Draft Environmental Assessment

Bathtub Beach Restoration Project

October 2008

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1.0 PROJECT PURPOSE AND NEED

1.1 Project Authority

Martin County and the State of Florida provide project sponsorship. These entities have authorized the design and permitting phase services for the Bathtub Beach Restoration Project based on the closure of Bathtub Beach County Park due to erosion.

1.2 Project Location

The Martin County Atlantic coastline is located in the southeastern section of Florida with the Indian River Lagoon to the west, the Atlantic Ocean to the east, St. Lucie Inlet to the south, and St. Lucie County to the north. The Bathtub Beach proposed project area extends approximately 1,250 ft along the Atlantic coastline in central Martin County on Hutchinson Island. The proposed 1,250 ft long beach restoration project spans Florida Department of Environmental Protection [FDEP] monuments R-34.5 to R-36.

1.3 Project Need or Opportunity

Bathtub Beach experiences extreme changes in beach width over short time periods. Recent storms have eroded the beach at Bathtub Beach County Park, causing the closuring of the park and loss of park structures. Additional erosion could lead to complete loss of the Park and MacArthur Boulevard. To date, Martin County has reacted to each erosion emergency on an individual basis. The County now seeks a permit to provide a plan for the as-needed protection of infrastructure after erosion events. This approach will provide those concerned with Bathtub Beach and Bathtub Beach Reef (the County, the public and regulatory agencies) with an appropriate long-term solution that considers the best balance of protecting essential structures and protecting natural resources.

The proposed beach restoration project is a protective measure that reduces the risk of storm damage to upland property. The beach also provides recreational opportunities to the public, promotes tourism, increases revenue to local businesses, and provides environmental habitat to marine, terrestrial wildlife and shorebirds.

1.4 Agency Goal or Objective

The objectives of the proposed beach restoration and dune management project are to increase the storm protection function of the beach and restore the recreational capacity of the beach.

1.5 Related Environmental Documents

Related design and planning documents of the project area include the following:

- MSA 434/434C Offloading and Beach Placement Emergency Dune Restoration in South Volusia County, Florida, Taylor Engineering Inc., 2005

1.6 Pending Decision

The decision under consideration relates to restoring the eroded beach and dune systems.

1.7 Scoping and Issues

1.7.1 Issues Evaluated in Detail

This Environmental Assessment (EA) considers the following issues related to the proposed action:

a. Vegetation
b. Threatened and Endangered Species
c. Hard bottom
d. Fish and Wildlife Resources
e. Essential Fish Habitat
f. Water Quality
g. Hazardous, Toxic, and Radioactive Wastes
h. Air Quality
i. Noise
j. Aesthetic Resources

k. Recreation Resources

l. Navigation

m. Historic Properties

1.7.2 Impact Measurement

This EA provides the means and rationale to measure and compare impacts for the alternatives.

1.7.3 Issues Eliminated from Detail Analysis

The proposed action should not affect the following issues:

a. Energy Requirements and Conservation

b. Scientific Resources

c. Native Americans

d. Reuse and Conservation Potential

e. Urban Quality

f. Solid Waste

g. Drinking Water

1.8 Permits, Licenses, and Entitlements

The Florida Department of Environmental Protection (FDEP) and the U.S. Army Corps of Engineers (USACE) must issue environmental permits to allow the proposed action.

2.0 ALTERNATIVES

This section presents a detailed discussion of the considered management alternatives.

2.1 Description of Alternatives

This section discusses possible beach management alternatives for the project area.

2.1.1 No Action Alternative

The No Action alternative allows nature to take its course, i.e., storms will continue to erode the beach and further threaten or destroy upland development.

2.1.2 Beach and Dune Management

The 1,250 ft project area lies approximately 300 ft south of FDEP monument R-34 and extends south to approximately 200 ft north of monument R-36 in Martin County. The proposed project includes a dune restoration that varies slightly in design throughout the project area. The template for the dune fill design extends from R-35F at the south end of the project area to R-34C at the north end. With the exception of R-34C, R-34D, and R-34E at the northern end of the project area, the design parameters are as follows:

- 1V:5H construction slope from seaward edge of parking lot (assumed 6 ft-NAVD elevation) to dune crest
- Dune Elevation: 12 ft-NAVD (R-35E to R-35F), 11 ft-NAVD (R-35A to R-35C), 10 ft-NAVD (R-34G)
- Dune width: varies
- 1V:5H construction slope from seaward edge of dune crest to 6 ft-NAVD elevation
- 1V:10H construction slope from 6 ft-NAVD elevation to construction toe of fill at 150 ft range from baseline

The exceptions to the given template occurred at the northern end of the project area at R-34C, R-34D, and R-34E. The template at R-34C begins at the existing 6 ft-NAVD contour and extends seaward at that elevation until it slopes down at 1V:3H to the existing mean high water (MHW) location. The template at R-34D also begins at the existing 6 ft-NAVD contour and extends seaward at that elevation until it slopes down at 1V:10H to the existing MHW location. At R-34E, the template consists of a 1V:5H construction slope from the seaward edge of the parking lot to a 6 ft-NAVD dune elevation. At the seaward crest of the dune, the template then slopes down at 1V:10H to the location of the 150 ft range from the baseline. The seaward slope of the construction profile (1V:10H) approximates the native beach slope. The construction profile should experience minimal adjustment after placement and the equilibrium profile will match the construction profile. The project also includes planting appropriate vegetation along the dune crest and dune face.

In total, the dune restoration project consists of placing just over 25,000 cy of sand over the 1,250 ft of beach length. The dune restoration will provide the as-needed protection of infrastructure from future erosion events.

The proposed borrow area is located off on the flood shoal west of the St. Lucie Inlet. Geotechnical data show there are two sections of the borrow area that may be used as beach fill material. The northeastern 36 acres of the shoal contains suitable material to a depth of -8.6 ft NAVD. The southeastern 18 acres contains suitable material to a depth of -4.8 ft NAVD.

2.1.3 Dune Management

Dune management entails the enhancement of the existing dune remnants via the construction of a sand dune and the planting of vegetation.

2.2 Issues and Basis for Choice

This EA compares formulated restoration alternatives to the existing conditions of each characteristic area. Section 1.7 lists the issues that provided the foundation for this comparison. The basis for choosing the preferred alternative included storm protection and recreational benefits. Presently, numerous shorefront structures (including a county park, public beach access facilities, vacation rental properties, private residence and roads) lack adequate storm protection. In addition, local residents and visitors appreciate Bathtub Beach because of a shallow beach area with nearshore and offshore reefs good for snorkeling and diving. When exposed at low tide, the rocky reef creates a protected tidal pool

providing close-up views of marine life. The county park and reef areas produce revenue from tourism for Martin County.

2.3 Preferred Alternative

The Preferred Alternative, as discussed in Section 2.1.2, includes 1,250 ft of beach and dune restoration from FDEP reference monuments R-34.5 to R-36 and dredging of the proposed offshore borrow area.

2.4 Alternatives Eliminated from Detailed Evaluation

2.4.1 Dune Management

Given the presently eroded beach conditions, dune management alone is not a viable alternative. Taylor Engineering does not expect a dune feature itself to survive for any reasonable period (one or two storm seasons). However, the alternative combined with other shore protection measures warrants consideration.

2.5 Alternatives Not Within Jurisdiction of Lead Agency

This study only considers alternatives within the jurisdiction of the project sponsors.

2.6 Comparison of Alternatives

Table 2.1 lists the alternatives and summarizes the major features and effects of each alternative. Chapter 4 provides a more detailed discussion of impacts of alternatives.

2.7 Mitigation

The proposed action would not adversely affect the natural resources in the project area; therefore, the project does not require mitigation.

Table 2.1 Summary of Direct and Indirect Impacts

Environmental Factor	Alternative	
	No Action	**Proposed Action, Beach and Dune Management**
Vegetation	Continued loss of vegetated dune	Enhancement of dune remnants via sand dune construction and planting of vegetation
Threatened or Endangered Species	Continued loss of beach habitat for nesting marine turtles.	No impact to marine turtles if construction occurs outside of nesting season. Possible impact if construction occurs during nesting season. Increase in beach width for additional nesting habitat.
Hard bottom	No impact	No impact
Fish and Wildlife Resources	Continued loss of beach habitat	Temporary impact to benthic infaunal communities within borrow and beach fill area
Essential Fish Habitat	No impact	Temporary, localized increase in turbidity during construction and disruption of benthic communities
Coastal Barrier Resources	No impact	No impact
Water Quality	No impact	Temporary, localized increase in turbidity during construction
Hazardous, Toxic, and Radioactive Waste	No impact	No impact
Air Quality	No impact	Minor, temporary effects due to presence of construction equipment
Noise	No impact	Minor, temporary effects due to presence of construction equipment
Aesthetic Resources	Continued loss of beach width and natural habitat.	Restored beaches and dunes would help re-establish the natural appearance. Temporary reduction in aesthetics during construction.
Recreation Resources	Less dry beach width for recreational activities	Restored beaches would allow for the park to reopen and continued recreational activities; temporary effect due to presence of construction equipment
Navigation	No impact	Temporary effects during construction because of dredging operations
Historic Properties	No impact	To Be Determined

3.0 AFFECTED ENVIRONMENT

3.1 General Environmental Setting

This section discusses the environmental setting characterizing the project area. It includes a discussion of the tides, waves, winds, and native and borrow area sediment characteristics.

3.1.1 Tides

The Land Boundary Information System (LABINS) provided tidal data for Bathtub Beach. The LABINS database contains a mean high water (MHW) elevation, referenced to NAVD, in close proximity to the project area. The MHW elevation is 0.50 ft-NAVD in the Bathtub Beach area of Martin County.

Dean and Chiu (1984) developed peak storm tide values for various return period storms. They combined historical hurricane statistics with a set of numerical models to simulate the storm surge throughout Martin County for 10-, 20-, 50-, and 100-year return period storms. The storm tide values, shown in Table 3.1, include components of astronomical tide, wind stress barometric pressure, and dynamic wave set-up.

Table 3.1 Storm Tide Values for Various Return Period Storms

Return Period (years)	**Storm Tide (ft-NGVD)**
	Northern Martin County
10	7.5
20	9.5
50	11.1
100	11.9

3.1.2 Waves

Waves provide important sediment transport mechanisms along the coast of Martin County. Waves, primarily driven by local wind patterns, transport sand cross-shore (approximately east-west) and longshore (approximately north-south) within the subaqueous regions. Winds provide the primary wave-generating mechanism and directly transport sand on and off the dry beach. Thus, knowledge of the nearshore wave and wind climate becomes necessary to ascertain the forces acting on the beach.

The U.S. Army Corps of Engineers (USACE) Wave Information Study (WIS) provides a 20-year wave hindcast dataset at select locations along the Atlantic Coast. Wave hindcast data, reported hourly, includes wave height, wave period, wave direction, wind speed, and wind direction. Dataset availability includes a 20-year period from 1980 to 1999. To characterize the nearshore wave and wind climate along the study area, Taylor Engineering used the WIS station closest to the study area, station 454 (27.17°N, 80.00°W), which is at a depth of about 206.7 ft.

Independent of wave direction, the mean wave height and periods of about 3.6 ft and 6.3 sec characterize the wave climate for the period between 1980 and 1999 at WIS station 454. On average, higher wave heights occur during the winter months (storm season) and smaller wave heights occur during the summer months. However, absolute maximum wave heights indicate that extreme wave heights, associated with hurricanes and tropical storms, can occur during the summer months between July and October.

3.1.3 Winds

Winds provide the primary wave-generating mechanism and directly transport sand on and off the dry beach. Winds blow from a wide variety of directions with easterly winds accounting for the highest percentage of time (12%). Overall, winds at WIS station 454 blow less than 25 mph approximately 98% of the time and less than 20 mph approximately 92% of the time.

3.1.4 Native Beach Sediment Characteristics

For the native sand characteristics, Gahagan and Bryant Associates INC. (GBA) compiled data from the Dr. Robert Dean, the United States Army Corp of Engineers (USACE) and Applied Technology and Management INC (ATM). The following sections describe the native beach sediment characteristics including size, composition, and color.

3.1.4.1 Average Grain Size and Composition

The average grain size from the Dr. Dean's analysis is 0.34 mm while the USACE's analysis showed a mean of 0.35 mm. ATM analyzed sand from Hutchinson Island and found that the grain sizes ranged from 0.32 mm to 0.54 mm. The USACE report found that the beach sand consisted of shell material (GBA, 2008).

3.1.4.2 Color

The GBA report notes that the native Hutchinson Island sand is grayish colored material (GBA, 2008).

3.1.5 St. Lucie Inlet Flood Shoal Borrow Area Sediment Characteristics

The proposed borrow area is the flood shoal in the St. Lucie Inlet near the project. The flood shoal provided material for previous beach restoration projects. To analyze the sediment, 23 vibracores with depths ranging from 4.5- to 18.2-ft were collected in the borrow area. As discussed in the sections below, the analysis of the samples included size and composition, color and compatibility.

3.1.5.1 Average Grain Size and Composition

The borrow area vibracore samples show an average grain size of 0.52 mm. The majority of the sampled material appears to be fine-grained quartz sand. The vibracores show the borrow material is 1.1% organic material, 54.0% carbonate and 44.9% siliciclastic grains. The high carbonate content is due to the large amount of shell and eroded reef material within the borrow sediment (GBA, 2008).

3.1.5.2 Color

Sand samples, obtained from various depths in the core borings, were used to determine if the borrow sand color is compatible with the native beach sand. Based on the Munsell Color palate, the color analysis classified the borrow material as 10YR 6/2 (light brownish gray). Since the sediment is similar in grain size and color to the native material, the borrow area material appears to be compatible with the native beach sand (GBA, 2008).

3.1.5.3 Compatibility with Native Beach

The quantitative compatibility (size and composition) of borrow area sediments with native beach sediments is generally expressed in terms of adjustment or overfill factor. The volume of material required to produce a unit volume of stable beach with the same grain size distribution as the native beach defines the overfill factor. For the borrow area material, the overfill analysis produced a factor of 1.1 which means that for every 1.0 cy of beach material lost,1.1 cy of material is required to replace it (GBA, 2008).

3.2 Vegetation

The erosion has destroyed the majority of the coastal sand dune/beach communities in the project area. Currently the sparse dune area on the beach consists of Seagrapes (*Coccoloba uvifera*). The

proposed constructed dune area will include planting sea oats (*Uniola paniculata*) to provide stabilization and promote natural dune growth, beach morning glory (*Ipomoea imperati*), railroad vine (*Ipomoea pes-caprae*), bitter panicgrass (*Panicum amarum*), dune sunflower (*Helianthus debilis*), seashore dropseed (*Sporobolus virginicus*), seashore elder (Iva imbricate) and sea rocket (*Cakile edentula*). The construction of the dune area will create additional habitat.

3.3 Threatened and Endangered Species

3.3.1 Marine Turtles

Florida's Atlantic coast beaches provide nesting grounds for federally listed (threatened and endangered) marine turtles. Marine turtle nesting season in this area spans from May 1 through October 31. The threatened Atlantic loggerhead turtle (*Caretta caretta*), the endangered green turtle (*Chelonia m. mydas*) and the endangered leatherback (*Dermochelys coriacea*) regularly nest on the beaches of Martin County. The endangered Kemp's ridley (*Lepidochelys kempi*) and hawksbill (*Eretmochelys imbricata*) sea turtles may also occasionally nest on east coast Florida's beaches. Table 3.2 shows average nesting occurrences for the loggerhead, green, and leatherback turtles within Bathtub Beach from 1998 to 2007.

Table 3.2 Marine Turtle Nesting Occurrences for Bathtub Beach

Year	Observed Beach Length (mi)	Loggerhead	Green	Leatherback
1998	.48	144	8	0
1999	.48	137	1	2
2000	.48	109	1	2
2001	.62	98	4	2
2002	.48	79	3	1
2003	.25	23	0	0
2004	.25	10	0	0
2005	.25	25	0	0
2006	.25	26	0	0
2007	.25	15	0	0

Source: Ecological Associates Inc, 2008

Marine turtles nest in high densities on the east coast of Florida especially in Martin County. Currently, at Bathtub Beach minimal nesting habitat exists. The beach restoration will increase the width of the beach and provides more nesting habitat.

3.3.2 Piping Plover

The piping plover (*Charadrius melodus*), a state- and federally-listed threatened species, generally nests well to the north of Florida but winters in different areas of the state, including the Atlantic coast. Piping plovers migrate south to Florida as early as late July and remain as late as early April. The piping plover nests above the high tide line on coastal beaches, sand flats at the end of sand spits or barrier islands, gently sloping foreshores, and areas behind primary dunes. Piping plovers nest in areas consisting of fine-grained sands to mixtures of sand and pebbles, shells, or cobble. Piping plovers primarily feed within the intertidal zone on invertebrates such as marine worms, insect larvae, crustaceans, and mollusks (Atlantic Coast Piping Plover Recovery Team, 1995). Piping plover foraging and resting habitat may occur within the project area.

3.3.3 Least Tern

The least tern *(Sternula a. antillarum)*, a state listed threatened species, generally nests in coastal areas throughout Florida, including beaches, lagoons, bays, and estuaries. In central Florida, nesting occurs from mid-May through July, and may continue through August. The least tern wintering grounds exist mostly in Latin America. The least tern nest in shallow “scrapes” they make on broad expanses of bare sand. Least tern primarily hunts within shallow estuaries and lagoons, where small fish area abundant (Wikipedia, 2008). Least tern foraging, resting and breeding habitat may occur within the project area.

3.3.4 Manatee

The West Indian manatee (*Trichechus manatus*) resides in Florida’s fresh, estuarine, and marine habitats. The West Indian manatee, one of the most endangered marine mammals in coastal waters of the United States, primarily feeds on submerged, floating, and emergent aquatic vegetation. In brackish habitats, a source of freshwater becomes a critical requirement and serves as an attractant where manatees congregate. Manatees frequently visit the Indian River Lagoon which is adjacent to the proposed borrow area. Collisions with watercraft, accounting for approximately 25% of annual manatee mortality in Florida, and destruction and degradation of habitat, resulting from widespread development, pose major threats to Florida manatees (USFWS, 1995).

3.4 Hard Bottom

Bathtub Reef, adjacent to Bathtub Beach, is the largest known worm reef in the southeast United States. In July and August 2008, CSA International, Inc. (CSA) conducted a cultural resource survey and detail phase sub-bottom seismic survey. The survey showed the major substrate type had greater than 50% rock cover. The majority of the epibiotic cover included wormrock and algae. The epibiotic and fauna cover was consistently low in the sampled areas. CSA observed 13 fish species with slippery dick (Halichoeres bivittatus), porkfish (Anisotremus virginicus), and sergeant major (Abudefduf saxatilis) being the most common. During the survey, CSA did not encounter any sea turtles. The permit application contains a copy of the detailed CSA report.

3.5 Fish and Wildlife Resources

Beach and dune management may potentially affect four natural communities within the beach placement and borrow areas — beach dune, unconsolidated substrate, worm reef and composite substrate. A brief synopsis of each community follows.

3.5.1 Beach Dune

Examples of wildlife using beach dune habitats include sea turtles (for nesting), shorebirds (for foraging and resting), reptiles such as six-lined racerunners (*Cnemidophorus sexlineatus*), and various nest predators such as raccoons (*Procyon lotor*) and snakes. Coastal areas, particularly beaches, are important wintering areas for shorebirds such as sanderling (*Calidria alba*), dunlin (*Calidris alpine*), short-billed and long-billed dowitchers (*Limnodromus griseus* and *Limnodromus scolopaceus*), plovers (*Charadrius* spp. and *Pluvialis* spp.), and willet (*Catoptrophorus semipalmatus*). Florida beaches and dunes are also important nesting sites for diving birds including terns (*Sterna* spp.) and black skimmers (*Rhynchops niger*).

3.5.2 Unconsolidated Substrate

FNAI defines the unconsolidated substrate community as expansive, relatively open areas of subtidal, intertidal, and supertidal zones that lack dense populations of sessile plant and animal species (FNAI, 1990). This area of the beach provides habitat for benthic and infaunal communities characterized by low species diversity.

This portion of the beach also provides foraging and resting habitat for numerous seabirds and shorebirds such as terns, gulls (*Larus* spp.), sandpipers (*Tringa*, *Calidris*, and *Actitis* spp.), plovers, skimmers, turnstones, and oystercatchers (*Haematopus* spp.). Fish and invertebrates within the intertidal zone are the staple diet for these avian species.

3.5.3 Worm Reef

A worm reef area comprises the eastern edge of the proposed beach restoration project. FNAI defines the worm reef community as Faunal Based Natural Communities characterized by large colonial conglomerates of rigid Sabellariid worm tubes of the species *Phragmatopoma lapidosa*. Generally, the lower reaches of the intertidal zone or upper reaches of the subtidal zone contain the shallow water worm "reefs". Worm reefs provide shelter for a diverse assortment of small benthic vertebrate and invertebrate organisms, which increases the faunal diversity of the area (FNAI, 1990). Bathtub Reef is the largest known worm reef in the southeast United States.

3.5.4 Composite Substrate

The composite substrate community, defined by FNAI, is areas with small patches of consolidated and unconsolidated bottom with or without sessile floral and faunal populations (FNAI, 1990). Composite substrate composes the remaining marine and estuarine natural communities. This EA assumes that similar benthic communities exist in the nearshore substrate zone off Martin County.

Many commercially, recreationally, and ecologically important fish species inhabit the nearshore area of the east coast of Florida. Table 3.3 lists fish species likely to occur in the worm reef, composite substrate, and nearshore waters of the project area.

Table 3.3 Common Nearshore Fish Species Likely to Occur in Project Area

Common Name	Scientific Name
Bull shark	*Carcharhinus leucas*
Nurse shark	*Ginglymostoma cirratum*
Spinner shark	*Carcharhinus falciformis*
Lemon shark	*Negaprion brevirostris*
Tarpon	*Megalops atlanticus*
Green Moray	*Gymnothorax funebris*
Spotted Moray	*Gymnothorax moringa*
Gulf Toadfish	*Opsanus beta*
Leopard Toadfish	*Opsanus pardus*
Stripped Mullet	*Mugil cephalus*
Common Snook	*Centropomus undecimalis*
Schoolmaster	*Lutjanus apodus*
Gray Snapper	*Lutjanus griseus*
Lane Snapper	*Lutjanus synagris*
Black Margate	*Anisotremus surinamensis*
Porkfish	*Anisotremus virginicus*
Tomtate	*Haemulon aurolineatum*
White Grunt	*Haemulon plumieri*
Sheepshead	*Archosargus probatocephalus*
Striped Croaker	*Bairdiella sanctaeluciae*
Jackknife Fish	*Equetus lanceolatus*
Spotted Drum	*Equetus punctatus*
High-hat	*Pareques acumunatus*
Blue Angelfish	*Holacanthus bermudensis*
Queen Angelfish	*Holacanthus ciliaris*
Gray Angelfish	*Pomacanthus arcuatus*
French Angelfish	*Pomacanthus paru*
Sergeant Major	*Abudefduf saxatilis*
Dusky Damselfish	*Stagastes adustus*
Beaugregory	*Stegastes leucostictus*

Table 3.3 Common Nearshore Fish Species Likely to Occur in Project Area

Common Name	Scientific Name
Bicolor Damselfish	*Stegastes partitus*
Cocoa Damselfish	*Stegastes variabilis*
Slippery Dick	*Halichoeres bivittatus*
Bluehead	*Thalassoma bifasticiatum*
Hairy Blenny	*Labrisomus nuchipinnis*
Atlantic Spadefish	*Chaetodipterus*
Ocean Surgeon	*Acanthurus bahianus*
Gray Triggerfish	*Balistes capriscus*
Yellowfin Mojarra	*Gerres cinereus*

Florida Fish and Wildlife Conservation Commission: http://myfwc.com/Wildlifelegacy/review/Annelid.pdf

3.6 Water Quality

The FDEP classifies the coastal waters in the project area as Class III, defined as waters suitable for recreation and the propagation of fish and wildlife. The FDEP requires monitoring of Class III water quality during dredging and beach fill operations.

3.7 Hazardous, Toxic, and Radioactive Waste

The project area lies primarily in residential and recreational areas. This EA knows of no sources of hazardous, toxic, and radioactive waste (HTRW) in the project area.

3.8 Air Quality

The popularity of the beaches contributes to vehicular traffic on roads adjacent to the beach; these vehicles may produce airborne pollutants in the project area. However, persistent ocean breezes readily disperse these pollutants.

3.9 Noise

Noise levels in the area are low to moderate. Because of the urbanization near the beaches and the popularity of the beaches, elevated noise levels (above the noise levels of breaking waves) includes recreating beachgoers.

3.10 Aesthetic Resources

The clean beach and nearshore reef provides a visually pleasing environment to beachgoers.

3.11 Recreation Resources

Bathtub Beach provides a beach area with nearshore and offshore reefs that provide snorkeling and diving opportunities. Worm reef, exposed at low tide, creates a protected tidal pool providing close-up views of marine life. Tourists are attracted to Bathtub beach for its excellent snorkeling opportunities on the worm reef. Surrounding the beach area lays an area of about 8 acres known as Bathtub Beach Park. The park includes lifeguards, crosswalks, showers, restrooms, nature pavilion with seating and a river boardwalk on west side of MacArthur Boulevard leading to Indian River.

3.12 Navigation

The St. Lucie Inlet provides passage form the Atlantic Ocean to Indian River Lagoon and the Intracoastal Waterway (ICWW). Traffic through the inlet includes fishing fleet and recreational craft. The proposed borrow area lies approximately .75 miles northwest of the inlet and, thus, should not affect inlet navigation.

3.15 Historic Properties

This EA knows of no historical properties in the area.

4.0 ENVIRONMENTAL EFFECTS

4.1 General Environmental Effects

The installation of sand fencing and salt tolerant vegetation along the project area will help control wind-blown sand. Completion of the project will ensure that a wide, protective beach and dune system exists. A beach and dune system will 1) provide storm protection of upland development and 2) provide increased foraging habitat for many birds, mammals, and reptiles, as well as increase nesting beach area for marine turtles. Additionally, besides providing dune protection from tides and waves, salt tolerant vegetation will trap wind-blown sand and further contribute to dune development.

4.2 Vegetation

4.2.1 No Action Alternative

The No Action alternative would adversely affect the vegetation within the project area. Continued erosion of the beach and dune would result in further loss of land available for plants to colonize and establish.

4.2.2 Proposed Action, Beach and Dune Management

The Proposed Action includes dune restoration, enhancement of the existing dune remnants via the construction of a sand dune and planting of vegetation. These activities will enhance opportunities for existing vegetation to colonize new areas and, through planting, will provide additional native plants to the beach and dune.

4.3 Threatened and Endangered Species

4.3.1 No Action Alternative

This section describes the No Action alternative effects on the threatened and endangered species — marine turtles, piping plover, least tern, and manatees — in the project area.

4.3.1.1 Marine Turtles

By allowing the continued loss of the beach and dune system, the No Action alternative would result in less or no marine turtle nesting habitat in the project area due to lack of beach above mean high tide elevation.

4.3.1.2 Piping Plover

By allowing the continued reduction of the beach width (inter-tidal beach), the No Action alternative would result in less piping plover foraging and resting habitat.

4.3.1.3 Least Tern

By allowing the continued reduction of the beach width (inter-tidal beach), the No Action alternative would result in less least tern foraging, resting and breeding habitat.

4.3.1.5 Manatees

The No Action alternative would not affect manatees.

4.3.2 Proposed Action, Beach and Dune Management

Continued erosion of the beaches and shorelines along the study area threatens coastal habitat important to many species. Beach and dune management practices, the Proposed Action, seek to maintain this habitat to ensure the long-term sustenance and viability of this ecosystem and the species that depend on it. They may also result in temporary environmental impacts during construction. However, a thorough understanding of the habitat and the species involved can help minimize or avoid environmental impacts. Methods to minimize environmental impacts caused by beach management practices include species observation, trapping and relocation, relocation of nest, nest identification/marking, avoidance of species and/or sensitive areas, lighting restrictions, noise abatement, and project time constraints. The design beach should enhance the coastal habitat by providing a wider beach and restoring the remnant dunes.

4.3.2.1 Marine Turtles

Onshore equipment employed for beach restoration generally consists of light vehicles, heavy earth moving equipment, and dredge pipe. Typically, a dredge pumps material through a pipeline to the

beach where bulldozers grade the material to the design elevations. Potential negative impacts to marine turtles during nesting season may include:

- Destruction of turtle nests by operation of heavy equipment;
- Creation of vehicle ruts, which hinder turtle hatchlings in their attempt to reach open water;
- Reduction in suitable nesting habitat for marine turtles resulting from excessively compacted or improperly selected soil materials; and
- Disorientation of nesting marine turtles and hatchlings because of artificial lighting.

Offshore equipment employed for beach restoration typically consists of a dredge, pipeline, equipment barges, marker buoys, and small tugs. Death or injury to marine turtles may result from contact, entanglement, or collision with the dredge cutterhead, equipment, and vessels.

A list of possible methods to minimize environmental impacts to marine turtles includes:

- Scheduling the project to avoid turtle nesting season;
- Educating the contractor and employees on possible environmental impacts and ways to minimize these impacts;
- Incorporating protected species monitors to provide professional assistance;
- Relocating nests or marine turtles in immediate danger from construction activities;
- Stopping operation of equipment when marine turtles enter the immediate vicinity;
- Restoring damaged habitat or mitigating for destroyed habitat;
- Carefully selecting sand source to ensure the compatibility with the native beach sand; and
- Requiring construction methods and materials have minimum impact. Example: Limiting heavy machinery to defined areas;
- Trawling and relocating marine turtles in the vicinity of the dredge during operation.

4.3.2.2 Piping Plover

Potential negative impacts to piping plovers from beach restoration may include:

- Disruption of resting or foraging birds by excessive vehicle noise or movement; and
- Temporary degradation of feeding habitat in intertidal zone.

A list of possible methods to minimize environmental impacts to piping plovers includes:

- Scheduling the project to avoid seasonal occurrence of migratory piping plovers;
- Educating the contractor and employees on possible environmental impacts and ways to minimize these impacts;
- Stopping operation of equipment when piping plovers enter the immediate vicinity; and
- Restoring damaged habitat or mitigate for destroyed habitat.

4.3.2.3 Least Tern

Potential negative impacts to least tern from beach restoration may include:

- Disruption of foraging, resting and breeding birds by excessive vehicle noise or movement; and
- Temporary degradation of feeding habitat in intertidal zone.

A list of possible methods to minimize environmental impacts to snowy plovers includes:

- Scheduling the project to avoid the least tern nesting season;
- Educating the contractor and employees on possible environmental impacts and ways to minimize these impacts;
- Stopping operation of equipment when least tern enter the immediate vicinity; and
- Restoring damaged habitat or mitigate for destroyed habitat.

4.3.2.5 Manatees

Death or injury to manatees may result from contact, entanglement, or collision with the dredge cutterhead, equipment, and vessels.

A list of possible methods to minimize environmental impacts to manatees includes:

- Educating the contractor and employees on possible environmental impacts and ways to minimize these impacts;

- Incorporating protected species monitors to provide professional assistance; and
- Stopping operation of equipment when manatees enter the immediate vicinity.

4.4 Hard Bottom

4.4.1 No Action Alternative

The No Action alternative would not affect the hard bottom in the project area.

4.4.2 Proposed Action, Beach and Dune Management

Due to recent storms, hard bottoms within the project area are continually being covered and exposed through accreting and eroding sand. The proposed project entails minimum protective fill, therefore the beach fill template results in the minimum potential risk to the adjacent reef.

4.5 Fish and Wildlife Resources

4.5.1 No Action Alternative

The No Action alternative negatively affects the fish and wildlife resources that utilize beach habitats by allowing the continued loss of habitat through beach erosion.

4.5.2 Proposed Action, Beach and Dune Management

Potential negative impacts to fish and wildlife from beach restoration may include:

- Destruction of wildlife nests by operation of heavy equipment;
- Disruption of nesting, resting, or foraging birds by excessive vehicle noise or movement;
- Destruction of vegetation suitable for food, protective cover, or nesting sites;
- Degradation or destruction of habitat resulting from placement of unsuitable material or excessive turbidity;
- Death or injury of sea life due to contact, entanglement, or collision with the dredge cutterhead, equipment, and vessels; and
- Destruction or degradation of habitat.

A list of possible methods to minimize environmental impacts to fish and wildlife includes:

- Educating the contractor and employees on possible environmental impacts and ways to minimize these impacts; and
- Ensuring construction methods and materials provide the least impact. Example: Requiring turbidity control measures.

Dredging and beach placement would temporarily affect water quality by increasing local turbidity levels around the dredging and beach placement sites. Elevated turbidity levels resulting from construction should not have a significant negative effect on organisms inhabiting the area. Given the naturally dynamic waters of the Atlantic Ocean, organisms inhabiting the nearshore zone adapt well to reasonable 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.

Dredging and beach placement would result in significant mortality of non-motile benthic organisms. However, these organisms typically adapt well to the dynamic coastal environment. With their high fecundity and recruitment potential, they should repopulate the affected areas in a relatively short time.

Taylor Engineering has reviewed readily available literature concerning the potential effects of beach nourishment on benthos and benthic habitats. As part of that effort, to glean a better understanding of benthic habitat, we also contacted Dr. Beth Irlandi, Florida Institute of Technology, and Mr. Alan Shirey, U.S. Army Corps of Engineers, Charleston District. Dr. Irlandi has responded and suggested several articles to research; we still await a response from Mr. Shirey.

The documents reviewed below detail a wide variety of sites along the United States coasts of the Atlantic Ocean and the Gulf of Mexico. Most articles relate directly to beach nourishment. A few are more general in nature or refer to key findings. The key findings include the following:

- The articles attribute the recovery rate of benthic habitat to the season in which the fill activities occur and to the grain size of the nourished sediments.
- The majority of the articles suggest that nourishing a beach in winter has less of an impact on the benthic habitat than nourishing in other seasons. The articles also suggest that selecting sediments for a nourishment project that match the receiving beach's native sand should lessen the impacts to benthic habitat.

- Research suggests that benthic habitat within nourished areas typically recover 2 – 7 months after nourishment.

The following paragraphs cite the reviewed articles and list the key findings related to the effects of beach nourishment on benthos. Quotes indicate phrases taken directly from the listed articles.

1. Brown, P.R.; W.R. Jr. Courtney; D.R. Deis; G.A. Marsh; D.B. Turbeville. 1980. *Ecological Evaluation of a Beach Nourishment Project at Hallandale (Broward County) Florida. Volume II. Evaluation of Benthic Communities Adjacent to a Restored Beach, Hallandale (Broward County), Florida.*
   - "This study assesses the post nourishment condition of sandy-bottom and reef-dwelling communities approximately 7 years after beach nourishment and offshore dredging."
   - "The reefs appeared in good conditions, and showed no apparent effects from a 1971 beach nourishment project."

2. U.S. Army Corps of Engineers Coastal Engineering Research Center. 1982. *Biological Effects of Beach Restoration with Dredge Material on the Mid-Atlantic Coast.*
   - "Beach animals recruited from the pelagic larval stock were inhibited from returning to the beach during the spring portion of the nourishment operation because of high turbidities and sedimentation."
   - "Animals that spend their entire life cycle in the beach sand were not seriously impacted by beach nourishment."
   - "Nourishment destroyed or drove away the intertidal macrofauna; but, based in other regional studies, recovery should occur within one or two seasons."
   - "Replenishment operations during the winter would reduce the effects of planktonic larval recruitment and migratory species that return to beaches from offshore during the spring."

3. Saloman, C.H. and Naughton, S.P. 1984. *Beach Restoration with Offshore Dredged Sand: Effects on Nearshore Macroinfauna*.
   - Several past studies have shown no significant long-term effects on benthic communities from beach restoration. Saloman and Naughton (1984) studied the effects of beach restoration with offshore dredged sand on nearshore macroinfauna at Panama City Beach, Florida. They concluded that beach restoration had minor, short-term effects on benthic

macroinvertebrates, noting that populations appeared to stabilize within five to six weeks after restoration.

4. U.S. Army Corps of Engineers New York District. Year after 1999. *Biological Monitoring Program Beach Erosion Control Project Atlantic Coast of New Jersey Beach Section II – Asbury Park to Manasquan.*
   - "No long term effects to intertidal benthos, Intertidal recovery within 2-6.5 months, No long term impacts to nearshore benthos."

5. Sea Grant. 2001. *Impacts of Beach Nourishment and Beach Scarping on Critical Habitat and Productivity of Surf Fishes.*
   - "Significant decline in abundance of ghost crabs (*Ocypoce quadrata*) occurred on bulldozed beaches for six to eight months."
   - "Repeated disturbance caused by beach disposal appears to prevent the full recovery of coquina clams (*Donax variabilis and Donax parvula*), ghost crabs, mole crabs (*Emerita talpoida*), and several species of amphipod (*Parahaustorius longimerus and Haustorius spp*.) which consequently results in their decreased productivity and decreased energy flow to vertebrate consumers."

6. Atlantic States Marine Fisheries Commission. 2002. *Review of the Biological and Physical Impacts.*
   - "Intertidal infauna is usually highest in both abundance and biomass in the summer and lowest during mid-winter."
   - "Organisms living in the high-energy beach environment, especially the intertidal area, may better adapt to disturbances."
   - "Studies from 1985-1996 report short-term declines in infaunal abundance, biomass, and taxa richness following beach nourishment, with recovery occurring between 2 to 7 months."
   - "Studies from 1994-2001 reported recolonization of infauna occurred within two weeks."

7. Burlas, M.; D. G., Clark; G. L. Ray; D. Wilber. 2002. *Biological Monitoring of Beach Nourishment Operations in Northern New Jersey, USA: Linkage between Benthic Impacts and Higher Trophic Levels.*

- "On the northern coast of New Jersey, monitoring of benthos and fishery resources was conducted for three years before nourishment, during placement, and up to two years afterwards."
- "In general, impacts on benthos were found to be short-term (2-6 months) and spatially limited."

8. Ray, G. L.; M. Burlas. 2003. *Impacts of Beach Nourishment Operations on Intertidal and Nearshore Infauna along the Atlantic Coast of Northern New Jersey.*
   - "Samples were taken biannually over a span of 6.5 years and monthly during nourishment operations (two years) to detect potential impacts."
   - "Results from Mean Low Water (MLW) assemblages indicated recovery of abundance (no. /m^2), biomass, taxa richness, and species composition within 2 months at on nourished beach and 6.5 months at a second beach."
   - "This observation was attributable to timing of the nourishment relative to seasonal peaks in assemblage abundance."

9. Dredging Operations and Environmental Research (DOER). 2005. *Sedimentation: Potential Biological Effects of Dredging Operations in Estuarine and Marine Environments.*
   - "Most shallow benthic habitats in estuarine and coastal systems are subject to deposition and resuspension events on daily or even tidal time scales."
   - "Many organisms have physiological or behavioral methods of dealing with sediments that settle on or around them, ranging from avoidance to tolerance of attenuated light and/or anaerobic conditions caused by partial or complete burial."

10. U.S. Army Corps of Engineers. December 5, 2006. *Response to Request for Additional Information #1 for NAS Pensacola Channel Dredging.*
    - "The nearhore disposal areas are all located in the high-energy littoral zone, which is an extremely dynamic environment that changes drastically as a function of wave conditions and storm activity."

11. NOAA Benthic Habitat Mapping. 2007. *Applying Benthic Data: Dredging and Disposal of Marine Sediment.*
    - "Benthic organisms living in shallow water estuarine and nearshore environments are well adapted to frequent physical disturbance."

- "Tides, currents, waves, and storms cause sediments to be lifted, deposited, or shifted."
- "The resilience of benthic organisms to these environmental changes allows them to recolonize areas of the seafloor affected by dredging."

12. Section 404(b) Evaluation, *Pinellas County Florida Beach Erosion Control Project Alternative Sand Source Utilization.*

- "Fill material will bury some benthic organisms."
- "Most organisms in this high wave energy environment are adapted for existence in area of considerable substrate movement."
- "Re-colonization will occur in most cases within one year following construction."
- "Benthic organisms associated with nearshore hardground areas that are covered will be lost. In some areas losses to hardground habitat has already taken place from pervious beach nourishment projects."

The findings from this literature review suggest that beach nourishment may result in short-term impacts to benthic habitat. Most consider those impacts short-term because most organisms have the ability to adapt for existence in areas of considerable substrate movement.

4.6 Essential Fish Habitat

4.6.1 No Action Alternative

The No Action alternative would not affect the Essential Fish Habitat in the project area.

4.6.2 Proposed Action, Beach and Dune Management

Construction activities will impart temporary, water quality effects on the Essential Fish Habitat by producing localized increases in turbidity in the project area. However, elevated turbidity levels resulting from dredging and beach placement should not have a significant negative effect on organisms inhabiting the project area. Given the naturally dynamic waters of the Atlantic Ocean, organisms inhabiting the nearshore zone adapt well to reasonable environmental changes such as moderate increases in turbidity. Fish and other mobile species may temporarily leave the adjacent surf zone if turbidity becomes too great. Construction noise may also drive fish away from the project area.

Additionally, sediments disturbed during dredging and disposal activities would settle on adjacent habitats. Loss of benthic fauna during these activities would temporally affect fish feeding habitat in the project area. With their high fecundity and recruitment potential, the benthic fauna should repopulate the affected areas in a relatively short time. See comments in Section 4.5.2 for results from past studies on long term affects on benthic communities from beach restoration.

4.7 Historic Properties

4.7.1 No Action Alternative

This EA knows of no historic properties in the beach placement areas.

4.7.2 Proposed Action, Beach and Dune Management

This EA knows of no historic properties in the beach placement areas.

4.8 Socio-Economic

4.8.1 No Action Alternative

The No Action alternative would significantly affect the local economy. The beaches would continue to erode and provide less width for recreation. The No Action alternative may lead to a decrease in tourism revenue.

4.8.2 Proposed Action, Beach and Dune Management

The beaches of Martin County play an important economic role in the recreational resources of the area. Martin County's economy is largely based on tourism. The tourist dollars brought into Martin County each year account for a large portion of the County's revenues base. Many businesses, particularly along the coast, are tourist-oriented and rely on revenue generated from tourists. The beach and dune management activities in the project area would allow Martin County to continue deriving revenues from the beach tourism.

4.9 Aesthetics

4.9.1 No Action Alternative

The No Action alternative would reduce aesthetics because of loss of beach width and natural habitat.

4.9.2 Proposed Action, Beach and Dune Management

The project would restore the eroded beaches and dunes. Restored beaches and dunes would help re-establish the natural appearance of the project area. The construction process would reduce the aesthetics of the project during the short-term but should not adversely affect the long-term beach aesthetics.

4.10 Recreation

4.10.1 No Action Alternative

Loss of beach associated with the erosion would result in less beach width available for recreation along the project area.

4.10.2 Proposed Action, Beach and Dune Management

Once completed, the project would provide a large dry beach, which will supply more area for active and passive recreational activities. Recreational and commercial fishing in the nearshore and offshore waters maybe temporarily affected during construction. A direct impact maybe caused by digging into the borrow area, with a possibility of disrupting local fish habitat. An indirect impact maybe arise due to creation of turbidity from dredging around the borrow area. After construction the fishing areas are expected to recolonize and return to normal conditions. For a short time, the construction process would limit recreational activities, especially near the dredge pipe and equipment staging areas.

4.11 Coastal Barrier Resources

4.11.1 No Action Alternative

Coastal Barrier Resources (CBRA) do not exist within the project area.

4.11.2 Proposed Action, Beach and Dune Management

Coastal Barrier Resources (CBRA) do not exist within the project area.

4.12 Water Quality

4.12.1 No Action Alternative

The No Action alternative would not affect water quality in the project area.

4.12.2 Proposed Action, Beach and Dune Management

Dredging and beach placement would temporarily affect water quality by increasing local turbidity levels around the dredging and beach placement sites. According to Chapter 62-4.244, Florida Administrative Code, the boundary of a dredge and fill-mixing zone shall not exceed 150 meters in radius, defined as the distance from the cutterhead, return flow, discharge, or other points of generation of turbidity or other pollutants. Discharge operations within the beach restoration area will not require a water quality variance.

4.13 Hazardous, Toxic and Radioactive Waste

4.13.1 No Action Alternative

This EA knows of no sources of HTRW in the project area.

4.13.2 Proposed Action, Beach and Dune Management

This EA knows of no sources of HTRW in the project area.

4.14 Air Quality

4.14.1 No Action Alternative

The No Action alternative would not affect air quality in the project area.

4.14.2 Proposed Action, Beach and Dune Management

The Proposed Action would cause minor, temporary effects on air quality because of emissions from the dredge and other construction equipment. Ambient sea breezes, prevalent throughout the project area, helps limit these effects.

4.15 Noise

4.15.1 No Action Alternative

The No Action alternative would not affect the noise levels in the project area.

4.15.2 Proposed Action, Beach and Dune Management

The Proposed Action would cause a temporary increase in noise, primarily from heavy equipment working at the discharge point on the beach. Increases to the ambient noise levels because of the project would only occur during construction.

4.16 Public Safety

4.16.1 No Action Alternative

Presently, numerous shorefront structures (including public beach access facilities, vacation rental properties, and private residence) lack adequate storm protection. Storms would continue to cause beach erosion, further compromising these shorefront structures. The No Action alternative would continue to leave structures susceptible to storm damage.

4.16.2 Proposed Action, Beach and Dune Management

Dredging operations and beach restoration mandate rigid application of safety and health requirements. Dredging with deep draft equipment, operating in relatively shallow water, requires extreme skill to stay within safe operating tolerances. Additionally, heavy equipment and transport operators must employ the same extreme caution on the beach, where the public may not truly appreciate

the inherent danger. Accordingly, the project sponsors require contractors to submit extensive health, safety, and accident prevention plans to protect the onsite personnel, public, and environment.

4.17 Natural or Depletable Resources

Removing sand from the borrow area would deplete the sand from the St. Lucie Inlet flood shoal and will put the sand trapped inside the inlet back into cycle. The excavated borrow area is likely to refill with sand.

4.18 Cumulative Impacts

Overall cumulative impacts, defined as the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7), may result in both beneficial and adverse impacts. Primary benefits from beach and dune management mainly consist of beach or dune habitat restoration previously eroded by natural and artificial causes. Secondary benefits may include mitigation planting, wildlife species monitoring, and habitat enhancement.

Beach and dune management can also result in environmental impacts to species and the areas they inhabit. However, a thorough understanding of the habitat and the species involved can help minimize or avoid environmental impacts. Methods to minimize environmental impacts caused by beach management practices include species observation, trapping and relocation, relocation of nest, nest identification/marking, avoidance of species and/or sensitive areas, lighting restrictions, noise abatement, and project time constraints. If one implements adequate environmental protection measures, environmental impacts from beach management activities are generally short-term and minimal.

4.19 Irreversible and Irretrievable Commitment of Resources

4.19.1 Irreversible

The fossil fuels for construction and public funds represent an irreversible commitment of resources, defined as forever losing the ability to use and/or enjoy the resource, for the proposed action.

4.19.2 Irretrievable

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

4.20 Unavoidable Adverse Environmental Impact

Unavoidable adverse environmental impacts resulting from beach and dune restoration include a temporary loss of beach habitat, a localized increase in turbidity levels, and a temporary loss of infaunal communities.

4.21 Local Short-Term Uses and Maintenance/Enhancement of Long-Term Productivity

Short-term temporary effects to the physical environment during construction would result in long-term environmental benefits from less degraded and restored beaches and dunes.

4.22 Indirect Effects

The Proposed Action should not result in adverse indirect effects.

4.23 Compatibility with Federal, State, and Local Objectives

The Proposed Action complies with Federal, state, and local objectives.

4.24 Environmental Commitments

The local sponsors commit to avoiding, minimizing, or mitigating for adverse effects during construction activities by employing the following practices and all environmental permit requirements:

4.24.1 Marine Turtles

If construction occurs during the nesting season (May 1 through October 31), the local sponsors will monitor and relocate nests. Biological monitoring activities typically occur during the three nesting seasons following beach and dune restoration and include:

- Pre-nesting season sand compaction monitoring;
- Scarp formation monitoring; and
- Daily marine turtle nest monitoring.

If sand compaction values exceed permitted criteria, one must till the beach before the beginning of the nesting season. Likewise, if scarps exceed permitted criteria, one must remove the scarps before the beginning of the nesting season. In addition, the regulatory agencies require monitoring of the scarp formation throughout the nesting season and, if scarps exceed permitted criteria, then one must consult them to determine appropriate management actions. Daily marine turtle nest monitoring usually includes the project beach and an adjacent, unaffected beach. The daily nest monitoring will include early morning beach observation during nesting season to locate turtle crawls and nests, mark nests, and evaluate hatches. The FDEP requires the results of these activities at the end of each nesting season.

4.24.2 Migratory Birds

The local sponsors will require the Contractor to conduct construction activities in such a way as to prevent impacts to migratory birds and their nests in accordance with the USACE, Jacksonville District's Migratory Bird Protection Policy. Additionally, the Florida Endangered and Threatened Species Act of 1977, Title XXVIII, Chapter 372.072, and the U.S. Fish and Wildlife Service pursuant to the Migratory Bird Treaty Act of 1918 and the Endangered and Threatened Species Act of 1982, as amended, protect migratory birds.

Monitoring of the construction area will continue daily from April 1 through August 31, if construction activities occur during that period. If nesting occurs within the construction area, the Contractor will implement guidelines set forth in the FDEP and Department of the Army permits.

4.24.3 Manatees

Implementation of the following protection measures would minimize potential impacts to manatees:

- The Contractor shall instruct all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees;

- The Contractor shall advise all construction personnel that one will face civil and criminal penalties for harming, harassing, or killing manatees, which the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, and the Florida Sanctuary Act of 1978 protect. The local sponsors may hold the Contractor responsible for any manatee harmed, harassed, or killed as a result of construction activities;
- All vessels associated with the project shall operate at "no wake/idle" speeds at all times while in water where the draft of the vessel provides less than four feet clearance from the bottom and that vessels shall follow routes of deep water whenever possible;
- If one sights a manatee within 100 yards of the project area, the Contractor shall implement all appropriate precautions to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 ft of a manatee. If a manatee is closer than 50 ft to moving equipment or the project area, the Contractor shall shut down the equipment and cease all construction activities. Construction activities shall not resume until the manatee has departed the project area;
- The Contractor shall immediately report any collision with and/or injury to a manatee to the "Manatee Hotline" at 1-800-DIAL-FMP (1-800-342-5367). The Contractor should also report any collision and/or injury to the U.S. Fish and Wildlife Service in Panama City (1-850-769-0552) for northwest Florida;
- The Contractor shall post temporary signs concerning manatees prior to and during construction activities. The Contractor shall remove all signs upon completion of the project; and
- If nighttime construction occurs, the Contractor must place lights that illuminate a 100-ft radius around the construction site.

4.24.4 Turbidity

Implementation of the following measures would help avoid/minimize turbidity related impacts:

- The Contractor shall monitor water quality (turbidity) twice daily at the dredging site, as required by project permits; and

- If turbidity values at the dredging site exceed permitted values, the Contractor shall suspend all dredging activities. Dredging shall not continue until water quality meets state standards.

5.0 LIST OF PREPARERS

Table 5.1 presents people responsible for preparing this EA.

Table 5.1 List of Preparers

Name	Discipline/Company	Role
Carlyn Hiller	Environmental Scientist Taylor Engineering, Inc.	Author
Michael Trudnak P.E.	Assistant Director, Coastal Taylor Engineering, Inc.	Co-Author
Kristen Odroniec	Staff Engineer Taylor Engineering, Inc.	Co-Author
Renee Robertson	Staff Engineer Taylor Engineering, Inc.	Co-Author
Anthony Maguire	Environmental Scientist Taylor Engineering, Inc.	Reviewer

6.0 Public Involvement

Table 6.1 lists the various meetings held to elicit input from FDEP, FWS, and USACE staff concerning the proposed project plan.

Table 6.1 Agency and Public Meetings

Date	Attendees	Location
April 1, 2008	FDEP, Martin County, Taylor Engineering	Tallahassee, FL
April 8, 2008	USACE, FWS, Martin County, Hesperides Group, NOAA Fisheries, Taylor Engineering	Palm Beach Gardens, FL

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