducted additional diver identification of the seven targets, and identified all as modern debris. Based on these findings, the USACE determined the targets were ineligible for inclusion in the NRHP. In letters dated August 7, 2001 and October 9, 2001, the SHPO concurred with USACE's determination that use of this shoal as a borrow area posed of no effect to historic properties. The USACE then contracted with Southeastern Archaeological Research, Inc. (SEARCH) in 2009 to conduct an additional archaeological and historical underwater remote sensing survey of the proposed Johns Pass and Blind Pass dredging areas. In this effort, SEARCH identified 521 magnetic anomalies and four side scan sonar anomalies within the surveyed areas during the investigation. In a letter dated July 13, 2009, the Florida SHPO concurred with the USACE determination that none of these anomalies appeared to have potential to represent significant cultural resources, and the continued use of Johns Pass as a borrow area would have no adverse effect on historic properties.

As part of USACE efforts to identify potential historic properties, M-AT/ER conducted an investigation of a sand source location at Blind Pass, and of two sand source locations at Pass-a-Grille Inlet in 1999. The remote sensing survey (Hall 2001c) resulted in the identification of seven anomalies in the Blind Pass sand source APE and nine anomalies in the Pass-a-Grill APE. At Blind Pass, five targets were identified in the collected magnetometer data with characteristics associated with potentially significant submerged cultural resources. Three targets in the Pass-a-Grille APE demonstrated characteristics identified as potentially significant. The USACE then contracted for additional diver identification and evaluation of the five potentially significant submerged cultural resources at Blind Pass by M-AT/ER in August of 1999. Based on the information provided by the diver identification, the USACE determined all of the five magnetic anomalies were modern debris ineligible for inclusion in the NRHP. In a letter dated July 30, 2001, the SHPO concurred with the USACE's determination that the use of the Blind Pass APE as a borrow area posed of no effect to historic properties. USACE additionally contracted for diver investigations of the targets in the Pass-a-Grille APE (Watts 2003) and determined the three targets previously identified were not historic properties. SHPO concurred with the USACE by letter April 4, 2003 and August 4, 2003.

Prior to the first beach nourishment project within the current APE, the USACE established a erosion control line at the mean high water. All of the placement of sand on the Gulf-fronting shorelines of Treasure Island and Long Key from FDEP Monuments R-126 to R-166 are west (gulfward) of this line. All sediment placement in the TSP is in locations previously-nourished by USACE. Based on the absence of cultural resources and recurrent nature of material placement, USACE has determined no effect will occur to cultural resources or historic properties eligible for inclusion in the NRHP. Any effects to cultural resources associated with Johns Pass, Blind Pass, and Pass-a-Grille. The pipeline corridors from the borrow areas to the placement areas have established cultural resources buffers, to ensure no adverse effects in these area.

USACE has also reviewed the area between R-108 to R-109 for cultural resources. Given the disturbed nature and context of this placement area and the absence of archaeological sites recorded at the Florida Master Site File, USACE has determined no effect will occur to cultural resources eligible for inclusion in the NRHP. Moreover, the placement of sand along these specific areas is regarded as a protective measure, preventing erosion and degradation of any known and unknown cultural resources or historic properties.

The TSP (Alternative 2) and the other three action alternatives would dredge material from a combination of sand sources based on the availability of material. These sand sources include Egmont Shoal, Johns Pass, Blind Pass, and Pass-a-Grille. With the exception of the western portion of the previously surveyed Egmont Shoal, the remaining sand source areas have been previously subject to cultural resources surveys (DHR No. 2000-5820; DHR No. 2000-06210; DHR No. 2001-4093; DHR No. 2001-5819; DHR No. 2001-08376; DHR No. 2002-5430; DHR No. 2003-2216; DHR No. 2009-03433; and DHR No. 2013-02689). All potentially significant targets identified as a result of these surveys were investigated and determined ineligible for inclusion in the NRHP. Therefore, USACE has determined that the utilization of these areas will have no effect to cultural resources, or historic properties eligible for inclusion in the NRHP. Only the

eastern portion of the previously surveyed Egmont Shoal has been determined to have no effect on cultural resources eligible for inclusion in the NRHP. The eastern portion Egmont Shoal has been previously utilized as a sand source and is designed to avoid the use of the western portion that is currently associated with the Underwater Archaeological Preserve containing the USS Narcissus.

Previously, two side scan targets were identified as a barge in the Upham pipeline corridor and a pleasure vessel within the Sunshine pipeline corridor during diver resources investigations conducted by Atkins, North America, Inc. for Weeks Marine, Inc. The results of the investigations were submitted on May 20, 2014 for the Flood Control and Coastal Emergency Erosion Control Project, Treasure Island and Long Key segments. Adverse effects to these vessels will be avoided by maintaining a 300-foot buffer surrounding each resource.

As discussed in Chapter 2, substantial cultural resources work and investigations have been conducted throughout various portions of the project area. Previous consultation with the Florida SHPO and the appropriate Federally-recognized tribes on recurrent maintenance dredging of the inlets and the use of the previously surveyed eastern portion of Egmont Shoal and the ebb shoals of Johns Pass, Blind Pass, and Pass-a-Grille, has indicated that Alternative 3 will have no effect on cultural resources or historic properties listed or eligible for listing in the NRHP. In accordance with Section 106 of the NHPA, as amended, and its implementing regulations (36 CFR Part 800), consultation on the current action was initiated by letter on April 10, 2020 (located in the Pertinent Correspondence Appendix). Consultation for this EA has been initiated and is ongoing with the Florida SHPO and appropriate Federally-recognized tribes, and consultation will be concluded prior to the finalization of the EA. The USACE has determined that the future with-project conditions will have no effect on cultural or historic resources. The TSP should not result in adverse indirect effects to cultural resources. 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 or held by county owned parks, the TSP will not likely cause significant additional development to occur. Please see Table 5-1, which outlines the cumulative effects.

Dune Restoration/Enhancement

The construction of dune features will not result in adverse effects to cultural, historic, and archaeological resources. The proposed dune restoration APE has been subjected to prior nourishment within the tentative footprints. The extent of the shoreline within the alternative is a product of the previous renourishments. The proposed sand placement activities fall within areas that are exposed beach, the surf zone, and water in historic aerial photography and maps. The dunes in Pinellas County are a result of the Aeolian transport of sediment associated with the existing Federal project that expires in 2025/2030 as well as management by non-Federal actors.

The projected benefits of this alternative would protect cultural resources on the landward side of the dunes from erosion and wave attack. The potential increased resiliency of the shoreline may provide an additional benefit by requiring fewer sand borrowing events, reducing the potential to affect cultural

resources by dredging or sand mining. By matching the existing and historic dune levels, there is no significant change to viewsheds.

5.2.13.2 Alternative 3: Beach Nourishment with Jetty Improvements

With the expansion of the existing jetties, a permanent impact to the seafloor in the location of the jetty expansion would occur. This would cause the permanent loss of any submerged cultural resources. Terrestrial disturbances where staging and access occurs would be temporary in nature for the duration of construction. The accretion of material in the area of influence would be a protective measure for submerged cultural resources and would decrease the risks associated with erosion, subsidence, and overtopping of terrestrial resources in the location of the beach berm and dune.

5.2.13.3 Alternative 4: Beach Nourishment with Groins

Effects to cultural resources for groin construction would be similar to those described for jetty improvements.

5.2.13.4 Alternative 5: Beach Nourishment with Seawalls/Floodwalls

Due to the proximity of the proposed seawall locations to existing urban development, no additional impacts to cultural resources are anticipated to occur as a result of the construction of seawall or floodwall features.

5.2.14 Native Americans

As part of the development of this project, consultation is ongoing between USACE and the five Federally-recognized tribes within the immediate area of potential effect of the TSP. As discussed in Chapter 3, there are no known Native American properties within the project area and none of the Focused Array of Alternatives should have any foreseeable effects on Native Americans. Consultation with Native American tribes having ancestral ties to this region, including the Seminole Tribe of Florida, the Seminole Nation of Oklahoma, the Thlopthlocco Tribal Town, and the Miccosukee Tribe of Indians of Florida was initiated by letter on April 10, 2020. Consultation with the Muscogee (Creek) Nation was initiated by letter dated July 21, 2020. The consultation letters are included in the Pertinent Correspondence Appendix. Consultation will be concluded prior to finalization of the EA.

As the remaining alternatives that included jetties, groins, and seawalls were not carried forward to the Final Array of Alternatives, USACE did not consult with the Federally-recognized tribes on these actions. If these alternatives are pursued in the future, consultation would occur at that time.

5.3 NATURAL OR DEPLETABLE RESOURCES

Sand is a natural and depletable resource. Using sand from the proposed sand sources for any of the alternatives in the Focused Array will deplete the sand at the sand sources in the short-term. However, sediment associated with inlet systems will typically recharge at a higher rate than offshore resources. The inlet sand sources for this study are all associated with inlet systems and receive sediment as a result of alongshore sediment transport. The sand sources would likely recover over the long-term.

Tampa Bay's ebb-tidal delta is the second largest sediment body in the Gulf of Mexico and is an important source for local beach renourishment projects. The Egmont Shoal borrow area is located to the north of the Egmont Channel where the main ebb jet for the channel is deflected northward by local undersea terrain features located at the north end of Egmont Key (to the south). Egmont Shoal is a significant component of the active tidal delta complex which extends an estimated 6 miles offshore. It is an abundant renewable sand source fed by both the ebb flow from Egmont Channel and longshore sediment transport from the barrier islands to the north. Egmont Shoal has extensive historical use as a borrow area for Pinellas County and is currently authorized for renourishment of Sand Key, Treasure Island, and Long Key. Extensive monitoring in association with these projects have shown that Egmont Shoal meets stringent state environmental criteria with sufficient quantities of high quality beach compatible sand available for continued use for the project under consideration. Additionally, the borrow area is located far enough offshore that dredging of the shoal does not affect waves that reach the shore and does not cause beach erosion or adversely affect the sediment regime of the tidal complex. The effects of sea level change have not been fully evaluated, as that would require a level of analysis beyond the scope of the current study. However, the size of the ebb-tidal delta (indicating abundant sediment in the system) and underlying topography of the channel system ("funneling" sediment to the north side of the channel) are expected to limit impacts to possible shifting of the ebb shoal rather than loss or erosion of the shoal. Continued monitoring of Egmont Shoal is predicted as part of the FDEP permit throughout the life of the project.

5.4 CUMULATIVE EFFECTS

Cumulative effects are defined in 40 CFR §1508.7 as those effects that result 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. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

Table 5-1 summarizes the impact of cumulative actions by identifying the past, present, and reasonably foreseeable future condition of the various resources that are directly or indirectly impacted by the TSP. The table also illustrates the with-project and without-project condition (the difference being the incremental impact of the project), as well as the future condition with any reasonable alternatives (or range of alternatives).

CHAPTER 5: Environmental Effects

Table 5-1. Summary of cumulative effects.

	Past (baseline condition)	Present (existing condition)	Future Without Project	Future with Proposed Action Alternative 2: Beach Nourishment (TSP)	Future with Proposed Action Alternative 3: Beach Nourishment with Jetty Improvements	Future with Proposed Action Alternative 4: Beach Nourishment with Groins	Future with Proposed Action Alternative 5: Beach Nourishment with Seawalls/Floodwalls
Shorelines and Sand Resources (Egmont Shoal, Johns Pass, Blind Pass, Pass-a-Grille	Offshore sediments have been more abundant in the past; inlet sediments are used intermittently for placement on County beaches	Offshore sand resources are becoming depleted with use for beach placement and state sediment quality restrictions; ebb shoal and the Passes sediments are abundant as sediment accumulates from alongshore transport	Beaches may erode at a greater rate; material from navigational channels could be dredged for beach placement due to their generally renewable nature; seawalls may be required to protect upland structures	Beaches in the Focused Study Area would be wider with the placement of sediment; resources at the sand source locations would be temporarily impacted	Similar effects as the TSP, with slightly increased project footprint in the location of jetty expansions. Increased footprint would be a permanent loss to benthic resources in that location	Similar effects as the TSP, with slightly increased project footprint in the location of the groins. Increased footprint would be a permanent loss to benthic resources in that location	Similar effects as the TSP. Impacts to the adjacent beaches would be minimal due to the locations of the proposed seawalls only in locations with stable or accretional beaches
Protected Species	More abundant and widespread prior to development	Individuals of some species becoming increasingly rare; habitat shrinking; coastal species already impacted by sand placement activities; erosion can cause a decline in habitat	Beach habitat continues to shrink; no impact to hardbottom or seagrass resources; fisheries stocks and habitat may be impacted by anthropogenic activities	Individuals may be affected by dredging and placement activities; coastal habitat is sustained for life of project	Similar effects as the TSP, with additional impacts to turtles due to the attractant to forage on the jetty putting them at risk of boat strikes due to the close proximity to the navigation channel. Permanent impacts to benthic habitat. Minimal impacts to turtles and shorebirds due to the loss of the benthic habitat. Alternatively, the rock would provide additional shorebird foraging area.	Similar effects as the TSP, with additional impacts to nesting turtles and shorebirds due to the loss of the benthic habitats in the location of the groins and decreased access to the shoreline for nesting and hatchling turtles.	Similar effects as the TSP. Impacts to protected resources would be minimal due to the locations of the proposed seawalls only in locations with stable or accretional beaches
Water Quality	Pristine prior to development; increasing recreational usage and the development of the study's shoreline may have caused some decline in water quality over the past 30 years	Some degradation due to anthropogenic actions	No change to present condition; no known projects in the vicinity that would cause a decline in water quality	Temporary increases in local turbidity due to construction; no long-term change	Similar effects as the TSP. No additional impacts.	Similar Effects as the TSP. No additional impacts.	Similar effects as the TSP. No additional impacts.
Cultural Resources and Historic Properties	Cultural resources have been degraded or lost due to development, private collecting, erosion, and other factors.	Education and enforcement of relevant laws have helped conserve cultural resources.	Beach placement areas may continue to erode and adversely affect cultural resources outlined in Section 2.3.13. Other factors, such as sea level rise, may increase erosion	Sand placement using a combination of sand sources (proposed action) would have no effect on cultural resources. Anomalies of interest would be avoided or buffered, and additional	Similar effects as the TSP. Additional permanent impacts would occur to the seafloor in the area of the jetty expansion. A decrease would occur in erosion, subsidence, and overtopping of terrestrial resources in beach berm and dune with accretion of material	Similar effects as the TSP. Additional permanent impacts would occur to the seafloor in the area of the groins. A decrease would occur in erosion, subsidence, and overtopping of terrestrial	Similar effects as the TSP. No additional impacts.

	Past (baseline condition)	Present (existing condition)	Future Without Project	Future with Proposed Action Alternative 2: Beach Nourishment (TSP)	Future with Proposed Action Alternative 3: Beach Nourishment with Jetty Improvements	Future with Proposed Action Alternative 4: Beach Nourishment with Groins	Future with Proposed Action Alternative 5: Beach Nourishment with Seawalls/Floodwalls
			and impact some cultural resources.	surveys and consultation with the Florida SHPO and appropriate federally-recognized tribes may be required.	a protective measure for submerged cultural resources.	resources in beach berm and dune with accretion of material a protective measure for submerged cultural resources.	

	Past (baseline condition)	Present (existing condition)	Future Without Project	Future with Proposed Action Alternative 2: Beach Nourishment (TSP)	Future with Proposed Action Alternative 3: Beach Nourishment with Jetty Improvements	Future with Proposed Action Alternative 4: Beach Nourishment with Groins	Future with Proposed Action Alternative 5: Beach Nourishment with Seawalls/Floodwalls
Shorelines and Sand Resources (Egmont Shoal, Johns Pass, Blind Pass, Pass-a-Grille	Offshore sediments have been more abundant in the past; inlet sediments are used intermittently for placement on County beaches	Offshore sand resources are becoming depleted with use for beach placement and state sediment quality restrictions; ebb shoal and the Passes sediments are abundant as sediment accumulates from alongshore transport	Beaches may erode at a greater rate; material from navigational channels could be dredged for beach placement due to their generally renewable nature; seawalls may be required to protect upland structures	Beaches in the Focused Study Area would be wider with the placement of sediment; resources at the sand source locations would be temporarily impacted	Similar effects as the TSP, with slightly increased project footprint in the location of jetty expansions. Increased footprint would be a permanent loss to benthic resources in that location	Similar effects as the TSP, with slightly increased project footprint in the location of the groins. Increased footprint would be a permanent loss to benthic resources in that location	Similar effects as the TSP. Impacts to the adjacent beaches would be minimal due to the locations of the proposed seawalls only in locations with stable or accretional beaches
Protected Species	More abundant and widespread prior to development	Individuals of some species becoming increasingly rare; habitat shrinking; coastal species already impacted by sand placement activities; erosion can cause a decline in habitat	Beach habitat continues to shrink; no impact to hardbottom or seagrass resources; fisheries stocks and habitat may be impacted by anthropogenic activities	Individuals may be affected by dredging and placement activities; coastal habitat is sustained for life of project	Similar effects as the TSP, with additional impacts to turtles due to the attractant to forage on the jetty putting them at risk of boat strikes due to the close proximity to the navigation channel. Permanent impacts to benthic habitat. Minimal impacts to turtles and shorebirds due to the loss of the benthic habitat. Alternatively, the rock would provide additional shorebird foraging area.	Similar effects as the TSP, with additional impacts to nesting turtles and shorebirds due to the loss of the benthic habitats in the location of the groins and decreased access to the shoreline for nesting and hatchling turtles.	Similar effects as the TSP. Impacts to protected resources would be minimal due to the locations of the proposed seawalls only in locations with stable or accretional beaches
Water Quality	Pristine prior to development; increasing recreational usage and the development of the study's shoreline may have caused some decline in water quality over the past 30 years	Some degradation due to anthropogenic actions	No change to present condition; no known projects in the vicinity that would cause a decline in water quality	Temporary increases in local turbidity due to construction; no long-term change	Similar effects as the TSP. No additional impacts.	Similar Effects as the TSP. No additional impacts.	Similar effects as the TSP. No additional impacts.

	Past (baseline condition)	Present (existing condition)	Future Without Project	Future with Proposed Action Alternative 2: Beach Nourishment (TSP)	Future with Proposed Action Alternative 3: Beach Nourishment with Jetty Improvements	Future with Proposed Action Alternative 4: Beach Nourishment with Groins	Future with Proposed Action Alternative 5: Beach Nourishment with Seawalls/Floodwalls
Cultural Resources and Historic Properties	Cultural resources have been degraded or lost due to development, private collecting, erosion, and other factors.	Education and enforcement of relevant laws have helped conserve cultural resources.	Beach placement areas may continue to erode and adversely affect cultural resources outlined in Section 2.3.13. Other factors, such as sea level rise, may increase erosion and impact some cultural resources.	Sand placement using a combination of sand sources (proposed action) would have no effect on cultural resources. Anomalies of interest would be avoided or buffered, and additional surveys and consultation with the Florida SHPO and appropriate federally-recognized tribes may be required.	Similar effects as the TSP. Additional permanent impacts would occur to the seafloor in the area of the jetty expansion. A decrease would occur in erosion, subsidence, and overtopping of terrestrial resources in beach berm and dune with accretion of material a protective measure for submerged cultural resources.	Similar effects as the TSP. Additional permanent impacts would occur to the seafloor in the area of the groins. A decrease would occur in erosion, subsidence, and overtopping of terrestrial resources in beach berm and dune with accretion of material a protective measure for submerged cultural resources.	Similar effects as the TSP. No additional impacts.

5.4.1 Beach Nourishment

In addition to this current study, comparable beach nourishment projects with similar impacts include the existing Pinellas County, FL Beach Erosion Control (BEC) Project (discussed in detail in Section 1.5) and the Federal Manatee County, FL Shore Protection Project located to the south of Tampa Bay. The Sand Key segment of the existing Pinellas County, FL BEC project will continue to utilize the Clearwater Pass inlet and ebb shoal north of the island and the Egmont Shoal for its sand source. As discussed in Section 4.1.2, there is sufficient sediment available in Egmont Shoal to meet the needs of both the existing beach nourishment project that will continue at Sand Key and the needs of the current study at Treasure Island and Long Key. In addition, Egmont Shoal is expected to accrete material over time, which will add to the available sediment at this location for future projects.

5.4.2 Navigation Projects

The Tampa Harbor Federal Navigation Project is located on the west central coast of Florida in Tampa Bay and the adjacent Gulf of Mexico. The project is located in Pinellas and Hillsborough Counties, Florida. Maintenance dredging removes approximately 300kcy to 1mcy of shoaled materials from the Federal navigation channels annually. The entire harbor is dredging on a four to five year cycle where sections of the harbor are dredged each year. Port Tampa Bay conducts separate dredging of berthing areas as necessary. The sediment dredged from the channels is placed in different areas based on the location of dredging and the type of material that is being dredged. Silty material from the upper reaches of Tampa Bay is placed at islands constructed for this purpose and located in Hillsborough Bay in upper Tampa Bay known as Dredged Material Management Areas (DMMAs) 2-D and 3-D. Sandy material, which is typically located closer to the mouth of Tampa Bay, is typically placed on the beach at Egmont Key. In the past, material has also been used to restore holes dredged for development, placed in the nearshore of Egmont Key, and been placed on the beach at Mullet Key. Material dredged from expansion or deepening projects has also been placed at the Tampa Bay Ocean Dredged Material Disposal Site (ODMDS).

While the Tampa Harbor project has had a number of expansion and deepening projects since initial authorization, the most recent new construction associated with the project was the expansion of the Big Bend Channel in 2018-2019. This channel was expanded from the main shipping channel 10,200 feet east to connect with the irregularly shaped turning basin, and the turning basin was expanded to include a turning diameter of 1,200 feet. The dredged material from this expansion and maintenance dredging project was placed in DMMA 3-D, which is one of the two DMMAs associated with the Tampa Harbor Federal Navigation Project and located in Hillsborough Bay.

The St. Petersburg Harbor Federal Navigation Project is located in Pinellas and Hillsborough Counties, Florida. This project consists of an entrance channel 23 feet deep by 300 feet wide from Tampa Bay southwesterly and thence westerly along the south side of Port of St. Petersburg basin to Bayboro Harbor; a 24-foot depth in the port basin and in the area between the entrance channel and the Maritime Service south bulkhead; a channel 15 feet deep by 100 feet wide in Bayboro Harbor along southwesterly 300 feet of the Maritime Service bulkhead; a basin 12 feet deep by 700 -800 feet wide by 1,400 feet long in Bayboro Harbor; a channel 12 feet deep by 75 -300 feet wide in the mouth of Salt Creek; an entrance channel 20 feet deep by 200 feet wide extending northerly about 5.5 miles from deep water in lower Tampa Bay, and

thence a channel 19 feet deep by 250 feet wide leading westward to the 23-foot depth entrance channel. Dredged material is placed in approved dredged material management areas and other beneficial use sites, as well as placed nearshore on the beach of Egmont Key Fort De Soto/Mullet Key beach.

Congress authorized the Manatee Harbor Federal Navigation Project in the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662). Manatee Harbor extends from the main channel of Tampa Harbor, just north of the Sunshine Skyway, west to Port Manatee. Maintenance dredging of Manatee Harbor occurs approximately every two to three years, and the volume is typically between 250-500kcy. The material is typically placed at an upland disposal site.

The Anclote River Maintenance Dredging project extends from Tarpon Springs to the Gulf of Mexico and the turning basin is located adjacent to Tarpon Spring in Pinellas and Pasco Counties, Florida. For this project the dredged material is dewatered at a staging area near the Anclote River Channel, then used for upland construction fill, disposed of in an approved/permitted DMMA, and/or disposed in a licensed landfill.

5.4.3 Summary of Effects

There have been ongoing beach nourishment projects along this region of the Gulf Coast since the mid-1900s. Many of these projects have used offshore sand sources, which has increased the sediment available in the nearshore sediment environment. At the same time, material has been removed from the sediment system through the placement of navigation dredged materials in upland sites, “spoil” islands, or at the ODMDS. Using material from ebb shoals for beach placement helps to keep the system balanced with respect to sediment availability.

Dredging impacts to benthic resources and to water quality are temporary in nature. Turbidity in the water column at both the dredge and placement sites is elevated during construction, but quickly returns to background levels when construction ceases. Benthic invertebrates at both the dredging and placement sites typically recovers within three to six months. Construction at the Pinellas County, FL BEC segments (Sand Key, Treasure Island, and Long Key) typically occurs together, but these segments are occasionally constructed separately. Staggering construction allows for some non-impacted areas to be available to recolonize dredged areas following construction, and for recovery time of the benthic communities between construction events.

The navigation dredging of shallow-draft inlets in the project area either occurs in conjunction with the existing Pinellas County, FL BEC project or will occur with the current study to obtain sediment for placement on the beaches. Therefore, this type of dredging does not typically increase the impacts over what would occur in the project area. Navigation dredging of deep-draft harbors occurs in isolated spots throughout Tampa Bay, and does not have a significant increase in resource impacts due to the difference of resources associated with these areas in upper Tampa Bay compared to the impacts anticipated from the current study.

5.5 SEA LEVEL CHANGE

Supporting Engineering Regulation 1100-2-8162, Engineering Pamphlet (EP) 1100-2-1 recommends beginning a sea level rise evaluation by first understanding the strategic decision context, or "what's the decision to be made and how will a potential acceleration in sea level rise impact that decision." This section specifically describes the environmental effects of sea level change on the focused array of alternatives. Please refer to Section 2.4 for additional information on current rates of sea level rise in the project area and the effects of sea level change in the Future Without-Project Condition (also referred to as the No Action Alternative).

As discussed in Chapter 2, the Beach-fx model results show a small increase in damages between the base sea level curve and the intermediate curve, but a significant spike in damages between the intermediate and the high sea curves over the 50-year period of analysis. This is primarily due to the low-lying geography of the study area. The dunes (where present) are often the highest features on the islands, and both islands are vulnerable to flooding from the bay side during storm events in all of the sea level change scenarios. In circumstances when back bay flooding does not extend to the shorefront structures, all of the four action alternatives include beach nourishment, which will provide some level of protection from flooding. However, back bay flooding may cause a shorefront project to be ineffective in some locations during the 50-year period of analysis, especially if the rate of sea level rise is consistent with the high sea level change scenario, if further measures are not taken to protect infrastructure from the back bay risk.

5.5.1 Alternative 2: Beach Nourishment (TSP)

Berm Features

Constructed berms for this study will be tied to a tidal datum, which will rise with rising sea level to allow the base heights to be increased accordingly. Beach nourishment provides some level of protection from erosion due to rising seas if the berm is elevated to correspond to the rising MSL. It is not as effective in protecting against wave attack and flooding resulting from more frequent and intense storm events. The effects would be similar as described above during dredging of the Passes or Egmont Shoal for dune restoration/enhancement.

Dune Restoration/Enhancement

Constructed dunes will be tied to a tidal datum that will rise with rising sea level. Dunes will provide additional protection from wave attack and inundation during more frequent and intense storm events by protecting the infrastructure behind them.

5.5.2 Alternatives 3, 4, and 5

The engineering design of jetties, groins, or seawalls would be conducted following authorization, and the specifics of these features are not known at this time. However, they would be designed in consideration of sea level rise to ensure that they would be effective through the period of analysis in the high sea level change scenario.

5.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

5.6.1 Irreversible

An irreversible commitment of resources is one in which the ability to use and/or enjoy the resource is lost forever. One example of an irreversible commitment might be the mining of a mineral resource. The use of sand from the proposed sand sources would, for all practical purposes, irreversibly deplete the suitable sand reserves in the short-term. However, Egmont Shoal and the Passes proposed as sand sources for this study are self-renewing and are expected to reestablish following dredging. Therefore, no long-term irreversible commitment of resources is expected.

5.6.2 Irretrievable

An irretrievable commitment of resources is one in which, due to decisions to mandate the resource for another purpose, opportunities to use or enjoy the resources as they presently exist are lost for a period of time. An example of an irretrievable loss might be where a type of vegetation is lost due to road construction. As littoral drift restores the sand volumes in the ebb shoals over time, the Preferred Alternative would not result in an irretrievable commitment of resources.

5.6.3 Unavoidable Adverse Environmental Impacts

The Corps has completed numerous sand placement projects throughout the country, including past projects in Pinellas County and other counties along the Gulf Coast of Florida. Corps projects allow for adaptive management through extensive monitoring following placement. If monitoring shows any change in coastal dynamics from what was anticipated, future sand placement events can be modified to address any concerns.

CHAPTER 6: COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

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6 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS*

This chapter discusses the status of coordination and compliance of the Tentatively Selected Plan (TSP), which is also the NED Plan, with environmental requirements. Additionally, the TSP's applicability to the USACE environmental operating principles is addressed.

6.1 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (NEPA) (42 U.S.C. § 4321 *ET SEQ.*)

The report documents the effects of this study and serves as the Draft Environmental Assessment. It will be subject to public review and comment for a 30 day period. This public coordination of this integrated feasibility report and EA complies with the intent of NEPA. The project will be in compliance with the National Environmental Policy Act of 1969, as amended, 42 U.S.C. § 4321, *et seq*. (PL 91-190). This draft Feasibility Study and Environmental Assessment and the draft Finding of No Significant Impact (FONSI) will be made available to the public for a 30 day public comment period.

6.1.1 Scoping and Issues

An initial scoping period for the study was conducted from October 30, 2018 through November 29, 2018. On December 6, 2018, EPA responded to the scoping letter with technical comments and recommendations in regard to wetlands, water quality, groundwater and drinking water, transportation infrastructure, noise, air quality, environmental justice, recreation, socioeconomic, and green infrastructure. Assessments that are relative to this study are included in Sections 3.2 and 4.2 of this report for applicable project related issues.

All correspondence associated with the NEPA scoping process is included in Appendix H, Pertinent Correspondence.

This draft Feasibility Study and Environmental Assessment and the draft Finding of No Significant Impact (FONSI) will be made available to the public for a 30-day public comment period.

6.1.2 Agency Coordination and Cooperating Agencies

The FDEP, Bureau of Beaches and Coastal Systems and National Marine Fisheries Service (NMFS) have accepted USACE's invitations to participate as cooperating agencies in this study. Correspondence with all Federal and state agencies is included in Appendix H, Pertinent Correspondence.

6.1.3 List of Agency Recipients

A Notice of the Availability of the Draft EA and Draft FONSI will be mailed to those agencies listed in the Pertinent Correspondence Appendix. The document will also be available on USACE's website at: https://www.saj.usace.army.mil/About/Divisions-Offices/Planning/Environmental-Branch/Environmental-Documents/

6.1.4 Comments Received and Response

Comments received as a result of the public review of the draft EA will be addressed in the final NEPA document.

6.2 ENDANGERED SPECIES ACT OF 1973 (16 U.S.C. § 1531 *ET SEQ.*)

USACE has determined that sand placement activities may affect nesting sea turtles, and is not likely to adversely affect piping plover, rufa red knot, or manatees. The activities associated with the TSP fall within the scope of the USFWS Statewide Programmatic Biological Opinion (SPBO; USFWS, 2015) and the USFWS Piping Plover Programmatic Biological Opinion (P^3BO, 2013). USACE is coordinating with USFWS, and will finalize coordination prior to completing the NEPA process.

USACE has determined that beach nourishment using the inlet shoal complexes or Egmont Shoal may affect sea turtles in the water, and is not likely to adversely affect gulf sturgeon, whales, or the smalltooth sawfish. The terms and conditions of the NMFS Gulf of Mexico Regional Biological Opinion (GRBO) will be followed for these species (November 19, 2003; Revision No. 1, June 24, 2005; Revision No. 2, January 9, 2007). No additional coordination is required with NOAA Fisheries is required for these species.

Please see Table 6-1 for a summary of USACE's determinations of effect for the TSP pursuant to Endangered Species Act of 1973, as amended, 16 U.S.C. § 1531, *et seq*. (P.L. 93-205). This study is in compliance with this Act.

Table 6-1. Summary of Threatened and Endangered Species Determinations.

Common Name	Scientific Name	Status	Determination	Relevant Biological Opinion (if any)
Marine Mammals				
Florida manatee	*Trichechus manatus*	T	MANLAA	SPBO
Whales	Numerous		MANLAA	N/A
Sea Turtles				
Loggerhead sea turtle	*Caretta caretta*	T	MALAA	GRBO (Swimming Sea Turtles) SPBO (Nesting Sea Turtles)
Hawksbill sea turtle	*Eretmochelys imbricata*	E	MALAA	GRBO (Swimming Sea Turtles) SPBO (Nesting Sea Turtles)
Leatherback sea turtle	*Dermochelys coriacea*	E	MALAA	GRBO (Swimming Sea Turtles) SPBO (Nesting Sea Turtles)
Green sea turtle	*Chelonia mydas*	T	MALAA	GRBO (Swimming Sea Turtles) SPBO (Nesting Sea Turtles)
Kemp's ridley	*Lepidochelys kempii*	E	MALAA	GRBO (Swimming Sea Turtles) SPBO (Nesting Sea Turtles)

Fish				
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	MANLAA	GRBO
Smalltooth sawfish	*Pristis pectinata*	E	MANLAA	GRBO
Shorebirds				
Piping plover	*Charadrius melodus*	T	MANLAA	P3BO
Red knot	*Calidris canutus*	T	MANLAA	P3BO

GRBO: 2007 NOAA/NMFS Gulf Regional Biological Opinion (2003; Amended 9 January 2007)
SPBO: 2015 USFWS SPBO: Statewide Programmatic Biological Opinion (2011; Revised 2015)
P3BO: 2013 USFWS Piping Plover Programmatic Biological Opinion

6.3 FISH & WILDLIFE COORDINATION ACT OF 1958 (16 U.S.C. § 661 *ET SEQ.*)

This study has been coordinated with USFWS during the feasibility study process. A final Coordination Act Report will be submitted to USFWS. Additional coordination with the USFWS will be conducted as part of their review under the Endangered Species Act. Additionally, coordination is ongoing with NMFS. This study is in full compliance with the Act.

6.4 NATIONAL HISTORIC PRESERVATION ACT OF 1966 (INTER ALIA)

The aforementioned alternatives are in compliance with Section 106 of the NHPA, as amended. As part of the requirements and consultation process contained within the NHPA implementing regulations of 36 CFR 800, this project is also in compliance through ongoing consultation with the Archaeological and Historic Preservation Act, as amended (PL 93-291); Archaeological and Resources Protection Act (16 U.S.C. §§470aa-470mm; PL 96-95); American Indian Religious Freedom Act (PL 95-341); Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. §3001 *et seq.*) and its implementing regulations; Executive Orders (EO) 11593, 13007, and 13175; the Presidential Memo of 1994 on Government to Government Relations and appropriate Florida Statutes; and the Abandoned Shipwrecks Act (43 U.S.C. §§2101-2106). Consultation with the Florida SHPO, the Miccosukee Tribe of Indians of Florida, the Seminole Nation of Oklahoma, the Thlopthlocco Tribal Town and the Seminole Tribe of Florida was initiated in a letter dated April 10, 2020 (included in the Pertinent Correspondence Appendix). Consultation will be concluded prior to EA finalization. The proposed action shall be in compliance with the goals of this Act upon completion of coordination as stated above.

6.5 CLEAN WATER ACT OF 1972 (33 U.S.C. § 1251 *ET SEQ.*)

A Section 401 water quality certification 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. The study is in compliance with this Act.

6.6 CLEAN AIR ACT OF 1963 (42 U.S.C. § 7401 *ET SEQ.*)

The short-term impacts from construction equipment associated with the study would not significantly impact air quality. No air quality permits would be required for this project. Pinellas County is designated as an attainment area for federal air quality standards under the Clean Air Act. Because the study is located within an attainment area, USEPA's General Conformity Rule to implement Section 176(c) of the Clean Air Act does not apply and a conformity determination is not required.

6.7 COASTAL ZONE MANAGEMENT ACT OF 1972 (16 U.S.C. § 1451 *ET SEQ.*)

A Federal consistency determination in accordance with 15 CFR Part 930 Subpart C is included in this report as Appendix F. A federal consistency will be obtained from the State of Florida with the issuance of the Water Quality Certification prior to construction. USACE has determined that the study is consistent with the Florida Coastal Management Plan (FCMP) concerning acquisition of Water Quality Certifications and other state authorizations. The EA and Section 404 (b)(1) Evaluation will be submitted to the state in lieu of a summary of environmental effects to show consistency with the FCMP. This study will be in compliance with this Act.

6.8 FARMLAND PROTECTION POLICY ACT OF 1981 (7 U.S.C. § 4201 *ET SEQ.*)

No prime or unique farmland would be impacted by implementation of this project. This Act is not applicable to the study.

6.9 WILD AND SCENIC RIVER ACT OF 1968 (28 U.S.C. § 1271 *ET SEQ.*)

No designated Wild and Scenic river reaches would be affected by study related activities. This study is in compliance with this Act.

6.10 MARINE MAMMAL PROTECTION ACT OF 1972 (16 U.S.C. § 1361 *ET SEQ.*)

USACE does not anticipate the take of any marine mammal during any activities associated with the study. Should a hopper dredge be utilized, a trained, government-certified sea turtle and marine mammal observer will be stationed on the dredge during all water-related construction activities. Appropriate actions will be taken to avoid adverse effects to marine mammal species during project construction (see Section 4.3). Therefore, this study is in compliance with this Act.

6.11 ESTUARY PROTECTION ACT OF 1968 (16 U.S.C. §§1221-26)

In the Estuary Protection Act of 1968 (16 U.S.C. §§1221-26), Congress declared that "many estuaries in the United States are rich in a variety of natural, commercial, and other resources, including environmental natural beauty, and are of immediate and potential value to the present and future

generations of Americans." This Act is intended to protect, conserve, and restore estuaries in balance with developing them to further the growth and development of the Nation. USACE has considered the importance of estuaries in its planning, and there will be no long-term effects to the Tampa Bay ecosystem. This study is consistent with the purposes of this Act.

6.12 FEDERAL WATER PROJECT RECREATION ACT (16 U.S.C. § 460L-12 *ET SEQ.*)

Methods for determining Federal interest in a CSRM project are outlined in ER 1105-2-100. The legislative basis for Federal participation in recreation development is found in the Flood Control Act of 1944, as amended, the Federal Water Project Recreation Act of 1965 (Public Law 89-72), and the Water Resources Development Act of 1986 (Public Law 99-662). These give broad authority to include recreation as a project purpose.

As recreation is a low priority output, USACE does not plan for (formulate for) single purpose recreation unless a sponsor is willing to pay one hundred percent of the associated implementation costs. USACE will plan for and implement projects serving other purposes (e.g., coastal storm risk management), and these may have incidental recreation benefits. Benefits are incidental when: (1) a project is formulated for other primary purposes and recreation benefits are less than 50 percent of total benefits; or (2) a project is formulated for other primary purposes and average annual recreation benefits are less than 50% of the average annual benefits required for justification. This is equivalent to saying the recreation benefits, which are required for justification, must be less than an amount equal to 50% of project costs. There may be additional recreation benefits if they are not required for justification.

The current study is consistent with the guidance in ER 1105-2-100. The primary project purpose is coastal storm risk management, and the project is justified based on this purpose. Recreation benefits account for less than 50 percent of the total project benefits required for justification. This project is in compliance with this Act.

6.13 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976 (16 U.S.C. § 801 *ET SEQ.*)

Pursuant to the 1999 Finding between USACE and NMFS, USACE's Notice of Availability of this EA initiates USACE's consultation under the Magnuson-Stevens Fishery Conservation and Management Act. The EFH assessment is included in the integrated report as Section 5.2.4. Existing conditions and the "No Action," or Future Without-Project condition, are located in Section 2.3.4. The study is in compliance with the Act.

6.14 SUBMERGED LANDS ACT OF 1953 (43 U.S.C. § 1312 *ET SEQ.*)

The study would occur on submerged lands of the State of Florida. The study is being coordinated with the State and will be in compliance with the Act.

6.15 COASTAL BARRIER RESOURCES ACT AND COASTAL BARRIER IMPROVEMENT ACT (16 U.S.C. § 3501 *ET SEQ.*)

The CBRA and 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. CBIA 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.

Federal monies can be spent within the CBRA units for certain activities, including (1) projects for the study, management, protection, and enhancement of fish and wildlife resources and habitats; (2) establishment of navigation aids; (3) projects funded under the Land and Water Conservation Fund Act of 1965; (4) scientific research; (5) assistance for emergency actions essential to saving lives and the protection of property and the public health and safety, if preferred pursuant to the Disaster Relief Emergency Assistance Act and the National Flood Insurance Act and are necessary to alleviate the emergency; (6) maintenance, repair, or reconstruction, but not expansion, of publically owned or publically operated roads, structures, or facilities; (7) nonstructural projects for shoreline stabilization that are designed to mimic, enhance, or restore a natural stabilization system; (8) any use or facility necessary for the exploration, extraction, or transportation of energy resources; (9) maintenance or construction of improvements of existing federal navigation channels, including the disposal of dredge materials related to such projects; and (10) military activities essential to national security.

There are two CBIA OPAs in the study vicinity (see Sections 2.3.5 and 5.2.5). Egmont Shoal is located in Mullet Key, P24P (an Otherwise Protected Area); however, dredging is not prohibited in Otherwise Protected Areas. USACE is coordinating with the USFWS concerning the CBIA units in the study area, and will confirm that the study is in compliance with the Act prior to project construction.

6.16 RIVERS AND HARBORS ACT OF 1899 (33 U.S.C. § 401 *ET SEQ.*)

The proposed work would temporarily obstruct navigable waters of the United States. The proposed action was subject to the public notice, public hearing, and other evaluations normally conducted for activities subject to the Act. The study is in compliance with this Act.

6.17 ANADROMOUS FISH CONSERVATION ACT (16 U.S.C. §§ 757A-757G)

This Act authorizes the Secretaries of the Interior and Commerce to enter into cooperative agreements with the States and other non-Federal interests for conservation, development, and enhancement of anadromous fish and to contribute up to 50 percent as the Federal share of the cost of carrying out such agreements. As this study is not receiving funding for these purposes, this Act does not apply.

6.18 MIGRATORY BIRD TREATY ACT (16 U.S.C. §§ 703-712) AND MIGRATORY BIRD CONSERVATION ACT (16 U.S.C. §§ 715-715D, 715E, 715F-715R)

Migratory birds would be minimally affected by dredging at the proposed sand source locations. Temporary displacement of shorebirds utilizing the sand placement area would also occur. 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. Nourishment 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 (see also Sections 2.4.2.1 and 4.2.2). The study is in compliance with these Acts.

6.19 MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT (OCEAN DUMPING ACT) (33 U.S.C. § 1401 *ET SEQ.*)

The term "dumping" as defined in the Act (33 U.S.C. § 1402) 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 Act does not apply to this study. The disposal activities addressed in this EA have been evaluated under Section 404 of the Clean Water Act (see Appendix G).

6.20 UNIFORM RELOCATION ASSISTANCE AND REAL PROPERTY ACQUISITION POLICIES ACT OF 1970 (42 U.S.C. § 4601 *ET SEQ.*)

The purpose of 42 U.S.C. § 4601 et seq. (PL 91-646) is to ensure that owners of real property to be acquired for Federal and Federally-assisted projects are treated fairly and consistently, and that persons displaced as a direct result of such acquisition will not suffer disproportionate injuries as a result of projects designed for the benefit of the public as a whole. The sponsor will be responsible for acquiring lands necessary for construction, including staging and access areas. Therefore, the project will be in compliance with this Act.

6.21 EXECUTIVE ORDER (E.O.) 11990, PROTECTION OF WETLANDS

No wetlands would be affected by project activities. This study is in compliance with the goals of this E.O.

6.22 E.O. 11988, FLOOD PLAIN MANAGEMENT

To comply with E.O. 11988, the policy of USACE is to formulate projects that, to the extent possible, avoid or minimize adverse effects associated with the use of the floodplain and avoid inducing development in the floodplain unless there is no practicable alternative. No activities associated with this study are located within a floodplain, which is defined by E.O. 11988 as an “area which has a one percent or greater

chance of flooding in any given year." The study's shoreline is significantly developed, and further development is unlikely.

Beach erosion control projects are inherently located in coastal areas, and are often located in Coastal High Hazard Areas (CHHA) based on the problems the study is seeking to alleviate. The primary objective of the this study is to reduce infrastructure damage. There is no practicable alternative that could be located outside of the CHHA that would achieve this objective. In fact, the need for protection of the infrastructure located along this CHHA shoreline is the reason it was authorized by Congress.

For the reasons stated above, the study is in compliance with E.O. 11988, Floodplain Management.

6.23 E.O. 12898, ENVIRONMENTAL JUSTICE

On February 11, 1994, the President of the U.S. issued E.O. 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. This E.O. mandates that each Federal agency make environmental justice (EJ) 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. Significance thresholds that may be used to evaluate the effects of a proposed action related to EJ are not specifically outlined. However, Council on Environmental Quality (CEQ) guidance requires an evaluation of a proposed action's effect on the human environment and the Corps must comply with Executive Order 12898. USACE has determined that a proposed action or its alternatives would result in significant effects related to EJ if the proposed action or an alternative would disproportionately adversely affect an EJ community through its effects on:

- Environmental conditions such as quality of air, water, and other environmental media; degradation of aesthetics: loss of open space: and nuisance concerns such as odor, noise, and dust;
- Human health such as exposure of EJ populations to pathogens;
- Public welfare in terms of social conditions such as reduced access to certain amenities like hospitals, safe drinking water, public transportation, etc.; and
- Public welfare in terms of economic conditions such as changes in employment, income, and the cost of housing, etc.

USACE conducted an evaluation of EJ impacts using a two-step process: as a first step, the study area was evaluated to determine whether it contains a concentration of minority and/or low-income populations. The second step includes evaluation to determine whether the proposed action would result in a disproportionately, high adverse effect on these populations.

As defined in E.O. 12898 and the CEQ guidance, a minority population occurs where one or both of the following conditions are met within a given geographic area:

- The American Indian, Alaskan Native, Asian, Pacific Islander, Black, or Hispanic population of the affected area exceeds 50 percent; or

- The minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

An affected geographic area is considered to consist of a low-income population (i.e., below the poverty level for purposes of this analysis) where the percentage of low-income persons:

- is at least 50 percent of the total population; or
- is meaningfully greater than the low-income population percentage in the general population or other appropriate unit of geographic analysis.

Step 1: Study Area's Minority and Low-Income Population Average Percentages

Table 6-23. USEPA EJAssist environmental justice criteria percentages

	User-Defined Project Area %	Florida State Average %
Minority Population	9%	45%
Low Income Population	24%	36%

Using the USEPA EJAssist Tool, the project areas were identified for each of the two study areas and the average percentage for the EJ criteria were compared to the State of Florida's average percentage. Based on this comparison, the EJAssist tool did not identify minority and low-income populations in the two study areas. The population percentages for the two study areas are below 50 percent, indicating they do not contain a high concentration of minority and low-income population.

Since these two study areas do not contain a concentration of minority and/or low-income populations such that it would result in a disproportionate, high adverse effect on these populations, Step 2 is not incorporated.

In summary, the proposed actions would not use methods or practices that discriminate on the basis of race, color, or national origin and would not have a disproportionate effect on minority or low-income communities.

6.24 E.O. 13045, PROTECTION OF CHILDREN FROM ENVIRONMENTAL HEALTH RISKS AND SAFETY RISKS

On April 21, 1997, the President of the United States issued E.O. 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. The E.O. 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.

6.25 E.O. 13089, CORAL REEF PROTECTION

No corals exist within the study area. Hardbottom habitats are discussed in Sections 2.3.4 and 5.2.4. This study is in compliance with this Act.

6.26 E.O. 13112, INVASIVE SPECIES

The proposed action will require the mobilization of dredge equipment from other geographical regions. Dredge equipment has the potential to transport species from one region to another, introducing them to new habitats where they are able to out-compete native species. However, the action takes place primarily in Gulf waters, minimizing risk to more sheltered coastal habitats. The Project's plans and specifications will include conditions to avoid the introduction and/or promotion of non-native species to the region. USACE will require the Contractor to abide by those requirements. The project complies with this Order.

6.27 E.O. 13186, RESPONSIBILITIES OF FEDERAL AGENCIES TO PROTECT MIGRATORY BIRDS

This E.O. requires, among other things, a Memorandum of Understanding (MOU) between the Federal Agency and the USFWS 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 USACE. For many USACE civil works projects, the real estate interests are provided by the non-Federal sponsor. Control and ownership of the study lands remain with a non-Federal interest. Measures to avoid the destruction of migratory birds and their eggs or hatchlings are described in a section above on the MBTA.

6.28 E.O. 13547, STEWARDSHIP OF THE OCEANS, OUR COASTS AND THE GREAT LAKES

On July 19, 2010, the President of the United States issued E.O. 13547, Stewardship of the Ocean, Our Coasts, and the Great Lakes. This E.O. mandates that each federal agency make it a high priority to achieve an America whose stewardship ensures that the ocean, our coasts, and the Great Lakes are healthy and resilient, safe and productive, and understood and treasured so as to promote the well-being, prosperity, and security of present and future generations.

The proposed action incorporates the priorities mandated in E.O. 13547.

6.29 ENVIRONMENTAL OPERATING PRINCIPLES

The USACE Environmental Operating Principles (EOPs) were developed to ensure that USACE missions include totally integrated sustainable environmental practices. The EOPs provided corporate direction to ensure the workforce recognized USACE's role in, and responsibility for, sustainable use, stewardship, and restoration of natural resources across the Nation and, through the international reach of its support missions.

Since the EOPs were introduced in 2002 they have instilled environmental stewardship across business practices from recycling and reduced energy use at USACE and customer facilities to a fuller consideration of the environmental impacts of USACE actions and meaningful collaboration within the larger environmental community.

The re-energized Environmental Operating Principles are listed below, along with a description of how the study has implemented each principle:

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

The study prioritizes the use of material from the shoal complex and the passes that is already in the sediment system. This prevents the need from dredging offshore, previously undisturbed sediments, including Egmont Shoal.

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

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

3. Create mutually supporting economic and environmentally sustainable solutions.

The use of the shoal complex and the passes in the study incorporates RSM strategies, 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 study 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 activites.

The actions taken to involve the public, resource agencies, and NGOs that may be interested in the project are outlined in Section 6.1.

6.30 USACE GUIDANCE

6.30.1 Planning Bulletin 2019-04: Incorporating Life Safety into Flood and Coastal Storm Risk Management Studies

This guidance was issued on June 20, 2019, and applies to all coastal storm risk management feasibility studies. It requires the Project Delivery Team (PDT) to identify potential risks to life safety in the problems, opportunities, or objectives early in the study and document them in the decision document. While it is generally assumed that residents will evacuate during a hurricane or severe storm event as required by local authorities, this project does ensure the continued protection of the north-south evacuation route (SR699) through the project area.

CHAPTER 7

RECOMMENDATIONS

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7 RECOMMENDATIONS

NOTE: This report describes existing conditions in the study area, future conditions if a project is not constructed (the "No Action" alternative), problems that a project would address, and opportunities available to manage coastal risk. This report also describes plan formulation, including environmental considerations, to reach a Tentatively Selected Plan (TSP). The document will be updated per comments received during public and agency reviews, and the TSP could be modified. There will be additional review prior to the report being made "final," and information will be added to the report as the TSP is developed into a Recommended Plan.

The Recommended Plan has not yet been identified. This section will be completed for the final version of the report.

7.1 DRAFT 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 provide the following non-federal responsibilities:

a. Provide 35% of design and initial construction costs assigned to coastal storm risk management plus 100% of the costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits; and 50% of periodic nourishment costs assigned to hurricane and storm damage reduction, plus 100% of periodic nourishment costs assigned to protecting areas within the CBRS when such costs are not excepted from the CBRA's limitation on federal expenditures and 100% of costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits and as further specified below:

    1) Provide, during design, 35 percent of design costs;

    2) Provide all lands, easements, and rights-of-way, perform or ensure the performance of any relocations, and provide all relocation assistance determined by the federal government to be necessary for the initial construction, periodic nourishment, and operation and maintenance of the project, all in compliance with applicable provisions of the Uniform Relocation and Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. 4601- 4655) and the regulations contained in 49 CPR Part 24.;

    3) Pay, during construction, any additional amounts necessary to make its contribution equal to 35% of initial project costs assigned to hurricane and storm damage reduction, plus 100% of initial project costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits; and 50% of periodic nourishment costs assigned to hurricane and storm damage reduction, plus 100% of periodic nourishment costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits;

b. Operate, maintain, and repair the completed project, or functional 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 laws and regulations, and any specific directions prescribed by the federal government;

c. 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 projects, except for damages due to the fault or negligence of the United States or its contractors;

d. 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), Public Law 96-510, as amended, 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the federal government determines to be required for the initial construction, periodic nourishment, operation, and maintenance of the project. However, for lands that the federal government determines to be subject to the navigation servitude, only the federal government shall perform such investigations unless the federal government provides the non-federal sponsor with prior specific written direction, in which case the non-federal sponsor shall perform such investigations in accordance with such written direction;

e. Assume, as between the federal government and the non-federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located 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, or maintenance of the project;

f. 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, and repair the project in a manner that will not cause liability to arise under CERCLA;

g. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might reduce the level of protection the project affords, hinder operation and maintenance of the project, or interfere with the project's proper function;

h. Inform affected interests, at least annually, of the extent of risk reduction afforded by the project; participate in and comply with applicable federal floodplain management and flood insurance programs; comply with Section 402 of WRDA 1986, as amended (33 U.S.C. 70lb-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 the project;

i. For shores; other than federal shores, protected using federal funds, ensure continued conditions of public use of such shores compatible with the authorized purpose of the project;

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

k. At least annually, and after storm events, perform surveillance of the project, at no cost to the government, to determine losses of material and provide the results of such surveillance to the federal government.

CHAPTER 8

LIST OF PREPARERS

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8 LIST OF PREPARERS*

8.1 PREPARERS

This Feasibility Study with integrated Draft Environmental Assessment was prepared by the following U.S. Army Corps of Engineers personnel:

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8.2 REVIEWERS

This report was reviewed by the following personnel:

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CHAPTER 9

REFERENCES AND INDEX

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9 REFERENCES AND INDEX*

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