Final Environmental Assessment for the Issuance of a Noncompetitive Lease for Use of Outer Continental Shelf Sand for the Collier County Beach Renourishment Project

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CHAPTER 1 – INTRODUCTION

Collier County has proactively managed their coastal resources by developing and implementing a comprehensive beach management program. One of the main components of this program includes nourishment of segments of the shoreline, historically utilizing offshore sand resources supplemented with intermittent truck haul projects and inlet bypassing. The project discussed herein will restore three sections of shoreline in Collier County utilizing either fill from an offshore borrow area or upland sand sources.

Collier County plans to construct and maintain a beach renourishment project along their northwestern shoreline area. The project includes the renourishment of beach segments that were part of the 1996 and 2006 beach nourishment projects with some modifications for design integrity and project performance. This Environmental Assessment (EA) presents an updated evaluation of the potential environmental effects associated with the Bureau of Ocean Energy Management (BOEM) authorizing access to 500,000 cubic yards (cy) of Outer Continental Shelf (OCS) sand from Borrow Area T1 located in the Gulf of Mexico off the coast of Collier County, Florida. BOEM proposes to enter into a noncompetitive lease with Collier County, Florida, so that they can extract, transport, and place sand from BA T1 along 7.5 miles of eroded shoreline for construction of the next Collier County Beach Renourishment Project (Figure 1).

Pursuant to the National Environmental Policy Act of 1969 (NEPA), Collier County described the affected environment, evaluated potential environmental effects resulting from a similar action, and addressed alternatives to the action in previous NEPA documents. In 1995, USACE prepared an Environmental Assessment (EA) and issued a Finding of No Significant Impact (FONSI) for the initial 1996 nourishment project (USACE Permit No. 199404092 (IP-MN)), which utilized offshore borrow areas in State waters (Appendix A). In 2005, Coastal Planning & Engineering, Inc. (CPE) prepared an EA (Appendix B) in coordination with BOEM (formerly Minerals Management Service (MMS)) assessing potential impacts from the first renourishment project, which utilized OCS sand from Borrow Area T1 in Federal waters (USACE Permit No. SAJ-2003-12405 (IP-MN), provided in Appendix C). This EA, prepared by CPE in coordination with BOEM, supplements these existing environmental analyses. Its purpose is to update potential environmental effects resulting from the issuance of a new negotiated lease for Borrow Area T1, and to determine if the proposed action, in light of new information, would have a significant effect on the human environment and whether an EIS must be prepared. This EA will also be provided to the USACE who will use it to assist with their own NEPA process.

BOEM would authorize the use of sand from an Outer Continental Shelf (OCS) sand borrow area for the project under the OCS Lands Act, 43 U.S.C. § 1337(k). In 1994, OCSLA was amended to allow BOEM to convey, on a noncompetitive basis, the rights to OCS sand, gravel, or shell resources for use in a program for shore protection, beach restoration, or coastal wetlands restoration undertaken by a Federal, State, or local government agency (43 U.S.C. 1337(k)(2)(A)(i)). A two party lease will be negotiated between BOEM and Collier County.

This EA analyzes the potential environmental impacts associated with BOEM issuing a noncompetitive lease for offshore sand to Collier County Government. Any future use of

Federal borrow resources, outside of the length of the negotiated lease, would require further NEPA review.

1.1 Location of Proposed Action

The Collier County Beach Renourishment Project is located on the southwest Florida coastline in Collier County. Collier County is approximately 115 miles south of the entrance of Tampa Bay and about 100 miles west of Miami, Florida. The County is bordered to the west and southwest by the Gulf of Mexico, to the south by Monroe County, to the east by Dade and Broward Counties, and to the north by Lee and Hendry Counties. The project area encompasses approximately 7.5 miles of coastline between Wiggins Pass and Gordon Pass (Figure 1).

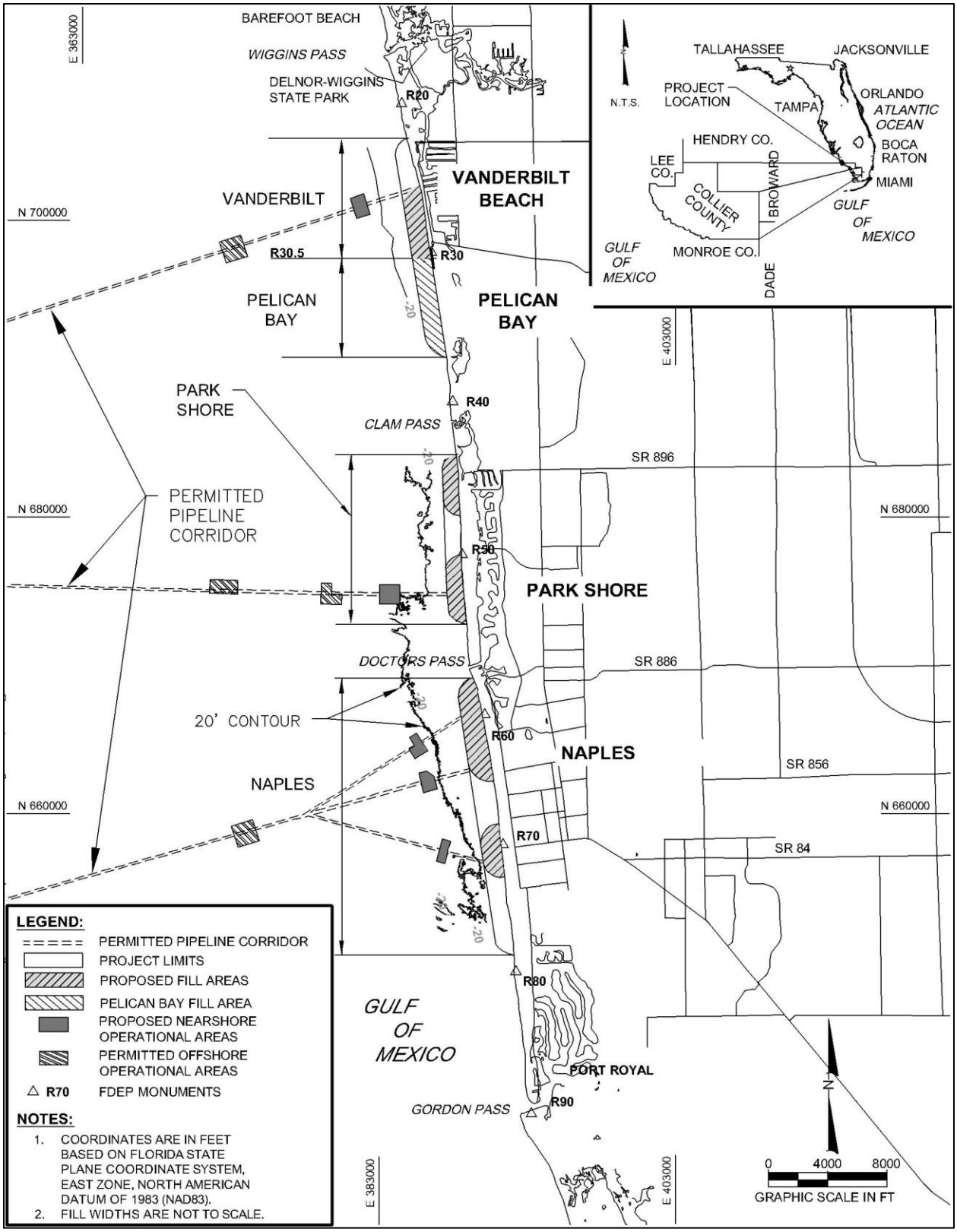

Figure 1. Project location map for the Collier County Beach Renourishment Project.

1.2 Collier County Beach Renourishment Project History

1996 – Initial Nourishment. The original Collier County beach nourishment project was authorized by DA Permit SAJ-1994-04092 in 1995 for Vanderbilt Beach, Park Shore Beach and Naples Beach. Collier County's initial beach nourishment project was constructed from November 1995 to May 1996 to restore nearly six miles of critically eroded shoreline. Approximately 1,270,000 cy of fill was placed on Vanderbilt, Park Shore and Naples Beaches. Sand was obtained from four offshore borrow areas (all located in State waters) and supplemented with fill from upland sand sources. The project also included the extension of the north jetty of Doctors Pass by approximately 75 ft, the removal of 36 groins and the restoration of six rock groins and a pile cluster groin. The project also included the restoration of ten existing stormwater outfalls on northern Naples Beach.

2006 – First Renourishment. Collier County received authorization under DA permit SAJ-2003-12405 (IP-MN) (Appendix C) and Florida Department of Environmental Protection (FDEP) Permit No. 0222355-001-JC (Appendix D) to renourish Vanderbilt, North Park Shore, Park Shore, Naples, and Pelican Bay beaches over a 10-year period with a 6-8 year renourishment cycle. The renourishment project was constructed between February and May 2006 along approximately 8.5 miles of Collier County shoreline, which included Vanderbilt Beach (R-22 to R-30+500), Pelican Bay (R-30+500 to R-37), Park Shore (R-45 to R-55) and Naples Beach (R-58A to R-79). The project placed approximately 668,000 cy of sand from an offshore borrow area located in Federal waters (Borrow Area T1). An EA (Appendix B) was prepared for BOEM (formerly MMS) in order to obtain a lease for use of the OCS sand in Borrow Area T1, located in federal waters. A 1.09-ac artificial reef was constructed for this project as mitigation for anticipated impacts from fill equilibration to nearshore hardbottom; however, no impacts were documented during post-construction hardbottom biological monitoring.

1996-2012 Supplemental Fill Projects. Supplemental fill projects, done by truck haul, have taken place within the project area since construction of the 1996 project. Two truck haul projects took place in summer 2010 and spring 2011 in order to address two erosion hot spots within the County. The summer 2010 project placed approximately 2,650 cy of sand south of Doctors Pass on Naples Beach from R-58A-500 to R-58A+100. The spring 2011 project placed 22,393 cy of sand on Naples Beach (R-58A-400 to R-58) and 7,836 cy on Park Shore (R-45+600 to R-46+400). The most recent truck haul project was constructed in winter 2012 to repair damage from Tropical Storm Debby; this project included placement of approximately 22,700 cy of sand on Vanderbilt Beach (R-26 to R-30) and Naples Beach (R-61 to R-63.5).

Additional, periodic dredging and bypassing has taken place at Wiggins Pass, Clam Pass, Doctors Pass, and Gordon Pass in recent history. Refer to the engineering report (CPE, 2011) for further details.

2013-14 – Proposed Second Renourishment. The second renourishment project, anticipated for 2013-14 construction, includes placement of approximately 500,000 cy of fill along 7.5 miles of shoreline including Vanderbilt Beach, Pelican Bay, Park Shore, and Naples Beach (Figure 1)

(project details provided in Section 1.4). Collier County has requested a negotiated noncompetitive lease from BOEM for offshore sand in Borrow Area T1 in order to construct the second renourishment project (Appendix E). The County has also requested modifications to the current USACE and FDEP permits which would allow the County to reconstruct the 2006 project, with minor changes in fill placement locations to address hot spots, as well as to allow construction to overlap with a portion of sea turtle nesting season. These permit modifications, and associated monitoring and mitigation requirements (Section 3.2.1.1), are being coordinated with U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) (refer to Section 1.3 for agency coordination). Collier County is requesting that the permits allow construction either using offshore Borrow Area T1 with a hydraulic dredge (cutterhead or hopper dredge), or using an upland sand source through a truck haul project.

1.3 Agency Coordination to Date for Proposed Project

Collier County, FDEP and FWC conducted a pre-application meeting on January 27, 2012 to discuss the proposed project and modifying the construction period to overlap with some of sea turtle nesting season. The agencies did not see any obstacles to this goal, as the U.S. Fish and Wildlife Service (USFWS) Statewide Programmatic Biological Opinion (SPBO) allows beach nourishment in Collier County during nesting season (with mitigation and monitoring measures in place).

Collier County, BOEM and USACE conducted a pre-application meeting on July 12, 2012 to discuss proposed project goals and alternatives, and to establish USACE and BOEM roles in agency (USFWS and National Marine Fisheries Service (NMFS)) coordination.

On July 16, 2012 CPE requested that NMFS and USFWS review and comment on the list of species intended to be included in the Collier County Beach Renourishment Biological Assessment. NMFS (Jason Reuter) concurred with the list on July 16, 2012, pointing out the change in status of loggerheads to the DPS status, and stating that the Acroporid (elkhorn and staghorn) corals would not need to be included in the BA. USFWS (Jeff Howe) concurred with the list of species under USFWS purview on July 23, 2012, but requested that red knots also be included in the assessment.

Collier County, FDEP and FWC conducted another pre-application meeting on July 19, 2012 to discuss the permitting process and timeframes associated with project alternatives.

CPE submitted a Draft Biological Assessment to BOEM on August 1, 2012 and received comments back from BOEM on August 10, 2012. The Final BA was submitted on November 9, 2012.

Based on discussions with BOEM, USACE, FDEP and FWC, Collier County submitted permit modification requests to USACE and FDEP on November 9, 2012 for the next renourishment project. These permit modifications would allow the County to reconstruct the 2006 project, with minor changes to address hot spots, as well as to allow construction to overlap with a portion of sea turtle nesting season. Collier County is requesting that the permits allow construction either

using an offshore borrow area with a hydraulic dredge (cutterhead or hopper dredge), or using an upland sand source through a truck haul project.

BOEM requested formal consultation with NMFS under Section 7 of the Endangered Species Act on November 16, 2012 (Appendix F).

USACE requested formal consultation with USFWS under Section 7 of the Endangered Species Act on December 20, 2012 (Appendix G).

USACE issued their Public Notice on January 7, 2013, thereby also initiating consultation with NMFS on Essential Fish Habitat (EFH) as required by the Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Appendix H).

USFWS issued the Biological Opinion (BO) for the proposed project on April 25, 2013 (Service Federal Activity Code 41420-2010-F-0225) (Appendix G). This BO includes an Incidental Take Statement and measures and conditions to minimize impacts to piping plovers. USFWS determined that the August 22, 2011, Statewide Programmatic Biological Opinion (SPBO) can be applied to this project, concluding consultation for nesting sea turtles and West Indian manatees.

On May 3, 2013, FDEP determined that Collier County's November 9, 2012 application requesting a permit modification was complete.

On May 22, 2013 USFWS issued a modification to the April 25, 2013 BO which allowed beach compatible material dredged from Doctors Pass Inlet maintenance to be placed between R-58A-480 and R-58+600.

1.4 Description of the Proposed Action

The preferred action will include sand placement along four segments of shoreline within Collier County: Vanderbilt Beach, Pelican Bay, Park Shore, and Naples Beach (Figure 1). Table 1 provides the fill limits, sand volumes, design beach width and berm elevation for each segment of the proposed renourishment project. The amount of fill needed to bring the historic project areas back to design standard with a six year design life is less than was constructed in 2006. Based upon the 2012 monitoring survey, approximately 410,000 cubic yards (cy) will be required (Table 1). The 2006 project will be rebuilt but with a smaller alongshore length and cross shore width and volume, while increasing five profiles' densities with no anticipated hardbottom impact. The project will incorporate several gaps in fill along each segment: Vanderbilt Beach will have a gap between R-22+300 and R-25+500; Park Shore will have a gap between R-47+500 and R-50; and Naples Beach will have gaps between R-64+300 and R-68+400 and R-72+200 to R-79 (Figure 1). The impacts of Hurricane Isaac have not been factored into the design and may add up to 90,000 cy of the volume. The potential total volume for the proposed project is 500,000 cubic yards (Table 1). Berm caps and vegetation are being planned for select locations in the project area, and plans will be provided when completed.

Two options for sand sources are proposed for the project – offshore and upland. To the maximum extent possible, the construction method will be left to the bidding process, subject to final permit conditions and County direction. The project's construction method could involve the use of a hopper dredge, a cutterhead dredge with scows, or truck haul. If the most economical bid is from an offshore dredger, Borrow Area T1 will be utilized. Borrow Area T1 is located in Federal waters 33 miles from Vanderbilt Beach (Figure 2), and was used for the 2006 renourishment project. However, if a truck haul and upland sand mine produce the most economical and responsive bid, an upland sand source will be used. This EA identifies the "preferred alternative" as beach nourishment using offshore Borrow Area T1; details of this preferred alternative are discussed in section 2.2. Details of the truck haul project alternative are discussed in section 2.3. This EA assesses impacts from the preferred alternative of using Borrow Area T1, so that BOEM may decide whether or not to issue a noncompetitive lease for offshore sand to Collier County Government.

The proposed action, despite the construction method chosen, will involve equipment mobilization no earlier than September 1, and the construction window will be limited to September 15 through May 31 in order to avoid peak sea turtle nesting season. Barring events such as severe weather or equipment failure, dredge and fill activities are anticipated to take up to 120 days (working 24 hours per day, 7 days a week). In the case of a truck haul project, the construction process may take between 137 to 231 days based upon production rates of between 1,776 to 3,000 c.y./day if a project of 410,000 cubic yards is constructed. It is possible that constructing the project as a truck haul project may extend construction into a second season, with a break to avoid peak sea turtle nesting season from June through mid-September.

Table 1. Fill volume, design beach width and berm elevation for each segment of the proposed project.

Beach Segment	Fill Limits	Fill Volume	Beach Width	Berm Elevation (NAVD)
Vanderbilt Beach	R-22+300 to R-30+500	57,000 cy	100 ft	4 ft
Pelican Bay	R-30+500 to R-37	35,000 cy	100 ft	4 ft
Park Shore	R-43+500 to R-54+400	112,851 cy	85 ft	4 ft
Naples Beach	R-58A-480 to R-79	205,149 cy	100 ft	4 ft
TOTAL VOLUME = 410,000 cy				
POTENTIAL TOTAL VOLUME* = 500,000 cy				

*Projected volume. Actual volume required will be determined based on preconstruction survey which is anticipated to occur in Fall 2013. Projected volume is actual volume measured on the beach based upon before- and after-dredge surveys.

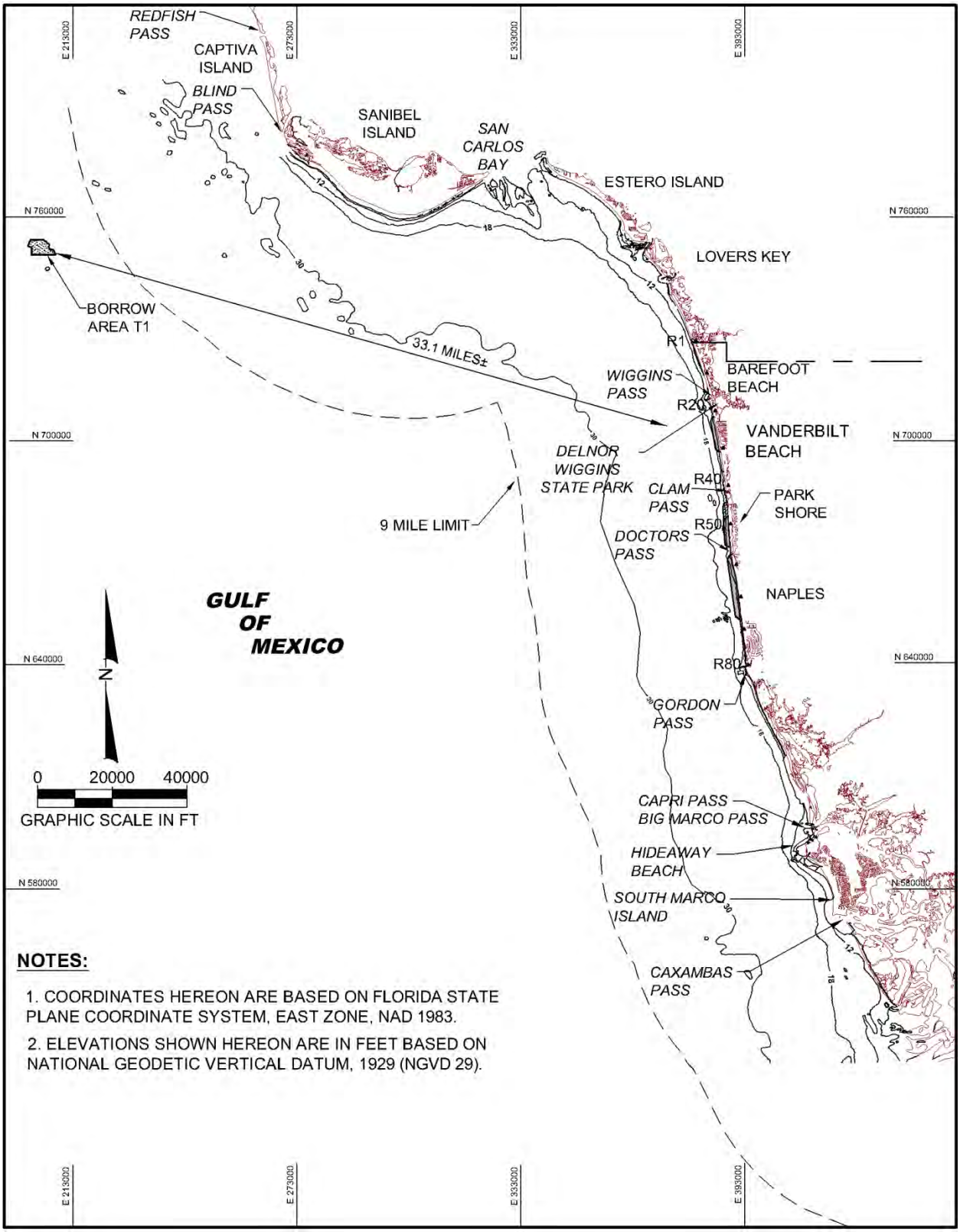

Figure 2. Borrow Area T1 location map for the Collier County Beach Renourishment Project.

1.5 Purpose and Need of the Proposed Action

The purpose of the proposed project is to restore and enhance beach berm conditions to provide storm damage reduction, recreational and environmental habitat benefits along eroded areas of the Collier County shoreline. The project will raise eroded beach berm elevations to those consistent with natural berm elevation and increase the distance between the active beach system and the upland line of coastal development. This action will reduce coastal storm related flooding and erosion, provide a more reliable recreational beach area, and restore and maintain marine turtle nesting habitat.

The purpose of the BOEM proposed action is to respond to a request for use of OCS sand under the authority granted to the Department of the Interior by the Outer Continental Shelf Lands Act (OCSLA).

CHAPTER 2 – PROPOSED ACTION AND ALTERNATIVES

BOEM considered the following as an alternative to the proposed action (Preferred Action, Section 2.2): *Do Not Authorize Use of OCS Sands*. Under this alternative, Collier County would not be authorized to access offshore sands in Borrow Area T1. In this case, the County could choose either:

(a) No Action, in which this project is not constructed (Section 2.1), or
(b) Beach Nourishment Utilizing Upland Sand Source Truck Haul Project (Section 2.3)

Factors taken into account in addressing the feasibility of alternatives included: construction feasibility, economic viability, and environmental sensitivity. Alternatives could reasonably be eliminated from detailed consideration due to: (1) failure to meet most of the basic project objectives; (2) infeasibility; or (3) inability to avoid significant environmental effects.

2.1 Alternative #1: No Action Alternative

The No Action alternative would allow erosion to continue unabated and provides no solution to the existing erosion and shore protection problems. The no-project scenario is considered unacceptable because it provides minimal storm protection for the beach/dune system, public infrastructure, and upland properties; and does not allow for the restoration of essential nesting habitat for listed sea turtle species.

2.2 Alternative #2: Preferred Action Beach Nourishment Project Utilizing Offshore Borrow Area T1

2.2.1 Borrow Area T1

If Collier County elects to construct the proposed project utilizing an offshore sand source, then Borrow Area T1, which was utilized for the 2006 project, will be used again. This borrow area will be used for its coarser sand which performed above expectations for the 2006 project. Borrow Area T1 is located in Federal OCS waters approximately 33 miles from Vanderbilt Beach (Figure 2). The sediment within the primary dredge area is characterized by light-gray (5Y 7/1), fine grained quartz sand. The shell content ranges from 1% to 8%. The silt content is 1.7%. Both the shell and silt contents generally increase with depth.

The sand is moderately sorted, with a sorting value of 0.77ϕ. The mean grain size was found to be 0.33 mm. These values were determined using the moment method. If a hopper dredge is utilized, screening will be conducted as the sand is being loaded into the dredge to sort rock and shell from the sand, although the quantities of rock in this borrow area are expected to be insignificant. Screening will also be conducted for cutterhead/scow operations. Based on a

compatibility analysis, the coarser sand from Borrow Area T1 is the only offshore sand source compatible for use in Vanderbilt, Pelican Bay, Park Shore, and Naples Beach.

2.2.2 Equipment and Transport

A dredge and fill approach to the beach fill project would employ a variety of dredge and dredge support equipment to access, load, transport and deliver sand to Collier County beaches. Central to this approach will be large, ocean-going transport vessels that can haul large quantities of sand in a cost effective manner, such as: (1) trailing-suction hopper dredges and/or (2) cutterhead dredge with scows and barges towed by tug. If the proposed project is constructed using an offshore borrow area, the project will either repeat the use of a hopper dredge with the existing corridors and operational areas or it will utilize a cutterhead dredge and transport the sand by scows. Permitting both types of dredge options will allow Collier County greater flexibility when scheduling with the dredge contractor, which in turn will result in significant cost savings to the County. Depending on the capacity of the transport vessel (hopper dredge or scow[s]), it is anticipated that up to seven round trips will be made per day. There may be up to two hoppers or several scows traveling between the borrow area and the pipeline per day, which would increase the vessel traffic. Barring events such as severe weather or major equipment failure, dredge and fill activities are anticipated to take up to 120 days (working 24 hours per day, 7 days a week), based upon historic project rates.

2.2.2.1 Hopper Dredge

A hopper dredge is a self-propelled vessel that can independently load, transport and unload between 3,000 and 5,000 cy of sand per load. The hopper dredge has a trailer suction pipe with a draghead which strips off layers of sediment and hydraulically suctions the material into the hopper. If this method is selected, Collier County desires that a screening process be included in the hopper dredging method. This is accomplished by placing a grizzly or screen in the flow of the material to the bins of the hopper. This screen will not impede any monitoring of the inflow screen by protected species observers. The grizzly or screen will sort rocks greater in size than ¾ inch and place them in a separate part of the hopper for future disposal. The sand is removed off the bottom via suction and stored in a hopper or bin within the vessel. This method is advantageous, since it washes the sand twice (when it is suctioned onto the dredge and when it is pumped out), removing fines and increasing the beach quality of the sand before placement on the beach.

Photograph 1. Hopper dredge Sugar Island approaching pump out locations, with two booster pumps, tugs and Naples in the background during 2006 project.

Once full, hopper dredges moor at a pump-out location, which is connected by a submerged pipeline to the shore. As a rule of thumb, mid-size hopper dredges (which will likely be utilized for the proposed project) require the pump-out station to be located in approximately 24 feet of

water, which is approximately three miles offshore in the Collier County area. The 2006 project utilized mid-size hopper dredges to excavate Borrow Area T1 (Photograph 1), and mooring (operational) areas were established (Figure 1). Three miles is a long pumping distance for a hopper dredge and will necessitate the use of a booster pump or two during the offloading process. In addition, the project area is spread out along approximately 10.5 miles of coastline and the fill areas are separated by inlets (Figure 1). These conditions will necessitate occasional movements of the submerged pipeline during construction so that the pumping distances can be minimized. During the movements of the submerged pipeline, the pipeline is lifted off the seafloor by the contractor's floating equipment in order to prevent damage to hardbottom resources and moved to its new location. Once the sand reaches the beach, pipes are placed alongshore to move the sand up and down the coast from the pipeline landing location. This lateral pumping may be limited up to ¼ to 2 miles alongshore, after a long onshore pump. This process is supported by bulldozers, front end loaders and other work vehicles to grade and distribute the sand along the beach. Shore-parallel dikes would be constructed along the waterline to allow settlement of fines and control turbidity. Construction access points are available in each beach segment for use by the contractor to move the equipment on the beach and to allow access by the work force. Equipment may be moved directly across the shallow depths of Clam Pass between the Vanderbilt reach and Park Shore reach, conditions permitting.

2.2.2.2 Cutterhead Suction Dredge with Scows

Another method of dredging and transporting offshore sediments is to utilize a cutterhead suction dredge. The use of hydraulic cutterhead dredge is optimal when the fill location is within an economically feasible and direct pumping distance from the dredging location, typically no more than six miles. Borrow Area T1 is located 33 miles offshore of Vanderbilt Beach; therefore, if a cutterhead is used, scows will be required to transport the sand to the seaward end of the submerged pipeline for placement in the fill area. A scow is an un-powered barge that transports sand via tugboat. A spider barge is often used in this process to facilitate the transfer of sand from the dredge to the scow. It is difficult to screen for rocks during the cutterhead dredging process. The most practical method is to screen for rock on the dredge with disposal over the side, back into the designated disposal section of the borrow area similar to what was done with the 2006 project, or screen on the beach. This method of disposal should cause no significant impacts, since Borrow Area T1 has insignificant quantities of rock.

Once the scows have been filled, they are moved to an offshore unloading point. A scow can unload in significantly shallower water than a hopper dredge, which is why this process may be less expensive. The scow would require a water depth of about 20 feet to offload the sand. New nearshore mooring (operational) areas are proposed for this unloading point (Figure 1). Based on the bathymetry, this would place the scow approximately 1 mile offshore. The scows are emptied using a hydraulic offloader or similar method. Booster pumps may be strategically placed along the pipeline corridors to pump the sand to the beach. The sand suspended in slurry moves through a pipeline and is deposited on the beach in a fashion similar to that used for standard hopper dredge projects described above.

2.2.3 Pipeline Corridors

If a dredge is utilized, the proposed project would use the pipeline corridors permitted in the 2006 project to the greatest extent possible. These pipeline corridors were investigated for the presence of any offshore hardbottom communities.

Three pipeline corridors (P1, P2 and P3) were permitted for the 2006 project and will be used for the proposed project if a dredge is utilized (Figure 1). P1 is the northernmost pipeline corridor and comes ashore between R-25 and R-26 on Vanderbilt Beach; P2 comes ashore between R-51 and R-53 on Park Shore; and P3 comes ashore between R-62 and R-64 on Naples Beach. The latter has two spurs. Collared pipelines were installed over hardbottom resources, as approved by FDEP, in order to elevate the pipeline above the substrate and minimize the area of direct contact with the seafloor and avoid physical abrasion to the benthic communities. The collared submerged pipeline consisted of the standard 30-inch dredge pipe with large tractor tires placed around the pipe at 100 ft (30.5 m) intervals over the portion of the corridor that crossed hardbottom resources. Table 2 details the previously permitted pipeline corridors, as shown in Figure 1, which will be used for the proposed project if a dredge is utilized. The pipeline length used in 2006 is shown (ft), with the length of collared pipeline shown in parentheses. The proposed scow pipeline lengths are shown in the last column, the entire lengths of which will be collared to protect hardbottom resources (with the exception of P3-Spur 5, where no benthic resources were identified).

Photograph 2. Collared pipeline within corridor P3 during the 2006 project.

Table 2. Details of previously permitted pipeline corridors from 2006 project.

Previously Permitted Pipeline Corridors	R-Monument Location	Beach	2006 Pipeline Length (collared length)	Scow Proposed Pipeline Length – entire length collared
P1	R-25 to R-26	Vanderbilt Beach	13,000 ft (5,900 m)	3,700 ft
P2	R-51 to R-53	Park Shore	17,200 ft (5,900 m)	4,600 ft
P3 (Spur 3)	R-60	Naples Beach	not used	4,700 ft
P3 (Main)	R-63	Naples Beach	18,000 ft (6,500 ft)	4,000 ft
P3 (Spur 5)	R-70 to R-71	Naples Beach	13,600 ft*	3,600 ft*

*No collar necessary since no benthic resources identified in this corridor.

The 2006 project utilized a hopper dredge for sand excavation and transport (Photograph 1). The portion of the pipeline corridors P1 through P3 used for the 2006 project extended from the shoreline out to the -25 ft depth contour and ranged in length from 13,000 ft to 17,000 ft and width from 150 ft to 250 ft. Actual permitted corridors are longer (Figure 1). If a cutterhead and

scow are utilized, this will allow for the western (offshore) end of the pipeline corridors to be closer to shore, which would reduce the length of pipeline that sits on the seafloor, thus minimizing potential impacts to hardbottom resources. The pipeline corridors will extend from shore out to the 20 ft depth contour with the same width range as the 2006 pipeline corridors, but length range will be reduced to between 3,600 and 4,700 ft. The western end of the pipeline will now require a work area that is wider in the alongshore direction for offloading the sand from the scow by hydraulic offloader for connection to the pipeline. These areas are presented in Figure 1 as proposed nearshore operational areas, and are at least 300 ft long by 1,000 ft wide. These areas were selected to avoid, where practical, hardbottom based on sidescan surveys of the corridors. In order to verify that the proposed operational areas did not contain hardbottom, additional operational area investigations were conducted in January and February 2013; a summary of these towed video and diver investigations is provided as Appendix I. The location of hardbottom areas is also shown in the permit sketches, provided as Appendix J. The pipeline will be laid and removed as project progress is made along the shoreline, and surveys will be conducted to assess any impacts from the pipeline to hardbottom resources. A summary of the pipeline corridor investigations is included in the Final Hardbottom Biological Monitoring Plan, provided as Appendix K.

2.2.4 Beach Design Standard

The beach design standard would include a 100 foot total width from a landward baseline at the existing seawalls or edge of vegetation at Vanderbilt, Pelican Bay and Naples Beaches (Figure 1). The design width is reduced to 85 ft in Park Shore to limit encroachment on nearshore hardbottom resources. This is the same design width as the 2006 project and the intent of the 1996 project. The beach construction template would include an 85 or 100 foot wide berm with an elevation of +3.0 feet NAVD (with +/- 0.5-ft tolerance) at its seaward edge and elevation +4.0 feet NAVD at its landward edge. Collier County used a turtle friendly stepped berm in 2006 and is proposing the same stepped berm with a 1V:5H slope between the 3 and 4 ft contours for the upcoming project. Gaps in the project are proposed where the shoreline does not need fill: Vanderbilt Beach will have a gap between R-22+300 and R-25+500; Park Shore will have a gap between R-47+500 and R-50; and Naples Beach will have gaps between R-64+500 and R-68+200 and R-72+600 to R-79 (Figure 1). Berm caps and vegetation are being planned for select locations in the project area. The berm caps are located in two regions of the project. One region is from R-44 to R-45, and the other is located in Naples from R-58A to R-58. The berm cap adds an additional 1 foot of elevation onto the upper berm crest in these regions. This 1 foot increase in select areas mimics the trend in a higher natural berm that has been observed from monitoring surveys in the specific areas. Cross sections of these profiles are included with the permit sketches, provided as Appendix J.

2.3 Alternative #3: Beach Nourishment Utilizing Upland Sand Source Truck Haul Project

2.3.1 Potential Upland Sand Sources

An upland sand source will be used if truck haul is selected as the preferred construction method. The specific sand mine will be determined at the time of contractor selection, and the fill will be

beach compatible. Several sand mines are located near Collier County. Three sand mines (Immokalee, Witherspoon and Lake Wales) have been investigated and can provide sand similar in characteristics to Borrow Area T1. The Immokalee sand mine has been used successfully on the County beaches. For the purpose of permitting, design and bidding, the upland sand source will have a mean grain size between 0.32 and 0.36 mm, with a sorting less than 1.0. Silt content will be below 1%. The Munsell color will be at least 7, although a value of 8 is preferred. The sand shall have a chroma of 1.

2.3.2 Truck Haul Operations

Using dump trucks, sand will be loaded at the sand mine from a stock pile and taken to the project area. The fill will be transported by dump truck to a sand stock pile location at the fill site or near the beach access location. From the stock pile, the sand will be moved by rough terrain dump truck and disposed in or near the construction template. Grading will be conducted using a bulldozer. A front end loader will assist in construction and trans-loading the sand between street and rough terrain equipment. A conveyor between the road and beach is also feasible. The fill will be placed in an approved construction template (described in section 2.3.3), and will extend into the nearshore zone. In the case of a truck haul project, the construction process may take between 137 to 231 days based upon production rates of between 1,776 to 3,000 c.y./day if a project of 420,000 cubic yards is constructed. It is possible that constructing the project as a truck haul project may extend construction into a second season, with a break to avoid peak sea turtle nesting season from June through mid-September.

There would be a significant increase in construction traffic from upland operations and overland transport, as compared to the no project alternative and the proposed project. This alternative, if implemented, would repeatedly disrupt public access.

CHAPTER 3 – ENVIRONMENTAL SETTING AND IMPACT ANALYSIS

Pursuant to the NEPA, the proposed action is evaluated to determine the potential environmental effects that may result from issuing a noncompetitive lease to authorize use of OCS sand resources for beach nourishment. As previously stated, this EA supplements the EA prepared by the USACE in 1995 for the initial 1996 nourishment project (Appendix A) and the EA prepared by CPE in 2005 for the 2006 renourishment project (CPE, 2005) (Appendix B). The 2005 EA presented three alternatives: no action; using inlet dredging and upland sources; and the preferred alternative of dredging sand from Borrow Area T1. BOEM has determined that the existing analyses contained in the 2005 EA and the proposed mitigation and minimization measures adequately address potential impacts to archaeology and cultural resources, beach and coastal habitat, physical oceanography, recreation and tourism. BOEM has determined these evaluations to be still valid since the project limits and construction methodologies, scope, and timing have remained essentially the same. These analyses are incorporated by reference.

Based on coordination with and guidance from BOEM, this EA supplements the 1995 EA and 2005 EA, providing additional information on water quality, air quality, noise, the status of and potential effects to threatened and endangered species, Essential Fish Habitat (EFH), benthic resources, non-threatened marine mammals, migratory birds, aesthetics and cumulative impacts.

The sections below provide updated information and impact analyses, and refer to relevant sections in the 2005 EA where appropriate.

3.1 Physical Environment

Collier County is bounded to the west by the Gulf of Mexico, to the north by Lee and Hendry Counties, to the east by Broward and Miami-Dade Counties and to the south by Monroe County (Figure 1). Collier County covers an area of approximately 1,280,000 acres and has over 50 miles of coastline.

The action area for this project is defined as all areas to be affected directly or indirectly by the proposed action, including approximately 13 miles of shoreline, including the 7.5 miles of fill area and adjacent, non-project sections of the beach within Collier County, between Wiggins Pass and Gordon Pass (Figure 1). It also includes the nearshore marine environment extending from the fill area to the equilibrium toe of fill (ETOF) (referred to as Proposed 2013 Equilibrium Toe of Slop on permit sketches, provided in Appendix J).

3.1.1 Geology and Geomorphology

A complete discussion of the geology and geomorphology within Collier County was included in section 3.1.1 of the EA prepared for the 2006 project (CPE, 2005). This section also included a description of the beach sand characteristics in the fill area and a description of Borrow Area T1

sand characteristics. The following section provides a brief summary of and update to the compatibility of Borrow Area T1 sand with existing sand in the fill area.

3.1.1.1 Beach Sand Characteristics

The beach sands in the project area are fine to medium-grained with shell. The sands have been influenced by nourishment projects, truck haul sand and bypassing at inlets. These activities have added moderate quantities of shell, minor quantities of rock, and coarse sand from upland sources, which make it difficult to accurately define the engineering qualities of the beach. A number of rock removal projects since 1996 have had a visible influence on the beaches of Naples and Vanderbilt.

In 1998, sand samples were collected at the berm, foreshore and toe of fill to meet permit conditions. In 2003, a more comprehensive sand sample collection was undertaken, with samples collected across the entire profile at the following elevations: mid-berm, MHW, MTL, MLW, -3, Trough, Bar, -6.5 and -9 ft NGVD. These latter samples were taken after rocks and shell were cleaned from the beach and coarse truck haul sand was placed on eroded beaches. The average composite mean grain size for 1998 and 2003 were 0.34 mm and 0.24 mm, respectively.

The dry beach has a range of dry Munsell colors from 5Y-8/1 (white) to 5Y-8/2 (pale yellow) and wet Munsell colors from 5Y-7/1 (light gray) to 5Y-8/2 (pale yellow). The subaerial beach has a range of dry Munsell colors from 5Y-6/2 (light olive gray) to 5Y-8/2 (pale yellow) and wet colors ranging from 5Y-5/1 (gray) to 5Y-7/2 (light gray).

Between September 18 and 19, 2012, sand samples were collected from the mid berm, MHW and MTW along profiles at R-14, R-27 (Vanderbilt Beach), R-45, R-52 (Park Shore) and R-64 (Naples Beach) to characterize the existing beach. The average composite mean grain size is 0.41 mm with a phi sorting of 1.34 and a silt content of less than 1%. The wet Munsell color value is typically 6. This sediment sampling was only performed on the dry beach and was overly influenced by shell hash from a recent major storm.

3.1.1.2 Borrow Area T1 Primary Dredge Area Sand Characteristics

Two potential borrow areas were initially identified by CPE for use in the 2006 Collier County renourishment project; however, during the permitting process for the 2006 project, Borrow Area N5 was deemed unsuitable by the FDEP because of the quality and quantity of the silt, which did not meet current State standards. Therefore, Borrow Area N5 was rejected as an alternative and removed from the project plans. The sediment from the primary dredge area of Borrow Area T1 was used during construction of the 2006 project, and the performance of the fill has exceeded expectations. Borrow Area T1 is the only feasible alternative borrow area and is proposed as the sole sand source for the potential dredging project.

Borrow Area T1 is located in Federal waters, approximately 33 miles northwest of Vanderbilt Beach (Figure 2). This borrow area is located within a vast complex of well-developed sand ridges, called the Captiva ridge field, that contains potentially beach compatible material (Finkl *et al.,* 2007). The Borrow Area T1 permit sketches are included in Appendix F as Attachment No. 2 to the Permit Modification Request.

The borrow area contains approximately 4.8 million cubic yards (mcy) of sand (1.76 mcy – primary dredge area, 3.06 mcy secondary dredge area) and covers an area of approximately 372 acres. In 2004, there was over 8 million cubic yards of sand located in Borrow Area T1, but the borrow area was reconfigured to meet the specific needs and objectives of this project. The borrow area volume has been sized to support a 6-year program of initial nourishment, renourishment and emergency restoration projects, with sufficient buffers to account for dredging methods and contingencies. The grain size characteristics of the material are superior, and provided good performance and minimal turbidity during the 2006 project. Borrow Area T1 primary dredge area is characterized by light-gray (5Y 7/1), fine-grained quartz sand. The shell content ranges from 1% to 8% and the silt content is 1.7%. Both the shell and silt content generally increase with depth. The sand is moderately sorted, with a phi sorting value of 0.77. The mean grain size was found to be 0.33 mm. These values were determined using the moment method. Screening will be used to sort rock and shell from the sand, although the quantities of rock in this borrow area are expected to be insignificant.

Although the sediments on beaches within the Collier County Beach Renourishment Project area have been influenced by periodic past nourishments in Collier County, they are still referred to as "native" sediments. It is necessary to match the borrow area sand to the sediment characteristics of the native beach to the maximum extent practicable in order to maintain integrity, appearance and shape, erosion behavior and quality of habitat for wildlife. Key sediment parameters include the mean grain size, sorting, and silt content. Table 3 compares these native beach characteristics (2003 survey data) to the sand within Borrow Area T1 (sampled in 2006 and 2012). The material placed in the 2006 project had a mean grain size of 0.33 mm; the sand currently on the project shorelines is assumed to be the same quality as the fill placed there in 2006. Since the 2006 project it has been observed that the coarser grain size has resulted in a steepening of the beach profile and the project has performed better than expected, avoiding spreading impacts to nearshore hardbottom resources.

Table 3. Composite sand characteristics for the Collier County native beach compared to Borrow Area T1

Segment Area	Mean Grain Size (mm)	Mean Grain Size (φ)	Sorting (φ)	Silt (%)
2003 Vanderbilt Beach (R27)	0.22	2.17	1.57	4.65
2003 Pelican Bay (R-33)	0.30	1.72	1.86	1.72
2003 Park Shore (R52)	0.18	2.51	0.92	2.61
2003 Naples (R64)	0.23	2.11	1.31	1.52
Borrow Area T1				
2006 Dredged Area 1	0.33	1.59	0.90	1.65
2012 Primary Dredge Area	0.33	1.62	0.77	1.71

Project Impacts to Geology and Geomorphology

Sand placement on the beach will widen the beach and protect the dune and associated vegetation. The material found in Borrow Area T1 is compatible with the existing sand found on the beaches in the project area. It is anticipated that utilization of this material for beach renourishment will result in increased beach habitat that provides a tourist and recreational attraction which can result in an increase to the local economy.

Monitoring/Mitigation

To protect the environmental functions of Florida's beaches, only beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Pursuant to Fla. Admin. Code r. 62B-41.008 (1) (k) 4.b., a QA/QC plan has been developed and will be followed to ensure that the sediment from the borrow areas (offshore and/or upland) to be used in the project will meet the standard in Fla. Admin. Code r. 62B-41.007(2)(j). The Sediment QA/QC Plans for Offshore and Upland Sand Sources are provided in Appendix F, as Attachment No. 4 to the Permit Modification Request. Collier County will implement best construction practices and conduct beach sampling and beach profiling requirements of FDEP Consistency Certification.

3.1.2 Physical Oceanography

Borrow Area T1 is located 33 miles offshore of Collier County, FL (Figure 1) and lies within BOEM's jurisdiction. The borrow area contains approximately 4.8 million cubic yards of sand. The proposed project will require a maximum of 500,000 cy of sand (Table 1). Subsequent renourishment operations will utilize the remaining material in the borrow area as needed, within the life of the permit and lease.

A complete discussion of the physical oceanographic conditions and a wave refraction analysis for Borrow Area T1 were described in 3.1.2 of the EA prepared for the 2006 project, with the complete wave refraction analysis included as Appendix C (CPE, 2005). Multiple scenarios were modeled, including a completely excavated borrow area (maximum impact), and no adverse impacts were determined. Therefore the modeling results are not anticipated to change for this project.

Project Impacts to Physical Oceanography

It was determined that the dredging of Borrow Area T1 was not expected to result in any significant adverse impacts on waves or shoreline erosion patterns (CPE, 2005).

3.1.3 Water Quality

A complete discussion of water quality in the project area was included in section 3.1.3 of the EA prepared for the 2006 project (CPE, 2005). The waters off the coast of Collier County are listed as Class III waters by the State of Florida. Class III category waters are suitable for recreation and propagation by fish and wildlife. In Class III waters, Florida state guidelines limit turbidity values from exceeding 29 NTU above ambient levels outside the turbidity mixing zone during beach restoration activities.

Project Impacts to Water Quality

In general, dredging temporarily suspends sediments and increases turbidity within the immediate vicinity of the operation. During construction of the proposed project, elevated turbidity and sedimentation levels will occur at the dredge and the fill sites but are not anticipated to extend beyond the duration of construction activities. During dredge operations, temporary turbidity can be generated on the seafloor by the cutterhead or draghead (of a hopper dredge) while removing sediments from the borrow area (Baird & Associates Ltd., 2004). Suspended sediments here are usually confined to the immediate vicinity of the cutterhead or draghead and do not reach the surface (LaSalle *et al*., 1991). Increased turbidity is also caused from the discharge of hopper dredge overflow (Baird & Associates Ltd., 2004). In sandy substrates typical of OCS sand borrow sites, turbidity is typically short-term and restricted in its extent (Baird & Associates Ltd., 2004). Studies of past projects indicate that the extent of the sediment plume is generally limited to 1,640 - 4,000 ft from the dredge and that elevated turbidity levels are generally short-lived, on the order of an hour or less (USACE, 1983; Hitchcock *et al*., 1999; MMS, 1999; Anchor Environmental, 2003; Wilber *et al*., 2006). The length and shape of the plume depends on the hydrodynamics of the water and the sediment grain size.

Given that the dominant substrate at the borrow sites is sand, it is expected to settle rapidly and cause less turbidity and oxygen demand than finer-grained sediments. No appreciable effects on dissolved oxygen, pH, or temperature are anticipated because the dredged material has low levels of organics and low biological oxygen demand. Additionally, dredging activities would occur within the open ocean where the hydrodynamics of the water column are subject to mixing and exchange with oxygen rich surface waters. Any resultant water column turbidity would be short term (i.e., present for approximately an hour) and would not be expected to extend more than several thousand feet from the dredging operation. Accordingly, it is anticipated that the project would have only minor impacts on marine waters at the offshore borrow site.

Turbidity monitoring was conducted at the fill sites during the 2006 project to ensure turbidity levels at the edge of the designated mixing zone did not exceed 29.0 NTU above background. Turbidity levels were not reported as exceeding 29.0 NTU above background at the fill site. Turbidity monitoring was not required at the dredge site (located in Federal waters) due to the low potential for impacts as explained above.

Monitoring/Mitigation

Turbidity monitoring will be conducted at the fill sites to ensure turbidity levels at the edge of the designated mixing zone do not exceed 29.0 NTU above background. Water quality monitoring will be conducted in compliance with permit requirements for the proposed project.

3.1.4 Air Quality

Refer to section 3.1.4 of the EA prepared for the 2006 project (CPE, 2005) for a discussion on air quality within the proposed project area. Areas that exceed a Federal air quality standard are designated as non-attainment areas. Collier County is located in an attainment area for all criteria pollutants; therefore, a General Conformity Review (under Section 176(c) of the CAA) does not apply to this project. According to the FDEP 2011 Air Monitoring Report (FDEP, 2011), the air

quality in the Collier County project area remains within the EPA's current National Ambient Air Quality Standards (NAAQS) (EPA, 2012).

Project Impacts to Air Quality

The project is exempt from the Clean Air Act conformity requirements because it is located in a Federal attainment area (F.A.C. 62-204.340 (1-4)). For the purposes of evaluating air quality impacts in this EA, emissions are considered to be minor if the Proposed Action would result in an increase of 250 tons per year or less for any criteria pollutant. The 250 tons per year value is used by the EPA in its New Source Review standards as an indicator for impact analysis for listed new major stationary sources in attainment areas. No similar regulatory thresholds are available for mobile source emissions. Lacking any mobile source emission regulatory thresholds, this threshold is used to equitably assess and compare mobile source emissions. For the assessment of greenhouse gases, the CEQ-recommended a 25,000 tonnes (27,500 tons) threshold is applied. The State of Florida does not regulate emissions from off-road equipment or marine vessels (FDEP, 2012); however, it is anticipated that insignificant additions of greenhouse gases will be emitted from all dredge and construction equipment. A complete analysis of emissions is included in section 3.1.4 and Appendix E of the 2005 EA (CPE, 2005). No significant impacts to air quality are anticipated based on information from prior projects.

3.1.5 Noise

Noise is defined as unwanted sound. The most commonly used reference for underwater sound is 1 μPa. Furthermore, under the Marine Mammal Protection Act (MMPA), root-mean-square (rms) levels are used to determine harassment, therefore all underwater sound levels will be reported in rms.

During a beach renourishment project along Wallops Island, Virginia, in summer 2012, NASA partnered with BOEM and USACE to record background in-water sound levels at the both offshore borrow site and the nearshore pump-out area. Data were collected at two listening depths at each site: approximately 10 ft and 30 ft depths at the offshore shoal and 10 ft and 20 ft at the nearshore sites. During the study, the majority of data collected when winds were at least 4-7 mph and wave heights were at least 1-2 ft; therefore, the data do not reflect "calm" sea conditions. Background sound pressure levels (SPLs) averaged 117 dB across all sampling days, sites, water depths and weather conditions. Minimum measured sound levels ranged from 91 dB to 107 dB depending on sampling location and water depth; maximum levels ranged from approximately 128 dB to just under 148 dB (Reine *et al*. *in prep*). Highest SPLs were found at frequencies of less than 200 hertz. The authors note that sea state and the associated sounds generated by waves interacting with the survey vessel likely contributed to the elevated readings.

Project Impacts to Noise

It is expected that in-water sound levels generated by the Preferred Action would be similar to those reported by Reine *et al*. (*in prep.)*, which summarizes recorded sound levels from hopper dredges operating in the nearshore waters off Wallops Island. Though the referenced study presents sound levels from three individual dredges, the sound levels presented for this analysis were logarithmically averaged into a single SPL for each activity in the dredging cycle. Based upon data collected by Reine *et al*. (*in prep.*) at 165 ft from the dredge, sediment removal and the transition from transit to pump-out would be expected to produce the highest sound levels at an estimated source level (SL) of 172 dB at 3 ft. The two quietest dredging activities would be

expected to be seawater pump-out (flushing pipes) and transiting (unloaded) to the borrow site, with expected SLs of approximately 159 and 163 dB at 3 ft, respectively.

This new information generally correlates with what was presented in the 2005 EA, which was based on Richardson *et al.*, 2005. However, the new information does suggest that SLs and the region of elevated sound around the dredges could be higher than originally anticipated, though not substantially different.

Based upon attenuation rates observed by Reine *et al*. (*in prep.),* it would be expected that at distances approximately 1.6 - 1.9 mi from the source, underwater sounds generated by the dredges would attenuate to background levels. However, wind (and corresponding sea state) would play a major role in dictating both the distance within which project-related underwater sounds would be above ambient levels and the potentially audible to nearby receptors.

The extent to which the introduction of higher background sound levels masks the ability of marine animals to detect and interpret sound signals from their environment is largely unknown, as is their reaction to man-made sounds (Robinson *et al.,* 2011; Normandeau Associates, Inc., 2012). It has been hypothesized that the noise associated with dredging activities can trigger an avoidance reaction in marine mammals and may interrupt fish migrations (Clarke et al., 2004; Southall et al., 2007; Thomsen et al., 2009; Normandeau Associates, Inc., 2012). Southall et al. (2007) reviewed several studies that observed changes in behavior or avoidance in several dolphin species due to increased noise levels from approaching research vessels and boat traffic. Clarke et al. (2004) found that cutterhead dredging operations are relatively quiet compared to other sounds in aquatic environments, whereas hopper dredges produce somewhat more intense sounds. If dredging activities cause local fauna to abandon an area for long periods of time (months-long dredging projects), measurable impacts may occur. Thomsen et al. (2009) conducted a field study to better understand if and how dredge-related noise is likely to disturb marine fauna. This study found that the low-frequency dredge noise would potentially affect low- and mid-frequency cetaceans, such as bottlenose dolphins.

The mitigation measures required for ESA-listed marine mammals (e.g., observers, vessel speed restrictions; avoidance measures; see *Listed Whales)* also apply to marine mammal species not listed under the ESA, but afforded protection under the Marine Mammal Protection Act (MMPA). With implementation of the proposed mitigation, potential impacts from noise on marine mammals and sea turtles would be localized and temporary in nature.

3.2 Biological Environment

3.2.1 Threatened and Endangered Species

Section 3.2.1 of the EA prepared for the 2006 project included discussion of species biology, occurrence and potential impacts for threatened and endangered species that could occur in the project area (CPE, 2005). This EA provides updated information for previously assessed species, as well as information for species which were not included in the 2005 EA, including the red knot, blue whale, sei whale, largetooth sawfish, and staghorn and elkhorn coral. A Biological Assessment (BA) was also prepared to assist BOEM and USACE with ESA Section 7

Consultation for the 2013-14 Collier County Beach Renourishment Project; this BA assesses potential impacts to Federally listed species, and is provided in Appendix E of this EA.

3.2.1.1 Sea Turtles

Five species of sea turtles can be found in Florida waters: loggerhead (*Caretta caretta*), green, *(Chelonia mydas)*, leatherback *(Dermochelys coriacea)*, hawksbill *(Eretmochelys imbricata)*, and Kemp's ridley *(Lepidochelys kempii)*. These species are described in section 3.2.1 of the 2005 EA. The U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) have listed green (Florida breeding populations), leatherback, hawksbill and Kemp's Ridley sea turtles as Endangered. On September 22, 2011, USFWS and NMFS revised the loggerhead's listing from a single worldwide threatened species to nine distinct population segments (DPS); the Northwest Atlantic Ocean distinct population segment (DPS) of loggerheads is listed as Threatened (76 FR 58868). On March 25, 2013, USFWS proposed critical habitat for the Northwest Atlantic Ocean Distinct Population Segment of the loggerhead sea turtle under the Endangered Species Act (Act) (78 FR 17999). The intended effect of this regulation is to assist with the conservation of the loggerhead sea turtle's habitat under the Act. The proposed critical habitat areas include 90 nesting beaches in North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi. The proposed critical habitat areas include 90 nesting beaches in coastal counties located in North Carolina, South Carolina, Georgia, Florida, Alabama and Mississippi. The proposed areas incorporate about 740 beach shoreline miles and account for approximately 84 percent of the documented nesting (numbers of nests) within these six states. Six proposed critical habitat areas (LOGG-T-FL units 27-32) include beaches within Collier County (Figure 3). This area includes 13.2 miles of beach from Big Hickory Pass in southern Lee County south to Doctors Pass, Collier County, 8.1 miles of beach on Keewaydin Island, 5.7 miles of beach on Cape Romano and 4.9 miles of beach in the Ten Thousand Islands. There is no proposed critical habitat along Naples beach between Doctors Pass and Gordon Pass.

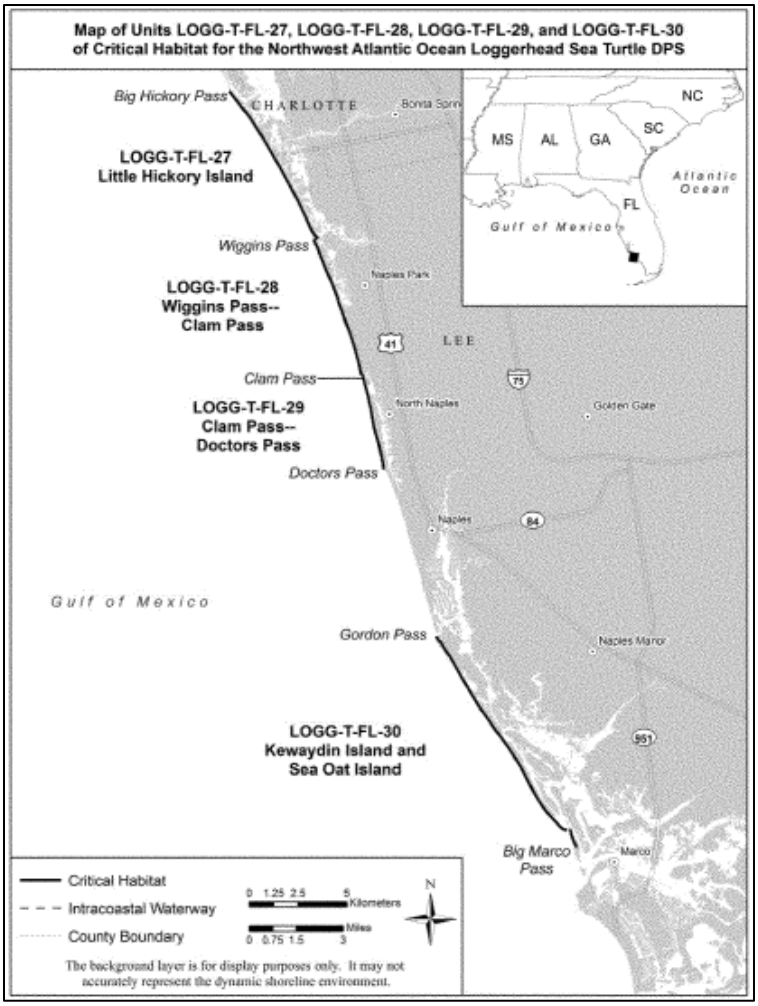

Figure 3. Proposed loggerhead critical habitat within Collier County (78 FR 17999)

Although green, Kemp's ridley, hawksbill and leatherback sea turtles have been documented as nesting on Florida's Gulf Coast beaches, the loggerhead sea turtle is the dominant nesting species, accounting for 99% of the nests in 2011 on the west coast and in Collier County. As a permit requirement for beach renourishment, Collier County is responsible for surveying 38.1 km (23.7 mi) of beach for sea turtle activities. The Sea Turtle Protection Program within the Collier County Parks and Recreation Department (CCPRD) monitors 27.2 km (16.9 mi) of shoreline on Barefoot, Vanderbilt, Park Shore and Marco Island. The remaining 9.0 km (5.6 mi) of beach in the City of Naples is subcontracted to the Conservancy of Southwest Florida (CSWF). An additional 1.2 miles of shoreline nesting is reported to CCPRD by Delnor-Wiggins Pass State Park. Table 4 and Figures 3 - 5 present the total number of sea turtle emergences (nests and false crawls) documented within Vanderbilt (R-22.5 to R-41.5; this area includes Pelican Bay), Park Shore (R-41.5 to R-57) and Naples (R-57.5 to R-89) monitoring segments between 1998 and 2011 (CCPRD, 2012). With the exception of one green turtle nest laid on Barefoot Beach in 2007, all nests laid along the 23.7 miles of monitored Collier County shoreline have been loggerhead nests.

Table 4 presents sea turtle emergences (nests and false crawls) for Vanderbilt Beach (including Pelican Bay), Park Shore and Naples from 1998 – 2011 (CCPRD, 2012).

Table 4. Sea turtle emergences in Vanderbilt (including Pelican Bay), Park Shore and Naples, Collier County, 2001-2011 (CCPRD).

Year	Vanderbilt (with Pelican Bay)		Park Shore		Naples	
	Nest	False Crawls	Nest	False Crawls	Nest	False Crawls
1998	186	175	150	133	49	70
1999	170	111	106	119	87	74
2000	167	136	154	186	68	70
2001	125	118	105	79	52	49
2002	90	131	81	75	31	49
2003	159	125	122	188	59	52
2004	90	45	73	64	61	39
2005	61	91	40	58	31	55
2006	78	81	68	78	30	40
2007	55	69	67	60	42	43
2008	82	64	73	52	50	38
2009	62	65	50	43	50	42
2010	111	88	86	74	72	35
2011	93	107	90	69	67	51

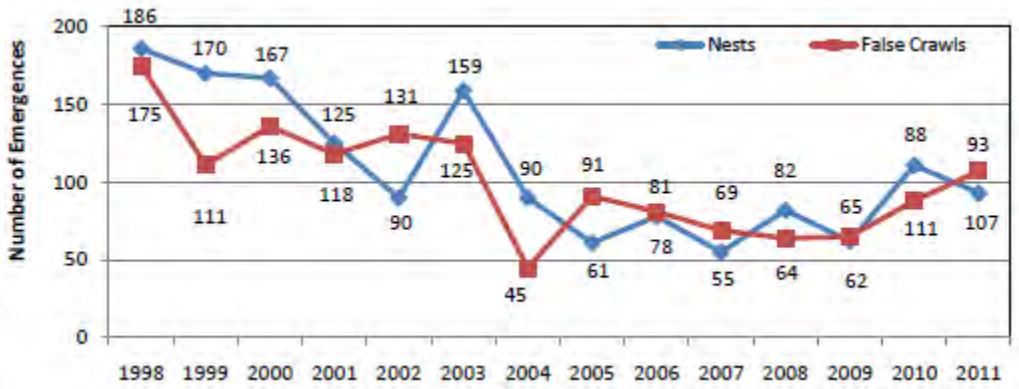

Figure 4. Vanderbilt Beach (including Pelican Bay) annual emergences, 1998-2011 (CCPRD, 2012)

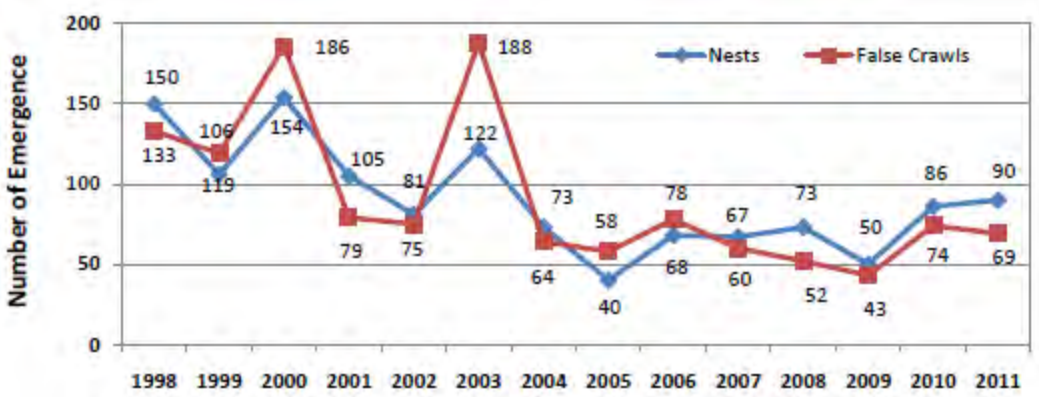

Figure 5. Park Shore Beach annual emergences, 1998-2011 (CCPRD, 2012)

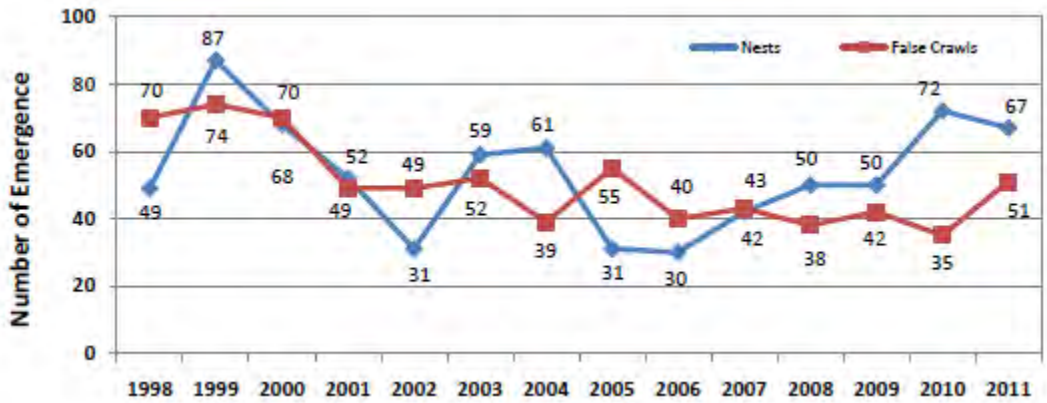

Figure 6. City of Naples annual emergences, 1998-2011 (CCPRD, 2012)

Project Impacts to Sea Turtles

Nesting sea turtles: While nourishment can be beneficial in restoring nesting habitat, it may also result in negative impacts to sea turtles. Sea turtle nesting season on the Gulf Coast is defined as May 1 through October 31. Although the proposed project will avoid peak nesting season, it may overlap with the end of the 2013 nesting season and the beginning of the 2014 nesting season. Direct impacts may result from use of construction equipment on the beach, artificial lighting, increased noise and nest relocation. Project construction during sea turtle nesting season will involve greater potential for the direct mechanical destruction and burial of nests, and greater likelihood for encounters with construction equipment and pipes on the beach during nesting activities. Mitigation measures are in place to prevent such interactions, but the no action alternative could also have impacts on sea turtles. An improperly nourished beach can deter nesting. A beach that is constructed at an unfavorable slope or where the sediment is too compacted can create false crawls and inhibit hatchling success. Sand color is also an important factor with the potential for impacts. Hatchlings exhibit temperature-dependent sex determination, therefore sand that is not the color typical of the native beach will result in an altered nest temperature and hence change the sex ratio (Hays *et al*., 2001). Secondary impacts to foraging habitat include decreased photosynthetic rates in and possible burial of macroalgae communities on the nearshore hardbottom, which are an important food source for sea turtles.

As part of their monitoring and reporting protocol, CCPRD compares emergence data on natural beaches to renourished beaches to assess any impacts to nesting from beach renourishment. Table 5 compares the nests and false crawls per mile on natural and renourished beaches of Barefoot, Vanderbilt (including Delnor-Wiggns Pass State Park), Park Shore, City of Naples and City of Marco Island from 2002-2011 (compiled from CCPRD annual nesting reports). According to this data, here have been no clear negative impacts from beach nourishment to sea turtle nesting.

Table 5. Comparison of nests and false crawls per mile on natural and renourished beaches in Collier County, 2002 – 2011 (CCPRD).

Year	Natural		Renourished	
	Nest	False Crawls	Nest	False Crawls
2002	12.0	14.8	10.1	14.0
2003	13.1	22.6	26.5	24.6
2004	14.4	16.9	17.5	13.2
2006	13.7	17.8	17.8	21.0
2007	8.0	8.8	14.3	18.5
2008	12.9	15.4	15.0	13.7
2009	11.8	15.6	13.3	12.2
2010	15.7	19.1	20.0	14.3
2011	16.1	15.8	18.0	18.1

Note: Natural versus renourished beaches were not compared in 2005.

Swimming sea turtles: Additionally, dredging operations pose a threat to in-water sea turtles, especially loggerheads. Hopper dredges, such as those that may be used for the Collier County Renourishment Project, can directly kill turtles if they are caught in drag heads. Hopper dredging occasionally results in sea turtle entrainment and death, even with seasonal dredging windows, turtle deflector drag heads in place, and concurrent relocation trawling (NMFS, 2003). Incidental takes of sea turtles have only been documented from hopper dredge operations that use trailing suction drag heads. Non-hopper dredges (i.e. clamshell bucket, cutterhead) are not monitored for sea turtle entrainments since the mechanical operation of these dredges has been identified as having minimal or no risk to sea turtles (Dickerson *et al.*, 2004; Dickerson and Theriot, 2012). Swimming sea turtles may also experience temporary impacts from increased turbidity generated by dredge and fill placement activities, but it is generally accepted that water column turbidity impacts to marine ecology from dredging operations in sandy substrates are temporary and restricted in area, and so are not a significant concern (Baird & Associates Ltd., 2004). Swimming sea turtles will also experience impacts from noise disturbance during construction activities (see Section 3.1.5). Noise impacts will be localized and temporary in nature.

The sea turtle species primarily affected by dredging are loggerhead, green, and Kemp's ridley, although hawksbill and leatherback are also potentially vulnerable (NRC, 1990). Leatherback sea turtles are generally found in deep, pelagic, offshore waters though they occasionally may come into shallow waters to feed on aggregations of jellyfish. The nearshore and inshore waters of the northern and eastern Gulf may be used by these species as post-hatchling developmental habitat or foraging habitat (NMFS, 2003).

As part of the required monitoring and mitigation of impacts to endangered and threatened species for the 2006 Collier County Beach Renourishment Project, NMFS-approved endangered species observers provided twenty-four hour monitoring during all hopper dredging operations and conducted relocation trawling starting ten days before dredging commenced and continuing throughout dredging. Coastwise Consulting, Inc. provided observers who looked for any evidence of turtle take, inspected screens, dragheads and turtle deflectors, and recorded pump times, dredge location, and environmental data. Observers also maintained a bridge watch for protected species and noted all sightings of turtles and marine mammals. Methods and results of the monitoring are presented in the final report (Coastwise Consulting, Inc., 2006). Two hopper dredges were utilized for construction of the project: the *Sugar Island* (91 dredge days) and the *Manahattan Island* (82 dredge days). Over the course of the 173 dredge days, no evidence of turtle take by either dredge was documented. A total of 87 sea turtles, including 86 loggerheads (*Caretta caretta*) and one green (*Chelonia mydas*) were relocated over the course of the project; no turtles were injured or killed as a result of the trawling.

Mitigation/Monitoring

The proposed project is planned to be constructed between September 15, 2013 and May 31, 2014 in order to avoid peak summer nesting season. The project will use beach compatible fill from Borrow Area T1, which was used for the 2006 project, in order to minimize impacts to nesting. Collier County used a turtle friendly stepped berm in 2006 and is proposing the same stepped berm with a 1V:5H slope between the 3 and 4 ft contours for the upcoming project. Daily sea turtle nesting surveys will be conducted in the project area, and nest relocation will be conducted when necessary and when approved by Florida Fish and Wildlife Conservation Commission (FWC). Reasonable and Prudent Measures and Terms and Conditions that will be included in the NMFS Biological Opinion will be applied to this project. Suggested measures, as found on pages 51-52 of the Biological Assessment, include lighting restrictions, relocation trawling, and compliance with the *Sea Turtle and Smalltooth Sawfish Construction Conditions*. Collier County Parks and Recreation Department and the Conservancy of Southwest Florida will continue to provide monitoring and relocation services for the proposed project. Construction, monitoring, relocation, dredge observation, trawling and reporting will comply with requirements of the Federal and State permits (Appendices C and D), the USFWS Statewide Programmatic Biological Opinion (SPBO) (USFWS, 2011) and with the NMFS Biological Opinion.

3.2.1.2 Birds

Several species of shorebirds and seabirds are present along the Gulf Coast of Florida and have the potential to occur in the project area, including the piping plover (*Charadrius melodus*), red knot (*Calidris canutus*), least tern (*Sternula antillarum*) and roseate tern (*Sterna dougallii*). General species information on the piping plover, least tern and roseate tern is included in section 3.2.1 of the EA prepared for the 2006 project (CPE, 2005). Red knots were listed as a candidate species in 2006, therefore species information is provided below.

Updated bird observation data is presented below, compiled from the eBird database and from the post-construction bird monitoring conducted following the 2006 project. Launched in 2002, by the Cornell Lab of Ornithology and National Audubon Society, eBird provides data concerning bird abundance and distribution at a variety of spatial and temporal scales. eBird is

sponsored in part by several Service programs, research groups, non-government offices, and the University of the Virgin Islands. Piping plover, red knot and least tern data from eBird for all of Collier County between 2009 and 2011 are provided in Tables 6, 7 and 8, respectively (eBird, 2013). It is important to note that this data is not specific to the project area, but contains all observations with Collier County. Data is also presented from the bird monitoring conducted from June 2006 through September 2008 following construction of the 2006 project (Addison, 2008). The post-construction monitoring included bi-monthly shorebird surveys for two full nesting seasons after construction of the 2006 renourishment project; the surveys covered both the nesting (February 1 – September 30, surveyed bi-monthly) and non-nesting seasons (October 1 – January 31, surveyed monthly). Over the two years of monitoring, no birds were observed nesting on the surveyed beaches (Addison, 2008).

Piping Plover

Piping plovers (*Charadrius melodus*) are small, migratory shorebirds that breed in only three geographic regions of North America: on sandy beaches along the Atlantic Ocean, on sandy shorelines throughout the Great Lakes region, and on the river-bank systems and prairie wetlands of the Northern Great Plains (Haig, 1992). The Great Lakes population is listed as endangered under the Endangered Species Act (ESA), whereas the Atlantic Coast and Great Plains populations are listed as threatened (December 11, 1985). Although this species does not breed in Florida, individuals from all three breeding populations winter in Florida. Wintering habitat has been proven a key factor in survival for piping plovers since they may spend 7-8 months per year away from breeding areas (Nicholls and Baldassarre, 1990; USFWS, 2009a).

Critical habitat for the wintering grounds of the piping plover was designated under Federal Register (66 FR 36038). There is no Federally designated piping plover critical habitat within the project area. The closest critical habitat units for wintering piping plovers are Units FL-26 and FL-27 (Figure 6). Unit FL-26 is located on Estero Island in Lee County, approximately 10 miles north of the project area and FL-27 is located on Tigertail Beach, at the entrance to Big Marco Pass, approximately 11 miles south of the project area.

Piping plover data from eBird for all of Collier County between 2009 and 2011 are provided in Table 6 (eBird, 2013). It is important to note that this data is not specific to the project area, but contains all observations with Collier County. The project area includes developed shoreline with high foot traffic, less likely to provide suitable piping plover habitat than other undeveloped areas in the County. The 2006 International Piping Plover Census (IPPC) did not document piping plovers within the project area (Elliott-Smith *et al.*, 2009); however, 49 piping plovers were observed on Big Marco Pass Shoal located approximately 11 miles south of the project area. No piping plovers were observed in the project area during the two years of post-construction shorebird monitoring from June 2006 through September 2008 (Addison, 2008).

Table 6. Piping plover observations in Collier County, 2009-2011 (eBird, 2013).

Year	Observations
2009	62
2010	70
2011	90

Red Knot

The USFWS designated the red knot (*Calidris canutus*) a candidate for ESA protection on September 12, 2006. The red knot is a medium-sized shorebird with a circumpolar breeding season distribution and migrates to coasts around the world, traveling up to 9,000 mi. It has one of the longest migrations of any bird. In August 2006, the red knot was designated a candidate species for possible addition to the Federal list of endangered and threatened wildlife. The declining population of the red knot is directly related to the increased harvest of horseshoe crabs as bait for the conch pot and eel fisheries in the mid-Atlantic. Red knots are dependent upon horseshoe crab eggs on their stopover in Delaware Bay to sustain them through the remaining 3,000 mi migration to summer breeding grounds in the arctic, as well as to ensure their survival once they arrive.

There are six subspecies of the red knot, two of which are known to winter and/or pass through the U.S. The *rufa* subspecies of the red knot breeds in the central Canadian arctic and mainly winters in Tierra del Fuego, and the *roselaari* subspecies is thought to breed in Alaska and Hunter Island, Russia but may migrate down the Pacific coast and winter in the Gulf of Mexico. Two other wintering populations, found in Maranhão in northern Brazil and Florida, have uncertain subspecific status. Current scientific opinion is that the Florida and Maranhão populations are *C. c. rufa* (Niles *et al.,* 2008). Nonetheless, Florida is known overwintering habitat for the red knot, and the west coast of Florida, specifically the project area, is an important stopover for the Tierra del Fuego population. Preservation of any habitat used by the red knot while they remain vulnerable may be critical to their survival.

Counts conducted in the winter of 2005-06 showed a minimum population of about 4,000 red knots in Florida plus another 1,500 scattered along the coasts of Georgia, North and South Carolina and Virginia (Niles *et al.,* 2006). Of the 4,000 in Florida, 2,500 were observed along 300 km of the west coast between Anclote Key and Cape Romano where an estimated 10,000 occurred in the 1980s (Morrison and Harrington, 1992). The project area falls within this stretch of shoreline. Further counts along the west coast of Florida showed declining numbers with 1,200 in 2006-07, only 550 in 2007-08, 1,532 in 2008-09, and 1,378 in 2009-10 (Dey *et al.,* 2011). Red knot data from eBird for all of Collier County between 2009 and 2011 are provided in Table 7 (eBird, 2013). It is important to note that this data is not specific to the project area, but contains all observations with Collier County. The project area includes developed shoreline with high foot traffic, less likely to provide suitable red knot habitat than other undeveloped areas in the County. Only one red knot was observed in the project area during the two years of post-construction shorebird monitoring from June 2006 through September 2008 (Addison, 2008).

Table 7. Red knot observations in Collier County, 2009-2011 (eBird, 2013).

Year	Observations
2009	69
2010	115
2011	550

Least Tern

Least terns (*Sternula antillarum*) are small, black-capped shorebirds that select nesting sites with a substrate of sand or gravel with fragments of shell. The interior population of least terns is Federally listed as endangered in the Midwest and great plains states, but not Federally listed in Florida. This species is listed as threatened within the state of Florida. Least tern data from eBird for all of Collier County between 2009 and 2011 are provided in Table 8 (eBird, 2013). A total of 122 least terns were observed during the two years of post-construction shorebird monitoring following the 2006 project; no least tern nesting was observed for this species (Addison, 2008).

Table 8. Least tern observations in Collier County, 2009-2011 (eBird, 2013).

Year	Observations
2009	249
2010	199
2011	668

Roseate Tern

The roseate tern (*Sterna dougallii*) is Federally listed as threatened in Florida. According to eBird, there have been no roseate tern observations between 2009 and 2012 (eBird, 2013). No roseate terns were observed in the project area during the two years of post-construction shorebird monitoring from June 2006 through September 2008 (Addison, 2008).

Project Impacts to Birds

The construction window (September through May) is projected to extended through one piping plover migration and wintering period (July 15 to May 15). Red knots also overwinter on Florida beaches. Least terns can be found year round in the project area and have the potential to nest during shorebird nesting season (February 15 – September 1), though they were not observed nesting in the project area between 2009 and 2011 (Addison, 2008). Roseate terns have the potential to occur in the project area, but have not been observed between 2006 and 2011 (Addison, 2008; eBird, 2013).

No long-term impacts to shorebirds are expected from project construction. The disposal of sand on the beach may temporarily interrupt foraging and resting activities of shorebirds that utilize the project area beach. This impact would be limited to the immediate area of disposal and the duration of construction. Heavy machinery and equipment (*e.g.*, trucks and bulldozers operating on project area beaches, the placement of the dredge pipeline along the beach, and sand disposal) may adversely affect any migrating and wintering piping plovers or red knots, or other shorebirds within the project area by disturbance and disruption of normal activities such as roosting and feeding, and possibly forcing birds to expend valuable energy reserves to seek available habitat elsewhere. The prey base for many shorebirds, which includes common invertebrate organisms in the beach and surf zone, would be temporarily reduced in areas of project fill. Burial and suffocation of invertebrate species will occur during each nourishment and renourishment cycle within the fill site. Research by Peterson *et al.* (2006) suggests that short-term impacts to foraging habitat for shorebird species may occur due to the temporary depletion of the intertidal food base. After nourishment, the dramatic decline in beach macro

invertebrate populations degraded the foraging habitat for shorebirds in Bogue Banks, North Carolina - shorebird use of the sandy beach plummeted 70 to 90%, most likely due to depression of prey species. Timeframes projected for benthic recruitment and re-establishment following beach nourishment are between three months and 2.5 years (Greene, 2002; Burlas *et al.*, 2002; Brooks *et al.,* 2006). Beach wrack has also been recognized as important to shorebirds, including piping plovers and red knots, for camouflage and foraging. Since piping plovers spend the majority of their overwintering time in Florida foraging along the shoreline, the wrack line provides an important foraging resource for this species. Destruction of wrack, through beach nourishment or wrack-removal programs, eliminates this habitat. Protection of wrack can help to offset the direct and indirect impacts associated with beach nourishment and ensuing human disturbance.

The closest critical habitat units for wintering piping plovers are located approximately 10 miles north of the project area and approximately 11 miles south of the project area; therefore, there will be no impact to piping plover critical habitat as a result of this project.

Mitigation/Monitoring

Piping plover surveys will be conducted three months prior to construction and for one year following each sand placement event. Surveys will be conducted twice-monthly in the project area during the piping plover migration and wintering period (July 15 to May 15) in compliance with the April 25, 2013 USFWS Biological Opinion (provided in Appendix G). Wrack protection and educational signage will also comply with BO Reasonable and Prudent Measures and Terms and Conditions. Nesting shorebird surveys will also be conducted as required by Federal and State permits (Appendices C and D).

3.2.1.3 Marine Mammals

Whales

Six ESA-listed whale species may be found in the coastal waters of the Florida Gulf Coast. The fin whale (*Balaenoptera physalus*), North Atlantic right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), sei whale (*Balaenoptera borealis*) and blue whale (*Balaenoptera musculus*) were listed as endangered under the Endangered Species Conservation Act, the precursor to the ESA, in June 1970. These species were subsequently listed as endangered under the ESA in 1973, and are also protected under the Marine Mammal Protection Act (MMPA) of 1972 which prohibits the "taking" (harassing, hunting, capturing, or killing) of marine mammals. Although not listed by NMFS Southeast Regional Office as likely to occur in the Gulf of Mexico, North Atlantic right whales have been sighted offshore of Sanibel Island (Staats, 2006), less than 30 miles north of the project area. Of the six endangered whale species, only sperm whales are considered to commonly occur in the Gulf of Mexico and over the greatest range of water depths (Scott *et al.,* 1994). Typically, no threatened or endangered species of whales occur in the nearshore waters (0-200 m) over the continental shelf of the Gulf of Mexico. Occasionally, North Atlantic right whales and humpback whales may be found in nearshore waters of the Gulf of Mexico, usually during the winter season. However, sightings of these species are relatively uncommon and the individuals observed were likely inexperienced juveniles straying from the normal range of their stocks (NMFS, 2003; 2008a).

Species information about the fin whale, North Atlantic right whale, humpback whale, and sperm whale are provided in Section 3.2.1 of the EA prepared for the 2006 project (CPE, 2005). Updated species information for these four species, including data from the NOAA 2010 and 2012 Marine Mammal Stock Assessments (NMFS, 2010a; 2013a), and general species information about the sei whale and blue whale are provided below.

Fin Whale

Fin whales (also called "Finback" whales, *Balaenoptera physalus*) are the second-largest whale species. Fin whales have been reported from the Gulf of Mexico northward to the arctic pack ice; however, their overall distribution pattern is complex (SAFMC, 2013). Fin whales are common in waters of the U. S. Atlantic Exclusive Economic Zone (EEZ), principally from Cape Hatteras northward. New England waters provide a major feeding ground for fin whales (NMFS, 2010a). Fin whales are a deepwater species and not expected to occur in the project vicinity (NMFS, 2003).

North Atlantic Right Whale

North Atlantic right whales (also referred to as "northern right whales" or "right whales", *Eubalaena glacialis*) are large, rotund, black whales with large heads, long rostrums, and no dorsal fins. The western North Atlantic right whale population ranges primarily from calving grounds in coastal waters of the southeastern United States to feeding grounds in New England waters and the Canadian Bay of Fundy, Scotian Shelf, and Gulf of St. Lawrence. Migrations south to the calving grounds occur by pregnant females during mid-November. In the late winter and early spring, right whales leave the southeast waters and travel north to a feeding and nursery area in Cape Cod Bay, Massachusetts.

Of the six whale species which may be found in the coastal waters of the Florida Gulf Coast, only the North Atlantic right whale has designated critical habitat. Critical habitat for the North Atlantic right whale was designated in 1994, and includes portions of Cape Cod Bay and Stellwagen Bank, the Great South Channel (each off the coast of Massachusetts), and waters adjacent to the coasts of Georgia and the east coast of Florida (59 FR 28805). Designated critical habitat in Southeastern U.S. is located between 31°15N (approximately the mouth of the Altamaha River, Georgia) and 30°15N (approximately Jacksonville, Florida) from the coast out to 15 nautical miles (nm) offshore, and within coastal waters out to 5 nm between 30°15N and 28°00N (approximately Sebastian Inlet, Florida). NMFS designated these areas as essential for the reproduction, rest and refuge, health, continued survival, conservation and recovery of the North Atlantic right whale population. There is no critical habitat located in the vicinity of the project area.

The few published records of North Atlantic right whales from the Gulf of Mexico (Moore and Clark 1963; Schmidly *et al.* 1972) represent either distributional anomalies, normal wanderings of occasional animals, or a more extensive historic range beyond the sole known calving and wintering ground in the waters of the southeastern United States (NMFS, 2010a). Whatever the case, the location of much of the population is unknown during the winter. Offshore (greater than 30 miles) surveys flown off the coast of northeastern Florida and southeastern Georgia from 1996 to 2001 had 3 sightings in 1996, 1 in 1997, 13 in 1998, 6 in 1999, 11 in 2000 and 6 in 2001 (within each year, some were repeat sightings of previously recorded individuals) (NMFS, 2010a; 2013a). Occasionally, North Atlantic right whales may be found in nearshore waters of

the Gulf of Mexico, usually during the winter season. The most recent sighting of North Atlantic right whales in nearshore Gulf of Mexico Florida waters was on February 28, 2006, when mother and calf North Atlantic right whales were sighted offshore of Sanibel Island, which is located less than 30 miles north of the Collier County project area. Prior to the 2006 observations, a pair of North Atlantic right whales was seen about a mile and a half off of Panama City (MSNBC, 2004), a dead calf stranded in Texas in winter in the 1970s, and one individual was observed off of Longboat Key in 1963 (Jefferson and Schiro, 1997). In light of the rarity of their occurrence in the Gulf of Mexico, it is unlikely that a North Atlantic right whale will occur in the project area.

Humpback Whale

The humpback (*Megaptera novaeangliae*), one of the larger rorqual species, is found in oceans and seas around the world, though less common in arctic waters, humpback whales typically migrate up to 25,000 km (15,500 miles) each year. Humpbacks feed only in summer, in polar waters, and migrate to tropical or sub-tropical waters to breed and give birth in the winter when they fast and live off fat reserves. Many summer habitats are apparently traditional feeding grounds, with long records of returns by identified individuals. The species' diet consists mostly of krill and small fish. They utilize diverse feeding methods, including the unique bubble net fishing technique. While on their wintering grounds, humpback whales can be found over shallow bars and shelf waters. Principal wintering grounds are located in the West Indies. In particular, protected breeding grounds for the humpback whale include portions of the Virgin Islands and Puerto Rico (NMFS, 1991).

Occasionally, humpback whales may be found in nearshore waters of the Gulf of Mexico, usually during the winter season. However, sightings are relatively uncommon and the individuals observed were likely inexperienced juveniles straying from the normal range of their stocks (NMFS, 2003; 2008a). Humpback whales are not expected to occur in the project vicinity.

Sperm Whale

Sperm whales (*Physeter macrocephalus*) are found in all of the world's oceans, except for the Arctic region. In U.S. waters, they may be found from California and Hawaii north to the Bering Sea, and from Maine to the Gulf of Mexico. Of the six endangered whale species, only sperm whales are considered to commonly occur in the Gulf of Mexico and over the greatest range of water depths (Scott *et al.,* 1994). The North Atlantic Population is divided into two management units: a western North Atlantic stock and a northern Gulf of Mexico stock. In the northern Gulf of Mexico, the sperm whale is the most common large cetacean. In the northern Gulf of Mexico, aerial and ship surveys indicate that sperm whales are widely distributed throughout the year in continental slope and open oceanic waters (NMFS, 2010a). The information for southern Gulf of Mexico waters is more limited, but there are sighting and stranding records from each season with sightings widely distributed in continental slope waters of the western Bay of Campeche (NMFS, 2010a; 2013a). Sperm whales tend to prefer deep waters and occur in the greatest density along the edge of continental shelves in water depths of 914 m (3,000 ft) to 1,829 m (6,000 ft) or farther out to sea (NMFS, 2006; 2008a). Sperm whales are not expected to occur in Collier County.

Sei Whale

Sei whales (*Balaenoptera borealis*) are members of the baleen whale family and considered one of the "great whales" or rorquals. They are very similar in external appearance to fin and Bryde's

whales, all three have typical rorqual body shapes. In both sei and Bryde's whales (Bryde's whales are not listed under the ESA), the dorsal fin rises at a steep angle from the back. Sei whales have only a single prominent longitudinal ridge on the rostrum and a slightly arched rostrum with a downturned tip. Bryde's and sei whales prove difficult to distinguish at sea unless the head can be seen at close range. Adults grow up to 18 m (59 ft) in length, although 15 m (49 ft) is an average adult length. Large adults can weigh up to 30 tons (27, 215 kg; 60,000 lbs). Sei whales have the most diverse diet of any baleen whale, eating up to 1 ton (907 kg) of food per day, including small fish, krill, and copepods. The life span of a sei whale is likely greater than 50 years (NMFS, 2013b).

The sei whale is one of the least well-studied of the "great whales". Hence little is known about the distribution or current population status for most stocks. They are believed to undertake seasonal north/south migrations, spending the summer on feeding grounds in the higher latitudes and winter in lower latitudes where they most likely breed or calve. During the summer, it is thought that a large segment of the western North Atlantic population is centered in northern waters, such as the Scotian Shelf (Mitchell and Chapman, 1977). Though they are not commonly found in the waters of the U.S. Atlantic, their southern range during the spring and summer includes the northern areas of the U.S. Atlantic Exclusive Economic Zone (EEZ) (i.e., Gulf of Maine and Georges Bank). Documented strandings along the northern Gulf of Mexico and in the Greater Antilles indicate those areas to be the southernmost range for this population (Mead, 1977). Sei whales may be found in one area for a while and then not return for years or decades. This behavior is unusual for rorquals, which generally have a predictable distribution. Sei whales usually live and travel by themselves or in small groups of only two to three whales. If there is abundant food in a particular area, larger groups will come together to feed. Up to 100 sei whales have been observed together, but this is an uncommon event (NMFS, 2013b).

Most stocks of sei whales were reduced, some of them drastically, by whaling in the 1950s through the early 1970s. International protection began in the 1970s for this species but exploitation continued by Icelandic and Japanese operations through 1986 when the IWC moratorium on commercial whaling was passed. Of the commercially-exploited "great whales," the sei whale is one of the least well-studied, and the current status of most sei whale stocks is poorly known (NMFS, 1998). NMFS estimated the population size between Cape Hatteras, North Carolina, and Nova Scotia, Canada at 253 from an aerial survey program conducted between 1978 and 1982 (NMFS, 1998). However, the 2011 recovery plan states that the current population is unknown (NMFS, 2011).

There are few if any data on fishery interactions or human impacts to the sei whale. From 2004 – 2008 there were at least two reports of ship strikes, both causing death, and three reports of entanglement with fishing gear, one leading to death and the others resulting in serious injury, on the U.S. Atlantic coast (NMFS, 2010a).

Sei whales are a deepwater species and are not expected to occur in the project vicinity (NMFS, 2003).

Blue Whale

The blue whale is the largest species of baleen whale; adults in the Antarctic have reached a maximum body length of about 33 m (108 ft) and can weigh more than 150,000 kg (165 tons).

Blue whales are long-bodied and slender. They have a mottled gray color pattern which appears light blue when seen through the water. The background color can be dark gray, interrupted by irregular light gray markings, with dark gray splotches (NMFS, 1998). Sexual maturity is achieved between 5 and 15 years of age, and some individuals live longer than 50 years (Yochem and Leatherwood, 1985). Gestation lasts 10-12 months and calves are nursed for 6-7 months. Calves are born approximately every two to three years. Mother and calf form a very close bond, with the calf often swimming close to its mother.

Blue whale distribution is largely governed by food requirements; thus populations are seasonally migratory. Poleward movements in spring allow these whales to take advantage of high zooplankton production in summer. Movement toward the subtropics in the fall allows blue whales to reduce their energy expenditure while fasting, avoid ice entrapment in some areas, and engage in mating activities in warmer waters of lower latitudes (NMFS, 1998).

There are three geographical populations of blue whales: the Antarctic stock (endangered), the North Pacific stock (low risk, conservation dependent), and the North Atlantic stock (vulnerable). The range of the North Atlantic stock extends from the subtropics north to Baffin Bay and the Greenland Sea (NMFS, 1998). There have been occasional sightings off Cape Cod, Massachusetts; this area may represent the southern limit of the blue whales' feeding range. Their distribution in southern waters remains largely unknown (Yochem and Leatherwood, 1985).

Although the species may be found in coastal waters, blue whales are thought to occur generally more offshore than North Atlantic right whales and humpback whales (NMFS, 2013b). The two documented records (pre-1970) of blue whale strandings in the Gulf of Mexico suggest that this species may occasionally stray into the area, but they are less common in these waters (NMFS, 1998; 2013). One blue whale stranded near Sabine Pass, Louisiana in 1924 and one stranded on the Texas coast in 1940 (Davis and Schmidly, 2013). There have been no recorded observations of blue whales in the Gulf of Mexico since 1970; therefore they are unlikely to occur in the project area.

Florida Manatee

The Florida manatee (*Trichechus manatus latirostris*) is a subspecies of the West Indian manatee (*Trichechus manatus*) and is listed as a Federally endangered marine mammal. Manatees were first listed as endangered under the Federal Endangered Species Preservation Act of 1966, later superseded by the 1969 Endangered Species Conservation Act. In 1973, manatees were listed under the ESA. They are also protected under the MMPA of 1972. Species information is provided in Section 3.2.1 of the EA prepared for the 2006 project (CPE, 2005); updated data is provided below.

Based on Florida Fish and Wildlife Conservation Commission (FWC) winter manatee synoptic surveys, the manatee population in Florida has ranged between 2,817 and 5,077 between 2005 and 2011 (FWC, 2013). The most significant threat to the Florida manatee is death or serious injury from watercraft strikes. In 2012, 392 manatee mortalities were recorded in Florida, 81 (21%) of which were attributed to watercraft strikes. Within Collier County, three manatee deaths out of 10 County-wide (30%) were attributed to watercraft (FWC, 2013). Between January 1 and April 26, 2013 there were 582 manatee mortalities in Florida, 24 (4%) of which resulted from watercraft strikes. Of the 14 manatee mortalities recorded in Collier County during this period, none were associated with watercraft or other anthropogenic sources (FWC, 2013).

Critical habitat for the West Indian manatee was designated on September 24, 1976 (41 FR41914). Critical habitat for the Florida manatee as defined in the Code of Federal Regulations 50 Parts 1 to 199, revised as of October 1, 2000, includes "all U.S. territorial waters adjoining the coast and islands and all connected bays, estuaries, and rivers from Gordon's Pass, near Naples, Collier County" south. The majority of Collier County's shoreline is in designated manatee critical habitat, and although the project area does not fall within these confines, critical habitat is located less than two miles to the south. The project area is within the known range of the manatee; therefore, it is possible that manatees may be present in or near the borrow areas, the fill area, and the pipeline corridors during construction. However, manatees are typically found in shallow coastal waters, so it is unlikely that a manatee would be observed near the offshore Borrow Area T1 located in Federal waters.

Project Impacts to Marine Mammals

During construction, vessels travel between the borrow areas and the seaward end of the pipeline corridor, as well as back and forth to port. Whales and manatees may avoid the project area during construction due to increased turbidity (Section 3.1.3) and noise (Section 3.1.5) in the area. While marine mammals may avoid the project area during construction, there is always the potential of a strike by watercraft. While ship strikes are a concern to whales offshore, dredge vessels operate at a slower speed, reducing the risk of interaction. There has never been a report of a whale strike or mortality by a hopper dredge in the U.S. (NMFS, 2003), although there is one report of a right whale calf mortality resulting from a strike by a dredging vessel in South Africa (Baird & Associates, 2004). It is generally thought that hopper dredges move slow enough to minimize the risk of a strike with a marine mammal.

Mitigation/Monitoring

Whales are not likely to occur within the project area. Project construction will adhere to the Florida Fish and Wildlife Conservation Commission (FWC) *Standard Manatee Conditions for In-Water Work* in order to protect manatees from direct project effects. These conditions include

idle speed/no wake of all project vessels and immediate shut down of all in-water activities when a manatee is within 50 ft of project activities.

3.2.1.4 Fish

Several listed fish species are present along the Gulf Coast of Florida and have the potential to occur in the project area, including Gulf sturgeon (*Acipenser oxyrinchus desotoi*) and smalltooth sawfish (*Pristis pectinata)*. General species information on the smalltooth sawfish and Gulf sturgeon is included in section 3.2.1 of the EA prepared for the 2006 project (CPE, 2005). National Marine Fisheries Service listed the largetooth sawfish (*Pristis perotteti*) as endangered under the Endangered Species Act (ESA) on July 12, 2010; species information is provided below.

Gulf Sturgeon

The USFWS and the Gulf States Marine Fisheries Commission (1995) listed the Gulf sturgeon (*Acipenser oxyrinchus desotoi*) as a threatened species throughout its entire range on September 30, 1991 (56 CFR 49653). On June 6, 2002, USFWS and NMFS designated fourteen geographic units as Gulf sturgeon critical habitats along the coasts of Florida, Alabama, Mississippi, and Louisiana encompassing approximately 2,544 km of rivers and tributaries and 6,042 km^2 of estuarine and marine habitats. There is no critical habitat designated in Federal waters, and there is no Gulf sturgeon critical habitat in the vicinity of the Collier County project area. The current range of Gulf sturgeon extends from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi respectively, east to the Suwannee River in Florida (USFWS and NMFS, 2009). Gulf sturgeon are not likely to occur south of Tampa Bay, and are thus not expected to be impacted by project related activities.

Smalltooth Sawfish

NMFS listed the U.S. distinct population segment (DPS) of smalltooth sawfish (*Pristis pectinata*) as endangered on April 1, 2003. In September 2009, NMFS designated critical habitat for the U.S. distinct population segment (DPS) of smalltooth sawfish (74FR 45353). The critical habitat consists of two units: the Charlotte Harbor Estuary Unit and the Ten Thousand Islands/Everglades Unit for a total of 840,472 ac. The two units are located along the southwestern coast of Florida between Charlotte Harbor and Florida Bay. The project area is located approximately four miles south of the Charlotte Harbor Estuary Unit and 16 miles north of the Ten Thousand Islands/Everglades Unit; no smalltooth sawfish critical habitat is located within the project area.

According to the "Status Review of Smalltooth Sawfish – December 2000", only six sawfish observations were recorded in Collier County between 1927 and 2000: two observations off of Marco Island, one off of Naples, and three near Ten Thousand Islands (NMFS, 2000). There have been dozens of reported smalltooth sawfish sightings along the entire coast of Collier County between 1998 and 2012. According to the National Sawfish Encounter Database, there were 45 sawfish observed in Collier County between May 2010 and May 2011 (FMNH, 2013).

A recent review of smalltooth sawfish sightings showed that most observations occurred in estuarine and nearshore habitats. Although some large smalltooth sawfish were observed in depths up to 73 m, there were more observations of smaller fish associated with inshore mangrove and seagrass habitats (Wiley and Simpfendorfer, 2010). This study showed that the

core range of smalltooth sawfish is currently the area in Florida from the Caloosahatchee River south through the Ten Thousand Islands and Everglades National Park to Florida Bay (Wiley and Simpfendorfer, 2010). Captures have been documented in Tampa Bay and in the southwest coast off Charlotte Harbor and San Carlos Bay – approximately 20 miles north of the project area (NMFS, 2000).

Smalltooth sawfish appear to utilize extensive estuary areas characterized by mangroves and shallow sandy bottoms to the north and south of the project area, and they may use the nearshore habitat along the proposed beach nourishment sites. However, there are no red mangroves within the action area and the shallow-water habitat consists entirely of beach shoreline habitat within high surf zones, which is not high quality smalltooth sawfish foraging or refuge habitat. Smalltooth saw fish are rarely seen as far offshore as the T1 borrow area.

Largetooth Sawfish

National Marine Fisheries Service listed the largetooth sawfish (*Pristis perotteti*) as endangered under the Endangered Species Act (ESA) on July 12, 2010 (76 FR 40822). No critical habitat has been designated for this species. Sawfish are generally a tropical marine and estuarine elasmobranch (shark and ray relative). The presence of a rostrum having laterally protruding teeth distinguishes sawfish from skates and rays. The rostrum has a saw-like appearance, hence the name "sawfish." The largetooth sawfish and smalltooth sawfish are similar in appearance, but can usually be differentiated by the number of teeth on one side of the rostrum (smalltooth sawfish can have between 14 and 21 rostral teeth on one edge of the saw, whereas largetooth sawfish usually have 23 to 34) (NMFS, 2013b).

Largetooth sawfish are generally confined to shallow (< 33 ft (10 m)) coastal, estuarine, and fresh waters, although they have been found at depths of up to 400 ft (122 m) in Lake Nicaragua. This species is typically found in brackish water near river mouths and large bays, preferring partially enclosed waters, lying in deeper holes and on bottoms of mud or muddy sand (Bigelow and Schroeder, 1953). Similar to the smalltooth sawfish, this species is highly associated with mangrove habitats (Burgess *et al.,* 2009). Like the smalltooth sawfish, largetooth sawfish are highly mangrove-associated. It is thought they spend most of their time on the bottom; however they are commonly observed swimming near the surface in the wild and in aquaria (Cook *et al.,* 2005). (NMFS, 2010b)

Primary threats to the largetooth sawfish include loss of coastal habitat due to urbanization and entanglement in fishing nests, lines and trawls. In addition, the lack of effective international regulations, the species' restricted habitat and low rate of population growth have all contributed to the decline in this species (NMFS, 2013b).

Historic accounts suggest the largetooth sawfish was found in tropical marine waters of the Gulf of Mexico from its northern most extent of its range in the U.S. (in the summer) following the Mexican coastline down into Central America, the Caribbean, South America, to the southernmost extent of its range in West Africa. The species range also includes the fresh waters of Lake Nicaragua. Though reported in the United States, it appears that the largetooth sawfish was never abundant, with approximately 39 confirmed records (33 in Texas) from 1910 through 1961, and no confirmed sightings since 1961. The last confirmed record largetooth sawfish in

U.S. waters was from Port Aransas, Texas on June 24, 1961. The last recorded largetooth sawfish in Florida was in 1941 (NMFS, 2010b).

Project Impacts to Fish

Gulf sturgeon and largetooth sawfish are unlikely to occur in the project vicinity; therefore, there are no anticipated impacts to these species. Smalltooth sawfish have been observed in Collier County, and so may be temporarily impacted by construction of the proposed project. Dredge impacts to smalltooth sawfish are unlikely and discountable. There has never been a reported take of a smalltooth sawfish by a dredge, and Borrow Area T1 is located nine miles offshore, which is farther than the typical nearshore habitat preferred by smalltooth sawfish (Wiley and Simpfendorfer, 2010). Adverse effects from the hopper dredging of the borrow area or during any dredging-related relocation trawling are not expected, because long-term dredge-related data show almost no impacts to smalltooth sawfish. While smalltooth sawfish can be caught by trawls, it is rare and none have ever been taken by relocation trawling conducted during the extensive past use of the Borrow Area T1, likely due to their rarity offshore.

Fill placement in the nearshore environment will temporarily increase turbidity, which could impair foraging ability. Though sawfish subsist chiefly on small schooling fish, they also feed to extent on crustaceans and other bottom dwelling inhabitants (Bigelow and Schroeder, 1953; NMFS, 2009). Sawfish use their rostrum to stir up sandy or muddy bottoms to expose crustaceans or other prey. Direct placement of sediment is expected to result in the mortality of some percentage of existing benthos upon which the smalltooth sawfish may forage. Impacts to fish species that prey on infauna, such as smalltooth sawfish, will be dependent on the time for infauna resources to recover; these impacts are likely to be localized and short-term, and, according to most studies, recovery will occur in approximately one to four years. In many cases, temporary alterations in the abundance, diversity, and species composition, ranging in duration from a few weeks to a few months, have been observed (NRC, 1995). A study in Palm Beach, Florida, showed that macrofauna (polychaetes, crustaceans, and molluscs) within the fill area were heavily affected by beach nourishment, but that within five months post-construction, macrofauna numbers and species richness had almost returned to pre-nourishment numbers (Noriega, 2008). There will also be temporary increases in noise during construction of the project which could deter smalltooth sawfish (Normandeau Associates, Inc., 2012; Clarke *et al.,* 2002). Noise may interfere with (mask) fish communication (Codarin *et al*., 2009; Vasconcelos *et al.*, 2007) and cause generalized stress (Wysocki *et al.*, 2006). It is anticipated that smalltooth sawfish may experience temporary, discountable, impacts due to burial of nearshore prey, turbidity, and noise, but that they will be able to move out of the immediate project area in order to avoid these impacts during construction operations.

Smalltooth sawfish will also not suffer any adverse effects from potential loss of habitat, or exclusion from habitat, because there is no foraging or refuge habitat in the action area. Juvenile smalltooth sawfish in south Florida have a strong affinity for red mangroves and shallow, euryhaline water depths less than one meter; however, the action area does not contain these features.

Mitigation/Monitoring

Collier County will comply with the NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions* developed by NMFS (provided in the Biological Assessment submitted as part of the

Permit Modification Request, enclosed in Appendix F to this EA). These conditions stipulate that if a sawfish is observed within 100 yards of construction operations, all appropriate precautions shall be implemented to ensure its protection, including cessation of operation if the animal moves within 50 ft of any moving equipment. If a hopper dredge is utilized for dredging of Borrow Area T1, relocation trawling for Gulf sturgeon (and sea turtles) will be conducted as required by the NMFS Gulf of Mexico Regional Biological Opinion (GRBO) (NMFS, 2003).

3.2.1.5 Acroporid Corals

Staghorn coral (*Acropora cervicornis*) and Elkhorn coral (*Acropora palmata)* were once two of the most abundant species of coral in the Caribbean and the Florida Keys. Both species play crucial roles on Caribbean reefs, not only as habitat providers, but also as reef building organisms. Both species experienced precipitous declines in the early 1980s throughout their ranges and this decline has continued. Although quantitative data on former distribution and abundance are scarce, in the few locations where quantitative data are available (e.g., Florida Keys, Dry Tortugas, Belize, Jamaica and the U.S.V.I.), declines in abundance (coverage and colony numbers) are estimated at >97% (ABRT, 2005).

In 2006, both Acroporids were listed as Threatened under the U.S. Endangered Species Act (71 FR 26852, May 9, 2006). Both staghorn and elkhorn coral are found throughout the Florida Keys, the Bahamas, the Caribbean islands, and Venezuela (NMFS, 2013b). NMFS designated critical habitat for staghorn and elkhorn corals in areas of Florida, Puerto Rico, St. John, St. Thomas, and St. Croix (73 FR 72210). Critical habitat in Florida extends from Palm Beach County to Key West which also includes the Dry Tortugas; this critical habitat does not include the Gulf coast of Florida. Staghorn coral and elkhorn coral have never been observed during surveys of Collier County's nearshore hardbottom habitat.

Project Impacts to Acroporid Corals

Staghorn coral and elkhorn coral have never been observed during surveys of Collier County's nearshore hardbottom habitat; therefore, these coral species are not expected to be impacted by the proposed project.

3.2.2 Essential Fish Habitat

Section 3.2.2 of the EA prepared for the 2006 project included an assessment of potential impacts to Essential Fish Habitat (EFH) that could occur in the project area (CPE, 2005). Updated EFH information is provided below.

Amendments to the Magnuson-Stevens Fishery Conservation and Management Act, approved by Congress in 1996, defined Essential Fish Habitat (EFH) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802 (10)). In the marine waters of the Gulf of Mexico, EFH is defined as "all marine waters and substrates (mud, sand, shell, rock, hardbottom, and associated biological communities) from the shoreline to the seaward limit of the EEZ [Exclusive Economic Zone]" (GMFMC, 1998). In 2005 the Gulf of Mexico Fishery Management Council (GMFMC) proposed to amend the definition of EFH, removing EFH description and identification from waters between 100 fathoms (fm) and the seaward limit of the EEZ (GMFMC, 2005). The GMFMC has identified various estuarine and marine areas as EFH based on the life stages of designated managed species. GMFMC EFH areas are listed in Table 9 below.

Table 9. Representative categories of estuarine and marine EFH areas identified in the Fishery Management Plan Amendment of the Gulf of Mexico Fishery Management Council (GMFMC). Generally, EFH for species managed under the NMFS Billfish and Highly Migratory Species (HMS) plans falls within the marine and estuarine water column habitats designated by the GMFMC (NMFS, 2008b).

ESTUARINE AREAS	MARINE AREAS
Estuarine emergent wetlands	Water column
Mangrove wetlands	Vegetated bottoms
Submerged aquatic vegetation	Non-vegetated bottoms
Algal flats	Live bottoms
Mud, sand, shell and rock substrates	Coral reefs
Estuarine water column	Geologic features
	Continental Shelf features

The project area includes primarily marine EFH, although estuarine water column and sandy, unvegetated bottom are found at the entrances of the inlets located within the project area. Submerged aquatic vegetation (SAV) occurs within the some bays and estuaries within Collier County, but no SAV is located within the vicinity of the beach placement or borrow area sites. Marine EFH within the project area includes the marine water column and non-vegetated bottoms in the borrow areas and fill placement area. Live bottom (i.e., hardbottom) resources are located in the nearshore environment adjacent to the project area, but the proposed project has been designed to avoid impacts to hardbottom habitat and associated corals. There is no hardbottom near Borrow Area T1 or within operational areas. Operational areas were surveyed and selected to avoid marine habitat (Appendix I). The offloading, or pump-out, operation produces negligible turbidity, since the sand is kept within the scow (barge), hopper and pipeline. The County conducted nearshore hardbottom biological monitoring before and after the 2006 nourishment project and found no project impacts. The County and FDEP have developed a hardbottom biological monitoring plan which will be implemented for the proposed project to detect any potential unanticipated impacts to hardbottom resources (Appendix K).

There are Fishery Management Plans (FMPs) in the Gulf region for shrimp, red drum, reef fishes, stone crabs, spiny lobsters, coral and coral reefs, coastal migratory pelagics (CMP), and highly migratory species (e.g., billfish, swordfish, tuna, and sharks). Species identified by the GMFMC to be representative of the species that commonly occur throughout all of the estuarine and marine waters of the Gulf of Mexico are listed in Table 10 under their respective FMP's. In total, the GMFMC manages 55 species, not including species included in the coral complex (NMFS, 2008b; GMFMC, 2004). In the Gulf of Mexico, highly migratory species (HMS) such as Atlantic tunas, swordfish, sharks, and billfish are Federally managed by NOAA's National Marine Fisheries Service (NMFS) (Table 11).

Table 10. Fishery Management Plans and managed species for the Gulf of Mexico (NMFS, 2008b).

Shrimp Fishery Management Plan
- brown shrimp - *Farfantepenaeus aztecus*
- pink shrimp - *F. duorarum*
- royal red shrimp - *Pleoticus robustus*
- white shrimp - *Litopenaeus setiferus*

Red Drum Fishery Management Plan
- red drum - *Sciaenops ocellatus*

Reef Fish Fishery Management Plan
- almaco jack - *Seriola rivoliana*
- anchor tilefish - *Caulolatilus intermedius*
- banded rudderfish - *S. zonata*
- blackfin snapper - *Lutjanus buccanella*
- blackline tilefish - *Caulolatilus cyanops*
- black grouper - *Mycteroperca bonaci*
- blueline tilefish - *C. microps*
- cubera snapper - *L. cyanopterus*
- dog snapper - *L. jocu*
- dwarf sand perch - *Diplectrum bivittatum*
- gag grouper - *M. microlepis*
- goldface tilefish - *C. chrysops*
- goliath grouper - *Epinephelus itajara*
- gray snapper - *L. griseus*
- gray triggerfish - *Balistes capriscus*
- greater amberjack - *S. dumerili*
- hogfish - *Lachnolaimus maximus*
- lane snapper - *Lutjanus synagris*
- lesser amberjack - *S. fasciata*
- mahogany snapper - *L. mahogoni*
- marbled grouper - *E. inermis*
- misty grouper - *E. mystacinus*
- mutton snapper - *L. analis*
- Nassau grouper - *E. striatus*
- queen snapper - *Etelis oculatus*
- red hind - *Epinephelus guttatus*
- red grouper - *E. morio*
- red snapper - *L. campechanus*
- rock hind - *E. adscensionis*
- sand perch - *Diplectrum formosum*
- scamp grouper - *M. phenax*
- schoolmaster - *L. apodus*
- silk snapper - *L. vivanus*
- snowy grouper - *E. niveatus*
- speckled hind - *E. drummondhayi*
- tilefish - *Lopholatilus chamaeleonticeps*
- vermilion snapper - *Rhomboplites aurorubens*
- Warsaw grouper - *E. nigritus*
- wenchman - *Pristipomoides aquilonaris*
- yellowedge grouper - *E. lavolimbatus*
- yellowfin grouper - *M. venenosa*
- yellowmouth grouper - *M. interstitialis*
- yellowtail snapper - *Ocyurus chrysurus*

Stone Crab Fishery Management Plan
- Florida stone crab - *Menippe mercenaria*
- gulf stone crab - *M. adina*

Spiny Lobster Fishery Management Plan
- Caribbean spiny lobster - *Panulirus argus*
- ridged slipper lobster - *Scyllarides nodifer*

Coral and Coral Reef Management Plan

- varied coral species and coral reef communities comprised of several hundred species

Coastal Migratory Pelagic Fishery Management Plan
- cobia - *Rachycentron canadum*
- king mackerel - *Scomberomorus cavalla*
- Spanish mackerel - *S. maculatus*

Table 11. Species managed in the Gulf of Mexico under Federally implemented Fishery Management Plans (NMFS, 2008b; 2006).

Tuna
- albacore - *Thunnus alalunga*
- Atlantic bigeye - *T. obesus*
- Atlantic bluefin - *T. thynnus*
- Atlantic yellowfin - *T. albacares*
- skipjack - *Katsuwonus pelamis*

Swordfish
- swordfish - *Xiphias gladius*

Billfish
- blue marlin - *Makaira nigricans*
- sailfish - *Istiophorus platypterus*
- white marlin - *T. albidus*
- longbill spearfish - *Tetrapturus pfluegeri*

Large Coastal Sharks
- basking shark - *Cetorhinus maximus*
- great hammerhead – *Sphyrna mokarran*
- scalloped hammerhead - *S. lewini*
- smooth hammerhead - *S. zygaena*
- white shark - *Carcharodon carcharias*
- nurse shark - *Ginglymostoma cirratum*
- bignose shark - *Carcharhinus altimus*
- blacktip shark - *C. limbatus*
- bull shark - *C. leucas*
- Caribbean reef shark - *C. perezi*
- dusky shark - *C. obscurus*
- Galapagos shark - *C. galapagensis*
- lemon shark - *Negaprion brevirostris*
- narrowtooth shark - *C. brachyurus*
- night shark - *C. signatus*
- sandbar shark - *C. plumbeus*
- silky shark - *C. falciformis*
- spinner shark - *C. brevipinna*
- tiger shark - *Galeocerdo cuvieri*
- bigeye sand tiger - *Odontaspis noronhai*
- sand tiger shark - *O. taurus*
- whale shark - *Rhinocodon typus*

Small Coastal Sharks
- Atlantic angel shark - *Squatina dumerili*
- bonnethead - *Sphyrna tiburo*
- Atlantic sharpnose – *R. terraenovae*
- blacknose shark - *C. acronotus*
- Caribbean sharpnose shark - *R. porosus*
- finetooth shark - *C. isodon*
- smalltail shark - *C. porosus*

Pelagic Sharks
- bigeye sixgill shark - *Hexanchus vitulus*
- sevengill shark – *Heptranchias perlo*
- sixgill shark - *H. griseus*
- longfin mako shark - *Isurus paucus*
- porbeagle shark - *Lamna nasus*
- shortfin mako shark - *I. oxyrinchus*
- blue shark - *Prionace glauca*
- oceanic whitetip shark - *C. longimanu*
- bigeye thresher shark - *Alopias superciliosus*
- common thresher shark - *A. vulpinus*

Habitat Areas of Particular Concern

The rules set forth by the Magnuson-Stevens Act also direct the Fishery Management Councils to consider a second, more limited habitat designation for each species in addition to EFH. Habitat Areas of Particular Concern (HAPC) are subsets of identified EFH which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. In general, HAPCs include high-value intertidal and estuarine habitats, offshore areas of high habitat value or vertical relief, and habitats used for

migration, spawning, and rearing of fish and shellfish (NMFS, 2008b). In the *Final Gulf Council EFH Amendment*, the GMFMC identifies specific HAPC sites in the Gulf of Mexico (Table 12). These designated HAPC sites replace the broad habitat classifications identified as HAPC in the 1998 Generic Amendment (GMFMC, 2005; 1998).

Table 12. Habitat Areas of Particular Concern (HAPC) identified in the 2005 Fishery Management Plan Amendment of the Gulf of Mexico Fishery Management Council (GMFMC, 2005).

HAPC - Gulf of Mexico
Madison-Swanson Marine Reserve
Tortugas North Ecological Reserve
Tortugas South Ecological Reserve
Florida Middle Grounds
Pulley Ridge
Individual reefs and banks of the Northwestern Gulf of Mexico:
East and West Flower Garden Banks, Stetson Bank, Sonnier Bank, MacNeil, 29 Fathom Bank, Rankin Bright Bank, Geyer Bank, McGrail Bank, Bouma Bank, Rezak Sidner Bank, Alderice Bank, and Jakkula Bank

No designated HAPC exists within the vicinity of project area.

Project Impacts to Essential Fish Habitat

The project would impact approximately 90 acres of submerged and intertidal sand flats utilized by various life stages of penaeid shrimp complex, red drum, reef fish (e.g. snapper/grouper complex), stone crab, spiny lobster, and migratory/pelagic fish. Dredging will temporarily increase noise and turbidity, remove benthic infauna and has the potential of entrainment of biota in the borrow area. Fill placement will also cause a temporary increase in noise and turbidity and burial of benthic infauna. Impacts to benthic fauna/infauna from dredging and fill placement are discussed further in Section 3.2.3. Operational areas were surveyed and selected to avoid marine habitat (Appendix I). The offloading, or pump-out, operation produces negligible turbidity, since the sand is kept within the scow (barge), hopper and pipeline. The County conducted nearshore hardbottom biological monitoring before and after the 2006 nourishment project and found no project impacts. The County and FDEP have developed a hardbottom biological monitoring plan which will be implemented for the proposed project to detect any potential unanticipated impacts to hardbottom resources (Appendix K). The proposed action is not expected to have a substantial adverse impact on EFH or Federally managed fisheries in the Gulf of Mexico.

The consultation requirements in the Magnuson-Stevens Act direct Federal agencies to consult with NOAA's National Marine Fisheries Service (NMFS) when any of their activities may have an adverse effect on EFH. The USACE initiated consultation with NMFS on EFH in their Public Notice, issued January 7, 2013 (Appendix H).

Mitigation/Monitoring

Water quality monitoring will be conducted at the fill sites to ensure turbidity levels at the edge of the designated mixing zone do not exceed 29.0 NTU above background. Water quality monitoring will be conducted in compliance with permit requirements for the proposed project. Nearshore hardbottom monitoring will be conducted pre- and post-construction and will follow the protocol approved by FDEP in the Hardbottom Biological Monitoring Plan (Appendix K).

3.2.3 Benthic Resources

The information presented below supplements Section 3.2.3 of the EA prepared for the 2006 renourishment project (CPE, 2005).

3.2.3.1 Offshore Borrow Area

Geology and geomorphology of Borrow Area T1 are discussed in Section 3.1.1 of this EA. An archaeological remote sensing survey of the borrow area was conducted by Tidewater Atlantic Research (TAR) in July 2003. This survey included magnetometer, sidescan sonar and seismic (sub-bottom) profiling (CPE, 2004). The investigation did not identify any hardbottom benthic communities within the scanned area. To ensure that no hardbottom exists within 400 feet of Borrow Area T1, the borrow area borders were reduced to achieve this buffer from the limit of the active investigation.

The benthos in Borrow Area T1 is most likely comprised of bacteria and other microbenthos, meiofauna (0.063-0.3 millimeters), macrofauna (larger than 0.3 mm), and megofauna (larger organisms such as crabs and demersal fish). On-site biological investigations have not been performed on Borrow Area T1; however, previous surveys in the offshore waters of the eastern Gulf of Mexico have documented extensive epibenthic communities with low invertebrate diversity (Blake *et al.,* 1996). A study by Blake *et al.,* 1996, sampled four sites located approximately 50 to 100 miles north of Borrow Area T1. At both dredged and undredged locations, the most dominant epibenthic community species included the iridescent swimming crab (*Portunus gibbesii*), the sand dollar (*Mellita tenuis*), and the pink shrimp (*Penaeus duorarum*) (Blake *et al.,* 1996). Benthic infaunal communities have also been described at three previous borrow sites (Egmont Key, Sarasota, and Manasota Key). The major faunal groups included species of annelids (tubificid oligochaetes and dwarf sandworms, *Aglaophamus verrilli*), mollusks (many-line lucine, *Parvilucina multilineata*, and tranverse arks, *Anadara transversa*), and arthropods (amphipods and decapods) (Blake *et al.,* 1996). All of these groups are represented in bottom sediments throughout the entire Gulf, from the continental shelf to the deepest abyss at about 3,850 meters. Benthic surveys are traditionally not required in Florida waters by the State and Federal permit agencies, largely based on the findings of previous investigations.

3.2.3.2 Nearshore / Onshore Fill Area

The direct fill placement area along the Collier County shoreline will impact upper (dry), intertidal and subtidal beach habitat. The upper beach zone (supratidal) is dominated by talitrid and haustoriid amphipod species and ghost crabs (*Ocypode quadrata*) (Williams, 1984). Macrofauna typically found in the lower intertidal zone (between mean high water and mean low water) include haustoriid amphipods, polychaetes, isopods, mollusks, and some larger crustacean species such as mole crabs and burrowing shrimp (Williams, 1984). Infauna macroinvertebrate communities typically found in the subtidal zone (nearshore surf zone and deeper sand bottom habitats) include polychaetes, amphipods, isopods, decapods, polychaetes, mollusks, echinoderms, and a variety of other taxa (Allen and Moore, 1987).

Nearshore hardbottom habitat is present along the Collier County shoreline. Hardbottom resources have been identified through sidescan survey and diver verification on several occasions. In February 2003, a sidescan survey was conducted along the Collier County shoreline between R-17 and R-81. The results of this survey documented approximately 500 acres (ac) of low relief nearshore hardbottom formations located within approximately 1,000 ft of the shoreline (CPE, 2004). In summer 2003, biologists conducted dive investigations on these resources to further document and characterize this habitat. Divers documented developed hardbottom communities, consisting of scleractinian coral species (*Siderastrea* spp., *Solenastrea* spp., *Oculina* sp. and *Phyllangia* sp.), gorgonian corals (*Leptogorgia* spp.), macroalgae (primarily *Gracilaria* spp., *Caulerpa* spp. and *Hypnea* spp.) sponges, tunicates and other benthic invertebrates and fish (CPE, 2004). The results of these investigations were used to assist Collier County and FDEP in the development of the hardbottom monitoring plan for the 2006 project. In compliance with the final FDEP-approved monitoring plan, biological monitoring surveys were completed in 2005 as a pre-construction assessment, and post-construction surveys were conducted in 2006, 2007, 2008 and 2009 (CPE 2006, 2007a, 2007b, 2009; Collier County, 2009). Biological monitoring results showed no impacts from the 2006 renourishment project to nearshore hardbottom resources. Monitoring will be conducted in compliance with the FDEP-approved Final Hardbottom Biological Monitoring Plan (Appendix K).

Project Impacts to Benthic Resources

Removal of sediment from borrow areas has a direct biological impact by removing benthic infaunal and epifaunal assemblages found within and on the surficial sediments in the borrow area (Culter and Mahadevan, 1982; Greene, 2002; Diaz et al., 2004). A reduction of infaunal biomass resulting from sediment removal could have an indirect effect on the distribution of certain demersal fishes and other epibenthic predators by interrupting established energy pathways to the higher trophic levels represented by these foraging taxa. The benthic community is critical to the health of higher trophic levels and serves as an important indicator of the effects of dredging (Gulland, 1970). However, impacts to benthic fauna and the resulting indirect impacts to fishes which prey on these species will likely be temporary. Studies have shown that though recovery rates are variable, the abundance and diversity of benthic fauna within the borrow areas frequently returns to pre-nourishment levels relatively quickly, often within one year post-dredging (NRC, 1995; Greene, 2002; Blake et al., 1996). However, a summary of post-dredge faunal recovery rates from 19 different projects in Europe and the U.S. compiled by Newell and Seiderer (2003) show a range from several weeks to more than ten years. The most rapid recovery rates were observed for muds and sands (i.e., several months up to two years), whereas the longest recovery periods (i.e., more than two years) were associated with gravel and reef habitats. Most studies indicate that dredging had only temporary effects on the infaunal community, and in some studies, differences in infaunal communities were attributed to seasonal variability or to hurricanes rather than to dredging (Posey and Alphin, 2000). Studies have resulted in several recommendations on methods to minimize disturbance and to assist in recovery. One way to ensure that the biological assemblages that recolonize a mined area resemble the pre-disturbance community would be to avoid total removal of the substrate. Leaving selected small, untouched areas to serve as refuges within the disturbed zone should minimize the potential alteration of community structure and function and, therefore, reduce potential effects upon trophically dependent species. Small marine refuge areas left within a project area would promote recolonization and serve as habitat for mobile species (Diaz *et al.*, 2004). Another recommendation that could minimize disturbance to natural assemblages in the

borrow area include dredging during the winter months when species abundance and diversity is lowest, which would also avoid periods of peak recruitment (which occur in spring and summer) for species of benthic invertebrates associated with shoals (Diat *et al.*, 2004; Slacum *et al.*, 2010). The proposed project is not incorporating refuges for recolonization within the borrow area; however, hopper dredging typically results in the creation of undisturbed furrows being left between disturbed furrows, which could promote recolonization within the borrow area. Dredging is anticipated to start in September and continue through the winter months, when species abundance and diversity is lowest.

Placement of beach fill buries benthic organisms in the nearshore marine environment as the beach is widened. Effects of burial are dependent on sediment type, depth of sediment, and the size and behavior of infaunal or epifaunal organisms (including the species' ability to burrow and species' mobility) (SCDNR, 1995). Direct burial results in mortality to sessile or attached animals, while some motile species can survive by moving either horizontally outside the placement area, or vertically to the surface of the placement fill (Blake *et al.*, 1996; NRC, 1995). Mortality during sedimentation has been found to depend on a species' ability to burrow through redeposited sediments and the rate at which sediment is deposited (IMG, 2004). In laboratory experiments, most estuarine infaunal species were able to survive burial to depths of 20 cm or more. If the bottom is covered with greater than 0.5 m of sand, most of the benthic fauna will be unable to move up through the placed fill (Adriaanse and Coosen, 1991). Fill placement can also result in increases in sedimentation and turbidity near the fill site, which can cause impacts to invertebrates. In some cases increased turbidity may cause sublethal impacts to sessile invertebrates that may include withdrawal into crevices or body cavities, and possibly termination of feeding. Similarly, motile invertebrates such as small crabs and shrimp may retreat into crevices, which would functionally prohibit them from seeking food (CSA, 2009).

However, fauna inhabiting the shallow nearshore marine habitat in the project area are adapted to a dynamic environment and therefore the recovery of these communities can take place relatively quickly (Nelson, 1993). A review of infaunal studies revealed that invertebrate recovery following placement of dredged material in relatively stable, unstressed marine environments generally takes between one and four years, while recovery in more naturally stressed areas is faster, often achieved within nine months (Bolam and Rees, 2003). A literature review of studies conducted on offshore benthic assemblages along the Gulf of Mexico and the U.S. East continental shelf showed that overall, benthic assemblages recovered from anthropogenic disturbance within three months to 2.5 years (Brooks *et al.,* 2006). A study conducted in Brevard County, Florida found that distribution, abundance and diversity of nearshore benthic fauna did not experience significant negative effects following beach nourishment (Gorzelany and Nelson, 1987). Most studies that did find impacts to nearshore infaunal communities generally found only limited or short-term alterations in the abundance, diversity and species composition (NRC, 1995). The quality of the dredged material in Borrow Area T1 is similar to that of the beaches in the project area, and therefore, similar to the subtidal marine environment. The similarity of the dredged sediment to the native sediment will aid in the recovery of the benthic communities impacted by the placement of the fill material. This project has been designed to avoid hardbottom impacts.

Mitigation/Monitoring

Nearshore hardbottom monitoring will be conducted pre- and post-construction and will follow the protocol approved by FDEP in the Hardbottom Biological Monitoring Plan (Appendix K). No benthic sampling is proposed as part of this project.

3.2.4 Non-Threatened Marine Mammals

More than 20 species of whales and dolphins live in the Gulf of Mexico. Results of research funded by BOEM in cooperation with other Federal and research organizations have shown that just two species, the bottlenose dolphin (*Tursiops truncatus*) and the Atlantic spotted dolphin (*Stenella frontalis*) are common in shallow waters over the continental shelf, less than 200 m (656 ft) in depth (Lang *et al.,* 2013). According to aerial surveys conducted by BOEM in deeper waters (100-2,000 m) in the northern Gulf of Mexico, seventeen cetacean species were sighted year-round. The most abundant marine mammals observed were the pantropical spotted dolphin (*Stenella attenuata*) and spinner dolphin (*S. longirostris*). Other abundant species in the offshore Gulf waters included bottlenose dolphin, Atlantic spotted dolphin, Risso's dolphin (*Grampus griseus*), striped dolphin (*S. coeruleoalba*) and clymene dolphin (*S. clymene*) (Davis *et al.*, 2000). Bryde's whales (*Balaenoptera edeni*) are also found in the Gulf of Mexico, though most sightings are limited to the northern Gulf of Mexico (NMFS, 2013a).

Project Impacts to Non-Threatened Marine Mammals

There has never been a report of a whale strike or mortality by a hopper dredge in the U.S. (NMFS, 2003), although there is one report of a right whale calf mortality resulting from a strike by a dredging vessel in South Africa. It is generally thought that hopper dredges move slow enough to minimize the risk of a strike with a marine mammal (Baird & Associates Ltd., 2004)

Very little research has been conducted on the effects of dredging noise on marine life and information is sparse. Refer to Section 3.1.5 of this EA for discussion of potential noise impacts from the proposed project.

3.2.5 Migratory Birds

Though not Federally listed as threatened or endangered species, there are several bird species that utilize Collier County beaches for nesting, overwintering, or as a stopover on their migratory routes. These species are protected by the Migratory Bird Treaty Act (MBTA) of 1918. The MBTA makes it illegal to "take" migratory birds, their eggs, feathers or nests. Take is defined in the MBTA to include by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof. A migratory bird is any species or family of birds that live, reproduce or migrate within or across international borders at some point during their annual life cycle. In total, 1,007 bird species are protected by the MBTA (USFWS, 2013).

Bird monitoring surveys were conducted from June 2006 through September 2008 following construction of the 2006 project (Addison, 2008). The post-construction monitoring included bi-monthly shorebird surveys for two full nesting seasons after construction of the 2006 renourishment project; the surveys covered both the nesting (February 1 – September 30, surveyed bi-monthly) and non-nesting seasons (October 1 – January 31, surveyed monthly).

Over the two years of monitoring, no birds were observed nesting on the surveyed beaches (Addison, 2008). Table 13 presents all species observed during these surveys, all of which are protected under the MBTA. Sanderlings (*Calidris alba*) and willets (*Tringa semipalmata*) were by far the most commonly observed shorebirds during all surveys, followed by ruddy turnstones (*Arenaria interpres*) and black-bellied plovers (*Pluvialis squatarola*) (Addison, 2008).

Table 13. Bird species identified during post-construction monitoring, 2006 – 2008 (Addison, 2008).

Common Name	Species Name
Black-bellied plover	*Pluvialis squatarola*
Black skimmer	*Rynchops niger*
Brown pelican	*Pelecanus occidentalis*
Double-crested cormorant	*Phalacrocorax auritus*
Fish crow	*Corvus ossifragus*
Great blue heron	*Ardea herodias*
Great egret	*Ardea alba*
Herring gull	*Larus argentatus*
Laughing gull	*Larus atricilla*
Least tern	*Sternula antillarum*
Little blue heron	*Egretta caerulea*
Magnificant frigatebird	*Fregata magnificens*
Osprey	*Pandion haliaetus*
Ring-billed gull	*Larus delawarensis*
Reddish egret	*Egretta rufescens*
Red knot	*Calidris canutus*
Royal tern	*Thalleseus maximus*
Ruddy turnstone	*Arenaria interpres*
Sanderling	*Calidris alba*
Sandwich tern	*Thalleseus sandvicensis*
Short-billed dowitcher	*Limnodromus griseus*
Snowy egret	*Egretta thula*
Tricolor heron	*Egretta tricolor*
White ibis	*Eudocimus albus*
Willet	*Tringa semipalmata*
Wilson's plover	*Charadrius wilsonia*
Yellow-crowned night heron	*Nyctanassa violacea*

Project Impacts to Migratory Birds

No long-term impacts to shorebirds protected under the MBTA are expected from project construction. The disposal of sand on the beach may temporarily interrupt foraging and resting activities of shorebirds that utilize the project area beach. This impact would be limited to the immediate area of disposal and the duration of construction. Heavy machinery and equipment (*e.g.*, trucks and bulldozers operating on project area beaches, the placement of the dredge pipeline along the beach, and sand disposal) may adversely affect any migrating and wintering

piping plovers or red knots, or other shorebirds within the project area by disturbance and disruption of normal activities such as roosting and feeding, and possibly forcing birds to expend valuable energy reserves to seek available habitat elsewhere. The prey base for many shorebirds, which includes common invertebrate organisms in the beach and surf zone, would be temporarily reduced in areas of project fill. Burial and suffocation of invertebrate species will occur during each nourishment and renourishment cycle within the fill site. Research by Peterson *et al.* (2006) suggests that short-term impacts to foraging habitat for shorebird species may occur due to the temporary depletion of the intertidal food base. After nourishment, the dramatic decline in beach macro invertebrate populations degraded the foraging habitat for shorebirds in Bogue Banks, North Carolina - shorebird use of the sandy beach plummeted by 70 to 90%, most likely due to depression of prey species. Timeframes projected for benthic recruitment and re-establishment following beach nourishment are between three months and 2.5 years (Greene, 2002; Burlas *et al.*, 2002; Brooks *et al.,* 2006). Beach wrack has also been recognized as important to shorebirds, including piping plovers and red knots, for camouflage and foraging. Since piping plovers spend the majority of their overwintering time in Florida foraging along the shoreline, the wrack line provides an important foraging resource for this species. Destruction of wrack, through beach nourishment or wrack-removal programs, eliminates this habitat. Protection of wrack can help to offset the direct and indirect impacts associated with beach nourishment and ensuing human disturbance.

3.3 Socioeconomic and Human Resources

This section describes the potential cultural resources located within the proposed shore protection project areas including archeological resources, recreational resources, aesthetic resources, and economic resources.

3.3.1 Archeological Resources

A full discussion of archeological resources in the project vicinity is presented in Section 3.3.1 of the 2005 EA (CPE, 2005). Analysis of remote sensing data revealed no acoustic and/or magnetic anomalies within or near Borrow Area T1. Although the potential exists for prehistoric archaeological resources to occur regionally, none were found or identified during the investigation.

Project Impacts to Archeological Resources

Excavation of Borrow Area T1 is not expected to have any impacts on archaeological resources. The pipeline corridors have previously been diver surveyed for hardbottom and no cultural resources were identified through those surveys. Therefore, the pumping out of sand to the placement areas is not expected to have any impacts to archaeological resources.

Mitigation/Monitoring

<u>Offshore Chance Finds Clause</u>

If any unanticipated and potentially significant cultural material is uncovered during project activities in Borrow Area T1, dredge operations will be halted immediately within the borrow area and actions will follow guidelines provided by BOEM in NTL No. 2005-G07, under "Required Notification of the Discovery of Shipwrecks on the Seafloor (30 CFR 250.194(c) and 30 CFR 250.1010(c))", which states:

> If you discover man-made debris that appears to indicate the presence of a shipwreck (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of man-made objects such as bottles or ceramics, piles of ballast rock) within or adjacent to your lease area or pipeline right-of-way during your shallow hazard survey, diver inspection, or remotely operated vehicle (ROV) inspection, you must immediately halt operations, take steps to ensure that the site is not disturbed in any way, and contact the Regional Supervisor, Leasing and Environment, within 48 hours of its discovery. You must cease all operations within 1,000 feet (305 meters) of the site until the Regional Director instructs you on what steps you must take to assess the site's potential historic significance and what steps you must take to protect it.

Dredge positioning will also be monitored throughout construction. During all phases of the project, Collier County will ensure that the dredge and any bottom disturbing equipment is outfitted with an onboard global positioning system (GPS) capable of maintaining and recording location within an accuracy range of no more than plus or minus 3 meters. The GPS must be installed as close to the cutterhead or draghead as practicable.

3.3.2 Recreational Resources

Recreational resources are discussed in Section 3.3.2 of the 2005 EA (CPE, 2005).

Project Impacts to Recreational Resources

The proposed project will have a short-term temporary impact to beach goers but only in the area of active construction. However, this impact will not be significant, as the activities will relocate to other areas of the beach and away from the active construction areas. In the long-term, the proposed project will preserve and enhance the recreational experience for residents and visitors, alike.

Mitigation/Monitoring

Collier County shall require its contractor(s) for the Project to place a notice in the U.S. Coast Guard Local Notice to Mariners regarding the timeframe and location of dredging and construction operations in advance of commencement of dredging.

3.3.3 Economic Resources

Refer to section 3.3.3 of the 2005 EA (CPE, 2005) for a discussion of economic resources.

3.3.4 Environmental Justice

Refer to section 3.3.4 of the 2005 EA (CPE, 2005) for a discussion of environmental justice.

3.3.5 Aesthetic Resources

The action area for this project encompasses approximately 13 miles of shoreline, including the 7.5 miles of fill area and adjacent, non-project sections of the beach within Collier County, between Wiggins Pass and Gordon Pass (Figure 1). Beach habitat has been highly eroded in some places along Collier County, and the project proposes widening and increasing the elevation of the existing low and narrow beach along the project segments. By widening the existing beach and stabilizing the eroded shoreline this project will create and improve existing beach habitat, thereby improving recreation and wildlife areas such as sea turtle nesting habitat, and providing greater levels of storm protection for the island. Dunes are also present in the

project area, though dune habitat is limited due to the developed nature of Collier County's shoreline. Currently, narrow low dunes are present throughout the length of the island, interrupted in some places by seawalls. Although the proposed project does not include any fill placement on the existing dunes, widening the beach area fronting the dunes will offer additional protection and stabilization to the dune system.

Project Impacts

The presence of heavy machinery and pipes on the beach and of dredges offshore and increased noise disturbance are aesthetically displeasing and inconvenient to beach users during construction. However, these impacts are temporary. Following project construction, the beach will be wider and more aesthetically pleasing than it was pre-construction.

3.4 Cumulative Impacts

Cumulative impacts are those impacts on the environment that result from the incremental impacts 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). Cumulative impacts can result from individually minor, but collectively, significant impacts taking place over a period of time. A cumulative effect is deemed significant if a project's incremental contribution to a cumulative impact is "considerable". Refer to section 3.3.4 of the 2005 EA (CPE, 2005) for a complete discussion of cumulative impacts.

Overall, past, proposed and future use of Borrow Area T1 for renourishment of the eroded Collier County shoreline is not expected to result in significant cumulative impacts. Other past, proposed and future projects within Collier County, such as maintenance dredging of inlets and small truck haul projects to address hot spots, are also not expected to result in significant cumulative impacts. Counties to the north of Collier County, including Lee, Sarasota and Manatee, are also planning beach renourishment projects; however, these projects are not anticipated to cause negative cumulative impacts. Overall, these coastal projects are addressing erosion issues along the Gulf Coast - while there are temporary impacts associated with each individual project, there are positive cumulative impacts that result from protection of valuable coastal habitat.

Continued monitoring of nearshore hardbottom resources, physical conditions of the borrow area and beach area, and utilization of the beach habitat by nesting sea turtles and shorebirds will provide a better understanding of any long-term changes within the project vicinity which may be associated with cumulative impacts from the nourishment projects.

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APPENDIX A

1995 U.S. ARMY CORPS OF ENGINEERS ENVIRONMENTAL ASSESSMENT AND STATEMENT OF FINDING

CESAJ-RD-W
199404092(IP-MN)

SEP 11 1995

MEMORANDUM FOR RECORD

SUBJECT: Department of the Army Environmental Assessment and Statement of Finding for Above-Numbered Permit Application

1. Applicant: Collier County BCC
3301 Tamiami Trail, East
Naples, Florida 33962

2. Location, Project Description:

a. Location: Gulf of Mexico at Vanderbilt Beach, Sections 19,20,29 and 32, Township 48 South, Range 25 East; Park Shore Beach, Sections 21,28 and 33, Township 49 South, Range 25 East; and Naples Beach, Sections 4,9,16,21,27, and 28, Township 50 South, Range 25 East, Collier County, Florida.

b. Project Description: To renourish the beaches of Vanderbilt Beach, Park Shore Beach, and Naples Beach with a total of 1.3 million cubic yards (cy) of beach compatible sand. The primary borrow area will be the ebb-tidal shoals at Capri-Big Marco Pass with sand transported to the locations by barge to then be deposited either hydraulically or mechanically on the beach. Alternate borrow areas include three offshore basins near the nourishment sites or upland commercial quarries. Vanderbilt Beach will require 200,000 cy of sand over a 10,000 foot length between DNR markers R-19 to R-35 with a construction width of 100 feet and a berm elevation of +5 feet NGVD; Park Shore Beach will require 100,000 cy of sand over a 4,400 foot length between DNR markers R-48 to R-58 with a construction berm width of 95 feet and a berm elevation of +5 feet NGVD; Naples Beach will require 1 million cy of sand over a 17,000 foot length between DNR markers R-59 to R-79 with a construction berm width of 175 feet and a berm elevation of +5 feet NGVD. The applicant also proposes to extend the north jetty at Doctor's Inlet by 220 feet with a crest elevation of +5 feet NGVD.

c. Revised Project Description: The borrow site at Capri-Big Marco Pass has been deleted and replaced with borrow site NB-11 located approximately 24,000 feet west of the City of Naples.

d. Mitigation: No hardbottom habitat was found to exist in any of the project areas to include the borrow areas and the project does not affect vegetated wetlands. Therefore, no mitigation is required.

3. Basic Project Purpose: Provide renourished beaches for storm protection and recreation.

4. Statutory Authority: Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) and Section 404 of the Clean Water Act.

5. Other Federal, State, and Local Authorizations Obtained or Required and Pending:

a. State Permit/Certification: The Department of Environmental Protection (DEP) permit/certification number 112544739 is pending.

b. Coastal Zone Management (CZM) consistency/permit: There is no evidence or indication from the State of Florida that the project is inconsistent with the Florida Coastal Zone Management Plan. Issuance of a DER permit certifies that the project is consistent with the CZM plan.

6. Date of Public Notice and Summary of Comments:

a. The application was received in the District Office on 12 August 1994. The application was initially considered complete on 16 August 1994. Due to applicant delay regarding the new borrow sites and necessary magnetometer surveys for SHPO clearance, the clock was advanced by 200 days. The new complete date was set as 5 March 1995. A public notice was issued on 12 September 1994, and sent to all interested parties including appropriate State and Federal agencies. All comments received on this application have been reviewed and are summarized below:

(1) U.S. Environmental Protection Agency (EPA): The EPA did not respond to the public notice.

(2) U.S. Fish and Wildlife Service (USFWS): By letter dated 20 September 1994, the FWS disagreed with the Corps determination that the project would have no-effect on nesting sea turtles and the Service initiated consultation under Section 7 of the Endangered Species Act (ESA). With regard to the Corps determination that the project would not affect the manatee, the Service agreed with the Corps determination. By letter dated 17 November 1994, the FWS submitted the Service's Biological Opinion (BO) for nesting sea turtles. In accordance with Section 9 of the ESA, the Service authorized a take for all nests laid prior to 1 May and any nest not hatched by 5 November. In accordance with the take statement, the Service provided mandatory Reasonable and Prudent Measures to minimize the take and Terms and Conditions necessary to implement the Reasonable and Prudent Measures.

REASONABLE AND PRUDENT MEASURES

--Beach nourishment will not occur during the sea turtle nesting season.

--Nourished beaches will be tilled if compaction or escarpments occur.

--Jetty construction will be scheduled to occur outside the nesting season if operation of heavy equipment on adjacent beaches is required, or if jetty boulders are to be stockpiled on the beach.

TERMS AND CONDITIONS

--To reduce the possibility of sea turtle nest burial or crushing of eggs, beach and dune restoration will be started after 5 November and be completed before 1 May.

--Heavy equipment operation or boulder stock piling on the beach may occur after 1 November and completed before 1 May.

--Prior to 1 May in the year of beach construction and prior to 1 May for three subsequent years, beach compaction will be monitored in the area of restoration. A minimum of 30 beach compaction measurements, at test depths of 15,30, and 50 centimeters, will be taken per 1,000 continuous linear meters of beach restoration.

--If the average of the 30 measurements at one or more of the test depths exceeds 500 cone penetrometer units (cpu), the applicant will immediately confer with the Service as to whether beach tilling to a depth of 75 cm or greater is needed. If the Service judges that tilling is needed, the tilling will be performed immediately prior to the sea turtle nesting season.

--Collier County will survey the reconstructed beach for any permanent escarpments that form and exceed 20 cm in height for a length exceeding 30 linear meters.

--If such escarpments form, the applicant will immediately confer with the Service as to whether the escarpment should be leveled and whether tilling is needed to loosen the beach material.

--A report describing the actions taken to implement the terms and conditions of this biological opinion will be submitted to the Vero Beach Field Office within 60 days of completion of the proposed work. A report of the beach compaction averaged cpu values will be provided to the Vero Beach Field Office prior to 1 April for three years following construction.

In the event a sea turtle nest is excavated during dune restoration activities, the following procedure should be followed:

--Immediately notify the DEP that the nest needs to be relocated. A permitted individual responsible for nest relocation should then remove the nest to a beach hatchery. Before eggs are relocated, the top of each egg will be marked with a non-toxic felt-tipped pen and individually and gently placed on 2-3 inches of moist sand in a rigid-walled container, being careful not to change the axis of the eggs. Eggs will be covered with a fine nylon mesh and then 2-3 inches of moist sand, shaded from the sun, and immediately transported to the hatchery. Eggs will be placed one at a time in the artificial nest chamber, while ensuring that the orientation of each egg remains as in the natural nest.

(3) National Marine Fisheries Service (NMFS): By letter dated 3 October 1994, the NMFS stated the Service did not have the manpower to review the project and took no position on the issuance of a permit.

(4) State Historic Preservation Officer (SHPO): By letter dated 20 October 1994, the SHPO indicated that the proposed project would have no effect on any sites listed, or eligible for listing, in the National Register of Historic Places, or otherwise of national, state, or local significance. In a subsequent letter dated 25 October 1994, the SHPO expressed concern for the existence of ship wrecks in the borrow area at Capri/Big Marco Pass. The SHPO requested that a magnetometer survey be done for this borrow area. Borrow areas adjacent to the nourishment areas (Areas 3-2-1, 3-5, and 6) need not be subjected to the magnetometer survey. The applicant deleted the Big Marco Pass borrow site and a magnetometer survey was done for the new borrow site (NB-11) and submitted to the SHPO. By letter dated 25 August 1995, the SHPO advised that the new borrow site would have no effect on historic resources.

(5) Organizations: By letter dated 22 September 1994, the Florida Wildlife Federation SW Florida Office expressed concern for the "window" of construction activities and they requested that no work be done during the turtle nesting season. By letter dated 28 September 1994, The Collier County Audubon Society objected to the Corps characterization in the public notice that the project would not affect nesting sea turtles. By letter dated 7 October 1994, the American Littoral Society Coral Reef Conservation Center expressed concerns for the project impacts to hard bottom habitats in the three project areas.

b. Applicant's response to the comments: The comments received in response to the public notice were coordinated with the applicant by letter dated 19 January 1995. The applicant's consultant responded by letter dated 16 February 1995, that the FWS sea turtle conditions were acceptable and he provided the results of the magnetometer survey. However, the magnetometer survey was not provided to the SHPO. The applicant's consultant also responded to the concern for hard bottom habitat impacts in either the beach nourishment areas or the offshore borrow areas by indicating that there was no hard bottom habitat within 2,500 feet of the toe of the equilibrium slope of the nourishment cross-sections or within 2,500 feet of the borrow areas.

7. Alternatives: The beach nourishment project does not involve a discharge into any vegetated wetland and no wetland acres will be impacted. The beach quality material will be placed on the existing sandy substrate waterward and landward of the mean high water line. A discussion of alternatives is not required.

8. Evaluation of the 404(b)(1) Guidelines:

a. Restrictions on discharges:

(1) Alternatives (See paragraph 7):

(a) The activity is located in a special aquatic site (wetlands, sanctuaries and refuges, mudflats, vegetated shallows, coral reefs, riffle & pool complexes): yes____ no__X__

(b) The activity needs to be located in a special aquatic site to fulfill its basic purpose. yes____ no__X__

(c) It has been demonstrated in paragraph 7 above that there are no practicable nor less damaging alternatives which would satisfy the project's basic purpose. yes_X__ no_____

(2) Other program requirements:

(a) The proposed activity violates applicable State water quality standards or Section 307 prohibitions or effluent standards. yes____ no__X__

(b) The proposed activity jeopardizes the continued existence of federally listed threatened or endangered species or affects their critical habitat. yes____ no__X__

(c) The proposed activity violates the requirements of a federally designated marine sanctuary. yes____ no__X__

(3) The activity will cause or contribute to significant degradation of waters of the United States, including adverse effects on human health; life stages of aquatic organisms; ecosystem diversity, productivity and stability; and recreational, esthetic, and economic values. yes____ no__X__

(4) Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem. yes_X__ no_____

b. Findings. The proposed site for discharge of dredged or fill material complies with the Section 404(b)(1) Guidelines.}

9. Public Interest Review:

a. Corps analysis of comments and responses: All comments received in response to the public notice have been considered in the following public interest review.

b. All public interest factors have been reviewed, including but not limited to the effects the work might have on conservation, economics, esthetics, general environmental concerns, wetlands, historic properties, land use, water quality, safety, and consideration of property ownership. It has been determined that the proposed work will not adversely impact any of the public interest factors. The following public interest factors were evaluated separately:

(1) Shore Erosion and Accretion: The project will renourish eroded beaches in the Naples area. There should be a positive impact on this value although the beach can be expected to erode over time necessitating future nourishments. The sand grain size is slightly larger than native material indicating the sand should erode more slowly than if the grain size was smaller than native material.

(2) Recreation: The renourished beach will add recreational values to the area over the eroded beaches. A positive impact can be expected.

(3) Navigation: The renourished beach will not be a navigational hazard to boats operating in the Gulf of Mexico.

(4) Fish and Wildlife Values: There will be no hardbottom habitat impacted by either the beach fill or the dredging of the borrow sites. The benthic organisms filled by the beach sand should become reestablished in a short time. No adverse impacts are anticipated.

c. Describe the relative extent of the public and private need for the proposed structure or work: The need is essentially public since the beach nourishment will provide storm protection for the upland properties and also provide increased recreational use of the areas by the public.

d. Describe the practicability of using reasonable alternative locations and methods to accomplish the objective of the proposed work where there are unresolved conflicts as to resource use: There are no unresolved conflicts regarding use of the resource so a discussion of alternatives is not necessary.

e. Describe the extent and permanence of the beneficial and/or detrimental effects which the proposed work is likely to have on the public and private uses to which the area is suited: The detrimental impacts of the project relate to covering of existing benthic organisms that are not mobile enough to move out of the way of the work. This detrimental impact will be temporary and other benthic organisms will colonize the beach nourishment area after the area stabilizes. The beneficial impacts of storm protection and recreational use increase will also be temporary dependent on erosion patterns caused by wave activity, local shoreline armoring structures, and storm events. Periodic renourishment of the beaches will be a continuing process.

f. Threatened or Endangered Species: The proposed project will not adversely affect any endangered species or their critical habitat provided the Reasonable and Prudent Measures and Terms and Conditions are made special conditions of the DA permit.

g. Corps Wetland Policy: No wetlands will be impacted by this project.

h. Cumulative and Secondary Impacts: There should be no adverse cumulative impacts since the impacts of beach nourishment projects are typically the same (impacts to non-mobile benthic organisms) and these impacts are temporary. Secondary impacts are normally related to further covering of benthic organisms during the time the construction profile stabilizes and moves seaward in response to normal wave activity. Secondary impacts are not expected to be significant or adverse since no hardbottom habitat will be impacted in any of the three nourishment locations.

10. Determinations:

a. Finding of No Significant Impact (FONSI). Having reviewed the information provided by the applicant and all interested parties and an assessment of the environmental impacts, I find that this permit action will not have a significant impact on the quality of the human environment. Therefore, an Environmental Impact Statement will not be required.

b. Compliance with 404(b)(1) guidelines. Having completed the evaluation in paragraph 7 above, I have determined that the proposed discharge complies with the 404(b)(1) guidelines.

c. Public Interest Determination: I find that issuance of a Department of the Army permit is not contrary to the public interest.

d. Section 176(c) of the Clean Air Act General Conformity Rule Review: The proposed permit action has been analyzed for conformity applicability pursuant to regulations implementing Section 176(c) of the Clean Air Act. It has been determined that the activities proposed under this permit will not exceed **de minimis** levels of direct emissions of a criteria pollutant or its precursors and are exempted by 40 CFR Part 93.153. Any later indirect emissions are generally not within the Corps' continuing program responsibility and generally cannot be practicably controlled by the Corps. For these reasons a conformity determination is not required for this permit action.

PREPARED BY:

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REVIEWED BY:

RONALD H. SILVER, C.E.P.
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APPROVED BY:

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CF:
CESAJ-RD-WT

APPENDIX B

MINERALS MANAGEMENT SERVICE (MMS) ENVIRONMENTAL ASSESSMENT (PREPARED BY COASTAL PLANNING & ENGINEERING, INC. , MAY 2005)

MINERALS MANAGEMENT SERVICE
ENVIRONMENTAL ASSESSMENT

Issuance of a Noncompetitive Lease for Collier County Beach Renourishment Borrow Area (Borrow Area T1)

Collier County Beach Renourishment Project
Collier County, Florida

May 2005

COASTAL PLANNING & ENGINEERING, INC.

MINERALS MANAGEMENT SERVICE
ENVIRONMENTAL ASSESSMENT

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1.0 INTRODUCTION

Collier County, in southwest Florida plans to construct and maintain a beach nourishment project along their northwestern shoreline area. The project includes the renourishment of beach segments that were part of the 1996 beach nourishment project and extensions of those segments, for design integrity and project performance. As part of this project, Collier County intends to use sand located within the boundaries of the Federal Outer Continental Shelf (OCS), which comes under the authority of the Department of the Interior, Minerals Management Service (MMS).

This Environmental Assessment analyzes the potential environmental impacts associated with the MMS issuing a noncompetitive lease for offshore sand to Collier County Government. It describes the project design, components, and parameters that reduce or avoid potential impacts (Chapter 2), and additional mitigation measures that will be implemented to further avoid or minimize potential impacts (Chapter 3). Chapter 4 describes alternatives considered by Collier County. References are listed in Chapter 5, and a list of preparers of this document is provided in Chapter 6.

2.0 PROJECT DESCRIPTION

2.1 PROJECT LOCATION AND SETTING

The proposed project is located along the Gulf of Mexico shoreline, approximately 115 miles south of the entrance to Tampa Bay, in Collier County, Florida. Collier County is bordered to the west by the Gulf of Mexico, to the east by Dade and Broward Counties, to the north by Lee and Hendry Counties, and to the south by Monroe County. Regionally, the project is located along the southwestern coast of Florida, in the northwestern area of Collier County. It includes the shoreline between Wiggins Pass and Gordon Pass. Two borrow areas, N5 and T1, were investigated for use as a sand source for the project. Borrow Area T1 is the only environmentally feasible alternative for the project.

Borrow Area T1 is located in the OCS zone, approximately thirty-three (33) miles northwest of the project shoreline (Figure 1). The proposed borrow area is approximately 3,600 ft in length (north to south) by 7,000 ft in width (east to west). The borrow area is the tip of a long sand ridge trending southeast to northwest. The sediment thickness (relief) available for dredging ranges from 3 to 17 ft, and averages 8 to 10 ft. The proposed borrow site includes segments of MMS Offshore Protraction Diagram (OPD) and block numbers are CH605 and CH606 shown on Figure 1. The nearest landmass is Sanibel Island, located approximately thirteen (13) miles to the east-northeast.

Coordination between the applicant and the Florida Department of Environmental Protection (FDEP) regarding the County's proposal to place sand dredged from Borrow Area T1 on the beach in Collier County have resulted in issuance of a Joint Coastal Permit for the project (Appendix D). Of particular concern to FDEP during the permitting process, is the potential of fill equilibration from the project encroaching on nearshore hardbottom resources. The project has been design to avoid hardbottom coverage, but the state permit requires Collier County to construct 1.09 acres of artificial reef as mitigation for potential fill equilibration impacts. A comprehensive Biological Monitoring and Mitigation Plan has been developed to monitor potential hardbottom impacts.

2.2 PURPOSE OF AND NEED FOR THE PROJECT

The primary objectives for this project are to:

- Provide storm protection for upland properties, provide sea turtle nesting and shorebird habitat, and increase areas for beach recreation, while reducing or avoiding any potential impacts to natural resources.

- Identify a long-term sand source that is less reliant on truck haul, to maintain the initial 1996 project.

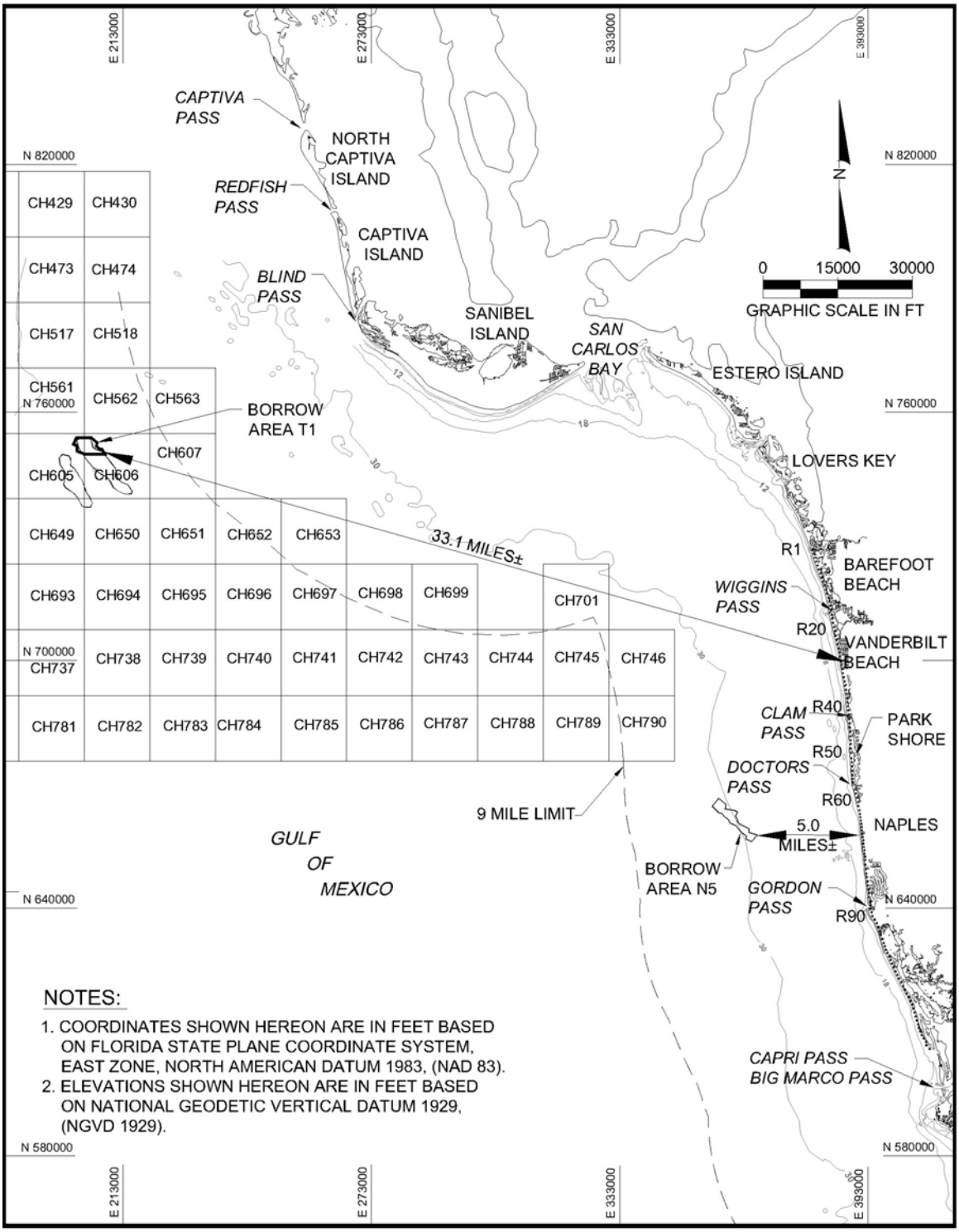

Figure 1. Borrow Area Location Map

The 1996 beach nourishment project is performing well, but has been maintained with truck haul sand from upland sources and above average sand bypassing at the inlets located within the project limits. Truck hauling is intrusive to the general public, beach environment, and public infrastructure, and is expensive. The County desires to implement a less invasive long-term maintenance plan without significant impacts to natural resources, especially the extensive nearshore hardbottom communities. The 1996 project was restricted in size to avoid hardbottom habitat coverage, and needed the supplemental fill and inlet bypassing to lengthen the project life. If inlet dredging decreases for any reason, the impact to the existing beach will be significant. Since 1996, the beaches have eroded to a point where they are at or near their design width, indicating a need to renourish.

2.3 PROJECT CHARACTERISTICS

The proposed project will place approximately 673,000 cubic yards of sand along approximately 8.6 miles of beach. The project area is designed as two phases (Figure 2): (1) the limits of the 1996 restoration project which include Vanderbilt Beach, Park Shore, and Naples Beach (Phase I); and (2) extension of the 1996 project area to the north and south, to increase project longevity and protect additional upland development (Phase II).

Project phasing was initially tied to funding availability and construction feasibility outside sea turtle nesting season within a single construction season. It is now likely that Phase I (the original fill sections of the 1996 project) and Phase II (added fill sections south of Vanderbilt Beach (Pelican Bay) and north of Park Shore) will be constructed together. Construction is expected to start in November 2005 and be completed by April 30, 2006. This construction period is expected to place the full 673,000 cubic yards of sand on the beach. If any portion of Phase II is not constructed during the approved construction period, the remainder would be constructed outside turtle nesting season, within one to five years of the completion of Phase I. Total volume for the proposed project is summarized in Table 1.

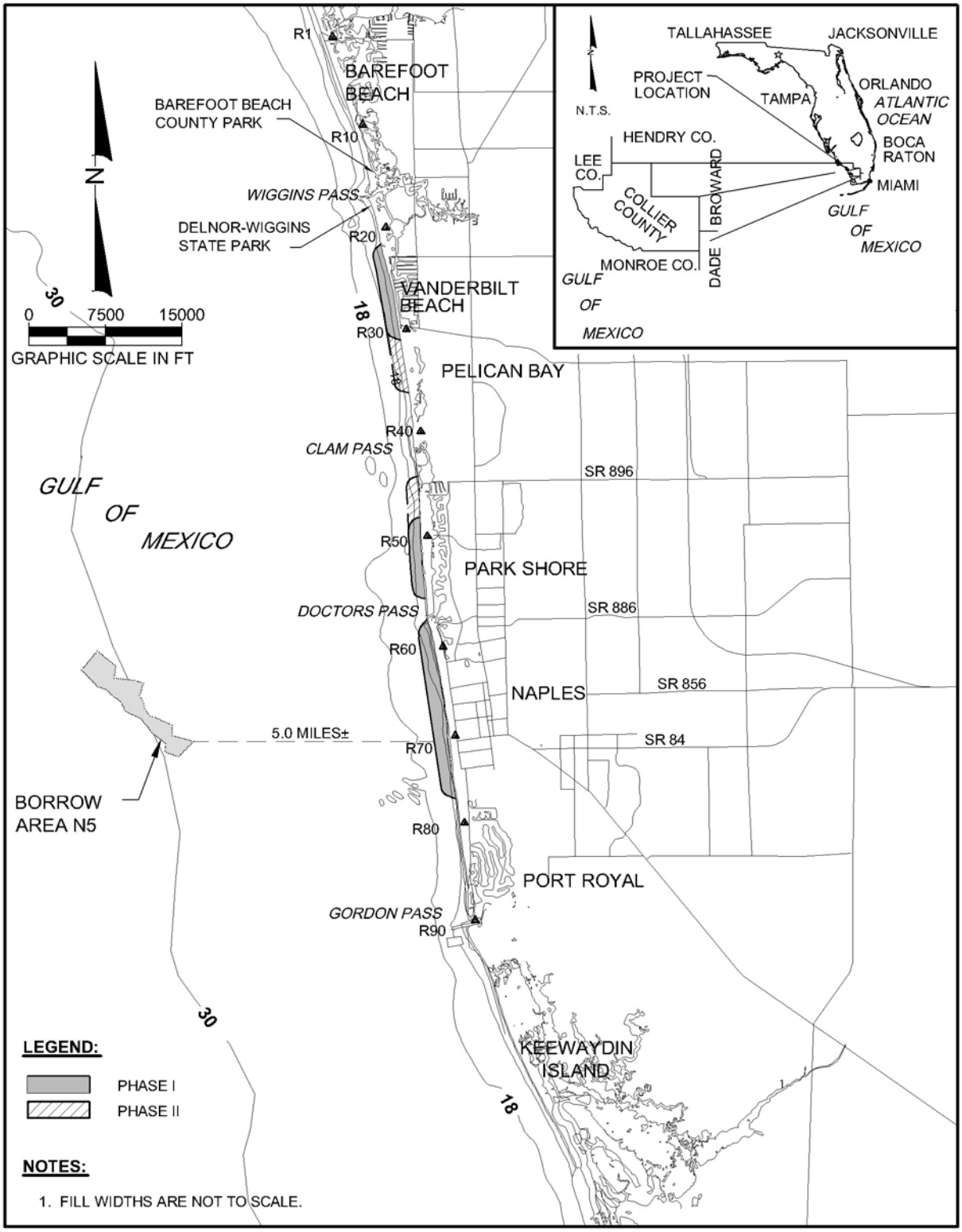

Figure 2. Project Fill Limits

Table 1
Design Fill Volumes

PROJECT SEGMENT AND PHASE (Phase I & II to be constructed at same time)		FILL LENGTH (FT)	TOTAL VOLUME (CY)
PHASE I - RENOURISHMENT (11/05 - 4/06)			
VANDERBILT BEACH	R22.5 - R31	8,424	109,119
PARK SHORE	R48 - R54.5	6,338	140,021
NAPLES BEACH	R58 - R79	19,408	315,188
PHASE II - INITIAL NOURISHMENT (11/05 - 4/06)			
PELICAN BAY	R31 - R37	6,578	63,209
NORTHERN PARK SHORE	R43.5 - R48	4,921	45,714
TOTAL		**45,669**	**673,251**

A renourishment interval of six years is estimated for the project and the timeline begins when project construction is complete. Phase I and Phase II are expected to be constructed together and treated as a single event in the post-construction monitoring phase, which will begin after the fill has been placed (2006). Year 6 will be reached in 2012, at which time the theoretical renourishment cycle for the proposed project would end. However, renourishment is more dependent upon project performance and subsequent projects will be constructed when the beach erodes back to its design width. The FDEP permit is valid until 2015 (Appendix H), which allows for flexibility in renourishment timing.

The beach design criterion is generally 100 feet total width, from a landward baseline at the existing seawalls or edge of vegetation to MHW. This is the design width at which the 1996 project has performed. The design width is 85 feet in the Park Shore area, established to avoid nearshore hardbottom impacts. The initial constructed width will be wider than the design to account for profile adjustment and background erosion expected during the life of the project. Six years of advanced nourishment are included in the fill volume to account for background erosion. This volume was considered in the calculations to avoid hardbottom. The design berm elevation is 5 feet NGVD. No new erosion control structures or repairs to existing structures are proposed. The plan and typical profile views of the project areas are provided in Appendix B.

Two offshore borrow areas were identified for use in the project, Borrow Areas N5 and T1. These borrow areas are characteristic of relict sand ridges. Borrow Area N5 is located in State waters, approximately five miles from the project shoreline, in water depths of 29-30 feet NGVD. Geotechnical investigations indicate that the N5 borrow area contains about 1.45 million cubic yards of beach quality sand. Dredging the N5 borrow site will require the use of a hopper dredge, due to the shallow cut depths of one to five feet. Moderate sized hopper dredges (2000 to 4000 cubic yard capacity) generally have operational depth requirements of approximately 24 feet of water. The 24-foot (NGVD) depth contour offshore of Collier County is generally located approximately 2.5 miles offshore. Large hopper dredges may require up to 35 feet of water to effectively operate. If a large hopper dredge is used for the project, the use of booster pump(s) may be required to transfer the material from the hopper dredge to the fill site. In addition, the project area is segmented along 11 miles of coastline and the fill areas are separated by the inlets. These factors will necessitate movements of the long submerged pipeline during construction so that the pumping distances can be minimized.

Borrow Area T1 is located approximately thirty-three miles from the project shoreline, within the OCS zone. The plan and cross-section views for Borrow Area T1 are provided in Appendix B. The T1 borrow area is located in water depths of 36-54 feet (NGVD), and encompasses an area of 372 acres. The sand resource identified for use in the proposed Collier County project contains an estimated 4.7 million cubic yards of beach compatible sand in dredge cuts ranging from 3-17 feet depending upon location within the sand ridge formation. The proposed T1 borrow area contains more sand than needed for the initial renourishment because the state and federal project permits allow for multiple nourishment events and are valid for 10 years. The sand remaining in the borrow site after completion of the Phase I and Phase II projects is intended to be used as a permitted reserve of beach compatible material to be used for initial project contingencies, future emergency projects and/or scheduled renourishment events, which may require a new MMS lease.

The T1 Borrow Area can be dredged using either a hopper dredge or a cutterhead dredge. The dredged sand will be screened at the borrow site to reduce the possibility of transporting and placing larger rock or shell fragments at the fill site. A cutterhead dredge would move sand from the borrow area to scows. A scow is an unpowered barge used to transport sand. A spider barge apparatus is often used in the process to facilitate the transfer of sand from the dredge to the scows. Once the scows are filled, they are moved to a nearshore transfer station where the sand is transported in suspension to the beach fill site through a submerged pipeline. A scow is capable of unloading in shallower water than a hopper dredge, which may be less expensive than the hopper process. This process is supported by bulldozers; front end loaders, other work vehicles, and perhaps small truck haul operations, to grade and distribute the sand within the beach fill template. Shore-parallel dikes will be constructed along the waterline to control turbidity at the point of discharge. Access points and equipment staging areas are available in each beach segment, for use by the contractor to move his equipment on the beach, and to allow access by his work force.

The project will use the three pipeline corridors established in the 1996 project. Additional pipeline corridors have been established to provide the necessary access to construct the project. The corridors are depicted in the plan views of the permit sketches attached in Appendix B.

Public access and parking is available throughout the project area, in an amount sufficient to warrant project cost-sharing by the State. Per State law, prior to construction of a beach restoration project, the State must establish the line of mean high water for the area to be restored. This line, known as the Erosion Control Line (ECL), becomes the boundary line between sovereign lands of the State bordering the Gulf of Mexico, and the upland properties. This ensures that public funds are used for the benefit of the public. The project has an existing ECL along the limits of the 1996 project and an ECL will be established for the added segments of the project, prior to the proposed renourishment.

The County is planning to increase public access to the project area by enhancing parking at public access points. Currently, a parking garage is planned for the Vanderbilt Beach segment, which will increase public parking in that area.

3.0 ENVIRONMENTAL IMPACT ANALYSIS

3.1 PHYSICAL ENVIRONMENT

3.1.1 GEOLOGY AND MINERAL RESOURCES

Environmental Setting

Geological Framework

Most of coastal Collier County is thinly mantled with loose, free running sand (the unconsolidated deposits generally thickening from south to north) that overlie eroded limestones of the Tamiami Formation (Drew and Schromer, 1984) as well as marl and lime mud deposits (McCoy, 1962). It is essential to note that the underlying antecedent topography of the Tertiary limestone surface (a drowned karst landscape and ravinement surface) significantly influences the cardinal orientation and geographic location of Holocene barrier islands (Evans *et al*., 1985; Hine *et al*., 1986); the west-central coast is fairly straight and oriented west of north, except for a major dislocation at Sanibel Island where there is bedrock control of a general east-west barrier island orientation (Evans et al., 1989). There is pronounced rock control of loci for sedimentary deposition, coastal configuration and shoreline position that must be appreciated when explaining coastal evolution and present attempts to manage these dynamic systems that respond to many factors.

Description of the geologic setting is central to comprehension of bedrock seafloor surfaces and the sediments sitting on them. The nature of sedimentary deposits determines sand quality and its potential use for beach nourishment. It is thus helpful to understand the general shelf environments because the distribution of beach-quality sands on the seabed is not random, but spatially well defined in terms of stratigraphy, grain composition, age of materials, and erosional-depositional events. The study area is part of a larger continuum (extending from Anclote Key in the north to Cape Romano in the south) that lies at the center of an ancient carbonate platform that faces an enormous ramp (an ancient carbonate platform that forms the proximal portion of the west Florida shelf-slope system) that has exerted large-scale control on coastal geomorphology, the availability of sediments, and wave energy (Hine et al., 2003). Although this region is relatively sediment-starved, ebb-tidal deltas and offshore sand ridges provide a ready-made source of sand for beach nourishment (Hine et al., 1986; Hine et al., 2003). Salient characteristics of this unique geologic environment, particularly the occurrence of sand ridge fields, are briefly summarized here as they relate to marine sand searches for beach sediments.

Quaternary sedimentary accumulation has produced a significant dislocation of the coastline at Cape Romano, which has several implications for interpretation of

regional geology, sediment transport and provenance, morphosedimentary history (evolution of sediment types), and morphodynamics. Cape Romano (a quartz sand cuspate foreland) (Davis, 1997) that is closely associated with a bank of linear, tide-dominated sand ridges (Davis and Klay, 1989) marks the southern end of the quartz sand dominated Gulf Barrier Island Chain; the siliciclastic to carbonate transition occurs rather abruptly around latitude 25°30' (Campbell, 1988; Sussko and Davis, 1992). Sedimentary environments south of the Cape thus become increasingly dominated by carbonates. Cape Sable, lying south of the Ten Thousand Island towards Florida Bay, is a carbonate-sand foreland containing three cuspate accretionary-ridge complexes (Roberts *et al.*, 1977). This stretch of coast clearly shows the quartz-carbonate transition of morphological shore features where quartz beaches with carbonate lag deposits become replaced by biogenic sand and gravel deposits.

The low wave energy regime of Collier County allows for the construction of ebb-tidal deltas, which store large quantities of sand (Davis *et al.*, 1993; Hine et al., 2003). Flood-tidal deltas along the west-central Florida coast are relatively inactive due to small tidal ranges, sheltered lagoons, and ebb dominated inlets (Davis, 1989; Finkl, 1994). Inlets along this coast show no strong regional trends and are stable in terms of channel width, length, geographic position, and orientation (Finkl, 1994).

Various types of sand ridges (linear accumulations of sand bodies) occurring on the inner shelves are verified throughout the world, including the southwest coast of Florida. Some of these topographically positive sandy accumulations on the seafloor are recognized as relict (formed in response to prior still stands of sea level) sand bodies associated with lowered sea levels compared to those of today while others are still active. In Collier County, prominent seabed morphologies on the inner continental shelf include linear sand ridges, some of which extend continuously for distances greater than 4 miles. These deposits are geologically young, having formed during the post-glacial sea-level rise (most recent Holocene trend in sea-level rise that took place in the latter half of the last 10,000 years) (Davis, 1997). Modern inner-shelf dynamic processes, such as the action of undertow currents and storm wave activity, reshaped and reworked the sedimentary architecture of these deposits to induce the morphologies presently seen.

Other commonly occurring features offshore of Collier County include various types of depressional (negative topographic) features that are incised into the karst surface and some surficial marls. When the continental shelf was exposed to surface geomorphic processes during sea-level lowstands, small streams and some larger rivers cut into the karstified surface and persisted as valleys until sea level rose and they were infilled with recent marine and terrigenous sediments.

The wide continental shelf offshore off Collier County, described by Davis (1997), which gently slopes seaward toward the central basin of the Gulf of

Mexico, maintains shallow depths to 5.5 miles offshore, to the 30-foot isobath. Shelf morphologies and coastal morphodynamics have received much attention by the scientific community in the last two decades due to their influence or impact on spatial distributions of mineral resources (*e.g.* Wright, 1995), large scale beach behavior (Short, 1999), and barrier island evolution (Oertel, 1979). Recent studies of shelf morphology and continental shelf depositional systems was summarized in *Marine Geology* (Volume 200, Numbers 1-4) (see Hine et al., 2003), providing new insights and interpretations of the geologic framework and deposits for the west-central coast of Florida.

Occurrence of Sand Ridges and Relevance to Other Deposits

The west Florida inner continental shelf is unique in that it separates a beach system composed of nearly pure siliciclastics (silica sand) from a shelf of nearly pure carbonate sediment (Twichell et al., 2003). Geographic location, morphologic orientation, and stratigraphic position thus become important to interpretations of sand ridges on the continental shelf. This new observation is pertinent to marine sand searches where siliciclastics deposits, which are compatible with beach sediments, are sought in an offshore carbonate shelf environment. The presence of sand ridges on the shelf has been appreciated as singularities for some time, but new studies emphasize the widespread occurrence of sand ridge fields that greatly enhances the potential for locating multiple good-quality borrow sites on ridges that are superposed on top of limestone bedrock. Multiple sand ridge fields occupy different parts of the continental shelf and although the sand ridges bear similarities, there are also differences in orientation, morphology, and composition.

For example, the shoreline-oblique (30-50º) inner shelf sand ridges offshore from Sand Key occur in an environment that is underlain by limestone and covered by a thin veneer of mixed carbonate and siliciclastic sands and gravels (Edwards et al., 2003; Locker et al., 2003). The ridges tend to be thicker and more widely spaced with increasing water depth, as observed elsewhere as seen in the sand ridges along the New Jersey coast (e.g. Stubblefield et al., 1984; Rine et al., 1991). These sand ridges have been investigated previously as sources of sand for beach nourishment (Gelfenbaum et al., 1995) and there is thus precedence for exploitation of sand ridges.

Grain-size compositional variation along this shelf show a shore-parallel gradation between beach and nearshore siliciclastics sand and the carbonate shelf sediment; the facies transition is, however, irregular in shape and closely linked to the morphology of the inner shelf (Gelfenbaum et al., 1995; Brooks et al., 1998; Locker et al., 2003). Much of the unconsolidated sediment on the inner shelf is contained in low-relief ridges with older strata exposed in the intervening troughs (Locker et al., 2003).

The series of low-relief ridges off Collier County are, for example, similar in length and width to ridges found on continental shelves of the eastern United States (e.g. Duane et al., 1972), eastern Canada (e.g. Hoogendorn and Dalrymple, 1986), and Europe (e.g. Dyer and Huntley, 1999). The ridges are, however, somewhat different from other sand ridges on the central-west coast in that northwestern and southeastern edges on the siliclastic sand component of the Holocene ridge deposits vary in origin. Along the southeastern edges of the siliciclastics sand bodies, the transition to carbonate sediment is abrupt and coincides with a discontinuity; the facies transition is the result of incomplete covering by Holocene sediment of the of the older strata below the ravinement surface (Twichell et al., 2003). On the northwestern side, the transition is equally abrupt but is a facies boundary within Holocene-aged sediment that appears to be the result of sediment sorting and redistribution by modern processes.

Stratigraphy

Sand ridges on the inner shelf off west-central Florida form extensive fields that extend from within 2 km of the beach to over 25 km offshore. Stratigraphically, the sand ridges are separated from the underlying Pleistocene and Tertiary carbonate strata by the Holocene ravinement surface (Twichell et al., 2003), as observed for the nearly shore-normal ridges off Sarasota County. The top of the oldest unit, the present hard rock seafloor, is probably the late Oligocene to early Pliocene Hawthorn Formation, a phosphate-rich limestone and dolostone (Davis and Hine, 1989). Depressions in this unit, which are related to karst topography, contain Pleistocene and older strata immediately below the ravinement surface cut during the Holocene marine transgression. The youngest unit is the sediment that comprises the ridges themselves (Twichell et al., 2003). The ravinement surface that separates the ridge deposits from older deposits is flat, and has only a thin discontinuous veneer of sediments in troughs between the ridges. The flatness of the surface suggests that there has been minimal erosion of trough floors during the Holocene rise in sea level.

Beach Sand Characteristics

The beach sands in the project area are fine to medium-grained with shell. The sands have been influenced by nourishment projects, truck haul sand and bypassing at inlets. These activities have added moderate quantities of shell, minor quantities of rock, and coarse sand from upland sources; which make it difficult to accurately define the engineering qualities of the beach. A number of rock removal projects since 1996 have had a visible influence on the beaches of Naples and Vanderbilt.

In 1998, sand samples were collected at the berm, foreshore and toe of fill to meet permit conditions. This collection method may show a higher composite value. In 2003, a more comprehensive sand sample collection was undertaken, with samples collected across the entire profile at the following elevations: +5, +1.5,

MHW, MTL, MLW, -3, Trough, Bar, -6.5 and -9 ft NGVD. These latter samples were taken after rocks and shell were cleaned from the beach and coarse truck haul sand was placed on eroded beaches. The average composite mean grain size for 1998 and 2003 were 0.33 mm and 0.24 mm, respectively.

The dry beach has a range of dry munsell colors from 5Y 8/1 (white) to 5Y 8/2 (pale yellow) and wet munsell colors from 5Y 7/1 (light gray) to 5Y 8/2 (pale yellow). The subaerial beach has a range of dry munsell colors from 5Y 6/2 (light olive gray) to 5Y 8/2 (pale yellow) and wet colors ranging from 5Y 5/1 (gray) to 5Y 7/2 (light gray).

Borrow Area Sand Characteristics

Two potential borrow areas were initially identified by Coastal Planning & Engineering, Inc. for use in the Collier County renourishment project. These borrow areas are characteristic of relict sand ridges. Borrow area boundaries are located at least 400 feet away from existing or potential hardbottom. During the permitting process, Borrow Area N5 was rejected as an alternative and removed from the project plans. Borrow Area T1 is the only feasible alternative and is proposed as the sole sand source for the project. The two borrow areas are described below, and a detailed geotechnical report is provided in Appendix F.

Borrow Area N5

Borrow Area N5 is located in State waters, five miles off the coastline of Florida. This borrow area is characterized by mostly light gray (5Y 7/1), fine-grained quartz sand with varying amounts of shell. The shell content ranges from 4 to 60 percent, the silt content ranges from 2 to 14 percent, and the calcium carbonate (C_aCO_3) ranges from 18 to 45 percent. Both the shell and silt contents generally increase with depth. The phi sorting value of the samples ranges from moderately well sorted to very poorly sorted, where most of the samples are generally in the poor to very poorly sorted categories. The mean munsell color for dry samples is light gray (5Y-7/1) with a range from gray (5Y-6/1) to white (5Y-8/1). Wet samples have a mean of light gray (5Y-7/1) and a range from gray (5Y-6/1) to light gray (5Y-7/1).

An analysis of the N5 Borrow Area found the mean grain size to be 0.19 mm indicating fine-grained sand (Table 2). The sorting was found to be 1.76, or poorly sorted. Both of these values were found using the moment method. The preliminary average silt content for the entire borrow area is 5.8 percent. The borrow area contains approximately 1.45 million cubic yards of sand. The proposed cut depth was defined above the rock layers and the shelly silty layers identified during the geotechnical investigations. The borrow area was deemed unsuitable by the FDEP because of the quality and quantity of the silt, which did not meet current State standards.

Table 2
Beach and Borrow Area Characteristics

Location	Mean Grain Size (PHI)	Mean Grain Size (mm)	Sorting (PHI)	Silt (%)	Overfill Ratio: Naples 5 Miles (N5)	Overfill Ratio: Toms Hill 1 (T1)
Vanderbilt Beach R-27	2.18	0.22	1.57	4.65	1.18	0.79
Pelican Bay R-33	1.74	0.30	1.86	1.72	2.31	1.33
Park Shore R-52	2.47	0.18	0.92	2.61	0.8	0.74
Naples Beach R-64	2.12	0.23	1.31	1.52	1.33	0.81
Naples Beach R-73	2.32	0.20	1.31	1.28	0.93	0.76
Borrow Areas					**Borrow Area Volume**	
Naples 5 Miles (N5)	2.36	0.19	1.76	5.80	1,451,000 cy	
Toms Hill I (T1)	1.67	0.31	0.92	1.75	4,650,000 cy	

Note:
Overfill ratio based on Equilibrium Profile Method and average beach width extension of 36 feet

Borrow Area T1

Borrow Area T1 is located in Federal waters, 33 miles northwest of Vanderbilt Beach. This area is characterized by light-gray (5Y 7/1), fine-grained quartz sand. The shell content ranges from 1 to 18 percent, but is mostly in the 3 to 8 percent range, the silt content ranges from 1 to 10 percent but is mostly in the 1 to 4 percent range, and the calcium carbonate (by weight) ranges from 18 to 26 percent. Both the shell and silt contents generally increase with depth. The phi sorting value of the samples ranges from moderately sorted to poorly sorted. The mean munsell color for dry samples is light gray (5Y-7/1) with a range from gray (5Y-5/1) to white (5Y-8/1). Wet samples have a mean of light gray (5Y-7/1) and a range from gray (5Y-5/1) to light gray (5Y-7/1).

An analysis of the Borrow Area T1 found the mean grain size to be 0.31 mm indicating medium-grained sand (Table 2). The sorting was found to be 0.92, or moderately sorted. Both of these values were calculated using the moment method. The composite silt content for the entire borrow area is 1.75 percent. As a beach sand source with the above characteristics, borrow area T1 is low in turbidity potential. The borrow area contains approximately 4.7 million cubic yards of sand and covers an area of approximately 372 acres. The preliminary borrow area borders and characteristics are described in Appendix F. The refined borrow area borders with a 400 foot buffer are shown on sheets 22 and 23 in Appendix B.

The borrow area volume has been sized to support a 10-year program of initial nourishment, renourishment and emergency restoration projects, with sufficient buffers to account for dredging methods and contingencies. The grain size characteristics of the material are superior, and will provide good performance and minimal turbidity.

Borrow Area Chemical Analysis

Chemical analysis of the water column and sand source is not generally required for an open ocean/gulf sand source. When the borrow areas were identified, they were chosen based on sediment grain size, sorting, color, and general cleanness. No contaminants were observed in the sediment samples or cores, and the area has a very low probability of hazardous chemicals or pollutants. MMS concurrence on no need for chemical testing is provided in Appendix A.

Sand proposed for ocean disposal in an unconfined site must meet the requirements defined in 40 CFR 227.6. Guidance on implementing the regulation is addressed in Evaluation of Dredged Material Proposed for Ocean Disposal – Testing Manual (USEPA/USACE 1991). Sand material that meets specific Tier 1 (40 CFR 227.13(b)) evaluation criteria may be excluded from the technical evaluation required by Section 40 CFR 227.13. In general, sand dredged from the open ocean/gulf for beach disposal does not require specific chemical testing. The sand from Borrow Area T1 meets these criteria for the following reasons: Borrow Area T1 is composed of sand and shell, and was formed by waves and currents in the recent geological time. The material is desired for beach nourishment of the Collier County shoreline. The Borrow Area T1 site is remote from likely pollution sources, including inlets and known navigation routes. The material in the site is compatible with the native beach sediments in Collier County, as defined by the Florida Administrative Code 63B-41.007 (see Appendix D-5). The Florida Department of Environmental Protection issued a permit for this project, based in part by a favorable decision on the borrow area's compatibility with the beach.

3.1.2 PHYSICAL OCEANOGRAPHY

Environmental Setting

Borrow Area T1 is located 33 miles offshore of Collier County, FL (Figure 1) and lies within MMS's jurisdiction. The borrow area contains approximately 4.7 million cubic yards of sand. The initial nourishment operation (Phases I & II) will require 673,000 cubic yards of sand. Subsequent renourishment operations will utilize the remaining material in the borrow area as needed, within the life of the permit and lease.

Physical aspects that could effect the local oceanographic environment include weather, waves, currents, and associated sedimentation. Sea conditions are generally calm in the Gulf of Mexico, except when storms associated with winter

cold fronts and hurricanes occur. Even during storms, the gulf currents are minor contributors to the local system when compared to wave action. The borrow area is the tip of a large sand ridge (Figure 1). Considering the small size of the borrow area in comparison to the surrounding geology, dredging Borrow Area T1 is not expected to have any significant effect on local currents or sedimentation. A wave refraction analysis for Borrow Area T1 is described below with the detailed analysis included in Appendix C.

The inner shelf (location of borrow T1) is where divergent surface and bottom frictional boundary layers play a major role in the circulation, whereas the mid and outer shelf (seaward of the shelf break) is an area that experiences strong interactions with the outer ocean loops. Hsueh and Weisberg (2002) investigated circulation on the continental shelf of the Northeastern Gulf of Mexico (Florida West and Panhandle Coast), including the T1 area, using two circulation models, the Princeton Ocean Model (POM) and the Geophysical Fluid Dynamics Laboratory Model (GFDL).

Continental shelf circulation results from both local and offshore forcings. In the west coast of Florida inner shelf, local forcings (tides and surface winds) are of primary importance because the shelf is wide enough for its inner shelf component to be well distinguished from the shelf break and outer shelf. Other factors affecting circulation in this area, to a lesser degree, include interactions with the Gulf of Mexico loop current that dominates the outer shelf. According to field measurements and modeling (Gelfenbaum and Brooks, 2003) inner shelf currents in the borrow area T1 region are predominantly driven by local wind and tidal forcings. These currents vary in intensity seasonally and have greater velocities in the surface (e.g. up to 0.4 m/s) and lower velocities in bottom layers (e.g. 0.01 to 0.05 m/s or less in 40 ft water depth). For comparison means, longshore bottom currents in shallow coastal waters (5 ft deep) offshore Anna Maria Island, for example, were measured at 0.4 m/s by Gelfeubaum and Brooks, 2003. Monthly mean currents at the T1 shelf area suggests a seasonal cycle with alongshore flows to the southeast in spring and to the northwest in late summer to early autumn.

Because inner shelf currents are large scale oceanographic phenomena that respond to equally large scale barometric gradients (that generate surface winds), and by astronomical tidal forcing, it is unlikely that localized, relatively small disturbances (e.g. dredging of borrow area T1) will have any significant effect in the current field of the area.

Currents from storm waves are comparable to the currents discussed above. A buoy approximately 90 miles east of Naples, Florida measured water column velocities during the passage of Hurricane Charley. The hurricane passed approximately 40 miles offshore. The NDBC buoy (Station 42023) data and an ocean current stick plot for the period August 11 to August 14 brackets the landfall time for Hurricane Charley on August 13. The velocities before and after

the hurricane passage are in the range of 0 and 20 cm/sec between the water surface and a depth of 42 meters. Velocities increased to the range of 20 cm/sec to 40 cm/sec during Hurricane Charley's passage. A few measurements were noted at the deepest depth greater than 40 cm/sec, but these may be bottom effects of the measurement method. The velocity information is shown in Appendix C. The peak depth average current velocity was approximately one foot per second at 1600 GMT on August 13.

To quantify the potential impacts of dredging Borrow Area T1, Coastal Planning & Engineering, Inc. conducted a wave refraction analysis (Appendix C) of the borrow area for three scenarios: 1) existing conditions; 2) fully excavated; and, 3) excavating Cuts 1-7 and Cut 9. Maximum potential impacts were assessed by comparing scenarios 1 and 2. Also, infilling of the borrow area was not factored in the analysis. Thus, the results of this study represent the upper limits of dredging impacts.

Project Impacts

Storm waves are the governing factor in considering short term levels of elevated circulation in the Gulf of Mexico. Therefore, effects of dredging Borrow Area T1 were modeled for changes in wave patterns and transformation to the nearshore. The methodology and findings of the wave transformation analysis are provided in Appendix C.

In summary, dredging of Borrow Area T1 is not expected to change the beach erosion patterns along Lee County or Collier County, Florida. Measurable changes to the wave patterns near excavated Borrow Area T1 may occur during storms. However, due to large distances between the borrow area and the shorelines of Lee and Collier counties, changes to the nearshore waves will not occur during either storms or average conditions. Accordingly, there will be no significant changes to the long-term and storm erosion patterns along Lee and Collier counties following excavation of Borrow Area T1.

Based on this analysis, dredging Borrow Area T1 will not result in any significant adverse impacts on waves or shoreline erosion patterns.

3.1.3 WATER QUALITY

Environmental Setting

The extensive concentrations of non-point source pollutants carried by riverine and other discharges have had a tremendously negative impact upon the water quality of the Gulf of Mexico. Urban and agricultural discharge into the Gulf contribute high concentrations of nutrients, pesticides, and fecal coliform bacteria; waste and runoff from 75% of U.S. farms and 80% of U.S. cropland are discharged into the Gulf of Mexico via the Mississippi River system (MMS,

1998). The degradation of water quality in the Gulf is evident not only along the coast but offshore as well. Large areas called “dead zones”, named for the lack of fish, shrimp, and crabs found, show extensive hypoxic conditions (Craig et al., 2001). Freshwater discharge and nutrient fluxes appear to influence the distribution and intensity of the hypoxia, as well as water column stratification and mixing (Rabalais et al., 1991). Bottom water hypoxia promotes a decrease in biodiversity, alters marine food webs, leads to the loss of habitats, and results in dermersal species mortality (Craig et al., 2001; Rabalais et al., 2002).

Hypoxic conditions within the Gulf of Mexico are the direct result of nitrification. Nutrient loadings, especially nitrogen loadings associated with eutrophication of coastal marine systems, are transported via atmospheric, surface flow, and ground-water pathways. Nitrogen (N) is a naturally occurring element essential to the propagation of crops and plants. Nitrate-nitrogen is continually supplied to streams and rivers through mineralization of soil organic matter, particularly where tile drainage has exposed formerly wet soils to oxidation and through the application of fertilizer and animal manures to cropland (Turner and Rabalais, 1991). It has been estimated that fertilizer and mineralization contribute about 13 million metric tons per year of nitrogen to the Mississippi River Basin (Goolsby et al., 1999). Agro-industrial wastes, atmospheric deposition of volatilized ammonia from manure and fertilizer, and dinitrogen fixation are other important sources (Jackson et al., 1973; Logan et al., 1994). Nitrogen concentrations entering the Gulf of Mexico are estimated to have increased three-fold since the 1950s (Rabalais, 2002a).

The rapid population growth of Florida’s southwest coast, specifically in the Naples area, is a suspected contributor to the environmental degradation of water quality within the Gulf of Mexico. Urban and suburban areas have significant runoff from lawns, parking lots, rooftops, roads, and highways. It was estimated that Collier County will increase its population by 50% between 1994 and 2015 (NPA Data Services, Inc., 1995). Even so, these concentrations and fluxes of nutrients, specifically nitrogen and phosphorus, are generally low compared to non-point agricultural sources (Goolsby et al., 1999).

In addition to non-point source pollutants, the Gulf of Mexico is inundated with a variety of point-source discharges. The major point sources of direct discharges of nutrients, particularly nitrate-nitrogen, appear to be domestic wastewater treatment plants (Goolsby et al., 1999). Conventional wastewater effluent, through secondary treatment, involves the removal of suspended materials, pathogens, and oxygen-demanding organics. As a result, organic matter is converted into inorganic forms, including ammonia-nitrogen, nitrate-nitrogen, and ortho-phosphates. Overall, domestic wastewater treatment is phosphorus-rich, with a much lower N:P ratio than agricultural runoff (Baker, 1992). Other point-source contaminants within the Gulf of Mexico are generated from petroleum refineries and petrochemical plants. The U.S. Gulf coast petrochemical industry,

the largest in the United States, includes offshore and onshore development, petroleum transport, and refining of petroleum products (MMS, 1998).

Project Impacts

In general, dredging temporarily suspends sediments and increases turbidity within the immediate vicinity of the operation. Turbidity within the water column undergoes dispersion through plumes that drift passively with the moving currents. The extent of this dispersion depends on a variety of factors: sediment composition, sediment transport processes, the type of dredging equipment (hopper or cutterhead suction dredge), amount of dredging, thickness of the dredged layer, etc. Suspended, non-nutritive particles interfere with the respiratory and food gathering processes of filter feeding invertebrates. Direct effects include mortality and reduced energy efficiency, while indirect effects include a reduction in reproduction success and a decreased ability to avoid predation (Sherk, 1971). Also, marine vegetation (e.g., macroalgae and seagrasses) may experience a deterioration of photosynthetic activity through decreased light penetration and altered light wavelength proportions.

In addition, a suspension-dispersion disturbance of the benthic sediments may cause changes in the sediment and water characteristics as nutrients and other substances are released from the substratum. Dredging operations have been known to produce visible turbidity plumes containing an organic matrix of fats, lipids, and carbohydrates from fragmented organisms (Limited, 1998). Also, the possibility of a temporary increase in biological oxygen demand (BOD) exists through the resuspension of buried materials. BOD is the quantity of dissolved oxygen used in the biochemical oxidation of organic matter in a specific time, at a specified time, at a specified temperature, and under specified conditions. BOD provides a somewhat standard measure of how much oxygen will be required to degrade a waste, and therefore it can be used to predict the effect waste may have on fish or other aquatic organisms that require oxygen to live. Dredging may produce localized hypoxia, or anoxia, pockets in the water column due to the oxygen consumption of organics in the suspended sediments (LaSalle et al., 1991), although these conditions have not been observed in open water body projects such as the Collier County Beach Renourishment Project.

The construction method of the project could involve the use of a hopper dredge, a cutterhead suction dredge, or a combination thereof. Hopper dredges trigger a small plume at the seabed from the draghead ("benthic plume") and a larger surface plume from the discharge of overspill of water with suspended sediment from the hopper (Taylor, 1990; LaSalle et al., 1991). The overspill occurs during "economic loading" of the hopper with consolidated sediment. Economic loading entails pumping dredged material into the hopper until all the material overflows (Herbich, 1992). On the other hand, cutterhead suction dredges generate turbidity by the rotating action of the cutterhead and the swinging action of the ladder (Herbich and Brahme, 1991; Herbich, 1992). Sediment discharges from the

dredge platform itself, however, are typically limited to periods of maintenance or emergencies and are therefore comparatively short in duration, and low in volume of discharged sediment (U.S. Department of the Interior, Minerals Management Service, 1999). Maximum suspended sediment concentrations typically occur 3 m above the cutterhead and decline exponentially to the sea surface (LaSalle et al., 1991).

Whether hopper dredging or cutterhead suction dredging is ultimately utilized for sand mining at the T1 Borrow Area, the amount of sediment resuspension that will result from these excavations are not anticipated to be of a scale that causes significant short or long term negative impacts to the benthic community. Turbidity and associated water quality parameters at the borrow areas and placement sites will rapidly return to preconstruction levels with no lingering adverse impacts (Naqvi and Pullen, 1982). Overall, turbidity effects are less influential in the unprotected offshore areas of the Gulf of Mexico. The open Gulf waters provide oceanographic conditions that are more physically dynamic, which minimize the settling effects of disturbance. Offshore sand tends to have a coarser grain size, with less clay and silt content than inshore areas. Offshore organisms are adapted to sediment transport processes, which under normal conditions create scouring, turbidity, and sedimentation. Physical disturbance of the bottom and resulting biological impacts from dredging are similar to those of storms, but at a much smaller scale (Herbich, 1992). Based on study results, as well as a general review of dredging operations across the country (LaSalle, 1986), it is reasonable to conclude that dredging related to the Collier County Renourishment Project will not produce significant adverse impacts on water quality.

Mitigation Measures

A borrow area infaunal monitoring plan will be implemented to determine pre-construction conditions of the benthic communities. The State of Florida Department of Environmental Protection (FDEP) and/or the U.S. Army Corps of Engineers project permits contain specific water quality monitoring requirements that will be fulfilled during project construction. The State of Florida water quality standards for beach renourishment activities require project construction activity cessation or modification in the event that compliance water quality monitoring documents turbidity levels that exceed 29 Nephelometric Turbidity Units (NTU) above background. The proposed monitoring plan and control measures are outlined in Appendix D. A copy of the FDEP Joint Coastal Permit is included in Appendix D, which summarizes required monitoring requirements. Generally, the FDEP monitoring requirements are adopted by the Corps of Engineers in their permit. The permit required plans in Appendix D are undergoing final review by the FDEP.

3.1.4 AIR QUALITY

Environmental Setting

Air pollutants are classified as either primary or secondary depending on how they are formed. Primary pollutants are generated daily and emitted directly from a source into the atmosphere. Primary pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), nitric oxide (NO), sulfur dioxide (SO_2), particulates (PM-10 and PM-2.5), and hydrocarbons (HC). Hydrocarbons are also known as volatile organic compounds (VOC).

Secondary pollutants are created over time as a result of chemical and photochemical reactions in the atmosphere. Ozone (O_3) is a secondary pollutant, formed when NO_x reacts with HC in the presence of sunlight.

The U.S. Environmental Protection Agency (EPA) has established national ambient air quality standards for six "criteria air pollutants". The State of Florida has adopted the same six criteria pollutants and related standards. The ambient air quality standards for criteria pollutants are shown in Table 3. The Southwest Florida Intrastate Air Quality Control Region, which includes Collier County, is classified as a Federal attainment area (an area designated by EPA as having attained the relevant national ambient air quality standard for a given pollutant).

The project is exempt from the Clean Air Act conformity requirements because it is located in a Federal attainment area. The State of Florida does not regulate emissions from off-road equipment or marine vessels (Personal communications with FDEP, April 2004).

Table 3
Ambient Air Quality Standards

Air Pollutant	National Standard	
	Primary	Secondary
Ozone (O_3)	0.12 ppm, 1-hr. average	0.12 ppm, 1-hr average
Carbon Monoxide (CO)	9.0 ppm, 8-hr. average 35 ppm, 1-hr. average	
Nitrogen Dioxide (NO_2)	0.053 ppm, AAM	0.053 ppm, AAM
Sulfur Dioxide (SO_2)	0.03 ppm, AAM 0.14 ppm, 24-hr. average	0.50 ppm, 3-hr. average
Suspended Particulate Matter (PM10)	150 µg/m^3, 24-hr. average 50 µgg/m^3 AAM	150 µg/m^3, 24-hr. average 50 µg/m^3 AAM
Lead (Pb)	1.5 µg/m^3, calendar quarter	1.5 µg/m^3

Source: EPA Office of Air Quality Planning and Standards
Notes:
ppm = parts per million by volume
AAM = annual arithmetic mean
µg/m^3 = micrograms per cubic meter

Project Impacts

Construction activity will generate air pollutants from the operation of the dredge pumps, pump-out equipment, tug boats, and transport boats. In addition, air emissions will result from heavy equipment used for beach grading, moving pipe, and other construction related activities. Project construction is estimated to take approximately 150 days using a hopper dredge. It will take less time with a cutterhead dredge and scows, but total fuel usage will be comparable to the hopper dredge.

Construction activity equipment emissions were estimated by combining approximate fuel consumption, by equipment type, and the emission factors developed by EPA. The construction method with the maximum emissions was used in calculating fuel consumption. This method involves the use of a hydraulic dredge and scows to transport the sand to the beach. A maximum daily fuel usage was assumed during construction. The emission calculation details are provided in Appendix E.

Since the project is in a federal attainment area for all criteria pollutants, there are no specific emission thresholds applicable to the proposed project. However, for the purpose of determining NEPA significance, EPA maintenance area thresholds are compared to the estimated maximum project emissions in Table 4.

Table 4
Emission Thresholds of Significance[1]

Pollutant	General Conformity *de minimis* Thresholds[(1)] (Tons)	Estimated Project Emissions (Tons)
Carbon Monoxide (CO)	100	115.1
Sulfur Oxides (SO_x)	100	34.9
Nitrogen Oxides (NO_x)	100	529.7
Particulate Matter (PM-10)	100	37.1
Volatile Organic Compounds (VOC)	100	43.2

[(1)]EPA maintenance area emission thresholds (40 CFR Part 93, Subpart B) are used for comparison purposes in evaluating NEPA significance.

Project emissions would come from short-term construction activities, as opposed to long-term operational activities. In comparing project emissions with maintenance area thresholds, project emissions would be below the de minimus limits for all criteria pollutants, except NO_x and CO. It is estimated that between 76 and 88 percent of the total NO_x and CO emitted would be with the offshore hopper dredge operation between the borrow area and offshore pumpout location. The dredge emissions will sufficiently mix and be diluted before reaching any part of the mainland due to the borrow area being located 33 miles offshore of the project area. Pumpout will occur approximately ½ mile offshore. Thus, pollutant concentration impacts are not expected to be large enough to contribute to any exceedance of the ambient air quality standards for the region.

For these reasons, the project will not result in a significant adverse impact on air quality.

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 THREATENED AND ENDANGERED SPECIES

Environmental Setting

Federally listed species that have the potential to occur in the proposed project area include: the West Indian manatee (*Trichechus manatus*); the Gulf Sturgeon (*Acipenser oxyrhynchus desotoi*); the smalltooth sawfish (*Pristis pectinata*); five species of sea turtles - the loggerhead (*Caretta caretta*), the green (*Chelonia mydas*), the leatherback (*Dermochelys coriacea*), the hawksbill (*Eretmochelys imbricata*), and the Kemp's ridley (*Lepidochelys kempii*); three avian species- the piping plover (*Charadrius melodus*), the least tern (*Sterna antillarum*), and the roseate tern (*Sterna dougallii*); and four species of whale - the Northern right (*Eubalaena glacialis*), the fin (*Balaenoptera physalus*), the sperm (*Physeter catodon*), and the humpback (*Megaptera novaeangliae*).

Species Not Likely To Be Affected

<u>Piping Plover</u>

Piping plovers (*Charadrius melodus*) are small, migratory shorebirds that breed in only three geographic regions of North America: on sandy beaches along the Atlantic Ocean, on sandy shorelines throughout the Great Lakes region, and on the river-bank systems and prairie wetlands of the Northern Great Plains (Haig, 1992). The Great Lakes population is listed as *endangered*, whereas the Atlantic Coast and Great Plains populations are listed as *threatened* according to the Endangered Species Act (U.S. Fish and Wildlife Service, 1985). Though this species does not breed in Florida, individuals from all three breeding populations over-winter in Florida. Although historical wintering sites are not well described, piping plovers have been generally seen along Gulf of Mexico beaches, southern

U.S. Atlantic beaches from North Carolina to Florida, in eastern Mexico, and numerous islands scattered throughout the Caribbean (Nicholls and Baldassarre, 1990). The complete winter distribution of the piping plover remains to be determined, although specific Gulf and Atlantic coastal sites are becoming better recognized for their importance to wintering birds (Haig and Oring, 1985, 1987; Nicholls and Baldassarre, 1990; Sprandel *et al.*, 1997; Smith, pers. obs., 2003). Some birds, however, may winter beyond North America. Nicholls (1989) documented small numbers of birds in the Bahamas, Bermuda, Puerto Rico, Virgin Islands, and Yucatan between 1985 and 1988. The limited number of piping plovers observed along the Gulf coast may indicate that a substantial number of the birds use wintering sites outside the United States.

At specific sites along the Gulf of Mexico coastline, such as northern Lee County barrier islands and Collier County, piping plover over-wintering habitat includes beaches, mudflats, and sandflats, as well as barrier island beaches and spoil islands (Haig, 1992). These birds may also be seen on ocean beaches and sand or algal flats in protected bays (Wilkinson and Spinks, 1994). Nicholls and Baldassarre (1990) surmise that environmental heterogeneity may be an important factor in winter piping plover distribution. For example, on the Gulf Coast, preferred foraging areas were associated with wider beaches, mudflats, and small inlets.

Piping plovers begin to arrive at the wintering grounds of Lee County in mid-July and stay until May. In response to the declining nature of the population, the U.S. Fish and Wildlife Service, established critical habitat regions for the wintering piping plovers in August 2001. One such habitat is Unit FL-23, which includes North Captiva Island. This unit spans approximately 36 ha (88 ac) within Lee County, and includes the western shoreline extending from 0.80 km (0.50 mi) south of Captiva Pass to Foster Pass. Another such habitat is Unit FL-25, which covers Bunche Beach. This unit spans approximately 187 ha (461 ac) within Lee County, and includes the area of the Cayo Costa Florida Conservation and Recreation Lands (CARL) that lies along San Carlos Bay and extends east from the Sanibel Causeway past the end of John Morris Road. Neither Unit FL-23 or Unit FL-25 are within the area of the Collier County Beach Renourishment Project. Unit FL-24 was a proposed critical over-wintering habitat for piping plovers covering Captiva Island and Sanibel Island, however due to the lack of use by piping plovers in this specific area, the unit has been deleted from the finalized Federal Register (U.S. Fish and Wildlife Service, 2001). In the Collier County project area, there is no federally designated piping plover critical habitat, and no piping plovers have been observed in the last fourteen years (Collier County Audubon Society, 2003; Doug Suitor, pers. comm., 2003). In a recent report on Coastal Waterbird Beach Utilization in Naples, FL by Theodore Below, piping plovers have been identified as visitors to Collier County in fall, winter, and spring, but their numbers are too low to be analyzed.

Least Tern

Least terns (*Sterna antillarum*) are small, black-capped shorebirds that select nesting sites with a substrate of sand or gravel with fragments of shell. Least Terns are protected under the Migratory Bird Treaty Act (MBTA, 1918). Least Terns nest primarily along the coast in Florida, where beaches and roofs provide nest sites and nearby estuarine and marine waters supply small fish as prey. Least Tern nesting colonies are variable and may range in numbers from a few nests, to several hundred. The number of nests and their density is governed by many factors, including past reproductive success of the colony, availability of food, and disturbance. Least Terns usually return to the same nesting site each year, unless the colony has consistently failed to fledge young (Morris, 1996).

Along Captiva and Sanibel Islands in Lee County, nesting for least terns occurs from mid-April until September. In 2002, the Sanibel-Captiva Conservation Foundation reported 50 pairs of least terns within the Bowman's Beach area on Sanibel Island. Nesting populations of least terns were not reported on Captiva Island or northern Sanibel (SCCF, Brad Smith, 2003). In the Collier County project area, there have been no least terns observed in the last 20 years (Collier County Audubon Society, 2003; Doug Suitor, pers. comm., 2003). In a recent report on Coastal Waterbird Beach Utilization in Naples, FL by Theodore Below, least terns have been identified as common during spring and summer and breed in Collier County, but do not nest on Naples Beach due to a lack of isolated suitable sand habitat.

Roseate Tern

Roseate terns (*Sterna dougallii*) have a white body and black head cap with bright orange-red legs and feet that are easy to distinguish. They are known to nest in colonies on sand/gravel beaches or pebbly/rocky offshore islands along the Atlantic coast from Nova Scotia south to Long Island, New York, and on the southern tip of Florida. Roseates that nest in the northeastern United States appear to winter primarily in the waters off Trinidad and northern South America from the Pacific coast of Columbia to eastern Brazil. Currently, about 6,000-6,500 Roseate Terns breed in an area from the south shore of Long Island, New York, north to Nova Scotia, Canada (Nisbet and Spendelow, 1999). The Northeast U.S. breeding population was declared *endangered* by the U.S. Fish and Wildlife Service in December 1987; the Caribbean breeding population, which includes the birds nesting in Florida, was declared *threatened* (U.S. Fish and Wildlife Service, 1998). There is an unequal sex-ratio in the Northeast U.S. breeding population with more females than males, but the causes of this unequal sex-ratio and its effects on overall reproductive success are not fully understood (Whittam and Leonard, 1999).

Roseate terns have a confirmed occurrence status in Monroe County from a documented record in the Florida National Areas Inventory (FNAI) database.

Even so, Roseates have been given a FNAI state rank of S1, which relates to five or fewer occurrences or less than 1000 individuals in the State of Florida (FNAI, 2004). In Collier County, Roseate terns are considered occasional spring-time visitors, with no consistency in annual occurrence (Collier County Audubon Society, 2003; Doug Suitor, pers. comm., 2003). In a recent report on Coastal Waterbird Beach Utilization in Naples, FL by Theodore Below, roseate terns were not identified in Collier County.

Smalltooth Sawfish

Smalltooth sawfish (*Pristis pectinata*) are large, shark-like fish that are one of several living species in the sawfish family. On April 1, 2003 the U.S. National Marine Fisheries Service placed the smalltooth sawfish on the Endangered Species List, making it the first marine fish species to receive protection under the Endangered Species Act (NMFS, 2003). They get their name from the long, flattened "saw", rimmed by dozens of teeth, that protrudes anterior from its head. A sawfish uses its saw to stir up muddy or sandy bottoms to find and injure prey. Smalltooth sawfish may grow to more than 18 ft long and may live more than 20 years (Poulakis and Seitz, 2004). Within the western Atlantic, they have historically ranged from New York to Brazil, including the Gulf of Mexico and Caribbean Sea. Smalltooth sawfish primarily occur in estuarine and coastal habitats such as bays, lagoons, and rivers. Currently, their distribution has extended to peninsular Florida and, within that area, they can only be found with any regularity off the extreme southern portion of the state. The current distribution is centered in the Everglades National Park, including Florida Bay. They have been historically caught as bycatch in commercial and recreational fisheries throughout their range; however, such bycatch is now rare due to population declines and population extirpations (Poulakis and Seitz, 2004). Between 1990 and 1999, only four documented takes of smalltooth sawfish occurred in shrimp trawls in Florida (Simpendorfer, 2001). There has never been a reported take of a smalltooth sawfish by a dredge, and such take is unlikely to occur because of smalltooth sawfishes' affinity for shallow, estuarine systems. Only dredging of Key West estuarine channels would have the potential to impact the primary habitat area of smalltooth sawfish. In the Collier County project area, smalltooth sawfish are rare and the likelihood of their impact is very low.

Gulf Sturgeon

The USFWS and the Gulf States Marine Fisheries Commission (1995) listed the Gulf sturgeon (*Acipenser oxyrinchus desotoi*), also known as the Gulf of Mexico sturgeon, as a threatened species throughout its entire range on September 30, 1991 (56 CFR 49653). It is a large, cylindrical fish with five rows of embedded bony plates. A V-shaped snout is extended with four fleshy chin barbells and a suction type mouth located beneath the head. Fins are light tan to cream in color and the upper lobe of the tail is longer than the lower lobe. Mature adults range from 1.8 to 2.4 m in length and average around 136 kg in mass; females are

slightly larger than males (Huff, 1975). The present range of the Gulf sturgeon extends from Lake Pontchartrain and Pearl River system in Louisiana and Mississippi to the Suwannee River in Florida. Sporadic occurrences have been recorded as far west as the Rio Grande River between Texas and Mexico, and as far east and south as Florida Bay (Wooley and Crateau, 1985).

The Gulf sturgeon is classified as an anadromous fish; adults spawn in freshwater then migrate to feed and grow in estuarine/marine habitats. After spawning in the upper river reaches, both adult and subadult Gulf sturgeon migrate from the estuaries and bays of the Gulf of Mexico to the coastal inland rivers during early spring (i.e., March through May), when river water temperatures range from 16 to 23°C (Odenkirk, 1989). Downstream migration from rivers into the Gulf of Mexico's estuaries begins in September (at water temperatures around 23°C) and continues through November (Foster and Clugston, 1997).

Gulf sturgeon critical habitat includes areas within the major river systems that support the seven currently reproducing subpopulations (USFWS et al., 1995; Wakeford, 2001) and associated estuarine and marine habitats. Gulf sturgeon utilize rivers for spawning, larval and juvenile feeding, adult resting, and staging, and to move between the areas that support these components. Estuaries and bays adjacent to the riverine units protect unobstructed passageways of sturgeon from feeding areas to spawning grounds.

On June 6, 2002, the USFWS and NMFS designated fourteen geographic areas (units) as Gulf sturgeon critical habitats along the coasts of Florida, Alabama, Mississippi, and Louisiana encompassing approximately 2,544 km of rivers and tributaries and 6,042 km^2 of estuarine and marine habitats:

Unit 1 = Pearl and Bogue Chitto Rivers in Louisiana and Mississippi
Unit 2 = Pascagoula, Leaf, Bowie, Big Black Creek and Chickasawhay Rivers in Mississippi
Unit 3 = Escambia, Conecuh, and Sepulga Rivers in Alabama and Florida
Unit 4 = Yellow, Blackwater, and Shoal Rivers in Alabama and Florida
Unit 5 = Choctawhatchee and Pea Rivers in Florida and Alabama
Unit 6 = Apalachicola and Brothers Rivers in Florida
Unit 7 = Suwannee and Withlacoochee River in Florida
Unit 8 = Lake Pontchartrain (east of causeway), Lake Catherine, Little Lake, the Rigolets, Lake Borgne, Pascagoula Bay and Mississippi Sound systems in Louisiana and Mississippi, and sections of the state waters within the Gulf of Mexico
Unit 9 = Pensacola Bay system in Florida
Unit 10 = Santa Rosa Sound in Florida
Unit 11 = Nearshore Gulf of Mexico in Florida
Unit 12 = Choctawhatchee Bay system in Florida
Unit 13 = Apalachicola Bay system in Florida, and
Unit 14 = Suwannee Sound in Florida

Currently, Gulf sturgeon occur in their historic range from the Mississippi River to Charlotte Harbor, Florida, but are becoming quite rare. Dams have been a major factor in the decline of the Gulf sturgeon by preventing the use of upstream areas for spawning. The Gulf sturgeon can not pass through dam and lock systems effectively. Dredging, removal of snags and rocks, and spoil deposition associated with channelization further threaten the species as a whole (Hoehn, 1998). However, in the Collier County project area, Gulf sturgeon are rare and the likelihood of their impact is very low.

Leatherback Sea Turtle

Leatherback sea turtles (*Dermochelys coriacea*), listed as an endangered species on June 2, 1970 (35 FR 8491), are generally distributed circumglobally from the Caribbean region to as far north as Norway and Iceland (Ernst et al., 1994). This species has been known to migrate into deep, pelagic, offshore waters more than any other sea turtle species (Bleakney, 1965; Lazell, 1980; Shoop and Kenney, 1992). Leatherbacks predominantly feed upon gelantinous zooplankton such as salps and jellyfish, however, in the North Atlantic Ocean the primary prey item is the lion's-mane jellyfish (Lazell, 1980; Bjorndal, 1997). Feeding usually takes place throughout the water column from the surface to depths as far as 1,200 m (Eisenberg and Frazier, 1983; Davenport, 1988). Nesting occurs regularly in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida (NMFS, 1992). Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands. Leatherbacks nest an average of five to seven times within a nesting season, with females remaining in the general vicinity of the nesting habitat for up to four months (Eckert et al., 1989; Keinath and Musick, 1993). Clutch size has an estimated average of 100 eggs. Recent projections of global leatherback nesting populations estimate 26,000 to 43,000 nesting females annually (Spotila et al., 1996). In the United States, small nesting populations are restricted to the east coast of Florida (35 females/year), Puerto Rico (30 to 90 females/year), and Sandy Point, U.S. Virgin Islands (50 to 100 females/year).

Leatherbacks are most commonly associated with the offshore waters of the Gulf of Mexico, occurring in waters beyond the 50 m isobath. They utilize these deep waters for feeding, resting, and as migratory corridors (Landry and Costa, 1999; Davis et al., 2000). Leatherback nesting, with the exception of one false crawl on Sanibel Island, has been documented without any consistency in either Collier or Lee Counties (LeBuff, 1990). In the Collier County project area, there are no expected adverse impacts to leatherback sea turtles.

Hawksbill Sea Turtle

The hawksbill sea turtle (*Eretmochelys imbricata*), listed as endangered on June 2, 1970, is one of the smallest sea turtles of the Gulf of Mexico weighing only 95-

165 lb (43-75 kg) as an adult and ranging in size from approximately 62.5 to 94.0 cm straight carapace length. Hawksbills have a hawk-like beak (from which their name originates), posteriorly overlapping carapace scutes, and two pairs of claws on their flippers (NMFS and USFWS, 1993; Bass, 1994). Hawksbills are found worldwide in tropical and subtropical seas where they inhabit shallow coastal areas, lagoons, and coral reefs. Being omnivores, hawksbills feed primarily on sponges, benthic crustaceans, tunicates, bryozoans, algae, and mollusks (Bjorndal, 1997). Smaller populations of foraging hawksbills reside along the hardbottom habitats of the Florida Keys and other small islands in Puerto Rico and the U.S. Virgin Islands (NMFS and USFWS, 1993). Hawksbills prefer to nest alone or in small groups on isolated beaches. The nesting season is the longest of all the sea turtles, with reported nesting starting as early as June and as late as October (Meylan et al., 1995). Hawksbill females nest an average of two to five times per season and have an estimated clutch size of 140 to 180 eggs. Hawksbill nesting within the continental U.S. is extremely rare, with areas restricted to south Florida beaches and the Florida Keys (Crouse, 1999).

Although they are common inhabitants of the shallow nearshore waters off of southern Florida, hawksbill sea turtles sighted in the Gulf of Mexico are almost always juveniles that have originated from nesting beaches in Mexico (Landry and Costa, 1999). In addition, no hawksbill sea turtles have ever been documented as nesting in Collier County (Collier County, 2003). In the Collier County project area, there are no expected adverse impacts to hawksbill sea turtles.

Kemp's Ridley Sea Turtle

The Kemp's ridley (*Lepidochelys kempii*) sea turtle was listed as endangered on December 2, 1970, and internationally, the Kemp's ridley is considered the most endangered sea turtle (USFWS and NMFS, 1992; TEWG, 2000). The smallest living sea turtle, the Kemp's ridley has a straight carapace length around 65 cm, with the adult's shell almost as wide as they are long. The dorsal carapace is round to heart-shaped and distinctly light gray. Adults of this species are usually confined to the Gulf of Mexico, although adult-sized individuals sometimes are found on the east coast of the United States (USFWS and NMFS, 1992).

Benthic immature Kemp's ridleys have been found along the east coast seaboard of the United States and in the Gulf of Mexico. Habitats frequently utilized by Kemp's ridleys in the continental U.S. include warm-temperate to subtropical sounds, bays, estuaries, tidal passes, shipping channels, and nearshore waters. These ecosystems coincide with where the turtle's preferred food source, the blue crab (*Callinectes* sapidus), is known to exist (Landry and Costa, 1999). The movements of Kemp's ridleys within and among developmental habitats have been documented along both the Atlantic and Gulf coasts (Henwood, 1987; Gitschlag, 1996). In the Atlantic, benthic immature turtles travel northward as the water warms to feed in the productive, coastal offshore waters (Georgia through

New England), migrating southward with the onset of winter (Lutcavage and Musick, 1985; Henwood and Ogren 1987; Ogren, 1989). In the Gulf, studies suggest that benthic immature Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud, 1995). The western coast of Florida (specifically the Cedar Keys area), the eastern coast of Alabama, and the mouth of the Mississippi River are identified as important developmental regions for the Kemp's ridley (USFWS and NMFS, 1992). Nearly all Kemp's ridley's occurring in the Gulf of Mexico originated from nesting beaches along the western Gulf (Renaud, 1995). Studies have shown the post-hatchling pelagic stage varies from 1-4 or more years, and the benthic immature stage lasts 7-9 years (Renaud, 1995). The TEWG (1998) estimates age to maturity between 7-15 years.

Females return to their nesting beach about every two years. The mean clutch size for Kemp's ridleys is approximately 100 eggs per nest, with an average of 2.5 nests per female within a season. Nesting occurs from April into July and is essentially limited to the beaches of the western Gulf of Mexico, near Rancho Nuevo in southern Tamaulipas, Mexico (TEWG, 1998). In addition, no Kemp's ridley sea turtles have ever been documented as nesting in Collier County (Collier County, 2003). In the Collier County project area, there are no expected adverse impacts to Kemp's ridley sea turtles.

Sea turtle nesting in the Collier County area is summarized in the 2004 annual County report contained in Appendix H.

Northern Right Whale

The northern right whale (*Eubalaena glacialis*), protected internationally since 1935, is considered the world's most periled large whale species and is classified as endangered under the Endangered Species Act of 1973 (IWC, 2001c) Northern right whales grow up to 17 meters in length and are mostly black with some white patches on their bellies. They have large heads (about one-fourth of their total length) with strongly arched jaws and wide, robust bodies. Their spouts are "V"-shaped and they are lacking a dorsal fin. Light-colored, wart-like skin patches, called callosities, can be found on their heads (Jefferson et al., 1993).

Northern right whales have been sighted in the nearshore and continental shelf waters between Florida (eastern Atlantic seaward) and Nova Scotia. Known calving and feeding grounds, areas where bottom topography, water column structure, currents, and tides combine to physically concentrate zooplankton, have been designated as critical habitat under the Endangered Species Act (IWC, 2001c). One such critical habitat includes the coastal waters within about 25 NM along a 90 NM stretch of the Atlantic coast in northeast Florida and Georgia. Since 1900, there have been only two confirmed records of Northern right whales in the Gulf of Mexico: 1) a spring sighting off of Sarasota, Florida, and 2) a winter stranding of a calf along the coast of Texas (Jefferson and Schiro, 1997).

These individuals observed have most likely been inexperienced juveniles straying from the normal range of their stocks. NOAA Fisheries believes there are no resident stocks of these species in the Gulf of Mexico, and these species are not likely to be adversely affected the project area in Collier County.

Fin Whale

Fin whales (*Balaenoptera physalus*), the second-largest whale species, have been under the full protection of the International Whaling Commission (IWC) since 1966 and are classified as endangered under the ESA. The fin whale is long, sleek, and streamlined, with a V-shaped head which is flat on top. A single ridge extends from the blowhole to the tip of the rostrum (upper jaw). There is a series of 50-100 pleats or grooves on the underside of its body extending from under the lower jaw to the navel (Jefferson et al., 1993).

In the North Atlantic, fin whales spend the summer in a broad region between North America and the Arctic, around Greenland, Iceland, Northern Norway, and the Barents Sea. In the winter, they are distributed between the Arctic's ice edge, to the Caribbean, Gulf of Mexico, and British Isles (Gambell, 1985; NMFS, 1998a). There is no stock differentiation information regarding fin whale occurrence or abundance within the Gulf of Mexico. The distribution of unidentified rorquals in the Gulf of Mexico has made it difficult to distinguish individual fin whale sightings. However, available fin whale records have placed all sightings and strandings outside of the Collier project area.

Sperm Whale

Sperm whales (*Physeter catodon*), classified as endangered under the ESA, and are the largest toothed whale species with adult males measuring as much as 18 m in length (Jefferson et al., 1993). The skin is dark brown to dark grey in color and appears to be wrinkly or scarred posterior of the head. The head is over a third of the total body length of the animal, and is well-known for its distinct square shape. Although the triangular tail fluke is broad and powerful, the flippers appear to be short and stubby, and the dorsal fin is a low, rounded hump with a series of bumps on the dorsal ridge of the tailstock (Jefferson et al., 1993).

Sperm whales are found in all of the world's oceans, except for the Arctic region. In U.S. waters, they may be found from California and Hawaii north to the Bering Sea, and from Maine to the Gulf of Mexico. They tend to prefer deep waters and generally remain along the edge of continental shelves in water 3,000-6,000 feet deep or further out to sea. When in open waters, this whale may dive for periods of more than one hour at depths of up to 8,000 feet (Waring et al., 1993; Rice, 1998).

In the Gulf of Mexico, the sperm whale is the most common large whale species with an estimated abundance of 411 individuals (Jefferson and Schiro, 1997;

Davis et al., 2000). Their range is expected to occur between the continental shelf break to the 3,000 m isobath. One area recognized for high densities of sperm whales can be found off of the Mississippi River Delta, between the continental shelf break and approximately the 1,000 m isobath (Biggs et al., 2000; Davis et al., 2000). This area represents a habitat where sperm whales can be predictably found due to their affinity for cyclonic (cold-core) eddies (Biggs et al., 2000). These eddies are hydrodynamic anomies that offer locally enhanced plankton stocks (Wormuth et al., 2000). There have been no reported sightings or strandings of sperm whales within the Collier County project area and the possibility of dredge collisions is remote due to the deepwater nature of this species.

Humpback Whale

Humpback whales (*Megaptera novaeangliae*), classified as endangered under the ESA, and are one of the rorquals, a group of whales that use keratin baleen plates for feeding. The body colorization is black to dark grey, with distinct long, white flippers. The head of a humpback whale is broad and rounded when viewed from above, but slim in profile. The body is not as streamlined as other rorquals, but is quite round, narrowing to a slender peduncle (tail stock). There are between 20-50 grooves that pattern the ventral side and the tail flukes have serrated, concave edges. These patterns can be used to identify individual humpback whales (Jefferson et al., 1993; Clapham and Mead, 1999).

Humpback whales are generally coastal in distribution, and are often observed over, and along the edges of continental shelves and oceanic islands. They feed and breed in coastal waters, wintering over shallow banks in tropical waters (such as the Caribbean and waters off Hawaii). Humpback cows and calves appear to predominate in shallow, generally sheltered waters, while adults may be found in deeper and more exposed waters. Even though humpbacks have been sighted quite close to shore off the western coast of Florida, as well as in waters seaward of the continental shelf break, these reports are most likely of rouge strays that have made their way into the Gulf of Mexico during the breeding season or on their return migration northward (Jefferson and Schiro, 1997). There has never been a report of a humpback whale within the Collier County project area and the possibility of a dredge collision is very unlikely.

Species and Critical Habitat Likely to Be Affected

West Indian Manatee

West Indian manatees (*Trichechus manatus*) are protected in the United States under federal law by the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973. Manatees are rotund, slow-moving aquatic mammals with bodies that taper to a flat, paddle-shaped tail. They have two forelimbs, called flippers, with three to four nails. Their small head has a squarish

snout with fleshy mobile lips, numerous whiskers, and two semi-circular nostrils at the front. The body is gray to brown, and is covered with fine hairs. The manatee's closest land relatives are the elephant and the hyrax, a small, gopher-sized mammal (Jefferson et al., 1993).

West Indian manatees occur in subtropical and tropical waters from the western North Atlantic to the southeastern U.S. Their preferred habitat is restricted to warm freshwater, estuarine, and nearshore coastal waters. Feeding areas are located in coastal and riverine systems, where shallow grass beds are adjacent to deep channels (Lefebvre et al., 2001). Manatees often seek refuge in secluded brackish canals and coastal sloughs for resting, mating, and calving (USFWS, 2001).

In 1976, critical habitat was designated for the manatee's known range in the state of Florida (USFWS, 1976). This critical habitat designation included waterways throughout about one-half of Florida with two types of manatee protection areas: manatee refuges and manatee sanctuaries (USFWS, 2001, 2002a, 2002b). Manatee sanctuaries, federally sanctioned in Citrus, Hillsborough, and Pinellas Counties, are specific zones where all waterborne activities are prohibited. Manatee refuges are areas where certain waterborne activities are regulated. Refuges are located in Brevard, Charlotte, DeSoto, Hillsborough, Lee, and Sarasota Counties (USFWS, 2001, 2002a, 2002b). In Collier County, manatees are common year-round residents with no distinct patterns of abundance. According to the Collier County Manatee Protection Plan, the 1986-1989 survey period yielded a total of 3,207 manatee sightings. Manatees are most likely to be impacted by support boats moving through channels from dock areas to the dredge vessels. Protection measures are outlined in Appendix D, within the FDEP permit, which follow the *Standard Manatee Protection Construction Conditions* published by the U.S. Fish and Wildlife Service. The implementation of these protection measures will minimize the potential for significant impact on manatees by project related activities.

Loggerhead Sea Turtle

The loggerhead sea turtle (*Caretta caretta*), listed as a threatened species on July 28, 1978 (43 FR 82808), inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans, and within the continental United States it nests from Louisiana to Virginia (NMFS and USFWS, 1991b). Adults and sub-adults have a large, reddish-brown carapace. Scales on the top and sides of the head and on top of the flippers are also reddish-brown, but have yellow borders. The neck, shoulders, and limb bases are dull brown on top and medium yellow on the sides and bottom. The plastron is also medium yellow. Adult average size is 92 cm straight carapace length; average weight is 115 kg. The relative size of a loggerhead's head when compared to the rest of its body is substantially larger than other sea turtle species.

The loggerhead is the most abundant sea turtle occurring in U.S. waters, and along the Gulf coast, the turtle's range extends from southern Florida to southern Texas. Aerial survey data has estimated that only 12% of all western North Atlantic loggerheads reside in the eastern Gulf of Mexico, with the majority of this population occurring off the coast of western Florida (TEWG, 1998; Davis et al., 2000). Along the Gulf coast, the predominant age classes for loggerhead sea turtles are juvenile and sub-adult (TEWG, 1998). To reach sexual maturity, these omnivores eat a constant mixed diet of fish, jellyfish, mussels, clams, squid, shrimp, seaweed, and marine grasses. Developmental habitats for immature loggerheads include estuarine lagoons, river mouths, bays, and coastal waters typically within the 100 m isobath (Davis et al., 2000). In particular, estuarine ecosystems represent a vital habitat for juvenile loggerhead sea turtle populations in the eastern Gulf of Mexico (Ogren, 1988). Juveniles may occupy these coastal nursery grounds for up to 20 years, feeding and growing, before their first sexually reproductive migration (Bjorndal et al., 2001). Offshore movements are not uncommon, as well. Associated within close proximity of artificial reefs and oil platforms, juvenile loggerheads are known to venture into the offshore waters of Gulf of Mexico where there is an abundance of prey items and suitable sheltered resting sites (Davis et al., 2000).

Satellite-tag tracking data from pelagic loggerheads verified both offshore and nearshore movements within the Gulf of Mexico (CCC, 2003). In relation to Collier County, most loggerhead tracks occurred within proximity to the nearshore beach. The closest recorded encounter was "Paul", a satellite-tagged male loggerhead that measured 96.0 cm in straight line carapace length. Released on November 15, 1997, off Egmont Key, Paul moved south and was located approximately 25 km offshore of Collier County on March 7, 1998. The turtle exhibited no site fidelity to this offshore Collier location and left those waters within days (CCC, 2003).

Throughout the world, loggerhead sea turtle nesting occurs almost exclusively on warm-temperate beaches rather than in the tropics (TEWG, 2000). Females typically select nesting sites on continental coastlines adjacent to warm-temperate currents, and in South Florida, the demographically independent loggerhead nesting population occurs from 29°N on the east coast to Sarasota on the west coast (Dodd, 1988; TEWG, 2000). Mating takes place in late March-early June, and eggs are laid throughout the summer, with a mean clutch size of 100-126 eggs in the southeastern United States. Individual females nest multiple times during a nesting season, with a mean of 4.1 nests per individual (Murphy and Hopkins 1984). In 2001, Florida Marine Research Institute (2002a, 2002b) reported a loggerhead nest density of 15.5 nests/km for Collier County.

The Collier County Environmental Services Department (ESD), responsible for the creation of the Collier County Sea Turtle Protection Plan, surveys loggerhead nesting within the proposed project area; this includes Delnor-Wiggins Pass State Recreation Area, Vanderbilt Beach, Park Shore, and Naples. The latest report is enclosed in Appendix H. Outside of the project area, survey sites included Barefoot Beach and Marco Island. In 2002, the ESD documented a total of 307 loggerhead nests (mean hatchling success = 66%) along 38.1 km (23.7 miles) of beach, a marked decrease from the 413 nests recorded in 2001. However, in 2003, the number of loggerhead nests on Collier County beaches increased to 504 with a mean hatchling success of 71% (Collier County, 2001; 2002; 2003; 2004).

Delnor-Wiggins Pass State Recreation Area is located between Florida Department of Environmental Protection (DEP) survey control monuments R-17 and R-22, with an approximate beach length of 1.2 miles, and while this segment is within the project area, it is outside the proposed fill zone. In 2002, a total of 15 loggerhead nests were recorded, with an average of 13 nests per mile; while in 2003, a total of 21 loggerhead nests were recorded, with an average of 18 nests per mile. Twenty-two false crawls were documented in 2002 and forty-nine false crawls were recorded in 2003. In 2002, of 1,425 eggs deposited, 302 loggerhead hatchlings emerged; this equates to a mean emergence success of 21%. The mean hatchling success for 2002 was 58%. There was a marked increase in 2003, as 932 loggerhead hatchlings emerged from 1,402 eggs deposited. In 2003, the mean emergence success equaled 66%, while the mean hatchling success was 82% (Collier County, 2002; 2003; 2005).

Vanderbilt Beach is located between FDEP survey control monuments R-22 and R-43, and contains approximately 3.5 miles of coastline of which 2.8 miles of shoreline lies within the proposed project fill zones. In 2002, a total of 90 loggerhead nests were recorded, with an average of 26 nests per mile. In 2003, a total of 159 loggerhead nests were recorded, with an average of 45 nests per mile. One hundred and thirty-one false crawls were documented in 2002, while in 2003, 125 false crawls occurred. In 2002, of 9,276 eggs deposited, 4,401 loggerhead hatchlings emerged, giving a mean emergence success of 47%. The mean hatchling success for 2002 was 51%. In 2003, 9,421 loggerhead hatchlings

emerged from 15,348 deposited eggs. The mean emergence success equaled 61%, while the mean hatchling success was 67% (Collier County, 2002; 2003).

Park Shore is located between FDEP survey control monuments R-43 and R-57, and contains approximately 3.2 miles of coastline of which 2.1 miles of shoreline lies within the proposed project fill zones. In 2002, a total of 81 loggerhead nests were recorded, with an average of 26 nests per mile. In 2003, a total of 122 loggerhead nests were recorded, with an average of 38 nests per mile. Seventy-five false crawls occurred in 2002, while in 2003, 188 false crawls were recorded. In 2002, of 8,899 eggs deposited, 6,326 loggerhead hatchlings emerged; the mean emergence success was 71%. The mean hatchling success in 2002 was 73%. In 2003, 7,589 loggerhead hatchlings emerged from 11,027 deposited eggs. The mean emergence success was 69%, while the mean hatchling success equaled 75% (Collier County, 2002; 2003).

Naples is located between FDEP survey control monuments R-57 and R-89, and contains approximately 5.6 miles of coastline of which 3.7 miles of shoreline lies within the proposed project fill zones. In 2002, a total of 31 loggerhead nests were recorded, with an average of 5 nests per mile. In 2003, a total of 59 loggerhead nests were recorded, with an average of 10 nests per mile. Fifty-four false crawls occurred in 2002, while in 2003, 80 false crawls were documented. In 2002, of 2,638 eggs deposited, 1,948 loggerhead hatchlings emerged, giving a mean emergence success of 74%. The mean hatchling success in 2002 was 76%. In 2003, 3,531 loggerhead hatchlings emerged from 6,094 deposited eggs. The mean emergence success was 58%, while the mean hatchling success was 66% (Collier County, 2002; 2003).

Barefoot Beach contains approximately 3.1 miles of beach and is located north of the project area between FDEP survey control monuments R-1 and R-16. In 2002, a total of 62 loggerhead nests were recorded, with an average of 20 nests per mile. In 2003, a total of 88 loggerhead nests were recorded, with an average of 28 nests per mile. Twenty-eight false crawls were recorded in 2002, while in 2003, 66 false crawls were documented. In 2002, of 6,015 eggs deposited, 4,628 loggerhead hatchlings emerged, giving a mean emergence success of 77%. The mean hatchling success in 2002 was 79%. In 2003, 6,967 loggerhead hatchlings emerged from 8,800 deposited eggs. The mean emergence success was 79%, while the mean hatchling success was 82% (Collier County, 2002; 2003).

Marco Island contains approximately 7.1 miles of coastline located south of the proposed project area. In 2002, a total of 28 loggerhead nests were recorded, with an average of 4 nests per mile. In 2003, a total of 55 loggerhead nests were recorded, with an average of 8 nests per mile. Fifty-four false crawls occurred in 2002, while in 2003, 80 false crawls were recorded. In 2002, of 2,777 eggs deposited, 1,655 loggerhead hatchlings emerged; the mean emergence success was 59%. The mean hatchling success in 2002 was 63%. In 2003, 2,933 loggerhead hatchlings emerged from 5,669 deposited eggs. The mean emergence

success was 52%, while the mean hatchling success equaled 57% (Collier County, 2002; 2003).

Collier County nesting data from the previous two years revealed that there was no loggerhead nesting preference in natural, non-renourished beach areas. In 2002, of the 23.7 miles that totaled the Collier County shoreline, 12.2 miles were natural beaches, while 11.5 miles were renourished. Along natural beaches, 146 loggerhead nests were recorded, resulting in a 12 nests/mile ratio. One hundred eighty-one false crawls occurred and the overall mean hatchling success was 66%. Similarly, 161 loggerhead nests were recorded along renourished beaches, giving a 14 nests/mile ratio. One hundred seventy-eight false crawls were documented and the overall mean hatchling success equaled 73%. In 2003, Collier County reported 12.0 miles of natural beaches and 11.7 miles of renourished beaches. Along natural beaches, 193 nests were recorded, giving a 16.1 nests/mile ratio. Two hundred eighty-nine false crawls occurred and the overall mean hatchling success was 64%. Along renourished beaches, 311 nests were recorded, giving a 26.5 nests/ratio. Two hundred seventy-one false crawls were detected and the overall mean hatchling success equaled 75% (Collier County, 2002; 2003).

Green Sea Turtle

The green sea turtle (*Chelonia mydas*), federally listed as a protected species on July 28, 1978 (43 FR 32800), has been classified worldwide as threatened, with the Florida and Mexican Pacific coast nesting populations listed as endangered under the ESA (NMFS and USFWS, 1991a). Adults commonly reach 100 cm in carapace length and 150 kg in mass. Colorization of the adult carapace range from solid black to gray, yellow, green, and brown in various patterns; the plastron is a much lighter yellow to white. Hatchlings are distinctively black on the dorsal carapace and white on the ventral plastron. The green sea turtle has a worldwide distribution in tropical and subtropical waters. Pelagic hatchlings are believed to reside in oceanic waters for a period of three to seven years (Balazs, 1999). Upon reaching a juvenile carapace length of 20 to 25 cm, greens migrate to shallow nearshore areas where they spend the majority of their lives developing to sexual maturity (NMFS and USFWS, 1991a; Ernst et al., 1994). Optimal developmental habitats possess two essential resources: 1) an abundance of submerged vegetation (seagrasses and/or algae) and 2) within close proximity of nearshore reefs or rocky areas that are used for resting (Ernst et al., 1994; Bjorndal, 1997). Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys (NMFS and USFWS, 1991a).

In the U.S. Gulf of Mexico region, adult greens are often restricted to the southernmost waters along the coasts of southwestern Florida and southern Texas (Renaud et al., 1995; Landry and Costa, 1999). Resident foraging populations have been known to inhabit the extensive seagrass beds of Florida Bay and the Florida Keys (Kinzel et al., 2002). In addition, nearshore water temperatures play

a major role in determining green sea turtle distribution along the Gulf and Atlantic coasts. Individual greens avoid becoming cold-stunned (motionless state of hypothermia when water temperatures drop below 10°C) in temperate waters by moving toward the southerly latitudes of Southern Florida (Ernst et al., 1994). Green sea turtles also utilize the developmental inshore waters of Central Florida (e.g., Cedar Keys, Homosassa Springs, Crystal River, and Tampa Bay), where advection from wind and currents concentrates nutrients for the proliferation of vegetation (NMFS and USFWS, 1991a). Since green sea turtles are primarily herbivorous, feeding on algae and seagrasses, most individuals utilize nearshore, rather than offshore, primary foraging grounds (Ernst et al., 1994). Repeated surveys of the deeper waters off of Naples, Florida have produced no green sea turtle sightings in waters beyond the 50 m isobath (Fritts et al., 1983a). Other principal benthic foraging areas in the southeastern United States include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Hildebrand, 1982; Shaver, 1994), the Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Carr, 1984), Florida Bay and the Florida Keys, the Indian River Lagoon System, Florida (Ehrhart, 1983), and the Atlantic Ocean off Florida from Brevard through Broward counties (Wershoven and Wershoven, 1992; Guseman and Ehrhart, 1992).

The vast majority of green turtle nesting within the southeastern United States occurs in Florida between May 15 and October 31 (Johnson and Ehrhart, 1994). Greens take an estimated 27 to 50 years to reach sexual maturity, the longest age to maturity for any sea turtle species, and mating occurs in the waters off of the nesting beaches (Frazer and Ehrhart, 1985). Each female deposits 1-7 clutches during the breeding season (two to three is typical) at 12-14 day intervals. Mean clutch size is highly variable among populations, but averages 110-115 eggs/nest with an incubation period of 50-60 days. Females usually have 2-4 or more years between breeding seasons, while males may mate every year (Balazs, 1983).

Within Collier County, green sea turtle nesting has been consistently low from year to year. Every other year from 1993 to 2003 (e.g., 1995, 1997, 1999), have yielded no green nests, and in the years 2000 and 2002, along approximately 63.0 km of surveyed beach, only five green nests were reported (FWCC, 2004). Likewise, Lee County has recorded low nesting totals for green sea turtles. In 2002, only seven green nests were detected within the entire county, while in 2003, the total number of nests decreased to three (FWCC, 2004).

Project Impacts

No long-term impacts to shorebirds are expected from project construction. The disposal of sand on the beach may temporarily interrupt foraging and resting activities of shorebirds that utilize the project area beach. This impact would be limited to the immediate area of disposal and the duration of construction. The prey base for many shorebirds, which includes common invertebrate organisms in the beach and surf zone, would be temporarily reduced in areas of project fill.

This impact would be short-term as recovery of beach infauna is expected within one year of sand placement. Potential short-term impacts to shorebirds during construction will be minimized or avoided by implementing the protection measures outlined in Appendix D within the State permit.

Potential impacts to sea turtles may occur in areas of beach fill. Concerns include the timing of construction activities, potential burial or excavation of sea turtle nests, and increased beach sand compaction due to the presence of heavy equipment and sand deposition. A beneficial effect will be the creation of additional nesting habitat for sea turtles. Furthermore, beach construction will not take place during sea turtle nesting season. In addition to any terms and conditions set by State and Federal regulatory agencies, protective measures outlined in Appendix D in the State permit will be implemented to minimize or avoid impacts to nesting sea turtles.

With the implementation of NOAA National Marine Fisheries' Gulf of Mexico Biological Opinion (Appendix D) recommendations for hopper dredging, and protection measures referenced above, the project will not have a significant impact on sea turtles.

The threatened and endangered fish and mammals mentioned in this section will not be effected by construction, since previous sightings indicated little activity by these species in the project area. Monitoring requirements will afford them protection, should they appear.

3.2.2 ESSENTIAL FISH HABITAT

Environmental Setting

Amendments to the Magnuson-Stevens Fishery Conservation and Management Act, approved by Congress in 1996, defined Essential Fish Habitat (EFH) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802 (10)). In the marine waters of the Gulf of Mexico, EFH is defined as "all marine waters and substrates (mud, sand, shell, rock, hardbottom, and associated biological communities) from the shoreline to the seaward limit of the EEZ [Exclusive Economic Zone]" (GMFMC, 1998).

The Gulf of Mexico Fishery Management Council is responsible for preparing fishery plans that manage designated EFH from where the State waters end out to the 200 mile limit of the Gulf of Mexico. The Gulf Council has identified EFH in the waters of the Gulf of Mexico based on the various life stages of 26 representative managed species and the coral complex (GMFMC, 1998; NMFS, 2002). The identified species are considered by the Gulf Council to be representative of the species that commonly occur throughout all of the estuarine and marine waters of the Gulf of Mexico (GMFMC, 1998). A list of selected species and associated Fishery Management Plan (FMP) is included in Table 5.

Table 5
Fishery Management Plans and Managed Species for the Gulf of Mexico

Shrimp Fishery Management Plan
brown shrimp - *Penaeus aztecus*
pink shrimp - *P. duorarum*
royal red shrimp - *Pleoticus robustus*
white shrimp - *Penaeus setiferus*

Red Drum Fishery Management Plan
red drum - *Sciaenops ocellatus*

Reef Fish Fishery Management Plan
black grouper- *Mycteroperca bonaci*
gag grouper - *M. microlepis*
gray snapper - *Lutjanus griseus*
gray triggerfish - *Balistes capriscus*
greater amberjack - *Seriola dumerili*
lane snapper - *L. synagris*
lesser amberjack - *S. fasciata*
red grouper - *Epinephelus morio*
red snapper - *L. campechanus*
scamp grouper - *M. phenax*
tilefish - *Lopholatilus chamaeleonticeps*
yellowtail snapper - *Ocyurus chrysurus*
vermilion snapper - *Rhomboplites aurorubens*

Stone Crab Fishery Management Plan
stone crab - *Menippe spp.*

Spiny Lobster Fishery Management Plan
spiny lobster - *Panulirus argus*

Coral and Coral Reef Fishery Management Plan
varied coral species and coral reef communities comprised of several hundred species

Coastal Migratory Pelagic Fishery Management Plan
bluefish - *Pomatomus saltatrix*
dolphin - *Coryphaena hippurus*
cobia - *Rachycentron canadum*
king mackerel - *Scomberomorus cavalla*
little tunny - *Euthynnus alleteratus*
Spanish mackerel - *S. maculatus*

Source: Generic Amendment for Addressing Essential Fish Habitat Requirements of the Gulf of Mexico, Gulf of Mexico Fishery Management Council, October 1998)

In addition, the National Marine Fisheries Service's (NMFS) Highly Migratory Species Management Division has identified EFH for specific migratory species within the nearshore and offshore waters of the Gulf of Mexico. The following are highly migratory species (HMS) for which EFH has been identified:

Atlantic Bluefin Tuna

Atlantic bluefin tuna (*Thunnus thynnus*) exhibit a seasonal migratory behavior by moving from spring spawning grounds within the Gulf of Mexico through the Straits of Florida to feeding grounds off the northeast U.S. coast (Mather et al., 1995). This western Atlantic stock has a range from Newfoundland south into the Gulf of Mexico and the Caribbean, and is separated by the Labrador Current from those stocks found in the east Atlantic (Tiews, 1963; ICCAT, 1997).

Western north Atlantic bluefin tuna inhabit spawning grounds within the Gulf of Mexico and the Florida Straits from mid-April to mid-June (McGowan and Richards, 1989). Even though individual bluefin tuna may spawn more than once a year, a single annual spawning period has been recognized for the western Atlantic stock (Richards, 1991). Most bluefin tuna larvae have been found around 1,000 fathom depth contour in the northern Gulf of Mexico, with sporadic collections off of Texas. In the Florida Straits, larvae are primarily collected along the western edge of

the Florida Current, suggesting active transport from the Gulf of Mexico (Richards, 1991). McGowan and Richards (1989) revealed that certain features (e.g., temperature and salinity) of bluefin tuna larval habitat in the Gulf of Mexico which determine growth and survival rates, and that these features show variability from year to year, perhaps accounting for a significant portion of the fluctuation in yearly recruitment success.

Designated EFH for Atlantic Bluefin Tuna includes:

For spawning, eggs, and larvae: In pelagic and near coastal surface waters from the North Carolina/South Carolina border at 33.5° N, south to Cape Canaveral, FL from 15 miles from shore to the 200 m isobath; all waters from offshore Cape Canaveral at 28.25° N south around peninsular Florida to the U.S./Mexico border from 15 miles from shore to the EEZ boundary.

For juveniles/subadults (<145 cm TL): All inshore and pelagic surface waters warmer than 12° C of the Gulf of Maine and Cape Cod Bay, MA from Cape Ann, MA (~42.75° N) east to 69.75° W (including waters of the Great South Channel west of 69.75° W), continuing south to and including Nantucket Shoals at 70.5 W to off Cape Hatteras, NC (approximately 35.5° N), in pelagic surface waters warmer than 12° C, between the 25 and 200 m isobaths; also in the Florida Straits, from 27° N south around peninsular Florida to 81° W in surface waters from the 200 m isobath to the EEZ boundary.

For adults (>145 cm TL): In pelagic waters of the Gulf of Maine from the 50 m isobath to the EEZ boundary, including the Great South Channel, then south of Georges Bank to 39° N from the 50 m isobath to the EEZ boundary; also, south of 39° N, from the 50 m isobath to the 2,000 m isobath to offshore Cape Lookout, NC at 34.5° N. In pelagic waters from offshore Daytona Beach, FL (29.5° N) south to Key West (82° W) from the 100 m isobath to the EEZ boundary; in the Gulf of Mexico from offshore Terrebonne Parish, LA (90° W) to offshore Galveston, TX (95° W) from the 200 m isobath to the EEZ boundary.

Atlantic Skipjack Tuna

Atlantic skipjack tuna (*Katsuwonus pelamis*) are circumglobal in tropical and warm-temperate waters, generally restricted to the 15°C isotherm. Skipjacks spawn opportunistically in equatorial and sub-tropical waters, with most spawning occurring during the summer months in the Caribbean, off Brazil (with the peak in January through March), and in the Gulf of Mexico from April to May (Richards, 1969).

Designated EFH for Atlantic Skipjack Tuna includes:

For spawning, eggs, and larvae: In offshore waters, from the 200 m isobath out to the EEZ boundary, from 28.25° N south around peninsular Florida and the Gulf Coast to the U.S./Mexico border.

For juveniles/subadults (<45 cm FL): In pelagic surface waters from 20° to 31° C in the Florida Straights off southeastern Florida, from the 25 m isobath to the m isobath, from 27.25° N south to 24.75° N southwest of the coast of Key Largo, FL.

For adults (>45 cm FL): In pelagic surface waters from 20° to 31° C in the Mid-Atlantic Bight, from the 25 m isobath to the 200 m isobath, from 71° W, off the coast of Martha's Vineyard, MA, south and west to 35.5° N, offshore Oregon Inlet, NC.

Atlantic Yellowfin Tuna

Atlantic yellowfin tuna is an epipelagic, circumglobal species, found in water temperatures between 18°C and 31°C. Within the Gulf of Mexico, yellowfin tuna occur beyond the 500 fathom isobath (Idyll and de Sylva, 1963).

Spawning occurs both in the Gulf of Mexico and the Caribbean, with peaks occurring in the summer. Larvae have been collected and identified near the Yucatan peninsula and in the northern Gulf of Mexico along the Mississippi Delta (ICCAT, 1994).

Due to their intolerance for oxygen (O_2) concentrations less than 2 ml/l, yellowfin tuna are confined to the upper 100 m of the water column (Collette and Nauen, 1983). In the Gulf of Mexico, adults usually occur 75 km or more offshore. Specifically, in the southern part of the Gulf of Mexico, there appears to be a year-round population of yellowfin tuna resulting in greater catches (Idyll and de Sylva, 1963).

Designated EFH for Atlantic Yellowfin Tuna includes:

For spawning, eggs, and larvae: In offshore waters, from the 200 m isobath out to the EEZ boundary, from 28.25° N south around peninsular Florida and the Gulf Coast to the U.S./Mexico border, especially associated with the Mississippi River plume and the Loop Current. Also, all U.S. waters in the Caribbean from the 200 m isobath to the EEZ boundary.

For juveniles/subadults (<110 cm FL): Pelagic waters from the surface to 100 m deep between 18° and 31° C from offshore Cape Cod, MA (70° W)

southward to Jekyll Island, GA (31° N), between 500 and 2,000 m; off Cape Canaveral, FL from 29° N south to the EEZ boundary (approximately 28.25° N) and from 79 W east to the EEZ boundary (approximately 76.75° W); in the Gulf of Mexico from the 200 m isobath to the EEZ boundary.

For adults (>110 cm FL): (Identical to juveniles/subadults EFH): Pelagic waters from the surface to 100 m deep between 18° and 31° C from offshore Cape Cod, MA (70° W) southward to Jekyll Island, GA (31° N), between 500 and 2,000 m; off Cape Canaveral, FL from 29° N south to the EEZ boundary (approximately 28.25° N) and from 79° W east to the EEZ boundary (approximately 76.75° W); in the Gulf of Mexico from the 200 m isobath to the EEZ boundary.

Swordfish

Swordfish (*Xiphias gladius*) are circumglobal, ranging through tropical, temperate, and occasionally cold water regions. The species is known for movements between warm water spawning grounds to cold water feeding grounds (Palko et al., 1981). Major spawning grounds are located in both the Straits of Yucatan and the Straits of Florida, with the largest larvae concentrations found to be associated with surface water temperatures between 24°C and 29°C (Grall et al., 1983). The Gulf of Mexico is believed to serve as an important nursery area for swordfish (Palko et al., 1981). Many swordfish larvae of all sizes are present year-round in the eastern Gulf of Mexico, and juvenile fish are frequently caught in the pelagic longline fishery in the Gulf of Mexico. Concentrations of adult swordfish seem to occur at ocean fronts between major water masses associated with boundary currents; for example, the Gulf Stream and Loop Current of the Gulf of Mexico (Arocha, 1997).

Designated EFH for Atlantic Swordfish includes:

For spawning, eggs, and larvae: From offshore Cape Hatteras, NC (approximately 35° N) extending south around peninsular Florida through the Gulf of Mexico to the U.S./Mexico border from the 200 m isobath to the EEZ boundary; associated with the Loop Current boundaries in the Gulf and the western edge of the Gulf Stream in the Atlantic; also, all U.S. waters of the Caribbean from the 200 m isobath to the EEZ boundary.

For juveniles/subadults (<180 cm LJFL): In pelagic waters warmer than 18° C from the surface to a depth of 500 m, from offshore Manasquan Inlet, NJ at 40° N, east to 73° N, and south to the waters off Georgia at 31.5° N, between the 25 and 2,000 m isobaths; offshore Cape Canaveral, FL (approximately 29° N) extending from the 100 m isobath to the EEZ boundary (south and east) around peninsular Florida; in the Gulf of

Mexico from Key West to offshore Galveston, TX (95° W) from the 200 m isobath to the EEZ boundary, with the exception of the area between 86° W and 88.5° W, where the seaward boundary of EFH is the 2,000 m isobath.

For adults (>180 cm LJFL): In pelagic waters warmer than 13° C from the surface to 500 m deep, offshore the U.S. east and Gulf coasts from the intersection of the 100 m isobath and the EEZ boundary southeast of Cape Cod, MA to south and offshore Biscayne Bay, FL at 25.5° N, from the 100 to 2,000 m isobath or the EEZ boundary, which ever is closer to land; from offshore Tampa Bay, FL at 85° N to offshore Mobile Bay, AL at 88° N between the 200 and 2,000 m isobaths; from offshore south of the Mississippi River delta, 89° N to offshore waters south of Galveston, TX, 95° N from the 200 m isobath to the EEZ boundary.

Great Hammerhead

Great hammerhead sharks (*Sphyrna mokarran*) are circumtropical, solitary fish found in both the open ocean and in shallow coastal waters (Castro, 1983). Little information is available on early juvenile stages, however adult great hammerheads are vulnerable to overfishing because of their biennial reproductive cycle, and because they are caught both in directed fisheries and as bycatch in tuna and swordfish fisheries.

Designated EFH for Great Hammerheads includes:

For neonate/early juveniles (<70 cm TL): At this time, information is insufficient for the identification of EFH for this life stage.

For late juveniles/subadults (71 to 220 cm TL): Off the Florida coast, all shallow coastal waters out to the 100 m isobath from 30° N south around peninsular Florida to 82.5° W, including Florida Bay and adjacent waters east of 81.5° W (north of 25° N), and east of 82.5° W (south of 25° N).

For adults (>220 cm TL): Off the entire east coast of Florida, all shallow coastal waters out to the 100 m isobath, south of 30° N, including the west coast of Florida to 85.5° W.

Scalloped Hammerhead

Scalloped hammerheads (*Sphyrna lewini*) are a very common, large, schooling shark that migrates seasonally north to south along the eastern United States (Compagno, 1984). Their reproductive cycle is annual, with a gestation period of nine to ten months (Stevens and Lyle, 1989). In the Gulf of Mexico, juvenile pups have been observed from Yankeetown to Charlotte Harbor, Florida, in temperatures between 23.2°C to 30.2°C (NFMS, 1999).

Designated EFH for Scalloped Hammerheads includes:

For neonate/early juveniles (<45 cm TL): Shallow coastal waters of the South Atlantic Bight, off the coast of South Carolina, Georgia, and Florida, west of 79.5° W and north of 30° N, from the shoreline out to 25 miles offshore. Additionally, shallow coastal bays and estuaries less than 5 m deep, from Apalachee Bay to St. Andrews Bay, FL.

For late juveniles/subadults (46 to 249 cm TL): All shallow coastal waters of the U.S. Atlantic seaboard from the shoreline to the 200 m isobath from 39° N, south to the vicinity of the Dry Tortugas and the Florida Keys at 82° W; also in the Gulf of Mexico, in the area of Mobile Bay, AL and Gulf Islands National Seashore, all shallow coastal waters from the shoreline out to the 50 m isobath.

For adults (>250cm TL): In the South Atlantic Bight from the 25 to 200 m isobath from 36.5° N to 33° N, then continuing south from the 50 m isobath offshore to the 200 m isobath to 30° N, then from the 25 m isobath to the 200 m isobath from 30° N south to 28° N; also, in the Florida Straights between the 25 and 200 m isobaths, from 81.5° W west to 82.25° W in the vicinity of Key West and the Dry Tortugas.

Nurse Sharks

Nurse sharks (*Ginglymostoma cirratum*) are a shallow water species, inhabiting littoral waters in the tropical and subtropical Atlantic. Nurseries include shallow turtle grass (*Thalassia testudinum*) beds, shallow coral reefs, and around mangrove islands (Castro, 1983). Juvenile nurse sharks have been found along the west coast of Florida, in temperatures of 17.5°C to 32.1°C and salinities of 28.5 to 35.1 ppt (Hueter, 1991).

Designated EFH for Nurse Sharks includes:

For neonate/early juveniles (<60 cm TL): Shallow coastal areas from West Palm Beach, FL south to the Dry Tortugas in waters less than 25 m deep.

For late juveniles/subadults (61 to 225 cm TL): Shallow coastal waters from the shoreline to the 25 m isobath off the east coast of Florida from south of Cumberland Island, GA (at 30.5° N) to the Dry Tortugas; also shallow coastal waters from Charlotte Harbor, FL (at 26° N) to the north end of Tampa Bay, FL (at 28° N); also, off southern Puerto Rico, shallow coastal waters out to the 25 m isobath from 66.5° W to the southwest tip of the island.

For adults (>226cm TL): (Identical to EFH for Late juveniles/Subadults): Shallow coastal waters from the shoreline to the 25 m isobath off the east coast of Florida from south of Cumberland Island, GA (at 30.5° N) to the Dry Tortugas; also shallow coastal waters from Charlotte Harbor, FL (at 26° N) to the north end of Tampa Bay, FL (at 28° N); also, off southern Puerto Rico, shallow coastal waters out to the 25 m isobath from 66.5° W to the southwest tip of the island.

Blacktip Sharks

The blacktip shark (*Carcharhinus limbatus*) is circumtropical, ranging from Virginia to Florida and the Gulf of Mexico. Their reproductive cycle is biennial, with a gestation cycle lasting about a year (Castro, 1996). Blacktip shark litters range from one to eight pups (Bigelow and Schroeder, 1948). Blacktip neonates and juveniles have been found over seagrass beds off of west Florida (from the Florida Keys to Tampa Bay) at temperatures of 18.5°C to 33.6°C and salinities of 15.8 to 37.0 ppt. The neonates were found between April and September, while the juveniles were observed year-round (NFMS, 1999).

Designated EFH for Blacktip Sharks includes:

For neonates/early juveniles (<99 cm): Shallow coastal waters to the 25 m isobath, from Bull's Bay, SC at 33.5° N, south to Cape Canaveral, FL at 28.5° N; also, on the west coast of Florida from Thousand Islands at 26° N to Cedar Key, FL at 29° N, especially Tampa Bay and Charlotte Harbor, FL. Additionally, shallow coastal waters with muddy bottoms less than five meters deep on the seaward side of coastal islands from Apalachee Bay to St. Andrews Bay, FL.

For late juveniles/subadults (100 to 155 cm): Shallow coastal waters from the shoreline to the 25 m isobath: from Cape Hatteras, NC at 35.25° N to 29° N at Ponce de Leon Inlet; the west coast of Florida, including the Florida Keys and Florida Bay, north to Cedar Key at 29° N; from Cape San Blas, FL north of 29.5° N to the east coast of the Mississippi River delta north of 29° N; also, the west coast of Texas from Galveston, west of 94.5° N, to the U.S./Mexico border.

For adults (>156 cm): Shallow coastal waters of the Outer Banks, NC from the shoreline to the 200 m isobath between 36° N and 34.5° N; shallow coastal waters offshore to the 50 m isobath from St. Augustine, FL (30° N) to offshore Cape Canaveral, FL (28.5° N); on the west coast of Florida, shallow coastal waters to the 50 m isobath from 81° W in Florida Bay, to 85° W, east of Cape San Blas, FL.

Bull Sharks

Bull sharks (*Carcharhinus leucas*) are large, shallow water sharks that are cosmopolitan in warm seas and estuaries. In the Gulf of Mexico, bull sharks constituted three percent of the shark catch in the directed shark fishery, and are vulnerable to overfishing because of their slow growth and limited reproductive potential. Major nursery areas have been identified as low-salinity estuaries of the Gulf of Mexico Coast (Castro, 1983). Neonates are found in temperatures of 28.2°c to 32.2°C and in salinities between 18.5 and 28.5 ppt. Juveniles were found in temperatures of 21.0°C to 34.0°C and in salinities between 3.0 and 28.3 ppt (NFMS, 1999).

Designated EFH for Bull Sharks includes:

For neonate/early juveniles (<110 cm TL): In shallow coastal waters, inlets and estuaries in waters less than 25 m deep: from just north of Cape Canaveral, FL at 29° N to just south of Cape Canaveral, FL at 28° N; from just south of Charlotte Harbor, FL at 26.5° N north to Cedar Key, FL at 29° N; the mouth of Mobile Bay, AL from 87.75° W to 88.25° W; the mouth of Galveston Bay, TX from 94.5° W to 95° W; from South Padre Island, TX south of 28.5° N to Laguna Madre, TX at 27° N.

For late juveniles/subadults (111 to 225 cm TL): In shallow coastal waters, inlets and estuaries in waters less than 25 m deep: from Savannah Beach, GA at 32° N southward to the Dry Tortugas, FL; from Ten Thousand Islands, FL at 26° N north to northern Cedar Key, FL at 29° N; from Apalachiacola, FL at 85° W to the Mobile Bay, AL area at 88.5° W; from just east of Galveston Bay, TX at 94.5° W to the U.S./Mexico border.

For adults (>226 cm TL): In shallow coastal waters, inlets and estuaries in waters less than 25 m deep: from just south of Charlotte Harbor, FL at 26.5° N north to Anclote Key, FL at 28° N.

Project Impacts

Physical injury through entrainment of adult fishes by hydraulic dredging has been reported (Larson and Moehl, 1988; McGraw and Armstrong, 1988; Reine et al., 1998). Most entrained fishes were demersal species such as flatfishes, sand lance, and sculpin; however, three pelagic species (anchovy, herring, and smelt) were recorded. Entrainment rates for the pelagic species were very low, ranging from 1 to 18 fishes/1,000 cy (McGraw and Armstrong, 1988). Comparisons between relative numbers of entrained fishes with numbers captured by trawling showed that some pelagic species were avoiding the dredge. Few of the coastal pelagic fishes occurring offshore of Florida should become entrained because the

dredge's suction field exists near the bottom and many pelagic species have sufficient mobility to avoid the suction field.

Noise associated with all aspects of the dredging process may affect organisms in several ways. Some reef fish larvae have been shown to respond to sound stimuli as a sensory queue to settlement sites (Stobutzki and Bellwood, 1998; Tolimieri et al., 2000). Alterations of background noise could impair the ability of newly settled fishes to locate preferred substrate. Changes in noise levels also may affect feeding or reproductive activities of reef fishes that depend on sound for these activities (Myrberg and Fuiman, 2002). Continental Shelf Associates, Inc. (2004) reviewed effects of noise on fishes. This report stated that all fish species investigated can hear, with varying degrees of sensitivity, within the frequency range of sound produced by cutterhead dredges, hopper dredges, and clamshell excavators. These sounds can mask the sounds normally used by fishes in their normal acoustic behaviors at levels as low as 60 to 80 dB (just above detection thresholds for many species). Levels as high as 160 dB may cause receiving fish to change their behaviors and movements that may temporarily affect the usual distribution of animals and commercial fishing. Continuous, long-term exposure to levels above 180 dB has been shown to cause damage to the hair cells of the ears of some fishes under some circumstances. These effects may not be permanent because damaged hair cells are repaired and/or regenerated in fishes. None of the dredge types proposed for this project produce continuous sounds above 120 dB (Richardson et al., 1995). Due to the short duration of most dredging projects, the effects of underwater noise on fish populations should be minimal.

Dredge-related turbidity (sediment plume) can divert pelagic fishes from normal migratory routes, feeding grounds, or spawning areas. Structures and vessels may attract pelagic fishes for various reasons and in doing so also divert them from regular migratory routes. Noise from working dredges could affect pelagic fishes attracted to the structures. Despite the possibility of these effects on pelagic fishes, dredging at the proposed sites is not likely to adversely affect pelagic fish populations unless specific spawning, aggregation, or migratory areas are disrupted. The limited spatial and temporal scale of dredging projects expected for the sand resource area would lessen the severity of any potential effects.

Motile populations, including non-migratory foragers, would be less stressed by sediment removal than infauna or sessile epibiota. Most epibiotal and demersal fish populations would have a low probability of being adversely impacted directly by the dredging of surficial sediments. Slow-moving or burrowing sessile epibiota inhabiting the borrow area would most likely experience a reduction in density due to sediment removal. Motile epifaunal generally are migratory and are not restricted to the borrow areas. Most demersal populations exhibit naturally dynamic distributions and are distributed over a wide geographic area. However, there have been questions regarding the importance of shoal areas as orientation sites, staging areas, or aggregating sites for pelagic and demersal

fishes (Research Planning, Inc. et al., 2001). Unfortunately, scientific data are lacking.

Most impacts of sediment removal on epibenthic and demersal fish taxa would be indirect in nature, through habitat alteration. A reduction of infaunal biomass resulting from sediment removal could have an indirect effect on the distribution of certain demersal fishes and other epibenthic predators by interrupting established energy pathways to the higher trophic levels represented by these foraging taxa. Reductions in densities of the preferred prey of bottom-feeding taxa could induce migration of foragers to unimpacted areas.

The Gulf Council has identified the loss of barrier islands and shorelines as a non-fishing related activity that may adversely affect EFH (GMFMC, 1998). Beach renourishment can provide areas with stable habitat suitable for natural communities. "Over the last 15 years, dune and beach stabilization have been accomplished more successfully by using more natural applications such as sand dunes, beach renourishment, and vegetative plantings" (GMFMC, 1998).

Habitat Areas of Particular Concern

Habitat Areas of Particular Concern (HAPC) are subsets of EFH containing particularly sensitive or vulnerable habitats. Borrow Area T1 does not meet the criteria for consideration as a Habitat Area of Particular concern.

Project Impacts

The proposed project will not result in significant adverse impacts on EFH. The identified finfish (Red Drum, Reef Fish, and Pelagic Fish) are highly motile and will leave the project area during construction and return upon completion of the project. The same can be said for the Highly Migratory Species, such as tuna and swordfish. Crabs and lobsters are also motile species capable of escaping construction activities, and their abundance is expected to be low due to the amount of structure and hardbottom in adjacent nearshore areas. Various coral species and reef communities are found throughout the waters of the Gulf of Mexico. However, the project is designed to avoid them (Section 3.2.3). Coordination on EFH matters was completed with NMFS on April 6, 2004 (Appendix A).

3.2.3 BENTHIC ORGANISMS

Environmental Setting

The upper beach zone (supratidal) is dominated by talitrid and haustoriid amphipod species and ghost crabs (*Ocypode quadrata*) (Williams, 1984). Macrofauna typically found in the lower intertidal zone (between mean high water and mean low water) include haustoriid amphipods, polychaetes, isopods,

mollusks, and some larger crustacean species such as mole crabs and burrowing shrimp (Williams, 1984). Infauna macroinvertebrate communities typically found in the subtidal zone (nearshore surf zone and deeper sand bottom habitats) include polychaetes, amphipods, isopods, decapods, polychaetes, mollusks, echinoderms, and a variety of other taxa (Allen and Moore, 1987). The nearshore and borrow area environments are described below.

Nearshore Environment

In February 2003, CPE conducted a side-scan sonar survey of the nearshore region between Florida Department of Environmental Protection (FDEP) survey control monuments R-17 and R-89, along approximately 13.5 miles of coastline in Collier County. The survey documented approximately 500 acres of hardbottom formations within 1,000 feet of the shoreline. The hardbottom formations are generally very low relief (averaging 0.51 feet) and ephemeral in nature with approximately one-third of the hardbottom covered with sediment. Underwater biological investigation of the nearshore hardbottom followed the side-scan survey (CPE, 2003), and the executive summary is provided in Appendix H. The area of investigation was defined as the nearshore marine environment, approximately 300 meters offshore of the June 2003 mean high water line. The study area was designed and coordinated with the FDEP to investigate those marine resources located landward of the project's proposed mixing zone. A total of 68 sites (60 transects and 8 points) directly offshore of Collier County were selected for exploratory verification, assessment, and characterization. These 68 sites were sorted into six study segments; Delnor-Wiggins State Park (R-17 to R-22), Vanderbilt Beach (R-23 to R-30), Pelican Bay (R-31 to R-35), Clam Pass Park (R-36 to R-43), Park Shore (R-44 to R-57), and Naples (R-58 to R-81).

The general nearshore trend showed macroalgae growth to be negatively correlated with average abiotic sediment depth and 100% sand cover over substrate. Where there were less 100% sand cover quadrats, there was more available hardbottom substrate for macroalgae growth. The County-wide average for total macroalgae cover was only 25%. This analysis suggests that a high percentage (75%) of the exposed nearshore hardbottom substrate throughout the County are still available for Cnidaria recruitment and sessile invertebrate growth. It also confirms the trend of an abiotic influence over flora survival, as the County-wide frequency of quadrats containing 100% sand cover had a higher average (32%) than total macroalgae cover (25%).

Species identification of average macroalgae percent cover revealed that *Gracilaria* spp. (8%) and *Hypnea* spp. (7%) were the two most dominant macroalgae genera within the County. This analysis addresses the hypothesis that turbid, ephemeral habitats, such as the nearshore mixing zone of Collier County, tends to select for a heavy proliferation of Rhodophyta. This is supported by the

accounts of heavy Rhodophyta cover printed in the 1990 (CSA, 1990) and 1994 (CEC, 1994) historical survey summaries.

Gracilaria spp. collectively were the most abundant macroalgae in the surveyed area. This genus occurs from cold temperate regions along the eastern Atlantic coast of Nova Scotia to warm subtropical regions around the east and west coasts of Florida. *Gracilaria* spp. can grow vegetatively over an indefinite period of time and has been shown to have a high growth rate under non-limiting light and nutrient conditions. *Gracilaria* spp. tends to be highly opportunistic, especially where nutrient loading leads to periodic eutrophication (nutrient poisoning) (Peckol and Rivers, 1995). Nutrient loading within the Naples, Park Shore, and Delnor-Wiggins State Park Segments are expected to be higher than average due to their close proximity to coastal passes. Doctors Pass channels a large amount of storm water drainage and agricultural runoff into the adjacent Naples and Park Shore Segments, contributing to the eutrophication of the waters and nearshore habitat. Likewise, Wiggins Pass loads nutrient-rich waters into the adjacent Delnor-Wiggins State Park Segment.

Even though Collier County's macroalgae assemblage was dominated by red algae, the absence of coralline red algae within this habitat is significant. Coralline algae are of particular significance in the ecology of coral reefs, where they lay down calcium carbonate as calcite material to aid in the structure of the reef, help cement the reef together, and are important sources of primary production. Although they contribute a considerable bulk of calcium carbonate to the structure of coral reefs, their more important role serves as the cement in which binds the reef materials together into a solid, sturdy structure (Woelkerling, 1988). The absence of coralline algae reef builders can be detrimental in a high-stress, high-bio-erosion environment like Collier County.

Gorgonacea were relatively infrequent in the surveyed area, with less than one colony encountered per average transect. Average Gorgonacea density was between 0.31 and 0.23 colonies m^{-2} at the northernmost and southernmost segments, Delnor-Wiggins State Park and Naples, respectively. Within these segments distribution of Gorgonacea were patchy, and ranged from zero to 1.09 colonies m^{-2}. Gorgonacea were essentially absent from the four interior segments, Vanderbilt Beach, Pelican Bay, Clam Pass Park, and Park Shore. One colony of *Leptogorgia* sp. <10 cm was recorded at each of two transects in Delnor-Wiggins State Park, and Gorgonacea <10 cm were absent from the remainder of the survey. Casual observations found sparsely distributed colonies smaller than 10 cm. Those encountered loosely followed shore-parallel distribution patterns, and were likely underrepresented by shore-perpendicular transects. Gorgonacea >10 cm were relatively infrequent throughout the survey. Colonies were recorded in only 8 of the 16 transects in Delnor-Wiggins State Park and Naples where Gorgonacea were relatively frequent, and in only 5 of 42 transects from Vanderbilt Beach to Park Shore, where Gorgonacea were nearly absent. Casual observations of Gorgonacea >10 cm found loose shore-parallel distribution

patterns, and were likely underrepresented by shore-perpendicular transects. The shore-perpendicular transects found more Gorgonacea in the northernmost and southernmost segments.

The Scleractinia density and species distribution in Collier County are characteristic of Florida's nearshore hardbottom. The average Scleractinia density in Collier County is less than the density found on the nearshore hardbottom in Palm Beach or Monroe Counties (Jaap 2003, Coastal Planning & Engineering, Inc. 2003), and coral colonies in Collier County were generally larger. *Oculina* sp., *Phyllangia* sp. and *Solenastrea* spp. were occasionally found, with the vast majority of coral records being *Siderastrea* spp. There were approximately twice as many Scleractinia colonies m^{-2} in the northern three segments than the southern three segments. Even in the northern three segments where Scleractinia were relatively abundant, the assemblage was relatively sparse.

Borrow Area Environment

Borrow Area T1 is located in Federal waters, about 33 miles northwest from Vanderbilt Beach and is part of an extensive ridge field that trends SE-NW. At Borrow Area T1 the sand source potential was already confirmed by preliminary investigations such as detailed bathymetry, seismic lines and two vibracores during the Captiva/Sanibel sand search investigations conducted by CPE (2002) and the Phases I and II Sand Search Investigations (CPE, 2002 and 2003). Phase II investigations (CPE, 2003) indicated that potentially clean, beach-compatible sands in these ridges, referred to as Tom's Hills, is available. The ridges were described in the Phase II report (CPE, 2003) as being of 2.5 miles long by 0.75 miles wide and spaced about 1,600 ft apart. Geophysical investigations (seismic survey) in the study area demonstrated that the sand deposits lie unconformably on top of pre-Holocene hardgrounds of irregular relief (drowned karstified surface) (Finkl *et al.*, 2003). These ridges show a typical asymmetry with a steeper seaward slope and a gentler landward-facing slope. Borrow Area T1 is located on the NW corner of one of these ridges (Figure 1) and contains about 4.7 million cy of relatively clean medium sand (generally less than 4% silt and 10% shell content). Detailed geophysical (seismic and side-scan) investigations and a geotechnical study of vibracores were used to define the Borrow Area T1. The Phase III geotechnical report is provided in Appendix F.

In July 2003, an archeological remote sensing survey of the borrow area was conducted by Tidewater Atlantic Research (TAR), which included magnetometer, side-scan sonar and seismic (sub-bottom) profiling (CPE, 2004). The investigation did not identify any hardbottom benthic communities within the scanned area. To ensure that no hardbottom exists within 400 feet of Borrow Area T1, the borrow area borders were reduced to achieve this buffer from the limit of the active investigation. The details of the investigation are described in the Cultural Resources Report provided in Appendix G.

The benthos in Borrow Area T1 is most likely comprised of bacteria and other microbenthos, meiofauna (0.063-0.3 millimeters), macrofauna (larger than 0.3 mm), and megofauna (larger organisms such as crabs and demersal fish). Even though on-site biological assessments have not been performed on Borrow Area T1, previous surveys in the offshore waters of the eastern Gulf of Mexico have documented extensive epibenthic communities with low invertebrate diversity (MMS, 1996). At both dredged and undredged locations, the most dominant epibenthic community species included the iridescent swimming crab (*Portunus gibbesii*), the sand dollar (*Mellita tenuis*), and the pink shrimp (*Penaeus duorarum*) (MMS, 1996). Benthic infaunal communities have also been described at three previous borrow sites (Egmont Key, Sarasota, and Manasota Key). The major faunal groups included species of Annelids (tubificid oligochaetes and dwarf sandworms, *Aglaophamus verrilli*), Mollusks (many-line lucine, *Parvilucina multilineata*, and tranverse arks, *Anadara transversa*), and Arthropods (amphipods and decapods) (MMS, 1996). All of these groups are represented in bottom sediments throughout the entire Gulf, from the continental shelf to the deepest abyss at about 3,850 meters. Benthic surveys are traditionally not required in Florida waters by the State and Federal permit agencies, largely based on the findings of previous investigations. For this project, Collier County proposes to collect and analyze pre-construction benthic samples. Future sampling, if needed, will be coordinated with the future MMS studies offshore of southwest Florida.

Project Impacts

The primary impact producing factor relative to dredging the borrow sites is mechanical disturbance of the seabed. This physical disruption includes removal, suspension/dispersion, and deposition of dredged material. Excavating upper sediments from the borrow sites will remove portions of the benthic invertebrate populations that inhabit shelf sediments, especially those fauna with sessile and slow-moving lifestyles resulting in drastic reductions in number of individuals, number of species, and biomass. Extraction of habitat and biological resources may in turn disrupt the functioning of existing communities. Removal of benthic resources is of concern because the resources are important in the food web for commercially and recreationally important fishes and invertebrates and contribute to the biodiversity of the pelagic environment through benthic-pelagic coupling mechanisms. These mechanisms include larval transport and diurnal migrations of organisms, which may have substantial impact on food availability, feeding strategies, and behavioral patterns of other members of the assemblage (Hammer and Zimmerman, 1979; Hammer, 1981).

An effect of dredging borrow sites is the removal of benthic organisms inhabiting the surficial sediments. During dredging activities, benthic organisms occupying the immediate area are subject to either transport from one site to another or to burial from dredged spoils. Many studies have documented that sessile organisms, such as non-motile mollusks and polychaetes, are killed through direct

burial from large quantities of discharged spoils (Carriker, 1967; Saila et al., 1972; Rose, 1973). When discharged materials are anoxic, such invertebrates are susceptible to oxygen deficiency. Dissolved oxygen in the sediments is rapidly used up and the animals can acquire an oxygen debt within their cells (Nicol, 1967; Saila et al., 1972). However, despite these possible effects, a study conducted off of Egmont Key showed no detectable difference in the epifaunal community between pre- and post-dredging activities (MMS, 1996). Likewise, a post-dredged sampling site off of Longboat Key displayed a consistency in faunal composition and confirmed that the effects of dredging on infaunal communities were minimal (MMS, 1996). These results are consistent with the dynamic sand substrate and low benthic biodiversity of the inner west Florida shelf.

The expected loss of benthic fauna due to sediment excavation could be considered to represent a negligible impact on the ecosystem when evaluating the impact on a broad spatial scale. A significant extent of non-dredged areas will surround the borrow site. These undisturbed areas would be a primary source of colonizing fauna for the excavated site (Van Dolah et al., 1984; Jutte et al., 2002) and would complement colonization of altered substrata via larval recruitment. The great densities and fecundity of invertebrate populations, along with the relatively small areas of impact proposed, would preclude significant long-term negative effects on benthic populations assuming the dredge area is allowed sufficient time for benthic communities to recover.

The only critical impact of dredging and disposal from a sampled offshore borrow area of Egmont Key was the actual alteration of the benthic topography (MMS, 1996). This habitat disturbance can result in the physical change of the sediments, the filling in of spawning grounds, the loss of vegetative cover, or the change in circulation patterns (Marshall, 1968; Taylor et al., 1970; Kaplan et al., 1974). Filter-feeding benthic organisms may be subject to indirect sublethal effects from the resuspension of particulate matter in the water column. The abrasive action of adhered silt and clay particles to food items may affect filtering mechanism efficiency, rate of water transport, and energy uptake (Sherk, 1971). Multiple studies have also reported specific physiological impairments on filter-feeders to include clogging of gills, abrasion of gill filaments, and reduced feeding, respiratory, and excretory functions (U.S. Fish and Wildlife Service, 1970; Smith and Brown, 1971; Gordon et al., 1972). Also, this alteration may indirectly affect other higher taxon species that use these organisms as a food source. Demersal fish, such as flounder species that utilize the ocean bottom as foraging habitat, would be impacted the greatest. However, according to previous studies, the potential impacts are expected to be temporary and less than significant because of the relatively small scale of the area affected and the large abundance of similar habitat on the continental shelf. In a study that sampled the post-dredged area from an offshore Longboat Key site, no observable physical alterations were detected. As a result, the infaunal trophic regime was consistent with a well sorted sandy environment (MMS, 1996).

Suspended sediments settle and are deposited nearby or some distance from dredged sites. The extent of deposition and boundaries of biological impact are dependent on the type and amount of suspended sediments and physical oceanographic characteristics of the area. Given the remoteness of the site, generally calm oceanographic conditions of the Gulf, and low silt content the sediment characteristics of Borrow Area T1 are such that suspension times will be limited. Sediment entrained in the water column as a result of dredging is expected to settle out of suspension before being transported significant distances from the site.

The regional currents have surface velocities up to 0.4 m/s, with velocities in the bottom layers of 0.01 to 0.05 m/s or less (see section 3.1.2). Assuming the borrow area composite mean grain size (0.31 mm) the sand will move laterally 347 ft during its fall through a constant current velocity of 1 ft/sec. This is a high depth averaged velocity in the Gulf of Mexico, and average daily movement will be much smaller.

Given the amount of sand to be dredged for this project, suspension and transport of sediments away from the dredging site should be minimal, and any subsequent deposition will be insignificant in degree. It is highly unlikely that any dredging-related deposition of fine-grained sediments will to occur nearshore; the deposited sediments likely would not persist at sites of initial redeposition because of the high-energy inner shelf environment. However, some low or depressional areas of the seafloor could receive substantial deposition of fine sediments under this scenario. Given the relatively small amount of sediment suspension anticipated to occur during dredging, the degree of burial should be substantially less than would be required to negatively impact infaunal populations.

Removal of sand resources can expose underlying sediments and change the sediment structure and composition of a borrow site, consequently altering its suitability for burrowing, feeding, or larval settlement of some benthic organisms. Many studies show decreases in mean grain size, and in some cases, increases in silt and clay in borrow sites following dredging (National Research Council, 1995). Changes in sediment composition could potentially prevent recovery to an assemblage similar to that which occurred in the borrow site prior to dredging and could by implication affect the nature and abundance of food organisms for commercial and recreational fishery stocks (Coastline Surveys Limited, 1998; Newell et al., 1998).

It is possible that a change in the surficial sediment composition within the excavated areas could become a long-term result of dredging. Several factors could contribute to such an outcome, primarily the type of sediments exposed by dredging, the degree of deposition of fine sediments into dredged areas, and bathymetric alteration that results in hypoxic or anoxic conditions. These factors would depend primarily on the depth of excavation, which would be determined by the vertical relief of the sand shoal to be excavated, the vertical extent of those

sediments suitable for coastal renourishment projects, and the volume of sand required.

The location and dredging method will minimize impacts due to changes in the substrate composition and shape. The cut elevations vary over the borrow area, and are positioned with at least 1-foot of beach compatible sediment buffer from less suitable underlayers. This will lead to an uneven dredged surface with a similar sediment composition to the ridges present surface. The dredged area is above the general seafloor elevation, and in conjunction with a low silt content, will minimize fine sediment infill of the borrow area.

Because the inner shelf ecosystem of the west Florida shelf exhibits some heterogeneity in sediment types and their associated infaunal assemblages, those assemblages that initially colonize dredged areas likely would be similar to some naturally occurring assemblages that inhabit nearby non-dredged areas, especially areas with finer sediments. When viewed within a context of scale, removal of sediments form portions of the inner shelf would at most minimally alter the existing spatial balance of habitat (sediment) types. Changes in habitat suitability that result from sand removal likely would be inconsequential in the shelf ecosystem, a system where both infaunal assemblage types and sedimentary parameters often are temporally and spatially variable.

Dredging effects are not necessarily limited to the borrow site alone. Far-field impacts from suspension, dispersion, and deposition of sediments during dredging can be detrimental or beneficial. Johnson and Nelson (1985) found decreases in faunal abundances and numbers of taxa at non-dredged stations, although these decreases were not as extreme as those observed in the borrow site. McCaully et al. (1977; as cited by Johnson and Nelson, 1985) also observed that dredging effects can extend to other nearby areas, and noted decreases in infaunal abundances ranging from 34% to 70% at undredged stations within 100 meters of a dredged site. Conversely, benthos may show increased biodiversity downstream from dredged sites (Center for Cold Ocean Resources Engineering, 1995). In some areas, population density and species composition of benthic invertebrates increased rapidly outside dredged sites, with the level of enhancement decreasing with increasing distance from the dredged site up to a distance of two kilometers (Stephenson et al., 1978; Jones and Candy, 1981; Poiner and Kennedy, 1984). The enhancement was ascribed to release of organic nutrients from the dredge plume, a process known from other studies (Ingle, 1952; Biggs, 1968; Sherk, 1972; Oviatt et al., 1982; Coastline Surveys Limited, 1998; Newell et al., 1998, 1999).

Nearshore Impacts

Deposition of sediments can suffocate and bury hardbottom and soft bottom benthic biota, although some mobile soft bottom organisms are able to migrate vertically to the new surface (Maurer et al., 1986; Nelson, 1988). Unlike most

soft bottom biota, many hardbottom organisms are sessile and unable to burrow up through sediment overburden (Nelson, 1989; Wesseling et al., 1999)

The project is designed to avoid impacts to nearshore hardbottom communities. However, sand will bury supratidal, intertidal, and subtidal habitats comprised of unconsolidated sediments. The temporary loss of infaunal communities located in these zones is expected. An indirect effect is the temporary loss of a food source for foraging marine and avian predators.

In 2003, CPE's biological investigations revealed the physical vulnerability of the nearshore hardbottom in Collier County. The highest quality hardbottom is located in the Pelican Bay and Clam Pass Park Segments. High quality, vulnerable hardbottom is in the Delnor-Wiggins State Park and Vanderbilt Beach Segments. Low quality, vulnerable hardbottom is in the Park Shore and Naples Segments. Borrow Area T1 fill contains a mean grain size and silt content percentage that allows for an equilibrium toe of fill that will not directly impact the exposed nearshore hardbottom. Even so, sedimentation upon hardbottom substrates is one of the most prominent anthropogenic factors threatening functioning and diversity of reefs (Ginsburg, 1993). At the individual level, sedimentation is associated with less live coral, lower coral growth rates, greater abundance of branching forms, decreased calcification, and a decrease in net productivity (Bak, 1978; Riegl and Branch, 1995). High concentrations of suspended particles impact corals indirectly by attenuating available light energy (Gleason, 1993). The energy expended when shedding sediments may further decrease colony fitness by limiting energy and time devoted to other processes such as food capture, growth, tissue repair, and reproduction (Bak, 1978; Bak, 1979; Gleason, 1993). It has been shown that sedimentation can also have deleterious effects on the population and community level of corals by inhibiting population recruitment, causing changes in the relative abundances of coral species, reducing substrate cover by live corals, and plummeting species richness and diversity (Connell, 1973; Bak, 1978). Sedimentation and eutrophication of tropical coastal areas may contribute to fundamental changes in community structure.

Due to these factors, the Florida Department of Environmental Protection (FDEP) is requiring Collier County to construct 1.09 acres of artificial reef as mitigation for potential impacts to the nearshore hardbottom as a result of the project. A detailed biological monitoring plan (Appendix D) has also been developed with FDEP guidance to evaluate project impacts and the effectiveness of the mitigation reef.

Borrow Area Impacts

Benthic recolonization will occur following cessation of dredging. Seasonality and recruitment patterns indicate that removal of sand between late fall and early spring as proposed would result in less stress on benthic populations. Early-stage

succession will begin within days of sand removal through larval recruitment dominated by opportunistic species, especially polychaetes and bivalves. These species are adapted to environmental stress and exploit suitable habitat when it becomes available. Later successional stages of benthic recolonization will be more gradual; involving taxa that generally are less opportunistic and longer lived. Immigration of motile annelids, crustaceans, and echinoderms into impacted areas will also begin soon after excavation. While community composition may differ for a period of time after the last dredging, the infaunal assemblage type that exists in mined areas will be similar to naturally occurring assemblages in the region, particularly those assemblages inhabiting inter-ridge troughs.

Substantial recovery of the benthic infaunal communities in both Borrow Area T1 and beach fill areas should occur within several months. Previous studies have documented that rates of recolonization in areas of disturbed soft bottom habitats are extremely rapid (Simon et al., 1976; Oliver et al., 1977; Conner and Simon, 1979; Van Dolah et al., 1984). Full recovery of both areas, to a condition resembling pre-project conditions, may take several years (Nelson, 1993).

Based on previous observations of infaunal reestablishment, and assuming that dredged sites do not create a sink for very fine sediments or result in hypoxic or anoxic conditions, the infaunal community in dredged sites most likely will become reestablished within two to five years, and will exhibit levels of infaunal abundance, diversity, and composition comparable to nearby non-dredged areas. Given that the expected beach replenishment interval is estimated to be 6 to 8 years and that the expected recovery time of the affected benthic community after sand removal is anticipated to slightly less than that, the potential for significant cumulative benthic impacts is possible but unlikely. The project will not result in a significant adverse impact on benthic communities.

Benthic Infaunal Collection and Analysis

The sampling program proposed by CPE will involve the collection and analysis of samples from six (6) representative sampling locations. Two (2) collection sites will be located inside of the proposed T1 borrow area: one site will be located on the peak of the sand ridge to the east side of the borrow area; the second site will be located in the trough of a sand ridge to the west of the borrow area. These sampling station locations were identified to document species composition and variations infaunal population characteristics that could be attributable to differences in water depth and peak / trough position within the borrow site. Four (4) control sites will be located outside of the borrow area and potential impact zone from dredging activities, approximately 1/2 mile from the north, south, east and west sides of the borrow area. Geographic coordinates (state plane or lat/long) of the sample stations will be collected using a differential global positioning system (DGPS) and presented on project maps.

Sampling will be accomplished using a Hand Held Coring Device (HHCD) to collect representative surface samples from the borrow area and control sites. An HHCD collection device has been historically accepted for use by the state of Florida for infaunal studies collect samples of an appropriate size and quantity. Replicate samples are retained by a diver in a collection bag underwater and returned to the surface after collection of all samples at a site. The diver collecting the sample will follow collection procedures designed to minimize losses while collecting individual samples. Sample collection will occur once preceding project construction.

To ensure a valid statistical evaluation, five (5) replicate samples will be obtained at each of the six (6) sampling sites. After collection, the samples shall be preserved in a buffered formalin solution containing Rose Bengal protein specific dye, and sieved through a 500-micron (0.5-mm) screen. All organisms retained by the sieve shall be sorted and identified to the lowest practical taxonomic level. Species in each replicate will be identified and enumerated, data will be presented per replicate, and total station formats. For each station, a list of the number of individuals from each taxon, number of species, total number of organisms per square meter, and calculations of the Shannon and Simpson diversity indices, species richness and equitability.

The statistical analysis of the benthos will allow for the assessment of biodiversity and structural frameworks for determining distribution and abundance of populations, communities, and habitats. Pre-construction sampling will provide a benchmark of the effects to benthic infaunal assemblages prior to dredging as a method of assessing effect and monitoring recolonization of borrow site.

Grain Size and Organic Content Collection

In addition to the benthic infauna samples collected during this phase, sub-samples will be acquired to analyze the surficial sediments for grain size and organic content. Identifying the physical characteristics of the sediment will allow for comparisons of community characteristics present at each sampling site. Furthermore, these physical characteristics are important in evaluating whether the borrow site is serving as a sink for fine sediment accumulation.

No hardbottom benthic communities were identified in the remote sensing survey of Borrow Area T1 (CPE, 2004). In addition, the borrow area borders have a 400-ft buffer from the limit of the scanned area. Since no hardbottom resources are located within the borrow area or buffer regions, no adverse impacts to benthic hardbottom are expected to result from dredging. The details of the investigation are in the Cultural Resources Report provided in Appendix G.

3.3 SOCIOECONOMIC AND HUMAN RESOURCES

3.3.1 ARCHAEOLOGICAL RESOURCES

Environmental Setting

An archaeological remote sensing survey of Borrow Area T1 (Toms Hill) was performed by Tidewater Atlantic Research, Inc. (TAR), under the direction of CPE, to determine the proposed project's affect on potentially significant submerged cultural resources. As mentioned in Section 3.1.1, Borrow Area T1 lies in federal waters approximately 33 miles northwest of Vanderbilt Beach. The borrow area is located in the northeast part of Block 605 and the northwest part of Block 606, Charlotte Harbor area. Water depths range from 35 to 60 feet MLW.

All portions of the archaeological survey were conducted in accordance with the latest guidelines established by the MMS in NTL-2002-G01. The survey methodology and findings are provided in Appendix G. Sub-bottom data and samples of seismic and side scan was previously submitted during MMS review of the cultural resources and geotechnical report. The data is provided on a CD accompanying this EA.

A survey of historical and archaeological literature and archival background research confirmed considerable evidence of maritime activity in the eastern Gulf of Mexico. The area encompassing the southwest coast of Florida has been identified by the MMS as a low, recently revised to moderate, probability area for shipwrecks and shipwreck preservation. Although there are no documented shipwrecks or small vessel losses in the Toms Hills borrow area, the potential for those submerged cultural resources is moderate. Previous research of the Sanibel area has identified at least 17 shipwrecks offshore of Sanibel Island. The compiled list of ships known to have been lost in the Toms Hills vicinity can not be considered exhaustive, and unrecorded wrecks, especially from the earlier periods, may be present in the area currently under consideration.

Project Impacts

A 1989 study for the MMS by Garrison concluded that the area encompassing the southwestern coast of Florida is a low probability area for shipwrecks and shipwreck preservation (Garrison et al., 1989). The current NOAA chart 11426 does not identify any shipwreck and derelict sites in the vicinity of Borrow Area T1. However, previous research by TAR for this coastal region has recorded at least 17 vessel losses (CPE, 2004). These documented losses and that of possible unknown wrecks in the vicinity of the borrow area suggest a low to moderate potential for shipwreck sites. This conclusion is in agreement with a recent study by Panamerican Consultants, Inc. which revised the 1989 study conclusion for potential shipwrecks in the region from low to moderate (Panamerican Consultants, 2003).

The geotechnical and cultural resource investigation of the Toms Hill area documented a number of buried channels. These channels appear to be tidal in nature and formed in conjunction with the retreat of the Captiva-Sanibel headland. Although relict channels and other submerged geological features have been identified as potential markers of submerged prehistoric resources, the potential for such resources within the vertical and horizontal limits of the borrow area appear limited. These channels lie between 5 to 13 feet below the general seafloor surface with depths ranging between 8 and 16 feet deeper. Since the borrow area is a large sand ridge rising tens of feet above the surrounding seafloor, the channels are well below the zone of beach quality sand defined for dredging. Thus, the relict channel features are not recommended for avoidance or additional investigation for cultural resources.

Analysis of the remote sensing data revealed no acoustic and/or magnetic anomalies within or near Borrow Area T1. Even though the potential exists for prehistoric archaeological resources to occur regionally, none were found or identified during the investigation. In summary, excavation of Borrow Area T1 is not expected to have any significant adverse impacts on archaeological resources.

Mitigation Measures

No acoustic and/or magnetic anomalies have been identified within or near Borrow Area T1. If any unanticipated and potentially significant cultural material is uncovered during project activities, the MMS Chief, Leasing Division, Herndon, Virginia will be contacted for an immediate assessment of the material.

Based on the results of the archaeological survey and implementation of the above mitigation measure in the case of unanticipated encounters, the proposed dredging of Borrow Area T1 will not have a significant adverse impact on archaeological resources.

3.3.2 RECREATIONAL RESOURCES

Environmental Setting

Collier County's beaches anchor a major tourism industry for the area. Public beach access and parking are provided at strategic points along the shoreline. In addition, tourists and residents enjoy water related activities such as fishing, sailing, kayaking, snorkeling, and recreational diving. In Collier County, listed dive shops and dive boat operations are concentrated in the City of Naples area. There are more than 16 artificial reefs in Collier County. On average, organized dive trips range up to 25 miles offshore and last five to seven hours. Also, local fishing guides provide full-day or half-day fishing tours.

Recreational Fisheries

The recreational fisheries in Collier County is a strong industry. Recreational fisheries land more jack, snapper and sport fish than commercial fisheries. In 2003, the recreational fisherman brought in to Collier County about 50,000 pounds of red drum, 100,000 pounds of grouper and a quarter million pounds of mackerel and kingfish. The County accounts for 5% to 20% of the total west Florida landings, depending on species (NMFS, 2005). The value of recreational fisheries extends beyond the value of the fish alone, and includes transportation, dining, hotels, gear, souvenirs, guides and party boats. A summary of marine recreational fisheries for 2003 is provided in Appendix H.

The proposed project will have a short-term (6 month) impact on water related recreational activities in the vicinity of the project during construction. The results of the 2003 marine resources investigation (Appendix H) may enhance the recreational diving opportunities in the region considering the unique resources documented (CPE, 2004).

There are no Federal parks or wildlife refuges in or adjacent to the project. There is one local park, Lowdermilk Park, located in the project boundary. Two other parks, Delnor-Wiggins State Park and Clam Pass Park (County), are located adjacent to the project.

Project Impacts

The proposed project will have a short-term temporary (6 months) impact to beach goers but only in the area of active construction. However, this impact will not be significant, as the activities will relocate to other areas of the beach and away from the active construction areas. In the long-term, the proposed project will preserve and enhance the recreational experience for residents and visitors, alike.

3.3.3 ECONOMIC RESOURCES

Beaches

The major economic impacts of beach nourishment projects occur in three ways: an impact on property values, an impact on the tax bases of government, and an impact on sales and employment.

Beach nourishment projects enhance property values to the extent that they receive storm protection or that property owners are saved the cost of alternative property protection measures (i.e., sea walls). Also, property values will reflect the storm protection provided to adjacent public infrastructure and the enhanced recreation value of the restored beaches. Increases in property values will be reflected in higher revenues of those taxing authorities that levy ad valorem

property taxes, such as municipalities, school districts, special taxing districts, and county government.

Additionally, beaches make contributions to the economy beyond the direct benefits that show up in increased property values. They contribute to the spending of beachfront residents and non-residents in connection with the recreational use of the beaches. This spending results in increased sales by local businesses, and, therefore the creation of jobs.

An example of an economic study that reflects these impacts is the 1995-96 study performed for the Anna Maria Island Shore Protection Project by Regional Research Associates, Inc. This project is located on the west coast of Florida, approximately 100 miles north of the proposed project for Collier County. Anna Maria Island's five miles of beaches were restored in 1993. An economic study was performed prior to and after construction, providing a comprehensive picture of the economic impacts of the project. This study estimates that property tax collections increased in the county by $1.7 million annually, as a result of increased property values. The local taxing authority receiving the largest increase was the school district followed by the county. Also, local government sales tax revenues increased by $0.1 million annually and state sales tax revenues increased $0.4 million annually. In addition, total sales by businesses in the county increased an estimated $39.1 million annually. This resulted in the creation of approximately 1,100 jobs. Total sales by businesses in West Central Florida increased an estimated $68.1 million annually, resulting in the creation of approximately 1,900 jobs (Regional Research Associates, 1997).

Recent studies conducted in Lee County, Florida illustrate the damage prevention benefits that can accure to a beach project. Benefits for three projects in Lee County were recently calculated: Captiva Island, Estero Island and Gasparilla Island. Each island had a project and development similar in size to the project proposed for Collier County. The Lee County project area is just north of Collier County, with Estero Island only 13 miles north of Vanderbilt Beach. The storm damage benefits on Captiva Island were determined by Dr. William B. Stronge (2004) formerly of Regional Research Associates. The average annual benefits were $1.30 million per mile. The Corps of Engineers calculated storm damage prevention benefits for Gasparilla and Estero Islands with their General Reevaluation Report (USACE, 1999). The average annual benefits were determined to be $1.00 million/mile. Using an average benefit value from Lee County, the 8.6 mile long Collier County average annual storm damage prevention benefits would be $9.53 million.

Recreational benefits were determined for the three Lee County, Florida projects. Recreational benefits are based on the increased number of people that can fit on the beach and the improvement in beach experience provided by the larger beach. The Corps of Engineers bases beach benefits on the travel cost method (USACE, 1999) while benefits on Captiva Island were based on user interviews. The

average annual recreational benefits were $0.77 million/mile for all three project areas (USACE, 1999; Stronge, 2004). Based on this amount, the 8.6 mile long Collier County project area would have average annual recreational benefits of $6.62 million.

The total average annual benefits for Collier County based on average rates in Lee County is $16.15 million. The average benefit to cost ratio for the Lee County projects is 1.7.

The proposed project is expected to show similar results as the above referenced studies, and, therefore will have a positive economic impact on the area, region and state.

The local share of project cost is being financed by the tourist development tax on temporary accommodations, such as motel, hotels, and short term condominium rentals. The success of the proposed project will directly influence this tax.

Commercial Fisheries

Commercial fishermen utilize Collier County's coastal waters, fishing a wide array of gear for various economically important species.

Commercial fisheries in Collier County bring in a fair share of the Statewide catch. The most important finfish landings are mullet, mackerels, groupers and sharks. The 2003 Collier County finfish landings were 1.87 million pounds (FWC, 2005). Collier County lands a high share of the State invertebrate landings, which was 853,000 pounds in 2003 for the County. Topping their list of invertebrates is stone crabs, which is 22% of the Statewide catch. Stone crabs lands were 586,000 pounds in 2003 (FWC, 2005). The annual summary of commercial finfish and invertebrate lands for Collier County and adjacent Counties is provided in Appendix H.

Crabbing, trawling, and netting are common forms of harvesting marine fish. Crabbing season occurs between October 15 and May 15 of each year. This time period would overlap with the proposed construction time period of the beach nourishment project, resulting in a potential short-term impact involving the potential loss of trapping equipment inadvertently placed in contractor vessel travel corridors and limited access to certain crabbing areas. Communication with the local commercial fishing industry in Collier County will help to reduce or avoid conflicts between beach nourishment activities and commercial fishing activities.

3.3.4 ENVIRONMENTAL JUSTICE

Executive Order 12898 requires that the relative impacts of federal actions on minority populations and low-income populations be addressed to avoid

placement of a disproportionate share of adverse impacts of these actions on these groups. Low income populations are defined as households with income at or below the Department of Health and Human Services poverty guidelines, and minority populations as a person who is Black or African American, American Indian and Alaska Native, Asian American, or Hispanic or Latino.

An adverse impact is found to have a disproportionately high and adverse impact on minority or low-income populations when:

- The adverse impact is predominately borne by a minority population and/or a low-income population, or
- The adverse impact that will be suffered by the minority population and/or low-income population is more severe or of greater magnitude than the adverse impact that will be suffered by the non-minority population and/or non-low income population.

For purposes of this analysis, the project area included the Census Blocks located within ¼ mile of the proposed beach nourishment project. The percentage of minority and low-income populations within the project area were compared with the total County minority and low-income population percentages. Table 6 shows the race comparison and Table 7 shows the low-income comparison.

TABLE 6 - RACE

RACE	COLLIER COUNTY		PROJECT AREA	
	COUNT	PERCENT	COUNT	PERCENT
White	216,345	86%	6,320	99%
Black or African American	11,419	5%	4	<1%
American Indian and Alaska Native	733	<1%	4	<1%
Asian	1,569	<1%	12	<1%
Native Hawaiian and Other Pacific Islander	153	<1%	1	<1%
Two or more races	5,604	2%	18	<1%
Some other race	15,554	6%	4	<1%
Total	**251,377**		**6,363**	
Hispanic or Latino[1]	49,296	20%	46	1%

Source: Census Blocks, U.S. Census Bureau, 2000

[1]Hispanic or Latino is referred to by the U.S. Census Bureau as a person's self-identified origin. Their race was included in one of the above classified races.

TABLE 7 – POVERTY LEVEL

	COLLIER COUNTY	PROJECT AREA
TOTAL HOUSEHOLDS	102,973	2,315
TOTAL HOUSEHOLDS BELOW POVERTY LEVEL	4,772	20
PERCENT HOUSEHOLDS BELOW POVERTY LEVEL	5%	<1%

Source: Census Blocks, U.S. Census Bureau 2000

The proposed project does not contain a disproportionately high minority population as compared to the total County minority population. Also, there are not a disproportionately high percentage of households in the project area living below poverty level, as compared to the percentage of households in the County living below poverty level.

Based on this analysis, the proposed project will not have a disproportionate impact on minority or low-income populations.

3.4 CUMULATIVE IMPACTS

Cumulative impacts can be defined as the change in the environment that results from the incremental impact of a proposed project when added to other, related past, present, and reasonably foreseeable future projects. Cumulative impacts can result from individually minor, but collectively, significant impacts taking place over a period of time. A cumulative effect is deemed significant if a project's incremental contribution to a cumulative impact is "considerable".

Countywide, the loss of nearshore hardbottom habitat functional value has been attributable to natural causes (hurricanes, cold-front storms, and increased or decreased salinities) and human-induced effects (increased turbidity and decreases in water quality resulting from dredging, boating activities, urban runoff and other development pressures), which work in concert to deteriorate the environmental quality of the habitat. Stress loads are defined as high-impact, moderate-impact, and low-impact, and can target a specific region or area.

In 1996, Coastal Engineering Consultants carried out a beach restoration project within the Collier County project area using offshore borrow areas. In addition, there has been periodic dredging of the three inlets located within and adjacent to the project area. CPE's (2003) nearshore marine resource investigation report of the Collier County project area revealed the trend of heavier sediment accumulations within the Naples and Park Shore Segments and suggested this trend was the cumulative effect of multiple high-impact stress factors targeting a specific region. Probably the most influential stress in this area is the location of Doctors Pass. Located directly north of Naples and directly south of Park Shore (between R-57 and R-58), Doctors Pass has been stabilized and maintained since 1960. The flow of freshwater from neighboring bays and canals channels agricultural and storm water runoff and land-based sediments into this depositional zone. Furthermore, litorally transported materials from adjacent shoreline contribute to sedimentation stress on nearshore hardbottom habitats. Recent inlet maintenance included the Doctors Pass Maintenance Dredging Project (CEC, 1997) that entailed the dredging of a sediment basin within the ebb shoal and the placement of approximately 55,000 cubic yards of fill onto Naples Beach in 1996. Doctors Pass was dredged again between 2000 and 2002, which

removed 39,800 cubic yards of sand and 9,070 cubic yards of sand/rock (Staiger, 2003).

The 1996 Collier County Beach Restoration Project accounted for approximately 90,700 cubic yards of fill along a 3,800 ft stretch of shoreline in Park Shore, between R-50+350 and R-53+850, and approximately 759,150 cubic yards of fill along a 17,800 ft stretch of shoreline in Naples, between R-57+100 and R-77+650 (CEC, 1996). CEC Borrow Areas NB-II A, NB-II B, and NB-II C were utilized during the 1996 restoration project. Information relating to these Borrow Area characteristics was not made available, except that the location of CEC Borrow Areas NB-II A and NB-II B were in close proximity to the proposed, but eliminated from consideration, Borrow Area N5. The longshore transport of sediments from Doctors Pass, along with frequent storm activity, leads to high erosion rates in this area.

Rapid population growth of Florida's southwest coast, specifically in the Naples area, may also contribute to the degradation of the nearshore marine habitats as a result of increased storm-water and freshwater flows from developed upland properties. Collier County's population is expected to increase by 50% between 1994 and 2015 (NPA Data Services, Inc., 1995).

Similarly, the two northern-most segments, Delnor-Wiggins State Park and Vanderbilt Beach, were determined to be susceptible to moderate sediment accumulations from multiple moderate-impact stress factors targeting a specific region (CPE, 2003). Probably the most influential stress in this area is Wiggins Pass. Located directly north of the Delnor-Wiggins State Park Segment (between R-17 and R-18), Wiggins Pass is a natural inlet that has been relatively stable since 1927. Recent inlet maintenance included the Wiggins Pass Inlet Management Plan (CPE, 1995) that entailed periodic dredging and sediment bypassing. An average yearly rate of 18,600 cubic yards has been dredged since 1984, of which an estimated 14,000 cubic yards per year has been placed on the beaches to the south of Wiggins Pass. The 1996 Collier County Beach Restoration Project accounted for approximately 322,800 cubic yards of fill along an 8,000 ft. stretch of shoreline in Vanderbilt Beach between R-22+700 and R-30+300 (CEC, 1996). CEC Borrow Areas 6, NB-II A, and NB-II B were utilized as a sand source for the 1996 restoration project. Information relating to borrow area characteristics was not made available, except that the location of CEC Borrow Areas NB-II A and NB-II B were in close proximity to the proposed, but eliminated from consideration, CPE Borrow Area N5. The longshore transport of sediments from Wiggins Pass, along with frequent storm activity, leads to high erosion rates in this area.

The areas of Pelican Bay and Clam Pass Park were determined to have a trend of minimum sediment accumulations as an effect of multiple low-impact stress factors targeting a specific region (CPE, 2003). Probably the most influential stress in this area is Clam Pass. Located in the southern section of the Clam Pass

Park Segment (between R-40 and R-41), Clam Pass is a small, natural inlet that has been subject to seasonal variations and periodic closures. The inconsistent flow of freshwater through the pass doesn't allow a major influx of agricultural storm water runoff or land deposition into this area. Recent inlet maintenance included the dredging of an average 11,250 cubic yards per year since 1995 (Collier County, 2002). The 1996 Collier County Beach Restoration Project supplied no fill for this area. The longshore transport of sediments from Clam Pass, along with frequent storm activity, leads to low average erosion rates in this area, although periodic hotspots occur. The lack of housing construction in this immediate area is most likely a contributor to the environmental integrity of this nearshore hardbottom community.

The combined factors currently affecting the project area include freshwater run-off and drainage, red-tide and decomposing estuarine deposits, population growth and urban development, storms and other natural processes, past beach projects and ongoing inlet maintenance activities. The incremental contribution of the proposed project is minor in comparison to historic and regional activities affecting coastal resources and will not cause significant changes to the coastal human and natural environment. The higher quality material, proposed for use from the T1 Borrow Site, combined with a project design life of six to eight years will effectively reduce the need for supplemental and reactive beach / dune restoration activities. These more frequent stress events related to beach restoration activities, such as periodic truck-haul projects using inland sand sources, will become less necessary given the comprehensive nature of the proposed project. Furthermore, although the current project is designed to avoid all hardbottom impacts to nearshore resources resulting from project fill equilibration, Collier County's commitment to construct 1.09 acres of nearshore artificial reef can be viewed as a net benefit of the project. Based on the current project design and construction features (Chapter 2), potential impacts and mitigation commitments (Chapter 3), the project is not expected to cause any significant cumulative impacts.

4.0 ALTERNATIVES

In addition to Borrow Area T1, the alternative sand source evaluated and rejected for use during the proposed project was Borrow Area N5. The characteristics of this site are identified in this document and were shown to be a viable alternative to T1 sand in selected areas of the proposed project. However, this borrow site was been withdrawn from consideration at the request of the Florida Department of Environmental Protection, and is longer a viable alternative. Borrow Area T1 is the only feasible alternative for constructing the proposed project with offshore sand.

The MMS considered the following alternative to the proposed action: Do Not Issue a Noncompetitive Lease for Offshore Sands. This alternative would deny Collier County access to offshore sands.

Under the do not issue a noncompetitive lease alternative, Collier County considered the following project alternatives: (1) a No Project Alternative under which the existing use of sand from upland sources and inlet dredging is retained; and (2) an alternative which increases inlet dredging and the use of upland sand sources to meet the volumetric needs of the proposed design.

Factors taken into account in addressing the feasibility of alternatives included: construction feasibility, economic viability, and environmental sensitivity. Alternatives could reasonably be eliminated from detailed consideration due to: (1) failure to meet most of the basic project objectives; (2) infeasibility; or (3) inability to avoid significant environmental effects.

4.1 No Project Alternative

Under this alternative, the project would not be developed. This would require Collier County to continue truck hauling sand from upland sources to repair any damage due to erosion. Truck hauling is expensive and intrusive. Sand placement from existing inlet dredging would supplement the upland sand source truck haul operation. The beneficial impacts of the project to substantially increase sea turtle nesting habitat would be precluded. The alternative would not mitigate the existing erosion and reduce exposure of existing infrastructure and upland properties to potential storm damage. There would be continued disruption to the public and beach environs. In addition, the cost of truck haul would lead to a reduction in the renourishment volumes, and ultimately the size of the beach.

The no-project scenario is considered unacceptable because it provides minimal storm protection for the beach/dune system, public infrastructure, and upland properties; and does not allow for the restoration of essential nesting habitat for listed sea turtle species.

4.2 Alternative Using Inlet Dredging and Upland Sources

Under this alternative, existing inlet dredging would be increased and upland sand sources would be used to satisfy the required fill volumes of the proposed project. An additional 100,000 cubic yards per year of sand would need to come from increased inlet dredging and upland sources to meet the proposed project's beach width and design life. This alternative would avoid adverse impacts to hardbottom communities. There would be a significant increase in construction traffic from upland excavation and overland transport, as compared to the no project alternative and the proposed project. This alternative, if implemented, would repeatedly disrupt public access. Beach/dune system disturbances would likely result on an annual basis resulting in a determination that this alternative is the most environmentally and economically expensive alternative to implement. The alternative would provide the benefit of increased sea turtle nesting habitat, but at a smaller beach width.

4.3 Environmentally Preferred Alternative

The no-project alternative with retention of the existing truck hauling and inlet dredging operations would not allow for any increase in sea turtle nesting habitat, would continue to impact beach environs, and would not address the Collier County's shoreline erosion problem in a comprehensive regional manner.

Under the alternative using increased inlet dredging and upland sources, sea turtle nesting habitat would be substantially increased. Construction impacts to beach habitats would be greater than the proposed project, due to the method, duration, and frequency of construction. Increased dredging activity of the inlets could have an adverse impact on adjacent beaches and fisheries during those periods of active sand transfer.

The proposed project utilizes beach compatible sand from an offshore borrow area to address the erosion problem with minimal environmental impacts. Because of the beneficial effects on sea turtle nesting habitat, avoidance of any impact to hardbottom communities, and the short-term nature of impacts to beach habitats, the proposed project has been selected and permitted by state and federal resource protection agencies as the environmentally preferred alternative.

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and U.S. FISH AND WILDLIFE SERVICE

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JOINT COASTAL (STATE) PERMIT
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SUB-APPENDIX D-3
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COASTAL SHOREBIRD MANAGEMENT PLAN

COASTAL PLANNING & ENGINEERING, INC.

SUB-APPENDIX D-4
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MITIGATION SITE (REEF) INVESTIGATION

SUB-APPENDIX H-4
COLLIER COUNTY SEA TURTLE PROTECTION PLAN ANNUAL REPORT - 2004

COASTAL PLANNING & ENGINEERING, INC.

SUB-APPENDIX H-5
MARINE FISHERIES INFORMATION

SUB-APPENDIX H-5-1
ANNUAL LANDINGS SUMMARY (FWC, 2003)

SUB-APPENDIX H-5-2
MARINE RECREATIONAL FISHERIES STATISTICS (NMFS)

APPENDIX C

USACE PERMIT NO. SAJ-2003-12405 (IP-MN), NOVEMBER 17, 2005

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

November 17, 2005

Regulatory Division
South Permits Branch
West Permits Section
SAJ-2004-12405(IP-MN)

Gary McAlpin, Coastal Project Manager
Collier County Government
3050 Horseshoe Drive, Suite 218
Naples, Florida 34104

Dear Mr. McAlpin:

We are pleased to enclose the Department of the Army permit and a Notice of Authorization which should be displayed at the construction site. Work may begin in accordance with the terms and conditions of the issued permit but the appropriate Regulatory Section Chief as representative of the District Engineer must he notified of:

a. The date of commencement of the work.

b. The dates of work suspensions and resumptions if work is suspended over a week, and

c. The date of final completion.

A map showing Regulatory field offices, addresses, and telephone numbers can be found on our website at www.saj.usace.army.mil/permit/offices/geographic_alignment.htm.

The field office is responsible for inspections to determine that permit conditions are strictly adhered to. A copy of the permit and drawings must de available at the site of work.

IT IS NOT LAWFUL TO DEVIATE FROM THE APPROVED PLANS ENCLOSED.

RECEIVED
NOV 21

Sincerely,

Lawrence C. Evans
Chief, Regulatory Division

Enclosures

This notice of authorization must be conspicuously displayed at the site of work

United States Army Corps of Engineers

To initially discharge approximately 825,000 cubic yards of beach quality sand to renourish Vanderbilt, Park Shore, Naples, Pelican Bay, and North Park Shore beaches and to discharge up to 800,000 cubic yards of beach quality sand to periodically renourish the same beaches. Gulf of Mexico in Sections 29 and 32, Township 48 South, Range 25 East, Sections 5,8,16,21 and 28, Township 49 South, Range 25 East, and Sections 4 and 9, Township 50 South, Range 25 East, Collier County, Florida.

has been issued to the **Collier County BCC**

on November 1, 2005.

Address of Permittee:
Collier County Government
3050 Horseshoe Drive, Suite 218
Naples, Florida 34104

SAJ-2003-12405(IP-MN)

Robert M. Carpenter
Colonel, U.S. Army
District Engineer

DEPARTMENT OF THE ARMY PERMIT

Permittee: COLLIER COUNTY BCC

Permit No. SAJ-2003-12405(IP-MN)

Issuing Office: U.S. Army Engineer District, Jacksonville

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: To periodically renourish Vanderbilt, Park Shore, Naples, Pelican Bay, and North Park Shore beaches over a **10-year period.** The initial renourishment will involve the discharge approximately 825,000 cubic yards (cy) of sand with up to 800,000 cubic yards of sand placed on these beaches over 10 years on 6-8 year renourishment cycles. The borrow area (T1) is located approximately 33 miles to the east northeast of Vanderbilt Beach. The method of sand placement will be through hopper dredging. All work is to be completed in accordance with the attached plans numbered SAJ-2003-12405(IP-MN) in 28 sheets dated 10-3-05 and Attachment "A" entitled "Standard Hopper Dredge Conditions" dated November 21, 2003.

Project Location: Sections 29 and 32, Township 48 South, Range 25 East, Sections 5,8,16,21 and 28, Township 49 South, Range 25 East, and Sections 4 and 9, Township 50 South, Range 25 East, Gulf of Mexico, Collier County, Florida.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **Nov 1,2015**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature **and mailing address** of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. The attached Specific Conditions of Water Quality Certification/Permit number 0222355-001-JC issued by the Florida Department of Environmental Protection (FDEP) on January 12,2005, address most of the conditions that the District Engineer (DE) has determined are necessary to satisfy legal and public interest requirements for issuance of this permit. Therefore, all of the FDEP permit specific conditions are hereby incorporated into this Department of the Army (DA) permit including the conditions related to the artificial reef construction, shorebird management plan, and Florida manatee construction conditions.

2. The permittee shall adhere to all the conditions contained in the attached Biological Opinion for nesting sea turtles dated September 20, 2005, by the U.S. Fish and Wildlife Service.

3. The permittee shall adhere to the conditions contained in Attachment "A" to this permit document and to the Regional Biological Opinion issued by the NMFS for hopper dredges dated October 11, 2003.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal projects.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

J Mary McAlpin 11/8/2005

(PERMITTEE) (DATE)

J. GARY McALPIN
COLLIER COUNTY COASTAL PROJECTS MANAGER

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

for (DISTRICT ENGINEER) 11/17/2005

(DATE)

Robert M. Carpenter
Colonel, U.S. Army

DEPARTMENT OF THE ARMY PERMIT TRANSFER REQUEST

PERMIT NUMBER: **SAJ-2003-12405(IP-MN)**

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. Although the construction period for works authorized by Department of the Army permits is finite, the permit itself, with its limitations, does not expire.

To validate the transfer of this permit and the responsibilities associated with compliance with its terms and conditions, have the transferee sign and date below and mail to the U.S. Army Corps of Engineers, Regulatory Division, Post Office Box 4970, Jacksonville, Florida, 32232-0019.

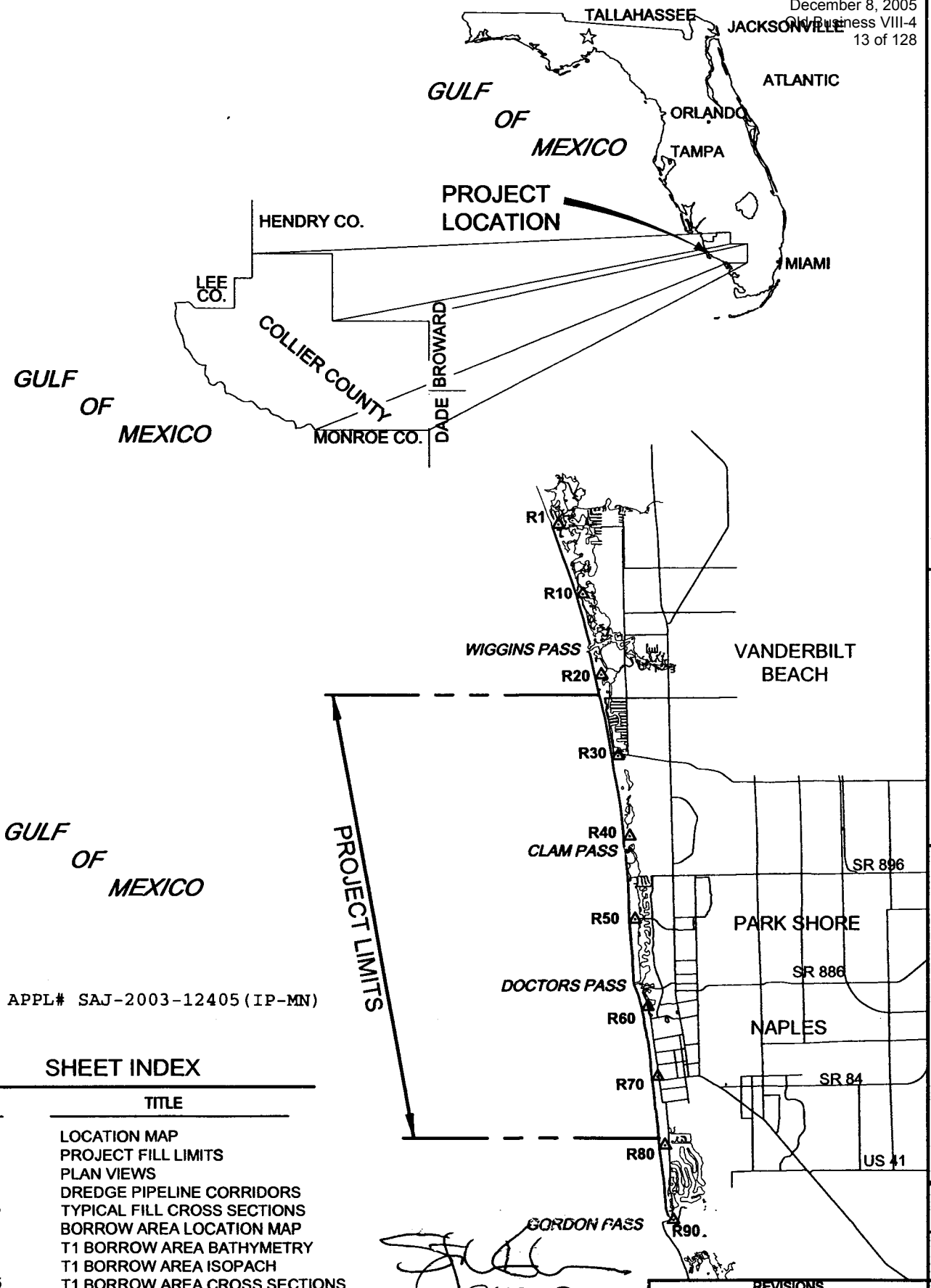
TRANSFEREE-SIGNATURE **DATE**

(NAME-PRINTED) **(NAME OF SUBDIVISION)**

(ADDRESS) **(Lot #)** **(Block #)**

(CITY, STATE, AND ZIP CODE)

(TELEPHONE NUMBER W/AREA CODE)



COE APPL# SAJ-2003-12405(IP-MN)

SHEET INDEX

NO.	TITLE
1	LOCATION MAP
2	PROJECT FILL LIMITS
3-16	PLAN VIEWS
17	DREDGE PIPELINE CORRIDORS
18-20	TYPICAL FILL CROSS SECTIONS
21	BORROW AREA LOCATION MAP
22	T1 BORROW AREA BATHYMETRY
23	T1 BORROW AREA ISOPACH
24-25	T1 BORROW AREA CROSS SECTIONS
26	T1 BORROW AREA FENCE DIAGRAM LINE 1
27	T1 BORROW AREA FENCE DIAGRAM LINE 2
28	COMBINED EQUILIBRUIM CROSS SECTION

34857
10-3-05

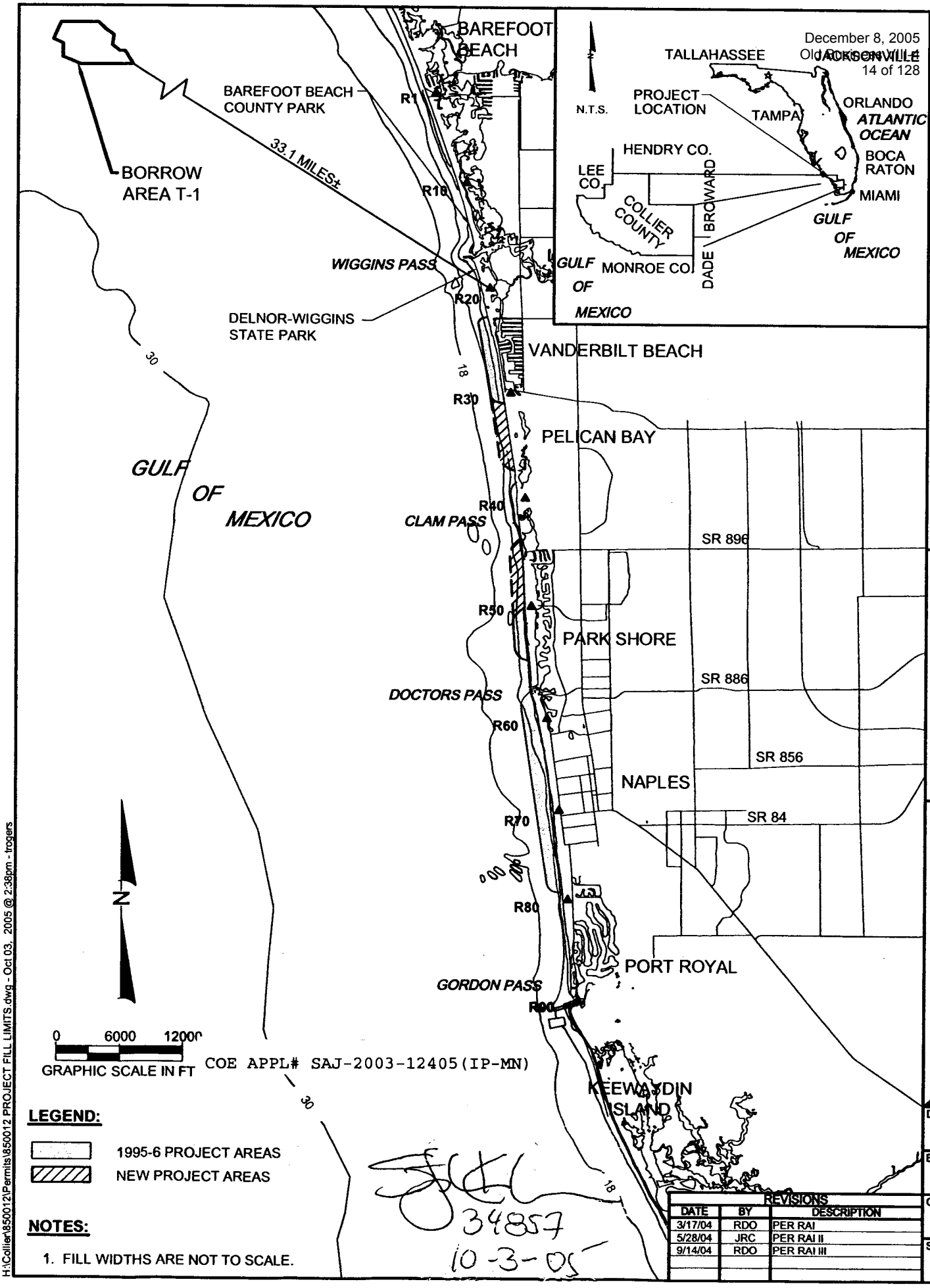
REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	PER RAI
5/28/04	JRC	PER RAI II
9/14/04	RDO	PER RAI III
2/4/05	DNR	PERMIT MOD 1
9/30/05	STR	N.T.P.

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
LOCATION MAP

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116
COASTAL PLANNING & ENGINEERING, INC.

DATE: 8/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 1

H:\Collier\850022\Permit\850022 LOCATON MAP.dwg - Oct 03, 2005 @ 9:07am - trogers



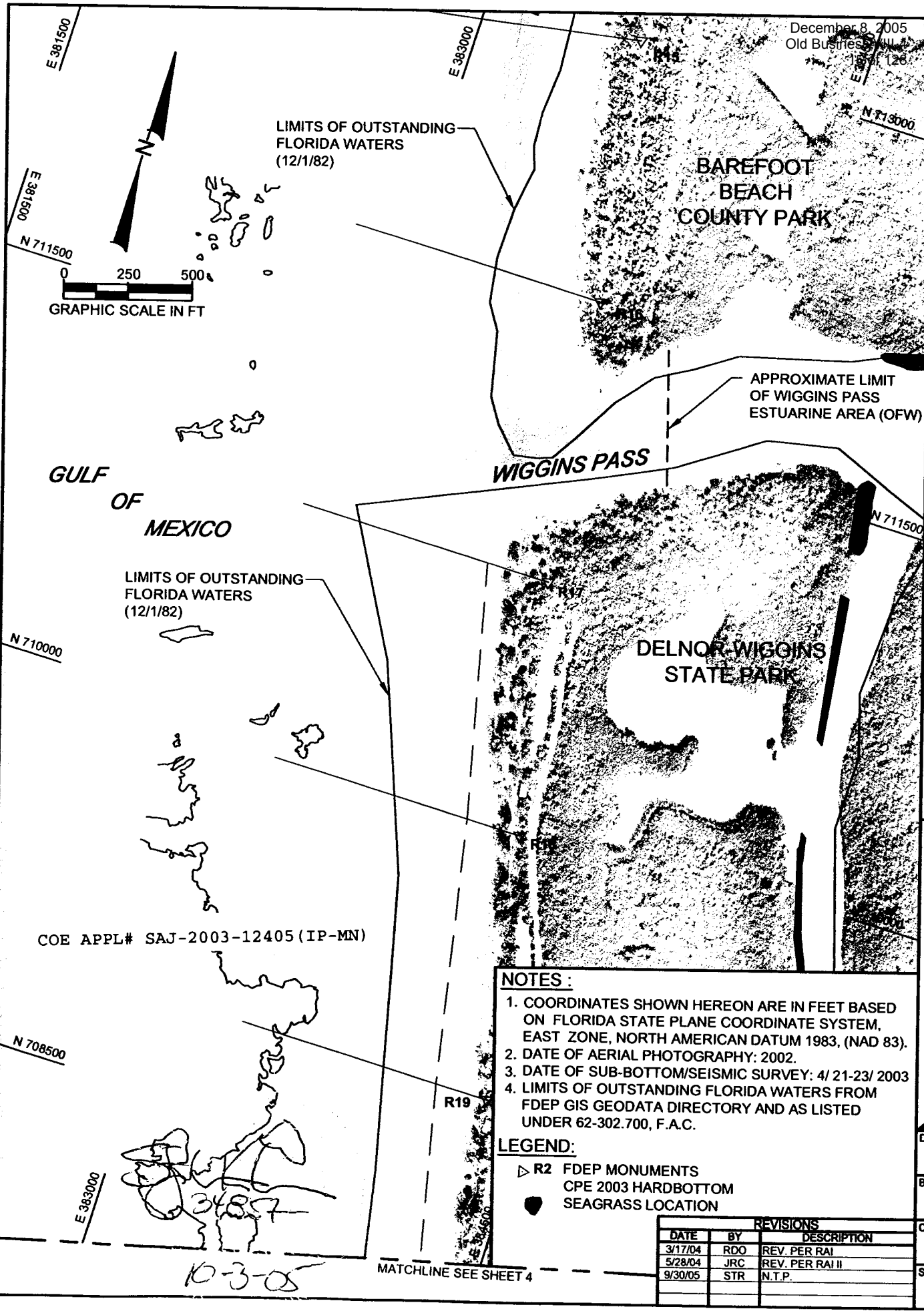
REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	PER RAI
5/28/04	JRC	PER RAI II
9/14/04	RDO	PER RAI III

TITLE: COLLIER COUNTY BEACH RENOURISHMENT PROJECT PROJECT FILL LIMITS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116
COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 2

H:\Collier\850012\Permits\850012 PROJECT FILL LIMITS.dwg - Oct 03, 2005 @ 2:38pm - trogers



NOTES :

1. COORDINATES SHOWN HEREON ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD 83).
2. DATE OF AERIAL PHOTOGRAPHY: 2002.
3. DATE OF SUB-BOTTOM/SEISMIC SURVEY: 4/ 21-23/ 2003
4. LIMITS OF OUTSTANDING FLORIDA WATERS FROM FDEP GIS GEODATA DIRECTORY AND AS LISTED UNDER 62-302.700, F.A.C.

LEGEND:

▷ R2 FDEP MONUMENTS
CPE 2003 HARDBOTTOM
SEAGRASS LOCATION

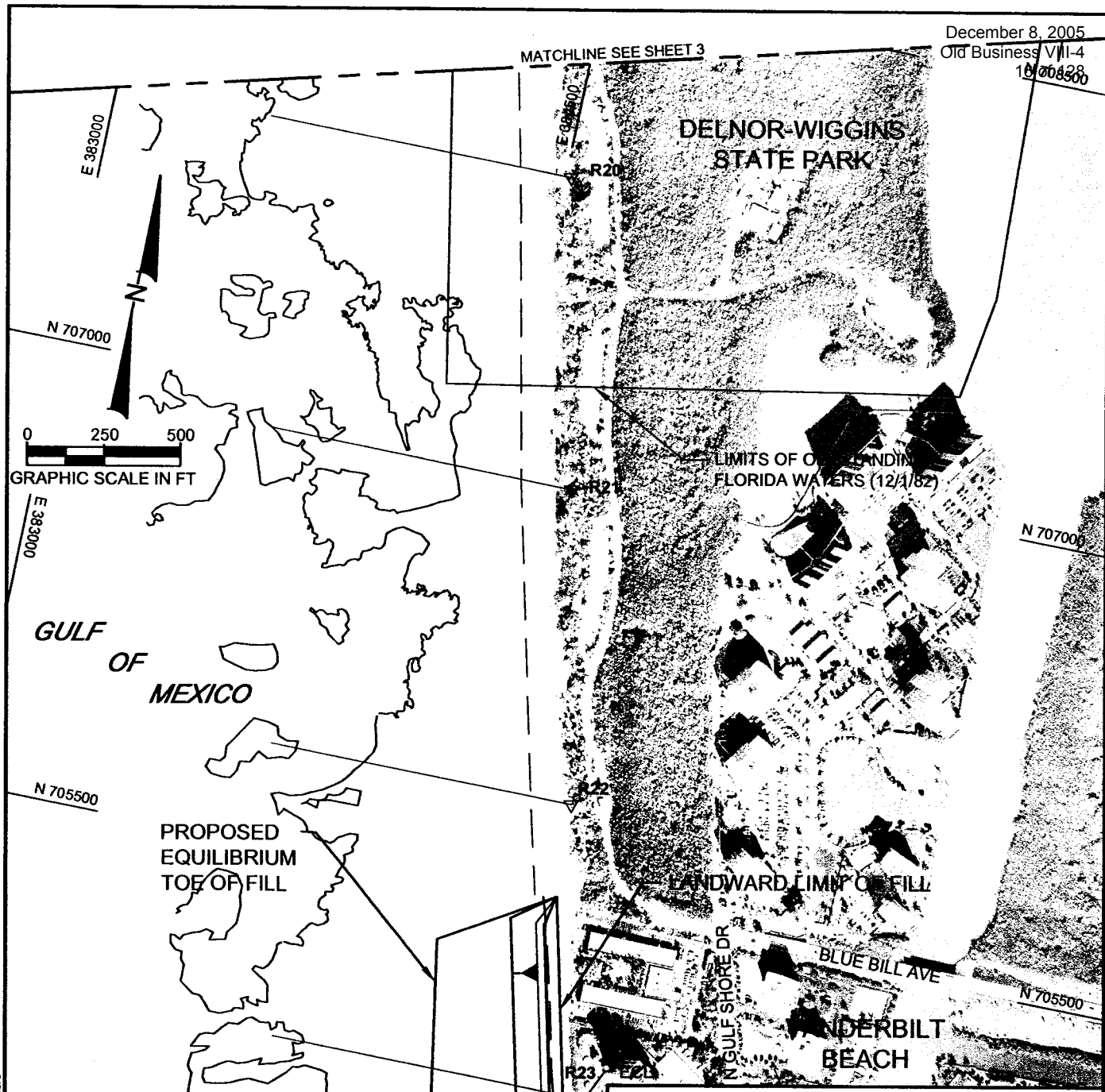
REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/30/05	STR	N.T.P.

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEWS

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 3

H:\Collier\850022\Permit\850022 Plan View.dwg - Oct 03, 2005 @ 8:41am - trogers



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3. LIMITS OF OUTSTANDING FLORIDA WATERS FROM FDEP GIS GEODATA DIRECTORY AND AS LISTED UNDER 62-302.700, F.A.C.
4. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
5. THE PROPOSED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.

LEGEND:

▷ R2 FDEP MONUMENTS
CPE 2003 HARDBOTTOM

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/14/04	RDO	REV. PER RAI III
9/30/05	STR	N.T.P.

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEWS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 4

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SGAL
34857
10-3-05

MATCHLINE SEE SHEET 4

N

0 250 500
GRAPHIC SCALE IN FT

N 702500

PROPOSED EQUILIBRIUM TOE OF FILL

E 384500

E 386000

R25

SEABREEZE AVE

CHANNEL DR

N 702500

BAYVIEW DR

R26

N GULFSHORE BLVD

LANDWARD LIMIT OF FILL

VANDERBILT BEACH

N 701000

2004 PROPOSED PIPELINE CORRIDOR P1

R27

N 701000

E 387500

GULF OF MEXICO

ECL

CONSTRUCTION TOE OF FILL

N 699500

CONSTRUCTION BERM CREST

COE APPL# SAJ-2003-12405(IP-MN)

34857
10-3-05

E 384500

E 386000

R29

MATCHLINE SEE SHEET 6

NOTES :

1. COORDINATES SHOWN HEREON ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD 83).
2. DATE OF AERIAL PHOTOGRAPHY: 2002.
3. DATE OF SUB-BOTTOM/SEISMIC SURVEY: 4/ 21-23/ 2003
4. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
5. THE PROPOSED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.

LEGEND:

▷ R2 FDEP MONUMENTS
CPE 2003 HARDBOTTOM
CONSTRUCTION ACCESS
AREAS OF CONCERN

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/14/04	RDO	REV. PER RAI III
9/30/05	STR	N.T.P.

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEWS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 5

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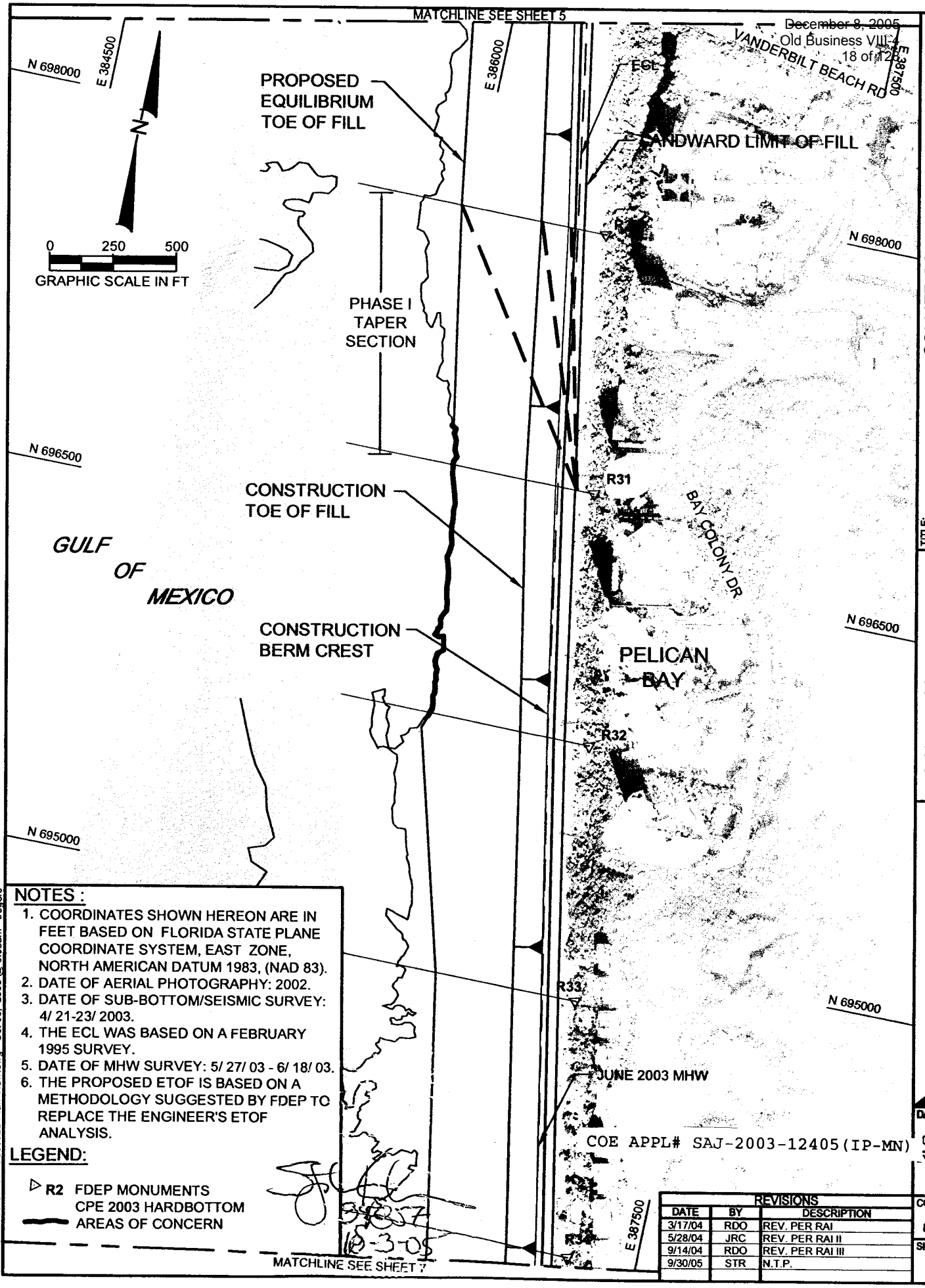

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2. DATE OF AERIAL PHOTOGRAPHY: 2002.
3. DATE OF SUB-BOTTOM/SEISMIC SURVEY: 4/ 21-23/ 2003.
4. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
5. DATE OF MHW SURVEY: 5/ 27/ 03 - 6/ 18/ 03.
6. THE PROPOSED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.

LEGEND:

▷ R2 FDEP MONUMENTS
CPE 2003 HARDBOTTOM AREAS OF CONCERN

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/14/04	RDO	REV. PER RAI III
9/30/05	STR	N.T.P.

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEWS

TITLE:

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 6

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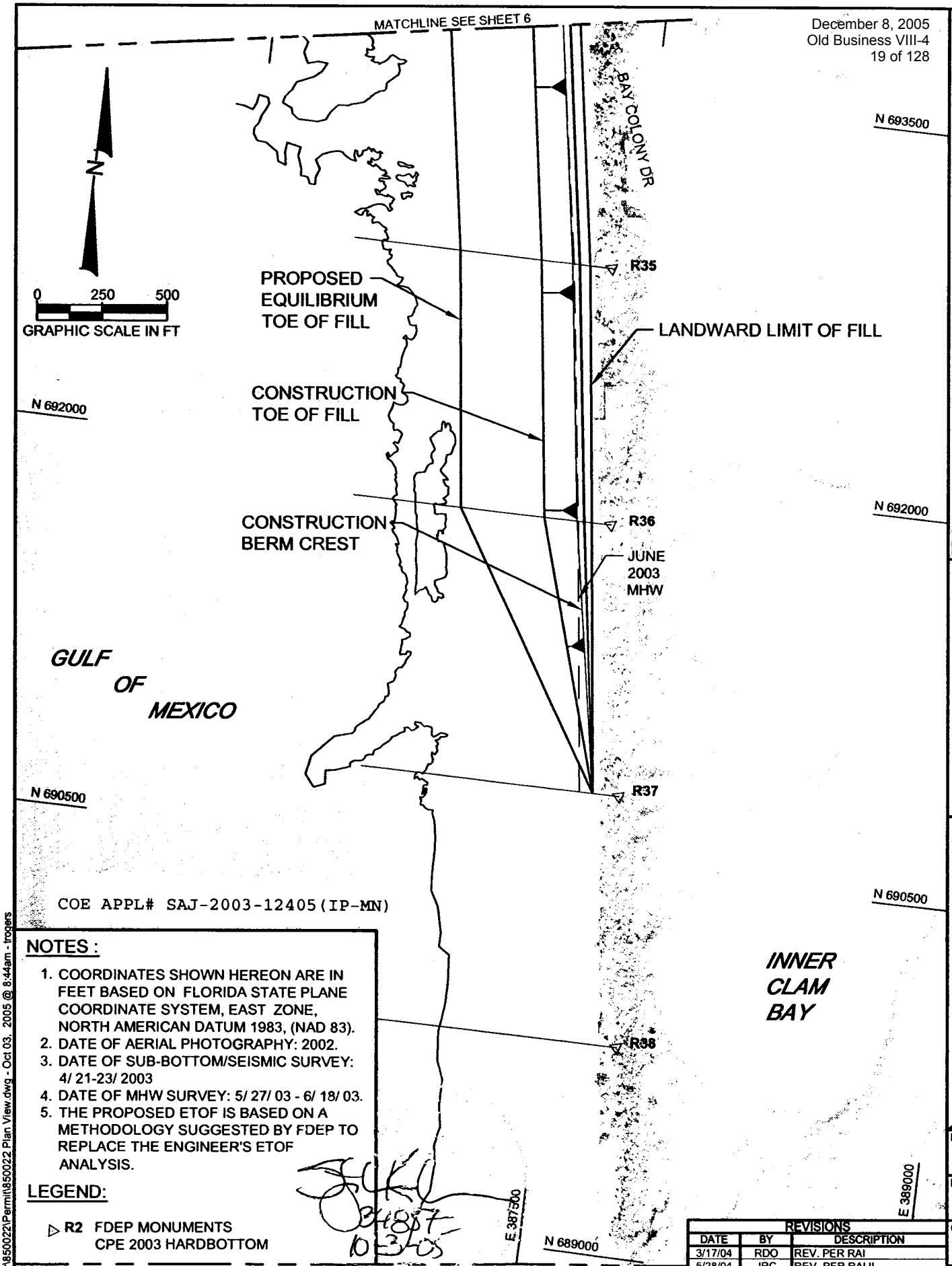

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4. DATE OF MHW SURVEY: 5/ 27/ 03 - 6/ 18/ 03.
5. THE PROPOSED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.

LEGEND:

▷ R2 FDEP MONUMENTS CPE 2003 HARDBOTTOM

SCKD 34857 10-3-05

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/14/04	RDO	REV. PER RAI III
9/30/05	STR	N.T.P.

TITLE: COLLIER COUNTY BEACH RENOURISHMENT PROJECT PLAN VIEWS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116
COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 7

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December 8, 2005
Old Business VII.4
20 of 28

MATCHLINE SEE SHEET 7

E 386000

E 387500

E 389000

N

0 250 500
GRAPHIC SCALE IN FT

N 687500

R39

R40

CPE 2003 HARDBOTTOM

N 687500

CLAM PASS

N 686000

GULF OF MEXICO

CLAM PASS COUNTY PARK

N 686000

E 389000

COE APPL# SAJ-2003-12405(IP-MN)

N 684500

R43

E 387500

MATCHLINE SEE SHEET 9

NOTES :

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2. DATE OF AERIAL PHOTOGRAPHY: 2002.
3. DATE OF SUB-BOTTOM/SEISMIC SURVEY: 4/ 21-23/ 03

LEGEND:

▷ R2 FDEP MONUMENTS
CPE 2003 HARDBOTTOM

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/30/05	STR	N.T.P.

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEWS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
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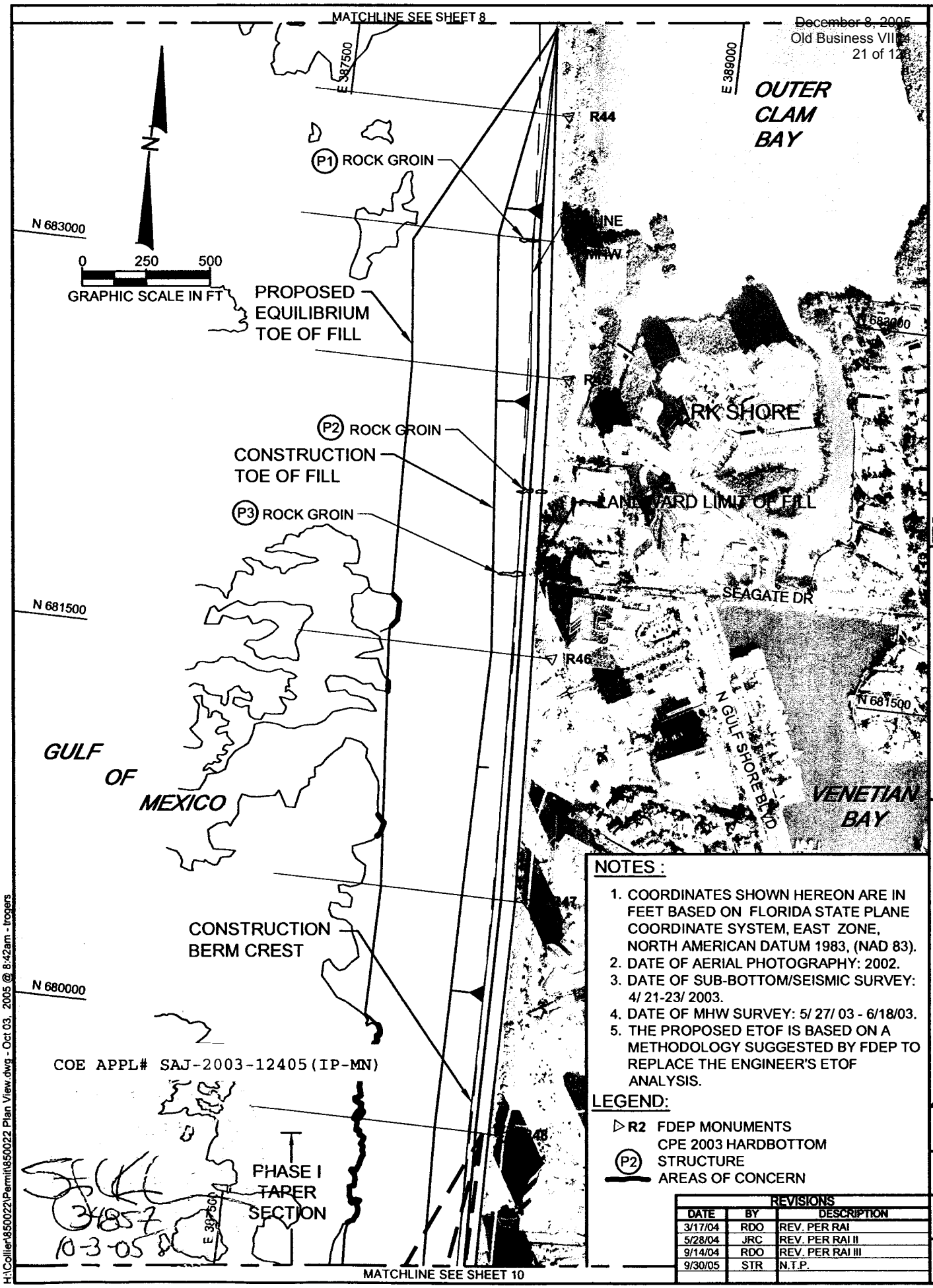
34857
10/23/05



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4. DATE OF MHW SURVEY: 5/ 27/ 03 - 6/18/03.
5. THE PROPOSED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.

LEGEND:

▷ R2 FDEP MONUMENTS
(P2) CPE 2003 HARDBOTTOM STRUCTURE
AREAS OF CONCERN

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/14/04	RDO	REV. PER RAI III
9/30/05	STR	N.T.P.

TITLE: COLLIER COUNTY BEACH RENOURISHMENT PROJECT PLAN VIEWS

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 9

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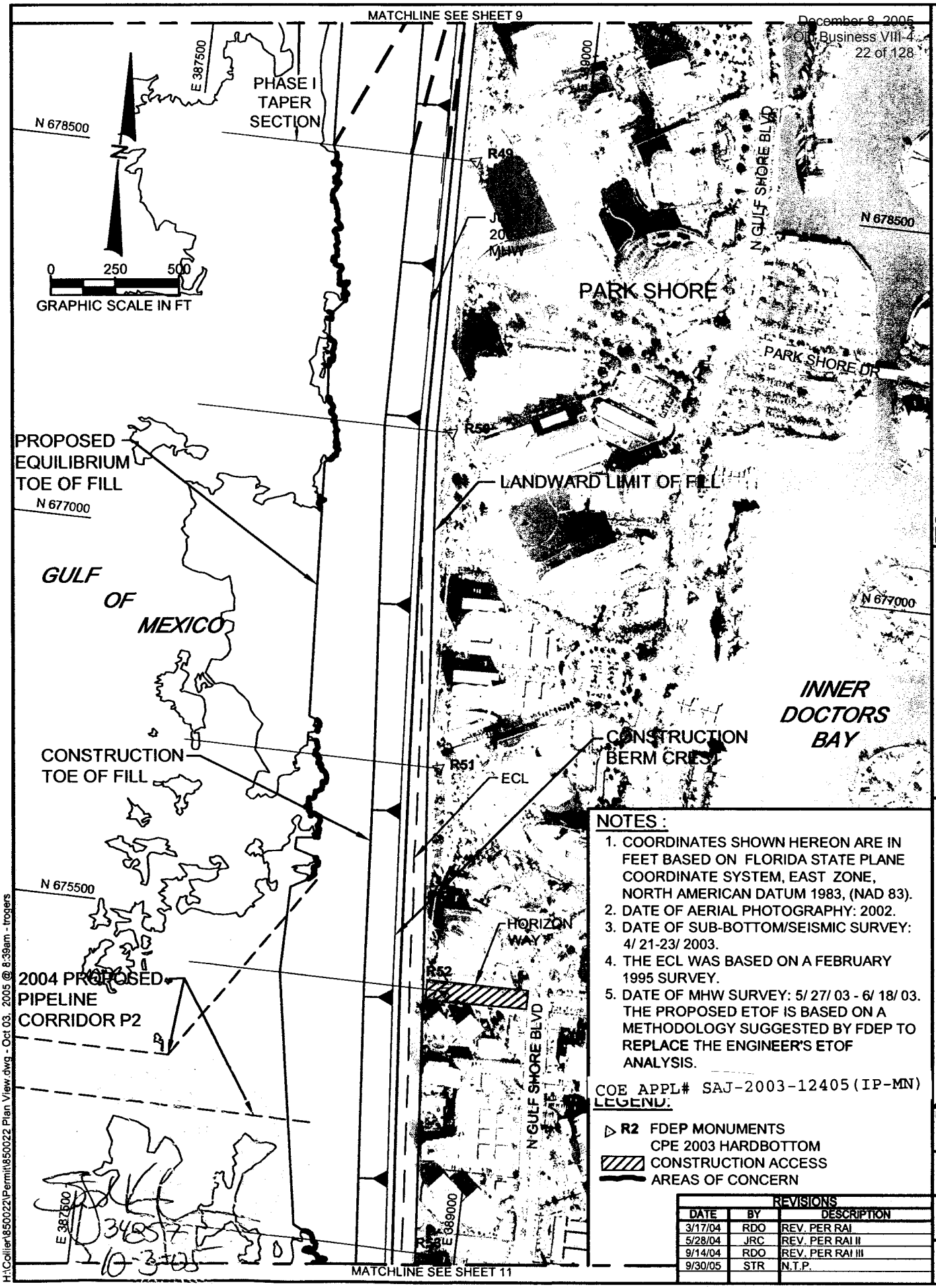
SFWMD 34857 10-3-05



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2. DATE OF AERIAL PHOTOGRAPHY: 2002.
3. DATE OF SUB-BOTTOM/SEISMIC SURVEY: 4/ 21-23/ 2003.
4. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
5. DATE OF MHW SURVEY: 5/ 27/ 03 - 6/ 18/ 03. THE PROPOSED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.

COE APPL# SAJ-2003-12405(IP-MN)

LEGEND:

- ▷ R2 FDEP MONUMENTS
- CPE 2003 HARDBOTTOM
- CONSTRUCTION ACCESS
- AREAS OF CONCERN

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/14/04	RDO	REV. PER RAI III
9/30/05	STR	N.T.P.

TITLE: COLLIER COUNTY BEACH RENOURISHMENT PROJECT PLAN VIEWS

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 10

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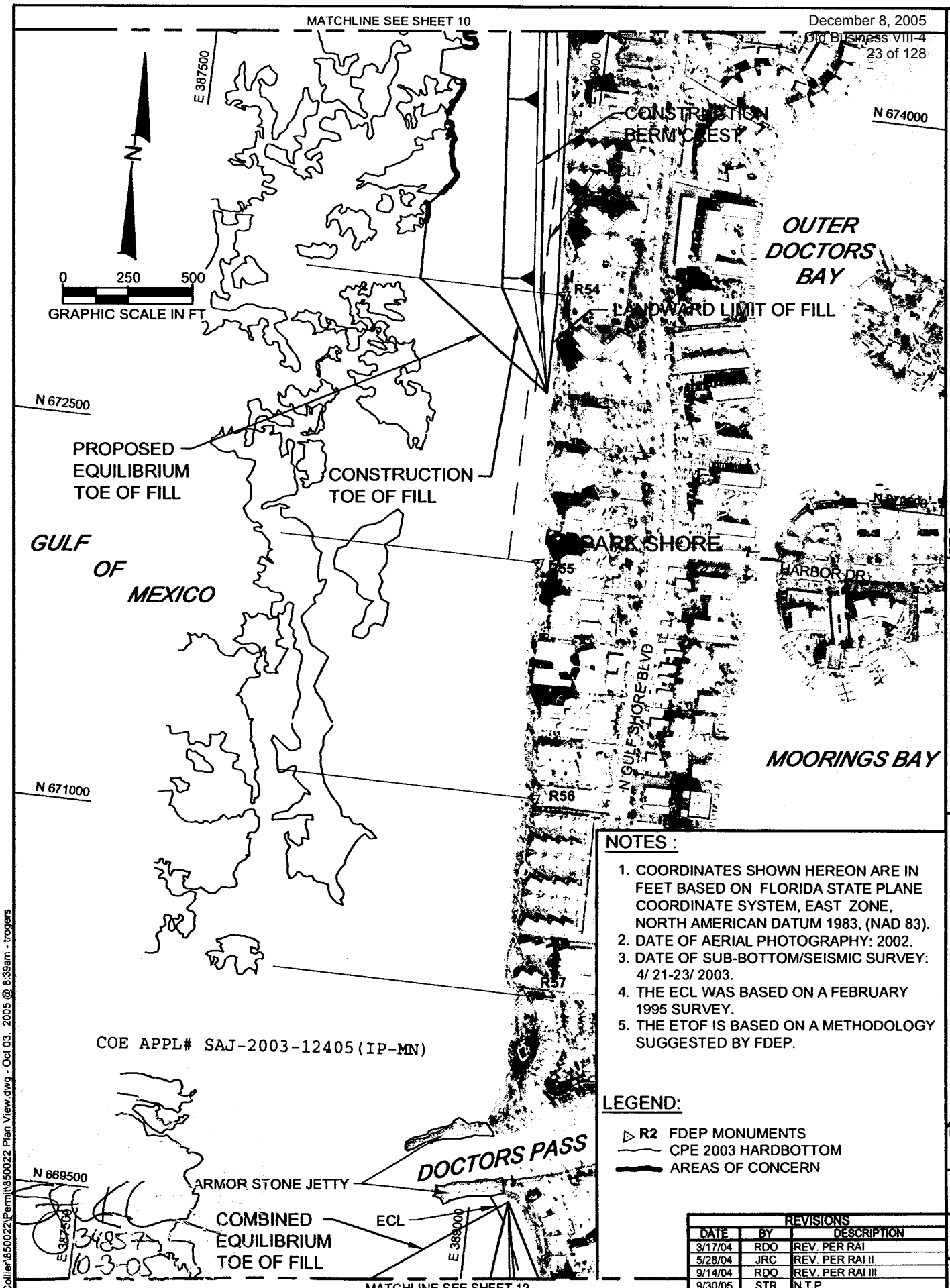

NOTES :

1. COORDINATES SHOWN HEREON ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD 83).
2. DATE OF AERIAL PHOTOGRAPHY: 2002.
3. DATE OF SUB-BOTTOM/SEISMIC SURVEY: 4/ 21-23/ 2003.
4. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
5. THE ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP.

LEGEND:

- ▷ R2 FDEP MONUMENTS
- CPE 2003 HARDBOTTOM
- AREAS OF CONCERN

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/14/04	RDO	REV. PER RAI III
9/30/05	STR	N.T.P.

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEWS

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 11

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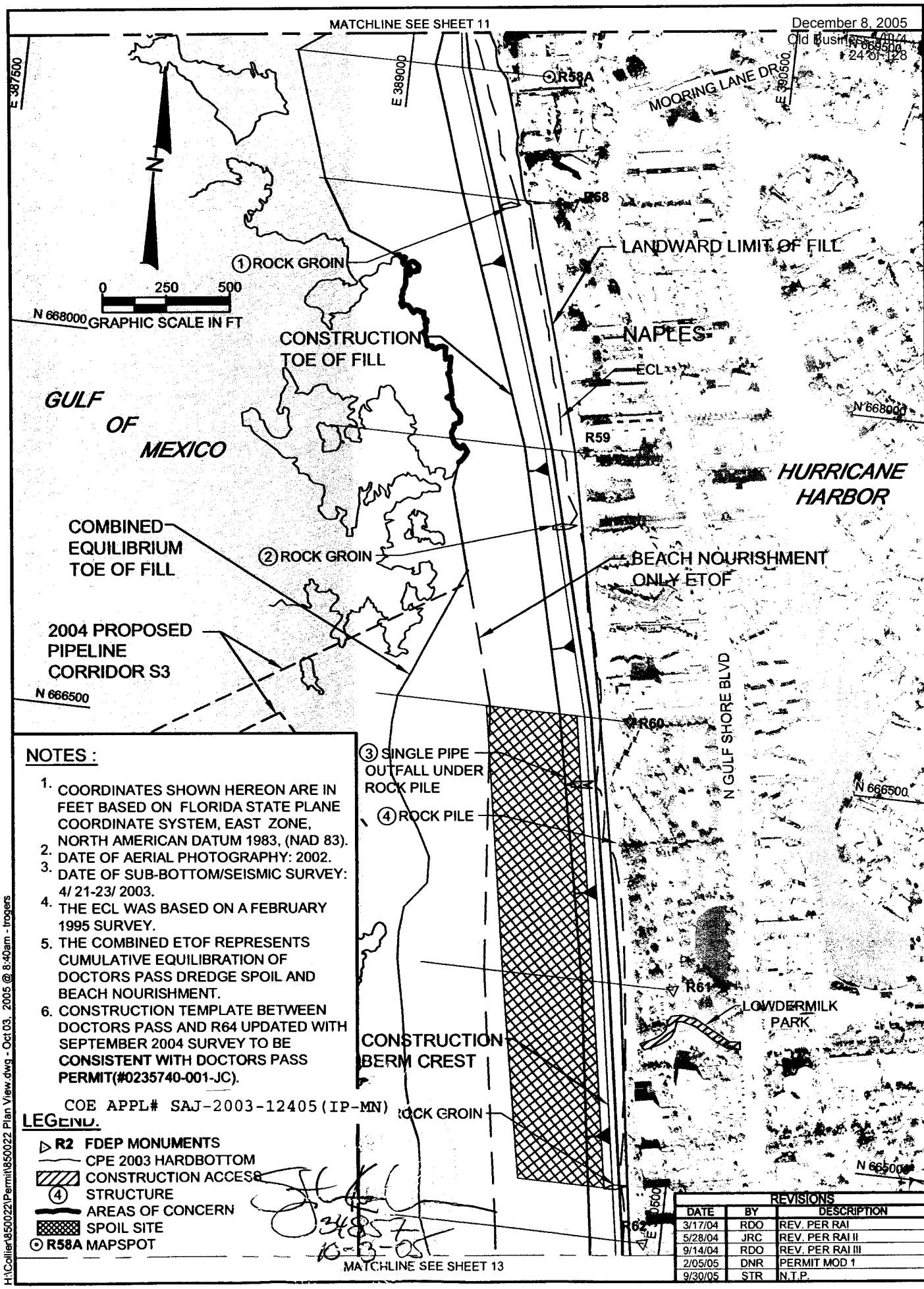
34857
10-3-05



NOTES :

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2. DATE OF AERIAL PHOTOGRAPHY: 2002.
3. DATE OF SUB-BOTTOM/SEISMIC SURVEY: 4/ 21-23/ 2003.
4. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
5. THE COMBINED ETOF REPRESENTS CUMULATIVE EQUILIBRATION OF DOCTORS PASS DREDGE SPOIL AND BEACH NOURISHMENT.
6. CONSTRUCTION TEMPLATE BETWEEN DOCTORS PASS AND R64 UPDATED WITH SEPTEMBER 2004 SURVEY TO BE **CONSISTENT** WITH DOCTORS PASS **PERMIT(#0235740-001-JC).**

COE APPL# SAJ-2003-12405(IP-MN)

LEGEND:

- ▷ **R2** FDEP MONUMENTS
- CPE 2003 HARDBOTTOM
- CONSTRUCTION ACCESS
- ④ STRUCTURE
- AREAS OF CONCERN
- SPOIL SITE
- ⊙ **R58A** MAPSPOT

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/14/04	RDO	REV. PER RAI III
2/05/05	DNR	PERMIT MOD 1
9/30/05	STR	N.T.P.

TITLE:

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEWS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 12

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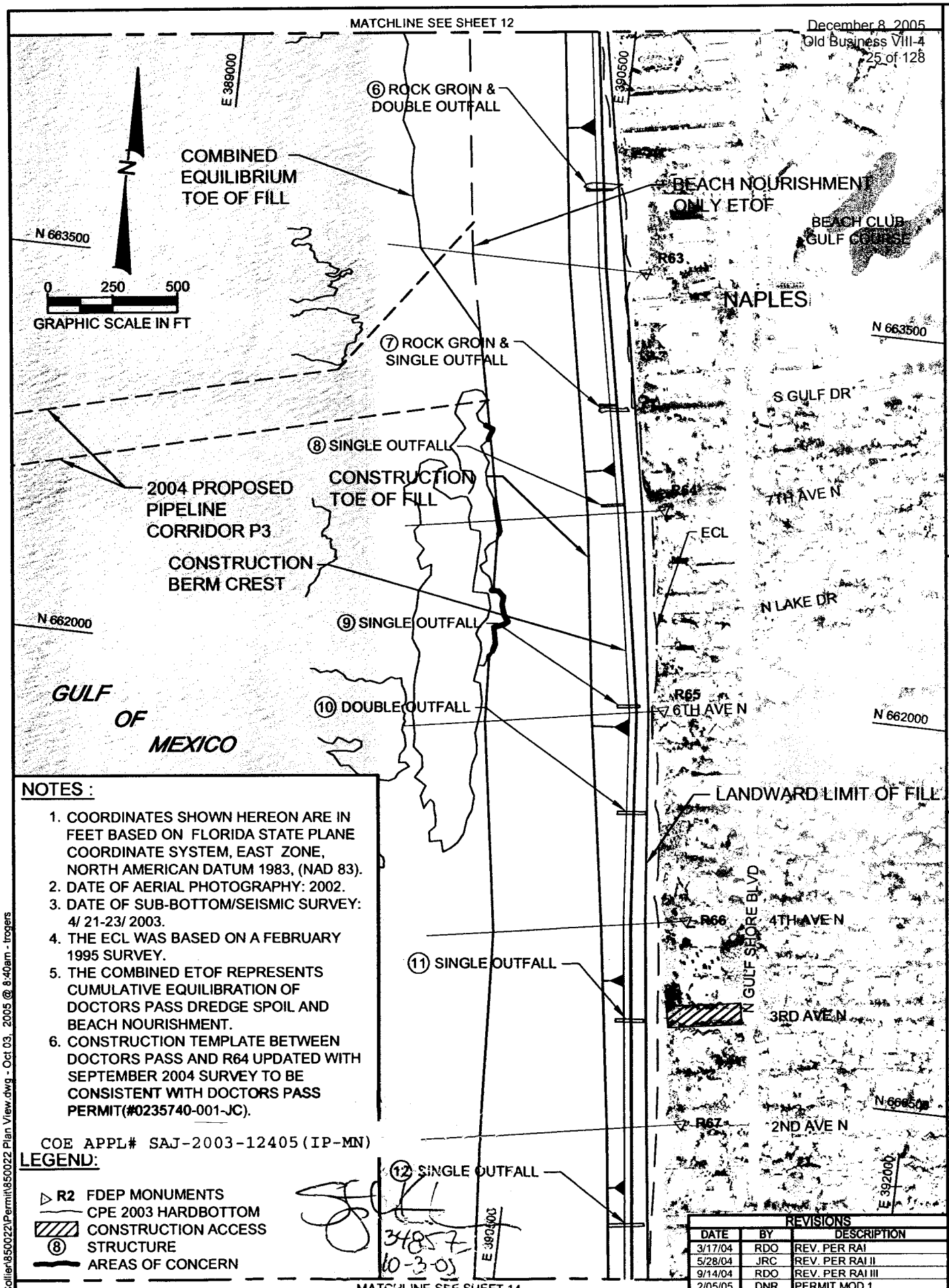

NOTES :

1. COORDINATES SHOWN HEREON ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD 83).
2. DATE OF AERIAL PHOTOGRAPHY: 2002.
3. DATE OF SUB-BOTTOM/SEISMIC SURVEY: 4/ 21-23/ 2003.
4. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
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6. CONSTRUCTION TEMPLATE BETWEEN DOCTORS PASS AND R64 UPDATED WITH SEPTEMBER 2004 SURVEY TO BE CONSISTENT WITH DOCTORS PASS PERMIT(#0235740-001-JC).

COE APPL# SAJ-2003-12405(IP-MN)

LEGEND:

- ▷ R2 FDEP MONUMENTS
- CPE 2003 HARDBOTTOM
- CONSTRUCTION ACCESS
- ⑧ STRUCTURE
- AREAS OF CONCERN

34857
10-3-05

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/14/04	RDO	REV. PER RAI III
2/05/05	DNR	PERMIT MOD 1
9/30/05	STR	N.T.P.

TITLE: COLLIER COUNTY BEACH RENOURISHMENT PROJECT PLAN VIEWS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116
COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 13

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MATCHLINE SEE SHEET 13

E 389000
E 390500
E 392000
N 659000
N 657500
N 656000

N

0 250 500
GRAPHIC SCALE IN FT

(13) SINGLE OUTFALL

LANDWARD LIMIT OF FILL

PROPOSED EQUILIBRIUM TOE OF FILL

(14) SINGLE OUTFALL

(15) PILE GROIN

CONSTRUCTION TOE OF FILL

GULF OF MEXICO

2004 PROPOSED PIPELINE CORRIDOR S5

CONSTRUCTION BERM CREST

COE APPL# SAJ-2003-12405(IP-MN)

R68
R69
R70
R71
R72
ECL

CENTRAL AVE
1ST AVE S
2ND AVE S
3RD AVE S
NAPLES
4TH AVE S
5TH AVE S
6TH AVE S
7TH AVE S
8TH AVE S
9TH AVE S
10TH AVE S
11TH AVE S
S GULF SHORE BLVD
2ND ST S

NOTES :

1. COORDINATES SHOWN HEREON ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD 83).
2. DATE OF AERIAL PHOTOGRAPHY: 2002.
3. DATE OF SUB-BOTTOM/SEISMIC SURVEY: 4/ 21-23/ 2003.
4. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
5. THE PROPOSED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.

LEGEND:

▷ R2 FDEP MONUMENTS
CPE 2003 HARDBOTTOM
(13) STRUCTURE

3-15-7
10-3-05

MATCHLINE SEE SHEET 15

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/14/04	RDO	REV. PER RAI III
9/30/05	STR	N.T.P.

TITLE: COLLIER COUNTY BEACH RENOURISHMENT PROJECT PLAN VIEWS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 14

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December 8, 2005
Old Business/III.A.2
97.01.128

MATCHLINE SEE SHEET 14

N 654500

E 390500

(16) NAPLES CITY PIER

PROPOSED EQUILIBRIUM TOE OF FILL

0 250 500
GRAPHIC SCALE IN FT

CONSTRUCTION TOE OF FILL

N 653000

CONSTRUCTION BERM CREST

N 651500

GULF OF MEXICO

COE APPL# SAJ-2003-12405(IP-MN)

N 650000

E 390500

E 392000

R74

R75

R76

R79

BROAD AVE S

12TH AVE S

13TH AVE S

14TH AVE S

15TH AVE S

16TH AVE S

17TH AVE S

18TH AVE S

GORDON DR

S. GULF SHORE BLVD

NAPLES

LANDWARD LIMIT OF FILL

ECL

AQUA COVE

N 654500

N 653000

34857
10-3-05

MATCHLINE SEE SHEET 16

NOTES :

1. COORDINATES SHOWN HEREON ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD 83).
2. DATE OF AERIAL PHOTOGRAPHY: 2002.
3. DATE OF SUB-BOTTOM/SEISMIC SURVEY: 4/ 21-23/ 2003.
4. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
5. THE PROPOSED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.

LEGEND:

▷ R2 FDEP MONUMENTS
CPE 2003 HARDBOTTOM
(16) CONSTRUCTION ACCESS STRUCTURE

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/14/04	RDO	REV. PER RAI III
9/30/05	STR	N.T.P.

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEWS

TITLE:

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 15

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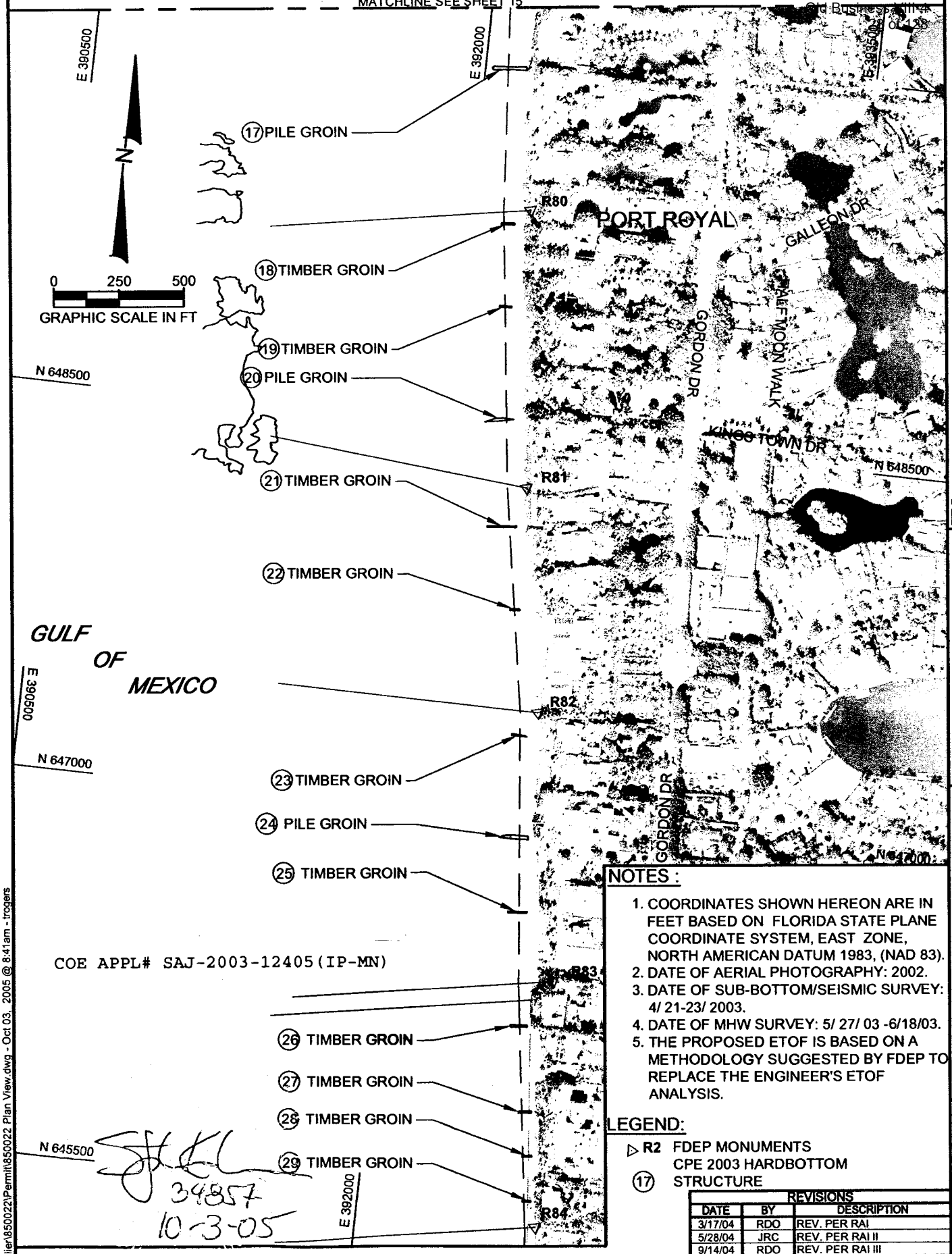
December 8, 2005
Old Business Item 4A

MATCHLINE SEE SHEET 15



NOTES :

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2. DATE OF AERIAL PHOTOGRAPHY: 2002.
3. DATE OF SUB-BOTTOM/SEISMIC SURVEY: 4/ 21-23/ 2003.
4. DATE OF MHW SURVEY: 5/ 27/ 03 -6/18/03.
5. THE PROPOSED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.

LEGEND:

▷ R2 FDEP MONUMENTS
CPE 2003 HARDBOTTOM
(17) STRUCTURE

34857
10-3-05

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI
5/28/04	JRC	REV. PER RAI II
9/14/04	RDO	REV. PER RAI III
9/30/05	STR	N.T.P.

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEWS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116
COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 16

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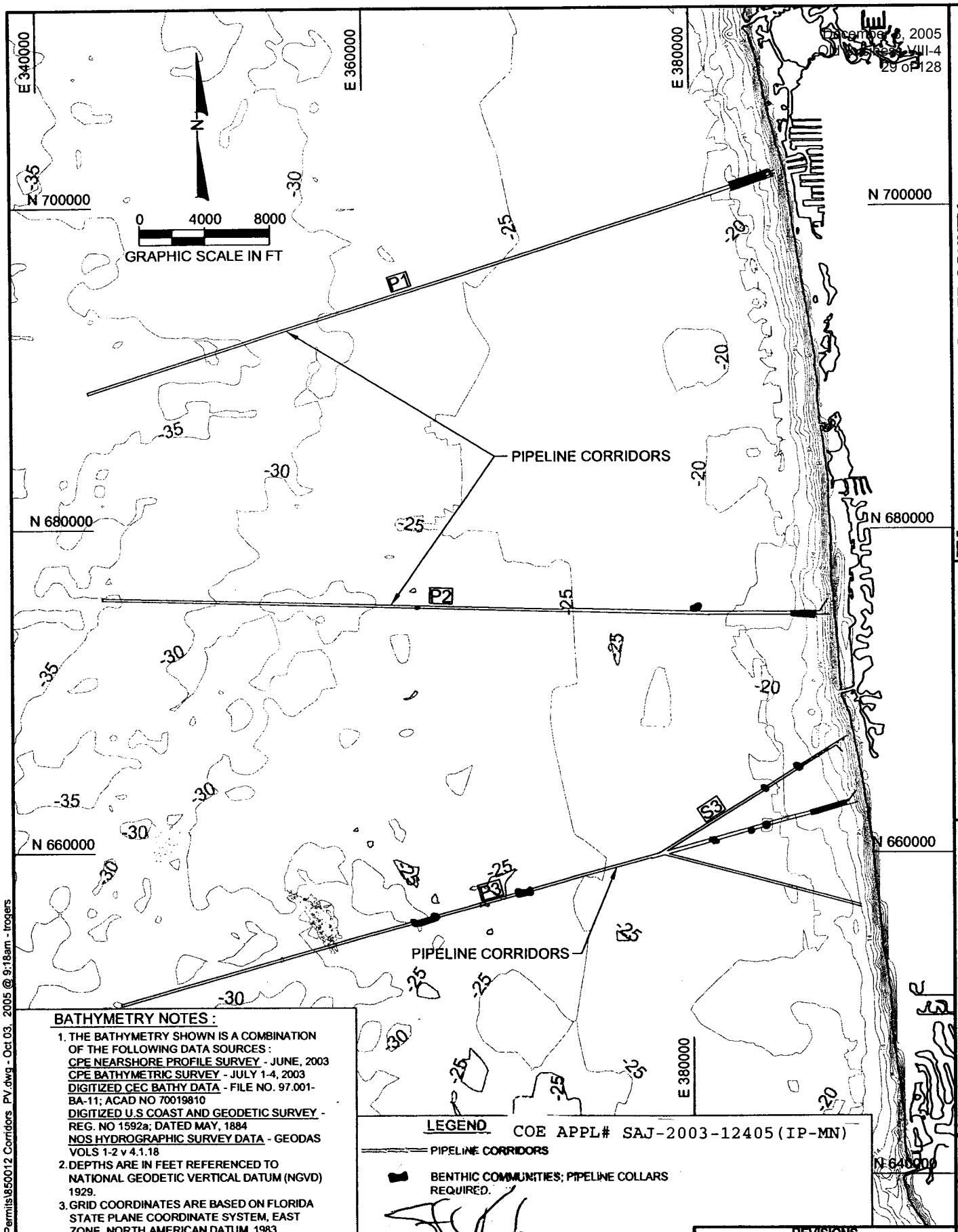

BATHYMETRY NOTES :

1. THE BATHYMETRY SHOWN IS A COMBINATION OF THE FOLLOWING DATA SOURCES :
   CPE NEARSHORE PROFILE SURVEY - JUNE, 2003
   CPE BATHYMETRIC SURVEY - JULY 1-4, 2003
   DIGITIZED CEC BATHY DATA - FILE NO. 97.001-BA-11; ACAD NO 70019810
   DIGITIZED U.S COAST AND GEODETIC SURVEY - REG. NO 1592a; DATED MAY, 1884
   NOS HYDROGRAPHIC SURVEY DATA - GEODAS VOLS 1-2 v 4.1.18
2. DEPTHS ARE IN FEET REFERENCED TO NATIONAL GEODETIC VERTICAL DATUM (NGVD) 1929.
3. GRID COORDINATES ARE BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM, 1983.
4. SOME NEARSHORE CORRIDORS WERE USED AND PERMITTED WITH THE 1996 PROJECT.
5. PUMP OUT OPERATIONS SHALL TAKE PLACE OUTSIDE THE BENTHIC COMMUNITIES AND THEIR LATERAL PERIPHERY.

LEGEND

COE APPL# SAJ-2003-12405(IP-MN)

PIPELINE CORRIDORS

BENTHIC COMMUNITIES; PIPELINE COLLARS REQUIRED.

34857
10-3-05

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	PER RAI
5/28/04	JRC	PER RAI II
9/14/04	RDO	PER RAI III

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
DREDGE PIPELINE CORRIDORS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

COASTAL PLANNING & ENGINEERING, INC.

DATE: 3/17/04
BY: RDO
COMM NO.: 8500.12
SHEET: 17

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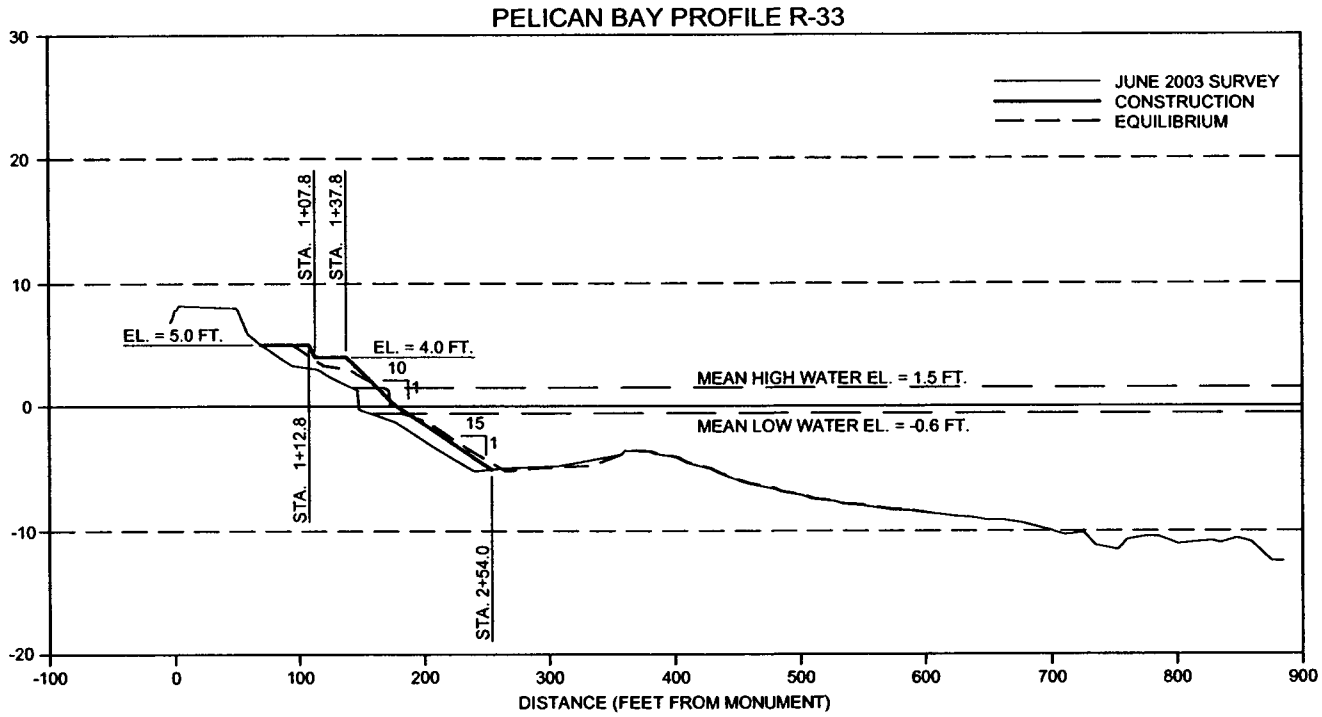

COE APPL# SAJ-2003-12405(IP-MN)

34857
10-3-05

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	PER RAI
8/24/04	JRC	PER RAI III
9/30/05	STR	N.T.P.

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
TYPICAL FILL CROSS SECTIONS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116
COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 18

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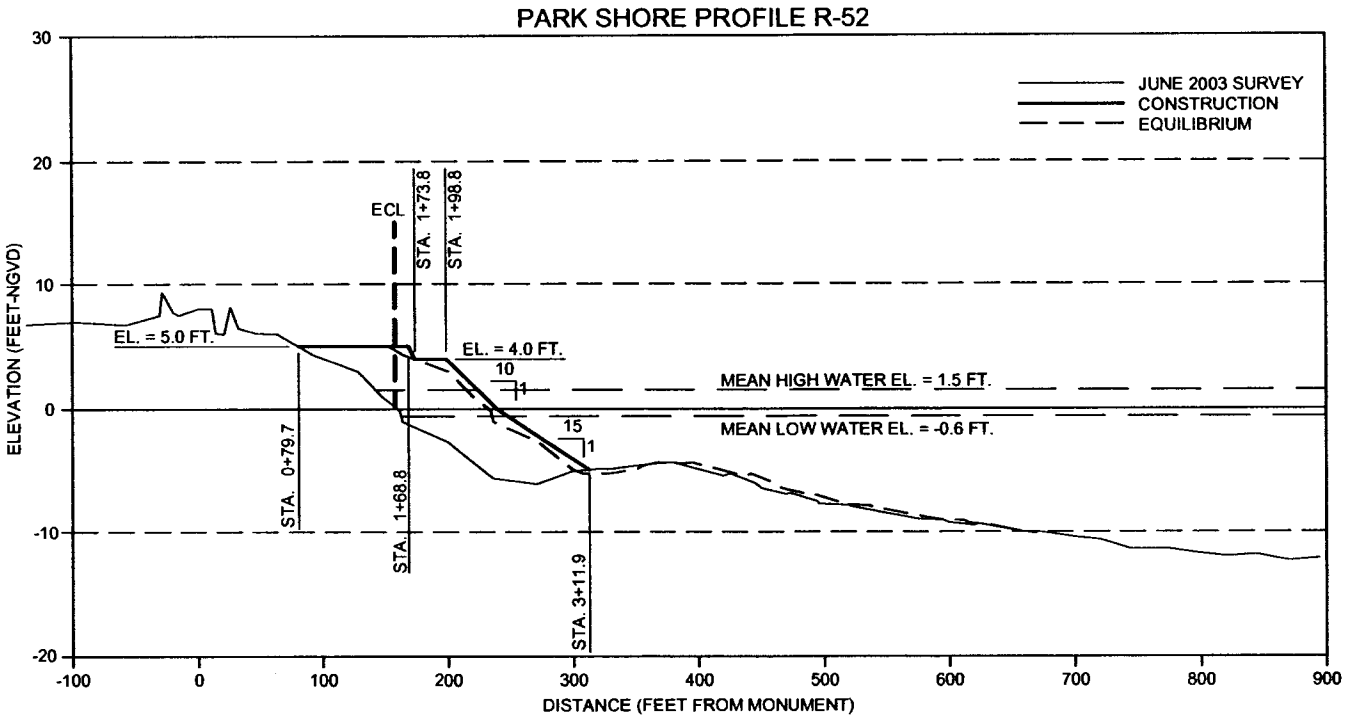

COE APPL# SAJ-2003-12405(IP-MN)

34857
10-3-05

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	PER RAI
8/24/04	JRC	PER RAI III
9/30/05	STR	N.T.P.

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
TYPICAL FILL CROSS SECTIONS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 19

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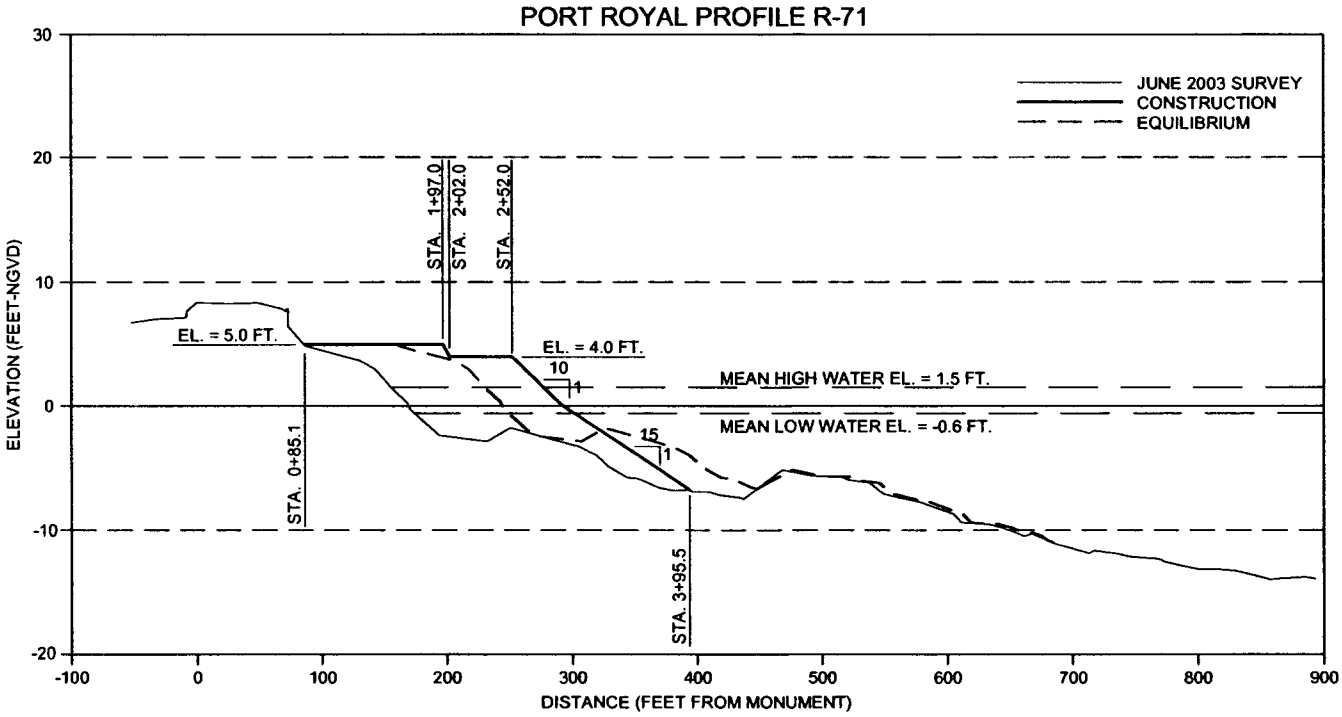

COE APPL# SAJ-2003-12405(IP-MN)

34857
10-3-05

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	PER RAI
5/28/04	JRC	PER RAI II
9/14/04	RDO	PER RAI III
9/30/05	STR	N.T.P.

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
TYPICAL FILL CROSS SECTIONS

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116
COASTAL PLANNING & ENGINEERING, INC.

DATE: 08/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 20

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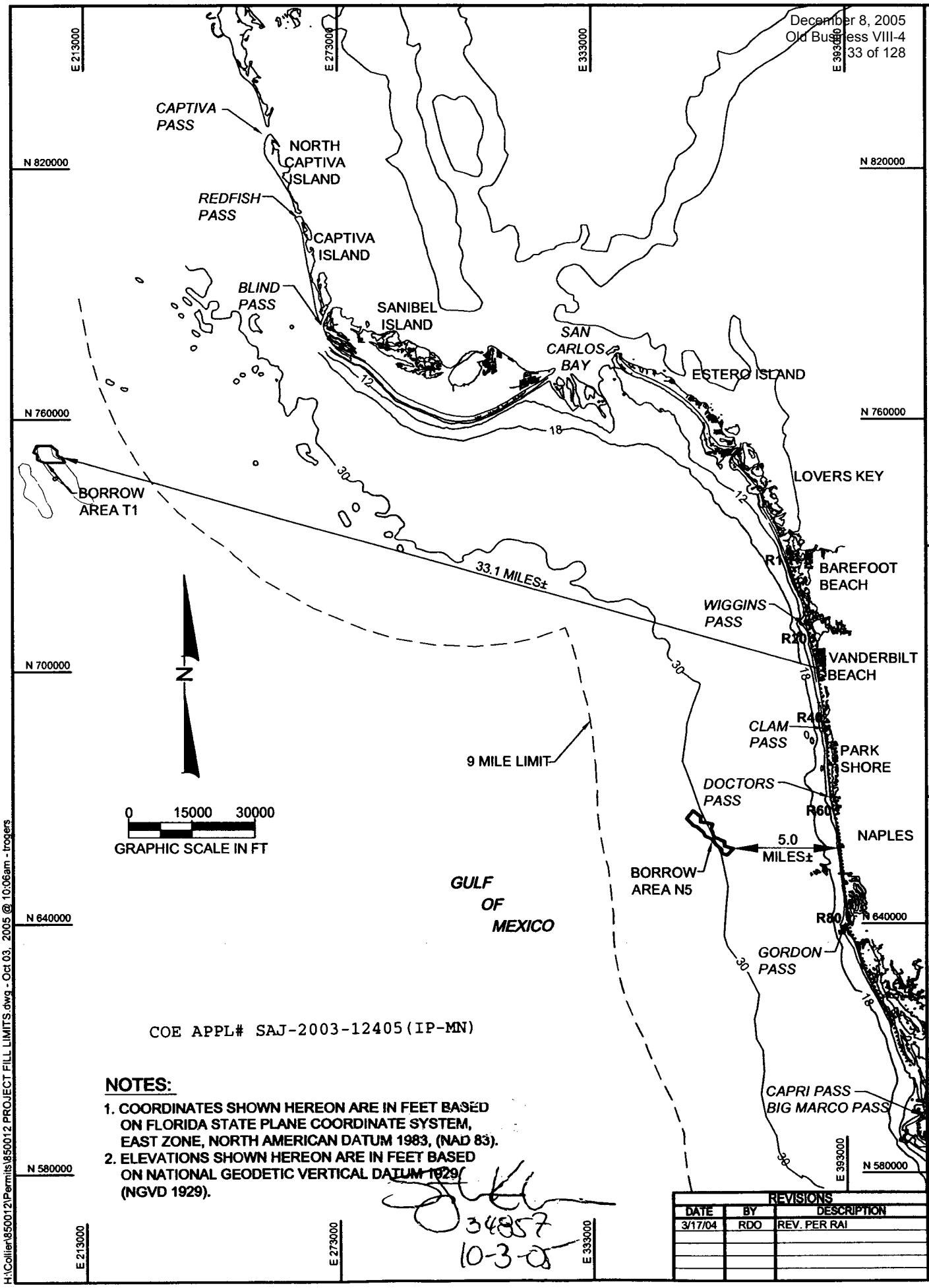


COE APPL# SAJ-2003-12405(IP-MN)

NOTES:

1. COORDINATES SHOWN HEREON ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD 83).
2. ELEVATIONS SHOWN HEREON ARE IN FEET BASED ON NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD 1929).

34857
10-3-05

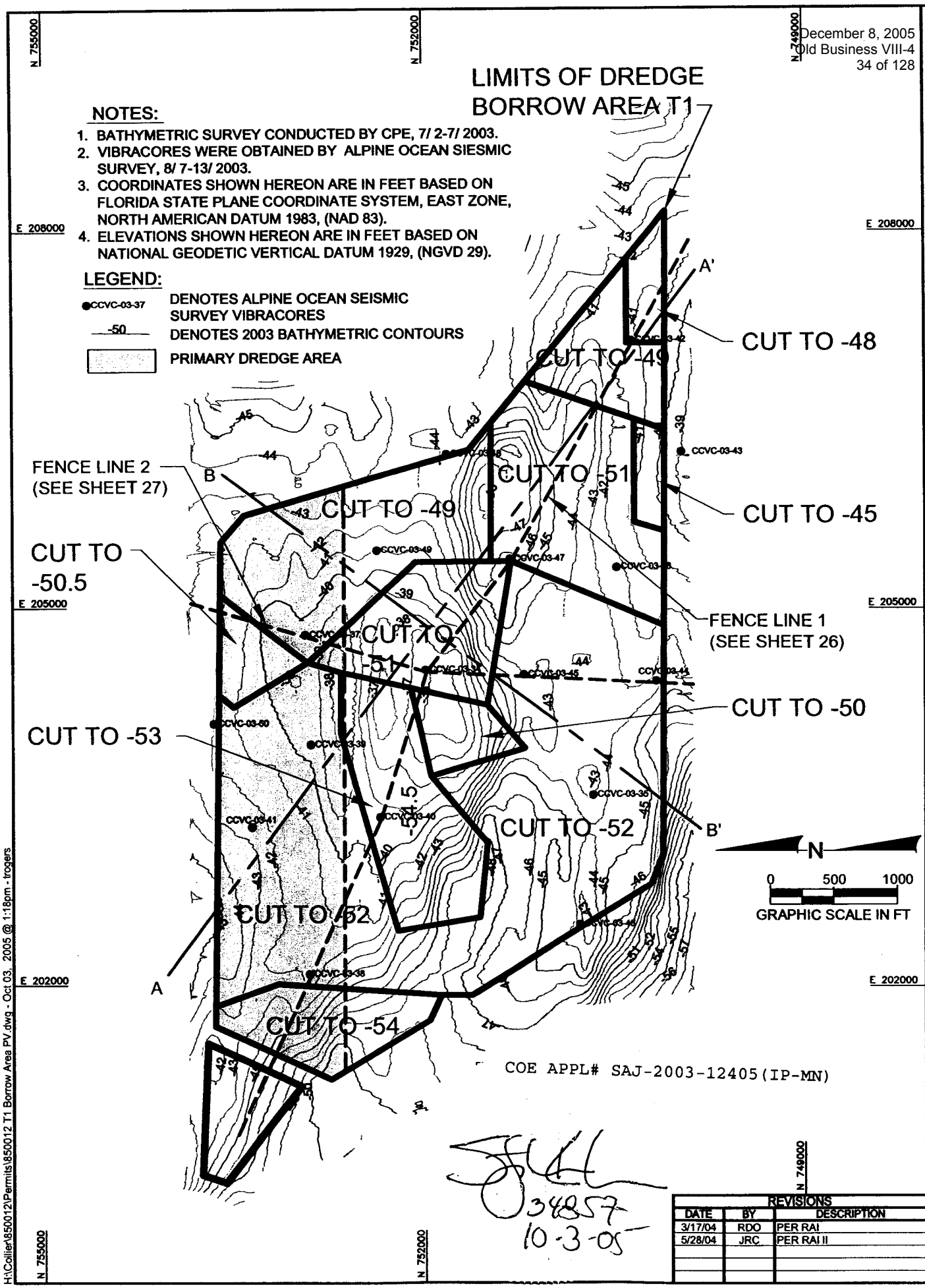
REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	REV. PER RAI

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
BORROW AREA LOCATION MAP

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

DATE: 8/27/03
BY: JRC
COMM NO.: 8500.12
SHEET: 21

H:\Collier\850012\Permits\850012 PROJECT FILL LIMITS.dwg - Oct 03, 2005 @ 10:06am - trogers


LIMITS OF DREDGE BORROW AREA T1
NOTES:
1. BATHYMETRIC SURVEY CONDUCTED BY CPE, 7/ 2-7/ 2003.
2. VIBRACORES WERE OBTAINED BY ALPINE OCEAN SIESMIC SURVEY, 8/ 7-13/ 2003.
3. COORDINATES SHOWN HEREON ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD 83).
4. ELEVATIONS SHOWN HEREON ARE IN FEET BASED ON NATIONAL GEODETIC VERTICAL DATUM 1929, (NGVD 29).
LEGEND:
CCVC-03-37 DENOTES ALPINE OCEAN SEISMIC SURVEY VIBRACORES
-50 DENOTES 2003 BATHYMETRIC CONTOURS
PRIMARY DREDGE AREA
N 755000
N 752000
N 749000
E 208000
E 205000
E 202000
A'
A
B
B'
CUT TO -48
CUT TO -49
CUT TO -51
CUT TO -45
CUT TO -49
CUT TO -50.5
CUT TO -51
CUT TO -50
CUT TO -53
CUT TO -52
CUT TO -52
CUT TO -54
FENCE LINE 2 (SEE SHEET 27)
FENCE LINE 1 (SEE SHEET 26)
CCVC-03-43
CCVC-03-49
CCVC-03-47
CCVC-03-45
CCVC-03-44
CCVC-03-50
CCVC-03-39
CCVC-03-41
CCVC-03-40
CCVC-03-35
CCVC-03-36
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GRAPHIC SCALE IN FT
COE APPL# SAJ-2003-12405(IP-MN)
34857
10-3-05
REVISIONS
DATE BY DESCRIPTION
3/17/04 RDO PER RAI
5/28/04 JRC PER RAI II
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
T1 BORROW AREA BATHYMETRIC SURVEY
TITLE:
2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116
COASTAL PLANNING & ENGINEERING, INC.
DATE: 08/27/03
BY: RDO
COMM NO.: 8500.12
SHEET: 22
H:\Collier\850012\Permits\850012 T1 Borrow Area PV.dwg - Oct 03, 2005 @ 1:18pm - trogers

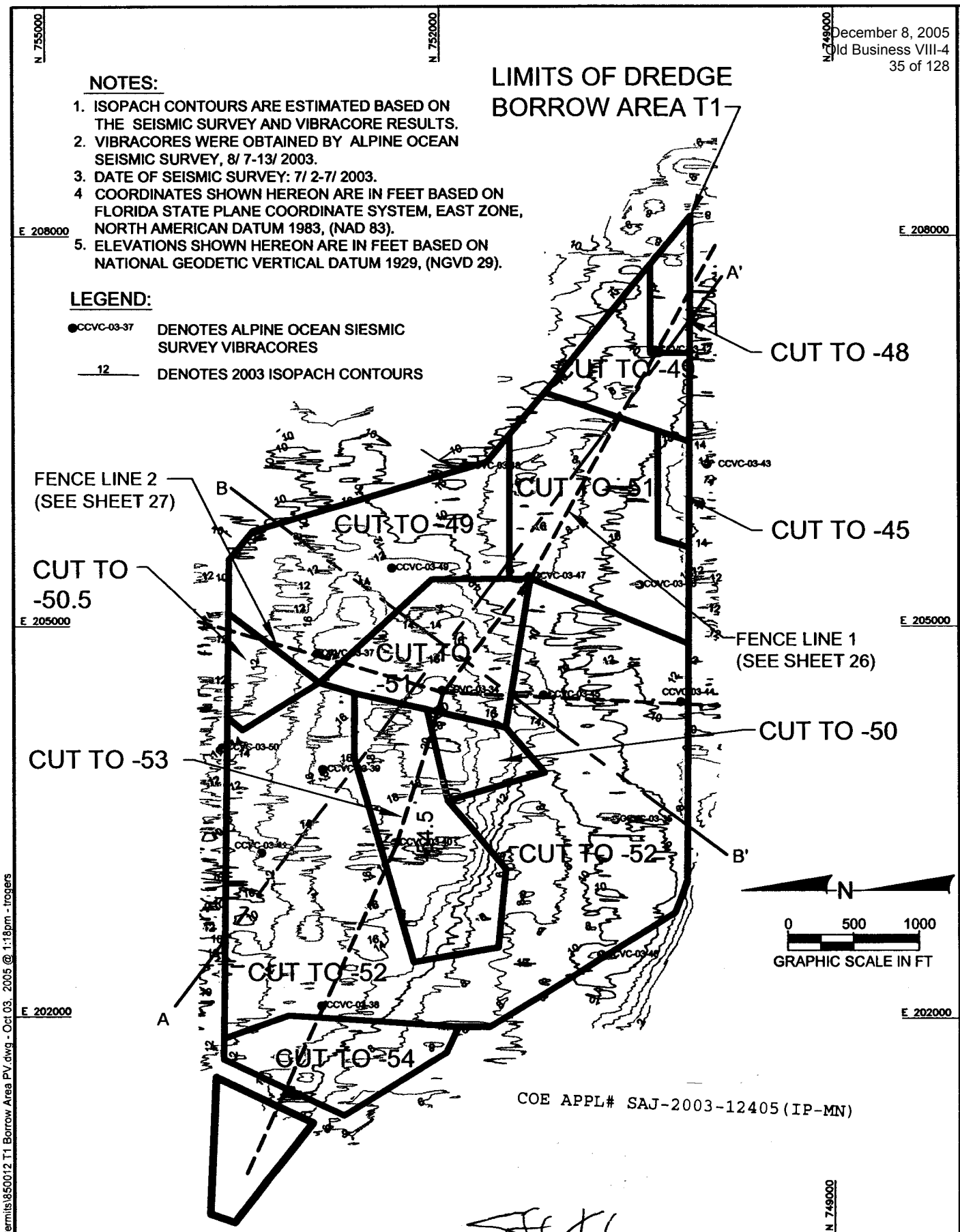
NOTES:

1. ISOPACH CONTOURS ARE ESTIMATED BASED ON THE SEISMIC SURVEY AND VIBRACORE RESULTS.
2. VIBRACORES WERE OBTAINED BY ALPINE OCEAN SEISMIC SURVEY, 8/ 7-13/ 2003.
3. DATE OF SEISMIC SURVEY: 7/ 2-7/ 2003.
4. COORDINATES SHOWN HEREON ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD 83).
5. ELEVATIONS SHOWN HEREON ARE IN FEET BASED ON NATIONAL GEODETIC VERTICAL DATUM 1929, (NGVD 29).

LEGEND:

●CCVC-03-37 DENOTES ALPINE OCEAN SIESMIC SURVEY VIBRACORES

—12— DENOTES 2003 ISOPACH CONTOURS



34857
10-3-05

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	PER RAI
5/28/04	JRC	PER RAI II

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
T1 BORROW AREA ISOPACH

TITLE:

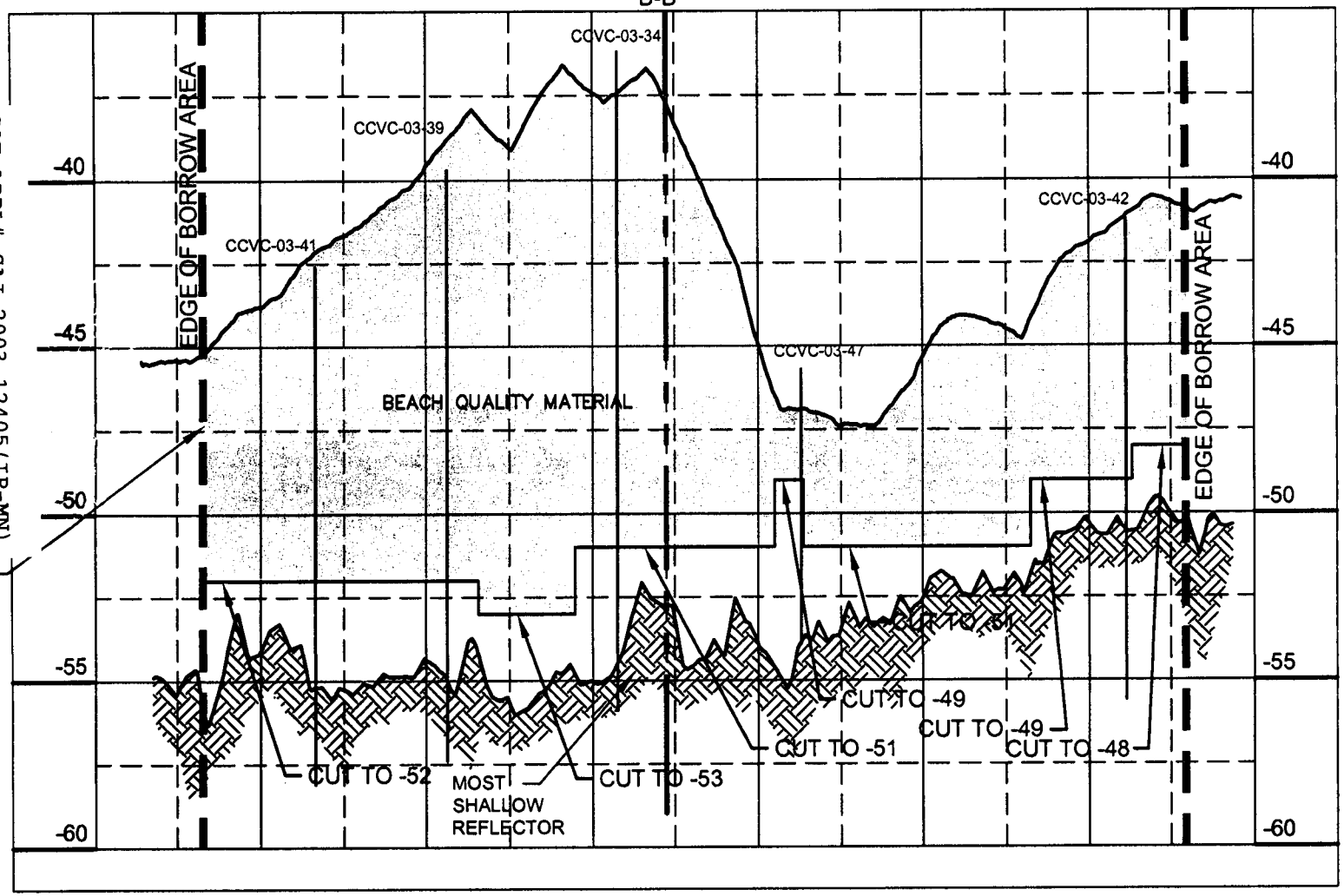
2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

COASTAL PLANNING & ENGINEERING, INC.

DATE: 8/27/03
BY: RDO
COMM NO.: 8500.12
SHEET: 23

H:\Collier\850012\Permits\850012 T1 Borrow Area PV.dwg - Oct 03, 2005 @ 1:18pm - trogers

BORROW AREA T1 A-A'



COE APPL# SAJ-2003-12405(IP-MN)

34857
10-3-05

EQUILIBRATED SIDE-WALL CUTS 1:15 (TYP.) SEE NOTE 4

NOTES:

1. CORES MAY NOT FALL DIRECTLY ON CROSS SECTION LINE, BUT ARE LOCATED SUFFICIENTLY CLOSE TO REPRESENT SIMILAR MATERIAL.
2. WIDTH OF LAYERS IS REPRESENTATIVE ONLY. ACTUAL MATERIAL MAY VARY.
3. SEE SHEETS 30 & 31 FOR LOCATION OF CROSS SECTION LINE.
4. SIDE-WALL SLOPE NOT VISIBLE DUE TO EXAGGERATED SCALE.

LEGEND:

- MOST SHALLOW REFLECTOR AS IDENTIFIED BY SEISMIC SURVEY
- BEACH QUALITY MATERIAL

SCALE: HORZ. 1" = 1000'
VERT. 1" = 5'

REVISIONS			
DESCRIPTION	BY	DATE
PER RAI	RDO	3/17/04
PER RAI II	JRC	5/28/04

SHEET: 24	COMM NO.: 8500.12	BY: RDO	DATE: 8/27/03

COASTAL PLANNING & ENGINEERING, INC.

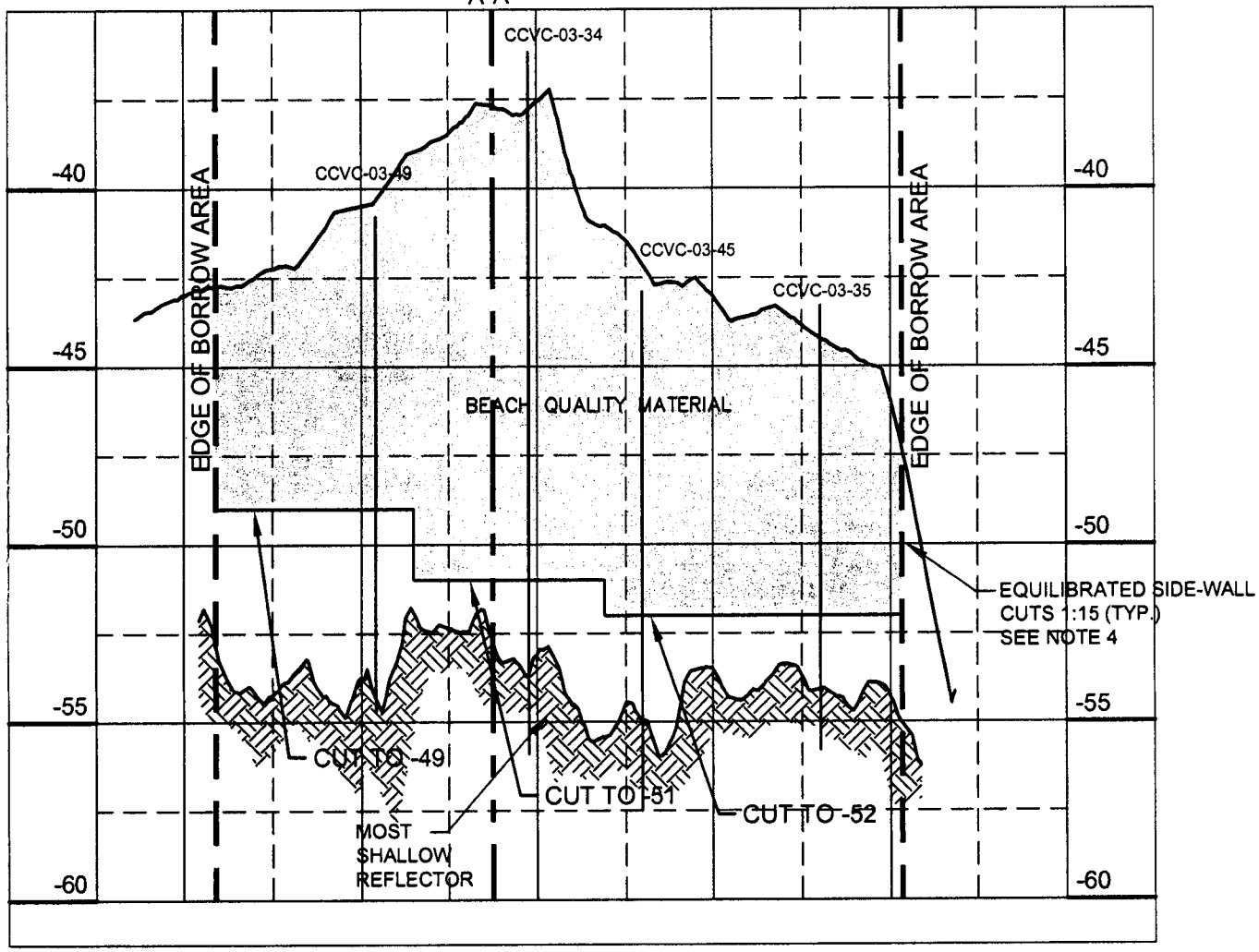
2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

TITLE:

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
T1 BORROW AREA SECTION A-A'

BORROW AREA T1 B-B'

A-A'



COE APPL# SAJ-2003-12405(IP-MN)

34857
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NOTES:

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SCALE: HORZ. 1" = 1000'
VERT. 1" = 5'

REVISIONS			
DESCRIPTION	BY	DATE	
PER RAI	RDO	3/17/04	
PER RAI II	JRC	5/28/04	

COMM. NO.:	8500.12
BY:	RDO
DATE:	8/27/03
SHEET:	25

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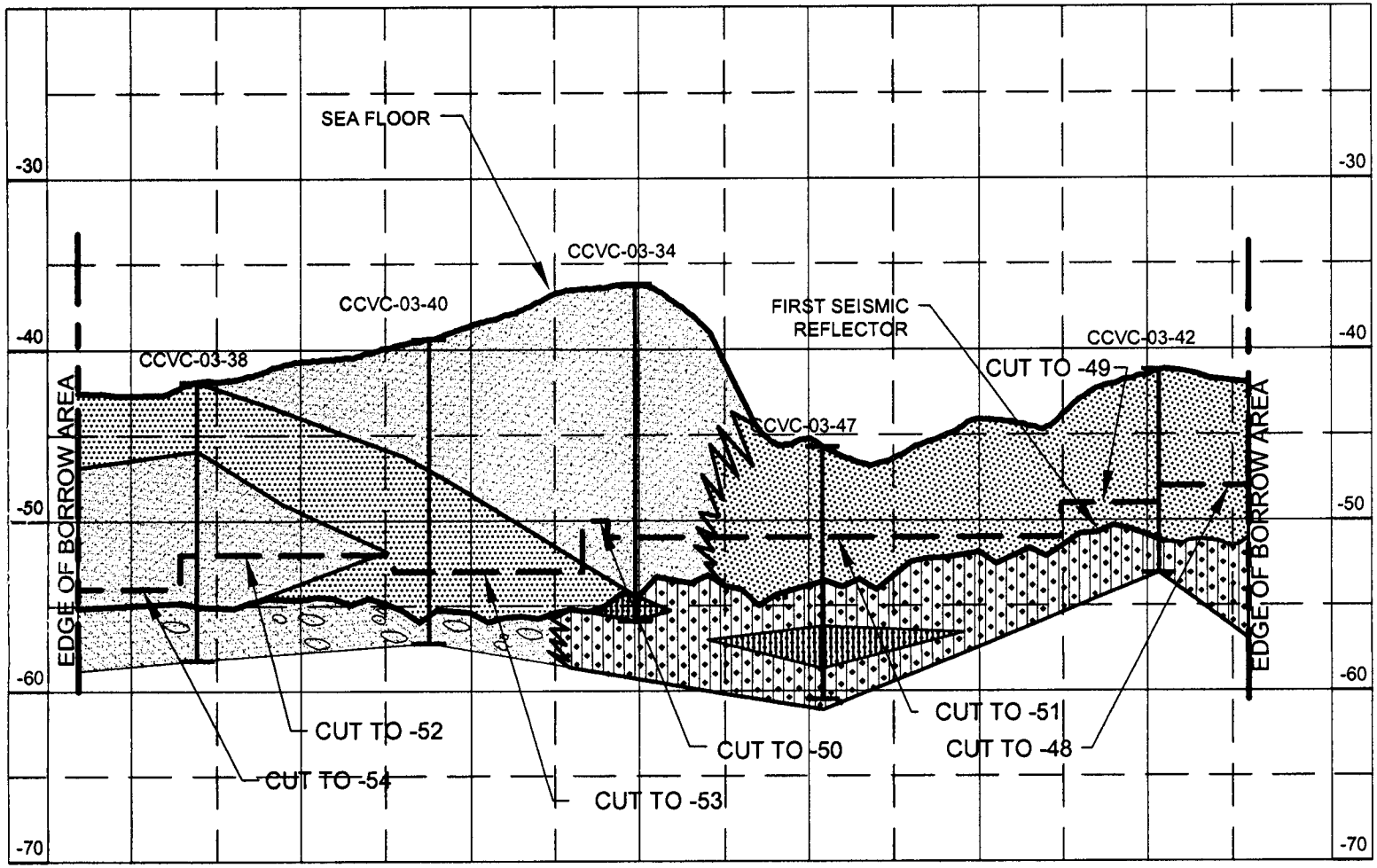
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

TITLE:

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
T1 BORROW AREA SECTION B-B'

BORROW AREA T1 FENCE LINE 1

COE APPL# SAJ-2003-12405(IP-MN)



LEGEND:

- SP (POORLY GRADED SANDS, LITTLE OR NO FINES)
- SW (WELL GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES)
- SW-SM (WELL-GRADED SILTY SANDS)
- GW (GRAVELS OR GRAVEL SAND MIXTURES)
- GM (SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES)
- SM (SILTY SANDS, SAND-SILT MIXTURES)

SCALE: HORZ. 1" = 1000'
VERT. 1" = 10'

REVISIONS			
DATE	BY	DESCRIPTION	
3/17/04	RDO	PER RAI	
5/28/04	JRC	PER RAI II	

COMM NO: 8500.12
SHEET: 26
BY: JRC
DATE: 1/19/04

COASTAL PLANNING & ENGINEERING, INC.
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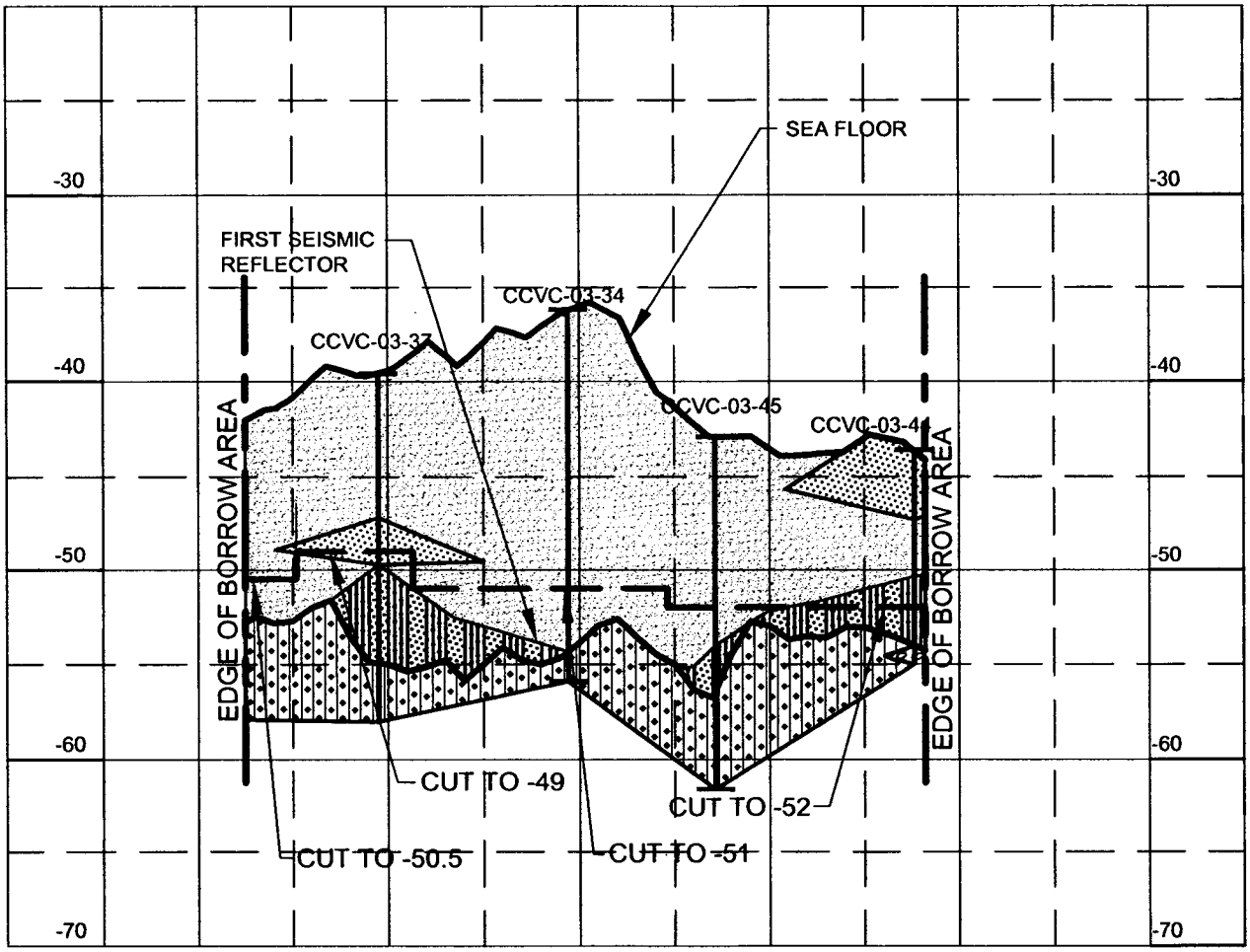
PH. (561) 391-8102 FAX (561) 391-9116

TITLE: COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
T1 BORROW AREA FENCE DIAGRAM LINE 1

BORROW AREA T1 FENCE LINE 2



LEGEND:

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COE APPL# SAJ-2003-12405(IP-MN)

34857
10-3-05

SCALE: HORZ. 1" = 1000'
VERT. 1" = 10'

REVISIONS		
DATE	BY	DESCRIPTION
3/17/04	RDO	PER RAI
5/28/04	JRC	PER RAI II

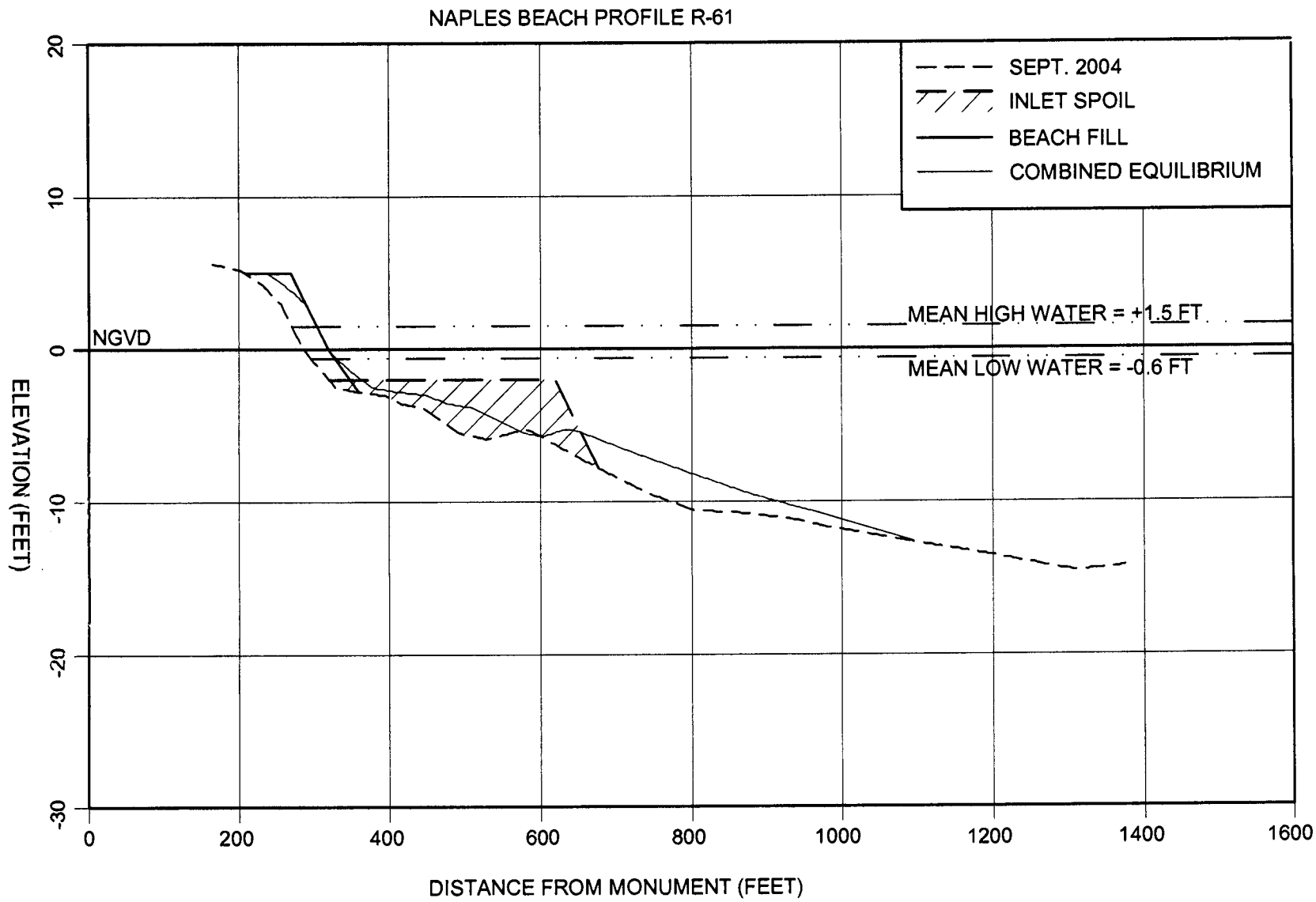
TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
T1 BORROW AREA FENCE DIAGRAM LINE 2

2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116
COASTAL PLANNING & ENGINEERING, INC.

DATE: 1/19/04
BY: JRC
COMM NO.: 8500.12
SHEET: 27

H:\Collier\850012\Permits\850012 T1 FENCE DIAGRAM.DWG - Oct 03, 2005 @ 10:04am - trogers

COE APPL# SAJ-2003-12405(IP-MN)



NOTE:
THE EQUILIBRIUM CROSS SECTION REPRESENTS EXPECTED PROFILE ADJUSTMENT FROM THE COMBINED PLACEMENT OF DOCTORS PASS DREDGE SPOIL AND BEACH NOURISHMENT.

REVISIONS			
DATE	BY	DESCRIPTION	
2/5/05	DNR	PERMIT MOD 1	

DNR
BY:
DATE: 02/05/05
COMM NO.: 8500.12
SHEET: 28

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BLVD.
BOCA RATON, FL 33431
PH. (561) 391-8102 FAX (561) 391-9116

TITLE:
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
COMBINED EQUILIBRIUM CROSS SECTION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

September 20, 2005

Colonel Robert M. Carpenter
District Engineer
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Log No.: 4-1-04-TR-8709
Corps Application No.: 200312405 (IP-MN)
Dated: January 24, 2004
Project: Collier County Beach Renourishment Project
Applicant: Collier County
County: Collier

Dear Colonel Carpenter:

This document transmits the Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed Collier County Beach Renourishment Project located in Sections 29 and 32, Township 48 South, Range 25 East; Sections 5, 8, 16, 21, and 28, Township 49 South, Range 25 East; and Sections 4 and 9, Township 50 South, Range 25 East, Collier County, Florida, and its effects on the threatened loggerhead sea turtle (*Caretta caretta*), endangered green sea turtle (*Chelonia mydas*), endangered leatherback sea turtle (*Dermochelys coriacea*), endangered hawksbill sea turtle (*Eretmochelys imbricata*), endangered Kemp's ridley sea turtle (*Lepidochelys kempii*), and endangered West Indian manatee (*Trichechus manatus*) in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*) and the Fish and Wildlife Coordination Act of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*). The U.S. Army Corps of Engineers' (Corps) February 19, 2004, request for formal consultation was received on February 23, 2004.

This biological opinion is based on information provided by the National Oceanic and Atmospheric Administration's Fisheries Service (NOAA Fisheries); Collier County (applicant); the applicant's agent, Coastal Planning & Engineering, Inc. (CPE); the Florida Department of Environmental Protection (DEP), Bureau of Beaches and Coastal Systems; the Florida Fish and Wildlife Conservation Commission (FWC); telephone conversations and email correspondence with the Corps and CPE, field investigations, and other sources. A complete administrative record of this consultation is on file at the South Florida Ecological Services Office, Vero Beach, Florida.

In the February 19, 2004, Public Notice, the Corps determined the proposed project "may affect, but would not likely adversely affect" the West Indian manatee, because the applicant agreed to

TAKE PRIDE IN AMERICA

incorporate the *Standard Manatee Construction Conditions*, and because these construction conditions will be included by the Corps as protection measures in the Federal Permit. As such, the Service concurs with this determination.

The Corps also determined the proposed project "may affect" federally listed sea turtles and requested to initiate formal consultation with the Service.

FISH AND WILDLIFE RESOURCES

In addition to sea turtles, the shoreline of Collier County supports the following shorebird species and habitats:

Piping Plover

Piping plovers (*Charadrius melodus*) are small, migratory shorebirds that breed in only three geographic regions of North America: on sandy beaches along the Atlantic Ocean, along sandy shorelines throughout the Great Lakes region, and on the river-bank systems and prairie wetlands of the Northern Great Plains (Haig 1992). The Great Lakes population is listed as endangered, whereas the Atlantic Coast and Great Plains populations are listed as threatened under the ESA (Service 1985). Though this species does not breed in Florida, individuals from all three breeding populations over-winter in Florida. In the project area, there is no federally designated piping plover critical habitat, and no breeding piping plovers have been observed in the last 14 years (Collier County Audubon Society 2003; Doug Suitor, personal communication, 2003). In a recent report on Coastal Waterbird Beach Utilization in Naples, Florida by Theodore Below (2003), piping plovers have been identified as visitors to Collier County in fall, winter, and spring, but their numbers are too low to be analyzed.

Least Tern

Least terns (*Sterna antillarum*) are small, black-capped shorebirds that select nesting sites with a substrate of sand or gravel with fragments of shell. Least terns are protected under the Migratory Bird Treaty Act (1918) (40 Stat. 755; 16 U.S.C. 701 *et seq.*). Least terns nest primarily along the coast in Florida where beaches and gravel roofs provide nest sites and where nearby estuarine and marine waters supply small fish as prey. In the project area, there has been no nesting least terns observed in the last 20 years (Collier County Audubon Society 2003; Doug Suitor, personal communication, 2003). In a recent report on Coastal Waterbird Beach Utilization in Naples, Florida by Theodore Below (2003), least terns have been identified as common during spring and summer, but do not nest on Naples Beach due to a lack of isolated suitable sand habitat.

Roseate Tern

Roseate terns (*Sterna dougallii*) have a white body and black head cap with bright orange-red legs and feet that are easy to distinguish. They are known to nest in colonies on sand/gravel beaches or pebbly/rocky offshore islands along the Atlantic coast from Nova Scotia south to Long Island, New York, and on the southern tip of Florida. The Caribbean breeding population, which includes birds nesting in Florida, is federally threatened (Service 1998). In Collier

County, roseate terns are considered occasional spring-time visitors, with no consistency in annual occurrence (Collier County Audubon Society 2003; Doug Suitor, personal communication, 2003). In a recent report on Coastal Waterbird Beach Utilization in Naples, Florida by Theodore Below (2003), roseate terns were not identified in Collier County.

A Shorebird Management Plan was developed by the Collier County Environmental Services Department to avoid and minimize potential impacts before, during, and after construction of the proposed beach renourishment project. The DEP permit includes specific conditions for the protection of nesting shorebird species during project construction.

The applicant has agreed to establish buffer zones in locations where shorebirds have been observed engaged in courtship or nesting behavior, or around areas where shorebird nesting occurs. Shorebird nesting surveys shall begin on February 1 or 45 days prior to construction commencement, whichever is later, and be conducted daily throughout the construction period or through September if no shorebird nesting activity is observed. If shorebird nesting occurs within the project area, a bulletin board will be placed and maintained in the construction area with the location map of the construction site showing the bird nesting areas and a warning, clearly visible, stating "BIRD NESTING AREAS ARE PROTECTED BY THE FLORIDA THREATENED AND ENDANGERED SPECIES ACT AND THE FEDERAL MIGRATORY BIRD ACT."

All tilling and scarp removal will be conducted in a manner that avoids or minimizes disturbance to nesting shorebirds. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible, pipes will be placed landward of the site before birds are active in that area. No sand will be placed seaward of a known shorebird nesting site during the shorebird nesting season. No scarp removal shall occur within or adjacent to areas being utilized for nesting by shorebirds. Therefore, the Service believes the effects to shorebird species will be insignificant and discountable, and they will not be discussed further in this biological opinion.

Hardbottom Reef Habitat

CPE conducted a side-scan sonar survey of the nearshore region of the study area in February 2003. The purpose of this survey was to document the presence of nearshore hardbottom habitats that may be affected by beach nourishment activities. The side-scan sonar investigations identified approximately 500 acres of hardbottom formations within 1,000 feet (ft) of the shoreline along the 13.5-mile study area. Subsequent biological investigations were conducted during the months of July to September 2003.

The focus of the biological investigation was the assessment and characterization of the nearshore hardbottom resources within the zone of potential influence of the beach renourishment project. The study focused on the nearshore portion of the hardbottom platform, specifically the 328 ft (measured in a shore perpendicular manner) of resource closest to the shoreline. Video transects; however, were conducted to 984 ft from shore. A total of 68 hardbottom sites (60 transects and 8 points) adjacent to the project area in the nearshore areas of Collier County were selected for exploratory verification, assessment, and characterization.

The DEP participated in the development of this 2003 marine resource investigation program implemented by the applicant.

During construction, direct impact to nearshore hardbottom habitat is not anticipated; however, secondary impacts may occur as a result of turbidity and sediment plumes. Epibenthic communities within the project area may be exposed to prolonged periods of turbidity and sedimentation during beach fill placement. As a result, the DEP permit requires the applicant implement a biological monitoring program to document hardbottom impacts, particularly to epibenthic communities. The DEP permit requires a network of nearshore monitoring stations and transects be established and monitored by the applicant to specifically identify project effects from turbidity and sediment movement to adjacent nearshore hardbottom communities.

Although no hardbottom impacts are anticipated based on project performance modeling, the applicant has agreed to construct a 1.09-acre artificial reef as up-front mitigation for potential nourishment project effects to hardbottom resources. The DEP supports the proposed mitigation construction and monitoring.

CONSULTATION HISTORY

In 2002-03, the applicant initiated planning for the first renourishment of a Collier County Beach Restoration Project that was completed in May 1996. The preliminary design of the project discussed in this biological opinion involved renourishment of the May 1996 project areas and four new segments, with sand from two new offshore borrow sources and supplemented by upland sources (CPE 2003).

On October 7, 2003, the applicant initiated coordination with the U.S. Department of the Interior, Mineral Management Service (MMS), for issuance of a non-competitive lease for the proposed borrow area located within the boundaries of the Federal Outer Continental Shelf (OCS).

On October 23, 2003, the applicant submitted a Joint Coastal Permit application to the DEP to renourish the beaches of northern Collier County. On October 24, 2003, a copy of the permit application was provided to the Corps.

On November 3, 2003, the applicant received MMS concurrence that Collier County qualifies for a negotiated lease agreement for the identified sand source. MMS requested an Environmental Assessment (EA) be prepared in support of the project.

On February 2, 2004, the applicant provided advanced information regarding the proposed project in the form of a letter transmittal to the Service with pertinent enclosures.

On February 19, 2004, the Corps issued Public Notice number SAJ-2003-12405 (IP-MN) for the placement of 843,500 cubic-yards of sand in a proposed three-phase project covering 13.2 miles of shoreline in northern Collier County and concluded an Environmental Impact Statement would not be required. In the Public Notice, the Corps determined the proposed project "may affect, but would not likely adversely affect" manatees, but "may affect" nesting sea turtles (primarily the loggerhead turtle) and swimming sea turtles (due to the use of a hopper dredge).

The Corps also determined the proposed action "would not have a substantial adverse impact" on Essential Fish Habitat (EFH) or federally managed fisheries in the Gulf of Mexico.

On March 11, 2004, NOAA Fisheries Habitat Conservation Division opted for "no action," noting their position was neither supportive nor in opposition to the subject activities. This concluded the agency's comments on EFH consultation.

On March 30, 2004, NOAA Fisheries notified the Corps that the effects of the proposed activity "are entirely comparable to the effects of similar activities" and "no new effects" beyond those previously analyzed were expected. NOAA Fisheries stipulated all terms and conditions contained in the *Gulf of Mexico Regional Biological Opinion* and its Incidental Take Statement must be adhered to during implementation of this proposed activity.

On April 1, 2004, the applicant submitted a response to DEP's first request for additional information (RAI#1) with a copy to the Service.

On May 3, 2004, the applicant submitted a Draft EA for MMS review.

On June 7, 2004, the applicant submitted a response to DEP's second request for additional information (RAI#2) with a copy to the Service. With this response, one of the project segments (Barefoot Beach) was withdrawn, along with the proposed need for an upland sand source. The closer offshore borrow area (N5) was also withdrawn as a sand source for the project. The project design was revised accordingly based on sediment characteristics of the remaining T1 Borrow Area located within MMS jurisdiction.

On June 8, 2004, MMS provided comments on the Draft EA and identified requested revisions.

On September 17, 2004, the applicant submitted a response to DEP's third request for additional information (RAI #3) with a copy to the Service. Although no coverage of nearshore hardbottom was identified by the applicant, DEP proposed an alternate method to evaluate potential impacts due to cross-shore equilibration.

On December 20, 2004, the DEP released a Consolidated Notice of Intent to Issue Joint Coastal Permit and Authorization to Use Sovereign Submerged Lands (JCP) under file number 0222335-001-JC for the Collier County Beach Renourishment Project.

On January 12, 2005, the DEP issued the JCP Final Order, which authorized the construction of a beach nourishment project along three segments of the Collier County shoreline. The permitted total volume of material for beach placement is approximately 673,000 cubic-yards of beach quality sand from a single offshore source. The project fill site encompasses approximately 8.7 miles of shoreline. The JCP project approval also mandates construction of 1.09 acres of artificial reef as a specific condition of the permit.

On May 17, 2005, the applicant submitted the revised EA to MMS.

In accordance with the ESA, the Service is providing the following Biological Opinion.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Proposed Action

The applicant has proposed to place approximately 673,000 cubic-yards of material obtained from a single offshore borrow site along 8.7 miles (46,000 linear feet) of Gulf of Mexico shoreline. The beach fill areas are located along the shorelines of Vanderbilt Beach, Park Shore Beach, Naples Beach, Pelican Bay, and Northern Park Shore, in Collier County, Florida (Figure 1), Sections 29 and 32, Township 48 South, Range 25 East; Sections 5, 8, 16, 21 and 28, Township 49 South, Range 25 East; and Sections 4 and 9, Township 50 South, Range 25 East, Gulf of Mexico, Class III Waters.

The proposed dredged material placement area generally extends from 1 mile south of Wiggins Pass (R-22) to 1 mile north of Gordon Pass (R-79) in three segments of the Collier County shoreline (Figure 1). The project segments are defined by renourishment in previously restored areas of Vanderbilt Beach (R-22.5 to R-31), Park Shore Beach (R-48 to R-54.5), and Naples Beach (R-58 to R-79) and initial restoration along the shores of Pelican Bay (R-31 to R-37) and Northern Park Shore (R-43.5 to R-48).

As proposed, the constructed beach will include a berm height of +5 ft National Geodetic Vertical Datum (NGVD) at the landward limit of fill with a step down to +4 feet NGVD on a slope of 1 foot vertical to 5 feet horizontal. The break in elevation lowers the seaward berm crest to +4 feet NGVD. The stepped berm design is being implemented under recommendation of the FWC to reduce scarps that may affect sea turtle nesting.

The material will be obtained from a single offshore borrow area identified as Borrow Area T1 (Figure 1). The borrow area is located approximately 33 miles to the north and offshore of the placement area within the waters of the OCS, which falls under the authority of the MMS. The applicant has applied for a Noncompetitive Lease from the MMS for consent to use of the offshore sand. Sediment characteristics are provided in Table 1.

The beach will be constructed entirely and uniformly of sand from Borrow Area T1. There will be no layering of the beach berm. The project will be constructed outside of sea turtle nesting season, which the applicant records as extending from May 1st to October 31st in Collier County (with, in the past decade, the earliest nesting recorded as April 4). The applicant anticipates a 6-year renourishment interval. The project's construction duration is expected to be 150 days.

The applicant contends that no direct burial of nearshore hardbottom resulting from equilibration of the project toe of fill is anticipated. The DEP is requiring construction of 1.09 acres of artificial reef as a specific permit condition in order to mitigate for any potential impacts. In accordance with the permit, the applicant has proposed to construct a low-relief nearshore artificial reef in the gulf waters of Naples Beach at DEP monument R-66. A biological

monitoring plan will be implemented to monitor colonization of the artificial reef by epibenthic species, and project effects on nearshore hardbottom resources.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action. The Service has determined the action area for this project includes 13.2 miles of Collier County shoreline between DEP monuments R-22 and R-79 and includes adjacent, non-project sections of beach.

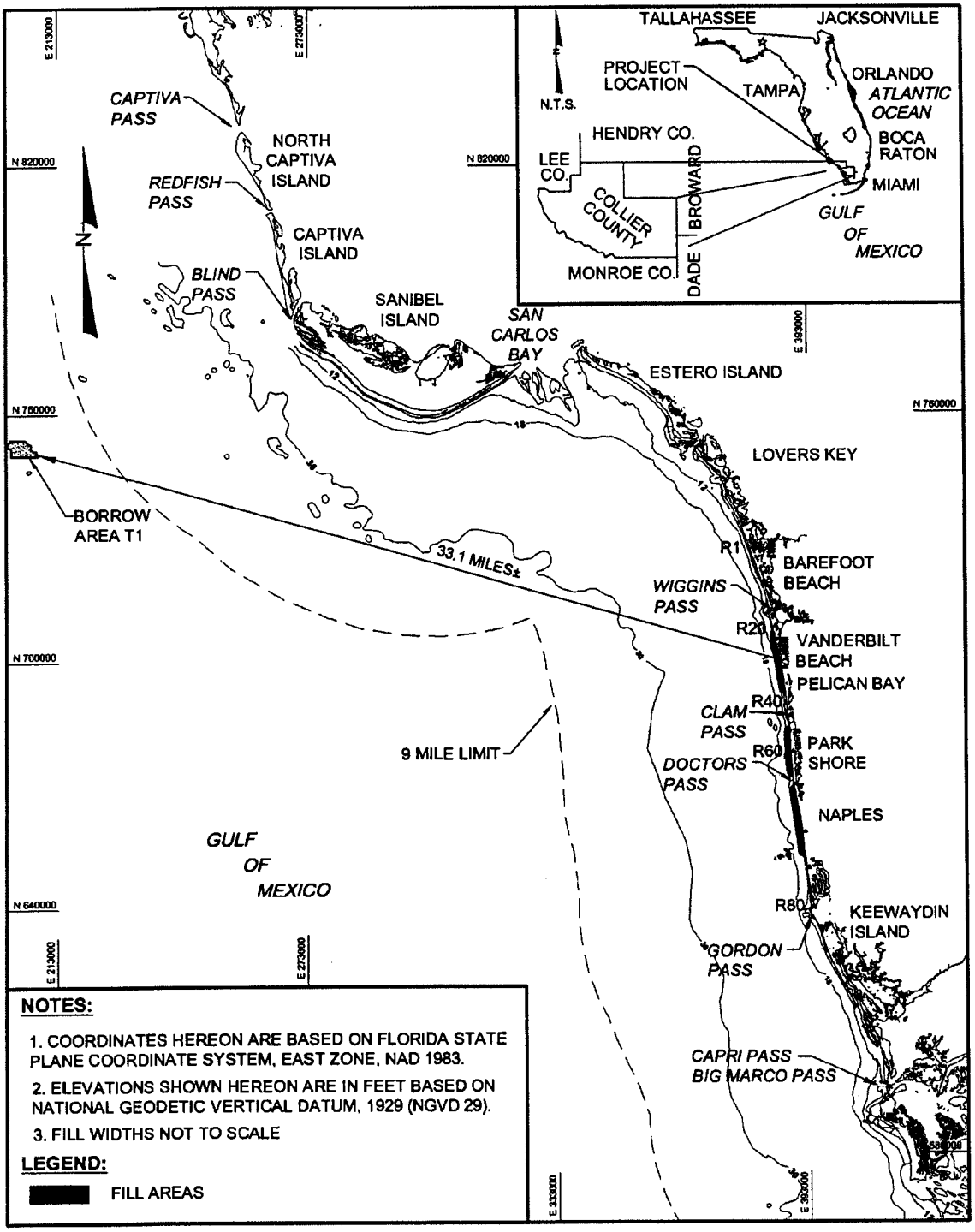
Table 1. Summary of Historical and Proposed Borrow Area Sediment Characteristics Collier County, Florida

Sample Type	Mean Grain Size (phi)	Mean Grain Size (mm)	Sorting (phi)	Silt (%)	Wet Munsell Color
NATIVE BEACH - 1988 (32nd St, Horizon Way, Vanderbilt Beach)					
Beach Composite	1.63	0.32	1.67	1.10	N/A
NATIVE BEACH - 1990 (R-27, R-33, R-54, R-66)					
Beach Composite	1.93	0.26	1.61	2.96	N/A
EXISTING BEACH - MARCH 2003 (R-27, R-35, R-52, R-64, R-73, R-84)					
Beach Composite	2.08	0.24	1.50	2.17	5Y-6/1.5*
Beach Range	0.18 to 3.60	0.08 to 0.88	0.36 to 2.54	0.35 to 30.51	5Y-5/1 – 5Y-8/1 to 5Y-6/2 – 5Y-8/2
BORROW AREA T1					
Borrow Area Composite	1.67	0.31	0.92	1.75	5Y-7/1
(*standard deviation*)	0.29	0.06	0.22	1.34	
Borrow Area Range	0.90 to 2.36	0.19 to 0.54	0.60 to 1.53	0.80 to 6.86	5Y-7/1

*Between 5Y-6/1 and 5Y-6/2 (Coastal Planning & Engineering, Inc.)

Figure 1.

Project Area Location Map



STATUS OF THE SPECIES AND CRITICAL HABITAT RANGEWIDE

Species/Critical Habitat Description

Loggerhead Sea Turtle

The loggerhead sea turtle, listed as a threatened species on July 28, 1978, (43 FR 32800; Service 1978), inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Loggerhead sea turtles nest on coasts within the continental United States (U.S.) from Louisiana to Virginia. Adults and sub-adults have a large, reddish-brown carapace. Scales on the top and sides of the head and on top of the flippers are also reddish-brown, but have yellow borders. The neck, shoulders, and limb bases are dull brown on top and medium yellow on the sides and bottom. The plastron is also medium yellow. Adult average size is 36.2 inches (in) straight carapace length; average weight is 253.5 pounds (lbs). The relative size of a loggerhead's head, when compared to the rest of its body, is substantially larger than other sea turtle species.

The loggerhead is the most abundant sea turtle occurring in U.S. waters. Along the Gulf coast, the turtle's range extends from southern Florida to southern Texas. Aerial survey data has estimated that only 12 percent of all western North Atlantic loggerheads reside in the eastern Gulf of Mexico, with the majority of this population occurring off the coast of western Florida (TEWG 1998; Davis et al. 2000). Major nesting concentrations in the U.S. are found on the coastal islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf Coasts of Florida (Hopkins and Richardson 1984).

No critical habitat has been designated for the loggerhead sea turtle.

Green Sea Turtle

The green sea turtle was federally listed as a protected species on July 28, 1978, (43 FR 32800; Service 1978). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. Adults commonly reach a carapace length of 39.4 in and 330.7 lbs in mass. Colorization of the adult carapace range from solid black to gray, yellow, green, and brown in various patterns; the plastron is a much lighter yellow to white. Hatchlings are distinctively black on the dorsal carapace and white on the ventral plastron. The green turtle has a worldwide distribution in tropical and subtropical waters. Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NOAA Fisheries and Service 1991a). Nesting also has been documented along the Gulf Coast of Florida on Santa Rosa Island (Okaloosa and Escambia Counties) and from Pinellas County through Collier County (Florida FWC statewide nesting database). Green turtles have been known to nest in Georgia, but only on rare occasions (Georgia Department of Natural Resources statewide nesting database). The green turtle also nests sporadically in North Carolina and South Carolina (North Carolina Wildlife Resources Commission statewide nesting database;

South Carolina Department of Natural Resources statewide nesting database). Unconfirmed nesting of green turtles in Alabama has also been reported (Bon Secour National Wildlife Refuge 2004).

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys.

Leatherback Sea Turtle

The leatherback sea turtle was listed as an endangered species on June 2, 1970, (35 FR 8491; Service 1970) and nests on shores of the Atlantic, Pacific and Indian Oceans. The carapace is distinguished by a rubber-like texture, about 1.6 in thick, and made primarily of tough, oil-saturated connective tissue. No sharp angle is formed between the carapace and the plastron, resulting in the animal being somewhat barrel-shaped. The average curved carapace length for adult turtles is 61 in and weight ranges from 440.9 to 1543.2 lbs. Non-breeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Nesting grounds are distributed worldwide, with the Pacific Coast of Mexico supporting the world's largest known concentration of nesting leatherbacks. The largest nesting colony in the wider Caribbean region is found in French Guiana, but nesting occurs frequently, although in lesser numbers, from Costa Rica to Columbia and in Guyana, Surinam, and Trinidad (NOAA Fisheries and Service 1992; National Research Council 1990a).

The leatherback regularly nests in the U.S. in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia (NOAA Fisheries and Service 1992). Leatherback turtles have been known to nest in Georgia, South Carolina, and North Carolina, but only on rare occasions (North Carolina Wildlife Resources Commission, South Carolina Department of Natural Resources, and Georgia Department of Natural Resources statewide nesting databases). Leatherback nesting also has been reported on the northwest coast of Florida (LeBuff 1990; FWC statewide nesting database); a false crawl (non-nesting emergence) has been observed on Sanibel Island (LeBuff 1990).

Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of Saint Croix, U.S. Virgin Islands.

Hawksbill Sea Turtle

The hawksbill sea turtle was listed as an endangered species on June 2, 1970, (35 FR 8491; Service 1970). One of the smallest sea turtles of the Gulf of Mexico weighing only 95-165 lb as an adult and ranging in size from approximately 24.6 to 37 in straight carapace length, hawksbills have a hawk-like beak, posteriorly overlapping carapace scutes, and two pairs of claws on their flippers (NOAA Fisheries and Service 1993; Bass 1994). The hawksbill is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean. Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Dade Counties) and to the Florida Keys in Monroe County, Florida (Meylan 1992;

Meylan et al. 1995). However, hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors. Therefore, surveys in Florida likely underestimate actual hawksbill nesting numbers (Meylan et al. 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NOAA Fisheries and Service 1993).

Critical habitat for the hawksbill sea turtle has been designated for selected beaches and/or waters of Mona, Monito, Culebrita, and Culebra Islands, Puerto Rico.

Kemp's Ridley Sea Turtle

The Kemp's Ridley sea turtle was listed as endangered on December 2, 1970, and internationally, the Kemp's ridley is considered the most endangered sea turtle (Service and NOAA Fisheries 1992; TEWG 2000). The smallest living sea turtle, the Kemp's ridley has a straight carapace length around 25.6 in, with the adult's shell almost as wide as they are long. The dorsal carapace is round to heart-shaped and distinctly light gray. Adults of this species are usually confined to the Gulf of Mexico, although adult-sized individuals sometimes are found on the east coast of the U.S. (Service and NOAA Fisheries 1992). A Kemp's ridley sea turtle was observed offshore of the Collier County coastline in May, 2004 by researchers from CPE conducting marine resource investigations.

No critical habitat has been designated for the Kemp's Ridley sea turtle.

Life History

Loggerhead Sea Turtle

Loggerheads are known to nest from 1 to 7 times within a nesting season (Talbert et al. 1980; Richardson and Richardson 1982; Lenarz et al. 1981); the mean is approximately 4.1 times (Murphy and Hopkins 1984). Females typically select nesting sites on continental coastlines adjacent to warm-temperate currents, and in South Florida, the demographically independent loggerhead nesting population occurs from 29°N on the east coast to Sarasota on the west coast (Dodd 1988; TEWG 2000). The interval between nesting events within a season varies around a mean of about 14 days (Dodd 1988). Mating takes place in late March to early June, and eggs are laid throughout the summer, with a mean clutch size of 100 to 126 eggs in the southeastern U.S. (NOAA Fisheries and Service 1991b). Nesting migration intervals of 2 to 3 years are most common in loggerheads, but the number can vary from 1 to 7 years (Dodd 1988). Age at sexual maturity is believed to be about 20 to 30 years (TEWG 1998).

Along the Gulf coast, the predominant age classes for loggerhead sea turtles are juvenile and sub-adult (TEWG 1998). To reach sexual maturity, these omnivores eat a mixed diet of fish, jellyfish, mussels, clams, squid, shrimp, seaweed, and marine grasses. Developmental habitats for immature loggerheads include estuarine lagoons, river mouths, bays, and coastal waters typically within the 100-m isobath (Davis et al. 2000). In particular, estuarine ecosystems represent a vital habitat for juvenile loggerhead sea turtle populations in the eastern Gulf of Mexico (Ogren 1988). Juveniles may occupy these coastal nursery grounds for up to 20 years,

feeding and growing, before their first sexually reproductive migration (Bjorndal et al. 2001). Offshore movements are not uncommon, as well. Associated within close proximity of artificial reefs and oil platforms, juvenile loggerheads are known to venture into the offshore waters of Gulf of Mexico where there is an abundance of prey items and suitable sheltered resting sites (Davis et al. 2000).

Green Sea Turtle

Green sea turtles take an estimated 20 to 50 years to reach sexual maturity, the longest age to maturity for any sea turtle species, and mating occurs in the waters off of nesting beaches (Frazer and Ehrhart 1985; Hirth 1997). Green turtles deposit from 1 to 9 clutches within a nesting season, but the overall average is about 3.3. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997) and the mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years. Usually 2, 3, 4, or more years intervene between breeding seasons, while males may mate every year (Balazs 1983; NOAA Fisheries and Service 1991a).

Leatherback Sea Turtle

Leatherbacks nest an average of 5 to 7 times within a nesting season, with an observed maximum of 11 times (NOAA Fisheries and Service 1992). The interval between nesting events within a season is about 9 to 10 days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Nesting migration intervals of 2 to 3 years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, Saint Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in 6 to 10 years (Zug and Parham 1996).

Hawksbill Sea Turtle

Hawksbills prefer to nest alone or in small groups on isolated beaches. The nesting season varies with locality, but in most locations nesting occurs between April and November (Meylan et al. 1995). Hawksbills nest at night and, on average, about 4.5 times per-season at intervals of approximately 14 days. In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per-nest (Crouse 1999). Remigration intervals of 2 to 3 years predominate. The incubation period averages 60 days. Age at sexual maturity is believed to be about 30 to 40 years (Rhodin and Pritchard 1999).

Kemp's Ridley Sea Turtle

Female Kemp's ridley sea turtles return to their nesting beach about every 2 years. The mean clutch size for ridleys is approximately 100 eggs per-nest, with an average of 2.5 nests per-female within a season. Nesting occurs from April into July and is essentially limited to the beaches of the western Gulf of Mexico, near Rancho Nuevo in southern Tamaulipas, Mexico (TEWG 1998). The western coast of Florida (specifically the Cedar Keys area), the eastern coast

of Alabama, and the mouth of the Mississippi River are identified as important developmental regions for the Kemp's ridley (Service and NOAA Fisheries 1992). Nearly all Kemp's ridleys occurring in the Gulf of Mexico originated from nesting beaches along the western Gulf (Renaud 1995). Studies have shown the post-hatchling pelagic stage varies from 1 to 4 or more years, and the benthic immature stage lasts 7 to 9 years (Renaud 1995). The TEWG (1998) estimates age to maturity between 7 to 15 years.

Population Dynamics

Loggerhead Sea Turtle

Total estimated nesting of loggerhead sea turtles in the southeast U.S. is approximately 68,000 to 90,000 nests per-year, according to the FWC, Georgia Department of Natural Resources, South Carolina Department of Natural Resources, and the North Carolina Wildlife Resources Commission statewide nesting databases in 2002. In 1998, there were over 80,000 nests in Florida alone. From a global perspective, the southeastern U.S. nesting aggregation is of paramount importance to the survival of the species and is second in size only to that which nests on islands in the Arabian Sea off Oman (Ross 1982; Ehrhart 1989; NOAA Fisheries and Service 1991b). The status of the Oman colony has not been evaluated recently, which is cause for considerable concern (Meylan et al. 1995). The loggerhead nesting aggregations in Oman, the southeastern U.S., and Australia account for about 88 percent of nesting worldwide (NOAA Fisheries and Service 1991b). About 80 percent of loggerhead nesting in the southeastern U.S. occurs in the six Florida counties of Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward (NOAA Fisheries and Service 1991b).

Green Sea Turtle

About 150 to 2,750 females are estimated to nest on beaches in the continental U.S. annually (FWC 2003). In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year (NOAA Fisheries and Service 1998). Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting aggregation in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season (Limpus et al. 1993). In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

Recent estimates of global nesting populations indicate 26,000 to 43,000 females nest annually (Spotila et al. 1996). The largest nesting populations at present occur in the western Atlantic in French Guiana (4,500 to 7,500 females nesting per-year) and Colombia (estimated several thousand nests annually), and in the western Pacific in West Papua (formerly Irian Jaya) and Indonesia (about 600 to 650 females nesting per-year). In the U.S. , small nesting populations occur on the Florida east coast (approximately 100 females per-year; FWC 2003), Sandy Point, U.S. Virgin Islands (50 to 190 females per-year; Alexander et al. 2002) and Puerto Rico (30 to 90 females per-year).

Hawksbill Sea Turtle

About 15,000 females are estimated to nest each year throughout the world with the Caribbean accounting for 20 to 30 percent of the world's hawksbill population (Meylan 1989). Panamá, which used to support the single most important nesting population in the Caribbean, is only a remnant population. Mexico is now the most important region for hawksbills in the Caribbean with 3,000 to 4,500 nests per-year (NOAA Fisheries and Service 1998). Other significant but smaller populations in the Caribbean still occur in Martinique, Jamaica, Guatemala, Nicaragua, Grenada, Dominican Republic, Turks and Caicos Islands, Cuba, Puerto Rico, and U.S. Virgin Islands. In the U.S. Caribbean, about 100 to 350 nests per-year are laid on Mona Island, Puerto Rico, and 60 to 120 nests per-year on Buck Island Reef National Monument, U.S. Virgin Islands (NOAA Fisheries and Service 1993). In the U.S. Pacific, hawksbills nest only on main island beaches in Hawaii, primarily along the east coast of the island of Hawaii (NOAA Fisheries and Service 1998). Hawksbill nesting has also been documented in American Samoa and Guam.

Kemp's Ridley Sea Turtle

At one time, more than 40,000 females nested in a single, mass nesting (termed "arribada" or "arrived" in English) in Tamaulipas, Mexico. Since 1947 a drastic reduction in the number of nesting females caused the near extinction of this species (Ross et al 1989). The nesting population produced a low of 702 nests in 1985; however, since the mid-1980's, the number of nests laid in a season has been increasing primarily due to nest protection efforts and implementation of regulations requiring the use of turtle excluder devices (TEDs) in commercial fishing trawls (Marquez 1989). During the 1999 and 2000 nesting seasons, more than 3,600 nests and 6,000 nests, respectively, were deposited on the Mexico nesting beaches (NOAA Fisheries and Service 1992).

Status and Distribution

Loggerhead Sea Turtle

Genetic research involving analysis of mitochondrial DNA has identified five different loggerhead subpopulations/nesting aggregations in the western North Atlantic: (1) the Northern Subpopulation occurring from North Carolina to around Cape Canaveral, Florida (about 29° North.); (2) South Florida Subpopulation occurring from about 29° North on Florida's east coast to Sarasota on Florida's west coast; (3) Dry Tortugas, Florida Subpopulation; (4) Northwest Florida Subpopulation occurring at Eglin Air Force Base and the beaches near Panama City; and (5) Yucatán Subpopulation occurring on the eastern Yucatán Peninsula, Mexico (Bowen 1994; Bowen et al. 1993; Encalada et al. 1998; Pearce 2001). These data indicate gene flow between these five regions is very low. If nesting females are extirpated from one of these regions, regional dispersal will not be sufficient to replenish the depleted nesting subpopulation. The Northern Subpopulation has declined substantially since the early 1970s, but most of that decline occurred prior to 1979. No significant trend has been detected in recent years (Turtle Expert Working Group 1998, 2000). Adult loggerheads of the South Florida Subpopulation have shown significant increases over the last 25 years, indicating the population is recovering, although a

trend could not be detected from the State of Florida's Index Nesting Beach Survey program from 1989 to 2002. To date, nesting surveys in the Dry Tortugas, Northwest Florida, and Yucatán Subpopulations have been too irregular to allow for a meaningful trend analysis (TEWG 1998, 2000).

Threats to loggerhead sea turtles include incidental take from channel dredging and commercial trawling, longline, and gill net fisheries; loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and disease. There is particular concern about the extensive incidental take of juvenile loggerheads in the eastern Atlantic by longline fishing vessels from several countries (NOAA Fisheries and Service 1991b).

Green Sea Turtle

Total population estimates for the green turtle are unavailable, and trends based on nesting data are difficult to assess because of large annual fluctuations in numbers of nesting females. For instance, in Florida, where the majority of green turtle nesting in the southeastern U.S. occurs, estimates range from 150 to 2,750 females nesting annually (FWC 2003). Populations in Surinam and Tortuguero, Costa Rica, may be stable, but there is insufficient data for other areas to confirm a trend.

A major factor contributing to the green turtle's decline worldwide is commercial harvest for eggs and food. Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor and has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die. Other threats include loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and incidental take from channel dredging and commercial fishing operations (NOAA Fisheries and Service 1991a).

Leatherback Sea Turtle

Declines in leatherback nesting have occurred over the last 2 decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (65 percent of worldwide population), is now less than 1 percent of its estimated size in 1980. Spotila et al. (1996) recently estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200 and an upper limit of about 42,900. This is less than one third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. The largest population is in the western Atlantic. Using an age-based

demographic model, Spotila et al. (1996) determined leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and even the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded leatherbacks are on the road to extinction and further population declines can be expected unless action is taken to reduce adult mortality and increase survival of eggs and hatchlings.

The crash of the Pacific leatherback population is believed primarily to be the result of exploitation by humans for the eggs and meat, as well as incidental take in numerous commercial fisheries of the Pacific. Other factors threatening leatherbacks globally include loss or degradation of nesting habitat from coastal development; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; and watercraft strikes.

Hawksbill Sea Turtle

The hawksbill sea turtle has experienced global population declines of 80 percent or more during the past century (Meylan and Donnelly 1999). Most populations are declining, depleted, or remnants of larger aggregations. Only 5 regional populations remain with more than 1,000 females nesting annually (Seychelles, Mexico, Indonesia, and 2 in Australia). Hawksbills were previously abundant, as evidenced by high-density nesting at a few remaining sites and by trade statistics. The decline of this species is primarily due to human exploitation for tortoiseshell. While the legal hawksbill shell trade ended when Japan agreed to stop importing shell in 1993, a significant illegal trade continues. It is believed individual hawksbill populations around the world will continue to disappear under the current trend of exploitation for eggs, meat, and tortoiseshell, loss of nesting and foraging habitat, incidental capture in fishing gear, ingestion of and entanglement in marine debris, oil pollution, and boat collisions. Hawksbills are closely associated with coral reefs, one of the most endangered of all marine ecosystem types.

Kemp's Ridley Sea Turtle

Since 1947, a drastic reduction in the number of nesting females caused the near extinction of this species (Ross et al 1989). The decline of this species is primarily due to human activities, including the direct harvest of adults and eggs and incidental capture in commercial fishing operations. It is estimated before implementation of TEDs, the commercial shrimp fleet killed 500 to 5,000 Kemp's ridleys each year. Besides shrimp trawls, Kemp's ridleys have been taken in pound nets, trawls, gill nets, hook and line, crab traps, and longline gear (Marquez 1989).

Analysis of the Species/Critical Habitat Likely to be Affected

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project area. The effects of the proposed action on sea turtles will be considered further in the remaining sections of this biological opinion. Potential effects include destruction of nests deposited within the boundaries of the proposed project, harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction

area or on adjacent beaches as a result of construction activities, disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting, and behavior modification of nesting females due to escarpment formation within the project area during a nesting season resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs. The quality of the placed sand could affect the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest. Critical habitat has not been designated in the continental U.S.; therefore, the proposed action would not result in an adverse modification.

ENVIRONMENTAL BASELINE

Status of the Species/Critical Habitat within the Action Area

The distribution of sea turtle nesting activity on Florida's Gulf Coast (Manatee, Sarasota, Charlotte, Lee, and Collier Counties) makes up a small percent of the overall distribution of nesting activity within the State when compared to the east coast epicenter of sea turtle nesting between Brevard and Palm Beach Counties (Addison et al. 2000). According to the FWC (2004), 9 to 10 percent of the total nesting activity on Florida's coastline occurs on the Gulf coast. During the 2004 nesting season, Collier County accounted for approximately 2.5 percent of the overall nesting in the state of Florida (Collier County 2005).

Though green, Kemp's ridley, and the leatherback sea turtles have been documented as nesting on Florida's Gulf Coast beaches, the loggerhead sea turtle is dominant. According to data provided by the FWC, Florida Marine Research Institute, the beaches of Sarasota County support the highest density of loggerhead sea turtle nests on the west coast of Florida (FWC 2003). Between 1988 and 2003, the mean number of nests recorded annually in Sarasota County was 2,616, which accounted for approximately 52 percent of loggerhead sea turtle nests in southwest Florida (FWC 2003). Conversely, Collier County recorded a mean number of 865 annual nests, which accounted for approximately 17 percent (Collier County 2005). The beaches of the remaining counties, Lee, Charlotte, and Manatee, support approximately 12, 14, and 5 percent of southwest Florida's loggerhead sea turtle nests in the same 16-year time frame, respectively.

According to data collected during the 2004 nesting season, the results indicate a decrease in total sea turtle emergences along Collier County when compared to the 2003 data (FWC 2004).

Loggerhead Sea Turtle

The loggerhead sea turtle nesting and hatching season for southern Gulf of Mexico beaches (includes Pinellas through Monroe Counties in Florida) extends from April 1 through November 30. Incubation ranges from about 45 to 95 days. The earliest recorded loggerhead nesting event within the project area occurred on April 4, 2002. Table 3 provides the historic loggerhead sea turtle nesting data for the project area from 1993 through 2004.

Table 2. Sea Turtle Nesting Activity in Collier County, Florida 1988 through 1997

Year	Nests	False Crawls (non-nesting emergences)	Total Emergences
1988	276	238	514
1989	176	54	230
1990	407	348	755
1991	605	632	1237
1992	560	661	1221
1993	556	713	1269
1994	1151	946	2097
1995	1060	1943	3003
1996	1152	1265	2417
1997	1104	925	2029
1998	1353	1424	2777
1999	1260	1335	2595
2000	1362	1283	2645
2001	954	826	1780
2002	741	922	1663
2003	1147	1365	**2512**
2004	645	590	**1235**

(FWC 2004)

Table 3. Loggerhead Sea Turtle Nesting ActivityWithin the Collier County Project Area

Year	Nests	False Crawls (non-nesting emergences)	Total Emergences
1993	216	236	452
1994	364	381	745
1995	388	520	908
1996	414	700	1114
1997	345	306	651
1998	421	395	816
1999	396	337	733
2000	411	418	829
2001	309	267	576
2002	222	274	496
2003	368	406	774
2004	235	186	421

(FWC 2004)

Green Sea Turtle

The green sea turtle nesting and hatching season for southern Gulf of Mexico beaches (includes Pinellas through Monroe Counties in Florida) extends from May 15 through October 31. Incubation ranges from about 45 to 75 days. Only one green turtle nest (laid on July 6, 1994) has been documented within the project area over the past 10 nesting seasons

Leatherback Sea Turtle

Longboat Key in Sarasota County was the first to document a leatherback nesting event along the central west coast shoreline of Florida. The nest was deposited on May 31, 2001. Incubation ranges from about 55 to 75 days. Leatherback nesting events have not been documented in Collier County.

Hawksbill Sea Turtle

Hawksbill sea turtle nesting events have not been documented in Collier County. A bordering county, Monroe, has documented nesting activities for hawksbill sea turtles. The hawksbill sea turtle nesting and hatching season for Monroe County (Table 4) extends from June 1 through December 31. Incubation lasts about 60 days.

Table 4. Hawksbill Sea Turtle Nesting Activity Monroe County

Year	Nests	False Crawls (non-nesting emergences)	Total Emergences
1989	1	0	1
1995	2	0	2
1997	2	2	4
1999	1	0	1
2000	3	0	3
2002	3	0	3
2004	3	7	10

(FWC 2004)

Kemp's Ridley Sea Turtle

Kemp's ridley sea turtle nesting events have not been documented in Collier County. Lee and Sarasota Counties have documented one and two Kemp's ridley sea turtle nests, respectively. Incubation ranges from 45 to 70 days (Table 5).

Table 5. Kemp's Ridley Sea Turtle Nesting Activity Lee and Sarasota Counties

Year	Nests	False Crawls (non-nesting emergences)	Total Emergences
Lee County			
1996	1	0	1
Sarasota County			
1999	2	0	2

(FWC 2004)

Factors Affecting the Species Habitat within the Action Area

The action area for this project borders the southeastern Gulf of Mexico and includes 13.2 miles of Collier County shoreline in three segments (segments totaling 8.7 miles) between DEP monuments R-22 and R-79. The area is characterized by high-density residential and commercial development. The barrier beaches are separated from the mainland by mangrove swamps, salt marshes, and small bays, and are divided by Wiggins Pass, Doctors Pass, and Gordon Pass. There are 8.5 miles of critically eroded beach in the Collier County action area, which include (FDEP 2005):

- R22.3 – R30.5 is a 1.6-mile segment of critically eroded beach at Vanderbilt Beach;
- R50.65 – R57.5 is a 1.3-mile segment of critically eroded beach at Park Shore north of Doctors Pass;
- R57.8 – R89 is a 5.6-mile segment of critically eroded beach at Naples between Doctors Pass and Gordon Pass.

Erosion is attributed to winter frontal systems, tropical weather systems in the Gulf, and the effects of the inlets. The most erosive storms in recent years were a subtropical storm of 1982, Hurricane Andrew in 1992, and Tropical Storm Gordon in 1995.

Several erosion control programs have been implemented in Collier County. In 1960, the City of Naples improved Doctors Pass for navigation by channel dredging and jetty construction. In 1966, the Pass was again dredged and the jetties were augmented with rock and sand from the dredging. Maintenance dredging has been conducted, on average, every 4 years with dredged sand being placed on the beach or inshore zone south of the inlet. In 1996, a sediment basin was dredged within the ebb shoal and the north jetty was extended. In 1997, the DEP adopted an inlet management plan that specified all dredged material be placed on the beaches or inshore zone south of the inlet meeting a minimum bypassing goal of 10,000 cubic-yards on an average annual basis (FDEP 1997).

The navigation channel through Gordon Pass is part of a federal navigation project that includes an interior channel from Naples to Big Marco Pass. In 1962, the Corps dredged the channel and private interests constructed a jetty on the south side of the inlet. Groins and armoring have been constructed to protect gulf front development north of the inlet. Maintenance dredging by the Corps has been conducted about every 7 years with most of the dredged material placed on the beach a short distance south of the inlet (CPE 1998).

Since 1984, the applicant has conducted periodic maintenance dredging of a small boat channel through the ebb tidal shoal of Wiggins Pass and placed the dredged sand on the beach both north and south of the inlet (CPE 1995).

In 1996, the non-federal Collier County Beach Renourishment Project was constructed at Vanderbilt Beach (R-22 to R-30), Park Shore (R-50 to R-54), and Naples (R-58 to R-78) using sand from offshore borrow areas. Construction of this Project was initiated in November 1995 and completed in May 1996. Coastal Engineering Consultants, Inc. reported that 1,172,650 cubic-yards of sand was placed along the shorelines of Vanderbilt Beach, Park Shore Beach, and Naples Beach (CEC 1996). The project included extension of the north jetty of Doctors Pass by approximately 75 feet, removal of 36 groins, and restoration of 6 rock groins and a 345-foot pile cluster groin (PCG-18-1). The project also included restoration and extension of 10 existing storm water outfalls on northern Naples Beach. In 2000, the City of Naples constructed T-head groins and reconstructed wood plank groins along the gulf shoreline near Gordon Pass (CPE 2003). A non-compliance issue for the placement of incompatible material on Naples and Vanderbilt beaches was resolved and the applicant implemented a long term maintenance plan to continually remove non-compatible material from Naples and Vanderbilt beaches. The County has implemented an annual maintenance program of beach nourishment using sand from upland borrow areas.

EFFECTS OF THE ACTION

Factors to be Considered

The proposed sand placement activities are expected to occur along 8.7 miles (project footprint) of suitable sea turtle nesting habitat, however construction will not take place during the sea turtle nesting season. The protection of sea turtles, gopher tortoise, colonial shorebirds, manatees, and both hardbottom/reef habitat and seagrass beds are environmental concerns within this region. The timing of construction activities has been restricted during the marine turtle nesting season of May 1 through October 31. Projects, and the method of construction, are designed to avoid and minimize adverse impacts to wildlife and habitat.

As mentioned previously, the beach will be constructed entirely and uniformly of sand from Borrow Area T1, with no layering of the beach berm. The applicant contends that no direct burial of nearshore hardbottom resources resulting from equilibration of the project toe of fill is anticipated.

Analyses for Effects of the Action

Beneficial Effects - The placement of sand on a beach with reduced dry fore-dune habitat may increase sea turtle nesting habitat because the placed sand will be compatible (*i.e.*, grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may be more stable than the eroding one it replaces, thereby benefiting sea turtles.

Direct Effects - Placement of sand on a beach, in and of itself, may not provide suitable nesting habitat for sea turtles. Although beach nourishment may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not incorporated during project construction. Nourishment during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of eggs and hatchlings and, along with other mortality sources, may significantly impact the long-term survival of the species. For instance, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. While a nest monitoring and egg relocation program would reduce these impacts, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, and/or tides) or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. Even under the best of conditions, about 7 percent of the nests can be misidentified as false crawls by experienced sea turtle nest surveyors (Schroeder 1994).

Nest relocation

Besides the potential for missing nests during a nest relocation program, there is a potential for eggs to be damaged by their movement, particularly if eggs are not relocated within 12 hours of deposition (Limpus et al. 1979). Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus et al. 1979; Ackerman 1980; Parmenter 1980; Spotila et al. 1983; McGehee 1990). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. Water availability is known to influence the incubation environment of the embryos and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard et al. 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard et al. 1985), hatchling size (Packard et al. 1981; McGehee 1990), energy reserves in the yolk at hatching (Packard et al. 1988), and locomotory ability of hatchlings (Miller et al. 1987).

In a 1994 Florida study comparing loggerhead hatching and emergence success of relocated nests with *in situ* nests, Moody (1998) found hatching success was lower in relocated nests at 9 of 12 beaches evaluated and emergence success was lower in relocated nests at 10 of 12 beaches surveyed in 1993 and 1994.

Equipment

The placement of pipelines and the use of heavy machinery on the beach during a construction project may also have adverse effects on sea turtles. Pipelines and equipment can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure.

Artificial lighting

Visual cues are the primary sea-finding mechanism for hatchling sea turtles (Mrosovsky and Carr 1967; Mrosovsky and Shettleworth 1968; Dickerson and Nelson 1989; and Witherington

and Bjorndal 1991). When artificial lighting is present on or near the beach, it can misdirect hatchlings once they emerge from their nests and prevent them from reaching the ocean (Philibosian 1976; Mann 1977; and FWC sea turtle disorientation database). In addition, a significant reduction in sea turtle nesting activity has been documented on beaches illuminated with artificial lights (Witherington 1992). Therefore, construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, misdirect females trying to return to the surf after a nesting event, and misdirect emergent hatchlings from adjacent non-project beaches. Any source of bright lighting can profoundly affect the orientation of hatchlings, both during the crawl from the beach to the ocean and once they begin swimming offshore. Hatchlings attracted to light sources on dredging barges may not only suffer from interference in migration, but may also experience higher probabilities of predation to predatory fishes that are also attracted to the barge lights. This impact could be reduced by using the minimum amount of light necessary (may require shielding) or low pressure sodium lighting during project construction.

Indirect Effects - Many of the direct effects of beach nourishment may persist over time and become indirect impacts. These indirect effects include increased susceptibility of relocated nests to catastrophic events, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, the formation of escarpments, and future sand migration.

Increased susceptibility to catastrophic events

Nest relocation may concentrate eggs in an area making them more susceptible to catastrophic events. Hatchlings released from concentrated areas also may be subject to greater predation rates from both land and marine predators, because the predators learn where to concentrate their efforts (Glenn 1998; Wyneken et al. 1998).

Increased beachfront development

Pilkey and Dixon (1996) state beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also notes the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as older buildings were replaced by much larger ones that accommodated more beach users. Overall, shoreline management may create an upward spiral of initial protective measures resulting in more expensive development which leads to the need for more and larger protective measures. Increased shoreline development may adversely affect sea turtle nesting success. Greater development may support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas (National Research Council 1990b), and can also result in greater adverse effects due to artificial lighting, as discussed above.

Changes in the physical environment

Beach nourishment may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings (Nelson and Dickerson 1987; Nelson 1988).

Beach compaction and unnatural beach profiles that may result from beach nourishment activities could negatively impact sea turtles regardless of the timing of projects. Very fine sand and/or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson et al. 1987; Nelson and Dickerson 1988a). Significant reductions in nesting success (*i.e.*, false crawls occurred more frequently) have been documented on severely compacted nourished beaches (Fletemeyer 1980; Raymond 1984; Nelson and Dickerson 1987; Nelson et al. 1987), and increased false crawls may result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests and also cause increased physiological stress to the animals (Nelson and Dickerson 1988b). Nelson and Dickerson (1988c) concluded, in general, beaches nourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

These impacts can be minimized by using suitable sand and by tilling compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a nourished beach with a root rake may reduce the sand compaction to levels comparable to unnourished beaches. A pilot study by Nelson and Dickerson (1988c) showed a tilled nourished beach will remain uncompacted for up to 1 year. Therefore, the Service requires multi-year beach compaction monitoring and, if necessary, tilling to ensure project impacts on sea turtles are minimized.

A change in sediment color on a beach could change the natural incubation temperatures of nests in an area, which, in turn, could alter natural sex ratios. To provide the most suitable sediment for nesting sea turtles, the color of the nourished sediments must resemble the natural beach sand in the area. Natural reworking of sediments and bleaching from exposure to the sun would help to lighten dark nourishment sediments; however, the timeframe for sediment mixing and bleaching to occur could be critical to a successful sea turtle nesting season.

Escarpment formation

On nourished beaches, steep escarpments may develop along their water line interface as they equilibrate from the construction profile to a more natural beach profile (Nelson et al. 1987). These escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998). Researchers have shown that female turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (*e.g.*, in front of the escarpments, which often results in failure of nests due to prolonged tidal inundation). This impact can be minimized by leveling escarpments prior to the nesting season.

Species Response to a Proposed Action

Ernest and Martin (1999) conducted a comprehensive study to assess the effects of beach nourishment on loggerhead sea turtle nesting and reproductive success. The following findings illustrate sea turtle responses to and recovery from a nourishment project. A significantly larger proportion of turtles emerging on nourished beaches abandoned their nesting attempts than turtles emerging on control or prenourished beaches. This reduction in nesting success was most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics associated with the nourishment project (*e.g.*, beach profile, sediment grain size, beach compaction, frequency, and extent of escarpments). During the first post-construction year, the time required for turtles to excavate an egg chamber on the untilled, hard-packed sands of one treatment area increased significantly relative to control and background conditions. However, in another treatment area, tilling was effective in reducing sediment compaction to levels that did not significantly prolong digging times. As natural processes reduced compaction levels on nourished beaches during the second post-construction year, digging times returned to background levels.

During the first post-construction year, nests on the nourished beaches were deposited significantly farther from both the toe of the dune and the tide line than nests on control beaches. Furthermore, nests were distributed throughout all available habitat and were not clustered near the dune as they were in the control. As the width of nourished beaches decreased during the second year, among-treatment differences in nest placement diminished. More nests were washed out on the wide, flat beaches of the nourished treatments than on the narrower steeply sloped beaches of the control. This phenomenon persisted through the second post-construction year monitoring and resulted from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping, occurred as the beach equilibrated to a more natural contour.

Ernest and Martin (1999) found the principal effect of nourishment on sea turtle reproduction was a reduction in nesting success during the first year following project construction, as with other beach nourishment projects. Although most studies have attributed this phenomenon to an increase in beach compaction and escarpment formation, Ernest and Martin indicate changes in beach profile may be more important. Regardless, as a nourished beach is reworked by natural processes in subsequent years and adjusts from an unnatural construction profile to a more natural beach profile, beach compaction and the frequency of escarpment formation decline, and nesting and nesting success return to levels found on natural beaches.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. The Service is not aware of any cumulative effects in the project area.

CONCLUSION

After reviewing the current status of these species, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion the project, as proposed, is not likely to jeopardize the continued existence of the federally threatened loggerhead sea turtle, endangered green sea turtle, endangered leatherback sea turtle, endangered hawksbill sea turtle, or endangered Kemp's ridley sea turtle. No critical habitat has been designated in the project area for the loggerhead, green, leatherback, hawksbill, or Kemp's ridley sea turtle; therefore, none will be affected.

Of the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern U.S., the proposed project will affect 13.2 miles of beach proposed for nourishment. Research has shown the principal effect of beach nourishment on sea turtle reproduction is a reduction in nesting success, and this reduction is most often limited to the first year following project construction. Research has also shown the impacts of a nourishment project on sea turtle nesting habitat are typically short-term because a nourished beach will be reworked by natural processes in subsequent years, and beach compaction and the frequency of escarpment formation will decline. Although a variety of factors, including some that cannot be controlled, can influence how a nourishment project will perform from an engineering perspective, measures can be implemented to minimize impacts to sea turtles.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered to be prohibited under the ESA provided such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to

monitor the impact of incidental take, the Corps must report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

The Service anticipates 13.2 miles of nesting beach habitat could be taken as a result of this proposed action. The take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited from March 1 through April 30 and from September 1 through September 30 and missed by a nest survey and egg relocation program within the boundaries (footprint) of the proposed project; (2) destruction of all nests deposited from November 1 through February 28 (or 29 as applicable) when a nest survey and egg relocation program is not required to be in place within the boundaries (footprint) of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) misdirection of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

Incidental take is anticipated for only the 8.7 miles of beach that has been identified for sand placement, as well as the interstitial beaches (totaling 13.2 miles). The Service anticipates incidental take of sea turtles will be difficult to detect for the following reasons: (1) the turtles nest primarily at night and all nests are not found because [a] natural factors, such as rainfall, wind, and tides may obscure crawls and [b] human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls and result in nests being destroyed because they were missed during a nesting survey and egg relocation program; (2) the total number of hatchlings per undiscovered nest is unknown; (3) the reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown; (4) an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area; (5) lights may misdirect an unknown number of hatchlings and cause death; and (6) escarpments may form and cause an unknown number of females from accessing a suitable nesting site.

However, the level of take of these species can be anticipated by the disturbance and renourishment of suitable turtle nesting beach habitat because: (1) turtles nest within the project site; (2) beach renourishment may occur during a portion of the nesting season; (3) the renourishment project will modify the incubation substrate, beach slope, and sand compaction; and (4) artificial lighting will deter and/or misdirect nesting females and hatchlings.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined this level of anticipated take is not likely to result in jeopardy to the species. Critical habitat has not been designated in the project area; therefore, the project will not result in destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerhead, green, leatherback, hawksbill, or Kemp's ridley sea turtles:

1. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence must be used on the project site;

2. Beach nourishment shall be started after October 31 and be completed prior to May 1;

3. If the beach nourishment project will be conducted during the period from March 15 through April 30, surveys for early nesting sea turtles must be conducted. If nests are constructed in the area of beach nourishment, the eggs must be relocated;

4. Immediately after completion of the beach nourishment project and prior to the next 3 nesting seasons (March 15), tilling must be conducted as required to reduce the likelihood of impacting sea turtle nesting and hatching activities;

5. Immediately after completion of the beach nourishment project and prior to the next 3 nesting seasons (March 15), monitoring must be conducted to determine if escarpments are present and escarpments must be leveled as required to reduce the likelihood of impacting sea turtle nesting and hatching activities;

6. The applicant must ensure contractors doing the beach nourishment work fully understand the sea turtle protection measures detailed in this incidental take statement;

7. During the early (March 15 through April 30) and late (November 1 to November 30) portions of the nesting season, construction equipment and pipes must be stored in a manner that will minimize impacts to sea turtles to the maximum extent practicable; and

8. During the early and late portions of the nesting season, lighting associated with the project must be minimized to reduce the possibility of disrupting and misdirecting nesting and/or hatchling sea turtles.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. All fill material placed must be sand similar to a native beach in the vicinity of the site that has not been affected by prior renourishment activities. The fill material must be similar in both coloration and grain size distribution (sand grain frequency, mean and median grain size, and sorting coefficient) to the native beach and shall not contain:

   A. Greater than 10 percent, by weight, silt, clay, or colloids passing the #200 sieve;

   B. Greater than 5 percent, by weight, fine gravel or cobbles, exclusive of shell material (retained by the #4 sieve);

   C. The more restrictive of 5 percent coarse gravel, cobbles, or material retained on the ¾-in sieve, or in a percentage or size greater than found on the native beach; and

   D. Construction debris, toxic material or other foreign matter; and not result in contamination of the beach.

2. Beach nourishment shall be started after October 31 and be completed prior to May 1. During the May 1 through October 31 period, no construction equipment or pipes shall be stored on the beach;

3. If the beach nourishment project will be conducted before May 1, daily early morning surveys for sea turtle nests must be conducted from March 15 through April 30 or until completion of the project (whichever is earliest). In the event a sea turtle nest is excavated during construction activities, all work shall cease in that area immediately and the permitted person responsible for egg relocation for the project should be notified so the eggs can be relocated per the following requirements:

   A. Nesting surveys and egg relocations will only be conducted by personnel with prior experience and training in nesting survey and egg relocation procedures. Surveyors must perform under the supervision of a qualified professional with a valid FWC Marine Turtle Permit. Nesting surveys must be conducted daily between sunrise and 9 a.m. Surveys must be performed in such a manner so as to ensure construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures; and

   B. Only those nests that may be affected by construction activities will be relocated. Nests requiring relocation must be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association

with construction activities must cease when construction activities no longer threaten nests. Nests deposited within areas where construction activities have ceased or will not occur for 65 days must be marked and left in place unless other factors threaten the success of the nest. Any nests left in the active construction zone must be clearly marked, and all mechanical equipment must avoid nests by at least 10 feet.

4. If the beach nourishment project will be conducted during the period from November 1 through November 30, daily early morning surveys for sea turtle nests must be conducted until the last nest hatches. In the event a sea turtle nest is excavated during construction activities, all work shall cease in that area immediately and the permitted person responsible for egg relocation for the project should be notified so the eggs can be relocated per the requirements in 3A and 3B above;

5. Immediately after completion of the beach nourishment project and prior to March 15 for 3 subsequent years, if placed sand still remains on the beach, the beach shall be tilled as described below to a depth of 24 in. All tilling activity must be completed prior to March 15. If the project is completed during the nesting season, tilling shall not occur in areas where nests have been left in place or relocated unless authorized by the Service in an Incidental Take Statement;

6. Visual surveys for escarpments along the project area must be made immediately after completion of the beach nourishment project and prior to March 15 for 3 subsequent years if placed sand still remains on the beach. All scarps shall be leveled, or the beach profile shall be reconfigured, to minimize scarp formation. In addition, weekly surveys of the project area shall be conducted during the 2 nesting seasons following completion of fill placement as follows:

   A. The number of escarpments and their location relative to DEP reference monuments shall be recorded during each weekly survey and reported relative to the length of the beach surveyed (*e.g.*, 50 percent scarps). Notations on the height of these escarpments shall be included (0 to 2 feet, 2 to 4 feet, and 4 feet or higher) as well as the maximum height of all escarpments; and

   B. Escarpments that interfere with sea turtle nesting or that exceed 18 in high for a distance of 100 feet must be leveled to the natural beach contour by April 15. Any escarpment removal shall be reported relative to R-monument locations. The Service must be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 in high for a distance of 100 feet occurs during the nesting and hatching season (May 1 to October 31) to determine the appropriate action to be taken. If it is determined escarpment leveling is required during the nesting or hatching season, the Service will provide a brief written authorization that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken must be submitted to the Service. (NOTE: Out-year escarpment monitoring and remediation are not required if placed material no longer remains on the dry beach.)

7. The applicant must arrange a meeting between representatives of the contractor, the Service, the FWC, and the permitted person responsible for egg relocation at least 30 days prior to the commencement of work on this project. At least 10 days advance notice must be provided prior to conducting this meeting. This will provide an opportunity for explanation and/or clarification of the sea turtle protection measures;

8. From March 15 through April 30 and November 1 through November 30, staging areas for construction equipment must be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment not in use must be off the beach to minimize disturbance to sea turtle nesting and hatching activities during this period. In addition, all construction pipes placed on the beach must be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Temporary storage of pipes must be off the beach to the maximum extent possible. Temporary storage of pipes on the beach must be in such a manner so as to impact the least amount of nesting habitat and must likewise not compromise the integrity of the dune systems (placement of pipes perpendicular to the shoreline is recommended as the method of storage);

9. From March 15 through April 30 and November 1 through November 30, all on-beach lighting associated with the project must be limited to the immediate area of active construction only and must be the minimal lighting necessary to comply with all safety requirements. Lighting on offshore equipment must be minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast Guard and Occupational Safety and Health Administration (OSHA) requirements. Shielded low pressure sodium vapor lights are recommended for lights on offshore equipment that cannot be eliminated, and for illumination of the nesting beach and nearshore waters. Light intensity of lighting plants must be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields must be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (Figure 2);

10. A lighting survey shall be conducted from the nourished berm prior to April 15 of the first nesting season following nourishment and action taken to ensure no lights or light sources are visible from the newly elevated beach. A report summarizing all lights visible, using standard survey techniques for such surveys, shall be submitted to the Service by May 15 and documenting all compliance and enforcement action. Additional lighting surveys shall be conducted monthly through August and results reported by the 15th of each month of the first nesting season after project completion;

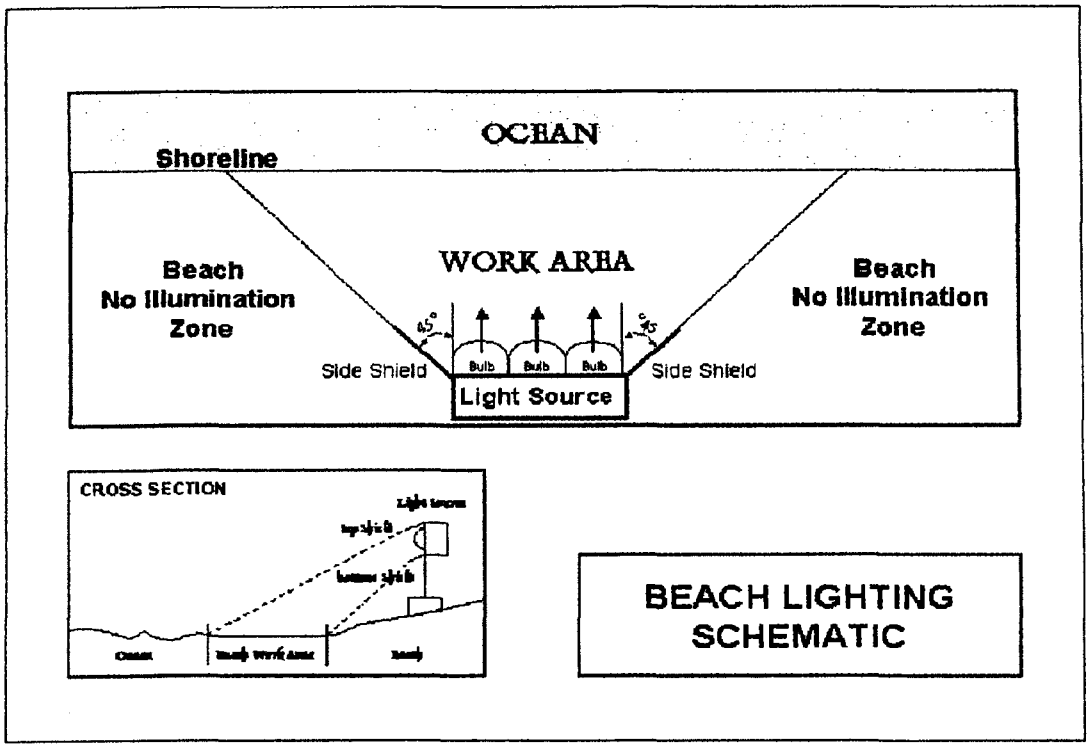


Figure 2. Lighting diagram

11. All reports describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the South Florida Ecological Services Office, Vero Beach, Florida, within 60 days of completion of the proposed work. Types of reporting will include, but is not limited to, that related to tilling, scarp reduction, nest and hatching data, lighting, and egg relocation, and shall include details such as dates of actual construction activities, names, and qualifications of personnel involved in nest surveys and relocation activities, descriptions and locations of self-release beach sites, nest survey and relocation results, and hatching success of nests;

12. In the event a sea turtle nest is excavated during construction activities, all work shall cease in that area immediately and the permitted person responsible for egg relocation for the project must be notified so the eggs can be moved to a suitable relocation site;

13. Upon locating a dead, injured, or sick endangered or threatened sea turtle specimen, initial notification must be made to the FWC at 1-888-404-3922, and the South Florida Ecological Services Office biologist listed at the end of this biological opinion. Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure evidence intrinsic to the specimen is not unnecessarily disturbed; and

14. In the event a hopper dredge is utilized for sand excavation, all conditions in the NOAA Fisheries *Biological Opinion for Dredging of Gulf of Mexico Navigation Channels and Sand Mining Borrow Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts* (Consultation Number F/SER/2000/01287) must be followed, and the Service shall be sent copies of the reports specified in the Biological Opinion.

The Service believes incidental take will be limited to the 8.7 miles of beach that have been identified for sand placement. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes no more than the following types of incidental take will result from the proposed action: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a one-time placement of sand on the 8.7 miles of beach that have been identified for sand placement. If during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. Conservation recommendations follow:

1. Appropriate native salt-resistant dune vegetation should be established on restored dunes. The DEP, Office of Beaches and Coastal Systems, can provide technical assistance on the specifications for design and implementation;

2. Surveys for nesting success of sea turtles should be continued for a minimum of 3 years following beach nourishment to determine whether sea turtle nesting success has been adversely impacted; and

3. Educational signs should be placed where appropriate at beach access points explaining the importance of the area to shorebirds and sea turtles and/or the life history of shorebird and sea turtle species that utilize the area.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listing species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the reinitiation request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending reinitiation.

Thank you for your cooperation and effort in protecting fish and wildlife resources. Should you have any questions regarding the findings and recommendations contained in this document, please contact Mike Carlson at extension 296.

Sincerely yours,

for James J. Slack
Field Supervisor
South Florida Ecological Services Office

cc:
Corps, Jacksonville, Florida (Michael Nowicki)
CPE, Boca Raton, Florida (Craig Kruempel)
DEP, Bureau of Beaches and Wetland Resources, Tallahassee, Florida (Becky Roland)
EPA, West Palm Beach, Florida
FWC, Bureau of Protected Species Management, Tallahassee, Florida (Robbin Trindell)
NOAA Fisheries, St. Petersburg, Florida
FWS, Jacksonville, Florida (Sandy MacPherson)

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Attachment "A"
STANDARD HOPPER DREDGE CONDITIONS
JACKSONVILLE DISTRICT
REGULATORY DIVISION
November 21, 2003

1. Hopper dredging is being approved under the Regional Biological Opinion issued on October 11, 2003, by the National Marine Fisheries Service. It should be noted that incidental takes of sea turtles are authorized on a Fiscal Year (FY) (October 1 - September 30) basis to be metered out by the Division Commander, South Atlantic Division, U.S. Army Corps of Engineers for the southeastern United States for Federal, military and permitted projects. If care is not taken, the take limits could be reached by any of these parties and hopper dredging would cease for the remainder of that FY.

2. This Corps permit does not authorize you to take an endangered species, in particular the threatened loggerhead sea turtle (Caretta caretta), endangered green sea turtle (Chelonia mydas), endangered leatherback sea turtle (Dermochelys coriacea), endangered Kemp's ridley sea turtle (Lepidochelys kempii), endangered hawksbill sea turtle (Eretmochelys imbricata), and threatened Gulf sturgeon (Acipenser oxyrinchus). In order to legally take a listed species, you must have separate authorization under the ESA (e.g., an ESA section 10 permit, or a Biological Opinion under ESA section 7, with "incidental take" provisions with which you must comply). The U.S. Fish and Wildlife Service (FWS) Biological Opinion and National Marine Fisheries Service (NMFS) Biological Opinion contain mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the Biological Opinion. Your authorization under this Corps permit is conditional upon your compliance with all of the mandatory terms and conditions associated with incidental take of the Biological Opinion, which terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of the

Biological Opinion, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Corps permit. However, the FWS and NMFS are the appropriate authority to determine compliance with the terms and conditions of its Biological Opinion, and with the ESA. For further clarification on this point, you should contact the FWS and/or NMFS.

3. No dredging shall be performed by a hopper dredge without a rigid sea turtle deflector device. If the permittee proposes to use a hopper dredge for this work, notification must be given at least 30 days prior to initiation of dredging. The Permittee shall submit drawings showing the proposed device and its attachment to the Permittee's equipment. Permittee's drawings to be submitted shall include the approach angle for any and all depths to be dredged during the dredging. A copy of the approved drawings and calculations shall be available on the vessel during the dredging. No dredging work shall be allowed to commence until approval of the turtle deflector device by the Chief, Enforcement Section. Sample Turtle Deflector Design Details may be viewed at http://www.saj.usace.army.mil/pd/turtle.htm.

4. The permittee shall install baskets or screening over the hopper inflow(s) with no greater than 4" x 4" openings. The method selected shall depend on the construction of the dredge used and shall be approved by the Chief, Enforcement Section prior to commencement of dredging. The screening shall provide 100% screening of the hopper inflow(s). The screens and/or baskets shall remain in place throughout the performance of the work.

5. The turtle deflector device and inflow screens shall be maintained in operational condition for the entire dredging operation.

6. The leading V-shaped portion of the deflector shall have an included angle of less than 90 degrees. Internal reinforcement shall be installed in the deflector to prevent structural failure of the device. The leading edge of the deflector shall be designed to

have a plowing effect of at least 6" depth when the drag head is being operated. Appropriate instrumentation or indicator shall be used and kept in proper calibration to insure the critical "approach angle". (Information Only Note: The design "approach angle" or the angle of lower drag head pipe relative to the average sediment plane is very important to the proper operation of a deflector. If the lower drag head pipe angle in actual dredging conditions varies tremendously from the design angle of approach used in the development of the deflector, the 6" plowing effect does not occur. Therefore, every effort should be made to insure this design "approach angle" is maintained with the lower drag pipe.)

7. If adjustable depth deflectors are installed, they shall be rigidly attached to the drag head using either a hinged aft attachment point or an aft trunnion attachment point in association with an adjustable pin front attachment point or cable front attachment point with a stop set to obtain the 6" plowing effect. This arrangement allows fine-tuning the 6" plowing effect for varying depths. After the deflector is properly adjusted there shall be NO openings between the deflector and the drag head that are more than 4" by 4".

8. The Permittee shall submit a certified copy of National Marine Fishery Service (NMFS) permit for sea turtle trawling and relocation as well as a statement as to the person responsible for implementation of the NMFS permit to the Chief, Enforcement Section.

9. Dredging operations shall cease if three loggerheads, one Kemp's ridley or one green sea turtle(s) are taken until the Chief, Enforcement Section notifies the Permittee to resume dredging. The **Sea Turtle Mortality Report**, attached to this permit, will be filled out immediately (within 6 hours) and sent by fax to the Chief, Enforcement Section at 904-232-1684.

10. Initiate trawling if one green or one Kemp's ridley or three loggerhead sea turtles are taken. The Permittee must initiate trawling and relocation activity in the dredging area within 8 hours of the occurrence of the

take. Trawling shall continue until suspended by the Chief, Enforcement Section.

11. A sea turtle risk assessment (summary of all trawls) shall be conducted following the take of one green, one Kemps Ridley or three loggerhead sea turtles and continue until directed by the Chief, Enforcement Section. The results of each trawl shall be recorded on **Sea Turtle Trawling Report** attached to this permit. A sea turtle risk assessment (summary of all trawls as recorded on the Sea Turtle Trawling Report which includes total trawling times, number of trawls, number of captures, and which summarizes the results of the assessment) shall be prepared and submitted to the Chief, Enforcement Section prior to re-commencement of dredging. Any turtles captured during the assessment shall be measured and tagged in accordance with standard biological sampling procedures with sampling data recorded on the **Sea Turtle Tagging and Relocation Report** attached to this permit. Any captured sea turtles shall be relocated at least 3 miles from the location recorded on the **Sea Turtle Tagging and Relocation Report** form.

12. An approved sea turtle trawling and relocation supervisor shall provide researchers and nets to capture and relocate sea turtles, shall conduct **Sea Turtle Risk Assessment**, and shall conduct any initiated sea turtle trawling. Turtles shall be captured with trawl nets to determine their relative abundance in the channel during dredging. Methods and equipment shall be standardized including observation sheets, nets, trawling direction to tide, length of station, length of tow, and number of tows per station. Data on each tow shall be recorded using **Sea Turtle Trawling Report**. The trawler shall be equipped with two 60-foot nets constructed from 8-inch mesh (stretch) fitted with mud rollers and flats as specified in **Turtle Trawl Nets Specifications**. Paired net tows shall be made for 10 to 12 hours per day or night. Trawling shall be conducted with the tidal flow using repetitive 15-30 minute (total time) tows in the channel. Tows shall be made in the center, green and red sides of the channel such that the total width of the channel bottom is sampled. Positions at

the beginning and end of each tow shall be determined from GPS positioning equipment. Tow speed shall be recorded at the approximate midpoint of each tow. Refer to EM 1110-1-1003, paragraph 5.3 and Table 5-1, for acceptable GPS criteria. A copy of the EM can be downloaded from the following website: http://www.usace.army.mil/inet/usace-docs/eng-manuals/em.htm.

13. Water temperature measurements shall be taken at the water surface each day using a laboratory thermometer. Weather conditions shall be recorded from visual observations and instruments on the trawler. Weather conditions, air temperature, wind velocity and direction, sea state-wave height, and precipitation shall be recorded on the **Sea Turtle Trawling Report.** Time of High and low tides shall also be recorded.

14. Approval for trawling for sea turtles without Turtle Excluder Devices (TEDs) must be obtained from NMFS. Approval for capture and relocation of sea turtles must be obtained from the Florida Fish and Wildlife Conservation Commission (FF&WCC). Approvals must be submitted to the Chief, Enforcement Section prior to trawling.

15. During dredging operations, an observer approved by the National Marine Fisheries Service (NMFS) for sea turtles shall be aboard to monitor for the presence of the species. The observer shall monitor the inflow screening for turtles and/or turtle parts. During transit to and from the disposal area, the observer shall monitor from the bridge during daylight hours for the presence of Right Whales (Atlantic only), during the period December through March.

16. The results of the monitoring shall be recorded on the appropriate **observation sheet.** An observation sheet shall be completed for each dredging cycle whether or not sea turtle or sea turtle parts are present. **Sample observation sheets are attached.**

17. The permittee shall ensure that the endangered species observer(s), if different from Trawling and Relocation Supervisors, are NMFS-approved. A list of acceptable

firms can be obtained by contacting NMFS Chief of Office of Protective Species in St. Petersburg, Florida at 727-824-5312.

18. Positively identified turtle parts shall be disposed of in accordance with the direction of the Chief, Enforcement Section. The observer(s) for later identification shall preserve turtle parts, which cannot be positively identified on board the dredge or barge(s). Observer(s) shall measure, weigh, tag, and release any uninjured turtles incidentally taken by the dredge. Observer(s) (or their authorized representative) shall transport, as soon as possible, any injured turtles to a rehabilitation facility such as Sea World at Orlando, Florida.

19. When initiating dredging, suction through the drag heads shall be allowed just long enough to prime the pumps, and then the drag heads must be placed firmly on the bottom. When lifting the drag heads from the bottom, suction through the drag heads shall be allowed just long enough to clear the lines, and then must cease. Pumping water through the drag heads shall cease while maneuvering or during travel to/from the disposal area. (Information Only Note: Optimal suction pipe densities and velocities occur when the deflector is operated properly. If the required dredging section includes compacted fine sands or stiff clays, a properly configured arrangement of teeth may enhance dredge efficiency, which reduces total dredging hours, and "turtle takes." The operation of a drag head with teeth must be monitored for each dredged section to insure that excessive material is not forced into the suction line. When excess high-density material enters the suction line, suction velocities drop to extremely low levels causing conditions for plugging of the suction pipe. Dredge operators should configure and operate their equipment to eliminate all low-level suction velocities. Pipe plugging in the past was easily corrected, when low suction velocities occurred, by raising the drag head off the bottom until the suction velocities increased to an appropriate level. Pipe plugging cannot be corrected by raising the drag head off the bottom. Arrangements of teeth and/or the

reconfiguration of teeth should be made during the dredging process to optimize the suction velocities.

20. Raising the drag head off the bottom to increase suction velocities is not acceptable. The primary adjustment for providing additional mixing water to the suction line should be through water ports. To insure that suction velocities do not drop below appropriate levels, the Permittee's personnel shall monitor production meters throughout the job and adjust primarily the number and opening sizes of water ports. Water port openings on top of the drag head or on raised standpipes above the drag head shall be screened before they are utilized on the dredging project. If a dredge section includes sandy shoals on one end of a tract line and mud sediments on the other end of the tract line, the Permittee shall adjust the equipment to eliminate drag head pick-ups to clear the suction line.

21. The Permittee shall keep the drag head buried a minimum of 6 inches in the sediment at all times. Although the over depth prism is not the required dredging prism, the Permittee shall achieve the required prism by removing the material from the allowable over depth prism.

22. The Permittee shall ensure that during turning operations the pumps must either be shut off or reduced in speed to the point where no suction velocity or vacuum exists. These operational procedures are intended to stress the importance of balancing the suction pipe densities and velocities in order to keep from taking sea turtles.

23. All hopper dredge(s) shall be equipped with recording devices for each drag head that capture real time, drag head elevation, slurry density, and at least two of the following: Pump(s) slurry velocity measured at the output side, pump(s) vacuum, and/or pump(s) RPM. The Permittee shall record continuous real time positioning of the dredge, by plot or electronic means, during the entire dredging cycle including dredging area and disposal area. Dredge location accuracy shall meet the requirements of the latest

version of EM 1110-1-1003. A copy of the EM can be downloaded from the following website: http://www.usace.army.mil/inet/usace-docs/eng-manuals/em.htm. The recording system shall be capable of capturing data at variable intervals but with a frequency of not less than every 60 seconds. All data shall be time correlated to a 24-hour clock and the recording system shall include a method of daily evaluation of the data collected. This data shall be made available at the request of the Chief, Enforcement Section.

24. The permittee understands and agrees that, if future operations by the United States require the cessation of the work authorized or if, in the opinion of the Secretary of the Army or his authorized representative, said work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to cease work, without expense to the United States. No claim shall be made against the United States on account of any such notification.

TURTLE TRAWL NETS SPECIFICATIONS

DESIGN: 4 Seam, 4 Legged, 2 Bridal Trawl Net
WEBBING: 4 inch bar, 8 inch stretch
Top - 36 Gauge Twisted Nylon Dipped
Side - 36 Gauge Twisted Nylon Dipped
Bottom - 84 Gauge Braided Nylon Dipped
NET LENGTH: 60 ft from cork line to cod end
BODY TAPER: 2 to 1
WING END HEIGHT: 6 feet
CENTER HEIGHT: Dependent on depth of trawl - 14 to 18 feet
COD END: Length 50 meshes x 4 inches equals 16.7 feet
Webbing 2 inch bar, 4 inch stretch, 84 gauge braid nylon
dipped, 80 meshes around, 40 rigged meshes with 1/4 x 2
inch choker rings, 1 each 1/2 x 4 inch at end
Cod End Cover - none
Chaffing Gear - none
HEAD ROPE: 60 ft 1/2 inch combination rope (braid nylon with
stainless cable center)
FOOT ROPE: 65 ft 1/2 inch combination rope
LEG LINE: Top - 6 ft, Bottom - 6 ft
FLOATS: Size - Tuna Floats (football style), Diameter - 7
Inches; Length - 9 inches; number - 12 each;
spacing - center of top net 2 inches apart
MUD ROLLERS: Size - 5 inch Diameter, 5.5 inch length
Number - 22 each; spacing - 3 ft attached with 3/8 inch
polypropylene rope (replaced with snap on roller when
broken)
TICKLER CHAINS: NONE (Discontinued - but previously used 1/4
inch x 74 ft galvanized chain)
WEIGHT: 20 ft of 1/4 inch galvanized chain on each wing, 40 ft
per net looped and tied
DOOR SIZE: 7 ft x 40 inches (or 8 ft x 40 inches); Shoe - 1 inch
x 6 inch; bridles - 3/8 inch high test chain
CABLE LENGTH (Bridle Length, Total): 7/16 inch x 240-300 ft
varies with bottom conditions
FLOAT BALL: NONE
LAZY LINES: 1 inch nylon
PICKUP LINES: 3/8 inch polypropylene
WHIP LINES: 1 inch nylon

PROJECT:

HOPPER DREDGE REPORTING LOG

TURTLE OBSERVER NOTES

LOAD NUMBER _____ DATE _____ TIME

PORT BASKET CONTENTS

STARBOARD BASKET CONTENTS

TURTLE OR TURTLE PARTS PRESENT YES _____ NO

COMMENTS AND OTHER OBSERVATIONS

BRIDGE WATCH: TIME _____ LOCATION

NUMBER OF TURTLES SIGHTED

OBSERVER'S NAME

SEA TURTLE TAGGING AND RELOCATION REPORT

Channel: _____
Date: _____
Time: _____

of

Ship Name: Net: Port: Starboard :

Flipper Tag	Sex	Weight
Left: _____ Right: _____ Recapture: This Effort: ___ Previous Effort: __	Male: _____ Female: _____ Unknown: _____	_____Kg _____lbs

Carapace S.L. Length	S.L. Width	Tail Length
_____ _cm _____in CCL: _____cm	_____ _cm _____in CCW: _____cm	(from plastron to tip) _____cm

Head Width	Photos Taken	Blood Taken
_____cm _____ in	Yes: _____ No: _____	Yes:_____ No: _____ Time:_____ No. of Vials:_____

Telemetry Tag
Radio:_____ Sonic:_____ Satellite: _____ _____ Mhz _____ Khz

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GENERAL CONDITIONS OF TURTLE
CPL: _____ cm _____
CPW: _____ cm _____
PIT Tag #: _____

Turtle Released	Release Location
Date: _____	Latitude: _____
Time: _____	Longitude: _____

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SEA TURTLE TRAWLING REPORT

Channel: _____ Vessel: _____ Captain: _____
Crew: _____

Date: _____

Survey: _____
Relocation: ___
PreDredge: ___

SUBSTRATE

Mud: _____
Sand: _____
Rocks: _____
Snag: _____
Other: _____

Time: _____

Shift #: _____

Dredge Location: _____

Total Tow Time: _____ **min**

Water Temp. (B: °C)(M: °C)(S: °C)
Wave Height: _____ ft
Air Temperature: _____ °C
Wind Speed/Direction: _____
Barometric Pressure: _____

Low Tide Time: _____
High Tide Time: _____
Ebb: _____ Flood: _____
Slack Ebb: ____ Slack Flood: ___
Comments: _____

BEGIN TOW

Time: _____
Depth: _____ ft
Speed Mid-Tow: _____ knots
Latitude: _____
Longitude: _____
Loran: _____
Station/Buoys: _____

END TOW

Time: _____
Depth: _____ ft
Total Tow Distance: _____ ft
Latitude: _____
Longitude: _____
Loran: _____
Station/Buoys: _____

NUMBER OF TURTLES

Port Net:

Logger: _____
Kemp: _____
Green: _____
Other: _____

Starboard Net:

Logger: _____
Kemp: _____
Green: _____
Other: _____

BYCATCH/COMMENTS

PROJECT: _____

INCIDENT REPORT OF SEA TURTLE MORTALITY
AND DREDGING ACTIVITIES

Species: _____

Date: _____ Time: 24 hour clock _____

Geographic Site: _____

Location: Latitude _____ Longitude _____

Vessel Name: _____

Type of Dredging Activity: _____

Load #: _____ Sampling Method: _____

Location Specimen Recovered: _____

Draghead Deflector? YES ____ NO ____

Condition of Deflector: _____

Weather Conditions: _____

Water Temp: Surface _____ Column _____

Head Width: _____ Plastron Length: _____

Carapace S.L. Length: _____ Carapace S.L. Width: _____

Carapace O.C. Length: _____ Carapace O.C. Width: _____

Condition of Specimen: _____

Turtle Tagged: YES ____ NO _____

Tag #: _____ Tag Date: _____

Comments/Other: _____

Observer's Name: _____

SPECIFIC CONDITIONS:

1. Pursuant to Chapter 161.141, Florida Statutes, prior to construction of the beach nourishment project, the board of trustees must establish the line of mean high water for any area affected by this project that does not already have an Erosion Control Line (ECL). This is required to establish the boundary line between sovereignty lands of the state bordering on the Gulf of Mexico and the upland properties. No work shall commence until the Erosion Control Line has been executed to the satisfaction of the Department and recorded in the County Records.

2. If historical or archaeological artifacts such as, but not limited to, Indian canoes, arrow heads, pottery or physical remains, are discovered at any time within the project site, the permittee shall immediately stop all activities which disturb the soil and notify the Department's District Office and the Bureau of Historic Preservation, Division of Historical Resources, R. A. Gray Building, 500 South Bronough Street, Tallahassee, Florida 32399-0250.

3. All reports or notices relating to this permit shall be sent to the DEP, Bureau of Beaches and Coastal Systems, JCP Compliance Officer, 3900 Commonwealth Boulevard, Mail Station 300, Tallahassee, Florida 32399-3000 and the DEP South District Office, (2295 Victoria Ave, Suite #364, Ft. Myers, Florida 33901-3881).

4. No work shall be conducted under this permit until the permittee has received a written notice to proceed from the Department. At least 60 days prior to the requested date of issuance of the notice to proceed, the permittee shall submit the following for review and approval by the Department:

   a. A detailed ***Physical Monitoring Plan***, as described in Specific Condition No. 11 (Physical Monitoring section).

   b. Final ***Biological Monitoring Plan***, as described in Specific Condition No. 10.

   c. A ***Mitigation Plan*** as described in Specific Condition No. 12.

   d. Final ***Sediment Quality Control / Quality Assurance Plan,*** as required by Rule 62B-41.008(1)(k)4.b., F.A.C. Once approved by the Department, compliance with the Plan shall be a specific condition of this permit and must be incorporated in the relevant Terms and Conditions of the construction contracts. The Plan shall include project-specific sediment quality specifications for grain size distribution, color, and carbonate composition to ensure that the sediment from the borrow sites will meet the standards in Rule 62B-41.007(2)(j), F.A.C., for the exclusion of non-compatible fill material. The Plan shall provide quality control procedures for excavating sediment from within the authorized horizontal and vertical limits of the permitted borrow sites; for monitoring and reporting the quality of sediment as it is

placed on the beach; and for altering construction operations if the sediment does not comply with the project specific sediment quality specifications or stopping the dredging operation if the specifications cannot be attained. Further, the Plan shall provide procedures for testing the quality of the sediment after it is placed and methods for remediation of any areas of fill material that do not comply with the sediment quality specifications.

e. Two hard copies and an electronic copy of detailed ***final construction plans and specifications*** for all authorized activities, including a vessel operations plan. These documents shall be signed and sealed by the design engineer who must be registered in the State of Florida, and shall bear the certifications specified in Rule 62B-41.007(4), F.A.C. The plans and specifications shall include a description of the beach construction methods to be utilized and drawings and surveys which show all biological resources and work spaces (e.g., anchoring area, pipeline corridors, staging areas, boat access corridors, etc.) to be used for this project.

f ***Turbidity monitoring qualifications.*** Construction at the project site shall be monitored closely to assure that turbidity levels do not exceed the compliance standards established in this permit. Accordingly, an individual familiar with beach construction techniques and turbidity monitoring shall be present at all times when fill material is discharged on the beach. This individual shall have authority to alter construction techniques or shut down the dredging or beach construction operations if turbidity levels exceed the compliance standards established in this permit. The names and qualifications of those individuals performing these functions along with 24-hour contact information shall be submitted for approval.

g. Written verification that the ***Erosion Control Line*** has been executed and recorded throughout the entire project area.

h. ***Outfall Management Plan***. The County shall submit a long-range management plan (including an identification of viable funding sources) for the removal of storm water outfalls from the beach. Submittal of an acceptable plan will be a requirement of the Notice to Proceed for the **second** nourishment event.

5. At least 7 days prior to commencement of the initial and subsequent beach nourishment construction activities authorized by this permit, the permittee shall conduct a pre-construction conference to review the specific conditions and monitoring requirements of this permit with permittee's contractors, the engineer of record, FWC and Department staff representatives. The permittee shall provide written notification, at least 14 days in advance of the meeting, to the following offices advising of the date, time, and location of the pre-construction conference.

DEP, Bureau of Beaches and Coastal Systems
Attention - JCP Compliance Officer
Mail Station 300
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000
Phone: (850) 487-4471
fax: (850) 488-5257

DEP, South District Office
Submerged Lands & Environmental Resources Program
2295 Victoria Ave, Suite #364
Ft. Myers, Florida 33901-3881
Phone: (239) 332-6975

FWC, ISMS
620 South Meridian Street
Tallahassee, Florida 32399-1600
Phone: (850) 922-4330

6. Pursuant to Chapter 370.25, Florida Statutes (F.S.), the permittee shall require the selected artificial reef contractor to complete the attached *MATERIAL CARGO MANIFESTO* form required by the FWC, Division of Marine Fisheries Artificial Reef Program. This form shall be maintained on board the vessel during transport of artificial reef material over state waters.

7. Following construction of the artificial reef(s), the permittee shall complete the attached *MATERIALS PLACEMENT REPORT* form required by the FWC, Division of Marine Fisheries Artificial Reef Program. Within 30 days following construction, the completed form shall be submitted to the Florida Fish & Wildlife Conservation Commission, Division of Marine Fisheries, Artificial Reef Program, 620 S. Meridian Street, Tallahassee, FL 32399 and a copy e-mailed to the JCP Compliance Officer, Bureau of Beaches & Coastal Systems. In addition to attaching the completed form, please indicate on the e-mail that the information is being submitted for the Collier County Beach Nourishment Project, Permit No. 0222355-001-JC, as required by Specific Condition 7.

8. The permittee shall construct and maintain a shore-parallel sand dike at the beach placement area at all times during hydraulic discharge on the beach to meet turbidity standards prescribed by this permit.

9. During all dredging operations, the permittee shall require the dredging contractor to have electronic positioning equipment that continuously measures the vertical and horizontal location of the dredge at all times during construction operation. The horizontal positioning equipment shall be installed on the dredge so as to monitor the actual location of the dredge equipment and

be interfaced with the depth-monitoring device. This equipment shall provide a permanent record of the position referenced to State Plane Coordinates and NGVD. The Contractor shall provide telemetry of the instantaneous dredging positioning and digging functions of the project dredges that accommodates electronic charting functions by the Permittee at a remotely located system. As part of the final report, the permittee shall provide a daily record of the position of the dredge equipment which includes the dredge area limits with actual and maximum authorized dredge depth referenced to state plane coordinates and NGVD. Vertical and horizontal accuracy of the positioning equipment shall also be reported.

MONITORING REQUIRED:

10. **Biological Monitoring.**

The goal of the biological monitoring program is to evaluate the potential impacts of the project upon the extensive, nearshore hardbottom communities along the project area shoreline and nearshore/offshore communities along the submerged pipeline corridors. The monitoring shall be specifically directed to the assessment of the dynamics of the equilibrium toe of fill.

Twenty-four, permanent, 150-meter long, cross-shore monitoring transects shall be established beginning from the preconstruction landward nearshore edge of the hardbottom. Six to eight similar transects will be established north and south of each of the fill segments to monitor hardbottom at the adjacent areas. Eight control transects shall be established in the areas where the effects of beach fill placement are not anticipated. Video surveys and *in situ* estimations shall be used for the nearshore biological monitoring surveys. At least twenty $0.5m^2$ quadrats shall be placed along each transect for *in situ* estimations. The following information shall be collected along each transect: the current position of the nearshore edge of the hardbottom; surveys of the $0.5m^2$ quadrats (as outlined below); and photographs (taken at permanently established photo quadrats) to document status of scleractinian corals, octocorals, and other prominent organisms observed.. Within each $0.5m^2$ quadrat, the surveys shall estimate cover by macroalgae and other organisms, number and dimensions of scleractinian corals and octocorals, cover and thickness of loose sediments, and physical relief of hardbottom. The details of the methodology and selected transect locations are attached in the latest version of the Draft Biological Monitoring Plan dated September 22, 2004.

Multibeam fathometer or side-scan sonar survey and diver verification survey along the nearshore edge of the hardbottom shall be conducted to document the changes in the sand/hardbottom border due to the equilibration of the toe of fill.

Aerial photography shall be taken annually for five years, during the summer, at the time of the best visibility in nearshore waters, from an altitude that would allow the photographs to clearly show **both** the shoreline and sand/hardbottom border. Aerial photography shall also include the artificial reef.

Monitoring of the mitigation site shall be conducted using a methodology that is similar to natural hardbottom survey. Ten permanent, 20-meter-long transects shall be established over the 1.09-acre mitigation artificial reef immediately after construction.

Nearshore hardbottom monitoring, including cross-shore transects and sand/hardbottom border surveys, shall be conducted during the summer prior to construction and then in years 1, 2, 3, and 5 after construction.

Reports shall include survey data, data analysis and their interpretation. Reports shall be provided within 60 days of the completion of each survey, but no later than November 1 of each year.

Pipeline corridors shall be video surveyed immediately after pipeline placement and immediately after removal. If damage to hardbottom organisms is detected at any time, then the permittee shall immediately attempt to save the damaged organisms, and then report the damage and remediation efforts to the Department (via e-mail to the JCP Compliance Officer).

Reports of the video surveys shall include data regarding condition of organisms, data analysis and their interpretation. Reports shall be provided within 60 days of the completion of survey, but no later than November 1 of that year. The reports shall include accurate estimates of the extent of damage to hardbottom communities not previously restored, and failed restoration efforts. The final report shall also propose mitigation for any residual damage to the hardbottom community.

The permittee shall conduct physical monitoring as stated below to assess the performance of the project and sediment dynamics over the period of record represented by the surveys. Results of physical monitoring data shall also be used to determine the extent of biological impacts. Physical monitoring data shall be compared to the hardbottom edge survey. All hardbottom cover seaward of the initial (preconstruction) location of the nearshore edge of the hardbottom shall be attributed to the project due to cross-shore sediment transport seaward of the applicant's estimated depth of closure.

11. Physical monitoring

Pursuant to 62B-41.005(16), F.A.C., physical monitoring of the project is required through acquisition of project-specific data to include, at a minimum, topographic and bathymetric surveys of the beach, offshore, and borrow site areas, aerial photography, and engineering analysis. The monitoring data is necessary in order for both the project sponsor and the Department to regularly observe and assess, with quantitative measurements, the performance of the project, any adverse effects which have occurred, and the need for any adjustments, modifications, or mitigative response to the project. The scientific monitoring process also

provides the project sponsor and the Department information necessary to plan, design, and optimize subsequent follow-up projects, potentially reducing the need for and costs of unnecessary work, as well as potentially reducing any environmental impacts that may have occurred or be expected.

Prior to issuance of the Notice to Proceed, the permittee shall submit a detailed Monitoring Plan subject to review and approval by the Department. The Monitoring Plan shall indicate the project's predicted design life.

The approved Monitoring Plan can be revised at any later time by written request of the permittee and with the written approval of the Department. If subsequent to approval of the Monitoring Plan there is a request for modification of the permit, the Department may require revised or additional monitoring requirements as a condition of approval of the permit modification.

As guidance for obtaining Department approval, the plan shall generally contain the following items:

> Topographic and bathymetric profile surveys of the beach and offshore shall be conducted within 90 days prior to commencement of construction, and within 60 days following completion of construction of the project. Thereafter, monitoring surveys shall be conducted annually for a period of three (3) years, then biennially until the next beach nourishment event or the expiration of the project design life, whichever occurs first. The monitoring surveys shall be conducted during a spring or summer month and repeated as close as practicable during that same month of the year. If the time period between the immediate post-construction survey and the first annual monitoring survey is less than six months, then the permittee may request a postponement of the first monitoring survey until the following spring/summer. A prior design survey of the beach and offshore may be submitted for the pre-construction survey if consistent with the other requirements of this condition.
>
> The monitoring area shall include profile surveys at each of the Department of Environmental Protection's DNR reference monuments within the bounds of the beach fill area and along at least 5,000 feet of the adjacent shoreline on both sides of the beach fill area. For those project areas that contain erosion control structures, such as groins or breakwaters, additional profile lines shall be surveyed at a sufficient number of intermediate locations to accurately identify patterns of erosion and accretion within this subarea. All work activities and deliverables shall be conducted in accordance with the latest update of the Bureau of Beaches and Coastal Systems (BBCS) *Monitoring Standards for Beach Erosion Control Projects, Sections 01000 and 01100.*

b. Aerial photography of the beach shall be taken concurrently with the post-construction survey and each annual and biennial monitoring survey required above, as close to the date of the beach profile surveys as possible. The limits of the photography shall include the surveyed monitoring area as described above. All work activities and deliverables shall be conducted in accordance with the latest update of the *BBCS Monitoring Standards for Beach Erosion Control Projects, Section 02100.*

c. The permittee shall submit an engineering report and the monitoring data to the BBCS within 90 days following completion of the post-construction survey and each annual or biennial monitoring survey.

   The report shall summarize and discuss the data, the performance of the beach fill project, and identify erosion and accretion patterns within the monitored area. In addition, the report shall include a comparative review of project performance to performance expectations and identification of adverse impacts attributable to the project.

   Appendices shall include plots of survey profiles and graphical representations of volumetric and shoreline position changes for the monitoring area. Results shall be analyzed for patterns, trends, or changes between annual surveys and cumulatively since project construction.

d. Monitoring reports and data shall be submitted to the Bureau of Beaches and Coastal Systems, JCP Compliance Officer, in Tallahassee. Failure to submit reports and data in a timely manner constitutes grounds for revocation of the permit. When submitting any monitoring information to the Bureau, please include a transmittal cover letter clearly labeled with the following at the top of each page: "This monitoring information is submitted in accordance with Item No. [XX] of the approved Monitoring Plan for Permit No. 0222355-001-JC for the monitoring period [XX].

12. **Mitigation**

In order to offset impacts to an estimated 1.09 acres of nearshore hardbottom communities, which is associated with the seaward spreading of fill to the estimated equilibrium toe of fill (ETOF), the permittee shall build 1.09 acres of low relief artificial reef as the initial mitigation. The construction of this mitigation reef should be completed prior to commencement of beach construction. However, if the construction schedule would not allow up-front mitigation, construction of the mitigation reef shall be completed no later than six months after the completion of the initial nourishment event authorized by this permit. If the mitigation reef is not completed by one year after the commencement of the initial beach nourishment, an additional 0.2 acres of artificial reef shall be added to the mitigation reef to address the time lag

associated with lost productivity. The mitigation requirement shall continue to increase by 0.2 acres for each additional year of delay. Furthermore, if the post-construction monitoring reveals damage to hardbottom communities (due to either burial or sedimentation) exceeding the initial estimate of 1.09 acres, the permittee shall build additional mitigation reef at a ratio of 2:1, due to the time lag.

The mitigative artificial reef shall be built of limestone boulders and shall simulate a flat hardbottom with approximately 0.3 to 0.6 meters (1 to 2 feet) of vertical relief. The maximum vertical dimension of the boulders shall be no more than 1.5 m and not less than 1 m, and shall have an average vertical dimension of approximately 1.2 m. The artificial reef shall be constructed in a sandy area with sand thickness not less than 0.3 m (one foot) and not more than 0.6 m (two feet). The artificial reef shall remain at least 15 m (50 feet) away from the nearest hardbottom community (including populated hardbottom communities covered by a thin veneer of sand). The Mitigation Reef Construction Plans and Specifications shall be submitted to the Department no later than 60 days prior to the beginning of the beach fill construction (see Specific Condition 4.c). The Mitigation Reef Construction Plan shall include a map indicating the location of the initial 1.09 acres of artificial reef and also show possible locations for at least an additional acre of mitigation reef, which may be required later. The Plan shall also include a description of the artificial reef construction methods and material used, surveys which show the thickness of the sand in the selected mitigation area(s), the location of adjacent hardbottom communities, and the location of work spaces (e.g., anchoring area, staging areas, boat/barge access corridors, etc.).

A notice of completion of the artificial reef construction shall be submitted to the BBCS (compliance officer) within seven days of construction completion. This notice shall include an as-built survey of the artificial reef. Monitoring of the artificial reef shall be conducted and reported according to Specific Condition 11.

13. In order to ensure that marine turtles are not adversely affected by construction activities, the following conditions shall be followed in order to protect nesting marine turtles:

a. Beach nourishment shall be started after October 31 and be completed prior to May 1.

b. All fill material placed on the beach must be analogous to that which naturally occurs within the project location or vicinity in quartz to carbonate ratio, color, median grain size, and median sorting. The material shall be similar in color and grain size distribution (sand grain frequency, mean and median grain size, and sorting coefficient) to the material in the existing coastal system at the disposal site and shall not contain:

   i. Greater than five percent, by weight, silt, clay or colloids passing the #230 sieve;
   ii. Greater than five percent, by weight, fine gravel retained on the #4 sieve;

iii. Coarse gravel, cobbles, or material retained on the ¾ inch sieve in a percentage or size greater than found on the native beach;
iv. Construction debris, toxic material or other foreign matter; and not result in contamination of the beach.
v. These standards must not be exceeded in any 1,000 square foot section, extending through the depth of the nourished beach. If the natural beach exceeds any of the limiting parameters listed above, than the fill material must not exceed the naturally occurring level for that parameter.

c. Immediately after completion of the beach fill placement event and prior to February 1 for 3 subsequent years if placed sand still remains on the beach, the beach shall be tilled as described below. During the 3 years following each fill placement event, the permittee may measure sand compaction in the area of restoration in accordance with a protocol agreed to by the FWC, the Department, the U.S. Fish & Wildlife Service, and the applicant to determine if tilling is necessary. At a minimum, the protocol provided below shall be followed. If required, the area shall be tilled to a depth of 24 inches.

i. All tilling activity must be completed prior to February 1. An annual summary of compaction surveys and the actions taken shall be submitted to the FWC. If the project is completed during the nesting season, tilling shall not occur in areas where nests have been left in place or relocated unless authorized by the U.S. Fish and Wildlife Service in an Incidental Take Statement. A report on the results of compaction monitoring shall be submitted to the FWC prior to any tilling actions being taken. This condition shall be evaluated annually and may be modified if necessary to address sand compaction problems identified during the previous year.
ii. Compaction sampling stations shall be located at 500-foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area) and one station shall be midway between the dune line and the high water line (normal wrack line).
iii. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports shall include all 18 values for each transects line, and the final 6 averaged compaction values.

iv. If the average value for any depth exceeds 500 psi for any two or more adjacent stations, then that area shall be tilled prior to February 1. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the FWC shall be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling shall not be required.

v. Compaction measurements and tilling shall not occur within or adjacent to areas being utilized for nesting by shorebirds.

d. Visual surveys for escarpments along the beach fill area shall be made immediately after completion of the beach nourishment project and prior to April 1 for the following three years if placed sand still remains on the beach. All scarps shall be leveled or the beach profile shall be reconfigured to minimize scarp formation. In addition, weekly surveys of the project area shall be conducted during the two nesting seasons following completion of fill placement as follows.

i. The number of escarpments and their location relative to DNR-DEP reference monuments shall be recorded during each weekly survey and reported relative to the length of the beach surveyed (e.g., 50% scarps). Notations on the height of these escarpments shall be included (0 to 2 feet, 2 to 4 feet, and 4 feet or higher) as well as the maximum height of all escarpments.

ii. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled to the natural beach contour by April 15. Any escarpment removal shall be reported relative to R-monument.

iii. If weekly surveys during the marine turtle nesting season document subsequent reformation of escarpments that exceed 18 inches in height for a distance of 100 feet, the FWC shall be contacted immediately to determine the appropriate action to be taken.

iv. No scarp removal shall occur within or adjacent to areas being utilized for nesting by shorebirds.

e. A lighting survey shall be conducted from the nourished berm prior to April 15 of the first nesting season following nourishment and action taken to ensure that no lights or light sources are visible from the newly elevated beach. A report summarizing all lights visible, using standard survey techniques for such surveys, shall be submitted to FWC by May 15 and documenting all compliance and enforcement action. Additional lighting surveys shall be conducted monthly through August and results reported by the 15th of each month.

f. Reports on all nesting activity shall be provided for the initial nesting season and for a minimum of three additional nesting seasons. Monitoring of nesting activity in the four seasons following construction shall include daily surveys and any additional

measures authorized by the FWC. Reports submitted shall include daily report sheets noting all activity, nesting success rates, hatching success of all relocated nests, hatching success of a representative sampling of nests left in place (if any), dates of construction and names of all personnel involved in nest surveys and relocation activities. Data should be reported separately for the nourished areas and for an equal length of adjacent beach that is not nourished in accordance with Table 1 below. Summaries of nesting activity shall be submitted in electronic format (Excel spreadsheets). All reports should submitted by January 15 of the following year.

g. In the event a sea turtle nest is excavated during construction activities, all work shall cease in that area immediately and the permitted person responsible for egg relocation for the project should be notified so the eggs can be moved to a suitable relocation site.

h. Upon locating a dead, injured, or sick endangered or threatened sea turtle specimen, initial notification must be made to the FWC at 1-888-404-FWCC. Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

In the event a hopper dredge is utilized for sand excavation, all conditions in the National Marine Fisheries Service (NMFS) *Biological Opinion for Dredging of Gulf of Mexico Navigation Channels and Sand Mining Borrow Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts* (Consultation Number F/SER/2000/01287) must be followed, and the FWC shall be sent copies of the reports specified in the Biological Opinion.

Table 1. Marine Turtle Monitoring for Beach Restoration Projects

The following monitoring is required for beach restoration projects. Reports summarizing the nesting should be submitted to the Tequesta office with a copy to the Tallahassee office by January 15 of the subsequent year. Data for nesting activity on the nourished beach and on an equal length of beach that is not nourished shall be reported separately, and should include numbers of nests lost to erosion or washed out. Summaries of nesting activity shall be submitted in electronic format (Excel spreadsheets).

Characteristic	Parameter	Measurement	Variable
Nesting Success	False crawls - number	Visual assessment of all false crawls	Number and location of false crawls in fill areas and nonfilled areas: any interaction of the turtle with obstructions, such as groins, seawalls, or scarps, should be noted.
	False crawl - type	Categorization of the stage at which nesting was abandoned	Number in each of the following categories: emergence-no digging, preliminary body pit, abandoned egg chamber.
	Nests	Number	The number of marine turtle nests in filled and nonfilled areas should be noted. If possible, the location of all marine turtle nests shall be marked on map of project, and approximate distance to sea walls or scarps measured using a meter tape. Any abnormal cavity morphologies should be reported as well as whether turtle touched groins, seawalls, or scarps during nest excavation
		Lost Nests	The number of nests lost to inundation, erosion or the number with lost markers that could not be found.
	Lighting Impacts	Disoriented sea turtles	The number of disoriented hatchlings and adults shall be documented and reported in accordance with existing FWC protocol for disorientation events.
Reproductive Success	Emergence & hatching success	Standard survey protocol	Numbers of the following: unhatched eggs, depredated nests and eggs, live pipped eggs, dead pipped eggs, live hatchlings in nest, dead hatchlings in nest, hatchlings emerged, disoriented hatchlings, depredated hatchlings

14. In order to ensure that shorebirds are not adversely affected by construction activities, the following conditions shall be followed in order to protect shorebirds:

a. Shorebird surveys should be conducted by trained, dedicated individuals using accepted, appropriate ecological survey procedures (for example, see "*Breeding Season Population Census Techniques for Seabirds and Colonial Waterbirds Throughout North America*" at URL: http://www.mp2-pwrc.usgs.gov/cwb/manual/) during the shorebird nesting season, February 1 through September 1.

   i. Nesting season surveys shall begin on February 1 or 45 days prior to construction commencement, whichever is later, and be conducted daily throughout the construction period or through September if no shorebird nesting activity is observed.
   ii. For projects conducted in piping plover habitat, surveys to detect piping plovers or concentrations of other wintering or migratory shorebirds should begin 14 days prior to construction commencement and be conducted once every 2 weeks for all work from December through April. Each shorebird species observed, a rough estimate of numbers of each species, the location of the birds, and their activity (e.g., foraging, resting, nesting, courtship behavior) should be logged and reported to the FWC Regional Wildlife Diversity Conservation Biologist monthly.
   iii. The FWC Regional Wildlife Diversity Conservation Biologist shall be contacted at (561) 625-5133 within 24 hours if shorebird nesting occurs within or immediately adjacent to the project area.

b. Buffer Zones and Travel Corridors. Within the project area, the permittee shall establish a 300 ft-wide buffer zone around any location where shorebirds have been engaged in courtship or nesting behavior, or around areas where piping plovers occur or winter migrants congregate in significant numbers. Any and all construction activities, including movement of vehicles, should be prohibited in the buffer zone.

   i. The width of the buffer zone shall be increased if birds appear agitated or disturbed by construction or other activities in adjacent areas.
   ii. Site-specific buffers may be implemented upon approval by FWC as needed.
   iii. Designated buffer zones must be posted with clearly marked signs around the perimeter. These markings shall be maintained until nesting is completed or terminated, the chicks fledge, or piping plovers or winter migrants depart.
   iv. No construction activities or stockpiling of equipment shall be allowed within the buffer area.
   v. FWC-approved travel corridors should be designated and marked outside the buffer areas. Heavy equipment, other vehicles, or pedestrians may transit past nesting areas in these corridors. However, other activities, such as stopping or

turning, shall be prohibited within the designated travel corridors adjacent to the nesting site.

vi. Where such a travel corridor must be established within the project area it should avoid critical areas for shorebirds (known nesting sites, wintering grounds, FWC-designated Critical Wildlife Areas, and USFWS-designated critical piping plover habitat) as much as possible, and be marked with signs clearly delineating the travel corridor from the shorebird buffer areas described above.

vii. To the degree possible, the permittee should maintain some activity within these corridors on a daily basis, without directly disturbing any shorebirds documented on site or interfering with sea turtle nesting, especially when those corridors are established prior to commencement of construction. Passive methods to modify nesting site suitability must be approved by the FWC Wildlife Diversity Conservation Biologist for that region.

c. Notification. If shorebird nesting occurs within the project area, a bulletin board will be placed and maintained in the construction area with the location map of the construction site showing the bird nesting areas and a warning, clearly visible, stating that "BIRD NESTING AREAS ARE PROTECTED BY THE FLORIDA THREATENED AND ENDANGERED SPECIES ACT AND THE FEDERAL MIGRATORY BIRD ACT."

d. Tilling. All tilling and scarp removal should be done outside the shorebird nesting season (February 1 through September 1). If necessary, contractors should contact the FWC Regional Wildlife Diversity Conservation Biologist at (561) 625-5133 to obtain data on known shorebird nesting areas. It is the responsibility of the contractors to avoid tilling or scarp removal in areas where nesting birds are present.

i. A relatively even surface, with no deep ruts or furrows, shall be created during tilling. To do this, chain-linked fencing or other material shall be dragged over those areas as necessary after tilling.

ii. The slope between the mean high water line and the mean low water line must be maintained in such a manner as to approximate natural slopes.

e. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible, pipes should be placed landward of the site before birds are active in that area. No sand shall be placed seaward of a known shorebird nesting site during the shorebird nesting season.

15. In order to ensure that manatees are not adversely affected by construction activities, the following conditions shall be followed in order to protect manatees:

a. The permittee shall instruct all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel are responsible for observing water-related activities for the presence of manatee(s).

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act of 1972, The Endangered Species Act of 1973, and the Florida Manatee Sanctuary Act.

c. Siltation barriers shall be made of material in which manatees cannot become entangled, are properly secured, and are regularly monitored to avoid manatee entrapment. Barriers must not block manatee entry to or exist from essential habitat.

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

e. If manatee(s) are seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet of a manatee. Operation of any equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment. Activities will not resume until the manatee(s) has departed the project area of its own volition.

f. Any collision with and/or injury to a manatee shall be reported immediately to the FWC Hotline at 1-888-404-FWCC. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-232-2580) for north Florida or Vero Beach (1-561-562-3909) in south Florida.

g. Temporary signs concerning manatees shall be posted prior to and during all construction/dredging activities. All signs are to be removed by the permittee upon completion of the project. A sign measuring at least 3 ft. by 4 ft. which reads *Caution: Manatee Area* will be posted in a location prominently visible to water related construction crews. A second sign should be posted if vessels are associated with the construction, and should be placed visible to the vessel operator. The second sign should be at least 8-1/2" by 11" which reads *Caution: Manatee Habitat. Idle speed is required if operating a vessel in the construction area. All equipment must be shutdown if a manatee comes within 50 feet of operation. Any collision with and/or injury to a manatee shall be reported immediately to the FWC Hotline at 1-*

888-404-FWCC. The U.S. Fish and Wildlife Service should also be contacted in Jacksonville (1-904-232-2580) for north Florida or in Vero Beach (1-561-562-3909) for south Florida.

16. Water Quality - Turbidity - Nephelometric Turbidity Units (NTUs)

Frequency: Twice daily at least 4 hours apart during all disposal operations.

Location: Background: At mid-depth, at least 300 meters upcurrent from the dredge discharge point and clearly outside the influence of any turbidity generated by the project. Samples shall be collected at the surface and mid-depth.

Compliance: no more than 150 meters downcurrent from the point where return water from the dredge discharge enters waters of the State, within the densest portion of any visible turbidity plume. Samples shall be collected at the surface and mid-depth.

All monitoring data shall be submitted within one week of analysis with documents containing the following information: (1) **"Permit Number 0222355-001-JC, Collier County Beach Nourishment Project"**; (2) dates of sampling and analysis; (3) a statement describing the methods used in collection, handling, storage and analysis of the samples; (4) a map indicating the sampling locations; (5) a statement by the individual responsible for implementation of the sampling program concerning the authenticity, precision, limits of detection and accuracy of the data

Monitoring reports shall also include the following information for each sample that is taken:

(a) time of day samples taken;
(b) depth of water body;
(c) depth of sample;
(d) antecedent weather conditions;
(e) tidal stage and direction of flow; and
(f) wind direction and velocity.

The compliance locations given above shall be considered the limits of the temporary mixing zone for turbidity allowed during construction. If monitoring reveals turbidity levels at the compliance site greater than or equal to 29 NTUs above background turbidity levels at the corresponding background site, construction activities shall cease immediately and not resume until corrective measures have been taken and turbidity has returned to acceptable levels. Any such occurrence shall also be immediately reported to DEP's Bureau of Beaches and Coastal Systems (JCP Compliance Officer), Phone: (850) 487-4471, and the DEP South District office in 2295 Victoria Ave, Suite #364, Ft. Myers, Florida 33901-3881, Phone: (239) 332-6975.

Monitoring reports shall be submitted to the Bureau of Beaches and Coastal Systems in Tallahassee and to the DEP South District office. Failure to submit reports in a timely manner constitutes grounds for revocation of the permit. When submitting this information to the DEP, please clearly include, at the top of each page or as a cover page to the submittal: **"This information is provided in partial fulfillment of the monitoring requirements in Permit No. 0222355-001-JC, Collier County Beach Nourishment Project."**

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

Michael R. Barnett, P.E., Chief
Bureau of Beaches and Coastal Systems

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to Section 120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Deputy Clerk 11/12/05
Date

31 pages attached.

APPENDIX D

FDEP PERMIT NO. 0222355-001-JC, JANUARY 12, 2005

Department of
Environmental Protection

Jeb Bush
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Colleen M. Castille
Secretary

CONSOLIDATED JOINT COASTAL PERMIT AND SOVEREIGN SUBMERGED LANDS AUTHORIZATION

PERMITTEE/AUTHORIZED ENTITY:
Collier County Board of County Commissioners
c/o Ron Hovell
Collier County Public Utilities Division
3301 East Tamiami Trail, Bldg. H
Naples, FL 34112

Permit/Authorization No.: 0222355-001-JC
Date of Issue: January 12, 2005
Expiration Date of Construction Phase: January 12, 2015
County: Collier
Project: Collier County Beach Nourishment Project

This permit is issued under the authority of Chapter 161 and Part IV of Chapter 373, Florida Statutes (F.S.), and Title 62, Florida Administrative Code (F.A.C.). Pursuant to Operating Agreements executed between the Department of Environmental Protection (Department) and the water management districts, as referenced in Chapter 62-113, F.A.C., the Department is responsible for reviewing and taking final agency action on this activity.

ACTIVITY DESCRIPTION:

The project entails the construction of a two-phase beach nourishment project along three segments of the Collier County shoreline. Phase I includes nourishment of previously restored areas of Vanderbilt Beach (R-21 to R-31), Park Shore Beach (R-48 to R-55), and Naples Beach (R-58 to R-79). Phase II will include beach restoration along the shores of Pelican Bay (R-31 to R-37) and Northern Park Shore (R-43.5 to R-48). The total volume of material for beach placement is approximately 673,000 cubic yards of beach quality sand from an offshore source over approximately 50,000 feet of shoreline. The project also includes construction of 1.09 acres of artificial reef in order to mitigate for anticipated hardbottom impacts resulting from equilibration of project toe of fill.

ACTIVITY LOCATION:

The borrow area is located approximately thirty-three (33) miles to the north and offshore of the placement area, outside of State waters. The beach fill areas are located along the shorelines of Vanderbilt Beach, Park Shore Beach, Naples Beach, Pelican Bay, and Northern Park Shore, in Collier County, Sections 29 and 32, Township 48 South, Range 25 East, Sections 5, 8, 16, 21 and 28, Township 49 South, Range 25 East and Sections 4 and 9, Township 50

South, Range 25 East, Gulf of Mexico, Class III Waters. The location of the mitigation artificial reef will be determined at a later date.

This permit constitutes a finding of consistency with Florida's Coastal Zone Management Program, as required by Section 307 of the Coastal Zone Management Act. This permit also constitutes certification of compliance with state water quality standards pursuant to Section 401 of the Clean Water Act, 33 U.S.C. 1341.

This activity also requires a proprietary authorization, as the activity is located on sovereign submerged lands owned by the Board of Trustees of the Internal Improvement Trust Fund, pursuant to Article X, Section 11 of the Florida Constitution, and Sections 253.002 and 253.77, F.S. The activity is not exempt from the need to obtain a proprietary authorization. The Department has the responsibility to review and take final action on this request for proprietary authorization in accordance with Section 18-21.0051, F.A.C., and the Operating Agreements executed between the Department and the water management districts, as referenced in Chapter 62-113, F.A.C. In addition to the above, this proprietary authorization has been reviewed in accordance with Chapter 253, F.S., Chapter 18-21, Section 62-343.075, F.A.C., and the policies of the Board of Trustees.

As staff to the Board of Trustees, the Department has reviewed the activity described above, and has determined that the beach placement activities and placement of the mitigative artificial reef qualify for a Letter of Consent to use sovereign, submerged lands, as long as the work performed is located within the boundaries as described herein and is consistent with the terms and conditions herein. Therefore, consent is hereby granted, pursuant to Chapter 253.77, F.S., to perform the activity on the specified sovereign submerged lands.

A copy of this authorization has been sent to the U. S. Army Corps of Engineers (USACOE) for review. The USACOE may require a separate permit. Failure to obtain this authorization prior to construction could subject you to enforcement action by that agency. You are hereby advised that authorizations also may be required by other federal, state, and local entities. This authorization does not relieve you from the requirements to obtain all other required permits and authorizations.

The above named permittee is hereby authorized to construct the work shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof. **This permit and authorization to use sovereign submerged lands is subject to the limits, conditions, and locations of work shown in the attached drawings, and is also subject to the General Conditions and Specific Conditions, which are a binding part of this permit and authorization.** You are advised to read and understand these drawings and conditions prior to commencing the authorized activities, and to ensure the work is conducted in conformance with all the terms, conditions, and drawings. If you

are utilizing a contractor, the contractor also should read and understand these drawings and conditions prior to commencing the authorized activities.

GENERAL CONDITIONS:

1. All activities authorized by this permit shall be implemented as set forth in the plans and specification approved as a part of this permit, and all conditions and requirements of this permit. The permittee shall notify the Department in writing of any anticipated deviation from the permit prior to implementation so that the Department can determine whether a modification of the permit is required pursuant to Section 62B-49.008, Florida Administrative Code.

2. If, for any reason, the permittee does not comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Bureau of Beaches and Coastal Systems and the appropriate District office of the Department with a written report containing the following information: a description of and cause of noncompliance; and the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

3. This permit does not eliminate the necessity to obtain any other applicable licenses or permits which may be required by federal, state, local, special district laws and regulations. This permit is not a waiver or approval of any other Department permit or authorization that may be required for other aspects of the total project which are not addressed in this permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of sovereignty land of Florida seaward of the mean high-water line, or, if established, the erosion control line, unless herein provided and the necessary title, lease, easement, or other form of consent authorizing the proposed use has been obtained from the State. The permittee is responsible for obtaining any necessary authorizations from the Board of Trustees of the Internal Improvement Trust Fund prior to commencing activity on sovereign lands or other state-owned lands.

5. Any delineation of the extent of a wetland or other surface water submitted as part of the permit application, including plans or other supporting documentation, shall not be considered specifically approved unless a specific condition of this permit or a formal determination under Section 373.421(2), F.S., provides otherwise.

6. This permit does not convey to the permittee or create in the permittee any property right, or any interest in real property, nor does it authorize any entrance upon or activities on property which is not owned or controlled by the permittee. The issuance of this permit does not convey any vested rights or any exclusive privileges.

7. This permit or a copy thereof, complete with all conditions, attachments, plans and specifications, modifications, and time extensions shall be kept at the work site of the permitted activity. The permittee shall require the contractor to review the complete permit prior to commencement of the activity authorized by this permit.

8. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel with proper identification and at reasonable times, access to the premises where the permitted activity is located or conducted for the purpose of ascertaining compliance with the terms of the permit and with the rules of the Department and to have access to and copy any records that must be kept under conditions of the permit; to inspect the facility, equipment, practices, or operations regulated or required under this permit; and to sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules. Reasonable time may depend on the nature of the concern being investigated.

9. At least forty-eight (48) hours prior to commencement of activity authorized by this permit, the permittee shall submit to the Bureau of Beaches and Coastal Systems and the appropriate District office of the Department a written notice of commencement of construction indicating the actual start date and the expected completion date and an affirmative statement that the permittee and the contractor, if one is to be used, have read the general an specific conditions of the permit and understand them.

10. If historical or archaeological artifacts are discovered at any time on the project site, the permittee shall immediately notify the State Historic Preservation Officer and the Bureau of Beaches and Coastal Systems.

11. Within 30 days after completion of construction or completion of a subsequent maintenance event authorized by this permit, the permittee shall submit to the Bureau of Beaches and Coastal Systems and the appropriate District office of the Department a written statement of completion and certification by a registered professional engineer. This certification shall state that all locations and elevations specified by the permit have been verified; the activities authorized by the permit have been performed in compliance with the plans and specifications approved as a part of the permit, and all conditions of the permit; or shall describe any deviations from the plans and specification, and all conditions of the permit. When the completed activity differs substantially from the permitted plans, any substantial deviations shall be noted and explained on two copies of as-built drawings submitted to the Department.

SPECIFIC CONDITIONS:

1. Pursuant to Chapter 161.141, Florida Statutes, prior to construction of the beach nourishment project, the board of trustees must establish the line of mean high water for any area affected by this project that does not already have an Erosion Control Line (ECL). This is required to establish the boundary line between sovereignty lands of the state bordering on the Gulf of Mexico and the upland properties. No work shall commence until the Erosion Control Line has been executed to the satisfaction of the Department and recorded in the County Records.

2. If historical or archaeological artifacts such as, but not limited to, Indian canoes, arrow heads, pottery or physical remains, are discovered at any time within the project site, the permittee shall immediately stop all activities which disturb the soil and notify the Department's District Office and the Bureau of Historic Preservation, Division of Historical Resources, R. A. Gray Building, 500 South Bronough Street, Tallahassee, Florida 32399-0250.

3. All reports or notices relating to this permit shall be sent to the DEP, Bureau of Beaches and Coastal Systems, JCP Compliance Officer, 3900 Commonwealth Boulevard, Mail Station 300, Tallahassee, Florida 32399-3000 and the DEP South District Office, (2295 Victoria Ave, Suite #364, Ft. Myers, Florida 33901-3881).

4. No work shall be conducted under this permit until the permittee has received a written notice to proceed from the Department. At least 60 days prior to the requested date of issuance of the notice to proceed, the permittee shall submit the following for review and approval by the Department:

a. A detailed ***Physical Monitoring Plan***, as described in Specific Condition No. 11 (Physical Monitoring section).

b. Final ***Biological Monitoring Plan***, as described in Specific Condition No. 10.

c. A ***Mitigation Plan*** as described in Specific Condition No. 12.

d. Final ***Sediment Quality Control / Quality Assurance Plan,*** as required by Rule 62B-41.008(1)(k)4.b., F.A.C. Once approved by the Department, compliance with the Plan shall be a specific condition of this permit and must be incorporated in the relevant Terms and Conditions of the construction contracts. The Plan shall include project-specific sediment quality specifications for grain size distribution, color, and carbonate composition to ensure that the sediment from the borrow sites will meet the standards in Rule 62B-41.007(2)(j), F.A.C., for the exclusion of non-compatible fill material. The Plan shall provide quality control procedures for excavating sediment from within the authorized horizontal and vertical limits of the permitted borrow sites; for monitoring and reporting the quality of sediment as it is

placed on the beach; and for altering construction operations if the sediment does not comply with the project specific sediment quality specifications or stopping the dredging operation if the specifications cannot be attained. Further, the Plan shall provide procedures for testing the quality of the sediment after it is placed and methods for remediation of any areas of fill material that do not comply with the sediment quality specifications.

e. Two hard copies and an electronic copy of detailed ***final construction plans and specifications*** for all authorized activities, including a vessel operations plan. These documents shall be signed and sealed by the design engineer who must be registered in the State of Florida, and shall bear the certifications specified in Rule 62B-41.007(4), F.A.C. The plans and specifications shall include a description of the beach construction methods to be utilized and drawings and surveys which show all biological resources and work spaces (e.g., anchoring area, pipeline corridors, staging areas, boat access corridors, etc.) to be used for this project.

f ***Turbidity monitoring qualifications***. Construction at the project site shall be monitored closely to assure that turbidity levels do not exceed the compliance standards established in this permit. Accordingly, an individual familiar with beach construction techniques and turbidity monitoring shall be present at all times when fill material is discharged on the beach. This individual shall have authority to alter construction techniques or shut down the dredging or beach construction operations if turbidity levels exceed the compliance standards established in this permit. The names and qualifications of those individuals performing these functions along with 24-hour contact information shall be submitted for approval.

g. Written verification that the ***Erosion Control Line*** has been executed and recorded throughout the entire project area.

h. ***Outfall Management Plan***. The County shall submit a long-range management plan (including an identification of viable funding sources) for the removal of storm water outfalls from the beach. Submittal of an acceptable plan will be a requirement of the Notice to Proceed for the **second** nourishment event.

5. At least 7 days prior to commencement of the initial and subsequent beach nourishment construction activities authorized by this permit, the permittee shall conduct a pre-construction conference to review the specific conditions and monitoring requirements of this permit with permittee's contractors, the engineer of record, FWC and Department staff representatives. The permittee shall provide written notification, at least 14 days in advance of the meeting, to the following offices advising of the date, time, and location of the pre-construction conference.

DEP, Bureau of Beaches and Coastal Systems
Attention - JCP Compliance Officer
Mail Station 300
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000
Phone: (850) 487-4471
fax: (850) 488-5257

DEP, South District Office
Submerged Lands & Environmental Resources Program
2295 Victoria Ave, Suite #364
Ft. Myers, Florida 33901-3881
Phone: (239) 332-6975

FWC, ISMS
620 South Meridian Street
Tallahassee, Florida 32399-1600
Phone: (850) 922-4330

6. Pursuant to Chapter 370.25, Florida Statutes (F.S.), the permittee shall require the selected artificial reef contractor to complete the attached *MATERIAL CARGO MANIFESTO* form required by the FWC, Division of Marine Fisheries Artificial Reef Program. This form shall be maintained on board the vessel during transport of artificial reef material over state waters.

7. Following construction of the artificial reef(s), the permittee shall complete the attached *MATERIALS PLACEMENT REPORT* form required by the FWC, Division of Marine Fisheries Artificial Reef Program. Within 30 days following construction, the completed form shall be submitted to the Florida Fish & Wildlife Conservation Commission, Division of Marine Fisheries, Artificial Reef Program, 620 S. Meridian Street, Tallahassee, FL 32399 and a copy e-mailed to the JCP Compliance Officer, Bureau of Beaches & Coastal Systems. In addition to attaching the completed form, please indicate on the e-mail that the information is being submitted for the Collier County Beach Nourishment Project, Permit No. 0222355-001-JC, as required by Specific Condition 7.

8. The permittee shall construct and maintain a shore-parallel sand dike at the beach placement area at all times during hydraulic discharge on the beach to meet turbidity standards prescribed by this permit.

9. During all dredging operations, the permittee shall require the dredging contractor to have electronic positioning equipment that continuously measures the vertical and horizontal location of the dredge at all times during construction operation. The horizontal positioning equipment shall be installed on the dredge so as to monitor the actual location of the dredge equipment and

be interfaced with the depth-monitoring device. This equipment shall provide a permanent record of the position referenced to State Plane Coordinates and NGVD. The Contractor shall provide telemetry of the instantaneous dredging positioning and digging functions of the project dredges that accommodates electronic charting functions by the Permittee at a remotely located system. As part of the final report, the permittee shall provide a daily record of the position of the dredge equipment which includes the dredge area limits with actual and maximum authorized dredge depth referenced to state plane coordinates and NGVD. Vertical and horizontal accuracy of the positioning equipment shall also be reported.

MONITORING REQUIRED:

10. **Biological Monitoring.**

The goal of the biological monitoring program is to evaluate the potential impacts of the project upon the extensive, nearshore hardbottom communities along the project area shoreline and nearshore/offshore communities along the submerged pipeline corridors. The monitoring shall be specifically directed to the assessment of the dynamics of the equilibrium toe of fill.

Twenty-four, permanent, 150-meter long, cross-shore monitoring transects shall be established beginning from the preconstruction landward nearshore edge of the hardbottom. Six to eight similar transects will be established north and south of each of the fill segments to monitor hardbottom at the adjacent areas. Eight control transects shall be established in the areas where the effects of beach fill placement are not anticipated. Video surveys and *in situ* estimations shall be used for the nearshore biological monitoring surveys. At least twenty $0.5m^2$ quadrats shall be placed along each transect for *in situ* estimations. The following information shall be collected along each transect: the current position of the nearshore edge of the hardbottom; surveys of the $0.5m^2$ quadrats (as outlined below); and photographs (taken at permanently established photo quadrats) to document status of scleractinian corals, octocorals, and other prominent organisms observed.. Within each $0.5m^2$ quadrat, the surveys shall estimate cover by macroalgae and other organisms, number and dimensions of scleractinian corals and octocorals, cover and thickness of loose sediments, and physical relief of hardbottom. The details of the methodology and selected transect locations are attached in the latest version of the Draft Biological Monitoring Plan dated September 22, 2004.

Multibeam fathometer or side-scan sonar survey and diver verification survey along the nearshore edge of the hardbottom shall be conducted to document the changes in the sand/hardbottom border due to the equilibration of the toe of fill.

Aerial photography shall be taken annually for five years, during the summer, at the time of the best visibility in nearshore waters, from an altitude that would allow the photographs to clearly show **both** the shoreline and sand/hardbottom border. Aerial photography shall also include the artificial reef.

Monitoring of the mitigation site shall be conducted using a methodology that is similar to natural hardbottom survey. Ten permanent, 20-meter-long transects shall be established over the 1.09-acre mitigation artificial reef immediately after construction.

Nearshore hardbottom monitoring, including cross-shore transects and sand/hardbottom border surveys, shall be conducted during the summer prior to construction and then in years 1, 2, 3, and 5 after construction.

Reports shall include survey data, data analysis and their interpretation. Reports shall be provided within 60 days of the completion of each survey, but no later than November 1 of each year.

Pipeline corridors shall be video surveyed immediately after pipeline placement and immediately after removal. If damage to hardbottom organisms is detected at any time, then the permittee shall immediately attempt to save the damaged organisms, and then report the damage and remediation efforts to the Department (via e-mail to the JCP Compliance Officer).

Reports of the video surveys shall include data regarding condition of organisms, data analysis and their interpretation. Reports shall be provided within 60 days of the completion of survey, but no later than November 1 of that year. The reports shall include accurate estimates of the extent of damage to hardbottom communities not previously restored, and failed restoration efforts. The final report shall also propose mitigation for any residual damage to the hardbottom community.

The permittee shall conduct physical monitoring as stated below to assess the performance of the project and sediment dynamics over the period of record represented by the surveys. Results of physical monitoring data shall also be used to determine the extent of biological impacts. Physical monitoring data shall be compared to the hardbottom edge survey. All hardbottom cover seaward of the initial (preconstruction) location of the nearshore edge of the hardbottom shall be attributed to the project due to cross-shore sediment transport seaward of the applicant's estimated depth of closure.

11. Physical monitoring

Pursuant to 62B-41.005(16), F.A.C., physical monitoring of the project is required through acquisition of project-specific data to include, at a minimum, topographic and bathymetric surveys of the beach, offshore, and borrow site areas, aerial photography, and engineering analysis. The monitoring data is necessary in order for both the project sponsor and the Department to regularly observe and assess, with quantitative measurements, the performance of the project, any adverse effects which have occurred, and the need for any adjustments, modifications, or mitigative response to the project. The scientific monitoring process also

provides the project sponsor and the Department information necessary to plan, design, and optimize subsequent follow-up projects, potentially reducing the need for and costs of unnecessary work, as well as potentially reducing any environmental impacts that may have occurred or be expected.

Prior to issuance of the Notice to Proceed, the permittee shall submit a detailed Monitoring Plan subject to review and approval by the Department. The Monitoring Plan shall indicate the project's predicted design life.

The approved Monitoring Plan can be revised at any later time by written request of the permittee and with the written approval of the Department. If subsequent to approval of the Monitoring Plan there is a request for modification of the permit, the Department may require revised or additional monitoring requirements as a condition of approval of the permit modification.

As guidance for obtaining Department approval, the plan shall generally contain the following items:

> Topographic and bathymetric profile surveys of the beach and offshore shall be conducted within 90 days prior to commencement of construction, and within 60 days following completion of construction of the project. Thereafter, monitoring surveys shall be conducted annually for a period of three (3) years, then biennially until the next beach nourishment event or the expiration of the project design life, whichever occurs first. The monitoring surveys shall be conducted during a spring or summer month and repeated as close as practicable during that same month of the year. If the time period between the immediate post-construction survey and the first annual monitoring survey is less than six months, then the permittee may request a postponement of the first monitoring survey until the following spring/summer. A prior design survey of the beach and offshore may be submitted for the pre-construction survey if consistent with the other requirements of this condition.
>
> The monitoring area shall include profile surveys at each of the Department of Environmental Protection's DNR reference monuments within the bounds of the beach fill area and along at least 5,000 feet of the adjacent shoreline on both sides of the beach fill area. For those project areas that contain erosion control structures, such as groins or breakwaters, additional profile lines shall be surveyed at a sufficient number of intermediate locations to accurately identify patterns of erosion and accretion within this subarea. All work activities and deliverables shall be conducted in accordance with the latest update of the Bureau of Beaches and Coastal Systems (BBCS) *Monitoring Standards for Beach Erosion Control Projects, Sections 01000 and 01100.*

b. Aerial photography of the beach shall be taken concurrently with the post-construction survey and each annual and biennial monitoring survey required above, as close to the date of the beach profile surveys as possible. The limits of the photography shall include the surveyed monitoring area as described above. All work activities and deliverables shall be conducted in accordance with the latest update of the *BBCS Monitoring Standards for Beach Erosion Control Projects, Section 02100.*

c. The permittee shall submit an engineering report and the monitoring data to the BBCS within 90 days following completion of the post-construction survey and each annual or biennial monitoring survey.

   The report shall summarize and discuss the data, the performance of the beach fill project, and identify erosion and accretion patterns within the monitored area. In addition, the report shall include a comparative review of project performance to performance expectations and identification of adverse impacts attributable to the project.

   Appendices shall include plots of survey profiles and graphical representations of volumetric and shoreline position changes for the monitoring area. Results shall be analyzed for patterns, trends, or changes between annual surveys and cumulatively since project construction.

d. Monitoring reports and data shall be submitted to the Bureau of Beaches and Coastal Systems, JCP Compliance Officer, in Tallahassee. Failure to submit reports and data in a timely manner constitutes grounds for revocation of the permit. When submitting any monitoring information to the Bureau, please include a transmittal cover letter clearly labeled with the following at the top of each page: "This monitoring information is submitted in accordance with Item No. [XX] of the approved Monitoring Plan for Permit No. 0222355-001-JC for the monitoring period [XX].

12. **Mitigation**

In order to offset impacts to an estimated 1.09 acres of nearshore hardbottom communities, which is associated with the seaward spreading of fill to the estimated equilibrium toe of fill (ETOF), the permittee shall build 1.09 acres of low relief artificial reef as the initial mitigation. The construction of this mitigation reef should be completed prior to commencement of beach construction. However, if the construction schedule would not allow up-front mitigation, construction of the mitigation reef shall be completed no later than six months after the completion of the initial nourishment event authorized by this permit. If the mitigation reef is not completed by one year after the commencement of the initial beach nourishment, an additional 0.2 acres of artificial reef shall be added to the mitigation reef to address the time lag

associated with lost productivity. The mitigation requirement shall continue to increase by 0.2 acres for each additional year of delay. Furthermore, if the post-construction monitoring reveals damage to hardbottom communities (due to either burial or sedimentation) exceeding the initial estimate of 1.09 acres, the permittee shall build additional mitigation reef at a ratio of 2:1, due to the time lag.

The mitigative artificial reef shall be built of limestone boulders and shall simulate a flat hardbottom with approximately 0.3 to 0.6 meters (1 to 2 feet) of vertical relief. The maximum vertical dimension of the boulders shall be no more than 1.5 m and not less than 1 m, and shall have an average vertical dimension of approximately 1.2 m. The artificial reef shall be constructed in a sandy area with sand thickness not less than 0.3 m (one foot) and not more than 0.6 m (two feet). The artificial reef shall remain at least 15 m (50 feet) away from the nearest hardbottom community (including populated hardbottom communities covered by a thin veneer of sand). The Mitigation Reef Construction Plans and Specifications shall be submitted to the Department no later than 60 days prior to the beginning of the beach fill construction (see Specific Condition 4.c). The Mitigation Reef Construction Plan shall include a map indicating the location of the initial 1.09 acres of artificial reef and also show possible locations for at least an additional acre of mitigation reef, which may be required later. The Plan shall also include a description of the artificial reef construction methods and material used, surveys which show the thickness of the sand in the selected mitigation area(s), the location of adjacent hardbottom communities, and the location of work spaces (e.g., anchoring area, staging areas, boat/barge access corridors, etc.).

A notice of completion of the artificial reef construction shall be submitted to the BBCS (compliance officer) within seven days of construction completion. This notice shall include an as-built survey of the artificial reef. Monitoring of the artificial reef shall be conducted and reported according to Specific Condition 11.

13. In order to ensure that marine turtles are not adversely affected by construction activities, the following conditions shall be followed in order to protect nesting marine turtles:

a. Beach nourishment shall be started after October 31 and be completed prior to May 1.

b. All fill material placed on the beach must be analogous to that which naturally occurs within the project location or vicinity in quartz to carbonate ratio, color, median grain size, and median sorting. The material shall be similar in color and grain size distribution (sand grain frequency, mean and median grain size, and sorting coefficient) to the material in the existing coastal system at the disposal site and shall not contain:

   i. Greater than five percent, by weight, silt, clay or colloids passing the #230 sieve;
   ii. Greater than five percent, by weight, fine gravel retained on the #4 sieve;

iii. Coarse gravel, cobbles, or material retained on the ¾ inch sieve in a percentage or size greater than found on the native beach;
iv. Construction debris, toxic material or other foreign matter; and not result in contamination of the beach.
v. These standards must not be exceeded in any 1,000 square foot section, extending through the depth of the nourished beach. If the natural beach exceeds any of the limiting parameters listed above, than the fill material must not exceed the naturally occurring level for that parameter.

c. Immediately after completion of the beach fill placement event and prior to February 1 for 3 subsequent years if placed sand still remains on the beach, the beach shall be tilled as described below. During the 3 years following each fill placement event, the permittee may measure sand compaction in the area of restoration in accordance with a protocol agreed to by the FWC, the Department, the U.S. Fish & Wildlife Service, and the applicant to determine if tilling is necessary. At a minimum, the protocol provided below shall be followed. If required, the area shall be tilled to a depth of 24 inches.

i. All tilling activity must be completed prior to February 1. An annual summary of compaction surveys and the actions taken shall be submitted to the FWC. If the project is completed during the nesting season, tilling shall not occur in areas where nests have been left in place or relocated unless authorized by the U.S. Fish and Wildlife Service in an Incidental Take Statement. A report on the results of compaction monitoring shall be submitted to the FWC prior to any tilling actions being taken. This condition shall be evaluated annually and may be modified if necessary to address sand compaction problems identified during the previous year.
ii. Compaction sampling stations shall be located at 500-foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area) and one station shall be midway between the dune line and the high water line (normal wrack line).
iii. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports shall include all 18 values for each transects line, and the final 6 averaged compaction values.

iv. If the average value for any depth exceeds 500 psi for any two or more adjacent stations, then that area shall be tilled prior to February 1. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the FWC shall be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling shall not be required.

v. Compaction measurements and tilling shall not occur within or adjacent to areas being utilized for nesting by shorebirds.

d. Visual surveys for escarpments along the beach fill area shall be made immediately after completion of the beach nourishment project and prior to April 1 for the following three years if placed sand still remains on the beach. All scarps shall be leveled or the beach profile shall be reconfigured to minimize scarp formation. In addition, weekly surveys of the project area shall be conducted during the two nesting seasons following completion of fill placement as follows.

i. The number of escarpments and their location relative to DNR-DEP reference monuments shall be recorded during each weekly survey and reported relative to the length of the beach surveyed (e.g., 50% scarps). Notations on the height of these escarpments shall be included (0 to 2 feet, 2 to 4 feet, and 4 feet or higher) as well as the maximum height of all escarpments.

ii. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled to the natural beach contour by April 15. Any escarpment removal shall be reported relative to R-monument.

iii. If weekly surveys during the marine turtle nesting season document subsequent reformation of escarpments that exceed 18 inches in height for a distance of 100 feet, the FWC shall be contacted immediately to determine the appropriate action to be taken.

iv. No scarp removal shall occur within or adjacent to areas being utilized for nesting by shorebirds.

e. A lighting survey shall be conducted from the nourished berm prior to April 15 of the first nesting season following nourishment and action taken to ensure that no lights or light sources are visible from the newly elevated beach. A report summarizing all lights visible, using standard survey techniques for such surveys, shall be submitted to FWC by May 15 and documenting all compliance and enforcement action. Additional lighting surveys shall be conducted monthly through August and results reported by the 15th of each month.

f. Reports on all nesting activity shall be provided for the initial nesting season and for a minimum of three additional nesting seasons. Monitoring of nesting activity in the four seasons following construction shall include daily surveys and any additional

measures authorized by the FWC. Reports submitted shall include daily report sheets noting all activity, nesting success rates, hatching success of all relocated nests, hatching success of a representative sampling of nests left in place (if any), dates of construction and names of all personnel involved in nest surveys and relocation activities. Data should be reported separately for the nourished areas and for an equal length of adjacent beach that is not nourished in accordance with Table 1 below. Summaries of nesting activity shall be submitted in electronic format (Excel spreadsheets). All reports should submitted by January 15 of the following year.

g. In the event a sea turtle nest is excavated during construction activities, all work shall cease in that area immediately and the permitted person responsible for egg relocation for the project should be notified so the eggs can be moved to a suitable relocation site.

h. Upon locating a dead, injured, or sick endangered or threatened sea turtle specimen, initial notification must be made to the FWC at 1-888-404-FWCC. Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

In the event a hopper dredge is utilized for sand excavation, all conditions in the National Marine Fisheries Service (NMFS) *Biological Opinion for Dredging of Gulf of Mexico Navigation Channels and Sand Mining Borrow Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts* (Consultation Number F/SER/2000/01287) must be followed, and the FWC shall be sent copies of the reports specified in the Biological Opinion.

Table 1. Marine Turtle Monitoring for Beach Restoration Projects

The following monitoring is required for beach restoration projects. Reports summarizing the nesting should be submitted to the Tequesta office with a copy to the Tallahassee office by January 15 of the subsequent year. Data for nesting activity on the nourished beach and on an equal length of beach that is not nourished shall be reported separately, and should include numbers of nests lost to erosion or washed out. Summaries of nesting activity shall be submitted in electronic format (Excel spreadsheets).

Characteristic	Parameter	Measurement	Variable
Nesting Success	False crawls - number	Visual assessment of all false crawls	Number and location of false crawls in fill areas and nonfilled areas: any interaction of the turtle with obstructions, such as groins, seawalls, or scarps, should be noted.
	False crawl - type	Categorization of the stage at which nesting was abandoned	Number in each of the following categories: emergence-no digging, preliminary body pit, abandoned egg chamber.
	Nests	Number	The number of marine turtle nests in filled and nonfilled areas should be noted. If possible, the location of all marine turtle nests shall be marked on map of project, and approximate distance to sea walls or scarps measured using a meter tape. Any abnormal cavity morphologies should be reported as well as whether turtle touched groins, seawalls, or scarps during nest excavation
		Lost Nests	The number of nests lost to inundation, erosion or the number with lost markers that could not be found.
	Lighting Impacts	Disoriented sea turtles	The number of disoriented hatchlings and adults shall be documented and reported in accordance with existing FWC protocol for disorientation events.
Reproductive Success	Emergence & hatching success	Standard survey protocol	Numbers of the following: unhatched eggs, depredated nests and eggs, live pipped eggs, dead pipped eggs, live hatchlings in nest, dead hatchlings in nest, hatchlings emerged, disoriented hatchlings, depredated hatchlings

14. In order to ensure that shorebirds are not adversely affected by construction activities, the following conditions shall be followed in order to protect shorebirds:

a. Shorebird surveys should be conducted by trained, dedicated individuals using accepted, appropriate ecological survey procedures (for example, see "*Breeding Season Population Census Techniques for Seabirds and Colonial Waterbirds Throughout North America*" at URL: http://www.mp2-pwrc.usgs.gov/cwb/manual/) during the shorebird nesting season, February 1 through September 1.

   i. Nesting season surveys shall begin on February 1 or 45 days prior to construction commencement, whichever is later, and be conducted daily throughout the construction period or through September if no shorebird nesting activity is observed.
   ii. For projects conducted in piping plover habitat, surveys to detect piping plovers or concentrations of other wintering or migratory shorebirds should begin 14 days prior to construction commencement and be conducted once every 2 weeks for all work from December through April. Each shorebird species observed, a rough estimate of numbers of each species, the location of the birds, and their activity (e.g., foraging, resting, nesting, courtship behavior) should be logged and reported to the FWC Regional Wildlife Diversity Conservation Biologist monthly.
   iii. The FWC Regional Wildlife Diversity Conservation Biologist shall be contacted at (561) 625-5133 within 24 hours if shorebird nesting occurs within or immediately adjacent to the project area.

b. Buffer Zones and Travel Corridors. Within the project area, the permittee shall establish a 300 ft-wide buffer zone around any location where shorebirds have been engaged in courtship or nesting behavior, or around areas where piping plovers occur or winter migrants congregate in significant numbers. Any and all construction activities, including movement of vehicles, should be prohibited in the buffer zone.

   i. The width of the buffer zone shall be increased if birds appear agitated or disturbed by construction or other activities in adjacent areas.
   ii. Site-specific buffers may be implemented upon approval by FWC as needed.
   iii. Designated buffer zones must be posted with clearly marked signs around the perimeter. These markings shall be maintained until nesting is completed or terminated, the chicks fledge, or piping plovers or winter migrants depart.
   iv. No construction activities or stockpiling of equipment shall be allowed within the buffer area.
   v. FWC-approved travel corridors should be designated and marked outside the buffer areas. Heavy equipment, other vehicles, or pedestrians may transit past nesting areas in these corridors. However, other activities, such as stopping or

turning, shall be prohibited within the designated travel corridors adjacent to the nesting site.

vi. Where such a travel corridor must be established within the project area it should avoid critical areas for shorebirds (known nesting sites, wintering grounds, FWC-designated Critical Wildlife Areas, and USFWS-designated critical piping plover habitat) as much as possible, and be marked with signs clearly delineating the travel corridor from the shorebird buffer areas described above.

vii. To the degree possible, the permittee should maintain some activity within these corridors on a daily basis, without directly disturbing any shorebirds documented on site or interfering with sea turtle nesting, especially when those corridors are established prior to commencement of construction. Passive methods to modify nesting site suitability must be approved by the FWC Wildlife Diversity Conservation Biologist for that region.

c. Notification. If shorebird nesting occurs within the project area, a bulletin board will be placed and maintained in the construction area with the location map of the construction site showing the bird nesting areas and a warning, clearly visible, stating that "BIRD NESTING AREAS ARE PROTECTED BY THE FLORIDA THREATENED AND ENDANGERED SPECIES ACT AND THE FEDERAL MIGRATORY BIRD ACT."

d. Tilling. All tilling and scarp removal should be done outside the shorebird nesting season (February 1 through September 1). If necessary, contractors should contact the FWC Regional Wildlife Diversity Conservation Biologist at (561) 625-5133 to obtain data on known shorebird nesting areas. It is the responsibility of the contractors to avoid tilling or scarp removal in areas where nesting birds are present.

i. A relatively even surface, with no deep ruts or furrows, shall be created during tilling. To do this, chain-linked fencing or other material shall be dragged over those areas as necessary after tilling.

ii. The slope between the mean high water line and the mean low water line must be maintained in such a manner as to approximate natural slopes.

e. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible, pipes should be placed landward of the site before birds are active in that area. No sand shall be placed seaward of a known shorebird nesting site during the shorebird nesting season.

15. In order to ensure that manatees are not adversely affected by construction activities, the following conditions shall be followed in order to protect manatees:

a. The permittee shall instruct all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel are responsible for observing water-related activities for the presence of manatee(s).

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act of 1972, The Endangered Species Act of 1973, and the Florida Manatee Sanctuary Act.

c. Siltation barriers shall be made of material in which manatees cannot become entangled, are properly secured, and are regularly monitored to avoid manatee entrapment. Barriers must not block manatee entry to or exist from essential habitat.

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

e. If manatee(s) are seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet of a manatee. Operation of any equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment. Activities will not resume until the manatee(s) has departed the project area of its own volition.

f. Any collision with and/or injury to a manatee shall be reported immediately to the FWC Hotline at 1-888-404-FWCC. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-232-2580) for north Florida or Vero Beach (1-561-562-3909) in south Florida.

g. Temporary signs concerning manatees shall be posted prior to and during all construction/dredging activities. All signs are to be removed by the permittee upon completion of the project. A sign measuring at least 3 ft. by 4 ft. which reads *Caution: Manatee Area* will be posted in a location prominently visible to water related construction crews. A second sign should be posted if vessels are associated with the construction, and should be placed visible to the vessel operator. The second sign should be at least 8-1/2" by 11" which reads *Caution: Manatee Habitat. Idle speed is required if operating a vessel in the construction area. All equipment must be shutdown if a manatee comes within 50 feet of operation. Any collision with and/or injury to a manatee shall be reported immediately to the FWC Hotline at 1-*

888-404-FWCC. The U.S. Fish and Wildlife Service should also be contacted in Jacksonville (1-904-232-2580) for north Florida or in Vero Beach (1-561-562-3909) for south Florida.

16. Water Quality - Turbidity - Nephelometric Turbidity Units (NTUs)

Frequency: Twice daily at least 4 hours apart during all disposal operations.

Location: Background: At mid-depth, at least 300 meters upcurrent from the dredge discharge point and clearly outside the influence of any turbidity generated by the project. Samples shall be collected at the surface and mid-depth.

Compliance: no more than 150 meters downcurrent from the point where return water from the dredge discharge enters waters of the State, within the densest portion of any visible turbidity plume. Samples shall be collected at the surface and mid-depth.

All monitoring data shall be submitted within one week of analysis with documents containing the following information: (1) "**Permit Number 0222355-001-JC, Collier County Beach Nourishment Project**"; (2) dates of sampling and analysis; (3) a statement describing the methods used in collection, handling, storage and analysis of the samples; (4) a map indicating the sampling locations; (5) a statement by the individual responsible for implementation of the sampling program concerning the authenticity, precision, limits of detection and accuracy of the data

Monitoring reports shall also include the following information for each sample that is taken:

(a) time of day samples taken;
(b) depth of water body;
(c) depth of sample;
(d) antecedent weather conditions;
(e) tidal stage and direction of flow; and
(f) wind direction and velocity.

The compliance locations given above shall be considered the limits of the temporary mixing zone for turbidity allowed during construction. If monitoring reveals turbidity levels at the compliance site greater than or equal to 29 NTUs above background turbidity levels at the corresponding background site, construction activities shall cease immediately and not resume until corrective measures have been taken and turbidity has returned to acceptable levels. Any such occurrence shall also be immediately reported to DEP's Bureau of Beaches and Coastal Systems (JCP Compliance Officer), Phone: (850) 487-4471, and the DEP South District office in 2295 Victoria Ave, Suite #364, Ft. Myers, Florida 33901-3881, Phone: (239) 332-6975.

Monitoring reports shall be submitted to the Bureau of Beaches and Coastal Systems in Tallahassee and to the DEP South District office. Failure to submit reports in a timely manner constitutes grounds for revocation of the permit. When submitting this information to the DEP, please clearly include, at the top of each page or as a cover page to the submittal: **"This information is provided in partial fulfillment of the monitoring requirements in Permit No. 0222355-001-JC, Collier County Beach Nourishment Project."**

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

Michael R. Barnett, P.E., Chief
Bureau of Beaches and Coastal Systems

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to Section 120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Della Weaver 1/12/05
Deputy Clerk Date

31 pages attached.

APPENDIX E

BOEM COORDINATION AND BIOLOGICAL ASSESMENT (BA)

Collier County
Public Services Division
Coastal Zone Management

COPY

November 9, 2011

Ms. Renee Orr, Chief
Strategic Resources Office
Bureau of Ocean Energy Management
381 Elden Street
MS 4010
Herndon, VA 20170

RE: Request for Non-Competitive Negotiated Agreement for use of OCS sand from Collier Borrow Area T-1.

Dear Ms. Orr:

By way of this letter, the Collier County, Florida requests to enter into a non-competitive negotiated Agreement with the U.S. Department of Interior, Bureau of Ocean Energy Management (BOEM), for the use of sand from an existing Outer Continental Shelf (OCS) borrow area for purposes of renourishing the Collier County beaches. This is a non-federal beach renourishment project with construction anticipated to occur between November 1, 2013 and April 30, 2014.

Borrow Area T-1 was used in the 2005/2006 Collier County Renourishment Project in which approximately 668,000 CY's of T-1 material was used to renourish 13 miles of Collier County coastline between Wiggins and Gordon Passes.

The OCS sand borrow area T-1 is located in federal waters, approximately 33 miles offshore of Vanderbilt Beach in Collier County. It is requested that up to 1,000,000 cubic yards of sand be dredged from the OCS borrow area for placement along the Collier County beaches for shoreline protection. The sand will be hydraulically excavated by hopper dredge, then transported to the project area and hydraulically pumped from the dredge to the beaches. The location, methods and scope of the presently proposed project are unchanged from the 2005 project activity. It is our

understanding that as a result of this request, BOEM will inform Collier County what, if any, additional environmental survey/studies of Borrow Area T-1 may be required. Additionally, this project shall be constructed pursuant to existing State of Florida permit 02222355-001-JC. Maps and description of the offshore borrow area and the onshore project areas are attached.

The purpose of the project is to restore erosion losses to Collier County beaches as a result of storm waves and tides, including Tropical Storm Fay in 2008 and subsequent storms. In addition to periodic beach placement of material dredged from inlet bypassing, this project has renourished with sand on two subsequent occasions. The most recent project renourishment was in 2005, pursuant to erosion caused by severe hurricanes in 2004. The renourishment sand for the project was from the same OCS borrow source that is proposed herein, constructed per prior lease agreement OCS G-23707, dated September 27, 2005 (copy enclosed).

The public benefits of the proposed activity are significant. These include shore protection and storm damage reduction benefits for diverse residential, commercial, and public beach-park improvements, along with improvement of the beach resource and environmental habitat along this publicly-accessible, critically-eroded gulf shoreline. Beach profile data indicate that the previous renourishment has been highly successful in restoring this shoreline's sandy beach, and that the project has met or exceeded performance predictions.

Collier County looks forward to renewing its relationship with the Bureau of Ocean Energy Management for the use of Federal OCS sand for renourishment of our beaches. Please do not hesitate to contact me at 239-252-5342 or via email at GaryMcAlpin@colliergov.net if you have any questions relating to this request.

Thank you for your consideration in this matter.

Sincerely,

J Gary McAlpin

J. Gary McAlpin, P.E.
Coastal Zone Management Director
Collier County Public Service Division

Attachments

CC: Leo Ochs Jr., Collier County Manager
Marla Ramsey, Collier County Public Services Division Administrator
John Sorey, City of Naples Vice Mayor
Steve Keehn, CP&E Senior Coastal Engineer
Colleen Finnegan, Bureau of Ocean Energy Management
Colleen Greene, Collier County Assistant County Attorney

United States Department of the Interior

MINERALS MANAGEMENT SERVICE
Washington, DC 20240

SEP 2 7 2005

Mr. Gary McAlpin
Coastal Projects Manager
Collier County Public Utilities Engineering Department
3050 Horseshoe Drive, Suite 218
Naples, Florida 34104

Dear Mr. McAlpin:

Please find along with this cover letter, a draft final lease agreement and lease stipulations to allow for the Minerals Management Service to enter into a Noncompetitive Lease for the Collier County, Florida, Beach Renourishment Project. We understand that the proposed project will place approximately 673,000 cubic yards of OCS sand on 8.6 miles of beach to restore Vanderbilt Beach, Park Shore, Pelican Bay and the City of Naples public beaches. The sand source is a sand ridge identified as Borrow Area T1. The project will provide the County with storm protection for the upland properties, provide sea turtle nesting and shorebird habitat, and increase areas for beach recreation.

Please review the draft lease as soon as possible and provide your comments to me at the address below:

Minerals Management Service
Marine Minerals Branch
381 Elden Street
Mail Stop 4010
Herndon, Virginia 20170

Once we have your comments in hand, we will evaluate any suggested changes you might have. Upon completion of a final lease agreement approved by all parties, we will send three copies to you for signature by the Collier County, Board of Commissioners and subsequent signature by our Associate Director. A final agreement with all signatures will be provided to you for your records.

Please do not hesitate to contact Tony Giordano of my staff at (703) 787-1283 if you have any questions.

Sincerely,

Barry S. Drucker
Acting Chief, Marine Minerals Branch

cc: GOMR—Joe Christopher

TAKE PRIDE IN AMERICA

16F3

UNITED STATES
DEPARTMENT OF THE INTERIOR
MINERALS MANAGEMENT SERVICE

NEGOTIATED NONCOMPETITIVE LEASE FOR SAND, GRAVEL AND SHELL RESOURCES ON THE OUTER CONTINENTAL SHELF

This form does not constitute an information collection as defined by 44 U.S.C. 3502 and therefore does not require approval by the Office of Management and Budget.

Office: Washington, DC

Lease number: OCS-G-23707

This lease, is made under the authority of Section 8(k)(2)(A)(i) of the Outer Continental Shelf Lands Act of August 7, 1953 (43 U.S.C. 1331 et seq.), P.L. 95-372, as amended by P.L. 103-426, (hereinafter called the "Act"), between the United States of America (hereinafter called the "Government"), acting through the Minerals Management Service (hereinafter called the "Lessor"), and the Collier County, Board of County Commissioners, Florida (hereinafter called the "Lessee"). In consideration of the promises, terms, conditions, covenants, and stipulations contained herein or attached hereto, the parties mutually agree as follows:

Section 1. **Lease Area.** Under the terms and conditions of this lease, the Government hereby authorizes the removal of up to 673,000 cubic yards of sand only for exclusive use in the beach re-nourishment of a portion of Collier County beaches. The sand will be placed on 8.6 miles of beach to restore Vanderbilt Beach, Park Shore, Pelican Bay and the City of Naples public beaches. The sand source is a sand ridge identified as Borrow Area T1 which is located 33 miles from the beaches to be re-nourished between DNR monument (R-20) in the north and (R-80) in the south. This authorization includes the right of the Lessee to remove and place sand on these beaches prior to the expiration of this lease from the Federal Outer Continental Shelf (OCS) areas within the T1 Borrow Area within the following coordinates:

Borrow Area T1 Corner Coordinates
Collier County Renourishment Project

Easting	Lat. (Degrees)	Long. (Degrees)	Lat. (Decimal)	Long (Decimal)
208557	26 23 24.9	82 22 02.1	26.39024	82.36726
201944	26 23 23.8	82 23 14.9	26.38995	82.38746
201928	26 23 43.7	82 23 15.3	26.39548	82.38757
201026	26 23 47.6	82 23 25.2	26.39657	82.39034
201762	26 24 03.3	82 23 17.3	26.40093	82.38814
205279	26 24 03.5	82 22 38.7	26.40098	82.37740
205452	26 24 01.8	82 22 36.7	26.40050	82.37687
206055	26 23 56.8	82 22 30.0	26.39911	82.37501
206711	26 23 52.2	82 22 22.8	26.39784	82.37299
206583	26 23 42.6	82 22 24.1	26.39517	82.37335
207313	26 23 36.9	82 22 16.0	26.39360	82.37110
207800	26 23 37.1	82 22 10.6	26.39363	82.36962
208557	26 23 24.9	82 22 02.1	26.39024	82.36726

Section 2. Statutes and Regulations. This lease is issued subject to the Act (43 U.S.C. 1337(k)(2)(A)(i)), all regulations, orders, guidelines, and directives issued pursuant to the Act and in existence upon the Effective Date of this lease, all regulations, orders, guidelines, and directives subsequently issued pursuant to the Act that provide for the prevention of waste and conservation of the natural resources of the OCS and the protection of correlative rights therein, and all other applicable statutes and regulations.

Section 3. Effective/Expiration Date of Lease. The lease will be effective upon signature by both parties. This lease will expire one hundred eighty (180) calendar days from the effective date if the Lessee does not issue a Notice to Proceed to a dredging contractor during that time. If a timely Notice to Proceed is issued, then the lease will expire three hundred sixty five (365) days from the date the dredging contractors receive notice, or upon completion of the project, whichever occurs first. A written request for an extension of time may be submitted to MMS by the Lessee not less than thirty (30) days or more than ninety (90) days prior to the expiration of the lease.

Section 4. Notice of Operations. The Lessee shall immediately notify the Lessor of commencement or termination of operations after the Lessee receives such notification from its contractor.

Section 5. Plans and Performance. All operations in the leased area shall be conducted in accordance with the final approved project plan and all conditions as referenced in Attachment 1: Collier County Lease Stipulations, and all applicable regulations, orders, guidelines and directives.

The Lessee shall provide the Lessor with a copy of the Project's "Construction Solicitation and Specifications Plan" (herein referred to as the Plan) for review and approval. Not withstanding any other provision of this lease, no activity or operation authorized by it at the designated offshore borrow sites shall be carried out until the Lessor has determined that each such activity or operation described in the Plan will be conducted in a manner that is in compliance with the provisions and requirements of the lease. Any modifications to the Plan which affect the designated offshore borrow sites must be approved by the Lessor prior to implementation of the modification.

The Lessee acknowledges and assumes primary responsibility for all lease activities conducted by the Lessee, its employees, contractors or other persons or entities acting on the Lessee's behalf, and agrees to expressly require compliance with the terms and provisions of this lease in any contract entered into by the Lessee with such parties. The U.S. does not warrant the content or quality of the sand for the purposes for which it is intended. The Lessee further agrees to conduct periodic reviews and inspections of such activities to ensure compliance with the terms and conditions of the approved plan and this lease. Any modifications to the approved project plan shall be approved by the Lessor prior to implementation. The Lessee further agrees that no activities authorized by the approved plan or this lease will be carried out in a manner that (1) interferes with or endangers operations under any lease issued or maintained pursuant to the Act, (2) causes any undue harm or damage to aquatic life, (3) causes pollution, (4) creates hazardous or unsafe conditions, (5) unreasonably interferes with or harms other uses of the leased area, or (6) disturbs cultural resources.

Section 6. Safety Requirements. The Lessee shall require that all necessary steps be taken to assure that their Contractor: (1) maintains all operations within the leased area in compliance with regulations, orders, guidelines, and directives intended to protect persons, property, and the environment, including mineral deposits and formations of mineral deposits not leased hereunder, and (2) allows prompt access, at the site of any operation subject to safety regulations, to any authorized Federal inspector and shall provide any documents and records that are pertinent to occupational or public health, safety, or environmental protection as may be requested. This lease is valid only if such steps are incorporated in the contract between the Contractor and the Lessee.

Section 7. Violations, Suspensions and Cancellations. If the Lessee violates any provisions of this lease, the Lessor may, after giving written notice, suspend any further operations of the Lessee under this lease, except such operations as may be necessary to remedy any violations. If the Lessee fails to remedy all violations within thirty (30) days after receipt of suspension notice, the Lessor may, by written notice, cancel this lease and take appropriate action to recover all damages suffered by the Government by reason of such violations.

Section 8. **Responsibility for Damages Suffered, Costs, or Expenses Incurred by the Government.** The Lessor does not warrant that the sand to be used in this project is suitable for the purpose for which it is intended. If the Lessor incurs any damages, costs, or liabilities resulting from the use of such sand, or through the negligence of the Lessee or its agents, contractors, or employees in relation to any operations conducted under this lease, the Lessee shall indemnify the Lessor for such costs, damages, or expenses incurred. Such indemnification is not to be construed as a further waiver of sovereign immunity in excess of the legislative waiver of sovereign immunity in Section 768.28, Florida Statutes.

Section 9. **Assignment or Transfer of Lease**. This lease may not be assigned or transferred without written approval of the Lessor.

Section 10. **Surrender of Lease**. The Lessee may surrender this lease by filing with the Lessor a written relinquishment that shall be effective on the date of filing.

Section 11. **Stipulations**. The Lessee shall be subject to all the appended Stipulations to this Lease.

16F3

Collier County – Board of County Commissioners (Lessee)	THE UNITED STATES OF AMERICA, Lessor
Fred W. Coyle (Signature of Authorized Officer)	(Signature of Authorized Officer)
Fred W. Coyle (Name of Signatory)	(Name of Signatory)
Fred Coyle, Chairman Collier County, Board of County Commissioners (Title)	Associate Director for Offshore Minerals Management (Title)
11-29-05 (Date)	(Date)

By: Vicki R. Rockhold, DC
Attested: Clerk of Courts

November 1, 2005
(Date)

Attest as to Chairman's signature only.

(Address of Lessee)

If this lease is executed by a corporation, it must bear the corporate seal

Approved as to form & legal sufficiency
Colleen M. Greene
Colleen M. Greene
Assistant County Attorney

Item # 16F3
Agenda Date 11-29-05
Date Rec'd 12-1-05
H. Rockhold, DC
Deputy Clerk

Attachment 1

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
MINERALS MANAGEMENT SERVICE

NEGOTIATED NONCOMPETITIVE LEASE FOR SAND, GRAVEL AND SHELL RESOURCES ON THE OUTER CONTINENTAL SHELF

COLLIER COUNTY, FLORIDA STIPULATIONS

STIPULATION NO. 1 - Post-Dredging Hydrographic Surveys of the Ocean Borrow Site

Dredged excavations within the ocean borrow site shall not exceed maximum slide slopes of 2:1 and shall not result in the creation of a deep pit or hole. A hydrographic survey is required by the Lessee after the dredging is completed. This data shall be submitted to the Lessor within two (2) weeks after receipt by the Lessee. The hydrographic data shall be in a format that is compatible with pre-dredging hydrographic data to enable the latter to be subtracted from the former to calculate the volume of sand removed and the shape of the excavation.

STIPULATION NO. 2 - Endangered and Threatened Species Under the National Oceanographic Atmospheric Administration (NOAA) Fisheries Jurisdiction

Under the terms of section 7(b)(4) and section 7(o)(2) of the Endangered Species Act, taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions set forth below. The documented incidental take, by injury or mortality, of three (3) Kemp's Ridley's, three (3) green turtles, one (1) hawksbills, five (5) loggerhead turtles, and one (1) shortnose sturgeon is set per fiscal year for all channel dredging and sand mining by hopper dredge in the United States Army Corps of Engineers (USACE), Jacksonville District west of Key West by the November 22, 2003 Gulf of Mexico Regional Biological Opinion pursuant to section 7(b)(4) of the ESA. This take level represents the total authorized per year for hopper dredging projects conducted and permitted by the USACE Jacksonville District.

Lessee shall ensure that the following standards shall be met:

Hopper Dredging: Hopper dredging activities in Gulf of Mexico waters from the Mexico-Texas border to Key West, Florida up to one mile into rivers shall be completed, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters. The Lessee or its agent shall discuss with the Lessor and National Oceanographic Atmospheric Administration (NOAA) Fisheries why a particular project cannot be done within the December 1-March 31 "window."

Observers: The Lessee or designated representative shall arrange for NOAA Fisheries-approved observers to be aboard the hopper dredges to monitor the hopper spoil, screening, and drag-heads for sea turtles and Gulf sturgeon and their remains.

Observer coverage of hopper dredging of sand mining areas shall ensure 50% monitoring (i.e., one observer).

Operational Procedures: During periods in which hopper dredges are operating and NOAA Fisheries-approved observers are *not* required, the Lessee must:

a. Advise inspectors, operators and vessel captains about the prohibitions on taking, harming, or harassing sea turtles

b. Instruct the captain of the hopper dredge to avoid any turtles and whales encountered while traveling between the dredge site and offshore disposal area, and to immediately contact the Lessee or its agent if sea turtles or whales are seen in the vicinity.

c. Notify NOAA Fisheries if sea turtles are observed in the dredging area, to coordinate further precautions to avoid impacts to turtles.

d. Notify NOAA Fisheries and immediately by phone (727/570-5312) or fax (727/570-5517) and if a sea turtle or Gulf sturgeon is taken by the dredge.

4. *Screening*: When sea turtle observers are required on hopper dredges, 100% inflow screening of dredged material is required and 100% overflow screening is recommended. If conditions prevent 100% inflow screening, inflow screening may be reduced gradually, as further detailed in the following paragraph, but 100% overflow screening is then required. NOAA Fisheries must be consulted prior to the reductions in screening and an explanation must be included in the dredging report.

   a. Screen Size: The hopper's inflow screens should have 4-inch by 4-inch screening. If the Lessee or its agent, in consultation with observers and the drag-head operator, determines that the drag-head is clogging and reducing production substantially, the screens may be modified sequentially: mesh size may be increased to 6-inch by 6-inch, then 9-inch by 9-inch, then 12-inch by 12-inch openings. Clogging should be greatly reduced with these flexible options; however, further clogging may compel removal of the screening altogether, in which case effective 100% overflow screening is mandatory. The Lessee or its agent shall notify NOAA Fisheries beforehand if inflow screening is going to be reduced or eliminated, and provide details of how effective overflow screening will be achieved.

   b. Need for Flexible, Graduated Screens: NOAA Fisheries believes that this flexible, graduated-screen option is necessary, since the need to constantly clear the inflow screens will increase the time it takes to complete the project and therefore increase the exposure of sea turtles to the risk of impingement or entrainment. Additionally, there are increased risks to sea turtles in the water column when the inflow is halted to clear screens, since this results in clogged intake pipes, which may have to be lifted from the bottom to discharge the clay by applying suction.

5. *Dredging Pumps*: Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the drag-heads are not firmly on the bottom, to prevent impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations when the drag-head frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the drag-head is trimming off.

6. *Sea Turtle Deflecting Drag-head*: A state-of-the-art rigid deflector drag-head must be used on all hopper dredges in all Gulf of Mexico channels and sand mining sites at all times of the year.

7. *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges must be faxed to NOAA Fisheries Southeast Regional Office (727-570-5517) and the Lessor (703-787-1165) by onboard endangered species observers within 24 hours of any sea turtle, Gulf sturgeon, or other listed species take observed.

   A report summarizing the results of the hopper dredging and any documented sea turtle or Gulf sturgeon takes must be submitted to the Lessor and NOAA Fisheries within 30 working days of completion of the dredging project. Reports shall contain information on project location specific area dredged), start-up and completion dates, cubic yards of material dredged, problems encountered, incidental takes and sightings of protected species, mitigative actions taken (if relocation trawling, the number and species of turtles relocated), screening type

nflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information deemed relevant.

Sea Turtle Strandings: The Lessee or designated representative shall notify the Sea Turtle Stranding and Salvage Network (STSSN) state representative (contact information available at: http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp) of the start-up and completion of hopper dredging operations and bed-leveler dredging operations and ask to be notified of any sea turtle/sturgeon strandings in the project area that, in the estimation of STSSN personnel, bear signs of potential drag-head impingement or entrainment, or interaction with a bed-leveling type dredge.

Information on any such strandings shall be reported in writing within 30 days of project end to NOAA Fisheries Southeast Regional Office. Because of different possible explanations for, and subjectivity in the interpretation of potential causes of strandings, these strandings will not normally be counted against the USACE Jacksonville District's take limit; however, if compelling STSSN observer reports and evidence indicate that a turtle was killed by a hopper dredge or a bed-leveling type dredge, that take will be deducted from the ITS' anticipated take level for that USACE Jacksonville District where the take occurred.

Reporting - Strandings: The Lessee or its representative shall provide NOAA Fisheries Southeast Regional Office and the Lessor with a report detailing incidents, with photographs when available, of stranded sea turtles and Gulf sturgeon that bear indications of drag-head impingement or entrainment. This reporting requirement may be included in project report required in Term and Condition No. 7, above.

Conditions Requiring Relocation Trawling: Handling of sea turtles captured during relocation trawling in association with hopper dredging projects in Gulf of Mexico navigation channels and sand mining areas shall be conducted by NOAA Fisheries-approved endangered species observers. Relocation trawling shall be undertaken where <u>any</u> of the following conditions are met.

a. Two or more turtles are taken in a 24-hour period in the project.

b. Four or more turtles are taken in the project.

c. 75% of the USACE, Jacksonville District's sea turtle species quota for a particular species has previously been met

Relocation Trawling Waiver: The Lessee or designated representative may request to the USACE Jacksonville District and NOAA Fisheries a waiver of part or all of the relocation trawling requirements. NOAA Fisheries will consider these requests and decide favorably if the evidence is compelling.

Relocation Trawling - Annual Take Limits: The November 2003 Opinion authorizes the annual (by fiscal year) take of 300 sea turtles (of one species or combination of species) and eight Gulf sturgeon by duly-permitted, NOAA Fisheries-approved observers in association with all relocation trawling conducted or contracted by the four Gulf of Mexico USACE Districts to temporarily reduce or assess the abundance of these listed species during and in the 0-3 days immediately preceding) a hopper dredging project in order to reduce the possibility of lethal hopper dredge interactions, subject to the following conditions:

Trawl Time: Trawl tow-time duration shall not exceed 42 minutes (doors in - doors out) and trawl speeds shall not exceed 3.5 knots.

Handling During Trawling: Sea turtles and sturgeon captured pursuant to relocation trawling shall be handled in a manner designed to ensure their safety and viability, and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position (i.e., not rotating). Resuscitation guidelines are attached (Attachment 2).

c. *Captured Turtle Holding Conditions*: Captured turtles shall be kept moist, and shaded whenever possible, until they are released.

d. *Weight and Size Measurements*: All turtles shall be measured (standard carapace measurements including body depth) and tagged, and weighed when safely possible, prior to release; Gulf sturgeon shall be measured (fork length and total length) and–when safely possible–tagged, weighed, and a tissue sample taken prior to release. Any external tags shall be noted and data recorded into the observers log. Only NOAA Fisheries-approved observers or observer candidates in training under the direct supervision of a NOAA Fisheries-approved observer shall conduct the tagging/measuring/weighing/tissue sampling operations.

e. *Take and Release Time During Trawling - Turtles*: Turtles shall be kept no longer than 12 hours prior to release and shall be released not less than three nautical miles (nmi) from the dredge site. If two or more released turtles are later recaptured, subsequent turtle captures shall be released not less than five nmi away. If it can be done safely, turtles may be transferred onto another vessel for transport to the release area to enable the relocation trawler to keep sweeping the dredge site without interruption.

f. *Take and Release Time During Trawling - Gulf Sturgeon*: Gulf sturgeon shall be released immediately after capture, away from the dredge site or into already dredged areas, unless the trawl vessel is equipped with a suitable (not less than: 2 ft high by 2 ft wide by 8 ft long), well-aerated seawater holding tank where a maximum of one sturgeon may be held for not longer than 30 minutes before it must be released or relocated away from the dredge site.

g. *Injuries and Incidental Take Quota*: Any protected species injured or killed during or as a consequence of relocation trawling shall count toward the USACE, Jacksonville District's incidental take quota. Minor skin abrasions resulting from trawl capture are considered non-injurious. Injured sea turtles shall be immediately transported to the nearest sea turtle rehabilitation facility.

h. *Flipper Tagging*: All sea turtles captured by relocation trawling shall be flipper-tagged prior to release with external tags which shall be obtained prior to the project from the University of Florida's Archie Carr Center for Sea Turtle Research. This Opinion serves as the permitting authority for any NOAA Fisheries-approved endangered species observer aboard these relocation trawlers to flipper-tag with external tags (e.g., Inconel tags) captured sea turtles. Columbus crabs or other organisms living on external sea turtle surfaces may also be sampled and removed under this authority.

i. *Gulf Sturgeon Tagging*: Tagging of live-captured Gulf sturgeon may also be done under the permitting authority of this Opinion; however, it may be done only by personnel with prior fish tagging experience or training, and is limited to external tagging only, unless the observer holds a valid sturgeon research permit (obtained pursuant to section 10 of the ESA, from the NOAA Fisheries' Office of Protected Resources, Permits Division) authorizing sampling, either as the permit holder, or as designated agent of the permit holder.

j. *PIT-Tag Scanning*: All sea turtles captured by relocation trawling (or dredges) shall be thoroughly scanned for the presence of PIT tags prior to release using a scanner powerful enough to read dual frequencies (125 and 134 kHz) and read tags deeply embedded deep in muscle tissue (e.g., manufactured by Biomark or Avid). Turtles which scans show have been previously PIT tagged shall never-the-less be externally flipper tagged. The data collected (PIT tag scan data and external tagging data) shall be submitted to NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov.

k. *CMTTP:* External flipper tag and PIT tag data generated and collected by relocation trawlers shall also be submitted to the Cooperative Marine Turtle Tagging Program (CMTTP), on the appropriate CMTTP form, at the University of Florida's Archie Carr Center for Sea Turtle Research.

l. *Tissue Sampling*: All live or dead sea turtles captured by relocation trawling or dredging shall be tissue-sampled prior to release, according to the protocols described in (Attachment 3). Tissue samples shall be sent within 60 days of capture to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov. The November 2003 Opinion serves as the permitting authority for any NOAA Fisheries-approved endangered species observers aboard relocation trawlers or hopper dredges to tissue-sample live- or dead-captured sea turtles, without the need for a section 10 permit.

m. *PIT Tagging:* PIT tagging is not required or authorized for, and shall not be conducted by, Endangered Species Observers (ESO) who do not have 1) section 10 permits authorizing said activity and 2) prior training or experience in said activity; however, if the ESO has received prior training in PIT tagging procedures and is also authorized to conduct said activity by a section 10 permit, then the ESO must PIT tag the animal prior to release (in addition to the standard external flipper tagging). PIT tagging must then be performed in accordance with the protocol detailed at NOAA Fisheries' Southeast Science Center's webpage: http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. (See Appendix C on SEC's "Fisheries Observers" webpage). PIT tags used must be sterile, individually wrapped tags to prevent disease transmission. PIT tags should be 125 kHz, glass-encapsulated tags - the smallest ones made. Note: If scanning reveals a PIT tag and it was not difficult to find, then do not insert another PIT tag; simply record the tag number and location, and frequency, if known. If for some reason the tag is difficult to detect (e.g., tag is embedded deep in muscle, or is a 400 mHz tag), then insert one in the other shoulder.

n. *Other Sampling Procedures*: All other tagging and external or internal sampling procedures (e.g., PIT tagging, blood letting, laparoscopies, anal and gastric lavages, mounting satellite or radio transmitters, etc.) performed on live sea turtles or live sturgeon are not permitted under The November 2003 Opinion unless the observer holds a valid sea turtle or sturgeon research permit (obtained pursuant to section 10 of the ESA, from the NOAA Fisheries' Office of Protected Resources, Permits Division) authorizing the activity, either as the permit holder, or as designated agent of the permit holder.

o. *Handling Fibropapillomatose Turtles*: Observers handling sea turtles infected with fibropapilloma tumors shall either: 1) clean all equipment that comes in contact with the turtle (tagging equipment, tape measures, etc.) with mild bleach solution, between the processing of each turtle or 2) maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors or lesions. Tissue/tumor samples shall be sent within 60 days of capture to: NOAA Fisheries, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov. This Opinion serves as the permitting authority for all NOAA Fisheries-approved endangered species observers aboard a relocation trawler or hopper dredge to tissue-sample fibropapilloma-infected sea turtles without the need for a section 10 permit.

Hard-ground Buffer Zones: All dredging in sand mining areas will be designed to ensure that dredging will not occur within a minimum of 400 feet from any significant hard-ground areas or bottom structures that serve as attractants to sea turtles for foraging or shelter. NOAA Fisheries considers (for the purposes of this see the November 2003 Opinion only) a significant hard-ground in a project area to be one that, over a horizontal distance of 150 feet, has an average elevation above the sand of 1.5 feet or greater, and has algae growing on it. The Lessee or its agent shall ensure that sand mining sites are adequately mapped to enable the dredge to stay at least 400 feet from these areas. If the Lessee or designated representative is uncertain as to what constitutes significance, it shall consult with NOAA Fisheries' Habitat Conservation Division and NOAA Fisheries' Protected Resources Division for clarification and guidance.

Training - Personnel on Hopper Dredges: All contracted personnel involved in operating hopper dredges (whether privately-funded or federally-funded projects) receive thorough training on measures of dredge operation that will minimize takes of sea turtles. It shall be the goal of each hopper dredging operation to establish operating procedures that are consistent with those that have been used successfully during hopper dredging in other regions of the coastal United States, and which have proven effective in reducing turtle/dredge interactions. Therefore,

COE Engineering Research and Development Center experts or other persons with expertise in this matter shall be involved both in dredge operation training, and installation, adjustment, and monitoring of the rigid deflector drag-head assembly.

15. *Dredge Lighting*: From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pump-out barges operating within three nmi of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or Occupational Safety and Health Administration requirements. All non-essential lighting on the dredge and pump-out barge shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the water to reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natural beaches.

STIPULATION NO. 3 - Endangered and Threatened Species Under the Fish and Wildlife Service (FWS) Jurisdiction

The Service anticipates 13.2 miles of nesting beach habitat could be taken as a result of this proposed action. The take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited from March 1 through April 30 and from September 1 through September 30 and missed by a nest survey and egg relocation program within the boundaries (footprint) of the proposed project; (2) destruction of all nests deposited from November 1 through February 28 (or 29 as applicable) when a nest survey and egg relocation program is not required to be in place within the boundaries (footprint) of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) misdirection of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and *(7)* destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

Incidental take is anticipated for only the 8.7 miles of beach that has been identified for sand placement, as well as the interstitial beaches (totaling 13.2 miles). The Service anticipates incidental take of sea turtles will be difficult to detect for the following reasons: (1) the turtles nest primarily at night and all nests are not found because [a] natural factors, such as rainfall, wind, and tides may obscure crawls and [b] human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls and result in nests being destroyed because they were missed during a nesting survey and egg relocation program; (2) the total number of hatchlings per undiscovered nest is unknown; (3) the reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown; (4) an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area; (5) lights may misdirect an unknown number of hatchlings and cause death; and (6) escarpments may form and cause an unknown number of females from accessing a suitable nesting site. However, the level of take of these species can be anticipated by the disturbance and renourishment of suitable turtle nesting beach habitat because: (1) turtles nest within the project site; (2) beach renourishment may occur during a portion of the nesting season; (3) the renourishment project will modify the incubation substrate, beach slope, and sand compaction; and (4) artificial lighting will deter and/or misdirect nesting females and hatchlings.The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a one-time placement of sand on the 8.7 miles of beach that have been identified for sand placement. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided. The FWS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerheads, greens, hawksbill, or kemp's ridley sea turtles.

The Lessee shall ensure that the following standards shall be met:

1. All fill material placed must be sand similar to a native beach in the vicinity of the site that has not been affected by prior renourishment activities. The fill material must be similar in both coloration and grain size distribution

sand grain frequency, mean and median grain size, and sorting coefficient) to the native beach and shall not contain:

A. Greater than 10 percent, by weight, silt, clay, or colloids passing the #200 sieve;

B. Greater than 5 percent, by weight, fine gravel or cobbles, exclusive of shell material (retained by the #4 sieve);

C. The more restrictive of 5 percent coarse gravel, cobbles, or material retained on the %-in sieve, or in a percentage or size greater than found on the native beach; and

D. Construction debris, toxic material or other foreign matter; and not result in contamination of the beach.

2. Beach nourishment shall be started after October 31 and be completed prior to May 1. During the May 1 through October 3 1 period, no construction equipment or pipes shall be stored on the beach;

3. If the beach nourishment project will be conducted before May 1, daily early morning surveys for sea turtle nests must be conducted from March 15 through April 30 or until completion of the project (whichever is earliest). In the event a sea turtle nest is excavated during construction activities, all work shall cease in that area immediately and the permitted person responsible for egg relocation for the project should be notified so the eggs can be relocated per the following requirements:

A. Nesting surveys and egg relocations will only be conducted by personnel with prior experience and training in nesting survey and egg relocation procedures. Surveyors must perform under the supervision of a qualified professional with a valid FWC Marine Turtle Permit. Nesting surveys must be conducted daily between sunrise and 9 a.m. Surveys must be performed in such a manner so as to ensure construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures; and

B. Only those nests that may be affected by construction activities will be relocated. Nests requiring relocation must be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with construction activities must cease when construction activities no longer threaten nests. Nests deposited within areas where construction activities have ceased or will not occur for 65 days must be marked and left in place unless other factors threaten the success of the nest. Any nests left in the active construction zone must be clearly marked, and all mechanical equipment must avoid nests by at least 10 feet.

4. If the beach nourishment project will be conducted during the period from November 1 through November 30, daily early morning surveys for sea turtle nests must be conducted until the last nest hatches. In the event a sea turtle nest is excavated during construction activities, all work shall cease in that area immediately and the permitted person responsible for egg relocation for the project should be notified so the eggs can be relocated per the requirements in 3A and 3B above;

5. Immediately after completion of the beach nourishment project and prior to March 15 for 3 subsequent years, if placed sand still remains on the beach, the beach shall be tilled as described below to a depth of 24 in. All tilling activity must be completed prior to March 15. If the project is completed during the nesting season, tilling shall not occur in areas where nests have been left in place or relocated unless authorized by the Service in an Incidental Take statement;

6. Visual surveys for escarpments along the project area must be made immediately after completion of the beach nourishment project and prior to March 15 for 3 subsequent years if placed sand still remains on the beach. All scarps shall be leveled, or the beach profile shall be reconfigured, to minimize scarp formation. In addition, weekly surveys of the project area shall be conducted during the 2 nesting seasons following completion of fill placement as follows:

A. The number of escarpments and their location relative to DEP reference monuments shall be recorded during each weekly survey and reported relative to the length of the beach surveyed (*e.g.*, 50 percent scarps). Notations on the height of these escarpments shall be included (0 to 2 feet, 2 to 4 feet, and 4 feet or higher) as well as the maximum height of all escarpments; and

B. Escarpments that interfere with sea turtle nesting or that exceed 18 in high for a distance of 100 feet must be leveled to the natural beach contour by April 15. Any escarpment removal shall be reported relative to R-monument locations. The Fish and Wildlife Service must be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 in high for a distance of 100 feet occurs during the nesting and hatching season (May 1 to October 31) to determine the appropriate action to be taken. If it is determined escarpment leveling is required during the nesting or hatching season, the Fish and Wildlife Service will provide a brief written authorization that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken must be submitted to the Service. (NOTE: Out-year escarpment monitoring and remediation are not required if placed material no longer remains on the dry beach.)

7. The lessee or designated representative must arrange a meeting between representatives of the contractor, the Fish and Wildlife Service, the FWC, and the permitted person responsible for egg relocation at least 30 days prior to the commencement of work on this project. At least 10 days advance notice must be provided prior to conducting this meeting. This will provide an opportunity for explanation and/or clarification of the sea turtle protection measures;

8. From March 15 through April 30 and November 1 through November 30, staging areas for construction equipment must be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment not in use must be off the beach to minimize disturbance to sea turtle nesting and hatching activities during this period. In addition, all construction pipes placed on the beach must be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Temporary storage of pipes must be off the beach to the maximum extent possible. Temporary storage of pipes on the beach must be in such a manner so as to impact the least amount of nesting habitat and must likewise not compromise the integrity of the dune systems (placement of pipes perpendicular to the shoreline is recommended as the method of storage);

9. From March 15 through April 30 and November 1 through November 30, all on-beach lighting associated with the project must be limited to the immediate area of active construction only and must be the minimal lighting necessary to comply with all safety requirements. Lighting on offshore equipment must be minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast Guard and Occupational Safety and Health Administration (OSHA) requirements. Shielded low pressure sodium vapor lights are recommended for lights on offshore equipment that cannot be eliminated, and for illumination of the nesting beach and nearshore waters. Light intensity of lighting plants must be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields must be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (Figure 1);

10. A lighting survey shall be conducted from the nourished berm prior to April 15 of the first nesting season following nourishment and action taken to ensure no lights or light sources are visible from the newly elevated beach. A report summarizing all lights visible, using standard survey techniques for such surveys, shall be submitted to the Service by May 15 and documenting all compliance and enforcement action. Additional lighting surveys shall be conducted monthly through August and results reported by the 15th of each month of the first nesting season after project completion;

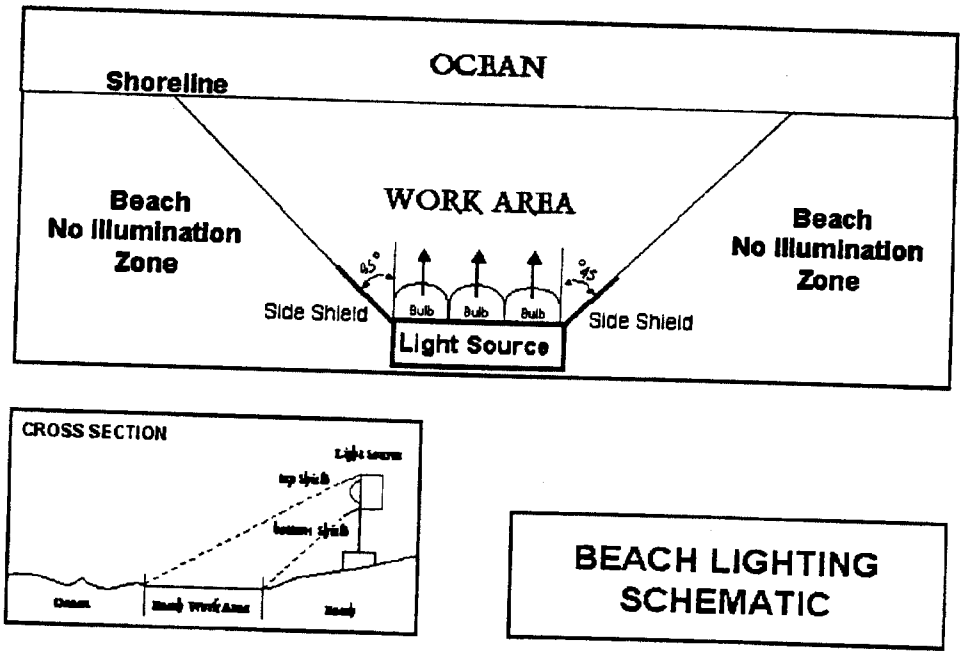

Figure 1. Lighting diagram.

11. All reports describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the Lessor and the South Florida Ecological Services Office, Vero Beach, Florida, within 60 days of completion of the proposed work. Types of reporting will include, but is not limited to, that related to tilling, scarp reduction, nest and hatching data, lighting, and egg relocation, and shall include details such as dates of actual construction activities, names, and qualifications of personnel involved in nest surveys and relocation activities, descriptions and locations of self-release beach sites, nest survey and relocation results, and hatching success of nests;

12. In the event a sea turtle nest is excavated during construction activities, all work shall cease in that area immediately and the permitted person responsible for egg relocation for the project must be notified so the eggs can be moved to a suitable relocation site;

13. Upon locating a dead, injured, or sick endangered or threatened sea turtle specimen, initial notification must be made to the FWC at 1-888-404-3922, the South Florida Ecological Services Office, Vero Beach and the Lessor. Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure evidence intrinsic to the specimen is not unnecessarily disturbed; and

14. In the event a hopper dredge is utilized for sand excavation, all conditions in the NOAA Fisheries *Biological Opinion for Dredging of Gulf of Mexico Navigation Channels and Sand Mining Borrow Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts* (Consultation Number F/SEW2000/01287) must be followed, and the Service shall be sent copies of the reports specified in the Biological Opinion.

STIPULATION NO. 4 - Calculation of the Volume of Sand Placed

To ascertain the total volume of sand placed, the Lessee will require that the contractor forward copies of the data employed to make this determination, the methodology used, and the calculations to the Lessor within two (2) weeks after receipt by the Lessee.

STIPULATION NO. 5 - National Oil and Hazardous Substances Pollution Contingency Plan

The Lessee must require that the construction solicitation and specifications contract use language which its contractors and subcontractors prepare for and take all necessary precautions to prevent discharges of oil and releases of hazardous materials. In event of an occurrence, notification and response will be in accordance with 40 CFR 300 and applicable regulations of the State of Florida. The Lessee shall notify the Lessor of any occurrences and remedial actions, and provide copies of reports of the incident and resultant actions.

STIPULATION NO. 6 - Archaeological Reporting Requirement Plan

If the Lessee or any contractor operating on the Lessee's behalf discovers any archaeological resource while conducting dredging operations in any of the offshore borrow areas the Lessee or contractor operating on the Lessee's behalf shall immediately halt operations within the area of the discovery and report the discovery to the Chief, Leasing Division, MMS. If investigations determine that the resource is significant, the Chief, Leasing Division, will inform the lessee how to protect it.

STIPULATION NO. 7 - Use of Electronic Positioning System on Dredge and Transmittal of Location and Production Information to the Lessor

Use of Electronic Positioning System and Transmittal of Location Information to MMS:

To ensure the accuracy of the dredge relative to the borrow area specifications denoted in this lease agreement, during all phases of the offshore operation conducted within the borrow area, the Lessee will ensure that the dredge is equipped with an on-board differential global positioning system (DGPS) capable of maintaining and recording the location of the dredge within an accuracy range of no more than plus or minus 3 meters. The specific system will be approved by the Lessor prior to the conduct of any dredge procedures within the borrow area.

Location information (latitude and longitude) in NAD83 must be supplied on CD-ROM on a weekly basis to Minerals Management Service, Chief, Marine Minerals Branch (MMB), 381 Elden Street, MS 4010, Herndon, Virginia 20170.

Submittal of Production and Volume Information to the Lessor:

The Lessor will ensure the accuracy of cut depths and widths, cut slopes, and site production (sand volumes removed) within the borrow area as specified in the project's operational plan and this lease agreement. This information is routinely collected continuously throughout the period of dredge operation at a borrow site. The Lessor shall retain all access rights to all operational data at any time during which dredging is occurring within the designated Federal borrow area.

The Lessee will submit a "certified" summary of all operational, production, and survey activity data to the MMS Chief, MMB at the address above on CD-ROM on a weekly basis, in a format and method agreed to between the Lessor, the Lessee, and the dredge operator prior to the commencement of operations at the borrow site. Any maps and/or profiles submitted to the Lessor will be provided in digital spatial format compatible with Arc GIS. Information pertaining to the volume of material removed must be provided with explanatory text outlining each preceding day's activities and production values.

Following completion of all activities within the lease area, the Lessee, in cooperation with the dredge operator, shall submit to the Lesssor, a "certified" copy of the complete operational data set (dredge tracklines, cut slope angles, cut depth, etc.), outlining any deviations from the original operational design plan. This report should be in MS Word format and should be sent to the Chief, MMB at the address above.

STIPULATION NO. 8 – Submittal of Project Completion Report to the MMS

Upon final completion of the project authorized under the terms and conditions of this lease, the Lessee shall submit to Minerals Management Service, Chief, Marine Minerals Branch, 381 Elden Street, MS 4010, Herndon, Virginia 20170, one (1) paper copy and one (1) electronic copy of a project completion report. The report shall contain, at a minimum, the following information:

- the names and titles of the project managers overseeing the effort (both for the Lessee and the dredging/engineering firm), including contact information (phone numbers, mailing addresses, and email addresses),
- the location and description of the project, including the final figures relative to the total volume of material extracted from the borrow site and the volume of material actually placed on the beach or shoreline (including a description of the volume calculation method used to determine these volumes),
- a narrative describing the final, as-built features, boundaries, and acreage, including the restored beach width and length,
- a table, an example of which is illustrated below, showing the various key project cost elements,

	Project Cost Estimate ($)	Cost Incurred as of Construction Completion ($)
Construction		
Engineering and Design		
Inspections/Contract Administration		
Total		

- a table, an example of which is illustrated below, showing the various items of work construction, final quantities, and monetary amounts,

Item No.	Item	Estimated Quantity	Unit	Unit Price	Estimated Amount	Final Quantity	Bid Unit Price	Final Amount	% Over/ Under
	Mobilization and Demobilization								
	Beach Fill								
	Any beach or offshore hard structure placed or removed								

- a listing of construction and construction oversight information, including the prime and subcontractors, contract costs, etc.,
- a list of all major equipment used to construct the project,
- a narrative discussing the construction sequences and activities, and, if applicable, any problems encountered and subsequent solutions,
- a list and description of any construction change orders issued, if applicable,
- a list of any pipelines or other oil/gas-related infrastructure in the project area, the owners, and any contacts made.
- a list and description of any safety-related issues or accidents reported during the life of the project,

- a narrative and any appropriate tables describing any environmental surveys/efforts associated with the project and costs associated with these efforts,
- any additional pertinent comments,
- a table listing significant construction dates beginning with bid opening and ending with final acceptance of the project by the Lessee,
- An appendix containing the as-built drawings, beach-fill cross-sections, and survey data.

The report shall be submitted within 120 days following completion of the project.

ST1IPULATION NO. 9– Submittal of all Copies of Project Data to the Lessor required under Florida's Joint Coastal Permit No. 0222355-001-JC

The Lessee is required to submit to the Lessor copies of all information mandated under Florida's Joint Coastal Permit for the Collier County Beach Nourishment Project.

Attachment 2

SEA TURTLE HANDLING AND RESUSCITATION GUIDELINES

Any sea turtles taken incidentally during the course of fishing or scientific research activities must be handled with due care to prevent injury to live specimens, observed for activity, and returned to the water according to the following procedures:

A) Sea turtles that are actively moving or determined to be dead (as described in paragraph (B)(4) below) must be released over the stern of the boat. In addition, they must be released only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels.

B) Resuscitation must be attempted on sea turtles that are comatose or inactive by:

1. Placing the turtle on its bottom shell (plastron) so that the turtle is right side up and elevating its hindquarters at least 6 inches (15.2 cm) for a period of 4 to 24 hours. The amount of elevation depends on the size of the turtle; greater elevations are needed for larger turtles. Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches (7.6 cm) then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response.

2. Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method in keeping a turtle moist.

3. Sea turtles that revive and become active must be released over the stern of the boat only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) must be returned to the water in the same manner as that for actively moving turtles.

4. A turtle is determined to be dead if the muscles are stiff (rigor mortis) and/or the flesh has begun to rot; otherwise, the turtle is determined to be comatose or inactive and resuscitation attempts are necessary.

Any sea turtle so taken must not be consumed, sold, landed, offloaded, transshipped, or kept below deck.

These guidelines are adapted from 50 CFR ' 223.206(d)(1). Failure to follow these procedures is therefore a punishable offense under the Endangered Species Act.

Attachment 3

PROTOCOL FOR COLLECTING TISSUE FROM DEAD TURTLES FOR GENETIC ANALYSIS

Method for Dead Turtles

IT IS CRITICAL TO USE A NEW SCALPEL BLADE AND GLOVES FOR EACH TURTLE TO AVOID CROSS-CONTAMINATION OF SAMPLES

- Put on a new pair of latex gloves.
- Use a new disposable scalpel to cut out an approx. 1 cm (2 in) cube (bigger is NOT better) piece of muscle. Easy access to muscle tissue is in the neck region or on the ventral side where the front flippers A insert near the plastron. It does not matter what stage of decomposition the carcass is in.
- Place the muscle sample on a hard uncontaminated surface (plastron will do) and make slices through the sample so the buffer solution will penetrate the tissue.
- Put the sample into the plastic vial containing saturated Na Cl with 20% DMSO *(SEE BELOW)
- Use the pencil to write the stranding ID number (observer initials, year, month, day, turtle number by day), species, state and carapace length on the waterproof paper label and place it in the vial with the sample. EXAMPLE: For a 35.8 cm curved carapace length green turtle documented by Jane M. Doe on July 15, 2001 in Georgia, the label should read AJMD20010715-01, C. mydas, Georgia, CCL=35.8 cm. If this had been the third turtle Jane Doe responded to on July 15, 2001, it would be JMD20010715-03.
- Label the outside of the vial with the same information (stranding ID number, species, state and carapace length) using the permanent marker.
- Place clear scotch tape over the writing on the vial to protect it from being smeared or erased.
- Wrap parafilm around the cap of the vial by stretching it as you wrap.
- Place vial within whirl pack and close.
- Dispose of the scalpel.
- Note on the stranding form that a part was salvaged, indicating that a genetic sample was taken and specify the location on the turtle where the sample was obtained.
- Submit the vial with the stranding report to your state coordinator. State coordinators will forward the reports and vials to NMFS for processing and archiving.

*The 20% DMSO buffer in the plastic vials is nontoxic and nonflammable. Handling the buffer without gloves may result in exposure to DMSO. This substance soaks into skin very rapidly and is commonly used to alleviate muscle aches. DMSO will produce a garlic/oyster taste in the mouth along with breath odor. The protocol requires that you WEAR gloves each time you collect a sample and handle the buffer vials.

The vials (both before and after samples are taken) should be stored at room temperature or cooler. If you don=t mind the vials in the refrigerator, this will prolong the life of the sample. DO NOT store the vials where they will experience extreme heat (like in your car!) as this could cause the buffer to break down and not preserve the sample properly.

Questions: Sea Turtle Program: NOAA/NMFS/SEFSC, 75 Virginia Beach Drive, Miami, FL 33149
Phone: 305-361-4207

16F3

A PROTOCOL FOR COLLECTING TISSUE FROM LIVE TURTLES FOR GENETIC ANALYSIS

Method for Live Turtles

IT IS CRITICAL TO USE A NEW BIOPSY PUNCH AND GLOVES FOR EACH TURTLE TO AVOID CROSS-CONTAMINATION OF SAMPLES

1. Turn the turtle over on its back.
2. Put on a new pair of latex gloves.
3. Swab the entire cap of the sample vial with alcohol.
4. Wipe the ventral and dorsal surfaces of the rear flipper 5-10 cm from the posterior edge with the Betadine/iodine swab.
5. Place the vial under the flipper edge to use the cleaned cap as a hard surface for the punch.
6. Press a new biopsy punch firmly into the flesh as close to the posterior edge as possible and rotate one complete turn. Cut all the way through the flipper to the cap of the vial.
7. Wipe the punched area with Betadine/iodine swab; rarely you may need to apply pressure to stop bleeding.
8. Use a wooden skewer to transfer the sample from the biopsy punch into the plastic vial containing saturated NaCl with 20% DMSO *(SEE BELOW)
9. Use the pencil to write the stranding ID number (observer initials, year, month, day, turtle number by day), species, state and carapace length on the waterproof paper label and place it in the vial with the sample. EXAMPLE: For a 35.8 cm curved carapace length green turtle documented by Jane M. Doe on July 15, 2001 in Georgia, the label should read AJMD20010715-01, C. mydas, Georgia, CCL=35.8 cm. If this had been the third turtle Jane Doe responded to on July 15, 2001, it would be JMD20010715-03.
10. Label the outside of the vial with the same information (stranding ID number, species, state and carapace length) using the permanent marker.
11. Place clear scotch tape over the writing on the vial to protect it from being smeared or erased.
12. Wrap parafilm around the cap of the vial by stretching it as you wrap.
13. Place vial within whirlpak and close.
14. Dispose of the biopsy punch.
15. Note on the stranding form that a part was salvaged, indicating that a genetic sample was taken and specify the location on the turtle where the sample was obtained.
16. Submit the vial with the stranding report to your state coordinator. State coordinators will forward the reports and vials to NMFS for processing and archiving.

*The 20% DMSO buffer in the plastic vials is nontoxic and nonflammable. Handling the buffer without gloves may result in exposure to DMSO. This substance soaks into skin very rapidly and is commonly used to alleviate muscle aches. DMSO will produce a garlic/oyster taste in the mouth along with breath odor. The protocol requires that you WEAR gloves each time you collect a sample and handle the buffer vials.

The vials (both before and after samples are taken) should be stored at room temperature or cooler. If you don't mind the vials in the refrigerator, this will prolong the life of the sample. DO NOT store the vials where they will experience extreme heat (like in your car!) as this could cause the buffer to break down and not preserve the sample properly.

Questions: Sea Turtle Program, NOAA/NMFS/SEFSC, 75 Virginia Beach Drive, Miami, FL 33149
Phone: 305-361-4207

16F3

Genetic Sample Kit Materials : LIVE turtles

1. latex gloves
2. alcohol swabs
3. Betadine/iodine swabs
4. 4-6 mm biopsy punch B sterile, disposable (Moore Medical Supply 1-800-678-8678, part #0052442)
5. plastic screw-cap vial containing saturated NaCl with 20% DMSO, wrapped in parafilm
6. wooden skewer
7. waterproof paper label, 3 x 4pencil to write on waterproof paper label
8. permanent marker to label the plastic vials
9. scotch tape to protect writing on the vials
10. piece if parafilm to wrap the cap of the vial
11. whirl-pak to return/store sample vial

Genetic Sample Kit Materials DEAD turtles

1. latex gloves
2. single-use scalpel blades (Fisher Scientific 1-800-766-7000, cat. # 08-927-5A)
3. plastic screw-cap vial containing saturated NaCl with 20% DMSO, wrapped in parafilm
4. waterproof paper label, 3 x 4 pencil to write on waterproof paper label
5. permanent marker to label the plastic vials
6. scotch tape to protect writing on the vials
7. piece of parafilm to wrap the cap of the vial
8. whirlpak to return/store sample vial

COLLIER COUNTY CONCEPTUAL RENOURISHMENT PROJECT ANALYSIS SELECTED SECTIONS AND DESCRIPTION

I. EXECUTIVE SUMMARY AND INTRODUCTION

This report describes the evaluation of conceptual structure and beach fill design modifications on five coastal segments along the Collier County Coast between Wiggins Pass and Gordon Pass. The purpose of this study is to develop conceptual designs that address the effectiveness of existing structures and beach fill design templates, and changes needed to solve hot spots and improve project performance and durability. Beach fill alternatives with a higher and wider beach berm will be evaluated with structural modifications to achieve these goals. The segments are located at Barefoot Beach, Vanderbilt Beach, Clam Pass Park, Park Shore, and Naples.

This design study assesses the feasibility of several renourishment alternatives for the beaches of Collier County. One alternative addresses the renourishment needs of the original three segments constructed as part of the 1996 and 2006 renourishment projects, both with the FEMA approved sand volume or the 2006 design standard. The third alternative is increasing the design width of the beach along with the consideration of including two additional small segments adjacent to Clam and Wiggins Passes. The same borrow area (BA-T1) is proposed as the primary sand source for use in the upcoming renourishment project. The fourth alternative considers structural changes or additional methods needed to meet the project objectives. A modeling report is included with this study to investigate the performance of groins and to assess the feasibility of the fill distribution proposed.

The modeling shows that with a strong nourishment and inlet bypassing program, most of the remaining structures could be removed, reducing regional hot spots caused by seasonal fluctuations of the beach at the groins. The main objective of this study is to develop a design that will enhance project performance and increase the project life to maintain a healthy beach for up to 10 years without significant impacts to the natural resources within the project area.

The performance of the beach in avoiding hardbottom coverage has exceeded permit expectations, and the results of four years of physical monitoring indicate that the beach can be widened without a significant increased risk of hardbottom impacts. The analysis and modeling indicate that the recommended plan with a 10 year project life is feasible with the use of minimal new structures.

The study area encompasses approximately 13 miles of coastline between the Wiggins Pass and Gordon Pass (Figure 1). Collier County is approximately 115 miles south of the entrance of Tampa Bay and about 100 miles west of Miami, Florida. The County is bordered to the west and southwest by the Gulf of Mexico, to the south by Monroe County, to the east by Dade and Broward Counties, and to the north by Lee and Hendry Counties.

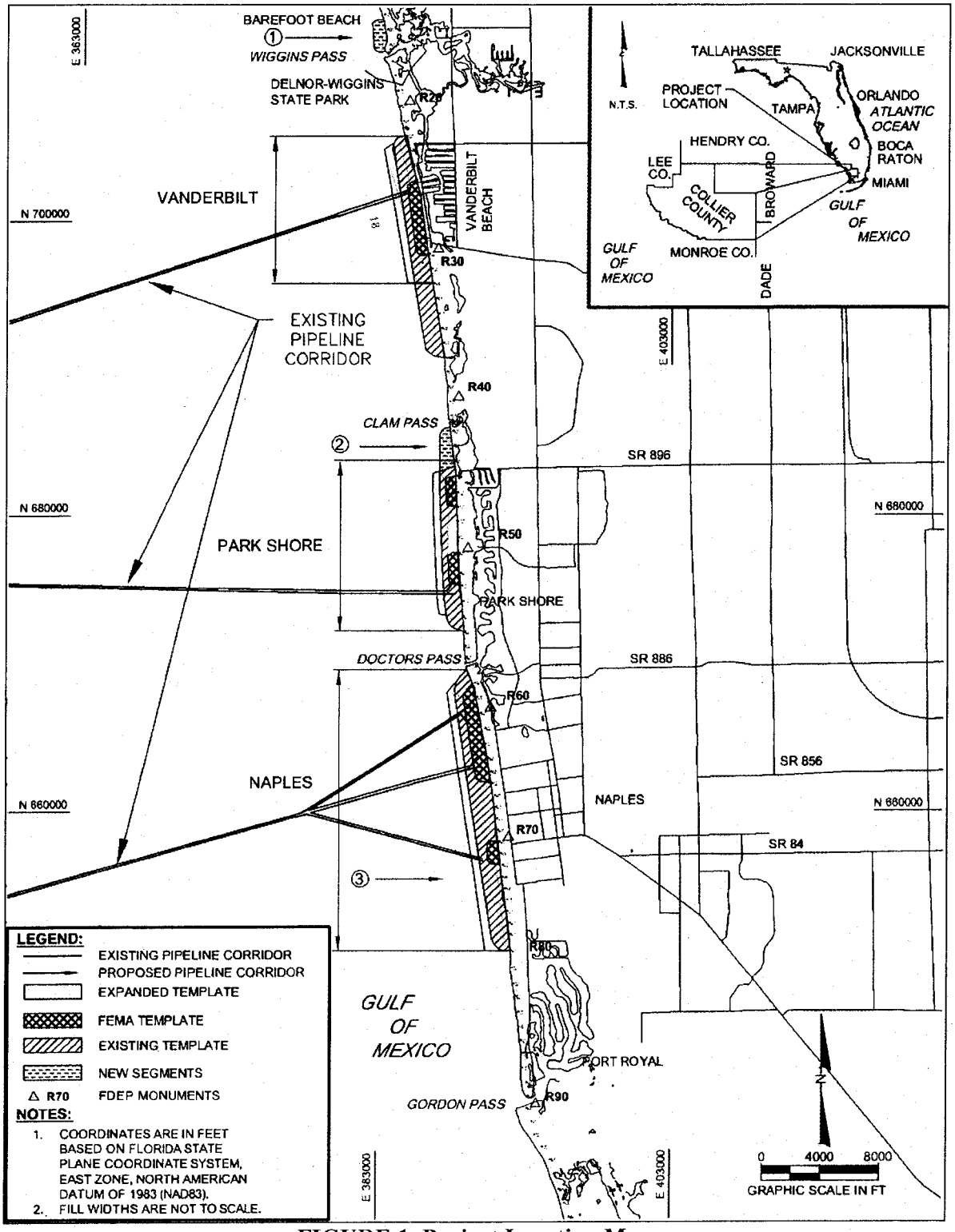

FIGURE 1. Project Location Map

X. BORROW AREA CHARACTERISTICS

Borrow Area T1 is proposed as the primary sand sources for use in the upcoming renourishment project. Borrow Area T1 was used for the 2005/6 renourishment project and is located 33 miles from Vanderbilt Beach (Figure 19 and end of report). From studies performed during the last renourishment, the sediment within the borrow area is characterized by light-gray (5Y 7/1), fine grained quartz sand. The shell content ranges from 1% to 18%. The silt content is 1.7%. Both the shell and silt contents generally increase with depth. The sand is moderately to poorly sorted, which was found to be 0.92. The mean grain size was found to be 0.32 mm. These values were determined using the moment method.

For areas with finer native sand and no nearshore hardbottom, such as South Naples or Port Royal, the Cape Romano sand source is a potential source (Figure 19). A design level geophysical and geotechnical investigations targeting the Cape Romano Shoals was completed in 2008, consisting of seismic reflection profiling, sidescan sonar, magnetometer survey, vibracoring and a cultural resources report prepared by a marine archaeologist. Based on the data that was collected, a sand resource area was developed and divided into Primary and Secondary Areas. The Primary Area contains material having an approximate grain size of 0.24 mm and contains an estimated 900,000 cy of material. The Secondary Area contains an estimated 2 million cy of material having a mean grain size finer than 0.24 mm with cut depths more difficult to dredge. Final borrow area design and permitting are required before use, although all pertinent information is available. The beach and borrow area characteristics are compared in Table 4

Upland sand sources and sand from the maintenance dredging of inlets can supplement the primary borrow areas and address small hot spots as they occur. The Immokalee Mines in northeast Collier County can provide sand sorted into a variety of characteristics, and has been used successfully on the county beaches.

The two offshore borrow areas require different dredging strategies. Borrow Area T1 needs to be dredged using a moderate size hopper dredge. Large hopper dredges with deep draft are impractical in the extremely shallow waters offshore of Naples. The water around the Cape Romano borrow area is relatively shallow, and will require either a small hopper dredge or a hydraulic dredge/scow combination. An advantage of the smaller dredge is that they can get much closer to shore to pump out. The asymmetry between the type of dredge may limit the effectiveness of using both borrow areas in the same contract. If a scow system is used, then the same equipment can be used with both offshore sand sources.

Sand Source Compatibility

The compatibility of the borrow areas for renourishment not only depends on fill grain size, but also the slope of the new beach created with this sand. Due to its use during the last renourishment, all of the projects beaches are compatible with Borrow Area T1. It is anticipated that a construction slope of 1V:10H will result from use of the coarser sand

from Borrow Area T1, which is a change from the 2006 construction plans.

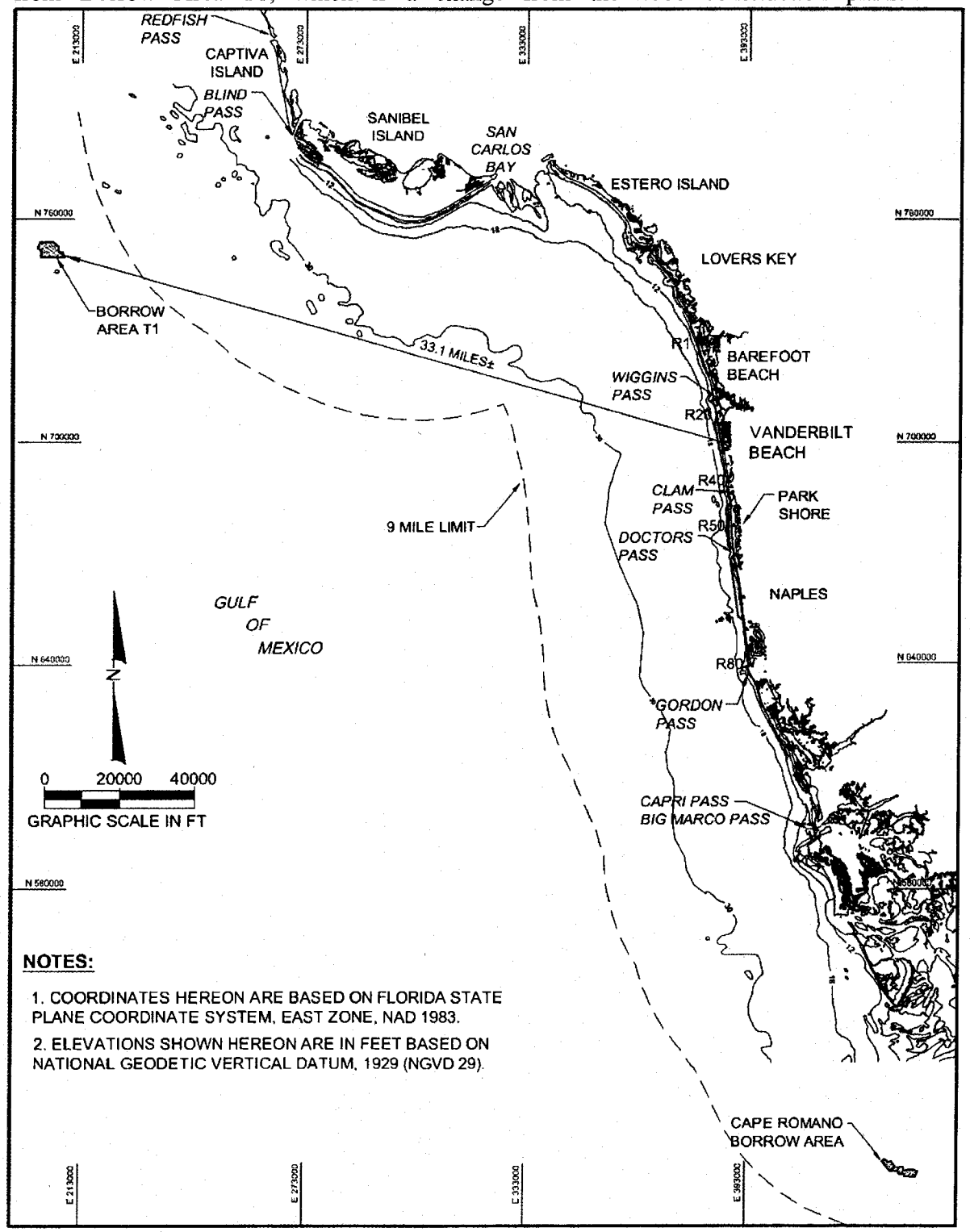

FIGURE 19. Borrow Areas

TABLE 6

COLLIER COUNTY RENOURISHMENT PROJECT
BEACH AND BORROW AREA CHARACTERISTICS AND COMPATIBILITY

Location	Mean Grain Size (PHI)	(mm)	Sorting (PHI)	Silt (%)	Borrow Area Volume
Vanderbilt Beach R-27	2.17	0.22	1.57	4.65	
Pelican Bay R-33	1.72	0.30	1.86	1.72	
Park Shore R-52	2.51	0.18	0.92	2.61	
Naples Beach R-64	2.11	0.23	1.31	1.52	
Naples Beach R-73	2.29	0.20	1.31	1.28	
Port Royal R-84	1.83	0.28	1.76	1.26	
2003 Beach Composite	2.08	0.24	1.50	2.17	
2010 Beach Composite	1.59	0.33	0.90	See Note	
1990 Native Beach	1.89	0.27	1.51	2.55	
Borrow Areas					
Toms Hill I (T1)	1.67	0.32	0.92	1.75	3,570,000 cy
Toms Hill I (T1)-Cut#1	1.59	0.33	0.90	1.65	870,000 cy
Cape Romano	2.06	0.24	0.43	1.90	900,000 cy

Notes:
Approximately 630,000 cy taken from Toms Hill in 2006 based on post-construction surveys.
The 2010 beach condition is assumes to have BA T1 Cut 1 characteristics in the fill area R22 to R79.

Only a few of the project area's beaches will be compatible with the Cape Romano sand source. This is due to the finer sand within the borrow area or the possibility that the equilibrium profile resulting from the finer sand from Cape Romano could encroach upon nearshore hardbottom. Both borrow areas contain sands that appear to be similar in color to the existing beach.

Native Beach Sand Characteristics

The beach sands in the project area are gray fine grained sand with shell based on 2003 samples. The dry beach color is light gray (5Y 8/1 to 5Y 7/1), but the sands become darker on the sub-aerial profile. The sands have been influenced by previous nourishment projects, truck haul sand, and bypassing at inlets. These activities have added moderate quantities of shell, minor rock, and coarse sand from upland sources, which make it difficult to accurately define the engineering qualities of the beach. A number of rock removal projects between 1996 and 2003 have had a visible influence on the beaches of Naples and Vanderbilt.

Grain size data has been collected between 1988 and 2003. The alongshore and cross-shore location of beach sampling has changed over time, and a direct comparison among composite values may not be accurate. In 1988, four samples were collected at each profile at elevations between approximately +2 to -5 feet, which may bias a composite towards the high side. In 1990, four samples were collected at each profile at the following elevations: +1.5, -5, -9 and -14/16 ft NGVD. If the deepest sample is ignored, the sample values may approximate the active beach profile. The 1988 and 1990 samples represent native beach conditions influenced by small fill projects and inlet bypassing activity. The average beach grain size for 1988 and 1990 are 0.32 mm and 0.27 mm, respectively.

In 2003, a comprehensive sand sample collection was undertaken, with 10 samples collected across the entire profile at the following elevations: +5, +1.5, MHW, MTL, MLW, -3, Trough, Bar, -6.5 and -9 ft NGVD. These samples were taken after rocks and shell were removed from the beach and coarse truck haul sand was placed on eroded beaches. The average composite mean grain size for 1998 and 2003 were 0.33 mm and 0.24 mm, respectively. The impact of rock cleaning is evident in these values.

Anomalies exist in the historic beach sand data. The 2003 composite mean grain size for Park Shore is 0.18 mm compared to a history in the 0.28 mm to 0.35 mm range. The coarser grain size is the likely characteristic. At Port Royal, the beach shape in 2003 is flatter than indicated by the sampled grain size. In this case, other data shows this region is being transformed by fill moving down drift from the Naples project.

The current implied grain size of the beach is similar to the sand placed during the recent renourishment project, which was 0.31 mm. No recent comprehensive sand sampling has been conducted.

Selected Alternative: Expanded Design

The design volume for the expanded design is based on the quantity of sand needed to widen the construction profile to provide 10 years of advanced nourishment. The design beach width remains the same as Alternative 2, except as stated below. The area south of Doctors Pass and Clam Pass will have a design width of 80 feet.

This design volume includes raising the berm 1 foot for the expanded design option. The berm will be raised from 4 ft NAVD to 5 ft NAVD, but additional analysis will be needed to provide the proper transition between the natural beach and berm system, and the additional height may not be practical everywhere. From preliminary analysis, it appears that approximately 75% of the profiles can be heightened. A typical cross-section comparing the 2005/06 permitted template versus the expanded template is shown Figure 8. The design method in spreadsheet form is provided in Table 12 and 13 at the end of this report.

Vanderbilt Beach

The fill limits of the Vanderbilt project area are approximately R-22 to R-31. Approximately 58,056 cubic yards is proposed within this project area to expand its design life and raise the berm elevation. The design beach width and berm elevation is 100 feet and 4 ft NAVD respectively. An increased elevation of 5 feet NAVD will be used where the landward intercept is accommodating and/or where beach width is restricted by near shore hardbottom.

Park Shore Beach

The fill limits of the Park Shore project area are approximately R-45 to R-55. Overall, approximately 186,166 cubic yards of material is proposed for placement within this reach. This volume is restricted at a few areas due to the close proximity of hardbottom, which may limit project life. This may be moderated by analysis during modeling or the detailed design phase. The design beach width and berm elevation is 85 feet and 4 ft NAVD respectively. An increased elevation of 5 feet NAVD will be used where the landward intercept is accommodating and/or where beach width is restricted by near shore hardbottom.

Naples Beach

The fill limits of the Naples Beach project area are approximately R-58A to R-79. The expanded design within this area requires 413,008 cubic yards of material. The profiles immediately south of Doctors Pass near R-58 cannot fit an expanded template needed to support a 10 year renourishment interval due to potential hardbottom impacts. Modified inlet management practices should be able to address much of the hot spot problem, supplemented with a spur off the Doctors Pass jetty. The volume for this reach does not change with a change in inlet disposal locations, but the distribution of fill in Table 12 does. The design beach width and berm elevation is 100 feet and 4 ft NAVD respectively. An increased elevation of 5 feet NAVD will be used where the landward intercept is accommodating and/or where beach width is restricted by near shore hardbottom. The design width south of the inlet is 80 feet through R-59, due to the hardbottom restrictions.

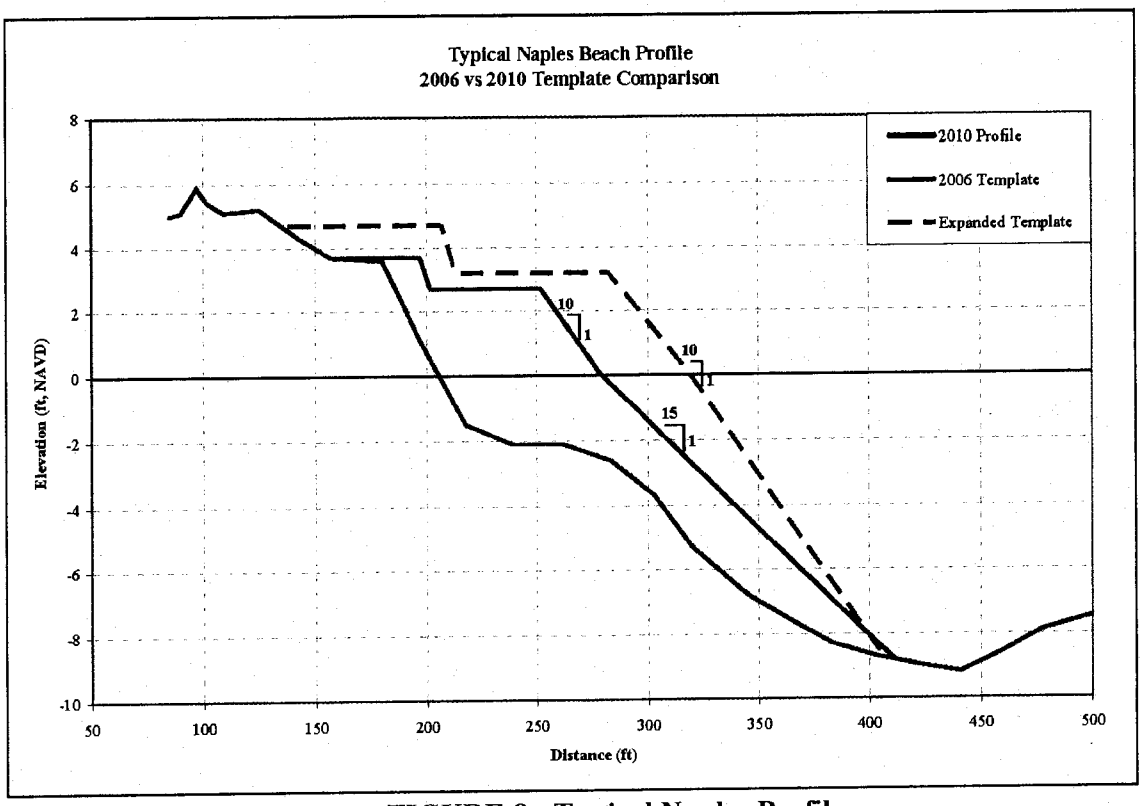

FIGURE 8: Typical Naples Profile.

New Areas

The two new areas that are proposed for the expanded project are located directly north of Wiggins Pass and directly south of Clam Pass.

Barefoot Beach

The Barefoot Beach area is located from R-14 to R-16 and has recently been designated as a critically eroded area by the FDEP. Approximately 100,000 cubic yards is proposed within this area to supplement fill placed from the maintenance dredging of Wiggins Pass and the proposed inlet realignment project.

Initial estimated total cut volumes from Wiggins Pass are realignment approximately 80,000 cubic yards. This material will be used to fill the meander channel and create dikes along with restoring the shoreline to the north. The shoreline at Barefoot Beach requires more sediment than available from dredging the Pass, so supplementing it with fill from the renourishment project will aid in its restoration. It is estimated that 25,000 cubic yards can be provided on the initial inlet dredging, and at least 35,000 cubic yards every 4 years thereafter. In conjunction with nourishment, almost 200,000 cubic yards can be placed in 8 years. The design berm elevation is 4 ft NAVD or equal to the natural

beach. The design goal in conjunction with inlet management is to restore the beach towards historic widths.

Clam Pass Park

The area south of Clam Pass from R-42 to R-45 is the second proposed expansion area to the Collier County Renourishment Project. Fill to the north of Park Shore will stabilize the area, acting as a feeder beach. Approximately 30,000 cubic yards is proposed within this area. The fill will supplement sand from bypassing at Clam Pass, which alone is insufficient. The disposal site for Clam Pass bypassing should be extended further south to address a hot spot located south of R-44. The design template will be the similar to that proposed for the Clam Pass dredging project. The design beach width and berm elevation is 80 feet and 4 ft NAVD, respectively. An increased elevation of 5 feet NAVD will be used where the landward intercept is accommodating and where beach width is restricted by near shore hardbottom. The width is restricted for this entire reach.

Alternative 4: Erosion Control Structures

Structures have been proposed as one means of alleviating erosion in hot spot areas. Some types of structures suitable for use in Collier County are illustrated at the end of this report in Photographs 10 through 15 and Figure 20. Structural changes being considered for modeling are described in section XIV.

Park Shore Beach

The fill limits of the Park Shore project area are approximately R-45 to R-55. Overall, approximately 186,166 cubic yards of material is proposed for placement within this reach. This volume is restricted at a few areas due to the close proximity of hardbottom, which may limit project life. This may be moderated by analysis during modeling or the detailed design phase. The design beach width and berm elevation is 85 feet and 4 ft NAVD respectively. An increased elevation of 5 feet NAVD will be used where the landward intercept is accommodating and/or where beach width is restricted by near shore hardbottom.

XX. CONCLUSIONS

The following conclusions have shaped the conceptual design for the project:

- If sufficient sand can be placed on the beach through nourishment and inlet bypassing, then a structural solution is less important. In general, the modeling shows a 10-year nourishment interval is feasible and most of the groins can be removed, resulting in improved performance of the beach. Modeling shows that a wider fill placement and removal of some of the existing structures is the most practical and direct solution, while many of the structures modeled had less convincing performance. The consideration of

new structures should also be delayed until sufficient monitoring of the expanded project is performed.

- The borrow area from the previous renourishment project (T1) will be utilized to support the renourishment project.

- The coarser sand used during the last renourishment has steepened the beach profile, as expected, and in general, most profiles within the County have experienced retreat at the toe of fill greater than the magnitude of shoreline retreat. This means that the permitted template can be increased in size without increased threat to nearshore hardbottom. This makes a 10 year nourishment interval feasible with few limitations.

- Additional field investigations are necessary to permit the next project.

- A 3D design phase is needed to refine the design to allow additional fill in these five regions without threatening the hardbottom. This detailed and refined design should be verified using the model.

- For economy, gaps in fill placement should be allowed in the project area to reduce the amount of fill needed and its associated cost.

- A jetty spur at Doctors Pass will reduce losses into the Pass from Naples and trap sand during the tropical storm season, which will be naturally released during the winter season.

- The two recent hot spots at Seagate Drive and south of Doctors Pass can be solved with changed inlet management practices and additional nourishment.

- The disposal area for sand bypassed from Clam Pass should be extended further south to address a small hot spot.

- Beach and inlet dredging should be scheduled for maximum mutual support of sand placement in restricted disposal areas.

The major project goal is a 10-year design life achieved with a wider and higher beach that addresses hot spots and increases the durability without hardbottom impacts, building on the 2006 permitted design. The three inlet projects are addressed in their separate inlet management studies, permits, and monitoring reports. The inlet work should be scheduled to complement, but not necessarily coincide with the beach nourishment work. Specific objectives are:

- Barefoot Beach (R14-R16): Nourish with approximately 100,000 cy of sand to supplement sand bypassing by the new Wiggins Pass Inlet Management Plan and restore the eroded beach.

- Vanderbilt Beach (R27-R31): Increase advanced nourishment where practical, and overfill near the hot spots. Consider structures only after nourishment alone proves insufficient or ineffective through performance monitoring.

- Clam Pass Park (R42-R44): Renourishment with approximately 30,000 cy of sand to supplement sand bypassing as part of the new Clam Pass maintenance dredging permit. Where practical, schedule maintenance dredging at different times from beach nourishment, so that maximum volume can be placed down drift of the inlet in a limited template. This fill will act as essential feeder beach for northern Park Shore. Extend the existing dredge disposal area further south, to eliminate a small hot spot between R44 and R45.

- Seagate Drive hot spot (R44-R46): Remove groins in conjunction with feeder beach created at Clam Pass Park. Increase advanced nourishment to supplement any short fall from these actions.

- Park Shore (R51-R54): Nourish for 10 year design life supported by modeling. Increase advanced nourishment or feeder beach volume in the vicinity R48 to address model hot spot. Delay consideration of any structures until performance monitoring of this nourishment alone option can be completed.

- South of Doctors Pass (R58): Increase nourishment rate, modify Doctors Pass dredging permit to dispose sand in the permitted beach fill template south of Doctors Pass. Build spur off of groin to stabilize this severe hot spot so that it performs with a 10 year renourishment interval. Bypassing to the closer disposal areas, a jetty spur, and nourishment alone may address most of the needs in this area, and additional structures should be delayed until performance monitoring of nourishment alone option can be completed. Timing of nourishment and dredge disposal should be separated when feasible, so that the limited space in the template can be maximized.

- South of Lowdermilk Park (R62-R64): Modify or eliminate groins in the vicinity of R6-2 and R-65 in conjunction with increased nourishment. Drainage modification must be decided before structural modifications can be implemented. It is also recommended to create a larger beach at Lowdermilk Park to mitigate for the change in dredge disposal practices.

- Design all reaches for a 10 year project life and skip segments that do not need fill to meet this goal. Maintain capability of truck haul project to address small hot spots if they occur. Consolidate small density fill sections into constructible reaches.

- Create a schedule for groin removal or modification, starting with the groins immediately south of inlets. Modify future plans based on performance monitoring.

XXI. RECOMMENDATIONS

The recommended plan is based on a combination of existing practices and new alternatives. The 2013-14 Design Alternative 3 without structures is the recommended plan. Modification to inlet management practices and beach drainage are needed to supplement the plan.

1. Continuation of Existing Practices.
   a. Beach fill
      i. Vanderbilt Beach R22.5 to R31.5
      ii. Park Shore R45.5 to R54
      iii. Naples Beach R58 to R79
   b. Inlet Bypassing at Wiggins, Clam and Doctors Passes

2. New Practices:
   a. Widen and raise the beach to support a 10-year nourishment interval where practical.
   b. Add Barefoot Beach (R14 –R16) to rebuild the ebb shoal and beach.
   c. Nourish Clam Pass Park (R42-R45.5) providing a feeder beach for Park Shore.
   d. Return the disposal area for Doctors Pass dredging to the area immediately south of the pass, using the permitted beach template from the 2005 permit.
   e. Modify or remove structures (groins and outfalls) from beach based on a sequence to address those with the largest impact, lowest cost and easiest to address outfall solution. Start with the structures located closest to Clam and Doctors Passes. Removal must be accompanied by continued periodic nourishment and inlet bypassing.
   f. Add a spur to the south Doctors Pass jetty to reduce losses from Naples Beach into the inlet and maximize the effectiveness on inlet bypassing.
   g. Plan on small (truck haul) nourishment project between the major nourishment interval to address hot spots caused by significant storms and changes in wave climate, long shore transport, and inlet bypassing not anticipated in this report and modeling.
   h. Delay any decision on adding other structures to the plan, unless the detailed design and/or permit restrictions significantly restrict use of an adequate fill template.

From conceptual analysis of the project, the following are recommendations for future investigation:

- Conduct detailed 3D design of the recommended alternatives using the 2011 monitoring results at each profile location and verify and refine design in model.

- Identify additional pipeline corridors for hopper dredges and scow operations.

- Begin permit modifications process for increased project size.

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
WASHINGTON, DC 20240-0001

RECEIVED
JAN 10 2012
COASTAL ZONE
MANAGEMENT

J. Gary McAlpin, P.E.
Coastal Zone Management Director
Collier County Public Service Division
3299 Tamiami Trail East
Suite 103
Naples, FL 34112

Dear Mr. McAlpin:

Thank you for your letter dated November 9, 2011, requesting to enter into a non-competitive negotiated agreement with the U.S. Department of the Interior, Bureau of Ocean Energy Management (BOEM). The request is specifically for the use of 1,000,000 cubic yards of sand from borrow area T-1, located on the Outer Continental Shelf, for purpose of renourishing 13 miles of Collier County coastline between Wiggins and Gordon Passes.

We have reviewed your request and find that it does meet the standard for a negotiated agreement under the Outer Continental Shelf Lands Act and the best instrument for leasing the requested material is a two-party lease between Collier County and BOEM. The executed two-party lease will contain all of the terms and conditions that BOEM will require.

There are certain requirements that must be completed prior to the issuance of a negotiated agreement in order to fulfill applicable statutes including, the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA) Section 7 consultation, the Magnuson-Stevens Fishery and Conservation Management Act Essential Fish Habitat (EFH) consultation (Section 305), and the National Historic Preservation Act (NHPA) Section 106 process. In addition, Coastal Zone Management Act Section 307 consistency concurrence must be obtained from the State of Florida prior to issuance of the negotiated lease. We ask that you work with the BOEM Division of Environmental Assessment and their representative, Jennifer Culbertson, on meeting these requirements. Dr. Culbertson can be reached at 703-787-1742, or by email at Jennifer.Culbertson@boem.gov.

The Leasing Division, Marine Minerals Program coordinator for this project will be Ms. Colleen Finnegan who can be reached at (703) 787-1275, or by email at Colleen.Finnegan@boem.gov. I have asked Ms. Finnegan to arrange a kick-off meeting for this project in an effort to discuss the particulars, including the needs of our Environmental Division to complete the requirements under the statutes listed above.

If you have any questions, please do not hesitate to call me at (703) 787-1215. We look forward to working with you on this endeavor.

Sincerely,

for Steven D. Textoris
Acting Chief, Leasing Division

cc: Steve Keehn
CP&E Senior Coastal Engineer
2481 N.W. Boca Raton Blvd.
Boca Raton, FL 33431

Dr. Jennifer Culbertson
Division of Environmental Assessment
BOEM MS 4042

146925

November 9, 2012

Jennifer Culbertson, Ph.D.
Department of Interior
Bureau of Ocean Energy Management
Headquarters, Division of Environmental Assessment
381 Elden Street
Herndon, VA 20170-4817

Re: Collier County Beach Renourishment Project, Biological Assessment

Dear Dr. Culbertson:

Please find enclosed the Collier County Beach Renourishment Project Biological Assessment (BA). This BA is being submitted in support of Collier County's request to enter into a non-competitive negotiated agreement with BOEM for use of borrow area T-1, located on the Outer Continental Shelf, for the 2013-14 Collier County Beach Renourishment Project. This assessment has been prepared in coordination with BOEM staff, and addresses BOEM comments received following review of the Draft BA. As you requested, we have provided one hardcopy and two CDs for your records.

If you have any questions, please call me or Lauren Floyd.

Sincerely,

COASTAL PLANNING & ENGINEERING, INC.

Stephen Keehn, P.E.
Senior Coastal Engineer

cc: Gary McAlpin, Collier County, w/enclosures
Colleen Finnegan, BOEM, w/enclosures
Tunis McElwain, USACE
Martin Seeling, FDEP
Lauren Floyd, CPE
Nicole Sharp, P.E., CPE

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November 2012

BIOLOGICAL ASSESSMENT

Prepared for the Bureau of Ocean Energy Management
Department of the Interior and
U.S. Army Corps of Engineers – Jacksonville District,
Department of Defense
In Support of Section 7 (ESA) Consultation for the
Collier County Beach Renourishment Project
Collier County, Florida
November 2012

Prepared by
Coastal Planning & Engineering, Inc.
Boca Raton, Florida

BIOLOGICAL ASSESSMENT
COLLIER COUNTY BEACH NOURISHMENT PROJECT

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BIOLOGICAL ASSESSMENT
COLLIER COUNTY BEACH RENOURISHMENT PROJECT

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1.0 PROPOSED ACTION

This Biological Assessment follows the format as recommended by NOAA's National Marine Fisheries Service (NMFS) Southeast Regional Office (SERO) and is organized to provide a clear understanding of the project and potential effects to federally listed (threatened and endangered) species and critical habitat, under the Endangered Species Act (ESA), that occur in the action area. Based on previous guidance from the Bureau of Ocean Energy Management (BOEM), the effects of the proposed action, conservation/mitigation measures, and effects determination are all presented in Section 7.0. Sections 8.0 and 9.0 present summaries of the conservation measures to be applied and the determination of effects.

Collier County is located on the southwest coast of Florida, approximately 115 miles south of the entrance of Tampa Bay and about 100 miles west of Miami, Florida. The Collier County Renourishment Project (the Project) encompasses approximately 7.5 miles of coastline between Wiggins Pass and Gordon Pass. There are public beach access areas along each stretch of shoreline in the project area.

The proposed project is planned to start in September 2013 and to be completed by the end of May 2014. This project includes renourishment of Collier County shorelines, which were nourished in 2006, and mitigation for impacts incurred from Tropical Storms Fay and Debby, which occurred in June 2012. This schedule will call for mobilization no earlier that September 1 and the start of sand placement on or after September 15. This project is based on the quantity of sand needed to re-establish the design berm and provide six to eight years of advanced nourishment using the 2006 project design (CPE, 2003). There are three sections of shoreline that are proposed for renourishment, which include Vanderbilt Beach (R-22+300 to R-30+500), Park Shore (R-43+500 to R-54+400), and Naples Beach (R-58A-480 to R-79). The amount of fill needed to bring the historic project areas back to design standard with a six year design life is less than was constructed in 2006. Based upon the 2012 monitoring survey, 420,000 cubic yards (cy) will be required (Figure 1). The 2006 project will be rebuilt but with a smaller alongshore length and cross shore width and volume, while increasing five profiles' densities with no hardbottom impact. The project will incorporate several gaps in fill along each segment. Vanderbilt Beach will have a gap between R-22+300 and R-25+500, Park Shore will have a gap between R-47+500 and R-50, and Naples Beach will have a gap between R-64+500 and R-68+200 and R-72+600 to R-79. Construction of the Pelican Bay reach from R-32 to R-37 will not be rebuilt. The impacts of Hurricane Isaac have not been factored into the design and may add up to 95,000 cy of the volume. The potential total volume for this Consultation is 515,000 cubic yards.

Two options for sand sources are proposed for the 2013 project – offshore and upland. The proposed project will be constructed either using an offshore borrow area with a hydraulic dredge (cutterhead) or hopper dredge, or the fill will be transported from an upland sand source to the beach as a truck haul project. The sand source used for the upcoming renourishment project will be dependent on the results from bidding. If the most economical and responsive bid is from an offshore dredger, borrow area T1, located in federal waters 33 miles from Vanderbilt Beach, will be utilized (Figure 2). This borrow area has been previously permitted by BOEM for use in the 2006 renourishment project. However, if a truck haul and upland sand mine produce

the most economical and responsive bid, an upland sand source will be used. If the project is constructed using a dredge, the project is estimated to take up to 120 days (working 24 hours per day, 7 days a week). If the County chooses a truck haul project, the project may take between 140 to 237 days.

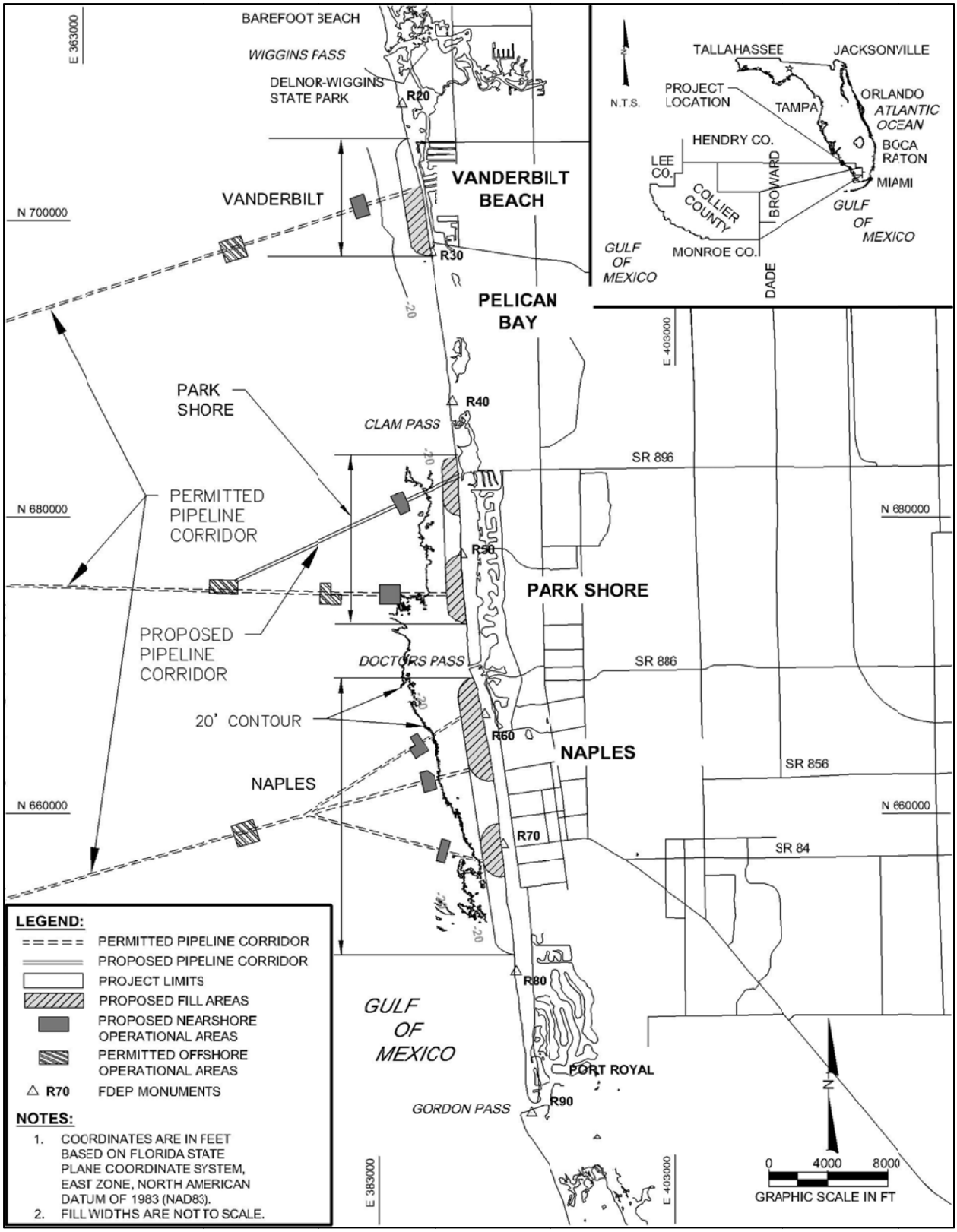


Figure 1. Project location map.

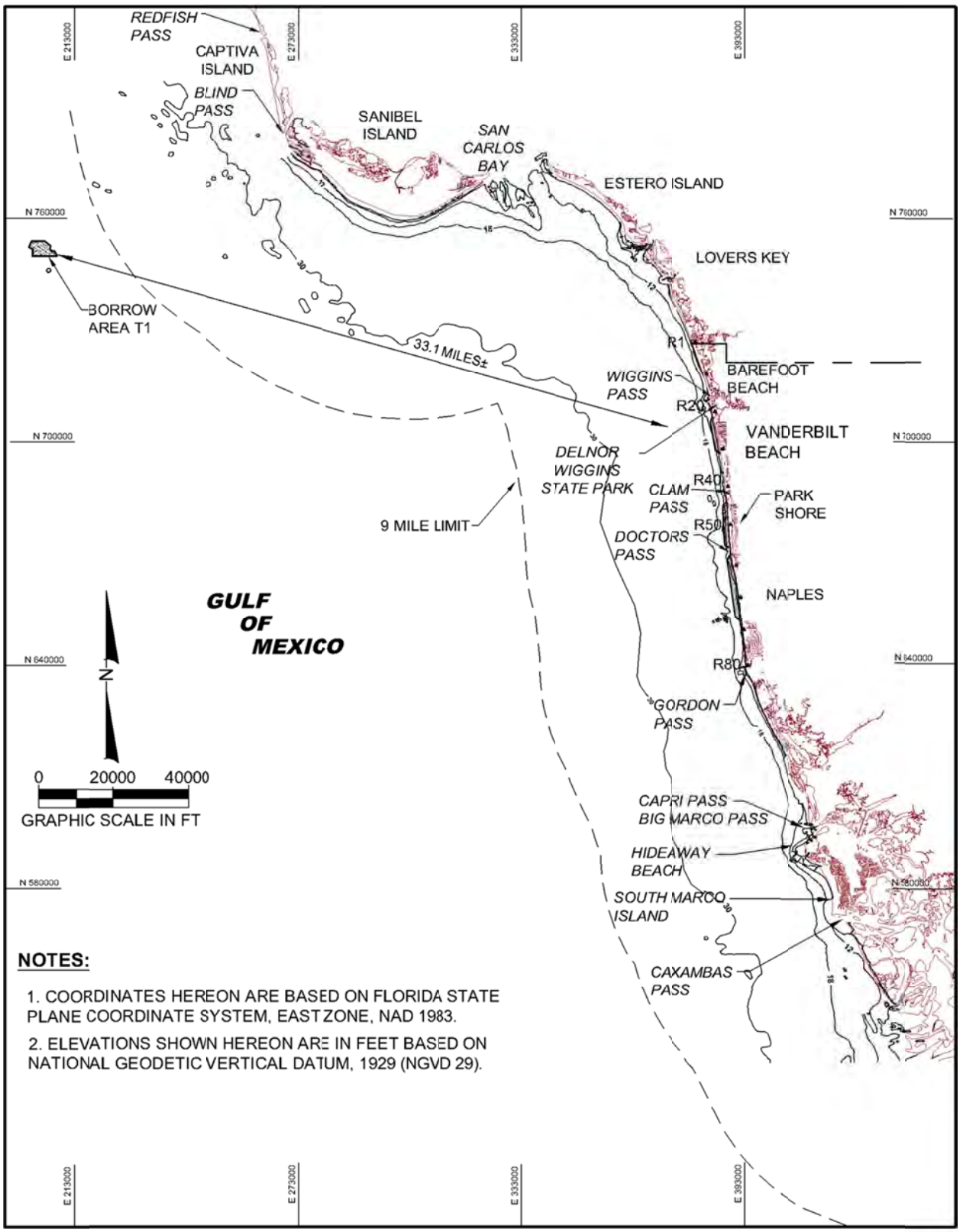


Figure 2. Borrow area location map.

BOEM and the U.S. Army Corps of Engineers, Jacksonville District (USACE-SAJ) have regulatory authority over different aspects of the proposed project. Similar to the 2006 project, this project will be permitted but not funded by the USACE-SAJ. The project requires authorization from BOEM for the use of Outer Continental Shelf (OCS) sand resources under the Outer Continental Shelf Lands Act (OCSLA), as well as a permit from USACE-SAJ under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act for conveyance and placement of sand resources. USACE-SAJ does not have Section 10 jurisdiction over the proposed OCS borrow area since it is located beyond the boundary of Florida state waters, which extend nine (9) nautical miles (3 marine leagues) offshore.

Although a single project is proposed by Collier County, there are federal actions which result from BOEM's and Corps' distinct federal authorities. The purpose of the coupled federal actions is to authorize the project proponents to dredge the sand resources (if an offshore borrow area is utilized) and then construct a beach nourishment template that will reduce shoreline erosion, enhance beach habitat, and protect valuable infrastructure along the project coastline. The most efficient vehicle for the required ESA Section 7 consultation would be the designation of one lead agency for the entire project which would evaluate all interrelated and interdependent actions (50 CFR 402.07). However, this preferred approach is not possible here since, under the National Marine Fisheries Service's Gulf of Mexico Regional Biological Opinion (GRBO) (NMFS 2003, rev. 2005, rev. 2007), BOEM authorization of dredging activities on the OCS is specifically excluded (p. 11). BOEM has previously coordinated an approach with NMFS where BOEM will serve as lead agency for the portion of the project associated with dredging operations on the OCS, and the Corps will serve as lead agency with the U.S. Fish and Wildlife Service (USFWS) for the portion of the project associated with placement of sand on the beach. .

The purpose of this Biological Assessment is to review this project in sufficient detail to determine to what extent the proposed action may affect any threatened, endangered or proposed species and designated or proposed critical habitats. This information is provided to comply with statutory requirements to use the best scientific and commercial information available when assessing risks posed to listed and/or proposed species and designated and/or proposed critical habitat by proposed federal actions. This report is prepared in accordance with legal requirements set forth under regulations implementing Section 7 of the ESA (50 CFR 402: 16 U.S.C. 1536 (c)).

2.0 PROJECT DESCRIPTION

The proposed beach renourishment includes three coastal segments along the Collier County coast between Wiggins Pass and Gordon Pass and will place approximately 420,000 cy of sand on the shoreline. Table 1 provides the fill limits, sand volumes, design beach width and berm elevation for each segment of the proposed renourishment project. This volume is based on the August 2012 physical monitoring survey; however, this does not take into account the impacts incurred from Hurricane Isaac which affected the Gulf coast of Florida in August 2012. A contingency volume of approximately 95,000 cy is anticipated but will not be finalized until the pre-construction survey. For the sake of this Biological Assessment, impacts from the greatest anticipated volume are assessed; the greatest volume that would be required for this project is

515,000 cy (Table 1). The primary offshore sand source (borrow area T1) is located in federal waters approximately 33 miles from Vanderbilt Beach (Figure 2). Potential upland sources include inland sand mines in Florida. Mobilization for this project will begin September 1, 2013 or later. The proposed construction window will be September 15, 2013 to May 31, 2014, which avoids peak sea turtle nesting season.

Table 1. Fill volume, design beach width and berm elevation for each segment of the proposed renourishment project.

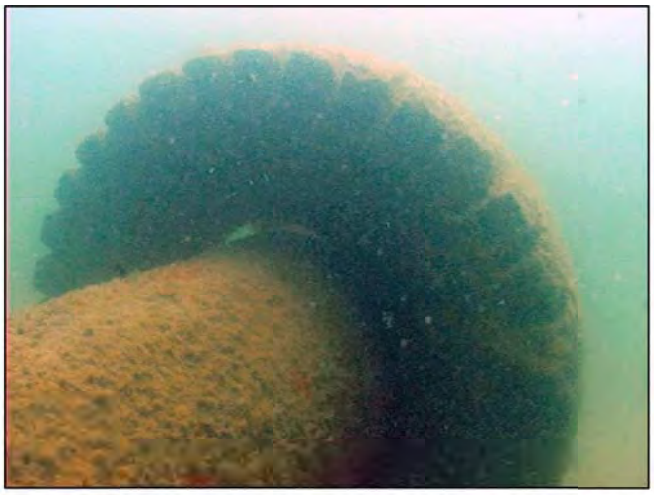
Beach Segment	Fill Limits	Fill Volume	Beach Width	Berm Elevation (NAVD)
Vanderbilt Beach	R-22+300 to R-30+500	59,724 cy	100 ft	4 ft
Park Shore	R-43+500 to R-54+400	118,246 cy	85 ft	4 ft
Naples Beach	R-58A-480 to R-79	241,151 cy	100 ft	4 ft
TOTAL VOLUME = 419,121 cy				
POTENTIAL TOTAL VOLUME* = 515,000 cy				

*Projected volume. Actual volume required will be determined based on preconstruction survey.

2.1 Dredging Operations

2.1.1 Pipeline Corridors

Three pipeline corridors (P1, P2 and P3) were permitted for the 2006 project and may be utilized for the proposed project (Figure 1). P1 is the northernmost pipeline corridor and comes ashore between R-25 and R-26 on Vanderbilt Beach; P2 comes ashore between R-51 and R-53 on Park Shore; and P3 comes ashore between R-62 and R-64 on Naples Beach. The latter has two spurs. Collared pipelines were installed over hardbottom resources, as approved by FDEP, in order to elevate the pipeline above the substrate and minimize the area of direct contact with the seafloor and avoid physical abrasion to the benthic communities. The collared submerged pipeline consisted of the standard 30-inch dredge pipe with large tractor tires placed around the pipe at 100 ft (30.5 m) intervals over the portion of the corridor that crossed hardbottom resources. Table 2 details the previously permitted pipeline corridors and an additional proposed spur off of P2 (Spur 6), as shown in Figure 1.



Photograph 1. Collared pipeline within corridor P3 during the 2006 project.

Table 2. Details of previously permitted pipeline corridors from 2006 project and proposed pipeline spur that may be used for the 2013-14 renourishment project.

Previously Permitted Pipeline Corridors	R-Monument Location	Beach	2006 Pipeline Length (collared) (ft)	Scow Proposed Pipeline Length (all collared) (ft)
P1	R-25 to R-26	Vanderbilt Beach	13,000 (5,900)	3,700
P2	R-51 to R-53	Park Shore	17,200 (5,900)	4,600
P2 (Spur 6)	R-45 to R-46	Park Shore	Proposed 17,000 (2,500)	4,000
P3 (Spur 3)	R-60	Naples Beach	not used	4,700
P3 (Main)	R-63	Naples Beach	18,000 (6,500 ft)	4,000
P3 (Spur 5)	R-70 to R-71	Naples Beach	13,600*	3,600*

*No collar necessary since no benthic resources identified in this corridor.

The 2006 project utilized a hopper dredge for sand excavation and transport (Photograph 2). The portion of the pipeline corridors P1 through P3 used for the 2006 project extended from the shoreline out to the -25 ft depth contour and ranged in length from 13,000 ft to 17,000 ft and width from 150 ft to 250 ft. Actual permitted corridors are longer (Figure 1). If the proposed project is constructed using an offshore borrow area, the project will either repeat the use of a hopper dredge with the existing corridors and operational areas or it will utilize a cutterhead dredge and transport the sand by scows. Collier County is also considering constructing the project using an upland sand source as an alternative to dredging offshore. The County is requesting that agencies consider all three construction types and that all three options be permitted. A cutterhead-scow operation is not cost-effective unless it is competitively bid; very few companies have the capabilities to conduct these operations, and cutterhead-scow operations are weather-dependent, subject to costly delays due to inclement weather. Permitting both types of dredge options will allow Collier County greater flexibility when scheduling with the dredge contractor, which in turn will result in significant cost savings to the County. If a cutterhead and scow are utilized, this will allow for the western (offshore) end of the pipeline corridors to be closer to shore, which would reduce the length of pipeline that sits on the seafloor, thus minimizing potential impacts to hardbottom resources. The pipeline corridors will extend from shore out to the 20 ft depth contour with the same width range as the 2006 pipeline corridors, but length range will be reduced to between 3,600 and 4,700 ft. The western end of the pipeline will now require a work area that is wider in the alongshore direction for offloading the sand from the scow by hydraulic offloader for connection to the pipeline. These areas are presented in Figure 1 as proposed nearshore operational areas, and are at least 300 ft long by 1,000 ft wide. These areas were selected to avoid, where practical, hardbottom based on surveys of the corridors. The pipeline

Photograph 2. Hopper dredge Sugar Island approaching pump out locations, with two booster pumps, tugs and Naples in the background during 2006 project.

will be laid and removed as project progress is made along the shoreline, and surveys will be conducted to assess any impacts from the pipeline to hardbottom resources.

2.1.2 Borrow Area

The primary sand source (borrow area T1) is located in federal waters approximately 33 miles from Vanderbilt Beach (Figure 2). Either a hopper (Photograph 2) or a cutterhead dredge will excavate the sand from the borrow area. If a cutterhead is used, scows will transport the sand to the seaward end of the submerged pipeline for placement in the fill area. Depending on the capacity of the transport vessel (hopper dredge or scow[s]), it is anticipated that up to seven round trips will be made per day. There may be up to two hoppers or several scows traveling between the borrow area and the pipeline per day, which would increase the vessel traffic. Barring severe weather, equipment failure, etc., dredge and fill activities are anticipated to take between 2 and 4 months.

2.2 Truck Haul Operations

An upland sand source will be used if truck haul is selected as the preferred construction method. The specific sand mine will be determined at the time of contractor selection, and the fill will be beach compatible. Several sand mines are located near Collier County. The Immokalee Mines in northeast Collier County can provide sand sorted into a variety of characteristics, and has been used successfully on the County beaches. There are other upland sand sources with similar sand quality to the Immokalee sand pit, and they should be acceptable based on submittal of a qualifying sand sample and use of the approved QA/QC plan for upland sand source projects for Collier County, similar to the 2010 plan.

Using dump trucks, sand will be loaded at the sand mine from a stock pile and taken to the project area. The fill will be transported by dump truck to a sand stock pile location at the fill site or near the beach access location. From the stock pile, the sand will be moved by rough terrain dump truck and disposed in or near the construction template. Grading will be conducted using a bulldozer. A front end loader will assist in construction and trans-loading the sand between street and rough terrain equipment. A conveyor between the road and beach is also feasible. The fill will be placed in an approved construction template, and will extend into the nearshore zone.

2.3 Impact Factors

2.3.1 Sedimentation and Turbidity

During construction, elevated turbidity and sedimentation levels will occur at the dredge and the fill sites but are not anticipated to extend beyond the duration of construction activities. Turbidity monitoring will be conducted at the fill sites to ensure turbidity levels at the edge of the designated mixing zone do not exceed 29.0 NTU above background. During the 2006 project, turbidity levels were not reported as exceeding 29.0 NTU above background at the fill site. Turbidity monitoring was not required at the dredge site, as the borrow area was located in federal waters. Gilliam *et al.* (2006) conducted five years of pre-nourishment monitoring to collect sediment data on reefs in proximity to borrow area sites in Broward County, off the east coast of Florida. Sampling continued throughout construction revealing that sedimentation levels

near the borrow area were elevated during construction but generally remained within the same range observed during pre-construction sampling. In addition, the generally standard 400-ft buffer zones between borrow areas and hardbottom resources greatly reduce the potential for negative impacts to occur due to increased turbidity and sedimentation. While dredge and fill operations result in temporary elevated turbidity and sedimentation levels, there are no listed species of corals located within the project vicinity.

2.3.2 Burial

Potential impacts to hardbottom resources that fell within the estimated Equilibrium Toe of Fill (ETOF) of the 2006 project were mitigated through construction of a 1.09-ac artificial reef. The ETOF for the proposed project will not extend any farther seaward than the ETOF for the 2006 project; therefore, no additional compensatory mitigation measures for hardbottom are proposed for this project. While dredge and fill operations sometimes result in burial of hardbottom and corals located there, there are no listed species of corals located within the project vicinity.

Burial may also impact epifaunal and infaunal species (e.g. polychaetes, crustaceans, echinoderms, molluscs) which provide an important food resource for higher trophic levels including demersal fish and large epifaunal organisms. Consequently, changes to the benthic community structure can impact those species, such as smalltooth sawfish, which depend on the benthos as prey (Zarillo *et al.*, 2008).

2.3.3 Entrainment

Entrainment of sea turtles, as well as of fish and invertebrates, is a potential impact of hopper dredging operations. Shrimp trawlers have been successfully used to capture sea turtles for relocation and research since the early 1980s (Bargo *et al.*, 2005). For research, turtles are generally captured for tagging purposes; however, relocation is implemented during periods when hopper dredging is imminent or ongoing (NMFS NE Biological Opinion F/NER/2003/00302). During dredging for the 2006 renourishment project, the turtle relocation trawler captured and removed 87 turtles from the dredging area. This included 86 loggerheads (*Caretta caretta*) and one green sea turtle (*Chelonia mydas*). No turtles were injured or killed as a result of trawling, nor was there any evidence of turtle take documented by either dredge (CCI, 2006). If hopper dredging is utilized for the proposed project, turtle trawling may be appropriate. However, this project may utilize a cutterhead dredge in which a turtle take has never been recorded. If a cutterhead dredge is used, the use of turtle trawlers will not be required since dredging will pose little to no threat of turtle entrainment. While cutterhead dredge operations result in less impact to swimming sea turtles, this is not always a viable option. Permitting both types of dredge options will allow Collier County greater flexibility when scheduling with the dredge contractor, which in turn will result in significant cost savings to the County.

2.3.4 Strike

The most significant threat to the Florida manatee is death or serious injury from watercraft strikes. As of September 7, 2012, 68 manatee deaths this year have been attributed to watercraft, comprising 25% of total manatee mortality state-wide (FWRI, 2012). During construction, vessels travel between the borrow areas and the seaward end of the pipeline corridor, as well as back and forth to port. Project construction will adhere to the Florida Fish and Wildlife Conservation Commission (FWC) *Standard Manatee Conditions for In-Water Work* (Appendix

No. 1) in order to protect manatees from direct project effects. In order to minimize the potential for collision with sea turtles or smalltooth sawfish, construction will also comply with National Marine Fisheries Service (NMFS) *Sea Turtle and Smalltooth Sawfish Construction Conditions* (Appendix No. 2). Other marine mammals such as whales are not likely to occur within the project area.

2.3.5 Noise

Suction dredgers produce a combination of sounds from relatively continuous sources including engine and propeller noise from the operating vessel and pumps and the sound of the drag head moving across the substrate (Normandeau Associates, Inc., 2012). Noise is generated from vessel travel between sites and the dredge process. Clarke *et al.* (2004) found that cutterhead dredging operations are relatively quiet compared to other sounds in aquatic environments, whereas hopper dredges produce somewhat more intense sounds. Studies have shown that cutterhead dredges produced a relatively continuous sound, and that the sounds could not be partitioned into discrete components attributed to separate sounds sources. Overall, cutterhead dredge noise fell into the 70-1,000 Hz range, and field observations found that cutterhead operation sounds became almost inaudible at relatively short distances (approximately 500 m) from the source (Clarke *et al.,* 2004). Hopper dredge operations result in continuous sound production as the dredge moves forward with the draghead in contact with the bottom, interspersed with periods when the dragheads are lifted so that the dredge can turn. As was observed with the cutterhead dredge, hopper dredge operations produced sounds in the 70-1,000 Hz range, however peak pressure levels were much higher for the hopper dredge in the 120-140 dB range (compared to cutterhead in the 100-110 dB range) (Clarke *et al.,* 2004). A 2011 report done for the Marine Aggregate Levy Sustainability Fund (MALSF) compared the Source Levels (measure of the acoustic noise output) generated by six trailing hopper suction dredges while extracting marine aggregate (Robinson *et al.,* 2011). This study found that the noise radiated at frequencies less than 500 Hz is similar to the noise generated by a merchant vessel travelling at moderate speed. However, while extracting aggregate, the vessels generate higher levels of noise at frequencies above 1 kHz, higher than a typical merchant vessel. Analysis of the data determined that the major source of this higher frequency noise is the impact/abrasion of the aggregate material passing through the draghead, suction pipe and pump. This means that the overall noise output level generated by a hopper dredge is partially dependent upon the aggregate being extracted, and results indicate that extracting gravel is noisier than extracting sand (Robinson *et al.,* 2011).

Very little research has been conducted on the effects of dredging noise on marine life and information is sparse. The extent to which the introduction of higher background sound levels masks the ability of marine animals to detect and interpret sound signals from their environment is largely unknown, as is their reaction to man-made sounds (Robinson *et al.,* 2011; Normandeau Associates, Inc., 2012). Marine dredging produces broadband and continuous low frequency sound (1-1,000 Hz). It has been hypothesized that the noise associated with dredging activities can trigger an avoidance reaction in marine mammals and may interrupt communication, migration, foraging and other behaviors by aquatic organisms (Clarke *et al.,* 2004; Thomsen *et al.,* 2009). If dredging activities cause local fauna to abandon an area for long periods of time (months-long dredging projects), measurable impacts may occur. Thomsen *et al.* (2009) conducted a field study to better understand if and how dredge-related noise is likely to disturb marine fauna. This study found that the low-frequency dredge noise would potentially affect

low- and mid-frequency cetaceans, such as bottlenose dolphins. Manatees have trouble distinguishing low frequency noises (Gerstein, 2002), and prefer habitats with less low frequency noise (Miksis-Olds *et al.*, 2007). This suggests that manatees may avoid areas where dredging activities are taking place and thus reduce the chance of dredge-manatee interactions. Fish with swim bladders appear to be more sensitive to sound than those without (Normandeau Associates, Inc., 2012). Although there is evidence that a range of invertebrates are sensitive to low frequency sounds it is not yet clear whether any of them are sensitive to sound pressure, or whether they show the same level of sensitivity to sounds as other aquatic organisms like fishes; our knowledge of marine invertebrate hearing capabilities is relatively poor (Normandeau Associates, Inc., 2012).

3.0 PREVIOUS COORDINATION

3.1 History of Beach Nourishment in Collier County

Collier County's initial beach nourishment project was constructed in November 1995 to restore nearly six miles of critically eroded shoreline. Approximately 1,270,000 cy of fill was placed on Vanderbilt, Park Shore and Naples Beaches. Sand was obtained from four offshore borrow areas and supplemented with fill from upland sand sources. The project also included the extension of the north jetty of Doctors Pass by approximately 75 ft, the removal of 36 groins and the restoration of six rock groins and a pile cluster groin. The project also included the restoration of ten existing stormwater outfalls on northern Naples Beach.

The second renourishment was constructed between February and May 2006 along approximately 8.5 miles of Collier County shoreline, which included Vanderbilt Beach (R-22 to R-37), Park Shore (R-45 to R-55) and Naples Beach (R-58A to R-79). The project placed 668,000 cy of sand from an offshore borrow area (T1) and 53,600 cy of sand from ongoing inlet maintenance at Doctors Pass onto the shoreline. A 1.09-ac artificial reef was constructed for this project as mitigation for anticipated impacts from fill equilibration to nearshore hardbottom; however, no impacts were documented during post-construction monitoring. The USACE permit for the 2006 project supports multiple nourishment projects during the 10-year permit life, whereas the FDEP permit requires permission for a second use.

Supplemental fill projects, such as truck haul, have taken place within the project area since construction of the 1996 project. The most recent truck haul projects took place in summer 2010 and spring 2011 in order to address two erosion hot spots within the County. The summer 2010 project placed approximately 2,650 cy of sand south of Doctors Pass on Naples Beach from R-58A-500 to R-58A+100. The spring 2011 project placed 22,393 cy of sand on Naples Beach (R-58A-400 to R-58) and 7,836 cy on Park Shore (R-45+600 to R-46+400).

Periodic dredging and bypassing has taken place at Wiggins Pass, Clam Pass, Doctors Pass, and Gordon Pass in recent history. See CPE (2011) for details.

3.2 Agency Coordination to Date

Collier County, FDEP and FWC conducted a pre-application meeting on January 27, 2012 to discuss the proposed project and modifying the construction period to overlap with some of sea turtle nesting season. The agencies did not see any obstacles to this goal, as the USFWS

Statewide Programmatic Biological Opinion allows beach nourishment in Collier County during nesting season (with mitigation and monitoring measures in place).

Collier County, BOEM and USACE conducted a pre-application meeting on July 12, 2012 to discuss proposed project goals and alternatives, and to establish USACE and BOEM roles in agency (USFWS and NMFS) coordination.

On July 16, 2012 CPE requested that NMFS and USFWS review and comment on the list of species intended to be included in the Collier County Beach Renourishment Biological Assessment. NMFS (Jason Reuter) concurred with the list on July 16, 2012, pointing out the change in status of loggerheads to the DPS status, and stating that the Acroporid (elkhorn and staghorn) corals would not need included in the BA. USFWS (Jeff Howe) concurred with the list of species under USFWS purview on July 23, 2012, but requested that red knots also be included in the assessment.

Collier County, FDEP and FWC conducted another pre-application meeting on July 19, 2012 to discuss the permitting process and timeframes associated with project alternatives.

CPE submitted a Draft Biological Assessment to BOEM on August 1, 2012 and received comments back from BOEM on August 10, 2010. This Final BA addresses the BOEM comments.

CPE submitted preliminary effects determinations for the species assessed in the BA to NMFS on September 19, 2012, and received comments back the same day. The effects determinations contained in the Final BA take into consideration NMFS comments.

Based on discussions with BOEM, USACE, FDEP and FWC, Collier County is requesting modifications to the current USACE and FDEP permits for the next renourishment project. These permit modifications would allow the County to reconstruct the 2006 project, with minor changes to address hot spots, as well as to allow construction to overlap with a portion of sea turtle nesting season. Collier County is requesting that the permits allow construction either using an offshore borrow area with a hydraulic dredge (cutterhead or hopper dredge), or using an upland sand source through a truck haul project.

4.0 DESCRIPTION OF AFFECTED ENVIRONMENT

The following is a description of the existing environmental resources located within the project area, with emphasis on those natural resources that are capable of supporting listed threatened and endangered species which may occur within the action area.

Collier County consists of barrier islands and headland features. Typically, the waterward profile of these islands is composed of a sandy beach backed by vegetated dunes. Barrier islands along the southwest coast of Florida naturally migrate landward, and experience growth of spits from headlands, overwash, and breaching. (Johnson and Barbour, 1990). However, due to encroachment of condominiums and hotels, and interruptions in the shoreline caused by seawalls, artificially maintained inlets, and other coastal armoring, these natural processes can be

stunted. Dune formation is often limited and erosion of beaches occurs in many places, as seen in Collier County.

4.1 Dune Environment

Barrier islands are dynamic environments, with topographic and vegetation profiles dictated by the interaction of plant growth and physical processes such as wind-driven sand movement and salt spray, and wave-driven erosion and accretion (Johnson and Barbour, 1990). High temperatures, strong winds, and varying wet and dry conditions typical of a dune environment along south Florida's barrier island system provide unique conditions for plant species with specific adaptations. These specific adaptations include extensive root systems, allowing for prolific growth in unconsolidated beach sand. Sand dunes and vegetation that comprise the dune system are important recreational and wildlife habitat areas and provide coastline protection from storm surge. Dunes are important reservoirs for sand, replacing beach material lost through erosion. Dunes also provide important protection to the island from storms and hurricanes. However, the extent of dune habitat is limited in the project area due to the developed nature of Collier County's shoreline. Currently, narrow low dunes are present throughout the length of the island, interrupted in some places by seawalls. Although the proposed project does not include any fill placement on the existing dunes, widening the beach area fronting the dunes will offer additional protection and stabilization to the dune system.

4.2 Beach Environment

Eroded material from the dune system contributes to the dry beach located between the toe of dune, or scarp, and the mean high water (MHW) line. The dry beach area does not support much vegetation and is susceptible to wind and storm surge. However, this habitat type provides recreational areas for humans and nesting grounds for sea turtles and shorebirds. The intertidal zone, or wet beach, of oceanfront barrier island beaches is the area periodically exposed and submerged by waves, varying with frequency and with lunar tide cycles. These areas are comprised mainly of sandy bottoms and are influenced by tidal changes. This high energy area is habitat to many benthic and infaunal organisms and offers foraging grounds for birds and finfish.

Photograph 3. The beach in Collier County (7/3/12) after Tropical Storm Debby passed through the area.

The action area of this project includes approximately 13.5 km (8.5 mi) of shoreline and adjacent, non-project sections of the beach within Collier County. Beach habitat has been highly eroded in some places along Collier County (Photograph 3), and the project proposes widening and increasing the elevation of the existing low and narrow beach along the project segments. By widening the existing beach and stabilizing the eroded shoreline this

project will create and improve existing beach habitat, thereby improving recreation and wildlife areas such as sea turtle nesting habitat, and providing greater levels of storm protection for the island.

4.3 Subtidal Habitats

4.3.1 Softbottom Communities

Subtidal habitat within the project area includes sandy, unvegetated softbottom marine habitat. Submerged aquatic vegetation occurs near the project area, within adjacent passes and bays and can occasionally be found in small patches offshore; however, no seagrass resources have been observed within the project area based on FWC's Fish and Wildlife Research Institute 2006 surveys (the most recent survey data available) (Figure 3). Softbottom, subtidal habitats consisting of various percentages of sand, sand-gravel and shell comprise the dominant benthic habitat along both Florida coasts. The unvegetated, softbottom subtidal areas are important habitats for benthic organisms living on (epibenthos) or within (infauna) the sediment, providing for high species diversity. Spatial and temporal gradients (*i.e.* salinity, temperature, water quality and sediment type) affect both community composition and diversity. The fauna is typically dominated by polychaete worms, crustaceans, mollusks and insect larvae (Myers and Ewel, 1990). The benthos is an important element in the food web, providing food for wading birds, shorebirds (e.g. piping plovers and red knots) and fish (e.g. smalltooth sawfish).

Fill Area. Although softbottom infauna will be temporarily impacted by dredging activities and fill placement in the nearshore marine environment, recent studies of infauna and supralittoral megafauna in the region (Pinellas County, Florida) before and after beach nourishment show that the indicator species studied (*Emerita talpoida, Donax variabilis, Scolepis* spp., and *Ocypode quadrata*) remained unaffected and were able to recruit back to the area immediately after project construction (Cobbs and Arnold, 2008). Grain size, organic content, amount of fines, and amount of fill can play a key role in the assemblage of infauna, and changing these factors by placement of sands with different characteristics than those of the native substrate can affect how the infaunal community will recover (*i.e.*, a delay in recovery may occur or a different assemblage may recruit altogether) (Cobbs and Arnold, 2008; Irlandi and Arnold, 2008). Placement of fill containing higher silt/clay content than that of the natural inshore habitat was shown to delay recovery of infauna during a study conducted in Perdido Key, Florida (Rakocinski *et al.*, 1996). Time of year of fill placement can also affect the recovery of infaunal communities; recruitment is highest in the late spring-early summer and construction during this time can prevent or delay recovery (Peterson *et al.*, 2000). A study off of Delray Beach, Florida, showed colonization of a borrow pit within 21 days of dredging, and complete recovery within 296 days post-dredging (Bowen and Marsh, 1988). Various other studies have shown that benthic communities return to their pre-dredging abundance within one to several years (Saloman *et al.*, 1982; Zarillo *et al.*, 2008).

Dredge Area. Epibenthic softbottom communities have previously been sampled and described at four sites in the region, which included three previously permitted borrow sites (Longboat Key, the ship channel off Egmont Key, and Manasota Key site) and an undredged site (Sarasota) (Blake *et al.*, 1996). A total of 41 different taxa were observed during the study, indicating the low species richness and constancy of the dynamic sandy habitat in this area. Approximately 120

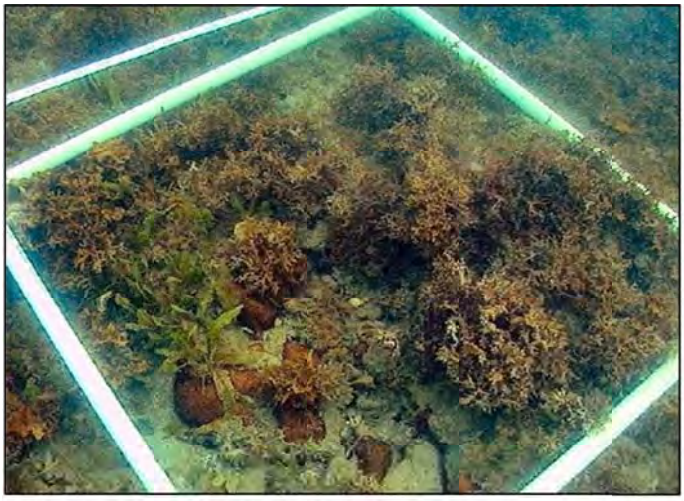
hours of underwater video was recorded over the study sites during which observations of flora and fauna were rare. Benthic infaunal communities were also sampled and described as part of the Blake *et al.* (1996) study, which revealed much higher taxonomic richness and abundances compared to the epibenthic community: 620 infaunal taxa were found compared to 41 epibenthic taxa. Annelids, mollusks, and arthropods contributed 44%, 22%, and 27% of the taxa, respectively. These three taxonomic groups represented 93% of the taxa and 89% of all fauna. Results indicated that three of the borrow sites studied supported a healthy, diverse infaunal community.

4.3.2 Hardbottom Habitat

Nearshore. The term "hardbottom" refers to areas of rock or consolidated sediments in temperate, subtropical, and tropical regions, generally located in the ocean rather than in the estuarine system. Hardbottom habitats provide food, shelter, spawning and nursery areas to a wide variety of fish, invertebrate and algal species.

In 2003, CPE conducted a sidescan sonar survey of the nearshore region of Collier County (R-17 to R-81). These surveys documented approximately 500 acres of nearshore hardbottom within 1,000 ft of the shoreline; however, the hardbottom resources that are within the ETOF for the proposed project have already been mitigated for by the 1.09-ac artificial reef that was built in conjunction with the 2006 project. Figure 3 presents the results of the sidescan sonar survey from 2009.

The hardbottom resources in the project area were monitored annually during pre- and post-construction of the 2006 renourishment project (2003-2009). Monitoring revealed a community dominated by turf and macroalgae species (Photograph 4). The macroalgae community primarily consisted of *Gracilaria, Hypnea, Caulerpa,* and *Botrycladia* species. *Jania* and *Sargassum* were also observed. Tunicates and sponges dominated the invertebrate community. Coral cover in the nearshore benthic community was generally less than 1%. *Leptogorgia* spp. was the primary octocoral species encountered; the stony coral community included *Siderastrea siderea, Solenastrea* spp., *Phyllangia americana, Oculina robusta,* and *Cladocora arbuscula*. The average size of stony coral colonies in the nearshore habitat is small (< 5cm).



Photograph 4. Benthic community on the nearshore natural hardbottom of Collier County.

As previously mentioned, Collier County constructed 1.09 ac of artificial reef as required mitigation for anticipated impacts to 1.09 ac of the nearshore natural hardbottom described above. These installations were monitored simultaneously with the nearshore hardbottom in conjunction with the 2006 renourishment.

Offshore. No hardbottom resources were identified during surveys completed to locate sand resources in the area now identified as borrow area T1. A buffer of 400 ft was established between the survey area boundary and the borrow area dredge limits to ensure that any potentially unidentified hardbottom resources would not be impacted.

Notes:

1. Coordinates are in feet based on the Florida State Plane Coordinate System, East Zone, North American Datum of 1983 (NAD 83).
2. The 2010 background image is from the United States Department of Agriculture National Agriculture Imagery Program.
3. R-32 to R-37 was part of the 2006 project but will not be nourished this time.

Legend:

FDEP Monuments

2012 Proposed Design

Construction Template

Equilibrium Toe of Fill

CPE August 2009 SSS Hardbottom Edge

2006 Fish and Wildlife Research Institute Seagrass

Continuous

Discontinuous

N

Feet

0 500 1,000

1 inch = 1,000 feet

TITLE:

Project Limits and Nearshore Natural Resources Collier County Beach Renourishment Project Collier County, Florida

COASTAL PLANNING & ENGINEERING, INC.
A SHAW GROUP COMPANY
2481 N. W. BOCA RATON BOULEVARD
BOCA RATON, FL 33431
PH. (561) 391-8102
FAX (561) 391 9116

Date: 10/29/12	By: HMV	Comm No. : 146925	**Figure No.: 3a**

G:\Enterprise\Collier\146925 2013-14 Beach Renourishment\Mxd\Seagrass Map 1.mxd

G:\Enterprise\Collier\146925 2013-14 Beach Renourishment\Mxd\Seagrass Map 2.mxd

Notes:

1. Coordinates are in feet based on the Florida State Plane Coordinate System, East Zone, North American Datum of 1983 (NAD 83).
2. The 2010 background image is from the United States Department of Agriculture National Agriculture Imagery Program.

Legend:

FDEP Monuments

2012 Proposed Design

Construction Template

Equilibrium Toe of Fill

CPE August 2009 SSS Hardbottom Edge

2006 Fish and Wildlife Research Institute Seagrass

Discontinuous

N

Feet

0 500 1,000

1 inch = 1,000 feet

TITLE: **Project Limits and Nearshore Natural Resources Collier County Beach Renourishment Project Collier County, Florida**

COASTAL PLANNING & ENGINEERING, INC.
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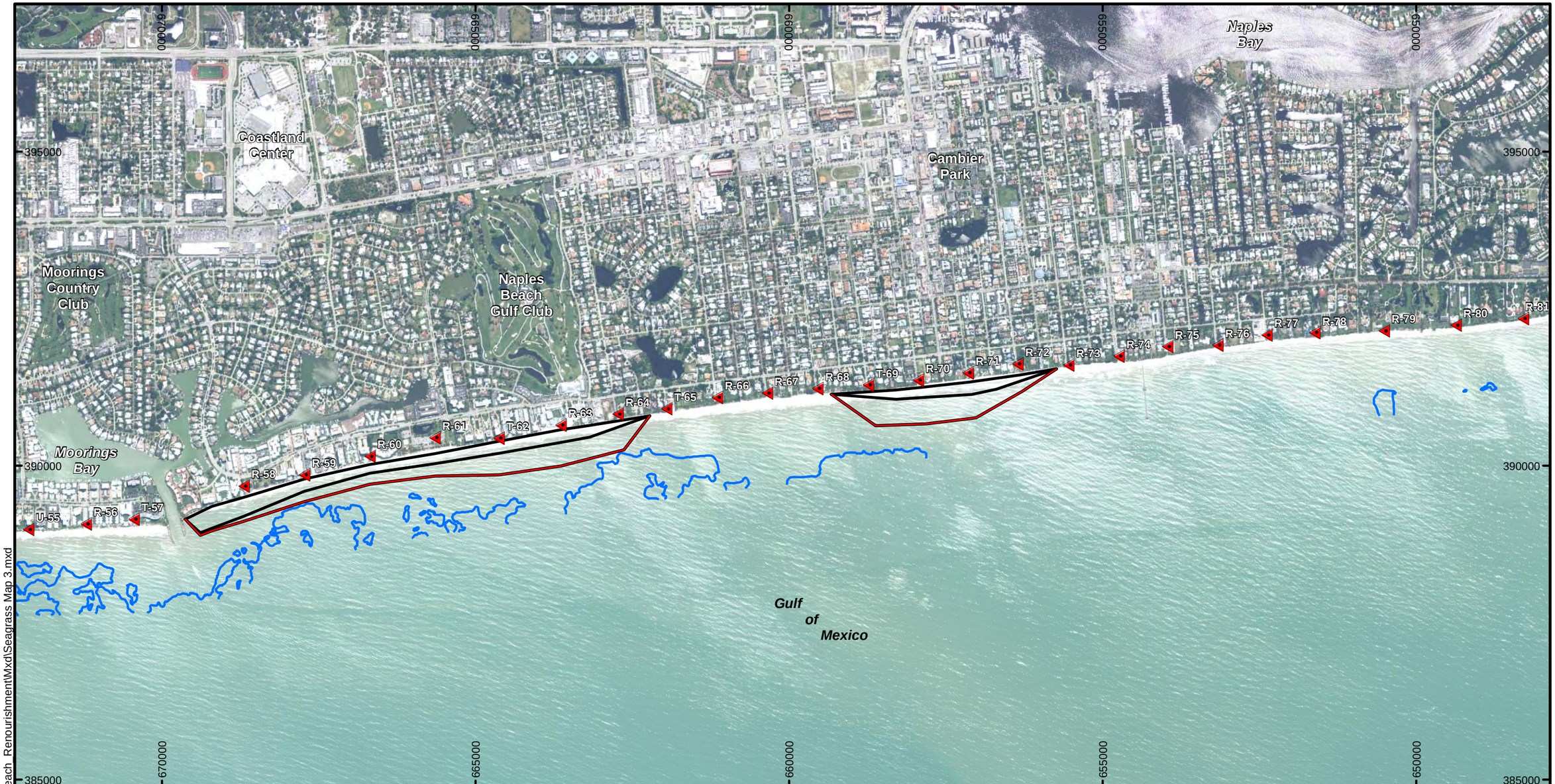
Date: 10/29/12	By: HMV	Comm No. : 146925	**Figure No.: 3b**



Notes:

1. Coordinates are in feet based on the Florida State Plane Coordinate System, East Zone, North American Datum of 1983 (NAD 83).
2. The 2010 background image is from the United States Department of Agriculture National Agriculture Imagery Program.

Legend:

FDEP Monuments

CPE August 2009 SSS Hardbottom Edge

2012 Proposed Design

Construction Template

Equilibrium Toe of Fill

N

Feet

0 800 1,600

1 inch = 1,600 feet

TITLE: **Project Limits and Nearshore Natural Resources Collier County Beach Renourishment Project Collier County, FL**

COASTAL PLANNING & ENGINEERING, INC.
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Date: 07/26/12	By: HMV	Comm No. : 146925	**Figure No.: 3c**

G:\Enterprise\Collier\146925 2013-14 Beach Renourishment\Mxd\Seagrass Map 3.mxd

5.0 DESCRIPTION OF SPECIES BIOLOGY

Table 3 provides all federally listed threatened and endangered species that have the potential to occur within the region based on each species' distribution and habitat preference, as determined by NMFS Southeast Regional Office and USFWS. There is no critical habitat designated for any of the listed species present in the project area. This section describes the basic biology of these species; specific information on the baseline condition of these species within the project area is provided in Section 6.0.

Table 3. Federally listed species in the Gulf of Mexico designated as Threatened (T), Endangered (E), or Candidate (C) by U.S. Fish & Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS).

Common Name	Scientific Name	USFWS/NMFS
SEA TURTLES		
Loggerhead	*Caretta caretta*	T[1]
Green	*Chelonia mydas*	E[2]
Leatherback	*Dermochelys coriacea*	E
Hawksbill	*Eretmochelys imbricata*	E
Kemp's ridley	*Lepidochelys kempii*	E
FISH		
Smalltooth sawfish	*Pristis pectinata*	E
MAMMALS		
Sei whale	*Balaenoptera borealis*	E
Fin whale	*Balaenoptera physalus*	E
North Atlantic right whale	*Eubalaena glacialis*	E
Humpback whale	*Megaptera novaeangliae*	E
Sperm whale	*Physeter macrocephalus*	E
Blue whale	*Balaenoptera musculus*	E
Florida manatee	*Trichechus manatus latirostris*	E
BIRDS		
Piping plover	*Charadrius melodus*	T/E[3]
Red knot	*Calidris canutus*	C[4]

[1]Northwest Atlantic Ocean (NWA) distinct population segment (DPS). On September 22, 2011, NMFS and USFWS issued a final rule changing the listing of loggerhead sea turtles from a single threatened species to nine distinct population segments (DPSs) listed as either threatened or endangered (FR 76 58868). The NWA DPS was listed as threatened.
[2]Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered.
[3]Piping plovers are listed as threatened, except for the Great Lakes population which is listed as endangered; Florida provides overwintering habitat for both threatened and endangered populations.
[4]Candidate species are those that are actively being considered for listing as endangered or threatened under the ESA, as well as species which NMFS and/or USFWS has initiated ESA status review.

Three additional listed species can be found in the Gulf of Mexico which are known not to occur in or near the project area: staghorn coral (*Acropora cervicornis*), elkhorn coral (*Acropora palmata*) and Gulf sturgeon (*Acipenser oxyrinchus desotoi*). Both staghorn and elkhorn coral are found throughout the Florida Keys, the Bahamas, the Caribbean islands, and Venezuela (NMFS, 2010). NMFS designated critical habitat for staghorn and elkhorn corals in areas of Florida,

Puerto Rico, St. John, St. Thomas, and St. Croix (73 FR 72210). Critical habitat in Florida extends from Palm Beach County to Key West which also includes the Dry Tortugas; this critical habitat does not include the Gulf coast of Florida. Staghorn coral and elkhorn coral have never been observed during surveys of Collier County's nearshore hardbottom habitat; therefore, these coral species are not expected to be impacted by the proposed project. The current range of Gulf sturgeon extends from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi respectively, east to the Suwannee River in Florida (USFWS and NMFS, 2009). Gulf sturgeon are not likely to occur south of Tampa Bay, and are thus not expected to be impacted by project related activities. Due to the fact that they are not found in the project area, it has been determined that the proposed action will have "No effect" on staghorn coral, elkhorn coral or Gulf sturgeon, therefore these species will not be evaluated further in this document.

5.1 Sea Turtles

Table 3 lists five federally listed sea turtle species that may be found in the coastal waters of the Florida Gulf coast: the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*) sea turtles. Sea turtles are protected under the U.S. Endangered Species Act of 1973, the Marine Turtle Protection Act Chapter 370.12 (Florida Administration Code), Collier County's Land Development Code (ordinance 05-01) under Protection of Endangered, Threatened or Listed Species (3.04.00B), and Section 114-101 Marine Turtle Protection Regulations under the City of Naples Code of Ordinances (05-10814).

5.1.1 Loggerhead Sea Turtle

The loggerhead sea turtle was first listed under the ESA as threatened throughout its range on July 28, 1978. On September 22, 2011, NMFS and U.S. Fish and Wildlife Service listed nine distinct population segments (DPS) of loggerhead sea turtles under the ESA; the population in the project area is the Northwest Atlantic Ocean DPS. Critical habitat has not been designated for the loggerhead sea turtle.

Loggerhead sea turtles inhabit the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Loggerhead sea turtles nest on coasts within the continental U.S. from Louisiana to Virginia. Adults and sub-adults have a large, reddish-brown carapace. Scales on the top and sides of the head and on top of the flippers are also reddish-brown, but have yellow borders. The neck, shoulders, and limb bases are dull brown on top and medium yellow on the sides and bottom. The plastron is also medium yellow. Adult average size is 91 cm (36 in) straight carapace length; average weight is 115 kg (253 lbs). The relative size of a loggerhead's head, when compared to the rest of its body, is substantially larger than other sea turtle species (NMFS and USFWS, 1991; NMFS, 2010).

The loggerhead is the most abundant sea turtle occurring in U.S. waters. Along the Gulf coast, the turtle's range extends from southern Florida to southern Texas. Aerial survey data has estimated that only 12% of all western North Atlantic loggerheads reside in the eastern Gulf of Mexico, with the majority of this population occurring off the coast of western Florida. Major nesting concentrations in the U.S. are found on the coastal islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf coasts of Florida. Loggerhead incubation

ranges from about 45 to 95 days (NMFS and USFWS, 1991; NMFS, 2010).

5.1.2 Green Sea Turtle

The green sea turtle was federally listed as a protected species on July 28, 1978 (43 FR 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. Critical habitat for the green sea turtle was designated in 1998 for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys (63 FR 46693). There is no critical habitat for the green sea turtle within the project area.

Adults commonly reach a carapace length of 101 cm (40 in) and 150 kg (330 lbs) in mass. Colorization of the adult carapace ranges from solid black to gray, yellow, green, and brown in various patterns; the plastron is a lighter yellow to white. Hatchlings are distinctively black on the dorsal carapace and white on the ventral plastron. The green turtle has a worldwide distribution in tropical and subtropical waters. Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties. Nesting has also been documented along the Gulf Coast of Florida on Santa Rosa Island (Okaloosa and Escambia Counties) and from Pinellas County through Collier County (FWRI, 2012a). Green sea turtle incubation ranges from about 45 to 75 days.

5.1.3 Leatherback Sea Turtle

The leatherback sea turtle was listed as an endangered species on June 2, 1970 (35 FR 8491) and nests on shores of the Atlantic, Pacific, and Indian Oceans. Critical habitat for the leatherback sea turtle has been designated as waters adjacent to Sandy Point on Saint Croix, U.S. Virgin Islands (44 FR 17710). There is no critical habitat for the leatherback sea turtle within the project area.

The carapace is distinguished by a rubber-like texture, about 4 cm (1.6 in) thick, and made primarily of tough, oil-saturated connective tissue. No sharp angle is formed between the carapace and the plastron, resulting in the animal being somewhat barrel-shaped. The average curved carapace length for adult turtles is 155 cm (61 in) and weight ranges from 200 kg to 699 kg (440 to 1,543 lbs). Non-breeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard, 1997). Nesting grounds are distributed worldwide, with the Pacific Coast of Mexico supporting the world's largest known concentration of nesting leatherbacks. The largest nesting colony in the wider Caribbean region is found in French Guiana, but nesting occurs frequently, although in lesser numbers, from Costa Rica to Columbia and in Guyana, Surinam, and Trinidad.

The leatherback regularly nests in the U.S. in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia. Leatherback turtles have been known to nest in Georgia, South Carolina, and North Carolina, but only on rare occasions. Leatherback nesting also has been reported on the northwest coast of Florida (FWRI, 2012a). The incubation period for leatherback sea turtles ranges from about 55 to 75 days.

5.1.4 Hawksbill Sea Turtle

The hawksbill sea turtle was listed as an endangered species on June 2, 1970 (35 FR 8491). Critical habitat for the hawksbill sea turtle has been designated for selected beaches and/or waters of Mona and Monito Islands, Puerto Rico (63 FR 46693). There is no critical habitat for the hawksbill sea turtle within the project area.

One of the smallest sea turtles of the Gulf of Mexico, weighing only 43 to 75 kg (95 to 165 lbs) as an adult and ranging in size from approximately 63.5 to 94 cm (25 to 37 in) straight carapace length, hawksbills have a hawk-like beak, posteriorly overlapping carapace scutes, and two pairs of claws on their flippers (NMFS and USFWS, 1993). The hawksbill is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean.

In contrast to all other sea turtle species, hawksbills nest in low densities on scattered small beaches. The most important hawksbill nesting beaches in the Caribbean occur along the Yucatán Peninsula of Mexico. Several Yucatán beaches account for 25 to 30 percent of all hawksbill nesting in the Caribbean. The Gulf and Caribbean coasts of the Yucatán Peninsula, Mexico, where hawksbills nest on long expanses of beach in densities of 20 to 30 nests/km, are exceptions (USFWS, 2012). Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Miami-Dade Counties) and to the Florida Keys in Monroe County, Florida. In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NMFS and USFWS, 1993). Incubation for hawksbill sea turtles lasts for about 60 days.

5.1.5 Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was listed as endangered on December 2, 1970, and internationally, the Kemp's ridley is considered the most endangered sea turtle (NMFS and USFWS, 1992; TEWG, 2000). Critical habitat has not been designated for the Kemp's ridley sea turtle. On February 17, 2010, NMFS and USFWS were jointly petitioned to designate critical habitat for Kemp's ridley sea turtles for nesting beaches along the Texas coast and marine habitats in the Gulf of Mexico and Atlantic Ocean. The agencies are currently reviewing the petition.

The smallest living sea turtle, the Kemp's ridley has a straight carapace length around 65 cm (25.6 in), with the adult's shell almost as wide as it is long. The dorsal carapace is round to heart-shaped and distinctly light gray. The range of the Kemp's ridley includes the Gulf coasts of Mexico and the U.S., and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland. As juveniles, Kemp's ridley turtles feed primarily on crabs, clams, mussels and shrimp and are most commonly found in productive coastal and estuarine areas. Adults of this species are usually confined to the Gulf of Mexico, although adult-sized individuals sometimes are found on the east coast of the U.S. (NMFS and USFWS, 1992).

Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a very small number of Kemp's ridleys nest consistently at Padre Island National Seashore, Texas (USFWS, 2012). In 1966, conservation efforts for the Kemp's ridley were initiated on the beach near Rancho Nuevo in Tamaulipas, Mexico. This locale is the only place in the world where large nesting aggregations of this sea turtle are known to occur

(USFWS, 2012). The incubation period for the Kemp's ridley sea turtle ranges from 45 to 70 days. Hatchlings, after leaving the nesting beach, are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 20 cm (8 in) in length, at which size they enter coastal shallow water habitats.

5.2 Smalltooth Sawfish

NMFS listed the U.S. distinct population segment (DPS) of smalltooth sawfish (*Pristis pectinata*) as endangered on April 1, 2003 (NMFS, 2009). In September 2009, NMFS designated critical habitat for the U.S. distinct population segment (DPS) of smalltooth sawfish (74FR 45353). The critical habitat consists of two units: the Charlotte Harbor Estuary Unit and the Ten Thousand Islands/Everglades Unit for a total of 840,472 ac. The two units are located along the southwestern coast of Florida between Charlotte Harbor and Florida Bay (Figure 4). The project area is located approximately four miles south of the Charlotte Harbor Estuary Unit and 16 miles north of the Ten Thousand Islands/Everglades Unit; no smalltooth sawfish critical habitat is located within the project area.

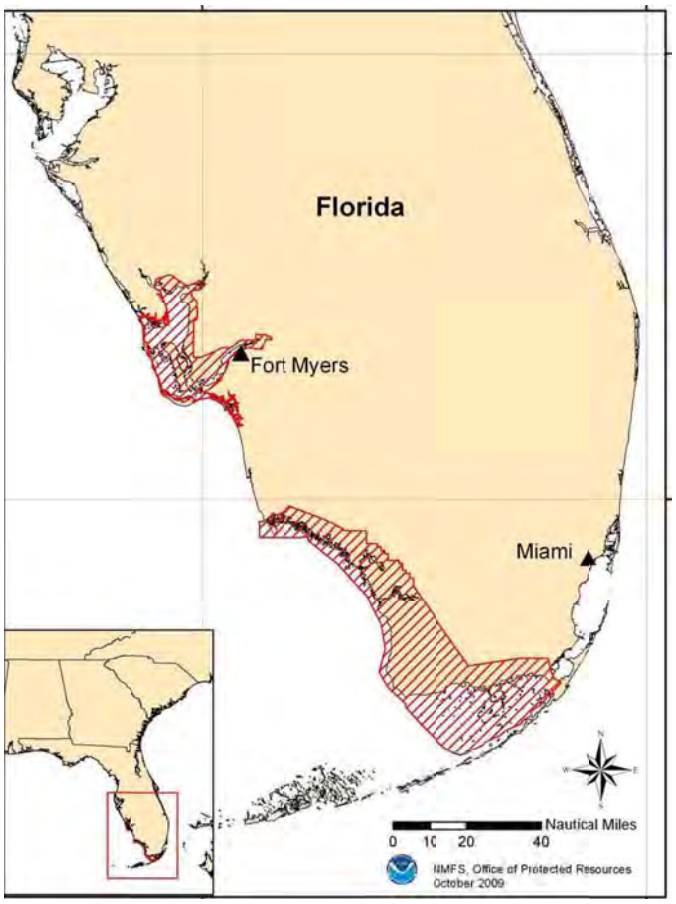

Figure 4. Designated smalltooth sawfish critical habitat (NMFS).

The smalltooth sawfish belongs to a group of fish called elasmobranchs, whose skeletons are made of cartilage and are actually modified rays with a shark-like body and gill slits on their

ventral side. As the name implies, they have saw-like snouts edged with pairs of teeth used to locate, stun and kill prey. The rostrum is about one quarter the total length of an adult specimen. They commonly reach 5.5 m (18 ft) in length and may grow up to 7.6 m (25 ft). (NMFS, 2009; 2012). Sawfish feed on crabs, shrimp, and other bottom dwelling animals along with any locally abundant small schooling fishes such as small mullet or members of the herring family (FWRI, 2012b).

Smalltooth sawfish are tropical marine and estuarine fish with a circumtropical distribution. The northwestern terminus of their Atlantic range is in the waters of the eastern U.S. They were once widespread throughout Florida and commonly encountered from Texas to North Carolina but currently, they can only be found with any regularity in south Florida between the Caloosahatchee River and the Florida Keys. In the U.S., smalltooth sawfish distribution is centered in the Ten Thousand Islands and Florida Bay region of Everglades National Park (Carlson *et al.*, 2007).

Based on the contraction in range and anecdotal data, it is likely that the population is currently at a level less than 5% of its size at the time of European settlement (NMFS, 2009). This decline has been attributed to commercial and recreational fishing, loss of habitat and a vulnerable life history (Simpfendorfer, 2002). The literature indicates that sawfish less than 10 ft in length are most common in shallow coastal waters with a depth less than 10 m (32 ft). Very small juveniles (< 1 m) are generally found in sand and mud banks (< 0.3 m water depth), whereas small juveniles (1-2 m) utilize similar habitat but are common in slightly deeper water (mostly less than 1 m). Larger sawfish (greater than 3 m) regularly occur at depths greater than 10 m (32 ft) and have been found as deep as 122 m (400 ft) (Poulakis and Seitz, 2004; Simpfendorfer and Wiley, 2005). Red mangrove root systems and shallow (< 1 m) euryhaline habitat appear to be especially important for juvenile sawfish and are potentially important in helping them avoid predation (Simpfendorfer, 2003).

Smalltooth sawfish were once caught as bycatch in commercial and recreational fisheries throughout their historic range but this is now rare due to population declines and population extirpations. Between 1990 and 1999, there were four documented takes of smalltooth sawfish in shrimp trawls in Florida (Simpendorfer, 2000). The U.S. Distinct Population Segment of smalltooth sawfish was listed as endangered under the ESA on April 1, 2003 (68 FR 15680) becoming the first elasmobranch on the Endangered Species List.

5.3 Marine Mammals

Table 3 lists six ESA-listed whale species that may be found in the coastal waters of the Florida Gulf coast. The sei whale (*Balaenoptera borealis*), fin whale (*Balaenoptera physalus*), North Atlantic right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), and blue whale (*Balaenoptera musculus*) were listed as endangered under the Endangered Species Conservation Act, the precursor to the ESA, in June 1970. These species were subsequently listed as endangered under the ESA in 1973, and are also protected under the Marine Mammal Protection Act (MMPA) of 1972 which prohibits the "taking" (harassing, hunting, capturing, or killing) of marine mammals. Although not listed by NMFS Southeast Regional Office as likely to occur in the Gulf of Mexico, right whales have

been sighted offshore of Sanibel Island (Staats, 2006), less than 30 miles north of the project area. Of the six whale species listed in Table 3, only the right whale has designated critical habitat, described in Section 5.3.3.

The Florida manatee (*Trichechus manatus latirostris*) is also an ESA-listed endangered marine mammal. Manatees were first listed as endangered under the Federal Endangered Species Preservation Act of 1966, later superseded by the 1969 Endangered Species Conservation Act. In 1973, manatees were listed under the ESA. They are also protected under the MMPA of 1972. Designated critical habitat for the Florida manatee is described in Section 5.3.7.

5.3.1 Sei Whale

Sei whales are members of the baleen whale family and considered one of the "great whales" or rorquals. They are very similar in external appearance to fin and Bryde's whales, both of which also have a prominent falcate dorsal fin. All three have typical rorqual body shapes. In both sei and Bryde's whales (Bryde's whales are not listed under the ESA), the dorsal fin rises at a steep angle from the back. Sei whales have only a single prominent longitudinal ridge on the rostrum and a slightly arched rostrum with a downturned tip. Bryde's and sei whales prove difficult to distinguish at sea unless the head can be seen at close range. Adults grow up to 18 m (59 ft) in length, although 15 m (49 ft) is an average adult length. Large adults can weigh up to 30 tons (27, 215 kg; 60,000 lbs). At birth, sei whales are 4.5-4.8 m (14.7-15.7 ft) long. Sei whales have the most diverse diet of any baleen whale, eating up to 1 ton (907 kg) of food per day, including small fish, krill, and copepods. The life span of a sei whale is likely greater than 50 years (NMFS, 2012).

The sei whale is one of the least well-studied of the "great whales". Hence little is known about the distribution or current population status for most stocks. They are believed to undertake seasonal north/south migrations, spending the summer on feeding grounds in the higher latitudes and winter in lower latitudes where they most likely breed or calve. During the summer, it is thought that a large segment of the western North Atlantic population is centered in northern waters, such as the Scotian Shelf (Mitchell and Chapman, 1977). Though they are not commonly found in the waters of the U.S. Atlantic, their southern range during the spring and summer includes the northern areas of the U.S. Atlantic Exclusive Economic Zone (EEZ) (i.e., Gulf of Maine and Georges Bank). Documented strandings along the northern Gulf of Mexico and in the Greater Antilles indicate those areas to be the southernmost range for this population (Mead, 1977). Sei whales may be found in one area for a while and then not return for years or decades. This behavior is unusual for rorquals, which generally have a predictable distribution. Sei whales usually live and travel by themselves or in small groups of only two to three whales. If there is abundant food in a particular area, larger groups will come together to feed. Up to 100 sei whales have been observed together, but this is an uncommon event (NMFS, 2012).

5.3.2 Fin Whale

Fin whales (also called "Finback" whales), the second-largest whale species, have been under the full protection of the International Whaling Commission (IWC) since 1966 and have been classified as endangered under precursors to the ESA since 1970. The fin whale is long, sleek, and streamlined, with a V-shaped head that is flat on top. A single ridge extends from the blowhole to the tip of the rostrum (upper jaw). There is a series of 50-100 pleats or grooves on

the underside of the body extending from under the lower jaw to the navel (Jefferson *et al.*, 1993). The basic body color of the fin whale is dark gray dorsally and white ventrally with a complex pigmentation pattern. The lower jaw is gray or black on the left side and creamy white on the right side. Fin whales show slight sexual dimorphism, with females measuring longer than males by 5-10%. The largest fin whale caught in the Northern Hemisphere was a 24.7 m (81 ft) female and a 22.9 m (75 ft) male during 1919-1926 (Clapham *et al.*, 1997).

Fin whales reach sexual maturity at about 6-10 years of age (ACS, 2004; NMFS, 2006). Gestation is 12 months, and calves are born at intervals of three to four years. Length at birth ranges from 5.5-6.5 m (14-20 ft) and weight is approximately 2 tons (1,814 kg). Calves nurse for 6-8 months and are weaned when they reach 10-12 m (30-40 ft) in length.

Fin whale aggregation areas in the Northern Hemisphere include the eastern North Pacific Ocean (from the Chukchi Sea, around the coast of Alaska, south to Baja California), the western North Pacific Ocean (from the Philippine Sea, East China Sea, Yellow Sea, Sea of Japan, Bering Sea and Sea of Okhotsk), the western North Atlantic Ocean (from Cape Hatteras, Canada, Newfoundland and Cape Cod, in the north, to the Gulf of Mexico, Florida and the Greater Antilles, in the south) and the eastern North Atlantic Ocean (Norway, Iceland, Jan Mayen and the Spitsbergen Archipelago, in the north, to the Straits of Gibraltar in the south) (Gambell, 1985). During the Northern Hemisphere summer (June - August), fin whales are concentrated between the shore and the 1800-m bathymetric contour from 41° N to 57° N (Gambell, 1985). There is no stock information regarding fin whale occurrence or abundance within the Gulf of Mexico.

5.3.3 North Atlantic Right Whale

North Atlantic right whales (also referred to as “northern right whales” or “right whales”) are large, rotund, black whales with large heads, long rostrums, and no dorsal fins. They can grow up to 16.2 m (53 ft) long. They are baleen whales, eating mostly small crustaceans including copepods and euphausiids (Caldwell and Caldwell, 1983). Right whales reach sexual maturity around eight years old. Gestation lasts approximately 13 months and calves are born every three to five years. Calves have the ability to swim when born. A mother and her calf form a very close bond, with the calf spending most of its time swimming close to its mother, being carried in the mother's "slip stream" or wake. There are estimated to be about 300-400 remaining individuals in the western North Atlantic Ocean and due to the slow reproduction rates, the population is biologically incapable of rapid increase (NMFS, 2012). Every death is therefore detrimental to the species’ survival.

The right whale primarily occurs in coastal or shelf waters. Individuals in the western North Atlantic population range from winter-calving and nursery areas in coastal waters off the southeastern U.S. to summer feeding grounds in New England waters and north to the Bay of Fundy and Scotian Shelf (NMFS, 2005). Migrations south to the calving grounds occur by pregnant females during mid-November. In the late winter and early spring, right whales leave the southeast waters and travel north to a feeding and nursery area in Cape Cod Bay, Massachusetts.

Critical habitat for the North Atlantic right whale was designated in 1994, and includes portions of Cape Cod Bay and Stellwagen Bank, the Great South Channel (each off the coast of

Massachusetts), and waters adjacent to the coasts of Georgia and the east coast of Florida (59 FR 28805). Designated critical habitat in Southeastern U.S. is located between 31°15N (approximately the mouth of the Altamaha River, Georgia) and 30°15N (approximately Jacksonville, Florida) from the coast out to 15 nautical miles (nm) offshore, and within coastal waters out to 5 nm between 30°15N and 28°00N (approximately Sebastian Inlet, Florida). NMFS designated these areas as essential for the reproduction, rest and refuge, health, continued survival, conservation and recovery of the northern right whale population. There is no critical habitat located in the vicinity of the project area.

As recently as February 28, 2006, mother and calf right whales (Photograph 5) were sighted offshore of Sanibel Island, which is located on less than 30 miles north of the Collier County project area. The same individuals were spotted the day before offshore of Bradenton Beach in Sarasota County and offshore Texas in January, identified by a boomerang marking on the mother's tail fluke, (Staats, 2006). Prior to the 2006 observations, a pair of right whales was seen about a mile and a half off of Panama City (MSNBC, 2004), a dead calf stranded in Texas in winter in the 1970s, and one individual was observed off of LBK in 1963 (Jefferson and Schiro, 1997). NMFS maintains that the few published records from GOM waters represent either distributional anomalies, normal wanderings, or a more extensive range beyond the sole known calving and wintering ground in the southeastern U.S. and that there is no resident stock in the GOM (NMFS, 2009a).

Photograph 5. Mother and calf North Atlantic right whales spotted off Sanibel Island in 2006.

5.3.4 Humpback Whale

The humpback whale has been federally listed as endangered throughout its range under the precursor to the ESA since June 2, 1970. One of the larger rorqual species, adult humpbacks range in length from 12–16 m (40–50 ft) and weigh approximately 36,000 kg (40 tons). The humpback has a distinctive body shape, with unusually long pectoral fins (up to 5 m or about 1/3 total body length) and a knobby head. The maximum size of a humpback whale recorded is 18 m (59 ft). Calves are born in tropic and subtropical waters and nurse for about 5 months (Winn and Reichley, 1985). At birth, they are between 4 and 5 m long and weigh between 1,300 and 1,400 kg. Humpbacks are acrobatic animals, often breaching and slapping the water. Males produce a complex whale song, which lasts for up to 30 minutes and is repeated for hours at a time during courtship. (NMFS, 1991).

Found in oceans and seas around the world, though less common in arctic waters, humpback whales typically migrate up to 25,000 km (15,500 miles) each year. Humpbacks feed only in summer, in polar waters, and migrate to tropical or sub-tropical waters to breed and give birth in

the winter when they fast and live off fat reserves. Many summer habitats are apparently traditional feeding grounds, with long records of returns by identified individuals. The species' diet consists mostly of krill and small fish. They utilize diverse feeding methods, including the unique bubble net fishing technique. While on their wintering grounds, humpback whales can be found over shallow bars and shelf waters. Principal wintering grounds are located in the West Indies. In particular, protected breeding grounds for the humpback whale include portions of the Virgin Islands and Puerto Rico (NMFS, 1991).

5.3.5 Sperm Whale

Sperm whales have been classified as endangered in their entire range since 1970. Sperm whales are the largest toothed whale species with adult males measuring as much as 18 m (59 ft) in length. The skin is dark brown to dark grey in color and appears to be wrinkly or scarred posterior of the head. The head, well known for its distinct shape, is over a third of the total body length of the animal. Although the triangular tail fluke is broad and powerful, the flippers appear to be short and stubby, and the dorsal fin is a low, rounded hump with a series of bumps on the dorsal ridge of the tailstock (Jefferson *et al.*, 1993; NMFS, 2006a). The core units of sperm whales are made up of up to a dozen related and unrelated females, accompanied by their female and young male offspring. Males start leaving these family groups at about six years of age to live in ‘bachelor schools’. During breeding prime and old age, male sperm whales are essentially solitary. (NMFS, 2006a).

Sperm whales are found in all of the world's oceans, except for the Arctic region. In U.S. waters, they may be found from California and Hawaii north to the Bering Sea, and from Maine to the Gulf of Mexico. The North Atlantic Population is divided into two management units: a western North Atlantic stock and a northern Gulf of Mexico stock. In the northern Gulf of Mexico, the sperm whale is the most common large cetacean. NMFS (2006a) reported an estimate of 1,349 individuals in the northern Gulf of Mexico based on vessel surveys conducted between 1996 and 2001.

Sperm whales tend to prefer deep waters and occur in the greatest density along the edge of continental shelves in water depths of 914 m (3,000 ft) to 1,829 m (6,000 ft) or farther out to sea. They are especially common near the Mississippi Canyon where they reside year-round (NMFS, 2006a). When in open waters, they may dive for periods of more than one hour at depths of up to 2,438 m (8,000 ft) (Waring *et al.*, 1993; Rice, 1998). No published observations of sperm whales were identified near Collier County.

5.3.6 Blue Whale

The blue whale is the largest species of baleen whale; adults in the Antarctic have reached a maximum body length of about 33 m (108 ft) and can weigh more than 150,000 kg (165 tons). Blue whales are long-bodied and slender. They have a mottled gray color pattern which appears light blue when seen through the water. The background color can be dark gray, interrupted by irregular light gray markings, with dark gray splotches (NMFS, 1998). Sexual maturity is achieved between 5 and 15 years of age, and some individuals live longer than 50 years (Yochem and Leatherwood, 1985). Gestation lasts 10-12 months and calves are nursed for 6-7 months. Calves are born approximately every two to three years. Mother and calf form a very close bond, with the calf often swimming close to its mother.

Blue whale distribution is largely governed by food requirements; thus populations are seasonally migratory. Poleward movements in spring allow these whales to take advantage of high zooplankton production in summer. Movement toward the subtropics in the fall allows blue whales to reduce their energy expenditure while fasting, avoid ice entrapment in some areas, and engage in mating activities in warmer waters of lower latitudes (NMFS, 1998).

There are three geographical populations of blue whales: the Antarctic stock (endangered), the North Pacific stock (low risk, conservation dependent), and the North Atlantic stock (vulnerable). The range of the North Atlantic stock extends from the subtropics north to Baffin Bay and the Greenland Sea (NMFS, 1998). There have been occasional sightings off Cape Cod, Massachusetts; this area may represent the southern limit of the blue whales' feeding range. Their distribution in southern waters remains largely unknown (Yochem and Leatherwood, 1985).

Although the species may be found in coastal waters, blue whales are thought to occur generally more offshore than northern right whales and humpback whales (NMFS, 2012). The two documented records (pre-1970) of blue whale strandings in the Gulf of Mexico suggest that this species may occasionally stray into the area, but they are less common in these waters (NMFS, 1998; 2012). One blue whale stranded near Sabine Pass, Louisiana in 1924 and one stranded on the Texas coast in 1940 (Bradley, 1997). There have been no recorded observations of blue whales in the Gulf of Mexico since 1970.

5.3.7 Florida Manatee

The Florida manatee (*Trichechus manatus latirostris*) is a subspecies of the West Indian manatee (*Trichechus manatus*) and is listed as a federally endangered marine mammal. Manatees were first listed as endangered in 1967 under the Federal Endangered Species Preservation Act of 1966, later superseded by the 1969 Endangered Species Conservation Act. In 1973 manatees were listed under the ESA.

The average size of an adult manatee is 3 m (10 ft), weighing approximately 998 kg (2,200 lbs). They are commonly referred to as "sea cows." The coloring of the manatee is grayish brown which contributes to the difficulty in detecting manatees in silt-laden waters. This mammal can be found in shallow waters (1.5-6.1 m/ 5-20 ft) of varying salinity levels including coastal bays, lagoons, estuaries and inland river systems. Manatees primarily feed on aquatic vegetation, but can be found feeding on fish, consuming four to nine percent of their body weight in a single day (Schwartz, 1995; USFWS, 2001). Sheltered areas such as bays, sounds, coves and canals are important for resting, feeding and reproductive activities (Humphrey, 1992).

The Florida manatee can be found occupying the coastal, estuarine and some riverine habitats throughout the southeastern U.S. During the winter months, the entire U.S. population typically moves to the waters surrounding Florida (Humphrey, 1992) and are generally restricted to the inland and coastal waters of peninsular Florida during the winter (USFWS, 2009). Although there are four USFWS manatee management areas in Florida, the Florida population is considered part of the same stock; the project area is within the Southwest management unit.

Critical habitat for the West Indian manatee was designated on September 24, 1976 (41

FR41914). Critical habitat for the Florida manatee as defined in the Code of Federal Regulations 50 Parts 1 to 199, revised as of October 1, 2000, includes "all U.S. territorial waters adjoining the coast and islands and all connected bays, estuaries, and rivers from Gordon's Pass, near Naples, Collier County" south (Figure 5). The majority of Collier County's shoreline is in designated manatee critical habitat, and although the project area does not fall within these confines, critical habitat is less than 2 miles to the south. The project area is within the known range of the manatee; therefore, it is possible that manatees may be present in or near the borrow areas, the fill area, and the pipeline corridors during construction. However, it is very unlikely that a manatee would be observed near the offshore borrow area T1 located in federal waters due to the distance from shore. FWC standard manatee conditions for in-water work are implemented during project activities in order to eliminate any impacts to manatees. These conditions include idle speed/no wake of all project vessels and immediate shut down of all in-water activities when a manatee is within 50 ft of project activities.

Figure 5. Designated Florida manatee critical habitat (USFWS).

5.4 Birds

Although several state-listed shorebirds and waterfowl are present along the Gulf Coast of

Florida and can be found within the project area, the only federally listed bird species that occur within the project area are the piping plover (*Charadrius melodus*) and the candidate species, the red knot (*Calidris canutus*).

5.4.1 Piping Plover

Piping plovers are small, migratory shorebirds that breed in only three geographic regions of North America: on sandy beaches along the Atlantic Ocean, on sandy shorelines throughout the Great Lakes region, and on the river-bank systems and prairie wetlands of the Northern Great Plains (Haig, 1992). The Great Lakes population is listed as endangered under the ESA, whereas the Atlantic Coast and Great Plains populations are listed as threatened (December 11, 1985). Although this species does not breed in Florida, individuals from all three breeding populations winter in Florida. Wintering habitat has been proven a key factor in survival for piping plovers since they may spend 7-8 months per year away from breeding areas (Nicholls and Baldassarre, 1990; USFWS, 2009a).

Critical habitat for the wintering grounds of the piping plover was designated under Federal Register (66 FR 36038). On July 10, 2001, 142 areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas encompassing approximately 1,793 miles of mapped shoreline were designated as critical habitat for the wintering piping plover; the rule erroneously states 137 areas (USFWS, 2009a). Although historical wintering sites are not well described, piping plovers have been generally seen along Gulf of Mexico beaches, southern U.S. Atlantic beaches from North Carolina to Florida, in eastern Mexico, and numerous islands scattered throughout the Caribbean (Nicholls and Baldassarre, 1990). The complete winter distribution of the piping plover remains to be determined, although specific Gulf and Atlantic coastal sites are becoming better recognized for their importance to wintering birds (Haig and Oring, 1985, 1987; Nicholls and Baldassarre, 1990; Sprandel *et al.*, 1997; USFWS, 2009a).

There is no federally designated piping plover critical habitat within the project area. The closest critical habitat units for wintering piping plovers are Units FL-26 and FL-27 (Figure 6). Unit FL-26 is located on Estero Island in Lee County, approximately 10 miles north of the project area and FL-27 is located on Tigertail Beach, at the entrance to Big Marco Pass, approximately 11 miles south of the project area.

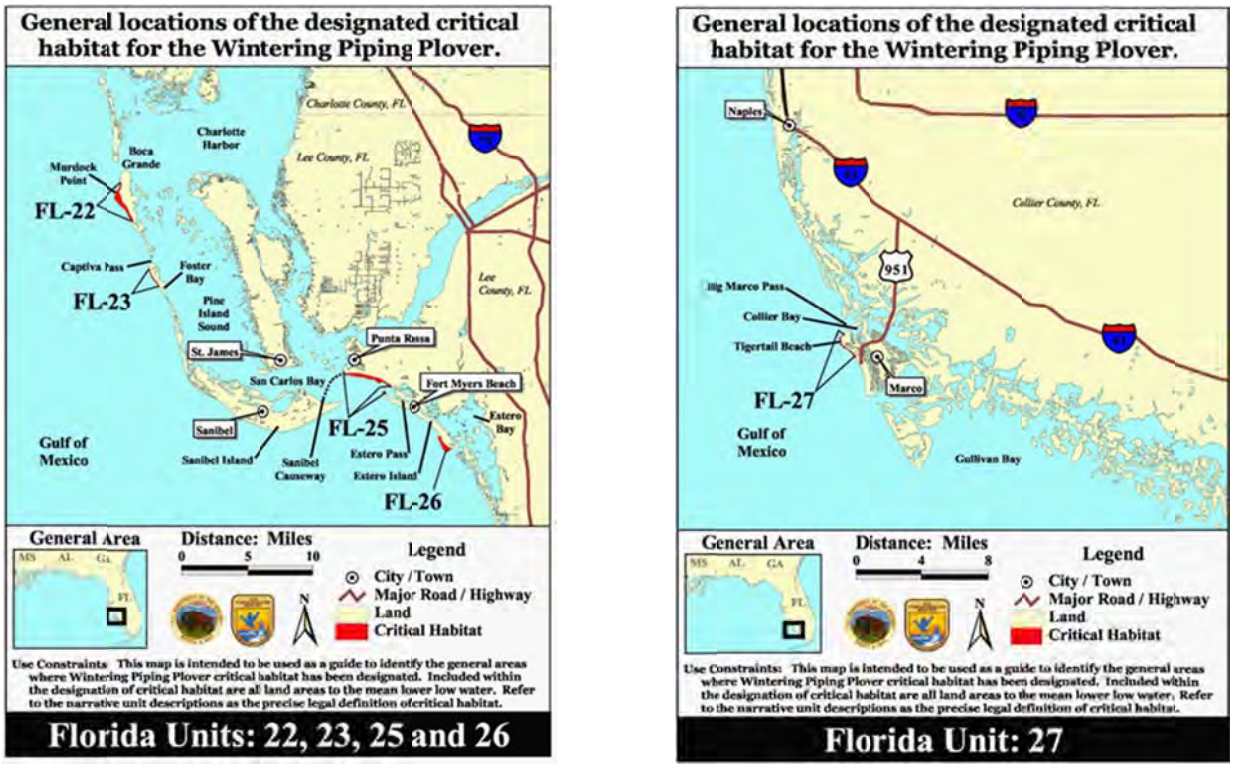

Figure 6. Designated piping plover critical habitat FL Units 22 – 27 (USFWS).

5.4.2 Red Knot

The USFWS designated the red knot a candidate for Endangered Species Act protection on September 12, 2006. The red knot is a medium-sized shorebird with a circumpolar breeding season distribution and migrates to coasts around the world, traveling up to 9,000 mi. It has one of the longest migrations of any bird. In August 2006, the red knot was designated a candidate species for possible addition to the federal list of endangered and threatened wildlife. The declining population of the red knot is directly related to the increased harvest of horseshoe crabs as bait for the conch pot and eel fisheries in the mid-Atlantic. Red knots are dependent upon horseshoe crab eggs on their stopover in Delaware Bay to sustain them through the remaining 3,000 mi migration to summer breeding grounds in the arctic, as well as to ensure their survival once they arrive.

There are six subspecies of the red knot, two of which are known to winter and/or pass through the U.S. The *rufa* subspecies of the red knot breeds in the central Canadian arctic and mainly winters in Tierra del Fuego, and the *roselaari* subspecies is thought to breed in Alaska and Hunter Island, Russia but may migrate down the Pacific coast and winter in the Gulf of Mexico. Two other wintering populations, found in Maranhão in northern Brazil and Florida, have uncertain subspecific status. Current scientific opinion is that the Florida and Maranhão populations are *C. c. rufa* (Niles *et al.*, 2008). Nonetheless, Florida is known overwintering habitat for the red knot, and the west coast of Florida, specifically the project area, is an important stopover for the Tierra del Fuego population. Preservation of any habitat used by the red knot while they remain vulnerable may be critical to their survival.

6.0 DESCRIPTION OF CURRENT CONDITIONS FOR EACH SPECIES

This section describes the current status of those species listed in Table 3, including threats to their populations. The current condition of each species is described, with data presented for any listed species known to occur in the vicinity of the project area.

6.1 Sea Turtles

The distribution of sea turtle nesting activity on Florida's Gulf Coast (Manatee, Sarasota, Charlotte, Lee, and Collier Counties) makes up a small percentage of the overall nesting activity within the State when compared to the east coast epicenter of sea turtle nesting located between Brevard and Palm Beach Counties. According to the FWC statewide nesting database, 8% of the total 2011 nesting activity on Florida's coastline occurred on the Gulf Coast. During the 2011 nesting season, 764 nests were recorded along 59.3 km (36.8 mi) of Collier County's shoreline; Collier County nesting accounted for 11% of the total sea turtle nesting along Florida's Gulf coast and 0.9% of the total recorded sea turtle nesting in the State of Florida (FWRI, 2012a). Although the green, Kemp's ridley, hawksbill and leatherback sea turtles have been documented as nesting on Florida's Gulf coast beaches, the loggerhead sea turtle is the dominant nesting species, accounting for 99% of the nests in 2011 on the west coast and in Collier County.

As a permit requirement for beach renourishment, Collier County is responsible for surveying 38.1 km (23.7 mi) of beach for sea turtle activities. The Sea Turtle Protection Program within the Collier County Parks and Recreation Department (CCPRD) monitors 27.2 km (16.9 mi) of shoreline on Barefoot, Vanderbilt, Park Shore and Marco Island. The remaining 9.0 km (5.6 mi) of beach in the City of Naples is subcontracted to the Conservancy of Southwest Florida (CSWF). An additional 1.2 miles of shoreline nesting is reported to CCPRD by Delnor-Wiggins Pass State Park. Table 4 presents the total number of sea turtle nests as documented from these monitoring programs. With the exception of one green turtle nest laid on Barefoot Beach in 2007, all nests laid along this 23.7 miles of shoreline have been loggerhead nests.

Table 4. Sea turtle nesting data, 2001-2011, for 23.7 mi of Collier County shoreline (CCPRD).

Year	Total Nests
2001	413
2002	307
2003	504
2004	378
2005	258
2006	298
2007	262
2008	331
2009	297
2010	422
2011	404

6.1.1 Loggerhead Sea Turtle

Threats to loggerhead sea turtles include: incidental take from channel dredging and commercial trawling, longline, and gill net fisheries; loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and disease. There is particular concern about the extensive incidental take of juvenile loggerheads in the eastern Atlantic by long-line fishing vessels from several countries (NMFS and USFWS, 1991).

Florida accounts for more than 90% of the U.S. loggerhead nesting (FWRI, 2012). Results from a study conducted as part of the FWC Index Nesting Beach Survey indicate that following a 24% increase between 1989 and 1998, nest counts declined 16% between 1998 and 2011. Loggerhead turtles accounted for 99% of the sea turtle nests observed in Collier County in 2011 (FWRI, 2012). Table 4 lists the nesting data along 23.7 mi of Collier County shoreline from 2001 to 2011; with the exception of one green turtle nest laid in 2007, all of the data accounts for loggerhead nesting (Kraus, pers. comm., 2012). In 2011, Vanderbilt and Park Shore beaches had the highest nesting densities, with 26.6 and 28.1 nests per mile, respectively (CCPRD, 2012).

6.1.2 Green Sea Turtle

Two major factors contributing to the green turtle's decline worldwide is commercial harvest for eggs and meat, and fibropapillomatosis. Fibropapillomatosis in sea turtles is characterized by the development of multiple tumors on the skin and internal organs and has no cure. This disease has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. Although fibropapillomatosis is primarily found on green sea turtles, it has now been found on all species of sea turtles (The Turtle Hospital, 2010). The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens generally die. Other threats to green sea turtles include: loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and incidental take from channel dredging and commercial fishing operations (NMFS and USFWS, 1991a).

Total global population estimates for the green turtle are unavailable, and trends based on nesting data are difficult to assess because of large annual fluctuations in numbers of nesting females. The majority of green turtle nesting in the southeastern U.S. occurs in Florida. Between 1989 and 2011, green turtle nests at core index beaches ranged between 267 and 10,701 nests. This past nesting season (2011) was the highest since the trend-monitoring program began in 1989 (FWRI, 2012). Overall, the green turtle nesting trend differs dramatically from the loggerhead nesting trend, with green turtle nests increasing by a factor of ten over the 22-year study period (FWRI, 2012). On the west coast of Florida, green sea turtles generally represent approximately 1% of the nesting sea turtle population and Collier County is no exception. In 2011, seven of the total 764 nests laid in all of Collier County were green sea turtle nests. All the 2011 green sea turtle nests were laid outside of the project area and outside of the 38.1 km (23.7 mi) Collier County Parks and Recreation Department sea turtle monitoring survey area (Table 4).

6.1.3 Leatherback Sea Turtle

The global leatherback population has been estimated between 26,000 and 43,000, which is a dramatic decline from the estimated population of 115,000 in 1980 (Spotila *et al.*, 1996). This is primarily due to the exponential decline in leatherback nesting over the last two decades along the Pacific coasts of Mexico and Costa Rica. Leatherbacks are rare in the Indian Ocean and now exist in very low numbers in the western Pacific Ocean. These populations cannot withstand even moderate levels of adult mortality and even the largest population, which now exists in the western Atlantic, is being exploited at a rate that cannot be sustained (Spotila *et al.*, 1996). Leatherbacks are heading towards extinction and further population declines can be expected unless action is taken to reduce adult mortality and increase survival of eggs and hatchlings.

Factors threatening leatherbacks in Florida include loss or degradation of nesting habitat from coastal development, disorientation of hatchlings by beachfront lighting, excessive nest predation by native and non-native predators, marine pollution and debris, watercraft strikes, and incidental takes from commercial fishing operations (NMFS and USFWS, 1992a). Results from the FWC Index Nesting Beach Survey show a long-term increasing trend in the number of leatherback nests, ranging from 27 to 498 between 1989 and 2008 at the core set of Florida index beaches. In 2009, the number of leatherback nests on index beaches was the highest since the trend-monitoring program began in 1989 (FWRI, 2012).

With the exception of a few nests on the west coast, leatherback nesting occurs primarily on the east coast of Florida – almost 50% of all leatherback nests in Florida occur in Palm Beach County (FWRI, 2012). The first leatherback nesting event documented along the central west coast shoreline of Florida was deposited on May 31, 2001 on Longboat Key in Sarasota County (Tucker, pers. comm., 2010); one nest was also deposited on Sanibel Island in Lee County in 2009 (Tucker *et al.*, 2009). An injured adult leatherback came ashore on Vanderbilt Beach in Collier County in January 2010. After being coaxed back to sea, the leatherback stranded further north on Big Hickory Island in Lee County. The turtle was treated at Mote Marine Lab and released offshore several days later. Leatherbacks are not known to nest on Collier County beaches (FWRI, 2012; Kraus, pers. comm., 2012)

6.1.4 Hawksbill Sea Turtle

About 15,000 females are estimated to nest each year throughout the world; the Caribbean accounts for 20 to 30% of the world's hawksbill population. The decline of the hawksbill species is primarily due to human exploitation for tortoiseshell. While the legal hawksbill shell trade ended when Japan agreed to stop importing shell in 1993, a significant illegal trade continues. In addition, there are serious attempts by Cuba, with support from other countries, to down-list hawksbills in Cuba to Appendix 2 of the Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora in order to make it possible to reopen trade with Japan and possibly other countries (USFWS, 2009b).

Threats in Florida include loss or degradation of nesting habitat from coastal development and beach armoring, disorientation of hatchlings by beachfront lighting, excessive nest predation by native and non-native predators, degradation of foraging habitat, marine pollution and debris, watercraft strikes, and incidental take from commercial fishing (NMFS and USFWS, 1993).

Between 1979 and 1992, only 11 hawksbill nests were reported statewide in Florida, 10 of which were in south Florida (Meylan *et al.* 1995). One hawksbill sea turtle nest was documented in Manatee County by FWC staff in 1979. This nest was verified at the time by phone descriptions; however, no specimens were taken for further verification. Because hawksbills are typically tropical nesters, Mote Marine Lab questions the validation of this single hawksbill nest (Tucker, pers. comm., 2010). Within the continental U.S., hawksbill nesting is restricted to and rare in the southeast coast of Florida and the Florida Keys (NMFS, 2012). Florida is not considered one of the nesting concentrations for hawksbill sea turtles (NMFS and USFWS, 2007).

6.1.5 Kemp's Ridley Sea Turtle

The Kemp's ridley is the most endangered of the sea turtles. Its numbers have precipitously declined since 1947, when over 40,000 nesting females were estimated in a single arribada (mass nesting event) in Rancho Nuevo, Mexico. Between the late 1940s and the mid-1980s, the Kemp's ridley experienced a sharp decline that produced only 720 nests in 1985 in Rancho Nuevo, where tens of thousands once nested. However, since the mid-1980's, the number of nests laid in a season has been increasing primarily due to nest protection efforts and implementation of regulations requiring the use of turtle excluder devices in commercial fishing trawls. In 2006, approximately 7,866 nests were laid in Rancho Nuevo and an additional 100 nests were laid on U.S. beaches, mostly Texas (NMFS and USFWS, 2007a). The decline of this species is directly related to human activities, including the harvest of adults and eggs and incidental capture in commercial fishing operations. Today, under strict protection, the population appears to be in the early stages of recovery (NMFS and USFWS, 1992; 2007a).

Occasional nesting has been documented in North Carolina, South Carolina, and the Gulf and Atlantic coasts of the U.S., including Florida (NMFS, 2012). On the central and southwest coast of Florida, two Kemp's ridley nests were observed on Casey Key, one on Venice (Sarasota County), and one on Manasota Key (Charlotte County) (Tucker *et. al*, 2009). There are no records of Kemp's ridley nests laid in Collier County (Kraus, pers. comm., 2012). As for swimming sea turtles, Davis *et al.* (2000) reported three Kemp's ridleys in open waters along the continental shelf in the northern Gulf of Mexico based on aerial and boat surveys.

6.1.6 Climate Change

According to the Intergovernmental Panel on Climate Change (2007), changes in the natural ecosystem caused by potentially rapid climate change pose significant challenges to wildlife. Sea Level Rise (SLR) caused by climate change has the potential to adversely affect nesting sea turtles. In an era of eroding shorelines, SLR may exacerbate erosional conditions, leading to further loss of sea turtle nesting habitat. Climate change may also lead to increased hurricane activity, which can further impact the limited remaining sea turtle nesting habitat. This was evident in June 2012 when 387 nests were lost to Tropical Storm Debby and in August 2012 when 74 nests were lost to Tropical Storm Isaac (Staats, 2012).

6.2 Smalltooth Sawfish

Historically, sawfish were a common sight off Florida's coastline. However, they have become less common during the last century because they were unintentionally overfished. Their long "saws", referred to scientifically as "rostrums" or "rostra", were easily entangled in any kind of fishing gear. Sawfish rostrums have also been popular trophy items. Since these fish produce few

young, it has been a challenge for their population to recover after being depleted (FWC, 2011). Juvenile sawfish use shallow habitats with a lot of vegetation, such as mangrove forests, as important nursery areas. Many such habitats have been modified or lost due to development of the waterfront in Florida and other southeastern states. Based on the contraction in range and anecdotal data, it is likely that the population is currently at a level less than 5% of its size at the time of European settlement (NMFS, 2009).

According to the "Status Review of Smalltooth Sawfish – December 2000", only six sawfish observations were recorded in Collier County between 1927 and 2000: two observations off of Marco Island, one off of Naples, and three near Ten Thousand Islands (NMFS, 2000). A recent review of smalltooth sawfish sightings showed that most observations occurred in estuarine and nearshore habitats. Although some large smalltooth sawfish were observed in depths up to 73 m, there were more observations of smaller fish associated with inshore mangrove and seagrass habitats (Wiley and Simpfendorfer, 2010). This study showed that the core range of smalltooth sawfish is currently the area in Florida from the Caloosahatchee River south through the Ten Thousand Islands and Everglades National Park to Florida Bay (Wiley and Simpfendorfer, 2010). Captures have been documented in Tampa Bay and in the southwest coast off Charlotte Harbor and San Carlos Bay – approximately 20 miles north of the project area (NMFS, 2000).

6.3 Marine Mammals

Of the six endangered whale species listed in Table 3, only sperm whales are considered to commonly occur in the Gulf of Mexico and over the greatest range of water depths (Scott *et al.*, 1994). Typically, no threatened or endangered species of whales occur in the nearshore waters (0-200 m) over the continental shelf of the Gulf of Mexico. Occasionally, North Atlantic right whales and humpback whales may be found in nearshore waters of the Gulf of Mexico, usually during the winter season. However, sightings of these species are relatively uncommon and the individuals observed were likely inexperienced juveniles straying from the normal range of their stocks (NMFS, 2003; 2008). According to Keith D. Mullin, PhD., Fishery Biologist with NOAA, the only marine mammal species that routinely occur in Florida Gulf Coast waters within 1-2 miles of the coast are bottlenose dolphins, Atlantic spotted dolphins (neither listed under the ESA) and Florida manatees.

6.3.1 Sei Whale

The final recovery plan for the sei whale was published by NMFS in 2011. Sei whales have a global distribution and occur in the North Atlantic Ocean, the North Pacific Ocean and the Southern Hemisphere. They were hunted by modern whalers primarily after the preferred larger, and more easily taken, baleen whale species had been seriously depleted, including the right, humpback, gray, blue, and fin whales. Most stocks of sei whales were reduced, some of them drastically, by whaling in the 1950s through the early 1970s. International protection began in the 1970s for this species but exploitation continued by Icelandic and Japanese operations through 1986 when the IWC moratorium on commercial whaling was passed. Of the commercially-exploited "great whales," the sei whale is one of the least well-studied, and the current status of most sei whale stocks is poorly known (NMFS, 1998a). NMFS estimated the population size between Cape Hatteras, North Carolina, and Nova Scotia, Canada at 253 from an aerial survey program conducted between 1978 and 1982 (NMFS, 1998a). However, the 2011

recovery plan states that the current population is unknown (NMFS, 2011).

There are few if any data on fishery interactions or human impacts to the sei whale. There have been at least five reports of ship strikes and one report of entanglement with fishing gear leading to death between 1994 and 2007 on the U.S. Atlantic coast from Boston, MA to Norfolk, VA (NMFS, 2008a). There was also a reported entanglement of a sei whale with commercial fishing gear in September 1996 on Jeffreys Ledge off New England (NMFS, 2008a).

Sei whales are a deepwater species and are not expected to occur in the project vicinity (NMFS, 2003).

6.3.2 Fin Whale

Fin whales are widely distributed around the world. Although most populations were depleted by modern whaling in the mid-twentieth century, there are currently believed to be tens of thousands of fin whales worldwide. Of the three stocks, the North Atlantic stock is the only one with reliable estimates. Commercial whaling for this species ended in the North Pacific in 1976, in the Southern oceans in 1976-77 and in the North Atlantic in 1987. However, fin whales are still hunted in Greenland and subject to catch limits under the IWC's "aboriginal subsistence whaling" scheme. Iceland resumed commercial whaling of fin whales in 2006 under formal objection to the IWC's ban and Japan has started killing fin whales in its scientific whaling program. The numbers of whales killed in this program are steadily increasing (NMFS, 1998a; 2006).

Ship strikes are considered a major threat to fin whales. According to NOAA's large whale ship strike database, fin whales are the most often reported species hit – 75 records of strike between 1975 and 2002 worldwide (Jensen and Silber, 2004). Schooling fish constitute a large proportion of the fin whale's diet in many areas of the North Atlantic. Thus, trends in fish populations, whether driven by fishery operations, human-caused environmental deterioration, or natural processes, may strongly affect the size and distribution of fin whale populations (NMFS, 1998a; 2006a; 2010).

Fin whales are a deepwater species and not expected to occur in the project vicinity (NMFS, 2003).

6.3.3 North Atlantic Right Whale

Ship collisions and entanglement in fishing gear are the most common recent human causes of serious injury and mortality of western North Atlantic right whales. Additional threats may include habitat degradation, contaminants, climate and ecosystem change, and predators such as large sharks and killer whales. Disturbance from such activities as whale watching and noise from industrial activities may affect the population. To reduce disturbance from boats, NMFS published regulations in 1997 that prohibit vessels from approaching within 500 yards of right whales (NMFS, 2005). North Atlantic right whales are the third most often reported species struck by ships – 38 records between 1975 and 2002 worldwide (Jensen and Silber, 2004).

While past population estimates were based on more limited information and may have been less accurate, the best population estimate for the North Atlantic right whale in 1991 was 350 animals. The population is currently believed to contain only about 300 individuals and it

remains unclear whether its abundance is static, undergoing modest growth or, as recent modeling exercises suggest, currently in decline. However, there has been no apparent sign of recovery in the last 15 years and the species may be rarer and more endangered than previously thought. A recent model predicts that under current conditions, the population will be extinct in less than 200 years (NMFS, 2005).

Occasionally, North Atlantic right whales may be found in nearshore waters of the Gulf of Mexico, usually during the winter season. The most recent sighting of right whales in Florida waters was a mother and calf right whale spotted off of Sanibel Island as they traveled south in February 2006 (Staats, 2006). Despite this sighting, these occurrences are considered rare; as such, this species is not expected to occur in the project vicinity.

6.3.4 Humpback Whale

As a species, humpback whales are probably the fourth most numerically depleted whale worldwide, after the northern right whale, blue whale, and bowhead whale. Prior to commercial whaling, the worldwide population of humpback whales was thought to be more than 125,000. American whalers alone killed between 14,000 and 18,000 humpbacks in the nineteenth century, and the total North Pacific kill was estimated at about 28,000. NMFS (2012) reports abundances in the North Atlantic at 11,570 and the North Pacific at 20,000. The southern hemisphere abundance may be over 25,000, although there is little data on which to base this estimate. There is no current or historical estimate for humpbacks in the Indian Ocean. There are five stocks of humpbacks that occur in U.S. waters – the Gulf of Maine stock in the Atlantic Ocean may occur in the Gulf of Mexico and is estimated at about 550 individuals.

Although whaling is no longer a threat, humpback whales that occur adjacent to human population centers are affected by human activities throughout their range. Both habitat and prey are affected by human-induced factors that could impede recovery. Such factors include subsistence hunting, incidental entrapment or entanglement in fishing gear, collision with ships, and disturbance or displacement caused by noise and other factors associated with shipping, recreational boating, whale watching or air traffic. Humpback whales are the second most often reported species struck by ships – 44 records between 1975 and 2002 worldwide (Jensen and Silber, 2004). Humpback whales may also be impacted by introduction and/or persistence of pollutants and pathogens from waste disposal, disturbance and/or pollution from oil, gas or other mineral exploration and production, habitat degradation or loss associated with coastal development, and competition with fisheries for prey species. These factors could affect individual reproductive success, alter survival, and/or limit availability of needed habitat (NMFS, 1991).

Occasionally, humpback whales may be found in nearshore waters of the Gulf of Mexico, usually during the winter season. However, sightings are relatively uncommon and the individuals observed were likely inexperienced juveniles straying from the normal range of their stocks (NMFS, 2003; 2008). Humpback whales are not expected to occur in the project vicinity.

6.3.5 Sperm Whale

Sperm whales were subject to commercial whaling for more than two and a half centuries in all parts the world. Commercial whaling for this species ended in 1988, with the implementation of a moratorium against whaling by the International Whaling Commission (IWC). According to

the final recovery plan for the sperm whale (NMFS, 2010a), the best available estimate of worldwide abundance of the sperm whale is approximately 300,000 to 450,000 from Whitehead (2002).

Sperm whales are still being targeted in some areas: there is a small catch by primitive methods in Indonesia, and Japan takes sperm whales for "scientific research". There is also some evidence to suggest that sperm whales are being hunted illegally in some parts of the world, but the impact of this take is unknown. Canada withdrew its membership in the IWC in 1982. Norway and Iceland have formally objected to the IWC ban on commercial whaling and are therefore free to resume whaling under IWC rules, but neither country has expressed an interest in taking sperm whales (NMFS, 2006a).

In addition to commercial whaling threats, sperm whales are susceptible to entanglement in fishing gear and collisions with ships. Their demonstrated responsiveness to loud, unfamiliar underwater sounds makes it likely that they are adversely affected, at least transiently, by anthropogenic noise in the marine environment (NMFS, 2006a). Also, levels of some contaminants in sperm whale tissue, such as heavy metals and organochlorine compounds, are high enough to raise concerns about toxicity and reproductive impairment. Site selection for whale migration, feeding, and breeding for sperm whales is linked to ocean currents and water temperature, which may be negatively impacted by climate change (NMFS, 2006a).

Of the six endangered whale species (Table 3), only sperm whales are considered to commonly occur in the Gulf of Mexico and over the greatest range of water depths (Scott *et al.*, 1994). There is a resident population of female sperm whales in the northern Gulf near the Mississippi Canyon, and whales with calves are spotted frequently (NMFS, 2003; 2008). The best estimate for this stock is pooled from data collected between 1996 and 2001 at 1,315 individuals.

Of particular concern for the Gulf of Mexico stock of sperm whales are the potential impacts from the 2010 Deepwater Horizon oil spill. Ackleh *et al.* (2012) indicate that some sperm whales may have relocated farther away from the oil spill. Acoustic activity at a site located 9 miles from the spill saw decreased activity while activity and abundance at a site 25 miles from the spill increased. Overall, sperm whales are rare in inshore Gulf of Mexico waters; therefore, it is unlikely that this species will occur in the project area.

6.3.6 Blue Whale

Stocks of the blue whale have been depleted by modern whaling, and the number of blue whales in the world's oceans is now only a fraction of what it was early in the twentieth century. Blue whales were only occasionally hunted by the sailing-vessel whalers of the nineteenth century. The introduction of steam power in the second half of that century made it possible for boats to overtake the large, fast-swimming blue whales, but killing on an industrial scale did not occur until the development of the deck-mounted harpoon cannon. Most of the technology for modern whaling was available by the early 1870s, and factory ships were added in the early twentieth century. Thus, from the turn of the century until the mid-1960s, blue whales from various stocks were intensively hunted in all the world's oceans (NMFS, 1998).

Since gaining complete legal protection from commercial whaling in 1966, some populations have shown signs of recovery, while others have not been adequately monitored to determine their status. Collisions with vessels, entanglement in fishing gear, reduced zooplankton production due to habitat degradation, and disturbance from low-frequency noise are the most obvious potential indirect threats (NMFS, 1998).

Blue whales are separated into populations by ocean basin in the North Atlantic, North Pacific and Southern Hemisphere. It is believed that Cape Cod, Massachusetts may represent the current southern limit of the blue whales' feeding range. There is some evidence that they occasionally stray into the Gulf of Mexico, but no confirmed observations exist. In general, blue whales are a deepwater species, and are not expected to occur in the vicinity of the project area. (NMFS, 2003; 2010; 2012).

6.3.7 Florida Manatee

The manatee population is difficult to assess. The most current count of Florida manatees is 4,834 animals (2,432 east coast, 2,402 west coast), based on a single synoptic survey of warm-water refuges in January 2012 (FWRI, 2012). Ground and aerial synoptic surveys are done one to three times every year; however, these surveys do not include individuals that are located away from wintering sites on the day of the count and therefore, do not provide an accurate representation of the population. Weather conditions, water clarity, manatee behavior, and other environmental factors add to the variability. As a result, scientists are reluctant to base their evaluations of the manatee population on these surveys. With these caveats in mind, the results from these synoptic surveys reported 17, 23 and 22 manatee sightings in 2006, 2007 and 2008 between Wiggins Pass and Gordon Pass, which includes the entire project area (FWRI, 2012). To evaluate the population, statistics are monitored such as adult survival rates, reproduction, and population growth rate. The Florida manatee population is considered one stock but is divided into four management units, formerly referred to as subpopulations: the Upper St. Johns River unit (4% of the population); the Atlantic Coast unit (46%); the Southwest unit (38%); and the Northwest unit (12%). Recent demographic analyses indicate that, with the exception of the Southwest management unit, manatee populations are increasing or stable throughout much of Florida (USFWS, 2009). There is little information on the status of the Southwest Florida sub-population because the data time series is comparatively shorter for this unit and no demographic data is available for manatees in the southernmost part of this region, though research is underway (USFWS, 2001; 2009).

Historically, the most significant threat to the Florida manatee is death or serious injury from watercraft strikes. As of September 7, 2012, 68 manatee deaths this year have been attributed to watercraft, comprising 25% of total manatee mortality state-wide (FWRI, 2012). Two manatee deaths due to watercraft have occurred in Collier County this year. Another important threat is loss of reliable warm water habitats that allow manatees to survive the cold in winter. Natural springs are threatened by increased demands for water supply and aging power plants may need to be replaced. Deregulation of the power industry may also result in less reliable man-made sources of warm water. Cold weather-related deaths were blamed for 113 Florida manatee deaths in 2011, with 10 of those deaths within Collier County (FWRI, 2012).

Consequences of an increasing human population and intensive coastal development are long-term threats to the Florida manatee. Seagrass and other aquatic foods that manatees depend on are affected by water pollution and sometimes direct destruction (USFWS, 2001). Although seagrass is not located within the project area, it is found within waterways east of the adjacent barrier islands (Figure 3). Manatees may use the project area as a travel corridor and are frequently seen in the nearshore habitat. During construction, there is a potential for manatee strike in the nearshore zone as project vessels travel between borrow areas, rehandling areas, and the seaward end of the pipeline corridor. Manatee protection measures will be implemented to minimize such events.

6.4 Birds

6.4.1 Piping Plover

In recent decades, piping plover populations have declined drastically, especially in the Great Lakes area. In the early 1900s, uncontrolled hunting drove them nearly to extinction. Destruction and degradation of winter habitat in Florida, shoreline erosion, human disturbance, and predators, including domestic animals, all contribute to low reproductive success and decline in numbers over much of the piping plovers' range. Although Florida's conservation lands provide considerable suitable habitat, increasing recreational demands result in increased harassment of foraging and roosting birds (FNAI, 2010).

Launched in 2002, by the Cornell Lab of Ornithology and National Audubon Society, eBird provides data concerning bird abundance and distribution at a variety of spatial and temporal scales. eBird is sponsored in part by several Service programs, research groups, non-government offices, and the University of the Virgin Islands. Piping plover data from eBird for all of Collier County between 2009 and 2011 are provided in Table 5 (Sullivan *et. al*, 2009). It is important to note that this data is not specific to the project area, but contains all observations with Collier County. The project area includes developed shoreline with high foot traffic, less likely to provide suitable piping plover habitat than other undeveloped areas in the County. The 2006 International Piping Plover Census (IPPC) did not document piping plovers within the project area (Elliott-Smith *et al.*, 2009); however, 49 piping plovers were observed on Big Marco Pass Shoal located approximately 11 miles south of the project area.

Table 5. Piping plover observations in Collier County, 2009-2011 (eBird).

Year	Observations
2009	62
2010	70
2011	90

6.4.2 Red Knot

Counts conducted in the winter of 2005-06 showed a minimum population of about 4,000 red knots in Florida plus another 1,500 scattered along the coasts of Georgia, North and South Carolina and Virginia (Niles *et al.*, 2006). Of the 4,000 in Florida, 2,500 were observed along 300 km of the west coast between Anclote Key and Cape Romano where an estimated 10,000

occurred in the 1980s (Morrison and Harrington, 1992). The project area falls within this stretch of shoreline. Further counts along the west coast of Florida showed declining numbers with 1,200 in 2006-07, only 550 in 2007-08, 1,532 in 2008-09, and 1,378 in 2009-10 (Dey *et al.*, 2011). Piping plover data from eBird for all of Collier County between 2009 and 2011 are provided in Table 6 (Sullivan *et. al*, 2009). It is important to note that this data is not specific to the project area, but contains all observations with Collier County. The project area includes developed shoreline with high foot traffic, less likely to provide suitable red knot habitat than other undeveloped areas in the County.

Table 6. Red knot observations in Collier County, 2009-2011 (eBird).

Year	Observations
2009	69
2010	115
2011	550

7.0 EFFECTS OF PROPOSED ACTION, CONSERVATION MEASURES AND EFFECTS DETERMINATIONS

This section describes how the proposed project will affect threatened and endangered species or any critical habitats that occur in the project area. The Endangered Species Act requires that all effects be considered when determining if an action may affect listed species. Direct effects, indirect effects, interrelated or interdependent actions, and cumulative effects are all considered. Direct effects are defined as those caused by the action and occur at the same time and place as the action. Indirect effects are caused by the action at a later time, but are reasonably certain to occur. Interrelated actions are those that are part of the primary action and depend on the primary action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Cumulative effects can be defined as the change in the environment that results from the incremental impact of a proposed project when added to other, related past, present, and reasonably foreseeable future projects. Cumulative impacts can result from individually minor, but collectively significant, impacts taking place over a period of time (40 C.F.R. § 1508.7).

Past and future beach nourishment projects on Collier County's shoreline and nearby beaches contribute to species effects and are referred to throughout the following species sections. Refer to Section 3.1 - History of Beach Nourishment in Collier County for details. The last project was constructed in 2006, and following the proposed 2013-2014 project, the area will likely be nourished again approximately six years later.

In order to address areas of severe erosion that require immediate repair before construction of the proposed project begins in September 2013, Collier County will construct a small truck-haul project. Tropical Storm Debby (June 2012) caused significant erosion to the beach area in Vanderbilt Beach (R-26 and R-30) along with the area of Naples Beach just south of Doctors Pass (R-61 to R-63.5). As a result, an Emergency Truck Haul beach restoration will be

performed in November 2012 (outside of sea turtle nesting season) to stabilize the beach and protect the upland property in these regions. Approximately 24,000 cubic yards of sand will be distributed evenly between the Vanderbilt and Naples Beach project areas. Sand placement will occur using a combination of conveyor system and dump trucks. The project will use dump trucks to haul sand to the project area from the upland sand source. Trucks will dump sediment from the upland source into a hopper connected to the conveyor system. The conveyor system will move sand from the nearest public road end to the beach. Selected construction equipment will transport the sand from the conveyor staging area along the beach to the proposed disposal area. Grading will occur to spread the placed sand within the desired template through the use of bulldozers, bobcats, front end loaders, and other appropriate equipment.

Periodic maintenance dredging of several passes in Collier County also occurs. These passes are periodically surveyed and, when shoaling occurs to a point where actual depths are less than the designed project depths, the County dredges these passes. Dredging of these passes aides in navigation and may provide compatible sand to nearby beaches where erosional effects are greatest.

Conservations measures are described for each species and indicate the specific actions and measures that will be incorporated into the design of the project to avoid or significantly reduce adverse effects or the incidental take of listed species. These conservation measures are commonly recommended by USFWS, NMFS, FWC and/or FDEP for beach nourishment projects. Effects determinations are also provided based on the existing information available for each species and associated habitat.

7.1 Sea Turtles

7.1.1 Nesting Sea Turtles and Hatchlings

According to nesting data collected by Collier County Parks and Recreation Department, loggerhead (*Caretta caretta*) sea turtles make up the majority of nesting sea turtles in the project area (usually between 99%-100%). The proposed project has the potential to adversely affect nesting females, nests, and hatchlings within the project area. Several conservation methods will be implemented in order to reduce these impacts. The timing of construction activities will be planned to avoid peak sea turtle nesting season. Construction will commence no earlier than September 15, 2013, and will be completed by May 31, 2014. Beach compatible material will be utilized to limit and/or prevent any unnecessary impacts to nesting sea turtles. If Collier County chooses to construct the project using an offshore sediment source, borrow area T1 has been selected based on the similarity of the material found there to the existing sand on the beach within the project area. If the County elects to construct a truck haul project using an upland sand source, the fill will be also be beach compatible. Using compatible material minimizes impacts to sea turtle nesting behavior and nesting and emergence success. Sea turtle monitoring surveys, and nest relocation when necessary, will also be conducted in compliance with federal (USFWS) and State (FWC and FDEP) recommendations and requirements.

<u>Direct and/or Indirect Effects</u>

The timing of construction activities will be planned to avoid peak sea turtle nesting season.

Construction will commence no earlier than September 15, 2013, and will be completed by May 31, 2014. If the project is constructed using a dredge, the project is estimated to take up to 120 days (working 24 hours per day, 7 days a week). If the County chooses a truck haul project, the project may take between 140 to 237 days, which is therefore more likely to extend construction into sea turtle nesting season. While construction will avoid peak nesting season, it will overlap with some of the 2013 and 2014 nesting seasons. There are several potential direct and indirect effects from the proposed project to nesting sea turtles. Direct impacts may result from use of construction equipment on the beach, artificial lighting, and nest relocation. Project construction during sea turtle nesting season will involve greater potential for the direct mechanical destruction and burial of nests, and greater likelihood for encounters with construction equipment/pipes on the beach during nesting activities. The presence of heavy machinery on the beach left overnight can create barriers to nesting females as they emerge from the surf and attempt to crawl up the beach, resulting in a higher occurrence of false crawls and needless energy expenditure. The operation of motor vehicles on the beach at night may result in collision with nesting females, disorientation of emergent hatchlings by headlights, and interference by vehicles or vehicle tracks in the sand as hatchlings crawl to the ocean. Studies have shown that hatchlings become diverted not because they are unable to maneuver out of the track (Hughes and Caine, 1994), but because the sides of the rut cast a shadow that causes the hatchlings to lose sight of the ocean horizon (Mann, 1977). Driving directly over incubating egg clutches or on the beach may destroy nests or cause sand compaction which can adversely impact nest site selection, digging behavior, clutch viability and hatchling emergence, thus decreasing nest success and killing pre-emergent hatchlings (Mann, 1977; Nelson and Dickerson, 1989).

Nest relocation as a protection measure for sea turtle nests in the project area may result in potential direct impacts. Relocation could damage eggs, particularly if relocation of the eggs does not occur within 12 hours of nest deposition (Limpus *et al.*, 1979). Other potential negative effects of nest relocation include impacts to incubation temperature (leading to sex ratio alteration) (Yntema and Mrosovsky, 1982; Godfrey and Mrosovsky, 1999), gas exchange parameters, nest moisture content, or reduction of hatching success and hatchling emergence relative to natural nests (Limpus *et al.*, 1979; Mortimer, 1999). More recently, Mrosovsky (2006) suggested that nest relocation over the long-term may distort gene pools. Relocation efforts can also concentrate nests in one location, making them more vulnerable to predation and wash-out from storms.

Artificial lighting may also impact sea turtle nesting and hatchling behavior. Artificial lighting on beaches tends to deter sea turtles from emerging from the sea to nest (Witherington and Martin, 1996). Project lighting can also result in hatchling disorientation. Hatchlings, which use visual cues to locate the sea once they emerge from the nest, can be misdirected by artificial lighting (Dickerson and Nelson, 1989; Lorne and Salmon, 2007). Following beach nourishment projects, the wider and flatter beach berm may expose turtles and their nests to artificial lighting that was less visible, or not visible at all, from nesting areas before the project leading to greater hatchling disorientation and possible mortality (Trindell *et al.*, 2005). Artificial lighting on offshore dredges may also impact nesting females who may be deterred from nesting by the lights in the nearshore waters. Hatchlings emerging from their nests could be attracted away from the shortest path to the water and instead crawl or swim toward the bright lights of a

nearshore dredge or anchored pumpout barge (instead of crawling or swimming seaward toward the open horizon), thus increasing their exposure time to predation (NMFS, 2003).

Beach renourishment projects can have indirect effects on sea turtle nesting in the project area, such as changes to the physical beach environment and escarpment formation. If the nourishment sand is dissimilar from the native sand, results can include changes in sand compaction, beach moisture content, sand color, sand grain size and shape, and sand grain mineral content, all of which may alter sea turtle nesting behavior (Grain *et al.*, 1995). Incompatibility of nourishment material with the nesting habitat can potentially affect female sea turtles' ability to nest and reproduce (Lutcavage *et al.*, 1997). Nest site selection and digging behavior of the female can be altered or deterred, if she finds the beach unsuitable. Beach compaction can lead to reductions in nesting success (*i.e.*, increased false crawls), which may result in increased physiological stress to the nesting females (Nelson and Dickerson, 1989). Clutch viability and hatchling emergence may also be impaired if the beach state is altered (Nelson and Dickerson, 1989; Grain *et al.*, 1995). Steep escarpments may form along nourished beaches as they adjust from an unnatural construction profile to a more natural beach profile (Grain *et al.*, 1995). These escarpments can impair or prevent access to nesting sites, in some cases leading to females selecting marginal or unsuitable nesting sites. Studies suggest that within the first year post-nourishment, turtle nesting decreases. Montague (1993) states that beach profiles of a newly restored beach are not conducive to nesting and hatchling success. Profiles may contain irregular or steep scarps and may be unstable. Eventually, with local wave, tide, and wind energy, the profiles equilibrate and the beach stabilizes to resemble a natural profile of the area.

It has been previously stated that beach nourishment may lead to more development in greater density within shorefront communities that are then left with the possible need for additional future replenishment or even coastal armoring in a negative feedback loop (Pilkey and Dixon, 1996). Increased development immediately adjacent to nesting beaches has often led to more coastal construction, sometimes with larger and larger structures being built to accommodate resultant increase in tourism. Aside from encroachment on sea turtle nesting habitat and exposure to artificial lighting, seaside development may attract and support populations of nest predators such as raccoons and foxes, which might not have occurred there naturally or in as large numbers (NRC, 1990).

Sea turtles may also benefit from the Collier County Renourishment Project by gaining accessibility to a greater area of beach on which to nest. Sea turtles may elect not to nest on critically eroded beaches and abandon sections of beach if they determine that the nest location will not be suitable. In this instance, nesting sea turtles may return to the ocean to find another more suitable location. This project will repair eroded sections of beach and will widen the dry beach to provide additional nesting habitat as well as additional protection from storms. A nourished beach that is designed and built to mimic the natural beach system will likely benefit nesting sea turtles more than the eroded beach it replaces.

Effects of Interdependent or Interrelated Actions

The only other actions that may occur near the project area are maintenance dredging of the passes. In some cases, material dredged from a pass may be placed onshore for additional protection from coastal erosion. In cases where dredged material is placed on the beach, the

material is always required to be compatible with existing beach sand to minimize impacts to nesting sea turtles, as discussed above.

Cumulative Effects

The effects of the multiple beach nourishments which have occurred in and around the proposed project area may ultimately lead to an increase in sea turtle nesting and hatching success rates due to expansion of suitable nesting beaches, as long as fill material is compatible with native sands and the fill profile mimics the natural one. All previous and future projects in Collier County and nearby beaches, including the Emergency Truck Haul Project scheduled for November 2012, represent actions that cumulatively impact sea turtle nesting habitat. Impacts include compaction of sand which may deter female turtles from nesting on a particular beach, alteration of the natural beach profile (Ernest and Martin, 1999), and other chemical and physiological changes in natural beach sand qualities such as color and moisture content as described above (Nelson and Dickerson, 1989; Grain *et al.*, 1995).

Alteration of the natural profile of the beach can cause sea turtles to nest closer to the water for the first year or two after nourishment (Trindell *et al.*, 2005). Nesting closer to the water elevates the risk of nests being washed away due to erosion or storms. The number of lost nests due to these factors may be small after a single nourishment, but if multiple nourishments occur over several years in an area, as has occurred in Collier County, the number of nests lost from theses causes may become significant if the profile is drastically altered.

Beach nourishment can also alter the natural color of the sand. The color of sand plays a role in heat transfer and retention of the sand. Altered temperature characteristics of a nesting beach may affect the nest incubation environment, which can in turn alter the sex ratio of unborn sea turtles in the nest, as temperature plays a direct role in determining the sex of the hatchling (Yntema and Mrosovsky, 1982; Godfrey and Mrosovsky, 1999). Again, the effects of a single nourishment on the sex ratio of a sea turtle population may be insignificant, but the cumulative effects over several years and several nourishment events may be detrimental to a local population of a species if sex ratios are continually altered.

The cumulative effects of periodic beach nourishment projects and placement of dredged material from pass maintenance dredging on eroded shorelines may, on the other hand, be beneficial to nesting sea turtles. The regular addition of suitable beach material to the shorelines provides additional nesting habitat and protects existing nesting beaches from future storm-induced erosion, given that the grain size and color, and placement profile remain similar to the native beach.

North of Marco Island, the Collier County coastline is already extensively developed; however, it is reasonable to expect that human occupancy and recreational use along the Gulf Coast of Florida will continue to increase in the future. It is unknown how much influence beach renourishment contributes to the development and recreational use of the shoreline, but it has been suggested that beach nourishment may lead to more development in greater density within shorefront communities (Pilkey and Dixon, 1996). Increased development immediately adjacent to nesting beaches may lead to more frequent and larger scale coastal construction projects in order to accommodate increases in tourism.

According to the Intergovernmental Panel on Climate Change (2007), changes in the natural ecosystem caused by potentially rapid climate change pose significant threats to wildlife and climatic changes in Florida could amplify existing land and water management challenges. Sea Level Rise (SLR) caused by climate change has the potential to adversely affect nesting sea turtles. In an era of eroding shorelines, SLR may exacerbate erosional conditions, leading to further loss of sea turtle nesting habitat. Climate change may also lead to increased hurricane activity, which can further impact the limited remaining sea turtle nesting habitat. The degree and intensity of climate change and SLR are difficult to estimate with any degree of precision. The magnitude of impacts to sea turtles as well as other wildlife will be better estimated in coming years as more comprehensive information becomes available.

Impacts from the Deep Horizon MC 252 oil spill on April 20, 2010 were not reported on the southwest coast of Florida, which includes the project area. Potential impacts considered were: 1) reduced nesting due to injuries to mature females or nesting beaches being covered in oil; and 2) reduced hatching success rates if oil washes up on the beach after the nests are already laid. These impacts were not realized during the 2010 and 2011 nesting seasons as abundance remained relatively constant in Collier County. Long-term impacts, however, of the oil spill and subsequent remediation measures taken remain unknown.

Conservation Measures

The following provides various conservation measures, previously recommended by federal and State agencies, for nesting sea turtles that will be implemented with the project.

- *Construction Methods.* Construction equipment and material shall be stored in a manner that will minimize impacts to nesting and hatchling sea turtles to the maximum extent practicable. If construction impedes on sea turtle nesting season, all construction pipeline will be placed parallel to shore and as far landward as possible without impacting the dune. All temporary storage of pipeline and equipment will be placed off the beach whenever possible, or as far landward as possible without impacting the dune.

- *Compatibility of Dredge Material with Native Beach Material.* During borrow area selection for this project, a sand compatibility analysis compared the composite characteristics for both beaches and the borrow area including mean grain size, sorting, silt content, shell content, carbonate content, and Munsell color. The results of this analysis show that the material contained within the borrow area is very similar to the existing sand on Collier County beaches. Beach quality sand was chosen not only for stability and aesthetics, but also for suitability for sea turtle nesting, successful incubation, and hatchling emergence. Following construction, any escarpments that might form will be leveled to maintain sea turtle access to the nesting beach.

- *Monitoring and Nest Relocation.* Compaction monitoring, tilling, and escarpment remediation measures will be performed in accordance with the Terms and Conditions of the USFWS Biological Opinion. Sea turtle monitoring, nest evaluation and protection measures shall be conducted by Collier County Parks and Recreation personnel beginning May 1 and continuing through October 31. In order to reduce negative impacts

to nests, those laid in areas that would interfere with construction activities will be relocated to a safe area determined by CCPRD personnel after coordination with FWC. Relocation methods will follow those specified by the USFWS and FWC.

- *Project Lighting.* Direct lighting of the beach and nearshore waters will be limited to the immediate construction area during the sea turtle nesting season and shall comply with safety requirements. Lighting on offshore or onshore equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, EM 385-1-1, and OSHA requirements. Intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order to minimize sea turtle disorientation. Shields shall be affixed to the light housing and be large enough to block light from being transmitted outside the construction area.

7.1.2 Swimming Sea Turtles

Although not all five species nest in the project area, loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*) and Kemp's ridley (*Lepidochelys kempi*) sea turtles all have the potential to occur in the nearshore marine habitat of Collier County, and may be directly or indirectly impacted by project activities.

Direct and/or Indirect Effects

Many factors pose a threat to sea turtles including coastal development, land-based pollution, habitat encroachment, and harvesting. Potential impacts associated with beach restoration projects include degradation or even elimination of foraging grounds. Additionally, dredging operations pose a threat to in-water sea turtles, especially loggerheads. Hopper dredges, such as those that may be used for the Collier County Renourishment Project, can directly kill turtles if caught in drag heads. Hopper dredging occasionally results in sea turtle entrainment and death, even with seasonal dredging windows, turtle deflector drag heads in place, and concurrent relocation trawling (NMFS, 2003). Incidental takes of sea turtles have only been documented from hopper dredge operations that use trailing suction drag heads. Thus far, no incidental takes of sea turtles have been reported from clamshell, pipeline cutterhead, or other types of dredges operating along southeastern coasts (Dickerson *et al.*, 2004). The sea turtle species primarily affected by dredging are loggerhead, green, and Kemp's ridley, although, hawksbill and leatherback are also potentially vulnerable (NRC, 1990). Leatherback sea turtles are generally found in deep, pelagic, offshore waters though they occasionally may come into shallow waters to feed on aggregations of jellyfish. The nearshore and inshore waters of the northern and eastern Gulf may be used by these species as post-hatchling developmental habitat or foraging habitat (NMFS, 2003).

Beach restoration projects can also indirectly affect sea turtles by burying nearshore foraging habitat. Within the fill template of the proposed project, no nearshore hardbottom resources will be impacted through direct burial. The 2006 project required compensatory mitigation for 1.09 acres of hardbottom with an artificial reef; however, no impacts were realized. The mitigated natural hardbottom was dominated by turf and macroalgae. The macroalgae community primarily consisted of *Gracilaria, Hypnea, Caulerpa,* and *Botrycladia* species. *Jania and Sargassum* were also observed. *Gracilaria, Hypnea* and *Jania* are preferred food resources for

juvenile green turtles (Makowski *et al.* 2006; Wershoven and Wershoven 1988, 1992). The nearshore artificial reef will not be impacted by the proposed project; therefore, it will continue to provide foraging habitat for sea turtles.

Effects of Interdependent or Interrelated Actions

The only other actions that may occur near the project area are maintenance dredging of the passes. This interrelated action impacts both the water column used by swimming sea turtles but will not likely impact nearshore benthic habitat used for foraging as described above.

Cumulative Effects

Collier County beaches have been nourished on multiple occasions, which may lead to cumulative impacts within the project area, such as additional sand movement and deposition within the habitats of the project area. Littoral transport of materials from adjacent shorelines contributes to sedimentation stress on nearshore hardbottom habitats. Dredging of offshore borrow areas can lead to sedimentation of offshore hardbottom resources and degrade water column quality in the form of increased turbidity. Inlets also add influential stress to the adjacent nearshore hardbottom as the flow of freshwater from neighboring bays and waterways channel storm water runoff, and land-based sediments may be deposited in the ebb tidal zone. All of these factors may degrade sea turtle swimming and foraging habitat over time.

Although direct impacts from the Deepwater Horizon MC 252 oil spill have not been realized in the project area, long-term impacts from the spill remain unknown. Between April 30 and February 15, 2011, a total of 1146 sea turtles were found within the designated spill area from the Texas/Louisiana border to Apalachicola, Florida. Of these 1146 turtles, a total of 609 stranded turtles were found dead and 537 stranded alive (NOAA, 2011a). Sea turtle hatchlings that have joined the rest of the population out at sea since the spill may still face direct oil exposure, contaminated prey and oil impacts on their habitat. It is difficult to estimate how long it will take for these types of impacts to show up in the population. Nesting numbers on the Gulf Coast have not displayed a dramatic decline since the spill; however, the turtles that nested in 2011 were not the same ones who nested in 2010. Over the next season or two, the turtles who nested during the oil spill will be nesting again, so impacts may yet be seen (National Geographic, 2012). In addition, impacts to hatchlings from the spill may not be realized for several years. Kemp's ridley sea turtles do not reach sexual maturity until they are 7-15 years old, so if large numbers of hatchlings were lost to the oil spill it could take a decade or more to begin to influence nesting numbers. For loggerhead and green sea turtles, which do not reach maturity to around 20 years of age, it could take even longer to see impacts. The final breadth of the oil spill and the effectiveness of the clean-up efforts remain unknown.

Conservation Measures

The following provides various conservation measures for swimming sea turtles that will be implemented with the project.

- *Relocation Trawling.* Shrimp trawlers have been successfully used to capture sea turtles for relocation and research since the early 1980s (Bargo *et al.*, 2005). For research, turtles are generally captured for tagging purposes; however, relocation is implemented during

periods when hopper dredging is imminent or ongoing (NMFS NE Biological Opinion F/NER/2003/00302).

If a hopper dredge is used, sea turtle relocation trawling will be conducted as a means to reduce the likelihood of turtle mortality associated with dredging activity during the proposed project. Trawling will target the active dredging site within the borrow area prior to and during dredging. It has been documented that the proportion of sea turtles caught in nets that are dead or comatose increases with an increase in tow time from 0% during the first 50 minutes to about 70% after 90 minutes (CLS, 1990); therefore, the temporal length of each tow will be strictly limited to less than 50 minutes (total time). Positions at the beginning and end of each tow will be determined using GPS, and tow speed will be recorded at the approximate midpoint of each tow. Tide and weather conditions will also be recorded during each tow including air temperature, wind velocity and direction, sea state, wave height, and precipitation. Captured turtles will be photographed, measured, biopsied for genetics, epibionts present recorded, and tagged. Turtles will then be relocated at least 3 nautical miles from the dredge site in a direction that provides for the least likelihood of recapture.

During dredging for the 2006 project, the turtle relocation trawler captured and removed 87 sea turtles (86 loggerheads, 1 green) over the course of the project using the methods described above. Fourteen turtles were recaptured during the project and no dredge takes were documented by either dredge used.

- *Construction Methods*. The permittee shall comply with the *Sea Turtle and Smalltooth Sawfish Construction Conditions* developed by NMFS (Appendix No. 2). For swimming sea turtles, this includes avoiding collision with swimming sea turtles, monitoring of siltation barriers for entanglement, operation at “no wake/idle” speeds in the construction area, taking precautions when sea turtles are observed within 100 yards of the active construction operations, cessation of operation of any moving equipment when within 50 ft of a sea turtle, and reporting of any collision with and/or injury to a sea turtle to NMFS Protected Resources Division and the local authorized sea turtle stranding/rescue organization.

- *Project Lighting.* Direct lighting of the beach and nearshore waters will be limited to the immediate construction area during the sea turtle nesting season and shall comply with safety requirements. Lighting on offshore or onshore equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area.

7.1.3 Sea Turtle Effects Determination

Loggerhead sea turtles are the most abundant nesting turtles on Collier County beaches (99%-100%) and also represent the most abundant swimming turtle species relocated using turtle

trawlers during the 2006 project (99%). Because this species is the most abundant in the project area, it has been assigned an effects determination of May Affect, Likely to Adversely Affect.

Green sea turtles are the only other species that have been documented to nest in the area, although generally less than 1% of the total nesting abundance. One green turtle was captured during turtle trawling near the borrow areas during the 2006 project. Due to the possibility of nesting and overall presence of green sea turtles in the project area, this species is assigned an effects determination of May Affect, Likely to Adversely Affect.

Hawksbill, Kemp's ridley, and leatherback sea turtles were not captured during turtle trawling efforts during the 2006 projects, and there is no documented nesting of these species in the project area. However, these species are known to be found swimming in the nearshore waters of the Gulf of Mexico. Therefore, these three species are assigned an effects determination of May Affect, Likely to Adversely Affect.

7.2 Smalltooth Sawfish

Direct and/or Indirect Effects

In the nearshore habitat, no hardbottom resources are projected to be directly impacted from fill placement. Increased turbidity during construction and anticipated burial of hardbottom resources are unlikely to impact sawfish as a minimal amount of sawfish encounters occur over rock and reef formations (4% each) compared to observations over mud (61%) (Poulakis and Seitz, 2004). If any risk of impacts to smalltooth sawfish exist, it would be greater near the borrow area as this habitat is similar to the sawfish preferred habitat of sand and mud substrate (Poulakis and Seitz, 2004). However, the actions proposed at the borrow area and within the fill area are not anticipated to adversely affect, directly or indirectly, the smalltooth sawfish due to the low likelihood of occurrence of smalltooth sawfish so far from shore (borrow area T1 is over 9 miles west of the coastline).

Effects of Interdependent or Interrelated Actions

Of all the actions in or near the project area, the dredging of passes in Collier County has the highest likelihood of impacting smalltooth sawfish. A recent review of smalltooth sawfish sightings showed that most observations occurred in estuarine and nearshore habitats. Although some large smalltooth sawfish were observed in depths up to 73 m, there were more observations of smaller fish associated with inshore mangrove and seagrass habitats (Wiley and Simpfendorfer, 2010).

Cumulative Effects

Destruction of mangrove and estuarine habitat preferred by smalltooth sawfish, along with historic fishing pressure have contributed to the drastic reduction in numbers of smalltooth sawfish. As the proposed project is not impacting preferred habitat of this species, it is not expected to add to cumulative impacts to smalltooth sawfish.

Conservation Measures

The permittee shall comply with the *Sea Turtle and Smalltooth Sawfish Construction Conditions* developed by NMFS (Appendix No. 2). These conditions stipulate that if a sawfish is observed

within 100 yards of construction operations, all appropriate precautions shall be implemented to ensure its protection, including cessation of operation if the animal moves within 50 ft of any moving equipment.

Effects Determination

NMFS has determined that there has never been a reported take of a smalltooth sawfish by a hopper dredge and impact to the species during dredging activities is unlikely due its affinity for shallow estuarine habitats (NMFS, 2003). Based on the low probability that smalltooth sawfish will occur in the project area, along with compliance to the *Sea Turtle and Smalltooth Sawfish Construction Conditions*, an effects determination of May Affect, Not Likely to Adversely Affect is assigned to the smalltooth sawfish.

7.3 Marine Mammals

7.3.1 Whales

Direct and/or Indirect Effects

Of the six endangered whale species (Table 3), only sperm whales are considered to commonly occur in the Gulf of Mexico, and no whales are expected to be present in the coastal waters off of Collier County. The only marine mammal species that routinely occur in Florida Gulf Coast waters within 1-2 miles of the coast are bottlenose dolphins, Atlantic spotted dolphins (which are not listed under the ESA) and Florida manatees. In the Gulf of Mexico Regional Biological Opinion on Hopper Dredging of Navigation Channels and Borrow Areas in the U.S. Gulf of Mexico, NMFS ascertained that blue, fin, or sei whales will not be adversely affected by hopper dredging operations; the possibility of dredge collisions is remote since these are deepwater species unlikely to be found near hopper dredging sites. There has never been a report of a whale taken by a hopper dredge (NMFS, 2003).

Very little research has been conducted on the effects of dredging noise on marine life and information is sparse. The extent to which the introduction of higher background sound levels masks the ability of marine animals to detect and interpret sound signals from their environment is largely unknown, as is their reaction to man-made sounds (Robinson *et al.*, 2011; Normandeau Associates, Inc., 2012). Marine dredging produces broadband and continuous low frequency sound (1-1000 Hz). It has been hypothesized that the noise associated with dredging activities can trigger an avoidance reaction in marine mammals and may interrupt communication, migration, foraging and other behaviors by aquatic organisms (Clarke *et al.*, 2004; Thomsen *et al.*, 2009). However, noise impacts associated with dredging for this project will be localized and temporary and are not expected to have negative impacts on whales.

Effects of Interdependent or Interrelated Actions

Within the same timeframe as the proposed action, only maintenance dredging of several passes may occur. Maintenance dredging is not associated with the proposed nourishment project, but is periodically undertaken by Collier County as needed to improve navigation and safety within the passes. If it occurs, this activity is not anticipated to adversely affect the whale species addressed in this biological assessment as they do not utilize the nearshore region within the project area. However, in 2006, mother and calf northern right whales were observed offshore of Sanibel Island, just north of the project. Although the proposed borrow areas (T1) is located over 9 miles offshore, the likelihood of whales occurring near dredge activities is low; thus, adverse impacts

to whale species are not anticipated.

Cumulative Effects

Collier County periodically nourishes the beach to repair damage done by storms and to widen beaches as protection against storm damage and erosion. While some spreading of the beach fill into the nearshore waters following beach nourishment occurs, this is limited to the shallow coastal marine environment and does not impact offshore areas where whales might be present. The impacts of dredging offshore borrow areas is typically temporary degradation of water quality (primarily turbidity) surrounding the borrow areas. When considering the proposed project along with previous and future projects, and their impacts to whales, it is not anticipated that these species will be affected by cumulative impacts due to their low likelihood of occurrence within the project area and the temporary nature of the water quality impacts.

Between April 30 and April 12, 2011, two dead sperm whales were found within the specific Deepwater Horizon MC 252 Spill Response area (NOAA, 2011b). Acoustic survey equipment located nine miles from the spill site and at 1000-m water depth showed a drop in sperm whale numbers since the spill. This site has nine years of acoustic data that showed a fairly steady rate of five sperm whales in the area. After the spill, the number dropped to two; however, at a site located 25 miles away from the spill, the numbers increased leading experts to believe the sperm whales relocated due to the presence of oil and possibly the noise of the disaster (emergency drilling, increased ship volume) (O'Hanlon, 2010; Ackleh *et al.*, 2012). Although direct impacts from the oil spill have not been realized in the project area, long-term impacts from the spill remain unknown.

Conservation Measures

Protected species observers will be onboard the dredge to search for and document whales and sea turtles in proximity to the dredge. Monitoring will follow the terms and conditions provided in the National Marine Fisheries Service's Gulf of Mexico Regional Biological Opinion (GRBO), which requires 100 % monitoring (i.e., two observers) between April 1 and November 30, and whenever surface water temperatures are 11°C or greater, and requires 50% monitoring (i.e., one observer) at all other times (NMFS, 2003). If a whale is sighted near the dredge, NMFS and USACE will be notified and all in-water operations will be shut down immediately. The captain of the dredge will also be instructed to avoid whales encountered while traveling between the dredge site and the pipeline and to contact NMFS and USACE if a whale is observed in the vicinity.

Effects Determination

Based on the unlikelihood of their presence, feeding habits, and very low likelihood of dredge interaction, an effects determination of May Affect, Not Likely to Adversely Affect is designated to all whales, including sperm whales, for this project.

7.3.2 Florida Manatee

Direct and/or Indirect Effects

Florida manatees' preferred habitat is warm freshwater, estuarine, and nearshore coastal waters. Feeding areas are located in coastal and riverine systems, where shallow seagrass communities

are found (USFWS, 2001). Although seagrass is not located within the project area, it is found within waterways east of the adjacent barrier islands. Manatees may use the project area as a travel corridor and are frequently seen in the nearshore habitat. Manatees are most likely to be impacted by vessel strike while support boats move through channels from dock areas to the dredge vessels. In this project, the smaller support boats will likely access the dock through Gordon or Doctors Passes but the larger vessels will utilize deeper drafted waterways such as Tampa Bay. Manatee protection measures will be implemented to minimize such impacts to manatees, limiting vessels to "Idle Speed/No Wake" and requiring in-water operations to shut down if a manatee is observed within 50 ft of the operation.

It is possible, but unlikely, that manatees could come into close proximity to dredge activities at the offshore borrow area, as manatees prefer nearshore habitat (USFWS, 2001). It is more likely that manatees will be present near the fill site; however, high activity and noise associated with beach fill placement are likely to deter manatees from entering the project area during construction. Additionally, *Standard Manatee Construction Conditions for In-Water Work* (Appendix No. 1) will be implemented as protection measures during construction of the Collier County Renourishment Project to minimize the potential for impacts to manatees.

In addition to potential impacts by collision with watercraft, manatees may be indirectly affected by project activities through impacts to foraging habitat. However, manatees forage mostly where seagrass beds are present (*i.e.*, submerged aquatic vegetation or SAV), which has not been observed growing in the nearshore habitat of the project area (Figure 3). The majority of Collier County's shoreline is in designated manatee critical habitat, and although the project area does not fall within these confines, critical habitat is less than 2 miles to the south. The project area is within the known range of the manatee; therefore, it is possible that manatees may be present in or near the borrow areas, the fill area, and the pipeline corridors during construction. It is not anticipated that this project will affect foraging habitat or designated critical habitat for the Florida manatee.

Dredging activities create temporary increased noise to the underwater environment (Clarke *et al.*, 2004). Different types of dredges cause increases to ambient underwater noise (Clarke *et al.*, 2004) and are generally considered to be low frequency noises (Thomsen, 2009). Manatees are passive listeners meaning they do not use sonar to navigate and detect objects in the environment; they merely listen to the noises around them (Gerstein, 2002). However, manatees are unlikely to be impacted by the noise of the offshore dredge as manatees prefer nearshore habitats (USFWS, 2001). Within the nearshore waters, the manatees would be exposed to the noise of the support boats. However, studies have shown that manatees have difficulty detecting the low-frequency sounds of a boat with slowly rotating propellers until it is dangerously close to the manatee (Gerstein, 2002; Miksis-Olds *et al.*, 2007). Therefore, rather than being deterred by the low-frequency noise of the boats, the manatees have difficulty discerning boat noise from ambient noise, and so are more likely to collide with these vessels.

Effects of Interdependent or Interrelated Actions

Within the same timeframe as the proposed action, only maintenance dredging of several passes may occur. Seagrass has not been documented in the passes (Figure 3), and the absence of SAV habitat in the project area eliminates impacts to manatee foraging habitat. Again, the impact to

manatees from these interrelated activities is due the increased risk of vessel strike.

Cumulative Effects

The Florida manatee primarily feeds on SAV. Therefore, negative cumulative effects to manatees could occur if there is an overall loss of SAV. The loss of SAV can be attributed to an increase in sedimentation and change in salinity levels and tidal flow. Although the beaches within Collier County have been nourished on multiple occasions, and other coastal construction projects have occurred over the years which may lead to some cumulative impacts to benthic habitat within the project area, there are no known SAV communities utilized as foraging habitat for manatees within the project limits. Cumulative impacts resulting from changes in manatee foraging habitat are not anticipated.

It has been suggested that beach nourishment can lead to increased coastal development and tourism (NRC, 1990). The project area is highly used by recreational boaters. As such, as tourism increases, recreational boating may in turn increase. An increased volume in boat traffic could potentially put manatees at a higher risk of collision.

Manatees appear to have avoided direct impacts from the Deepwater Horizon MC 252 oil spill; however, it is still unknown what long-lasting damage to manatee habitat, including food resources such as seagrass beds, may become apparent later.

Conservation Measures

Construction activities will incorporate the *Standard Manatee Construction Conditions for In-Water Work* (Appendix No. 1). These conditions include protection measures that will minimize the potential for significant impacts to manatees by project-related activities. This includes: operation of vessels at 'idle speed/no wake' at all times while in the immediate area and when the draft of the vessels provides less than four feet of clearance from the bottom; immediate shutdown of all in-water operations if a manatee comes within 50 ft of construction activities; posting of temporary signs concerning manatees prior to and during all in-water activities; use of turbidity barriers that manatees cannot become entangled in; and, reporting any collisions or injury to a manatee to FWC and USFWS.

Effects Determination

It is unlikely that manatees will be present near the offshore borrow areas; however, they may be in the vicinity of the fill area and may be impacted by vessel traffic. There will be no impacts to manatee foraging areas because seagrass is not present in or near the project area. Compliance with the *Standard Manatee Construction Conditions for In-Water Work* (Appendix No. 1) will also aid in reducing impacts to manatees. Although manatees may be present in the project area, it is unlikely that they will be negatively impacted by project activities and therefore, an effects determination of May Affect, Not Likely to Adversely Affect is designated to manatees for this project.

7.4 Birds

7.4.1 Piping Plover and Red Knot

Direct and/or Indirect Effects

Piping plovers and red knots have been observed in Collier County. The construction window (*i.e.*, disposal of sand) will extend through approximately one migration and winter season. If the project is constructed using a dredge, the project is estimated to take up to 120 days (working 24 hours per day, 7 days a week). If the County chooses a truck haul project, the project may take between 140 to 237 days, which would subject shorebirds to a longer period of disturbance on the beach. Heavy machinery and equipment (*e.g.*, trucks and bulldozers operating on project area beaches, the placement of the dredge pipeline along the beach, and sand disposal) may adversely affect any migrating and wintering piping plovers and red knots in the project area by disturbance and disruption of normal activities such as roosting and feeding, and possibly forcing birds to expend valuable energy reserves to seek available habitat elsewhere.

Burial and suffocation of infaunal invertebrate species will occur during each nourishment and renourishment cycle along the entire project fill site. Research by Peterson *et al.* (2006) suggests that impacts to foraging habitat for shorebird species may be short-term due to the temporary depletion of the intertidal food base. Timeframes projected for infaunal recruitment and re-establishment following beach nourishment are between six months and two years (Greene, 2002; Burlas *et al.*, 2002). Beach wrack has also been recognized as an important resource to shorebirds, including piping plovers and red knots, for camouflage and foraging. The wrack line provides an important foraging resource for these species since they spend the majority of their overwintering time in Florida foraging along the shoreline. Destruction of wrack, through beach nourishment or wrack-removal programs, eliminates this habitat. Protection of wrack can help to offset the direct and indirect impacts associated with beach nourishment and ensuing human disturbance.

Indirect effects of beach nourishment projects involve concern for the reduction in potential for formation of overwash habitats in the project area. During storm events, overwash across barrier islands is common, depositing sediments on the bayside, clearing vegetation and increasing the amount of open, sandflat habitat ideal for shoreline-dependent shorebirds. However, the Collier County project area is almost fully developed with hotels, condominiums, residential housing, restaurants, and commercial buildings, which precludes overwash and limits creation of open sand flats preferred by piping plovers and red knots. Both species have been observed in abundance south of the project area along Big Marco Pass.

There is no federally designated piping plover critical habitat within the project area. The closest designated critical habitat for wintering piping plovers are Units FL-26 and FL-27. Unit FL-26 is located on Estero Island in Lee County approximately 10 miles north of the project area and FL-27 is located on Tigertail Beach, at the entrance to Big Marco Pass, approximately 11 miles south of the project area. Therefore, it is unlikely that piping plovers or their critical habitat will be impacted as a result of this project. The red knot is still a candidate species and therefore does not have any designated critical habitat.

Piping plovers and red knots may benefit from the stabilization of existing beach habitat and the increase in available roosting habitat from this project.

Effects of Interdependent or Interrelated Actions

Potential maintenance dredging of passes in proximity to the project area may involve the use of

construction machinery and equipment on the beach and within potential piping plover roosting and foraging habitat. This activity may have impacts on the beaches within the project area including depletion of intertidal and beach infauna, and temporary disruption of roosting and foraging by piping plovers and red knots. Apart from potential temporary disturbances, no long-term negative effects to these birds are anticipated.

Cumulative Effects

Cyclical beach renourishments, continual routine maintenance dredging of inlets, emergency sand placement projects, and coastal armoring may all have cumulative impacts on piping plovers and red knots over time. These species overwinter along Florida's coastline and forage along the sandy beaches near the project area and adjacent shorelines. Although infauna recovery has been documented after beach renourishments, the repetitive burial of beach infauna may eventually change the abundance and composition of infaunal communities, which can in turn affect food sources for the piping plover. Additionally, large-scale removal of beach wrack associated with coastal construction projects and beach grooming programs (beach cleaning and raking) removes habitat used by these species for foraging and camouflage.

The Collier County coastline is already extensively developed; however, it is reasonable to expect that human occupancy and recreational use along the Gulf coast of Florida will increase in the future. It is unknown how much influence beach renourishment contributes to the development and recreational use of the shoreline. As the proposed project reduces optimal foraging and roosting habitat through wrack-removal, burial and/or disturbance, it may enhance the aesthetic and recreational value of these beaches, thus increasing recreational pressure within the project area. Recreational activities that may adversely affect piping plovers and red knots include disturbance by pets, increased pedestrian use (walking, sunbathing) and reduction of foraging habitat from wrack-removal programs permitted by FDEP.

The potential for rapid climate change and its effects on SLR could adversely impact the habitat of listed and candidates species such as piping plovers and red knots. As climate changes, we can reasonably expect the abundance and distribution of wildlife to change as well. Although estimating future climate change and its effects is difficult, we can speculate that SLR caused by global warming may adversely affect already eroded shorelines, reducing the amount of coastal and beach habitat available to wildlife including piping plovers and red knots. The magnitude of impacts to piping plovers as well as other shorebirds will be better estimated in the future as more information becomes available.

Impacts from the Deepwater Horizon MC 252 oil spill have not been realized onshore within the project area; however, the final breadth of the oil spill and the effectiveness of the clean-up efforts remain unknown.

Conservation Measures

During the permitting process for other nourishment projects, coordination with USFWS has resulted in several recommended conservation measures that have been incorporated into the Terms and Conditions of the USFWS Biological Opinions. These include shorebird monitoring, educational signs at public beach access areas, following FWC's best management practices for operating vehicles on the beach, and public outreach. If required, shorebird surveys will be

conducted as recommended to monitor impacts to shorebirds and their habitat. Monitoring reports will be submitted to the County. The Collier County Coastal Zone Management Department, Parks and Recreation Department and CPE occasionally drive on the beach in ATVs while conducting sea turtle and beach topographic surveys, respectively. All follow FWC's guidelines for beach driving which include avoidance of wrack.

Effects Determination

Based on the potential of piping plover utilization of the project area, an effects determination of May Affect, Likely to Adversely Affect is assigned to piping plovers for this project. Due to the low abundance of documented red knot observations in the project area and the conservation measures that will be implemented to reduce potential impacts, an effects determination of May Affect, Not Likely to Adversely Affect is assigned to red knots for this project.

8.0 CONSERVATION MEASURES SUMMARY

In general, the conservation measures that will be taken to protect federally listed species and their habitat will follow construction guidelines as set forth by State and federal agencies.

9.0 CONCLUSIONS

Table 7 presents the effects determinations for each species based on the existing information available for each species and its occurrence, as well as the design and conservation measures discussed by species in Section 7. No critical habitat is located within the project area; therefore, there will be no effect to any critical habitat.

Table 7. Effects determination for evaluated species.

Common Name	Scientific Name	Effects Determination
SEA TURTLES		
Loggerhead	*Caretta caretta*	May affect, likely to adversely affect
Green	*Chelonia mydas*	May affect, likely to adversely affect
Leatherback	*Dermochelys coriacea*	May affect, likely to adversely affect
Hawksbill	*Eretmochelys imbricata*	May affect, likely to adversely affect
Kemp's ridley	*Lepidochelys kempii*	May affect, likely to adversely affect
FISH		
Smalltooth sawfish	*Pristis pectinata*	May affect, likely to adversely affect
MAMMALS		
Sei whale	*Balaenoptera borealis*	May affect, not likely to adversely affect
Fin whale	*Balaenoptera physalus*	May affect, not likely to adversely affect
North Atlantic right whale	*Eubalaena glacialis*	May affect, not likely to adversely affect
Humpback whale	*Megaptera novaeangliae*	May affect, not likely to adversely affect
Sperm whale	*Physeter macrocephalus*	May affect, not likely to adversely affect
Blue whale	*Balaenoptera musculus*	May affect, not likely to adversely affect
Florida manatee	*Trichechus manatus latirostris*	May affect, not likely to adversely affect
BIRDS		
Piping plover	*Charadrius melodus*	May affect, likely to adversely affect
Red knot	*Calidris canutus*	May affect, not likely to adversely affect

Based upon the findings of this biological assessment, we have determined that the proposed action "May affect, likely to adversely affect" the following species:

Loggerhead sea turtle (*Caretta caretta*)
Green sea turtle (*Chelonia mydas*)
Leatherback sea turtle (*Dermochelys coriacea*)
Hawksbill sea turtle (*Eretmochelys imbricata*)
Kemp's ridley (*Lepidochelys kempii*)
Smalltooth sawfish (*Pristis pectinata*)
Piping plover (*Charadrius melodus*)

Based upon the findings of this biological assessment, we have determined that the proposed action "May affect, not likely to adversely affect" the following species:

Sei whale (*Balaenoptera borealis)*
Fin whale (*Balaenoptera physalus)*

North Atlantic right whale (*Eubalaena glacialis)*
Humpback whale (*Megaptera novaeangliae)*
Sperm whale (*Physeter macrocephalus)*
Blue Whale (*Balaenoptera musculus)*
Florida manatee (*Trichechus manatus latirostris)*
Red knot (*Calidris canutus*)

We have determined that the proposed action will have "No effect" on the following species because they are known not to occur in or near the project area:

Staghorn coral (*Acropora cervicornis*)
Elkhorn coral (*Acropora palmata*)
Gulf sturgeon (*Acipenser oxyrinchus desotoi*)

The May Affect, Likely to Adversely Affect; May Affect, Not Likely to Adversely Affect; and the No Effect determinations for the listed species and critical habitat were concluded based upon compiled local and regional data and conservation, monitoring and mitigation measures to avoid and minimize impacts to listed species.

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APPENDIX NO. 1

FWC STANDARD MANATEE CONDITIONS FOR IN-WATER WORK

Standard Manatee Conditions For In-water Work

July 2009

STANDARD MANATEE CONDITIONS FOR IN-WATER WORK

2009

The permittee shall comply with the following conditions intended to protect manatees from direct project effects:

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

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

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

d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

e. Any collision with or injury to a manatee shall be reported immediately to the FWC Hotline at 1-888-404-FWCC. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-731-3336) for north Florida or Vero Beach (1-772-562-3909) for south Florida.

f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Awareness signs that have already been approved for this use by the Florida Fish and Wildlife Conservation Commission (FWC) must be used (see MyFWC.com). One sign which reads *Caution: Boaters* must be posted. A second sign measuring at least 81/2" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities.

CAUTION: MANATEE HABITAT

All project vessels

IDLE SPEED / NO WAKE

When a manatee is within 50 feet of work
all in-water activities must

SHUT DOWN

Report any collision with or injury to a manatee:

Wildlife Alert:

1-888-404-FWCC(3922)

cell *FWC or #FWC

APPENDIX NO. 2

NMFS SEA TURTLE AND SMALLTOOTH SAWFISH

CONSTRUCTION CONDITIONS

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

The permittee shall comply with the following protected species construction conditions:

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

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

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

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

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

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

g. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Revised: March 23, 2006
O:\forms\Sea Turtle and Smalltooth Sawfish Construction Conditions.doc

APPENDIX F

NATIONAL MARINE FISHERIES SERVICE (NMFS)
ESA SECTION 7 CONSULTATION

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
WASHINGTON, DC 20240-0001

NOV 16 2012

Dr. Roy Crabtree
Regional Administrator
NOAA-Fisheries
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701

RE: Request for Section 7 Consultation under the Endangered Species Act for the Collier County Beach Nourishment Project

Dear Dr. Crabtree:

The Bureau of Ocean Energy Management (BOEM) would like to request formal consultation under Section 7 of the Endangered Species Act (ESA) for the Collier County Beach Nourishment Project in Collier County, Florida. BOEM worked jointly with Collier County to prepare the enclosed Biological Assessment (BA). BOEM has determined that the proposed action has the potential to affect National Marine Fisheries Service trust species and is therefore requesting consultation under Section 7 of the Endangered Species Act (ESA; 16 USC §1536(c); 50 CFR § 402).

The BOEM and U.S. Army Corps of Engineers (USACE) have regulatory authority over different aspects of the proposed project. Under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, the USACE has regulatory authority over the conveyance and placement of sand resources within navigable waters. It is our understanding that these activities are covered under the existing Gulf of Mexico Regional Biological Opinion. Under the Outer Continental Shelf Lands Act (43 U.S.C. § 1337(k)), BOEM has sole jurisdiction to authorize the proposed use of sand from the offshore federal borrow area, Borrow Area T1. Dredging Borrow Area T1 falls outside of the scope of activities covered under the existing Regional Biological Opinion because the borrow area is located on the Outer Continental Shelf and the project is not being undertaken, but permitted by the USACE. Actions solely within BOEM jurisdiction are not authorized under that opinion. As such, BOEM and USACE are jointly requesting formal consultation on this aspect of the project, with BOEM serving as the lead agency.

If you consider recommending measures to minimize impacts to ESA-listed species or if you determine a jeopardy or adverse modification situation may exist for all or any part of the proposed action, we ask that you notify us as early as possible, according to 50 CFR 402.14(g)(5), to allow us to jointly discuss the findings. We believe that such discussions will facilitate the consultation process and ensure that any proposed measures are within our authority to control and implement.

If you have further questions or concerns regarding this project, please contact Dr. Jennifer Culbertson at (703) 787-1742 or by email at jennifer.culbertson@boem.gov.

Sincerely,

Jill K. Lewandowski
Chief, Branch of Environmental Consultation,
Division of Environmental Assessment

Enclosure

cc: (without enclosure)

Mr. Tunis McElwain
USACE, Jacksonville District Regulatory Office, Ft. Myers Permits Section

Mr. Gary McAlpin
Collier County

Ms. Lauren Floyd
Coastal Planning & Engineering, Inc.

APPENDIX H

USACE PUBLIC NOTICE, JANUARY 7, 2013

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
1520 ROYAL PALM SQUARE BOULEVARD, SUITE 310
FORT MYERS, FLORIDA 33919

REPLY TO
ATTENTION OF

December 20, 2012

Regulatory Division
Fort Myers Permits Section
SAJ-2003-12405(MOD-KDS)

Mr. Larry Williams, Field Supervisor
South Florida Ecological Services Office
U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, Florida 32960

Dear Mr. Williams:

This letter refers to a request on behalf of Collier County for a request to modify an existing beach renourishment permit. The project would affect waters of the United States associated with Gulf of Mexico. The project area encompasses approximately 7.5 miles of coastline between Wiggins Pass and Gordon Pass. Specifically, the project area includes portions of Vanderbilt, Park Shore, and Naples Beach in Sections 29 and 32, Township 48 South, Range 25 East, Sections 5,8,16,21 and 28, Township 49 South, Range 25 East, and Sections 4 and 9, Township 50 South, Range 25 East, Gulf of Mexico, Collier County, Florida.

The U.S. Army Corps of Engineers (Corps) has completed an evaluation of the impacts the work may have on listed species. The Corps hereby requests initiation of formal consultation pursuant to Section 7 of the Endangered Species Act for the piping plover and confirmation the project can be included in the State Programmatic Biological Opinion for sand placement for the swimming sea turtles and manatee. In accordance with guidance provided in the Endangered Species Consultation Handbook, the Corps requests that you initiate consultation upon receipt of this request or provide a response within 30 days of receipt of this request stating what information is necessary to meet the requirements of 50 CFR §402.14(c). Upon your initiation of formal consultation, please provide this office with an expected completion date so that we may inform the applicant of the associated timeframes. The following information is provided in accordance with 50 CFR §402.14(c):

Description of the activity: The project is as described on the enclosed copy of the modification request for the project. A public notice will be posted at a later date and forwarded to FWS for review.

a. Area affected: The 2013-14 beach renourishment cycle will occur at the following locations:

Table 1: Project Sites and Volume

Project Reach	Project Limits	Gaps	Design Volume (CY)
Vanderbilt	R-22+300 to R-30+500	R-22+300 to R-25+500	59,724
Park Shore	R-43+500 to R-54+400	R-47+500 to R-50	118,246
Naples	R-58A-480 to R-79	R-64+500 to R-68+200, R-72+600 to R-79	241,151
Total			419,121
Maximum total Under 2006 Permitted Template			515,000

b. Listed species affected: The Corps has determined the proposal may affect the following threatened or endangered species on the beaches:

Green Sea Turtle *Chelonia mydas*
Leatherback Sea Turtle *Dermochelys coriacea*
Kemp's ridley Sea Turtle *Lepidochelys kempii*
Loggerhead Sea Turtle *Caretta caretta*
Piping Plover *Charadrius melodus*

The Corps has determined the project may affect, but is not likely to adversely affect the following endangered species:

West Indian Manatee *Trichechus manatus latirostris*

The project will not affect manatee critical habitat. In addition to the above listed species, the red knot (*Calidris canutus*), a candidate species, has been documented in the project area.

Please note the Corps is serving as lead agency for Section 7 consultation with the U.S. Fish and Wildlife Service. BOEM is also participating in the consultation.

c. Analysis: The applicant has agreed to implement the Reasonable and Prudent Measures (RPMs) listed in the SPBO that apply to the project. Based on this information, the Corps is requesting confirmation that the proposed project can be included under the SPBO for manatee and nesting sea turtles, which determined that work conducted under the SPBO is not likely to jeopardize the continued existence of the loggerhead, green, leatherback, hawksbill or Kemp’s ridley sea turtles and concurred the project is not likely to adversely affect the manatee.

The attached Biological Assessment provides a detailed analysis of the effects on all listed species in the project area, including piping plover. Piping plovers and red knots have been observed in Collier County. The construction window (*i.e.*, disposal of sand) will extend through approximately one migration and winter season. If the project is constructed using a dredge, the project is estimated to take up to 120 days (working 24 hours per day, 7 days a week). If the County chooses a truck haul project, the project may take between 140 to 237 days, which would subject shorebirds to a longer period of disturbance on the beach. Heavy machinery and equipment (*e.g.*, trucks and bulldozers operating on project area beaches, the placement of the dredge pipeline along the beach, and sand disposal) may adversely affect any migrating and wintering piping plovers and red knots in the project area by disturbance and disruption of normal activities such as roosting and feeding. The applicant is willing to comply with the Florida Fish and Wildlife Conservation Commission (FWC) standard guidelines to protect against impacts to nesting shorebirds during implementation of this project during the periods from February 15 to August 31.

d. Relevant reports. Enclosed are the following documents specific to this consultation: Project Description and Engineering Summary, Permit Sketches, Hardbottom Biological Monitoring Plan, Geotechnical Information, Biological Assessment, NMFS Checklist, USFWS Manatee Biological Evaluation

e. Other relevant information. Reference is made to the information found in the Multi-Species Recovery Plan, the state programmatic Biological Opinion, and the Gulf Regional Programmatic Biological Opinion.

If you have any questions regarding this letter, please contact Krista Sabin at the letterhead address, by telephone at 239-334-1975 extension 31, or by email at Krista.D.Sabin@usace.army.mil.

Sincerely,
for

Tunis W. McElwain
Chief, Fort Myers Regulatory Section

Enclosures (7)

Attachment 1: Project Description and Engineering Summary
Attachment 2: Permit Sketches
Attachment 3: Hardbottom Biological Monitoring Plan
Attachment 4: Geotechnical Information
Attachment 5: Biological Assessment
Attachment 6: NMFS Checklist
Attachment 7: USFWS Manatee Biological Evaluation

Copies Furnished(w/o enclosures):

Collier County, GaryMcAlpin@colliergov.net
Coastal Planning and Engineering, Lauren.Floyd@shawgrp.com
BOEM, Jennifer.Culbertson@boem.gov
DEP, elizabeth.yongue@dep.state.fl.us

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

April 25, 2013

Colonel Alan M. Dodd
U.S. Army Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Service Federal Activity Code:	41420-2010-F-0225
Corps Application No.:	SAJ-2003-12405 (MOD-KDS)
Date Received:	December 20, 2012
Formal Consultation Initiation Date:	March 14, 2013
Project:	Collier County Beaches Sand Placement
Applicant:	Collier County
County:	Collier

Dear Colonel Dodd:

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion to the U.S. Army Corps of Engineers (Corps) based on our review of a proposal to place beach compatible material along 7.5 miles of shoreline between Wiggins Pass and Gordon Pass, Collier County, Florida. This document will address potential effects of the proposed project on the threatened piping plover (*Charadrius melodus*), threatened loggerhead sea turtle (*Caretta caretta*), endangered leatherback sea turtle (*Dermochelys coriacea*), endangered green sea turtle (*Chelonia mydas*), endangered hawksbill sea turtle (*Eretmochelys imbricata*), endangered Kemp's ridley sea turtle (*Lepidochelys kempii*), and endangered West Indian manatee (*Trichechus manatus*). This document is provided in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*).

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) share Federal jurisdiction for sea turtles under the Act. The Service has the responsibility for sea turtles on the nesting beaches and NOAA Fisheries has jurisdiction for sea turtles in the marine environment. Our analysis will only address activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. NOAA Fisheries will assess and consult with the Corps concerning potential impacts to sea turtles in the marine environment.

This Biological Opinion is based on information provided in Corps letter dated December 20, 2012, supplemental documents, and correspondence with the Corps, NOAA Fisheries, and the Florida Fish and Wildlife Conservation Commission (FWC). A complete administrative record of this consultation is on file at the South Florida Ecological Services Office, Vero Beach, Florida.

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FISH AND WILDLIFE RESOURCES

Hardbottom reef habitat and seagrasses

Potential impacts to hardbottom resources that fell within the estimated Equilibrium Toe of Fill (ETOF) of a previous 2006 project were mitigated through construction of a 1.09-acre artificial reef. The ETOF for the proposed project will not extend any farther seaward than the ETOF for the 2006 project; therefore, no additional compensatory mitigation measures for hardbottom impacts are proposed for this project.

The proposed project will avoid hardbottom reef habitat. All pipeline corridors have been surveyed for the presence of any offshore hardbottom reef habitat communities. Collared pipelines will be installed over hardbottom resources as approved by the Florida Department of Environmental Protection (DEP), in order to elevate the pipeline above the substrate and minimize the area of direct contact with the seafloor and avoid physical abrasion to the benthic communities. The collared submerged pipeline will consist of the standard 30-inch dredge pipe with large tractor tires placed around the pipe at 100-foot intervals over the portion of the corridor that crosses over hardbottom resources.

The Corps permit does not authorize impacts to seagrass and all dredging is restricted to unvegetated areas. Prior to pipeline placement, visual seagrass surveys shall be conducted to verify the pipeline is located over unvegetated barren areas. No seagrass impacts are anticipated as a result of the proposed project, such as, but not limited to propeller scouring, pipeline placement, vessel or barge anchoring, grounding, or spudding. Collier County (Applicant) shall be liable for any unauthorized impacts. For any impacts caused by construction activities, seagrass restoration or mitigation may be required which will be coordinated through the Corps, NOAA Fisheries, and the Service.

The Corps will continue to consult with NOAA Fisheries whom will assess all potential effects to hardbottom reef habitat and seagrasses within the dredge template and sand placement fill template.

Consultation History

On December 20, 2012, the Service received a copy of the Corps' letter dated December 20, 2012, and supplemental documents concerning the proposed sand placement project between Wiggins Pass and Gordon Pass, Collier County, Florida.

On March 14, 2013, the Service completed their review of the proposed project and initiated formal consultation with the Corps concerning the potential effects of the proposed project on piping plovers.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Applicant proposes to place approximately 515,000 cubic yards (cy) of beach compatible sand along 7.5 miles of shoreline between Wiggins Pass and Gordon Pass in Collier County, Florida (Figure 1). Specifically, the sand placement template includes portions of Vanderbilt

Beach (between DEP reference monuments R-22+300 feet and R-30+500 feet), Pelican Bay (between DEP reference monuments R-30+500 feet and R-37), Park Shore (between DEP reference monuments R-43+500 feet and R-54+400 feet), and Naples Beach (between DEP reference monuments R-58A-480 feet and R-79). Approximately 59,724 cy, 40,000 cy, 118,246 cy, and 241,151 cy of sand will be placed along Vanderbilt Beach, Pelican Bay, Park Shore, and Naples Beach, respectively.

Depending on bidding, either an offshore or upland sand source will be used for the proposed project. If the offshore sand source is the most economical, Borrow Area T1, located approximately 33 miles west of Vanderbilt Beach will be utilized (Figure 2). Borrow Area T1 will be dredged using a hopper dredge, cutterhead dredge with a spider barge and scows, or combination of both. The dredged sand will be screened at the offshore borrow site regardless of the dredge used. The proposed project will use the pipeline corridors (P1, P2, and P3) permitted in the 2006 project (Figure 1). Pipeline corridor P1 is the northernmost pipeline corridor and comes ashore between DEP reference monument R-25 and R-26 on Vanderbilt Beach; P2 comes ashore between DEP reference monument R-51 and R-53 on Park Shore; and P3 comes ashore between DEP reference monument R-62 and R-64 on Naples Beach. Dredge material will be discharged through the pipeline onto the beach within diked work areas in compliance with the approved turbidity control plan and to comply with mixing zone requirements. A temporary shore-parallel dike comprised of sand will be constructed to confine and accommodate settlement of the beach fill material as required to meet State of Florida Water Quality standards. As the pipeline discharge point advances, the dike will be advanced along the shoreline. The dike shall be maintained so that at least 300 feet of dike exists ahead of the pipeline discharge point. Dredged sand will be distributed and graded using a variety of dump trucks, front end loaders, and bulldozers.

If an upland sand source is used, it will be trucked to a staging area using conventional triaxle dump trucks, deposited, loaded into all-terrain dump trucks using front end loaders, and then delivered to the fill template. The specific sand mine will be determined at the time of selection. Several sand mines are located near Collier County. The Immokalee Mines in northeast Collier County can provide sand sorted into a variety of characteristics, and has been used successfully on Collier County beaches. There are other upland sand sources with similar sand quality to the Immokalee sand mine, and they should be acceptable based on submittal of a qualifying sand sample and use of the approved Quality Assurance/Quality Control plan for an upland sand source project for Collier County.

Regardless of which sand source is utilized for the proposed project, all beach compatible sand placed within the sand placement templates will be graded to the permitted design fill profiles. All sand placed within the sand placement template must be approved by the DEP and meet all requirements as outlined in the Florida Administrative Code subsection 62B-41.007. The purpose of the Collier County beach nourishment project is to place the design volume of sand necessary for a 6 year design life without impacting nearshore hardbottom habitat based on impacts incurred from Tropical Storm Debby in June 2012.

All beach corridors, staging areas, and pipeline corridors will be selected to avoid effects to upland habitat. Construction vehicles and equipment must traverse or be stored within these

designated areas, corridors, and/or within the pipeline corridor. In addition, all construction pipes will be placed parallel to the shoreline and positioned as far landward as possible up to the vegetated dune line. Any affected vegetation at any of the beach corridors, staging areas, and pipeline corridors shall be restored to pre-construction conditions. In addition, if heavy equipment and vehicles are required to traverse the dry beach above the mean high water line (MHWL), the path will be tilled to a depth of 3 feet to avoid compaction effects prior to the following sea turtle nesting season.

The proposed sand placement project is scheduled to begin in September 2013, and to be completed by the end of May 2014. If the proposed project is constructed using the offshore sand source, the project is estimated to take up to 120 days working 24 hours per day, 7 days a week. If an upland sand source is utilized, the project may take between 140 to 237 days to complete.

Action area

The action area is defined as all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action. The Service identifies the action area to include the offshore borrow area and dredge template, upland mines, sand placement template (a total of approximately 7.5 miles), pipeline corridors, beach access corridors, staging areas, and downdrift area. The proposed project is located along the Gulf of Mexico, Collier County, Florida, at latitude 26.2583 and longitude -81.8249 (Vanderbilt Beach), latitude 26.2381 and longitude -81.8205 (Pelican Bay), latitude 26.1852 and longitude -81.8151 (Park Shore south end), and latitude 26.1728 and longitude -81.8139 (Naples Beach north end).

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

The piping plover is a small, pale sand-colored shorebird, about 7 inches long with a wingspan of about 15 inches (Palmer 1967). On January 10, 1986, the piping plover was listed as endangered in the Great Lakes watershed and threatened elsewhere within its range, including migratory routes outside of the Great Lakes watershed and wintering grounds (Service 1985). Piping plovers were listed principally because of habitat destruction and degradation, predation, and human disturbance. Protection of the species under the Act reflects the species' precarious status range-wide. Three separate breeding populations have been identified, each with its own recovery criteria: the northern Great Plains (threatened), the Great Lakes (endangered), and the Atlantic Coast (threatened). The piping plover winters in coastal areas of the U.S. from North Carolina to Texas, and along the coast of eastern Mexico and on Caribbean islands from Barbados to Cuba and the Bahamas (Haig and Elliott-Smith 2004). Piping plover subspecies are phenotypically indistinguishable, and most studies in the nonbreeding range report results without regard to breeding origin. Although a recent analysis shows strong patterns in the wintering distribution of piping plovers from different breeding populations, partitioning is not complete and major information gaps persist. Therefore, information summarized here pertains to the species as a whole (*i.e.*, all three breeding populations), except where a particular breeding population is specified.

Critical habitat

The Service has designated critical habitat for the piping plover on three occasions. Two of these designations protected different piping plover breeding populations. Critical habitat for the Great Lakes breeding population was designated May 7, 2001 (66 Federal Register [FR] 22938, Service 2001a), and critical habitat for the northern Great Plains breeding population was designated September 11, 2002 (67 FR 57637, Service 2002). The Service designated critical habitat for wintering piping plovers on July 10, 2001 (66 FR 36038; Service 2001a). Wintering piping plovers may include individuals from the Great Lakes and northern Great Plains breeding populations as well as birds that nest along the Atlantic Coast. The three separate designations of piping plover critical habitat demonstrate diversity of constituent elements between the two breeding populations as well as diversity of constituent elements between breeding and wintering populations.

Designated wintering piping plover critical habitat originally included 142 areas (the rule states 137 units; this is an error) encompassing approximately 1,793 miles of mapped shoreline and 165,211 acres of mapped areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas. Since the designation of wintering critical habitat, 19 units (TX-3, 4, 7-10, 14-19, 22, 23, 27, 28, and 31-33) in Texas have been vacated and remanded back to the Service for reconsideration by Court order (*Texas General Land Office vs. U.S. Department of Interior* [Case No. V-06-CV-00032]). On May 19, 2009, the Service published a final rule designating 18 revised critical habitat units in Texas, totaling approximately 139,029 acres (74 FR 23476).

The Courts vacated and remanded back to the Service for reconsideration, four units in North Carolina (*Cape Hatteras Access Preservation Alliance vs. U.S. Department of Interior* [344 F. Supp. 2d 108 D.D.C. 2004]). The four critical habitat units vacated were NC-1, 2, 4, and 5, and all occurred within Cape Hatteras National Seashore. A revised designation for these four units was published on October 21, 2008 (73 FR 62816). On February 6, 2009, Cape Hatteras Access Preservation Alliance and Dare and Hyde Counties, North Carolina, filed a legal challenge to the revised designation. A final decision has not been made on the North Carolina challenge to date.

The primary constituent elements (PCEs) for piping plover wintering habitat are those biological and physical features that are essential to the conservation of the species. The PCEs are those habitat components that support foraging, roosting, and sheltering, and the physical features necessary for maintaining the natural processes that support these habitat components. PCEs typically include those coastal areas that support intertidal beaches and flats, and associated dune systems and flats above annual high tide (Service 2001b). PCEs of wintering piping plover critical habitat include sand or mud flats or both with no or sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers (Service 2001b). Important components of the beach/dune ecosystem include surf-cast algae, sparsely vegetated back beach and salterns, spits, and washover areas. Washover areas are broad, unvegetated zones, with little or no topographic relief, that are formed and maintained by the action of hurricanes, storm surge, or other extreme wave action. The units designated as critical habitat are those areas that have consistent use by piping plovers and that best meet the biological needs of the species. The amount of wintering habitat included in the designation appears sufficient

to support future recovered populations, and the existence of this habitat is essential to the conservation of the species. Additional information on each specific unit included in the designation can be found at 66 FR 36038 (Service 2001b).

Feeding areas

Plovers forage on moist substrate features such as intertidal portions of ocean beaches, washover areas, mudflats, sand flats, algal flats, shoals, wrack lines, sparse vegetation, and shorelines of coastal ponds, lagoons, and ephemeral pools, and adjacent to salt marshes (Gibbs 1986; Zivojnovich 1987; Nicholls 1989; Coutu et al. 1990; Nicholls and Baldassarre 1990a; Nicholls and Baldassarre 1990b; Hoopes et al. 1992; Loegering 1992; Goldin 1993a; Elias-Gerken 1994; Wilkinson and Spinks 1994; Zonick 1997; Service 2001b). Studies have shown that the relative importance of various feeding habitat types may vary by site (Gibbs 1986; Coutu et al. 1990; McConnaughey et al. 1990; Loegering 1992; Goldin 1993a; Hoopes 1993). Cohen et al. (2008) documented more abundant prey items and biomass on sound island and sound beaches than the ocean beach. Ecological Associates Incorporated [EAI] (2009) observed that during piping plover surveys conducted at St Lucie Inlet, Martin County, Florida, intertidal mudflats and/or shallow subtidal grassflats appeared to have greater value as foraging habitat than the unvegetated intertidal areas of a flood shoal.

Foraging/food

Behavioral observations of piping plovers on the wintering grounds suggest that they spend the majority of their time foraging (Nicholls and Baldassarre 1990a; Drake 1999a, 1999b). Feeding activities may occur during all hours of the day and night (Staine and Burger 1994; Zonick 1997), and at all stages in the tidal cycle (Goldin 1993a; Hoopes 1993). Wintering plovers primarily feed on invertebrates such as polychaete marine worms, various crustaceans, fly larvae, beetles, and occasionally bivalve mollusks (Bent 1929; Cairns 1977; Nicholls 1989; Zonick and Ryan 1996) found on top of the soil or just beneath the surface.

Habitat

Wintering piping plovers prefer coastal habitats that include sand spits, islets (small islands), tidal flats, shoals (usually flood tidal deltas), and sandbars that are often associated with inlets (Harrington 2008). Sandy mud flats, ephemeral pools, and overwash areas are also considered primary foraging habitats. These substrate types have a richer infauna than the foreshore of high energy beaches and often attract large numbers of shorebirds (Cohen et al. 2008). Wintering plovers are dependent on a mosaic of habitat patches and move among these patches depending on local weather and tidal conditions (Nicholls and Baldassarre 1990a).

Recent study results in North Carolina, South Carolina, and Florida, complement information from earlier investigations in Texas and Alabama (summarized in the 1996 Atlantic Coast and 2003 Great Lakes Recovery Plans) regarding habitat use patterns of piping plovers in their coastal migration and wintering range. As documented in Gulf Coast studies, nonbreeding piping plovers in North Carolina primarily used sound (bay or bayshore) beaches and sound

islands for foraging and ocean beaches for roosting, preening, and being alert (Cohen et al. 2008). The probability of piping plovers being present on the sound islands increased with increasing exposure of the intertidal area (Cohen et al. 2008). Maddock et al. (2009) observed shifts to roosting habitats and behaviors during high-tide periods in South Carolina.

Seven years of surveys, two to three times per month, along 8 miles of Gulf of Mexico (ocean-facing) beach in Gulf County, Florida, cumulatively documented nearly the entire area used at various times by roosting or foraging piping plovers. Birds were reported using the midbeach to the intertidal zone. Numbers ranged from 0 to 39 birds on any given survey day (Eells unpublished data).

As observed in Texas studies, Lott et al. (2009) identified bay beaches (bay shorelines as opposed to ocean-facing beaches) as the most common landform used by foraging piping plovers in southwest Florida. However in northwest Florida, Smith (2007) reported landform use by foraging piping plovers about equally divided between Gulf of Mexico (ocean-facing) and bay beaches. Exposed intertidal areas were the dominant foraging substrate in South Carolina (accounting for 94 percent of observed foraging piping plovers; Maddock et al. 2009) and in northwest Florida (96 percent of foraging observations; Smith 2007). In southwest Florida, Lott et al. (2009) found approximately 75 percent of foraging piping plovers on intertidal substrates.

Recent geographic analysis of piping plover distribution on the upper Texas coast noted major concentration areas at the mouths of rivers, washover passes (low, sparsely vegetated barrier island habitats created and maintained by temporary, storm-driven water channels), and major bay systems (Arvin 2008). Earlier studies in Texas have drawn attention to washover passes, which are commonly used by piping plovers during periods of high bayshore tides and during the spring migration period (Zonick 1997, 2000). Elliott-Smith et al. (2009) reported piping plover concentrations on exposed seagrass beds and oyster reefs during seasonal low water periods in 2006.

Atlantic Coast and Florida studies highlighted the importance of inlets for nonbreeding piping plovers. Almost 90 percent of roosting piping plovers at ten coastal sites in southwest Florida were on inlet shorelines (Lott et al. 2009). Piping plovers were among seven shorebird species found more often than expected ($p = 0.0004$; Wilcoxon Test Scores) at inlet locations versus noninlet locations in an evaluation of 361 International Shorebird Survey sites from North Carolina to Florida (Harrington 2008).

Bird populations in and adjacent to the project area are monitored by volunteers. Launched in 2002, by the Cornell Lab of Ornithology and National Audubon Society, eBird provides data concerning bird abundance and distribution at a variety of spatial and temporal scales. eBird is sponsored in part by several Service programs, research groups, non-government offices, and the University of the Virgin Islands. Although not specific to the project area, the number of piping plovers observed in Collier County between 2009 and 2011, was 62, 70, and 90, respectively. The 2006 International Piping Plover Census did not document piping plovers within the project area (Elliott-Smith et al. 2009); however, 49 piping plovers were observed on Big Marco Pass Shoal located approximately 11 miles south of the proposed project area. In addition, piping plover PCEs are present throughout the proposed action area.

The effects of dredge material deposition merit further study. Drake et al. (2001) concluded conversion of southern Texas mainland bayshore tidal flats to dredged material impoundments results in a net loss of habitat for wintering piping plovers because impoundments eventually convert to upland habitat not utilized by piping plovers. Zonick et al. (1998) reported dredged material placement areas along the intracoastal waterway in Texas were rarely used by piping plovers, and noted concern that dredge islands block wind-driven water flows which are critical to maintaining important shorebird habitats. By contrast, most of the sound islands used by foraging piping plovers at Oregon Inlet were created by the Corps through deposition of dredged material in the subtidal bay bottom, with the most recent deposition ranging from 28 to less than 10 years prior to the study (Cohen et al. 2008).

Mean home range size (95 percent of locations) for 49 radio-tagged piping plovers in southern Texas in 1997 through 1998 was 3,113 acres, mean core area (50 percent of locations) was 717 acres, and the mean linear distance moved between successive locations (1.97 $\pm$ 0.04 days apart) averaged across seasons, was 2.1 miles (Drake 1999a; Drake et al. 2001). Seven radio-tagged piping plovers used a 4,967-acre area (100 percent minimum convex polygon) at Oregon Inlet in 2005 and 2006, and piping plover activity was concentrated in 12 areas totaling 544 acres (Cohen et al. 2008). Noel and Chandler (2008) observed high fidelity of banded piping plovers along a 0.62 and 2.8 mile section of beach on Little St. Simons Island, Georgia.

Migration

Plovers depart their breeding grounds for their wintering grounds between July and late August, but southward migration extends through November. Piping plovers use habitats in Florida primarily from July 15 through May 15. Both spring and fall migration routes of Atlantic Coast breeders are believed to occur primarily within a narrow zone along the Atlantic Coast (Service 1996). The pattern of both fall and spring counts at many Atlantic Coast sites demonstrates that many piping plovers make intermediate stopovers lasting from a few days up to 1 month during their migrations (Noel and Chandler 2005; Stucker and Cuthbert 2006). Some midcontinent breeders travel up or down the Atlantic Coast before or after their overland movements (Stucker and Cuthbert 2006). Use of inland stopovers during migration is also documented (Pompei and Cuthbert 2004). The source breeding population of a given wintering individual cannot be determined in the field unless it has been banded or otherwise marked. Information from observation of color-banded piping plovers indicates that the winter ranges of the breeding populations overlap to a significant degree. See the *Status and Distribution* section for additional information pertaining to population distribution on the wintering grounds. While piping plover migration patterns and needs remain poorly understood and occupancy of a particular habitat may involve shorter periods relative to wintering, information about the energetics of avian migration indicates that this might be a particularly critical time in the species' life cycle.

Natural protection

Cryptic coloration is a primary defense mechanism for piping plovers where nests, adults, and chicks all blend in with their typical beach surroundings. Piping plovers on wintering and migration grounds respond to intruders (*e.g.*, pedestrian, avian, and mammalian) usually by squatting, running, and flushing (flying).

Roosting

Several studies identified wrack (organic material including seaweed, seashells, driftwood, and other materials deposited on beaches by tidal action) as an important component of roosting habitat for nonbreeding piping plovers. Lott et al. (2009) found greater than 90 percent of roosting piping plovers in southwest Florida in old wrack with the remainder roosting on dry sand. In South Carolina, 18 and 45 percent of roosting piping plovers were in fresh and old wrack, respectively. The remainder of roosting birds used intertidal habitat (22 percent), backshore (defined as the zone of dry sand, shell, cobble and beach debris from the mean high water line up to the toe of the dune; 8 percent), washover (2 percent), and ephemeral pools (1 percent) (Maddock et al. 2009). Thirty percent of roosting piping plovers in northwest Florida were observed in wrack substrates with 49 percent on dry sand and 20 percent using intertidal habitat (Smith 2007). In Texas, seagrass debris (bayshore wrack) was an important feature of piping plover roosting sites (Drake 1999a). Mean abundance of two other plover species in California, including the listed western snowy plover, was positively correlated with an abundance of wrack during the nonbreeding season (Dugan et al. 2003).

Life history

Piping plovers live an average of 5 years, although studies have documented birds as old as 11 (Wilcox 1959) and 15 years. Piping plover breeding activity begins in mid-March when birds begin returning to their nesting areas (Coutu et al. 1990; Cross 1990; Goldin et al. 1990; MacIvor 1990; Hake 1993). Plovers are known to begin breeding as early as 1 year of age (MacIvor 1990; Haig 1992); however, the percentage of birds that breed in their first adult year is unknown. Piping plovers generally fledge only a single brood per season, but may re-nest several times if previous nests are lost.

The most consistent finding in the various population viability analyses conducted for piping plovers (Ryan et al. 1993; Melvin and Gibbs 1996; Plissner and Haig 2000; Wemmer et al. 2001; Larson et al. 2002; Amirault et al. 2005; Calvert et al. 2006; Brault 2007) indicates even small declines in adult and juvenile survival rates will cause increases in extinction risk. A banding study conducted between 1998 and 2004 in Atlantic Canada concluded lower return rates of juvenile (first year) birds to the breeding grounds than was documented for Massachusetts (Melvin and Gibbs 1994), Maryland (Loegering 1992), and Virginia (Cross 1996) breeding populations in the mid-1980s and very early 1990s. This is consistent with failure of the Atlantic Canada population to increase in abundance despite high productivity (relative to other breeding populations) and extremely low rates of dispersal to the U.S. over the last 15 plus years (Amirault et al. 2005). This suggests maximizing productivity does not ensure population increases.

Efforts to partition survival within the annual cycle are beginning to receive more attention, but current information remains limited. Drake et al. (2001) observed no mortality among 49 radio-tagged piping plovers (total of 2,704 transmitter days) in Texas in 2007 and 2008. Cohen et al. (2008) documented no mortality of 7 radio-tagged wintering piping plovers at Oregon Inlet from December 2005 to March 2006. They speculate their high survival rate was attributed to plover food availability much of the day as well as the low occurrence of days below freezing and infrequent wet weather. Analysis of South Carolina resighting data for 87 banded piping plovers

(78 percent Great Lakes breeders) in 2006 and 2007, and 2007 and 2008, found 100 percent survival from December to April (Cohen 2009). However, of those birds, one unique and one nonuniquely banded piping plover were seen in the first winter and resighted multiple times in the second fall at the same location, but not seen during the second winter. Whether these two birds died in the fall or shifted their wintering location is unknown (Maddock et al. 2009). Noel et al. (2007) inferred two winter (November to February) mortalities among 21 banded (but not radio-tagged) overwintering piping plovers in 2003 through 2004, and 9 mortalities among 19 overwintering birds during the winter of 2004 through 2005 at Little St. Simons Island, Georgia. Noel et al. (2007) inferred mortality if a uniquely banded piping plover with multiple November to February sightings on the survey site disappeared during that time and was never observed again in either its nonbreeding or breeding range. Note that most of these birds were from the Great Lakes breeding population, where detectability during the breeding season is very high. LeDee (2008) found higher apparent survival rates during breeding and southward migration than during winter and northward migration for 150 adult (*i.e.,* after-hatch year) Great Lakes piping plovers. "Apparent survival" does not account for permanent emigration. If marked individuals leave a survey site, apparent survival rates will be lower than true survival. If a survey area is sufficiently large, such that emigration out of the site is unlikely, apparent survival will approach true survival.

Mark-recapture analysis of resightings of uniquely banded piping plovers from seven breeding areas by Roche et al. (2009) found apparent adult survival declined in four populations and did not increase over the life of the studies (data were analyzed for 3 to 11 years per breeding area between 1998 and 2008). Some evidence of correlation in year-to-year fluctuations in annual survival of Great Lakes and eastern Canada populations, both of which winter primarily along the southeastern U.S. Atlantic Coast, suggests shared over-wintering and/or migration habitats may influence annual variation in survival. Further concurrent mark-resighting analysis of color-banded individuals across piping plover breeding populations has the potential to shed light on threats that affect survival in the migration and wintering range.

Population dynamics

The 2006 International Piping Plover Breeding Census, the last comprehensive survey throughout the breeding grounds, documented 3,497 breeding pairs with a total of 8,065 birds throughout Canada and the U.S, and a total of 454 in Florida (Elliott-Smith et al. 2009). The surveys covered approximately 760.5 miles and included 186 sites (Elliott-Smith et al 2009). As the Atlantic Coast is not included in the action area, the breakdown for the Gulf Coast of Florida is: 321 piping plovers at 117 sites covering approximately 522 miles of suitable habitat (Elliott-Smith et al 2009).

Numbers for Florida can be further broken down into 3 regions along the Gulf Coast. The northwest Florida census area in the panhandle extends from the Alabama line to Jefferson County, the north Florida census area from Taylor County south to Manatee County, and southwest Florida from Sarasota County south to Key West National Wildlife Refuge. Northwest Florida numbers for the 2006 International Piping Plover Census were 111 with an increased survey effort from previous years. This represents an increase from the 53 piping plovers sighted in the 2001 effort. North Florida reported 96 birds and estimated an additional 40 from missing data sheets. There were 74 piping plovers located in southwest Florida as

compared to 50 in the 2001 effort (Elliott-Smith et al 2009). The mainland portion of Monroe County is, technically, on the Gulf Coast of Florida; however, the predominant habitat is mangrove shoreline and no piping plovers were sighted at the survey location on Pavilion Key.

Atlantic Coast population

The Atlantic Coast piping plover breeds on coastal beaches from Newfoundland and southeastern Quebec to North Carolina. Historical population trends for the Atlantic Coast piping plover have been reconstructed from scattered, largely qualitative records. Nineteenth-century naturalists, such as Audubon and Wilson, described the piping plover as a common summer resident on Atlantic Coast beaches (Haig and Oring 1987). However, by the beginning of the twentieth century, egg collecting and uncontrolled hunting, primarily for the millinery trade, had greatly reduced the population, and in some areas along the Atlantic Coast, the piping plover was close to extirpation. Following passage of the Migratory Bird Treaty Act (MBTA) in 1918, and changes in the fashion industry that no longer exploited wild birds for feathers, piping plover numbers recovered to some extent (Haig and Oring 1985).

Available data suggest the most recent population decline began in the late 1940s or early 1950s (Haig and Oring 1985). Reports of local or statewide declines between 1950 and 1985 are numerous, and many are summarized by Cairns and McLaren (1980) and Haig and Oring (1985). While Wilcox (1939) estimated more than 500 pairs of piping plovers on Long Island, New York, the 1989 population estimate was 191 pairs (Service 1996). There was little focus on gathering quantitative data on piping plovers in Massachusetts through the late 1960s because the species was commonly observed and presumed to be secure. However, numbers of piping plover breeding pairs declined 50 to 100 percent at seven Massachusetts sites between the early 1970s and 1984 (Griffin and Melvin 1984). Piping plover surveys in the early years of the recovery effort found counts of these cryptically colored birds sometimes increased with increased census effort, suggesting some historic counts of piping plovers by one or more observers may have underestimated the piping plover population. Thus, the magnitude of the species decline may have been more severe than available numbers imply.

The New England recovery unit population has exceeded (or been within three pairs of) its 625-pair abundance goal since 1998, attaining a postlisting high of 711 pairs in 2008. The New York-New Jersey recovery unit reached 586 pairs in 2007, surpassing its 575-pair goal for the first time; however, in 2008, abundance dipped to 554 pairs. The Southern recovery unit, which attained 333 and 331 pairs in 2007 and 2008, respectively, has not yet reached its 400-pair goal.

The Eastern Canada recovery unit has experienced the lowest population growth (9 percent net increase between 1989 and 2008), despite higher overall productivity than in the U.S. The highest postlisting abundance estimate was 274 pairs in 2002, with a 2008 estimate of 253 pairs, placing this recovery unit furthest from its goal (400 pairs).

Great Lakes population

The Great Lakes plovers once nested on Great Lakes beaches in Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and Ontario. Great Lakes piping plovers nest on wide, flat, open, sandy or cobble shoreline with very little grass or other vegetation.

Reproduction is adversely affected by human disturbance of nesting areas and predation by foxes, gulls, crows and other avian species. Shoreline development, such as the construction of marinas, breakwaters, and other navigation structures, has adversely affected nesting and brood rearing.

The Recovery Plan (Service 2003a) set a population goal of at least 150 pairs (300 individuals), for at least 5 consecutive years, with at least 100 breeding pairs (200 individuals) in Michigan and 50 breeding pairs (100 individuals) distributed among sites in other Great Lakes states. In 2008, the current Great Lakes piping plover population was estimated at 63 breeding pairs (126 individuals). Of these, 53 pairs were found nesting in Michigan, while 10 were found outside the state, including six pairs in Wisconsin and four in Ontario. The 53 nesting pairs in Michigan represent approximately 50 percent of the recovery criterion. The 10 breeding pairs outside Michigan in the Great Lakes basin, represents 20 percent of the goal, albeit the number of breeding pairs outside Michigan has continued to increase over the past 5 years. The single breeding pair discovered in 2007 in the Great Lakes region of Canada represented the first confirmed piping plover nest there in over 30 years, and in 2008 the number of nesting pairs further increased to four.

Northern Great Plains population

The Northern Great Plains plover breeds from Alberta to Manitoba, Canada and south to Nebraska; although some nesting has recently occurred in Oklahoma. Currently, the most westerly breeding piping plovers in the U.S. occur in Montana and Colorado. The decline of piping plovers on rivers in the Northern Great Plains has been largely attributed to the loss of sandbar island habitat and forage base due to dam construction and operation. Nesting occurs on sand flats or bare shorelines of rivers and lakes, including sandbar islands in the upper Missouri River system, and patches of sand, gravel, or pebbly-mud on the alkali lakes of the northern Great Plains. Plovers do nest on shorelines of reservoirs created by the dams, but reproductive success is often low and reservoir habitat is not available in many years due to high water levels or vegetation. Dams operated with steady constant flows allow vegetation to grow on potential nesting islands, making these sites unsuitable for nesting. Population declines in alkali wetlands are attributed to wetland drainage, contaminants, and predation.

The International Piping Plover Census, conducted every 5 years, also estimates the number of piping plover pairs in the Northern Great Plains. None of the International Piping Plover Census estimates suggest the Northern Great Plains population has yet satisfied the recovery criterion of 2,300 pairs (Table 1).

The International Piping Plover Census results in prairie Canada reported 1,703 adult birds in 2006, well short of the goal of 2,500 adult piping plover as stated in the Service's Recovery Plan (Service 1988).

Status and distribution

Nonbreeding (migrating and wintering)

Piping plovers spend up to 10 months of their life cycle on their migration and at wintering grounds, generally July 15 through as late as May 15. Piping plover migration routes and

habitats overlap breeding and wintering habitats, and, unless banded, migrants passing through a site usually are indistinguishable from breeding or wintering piping plovers. Migration stopovers by banded piping plovers from the Great Lakes have been documented in New Jersey, Maryland, Virginia, and North Carolina (Stucker and Cuthbert 2006). Migrating breeders from eastern Canada have been observed in Massachusetts, New Jersey, New York, and North Carolina (Amirault et al. 2005). As many as 85 staging piping plovers have been tallied at various sites in the Atlantic breeding range (Perkins 2008), but the composition (*e.g.*, adults that nested nearby and their fledged young of the year versus migrants moving to or from sites farther north), stopover duration, and local movements are unknown. In general, distance between stopover locations and duration of stopovers throughout the coastal migration range remains poorly understood.

Review of published records of piping plover sightings throughout North America by Pompei and Cuthbert (2004) found more than 3,400 fall and spring stopover records at 1,196 sites. Published reports indicated piping plovers do not concentrate in large numbers at inland sites and they seem to stop opportunistically. In most cases, reports of birds at inland sites were single individuals.

Piping plovers migrate through and winter in coastal areas of the U.S. from North Carolina to Texas and in portions of Mexico and the Caribbean. Data based on four rangewide mid-winter (late January to early February) population surveys, conducted at 5-year intervals starting in 1991, show that total numbers have fluctuated over time, with some areas experiencing increases and others decreases (Table 2). Regional and local fluctuations may reflect the quantity and quality of suitable foraging and roosting habitat, which vary over time in response to natural coastal formation processes as well as anthropogenic habitat changes (*e.g.*, inlet relocation, dredging of shoals and spits). Fluctuations may also represent localized weather conditions (especially wind) during surveys, or unequal survey coverage. For example, airboats facilitated first-time surveys of several central Texas sites in 2006 (Elliott-Smith et al. 2009). Similarly, the increase in the 2006 numbers in the Bahamas is attributed to greatly increased census efforts; the extent of additional habitat not surveyed remains undetermined (Elliott-Smith et al. 2009). Changes in wintering numbers may also be influenced by growth or decline in the particular breeding populations that concentrate their wintering distribution in a given area. Opportunities to locate previously unidentified wintering sites are concentrated in the Caribbean and Mexico (Elliott-Smith et al. 2009). Further surveys and assessment of seasonally emergent habitats (*e.g.*, seagrass beds, mudflats, oyster reefs) within bays lying between the mainland and barrier islands in Texas are also needed.

Midwinter surveys may underestimate the abundance of nonbreeding piping plovers using a site or region during other months. In late September 2007, 104 piping plovers were counted at the south end of Ocracoke Island, North Carolina (National Park Service [NPS] 2007), where none were seen during the 2006 International Piping Plover Winter Census (Elliott-Smith et al. 2009). Noel et al. (2007) observed up to 100 piping plovers during peak migration at Little St. Simons Island, Georgia, where approximately 40 piping plovers wintered in 2003 to 2005. Differences among fall, winter, and spring counts in South Carolina were less pronounced, but inter-year fluctuations (*e.g.*, 108 piping plovers in spring 2007 versus 174 piping plovers in spring 2008) at 28 sites were striking (Maddock et al. 2009). Even as far south as the Florida Panhandle,

monthly counts at Phipps Preserve in Franklin County ranged from a midwinter low of four piping plovers in December 2006, to peak counts of 47 in October 2006 and March 2007 (Smith 2007). Pinkston (2004) observed much heavier use of Texas Gulf Coast (ocean-facing) beaches between early September and mid-October (approximately 16 birds per mile) than during December to March (approximately 2 birds per mile).

Local movements of non-breeding piping plovers may also affect abundance estimates. At Deveaux Bank, one of South Carolina's most important piping plover sites, 5 counts at approximately 10-day intervals between August 27 and October 7, 2006, oscillated from 28 to 14 to 29 to 18 to 26 (Maddock et al. 2009). Noel and Chandler (2008) detected banded Great Lakes piping plovers known to be wintering on their Georgia study site in 73.8 $\pm$ 8.1 percent of surveys over 3 years.

Abundance estimates for non-breeding piping plovers may also be affected by the number of surveyor visits to the site. Preliminary analysis of detection rates by Maddock et al. (2009) found 87 percent detection during the midwinter period on core sites surveyed three times a month during fall and spring and one time per month during winter, compared with 42 percent detection on sites surveyed three times per year (Cohen 2009).

Gratto-Trevor et al. (2009) found strong patterns (but no exclusive partitioning) in winter distribution of uniquely banded piping plovers from four breeding populations (Figure 3). All eastern Canada and 94 percent of Great Lakes birds wintered from North Carolina to southwest Florida. However, eastern Canada birds were more heavily concentrated in North Carolina, and a larger proportion of Great Lakes piping plovers were found in South Carolina and Georgia. Northern Great Plains populations were primarily seen farther west and south, especially on the Texas Gulf Coast. Although the great majority of Prairie Canada individuals were observed in Texas, particularly southern Texas, individuals from the U.S. Great Plains were more widely distributed on the Gulf Coast, from Florida to Texas.

The findings of Gratto-Trevor et al. (2009) provide evidence of differences in the wintering distribution of piping plovers from these four breeding areas. However, the distribution of birds by breeding origin during migration remains largely unknown. Other major information gaps include the wintering locations of the U.S. Atlantic Coast breeding population (banding of U.S. Atlantic Coast piping plovers has been extremely limited) and the breeding origin of piping plovers wintering on Caribbean islands and in much of Mexico.

Banded piping plovers from the Great Lakes, Northern Great Plains, and eastern Canada breeding populations showed similar patterns of seasonal abundance at Little St. Simons Island, Georgia (Noel et al. 2007). However, the number of banded plovers originating from the latter two populations was relatively small at this study area.

This species exhibits a high degree of intra- and interannual wintering site fidelity (Nicholls and Baldassarre 1990a; Drake et al. 2001; Noel and Chandler 2005; Stucker and Cuthbert 2006). Gratto-Trevor et al. (2009) reported that 6 of 259 banded piping plovers observed more than once per winter moved across boundaries of the seven U.S. regions. Of 216 birds observed in

different years, only eight changed regions between years, and several of these shifts were associated with late summer or early spring migration periods (Gratto-Trevor et al. 2009). Total number of individuals observed on the wintering grounds was 46 for Eastern Canada, 150 for the U.S. Great Lakes, 169 for the U.S. Great Plains, and 356 for Prairie Canada.

Local movements are more common. In South Carolina, Maddock et al. (2009) documented many cross-inlet movements by wintering banded piping plovers as well as occasional movements of up to 11.2 miles by approximately 10 percent of the banded population. Larger movements within South Carolina were seen during fall and spring migration. Similarly, eight banded piping plovers that were observed in two locations during 2006 and 2007 surveys in Louisiana and Texas were all in close proximity to their original location (Maddock 2008).

In 2001, 2,389 piping plovers were located during a winter census, accounting for only 40 percent of the known breeding birds recorded during a breeding census (Ferland and Haig 2002). About 89 percent of birds that are known to winter in the U.S. do so along the Gulf Coast (Texas to Florida), while 8 percent winter along the Atlantic Coast (North Carolina to Florida).

The status of piping plovers on winter and migration grounds is difficult to assess, but threats to piping plover habitat used during winter and migration identified by the Service during its designation of critical habitat continue to affect the species. Unregulated motorized and pedestrian recreational use, inlet and shoreline stabilization projects, beach maintenance and nourishment, and pollution affect most winter and migration areas. Conservation efforts at some locations have likely resulted in the enhancement of wintering habitat.

The 2004 and 2005 hurricane seasons affected a substantial amount of habitat along the Gulf Coast. Habitats such as those along Gulf Islands National Seashore have benefited from increased washover events which created optimal habitat conditions for piping plovers. Conversely, hard shoreline structures are put into place following storms throughout the species range to prevent such shoreline migration (see *Factors Affecting the Species Habitat within the Action Area*). Four hurricanes between 2002 and 2005 are often cited in reference to rapid erosion of the Chandeleur Islands, a chain of low-lying islands in Louisiana where the 1991 International Piping Plover Census tallied more than 350 piping plovers. Comparison of imagery taken 3 years before and several days after Hurricane Katrina found that the Chandeleur Islands lost 82 percent of their surface area (Sallenger et al. in review), and a review of aerial photography prior to the 2006 Census suggested little piping plover habitat remained (Elliott-Smith et al. 2009). However, Sallenger et al. (in review) noted habitat changes in the Chandeleurs stem not only from the effects of these storms, but rather from the combined effects of the storms, long-term (greater than 1,000 years) diminishing sand supply, and sea level rise relative to the land.

The Service is aware of the following site specific conditions that affect the status of several habitats piping plover use while wintering and migrating, including critical habitat units. In Texas, one critical habitat unit was afforded greater protection due to the acquisition of adjacent upland properties by the local Audubon chapter. In another unit in Texas, vehicles were removed from a portion of the beach decreasing the likelihood of automobile disturbance to

plovers. Exotic plant removal is occurring in another critical habitat unit in South Florida. The Service and other government agencies remain in a contractual agreement with the U.S. Department of Agriculture for predator control within limited coastal areas in the Florida panhandle, including portions of some critical habitat units. Continued removal of potential terrestrial predators is likely to enhance survivorship of wintering and migrating piping plovers. In North Carolina, one critical habitat unit was afforded greater protection when the local Audubon chapter agreed to manage the area specifically for piping plovers and other shorebirds following the relocation of a nearby inlet channel.

Recovery criteria

Northern Great Plains population (Service 1988, 1994)

1. Increase the number of birds in the U.S. northern Great Plains states to 2,300 pairs (Service 1994).
2. Increase the number of birds in the prairie region of Canada to 2,500 adult piping plovers (Service 1988).
3. Secure long term protection of essential breeding and wintering habitat (Service 1994).

Great Lakes population (Service 2003a)

1. At least 150 pairs (300 individuals), for at least 5 consecutive years, with at least 100 breeding pairs (200 individuals) in Michigan and 50 breeding pairs (100 individuals) distributed among sites in other Great Lakes states.
2. Five-year average fecundity within the range of 1.5 to 2.0 fledglings per pair, per year, across the breeding distribution, and 10-year population projections indicate the population is stable or continuing to grow above the recovery goal.
3. Protection and long-term maintenance of essential breeding and wintering habitat is ensured, sufficient in quantity, quality, and distribution to support the recovery goal of 150 pairs (300 individuals).
4. Genetic diversity within the population is deemed adequate for population persistence and can be maintained over the long-term.
5. Agreements and funding mechanisms are in place for long-term protection and management activities in essential breeding and wintering habitat.

Atlantic Coast population (Service 1996)

1. Increase and maintain for 5 years a total of 2,000 breeding pairs, distributed among 4 recovery units.

Recovery Unit	Minimum Subpopulation
Atlantic (eastern) Canada	400 pairs
New England	625 pairs
New York-New Jersey	575 pairs
Southern (DE, MD, VA, NC)	400 pairs

2. Verify the adequacy of a 2,000 pair population of piping plovers to maintain heterozygosity and allelic diversity over the long term.

3. Achieve a 5-year average productivity of 1.5 fledged chicks per pair in each of the 4 recovery units described in criterion 1, based on data from sites that collectively support at least 90 percent of the recover unit's population.

4. Institute long-term agreements to assure protection and management sufficient to maintain the population targets and average productivity in each recovery unit.

5. Ensure long-term maintenance of wintering habitat, sufficient in quantity, quality, and distribution to maintain survival rates for a 2,000-pair population.

Threats to Piping plovers

In the following sections, threats to piping plovers in their migration and wintering range are provided. This information has been updated since the 1985 listing rule, the 1991 status review, and the three breeding population recovery plans. Previously identified and new threats are discussed. With minor exceptions, this analysis is focused on threats to piping plovers within the continental U.S. portion of their migration and wintering range. Threats in the Caribbean and Mexico remain largely unknown.

Present or threatened destruction, modification, or curtailment of its habitat or range

The 1985 final rule stated the number of piping plovers on the Gulf of Mexico coastal wintering grounds might be declining as indicated by preliminary analysis of the Christmas Bird Count data. Independent counts of piping plovers on the Alabama coast indicated a decline in numbers between the 1950s and early 1980s. At the time of listing, the Texas Parks and Wildlife Department stated that 30 percent of wintering habitat in Texas had been lost over the previous 20 years. The final rule also stated in addition to extensive breeding area problems, the loss and modification of wintering habitat was a significant threat to the piping plover.

The three recovery plans stated that shoreline development throughout the wintering range poses a threat to all populations of piping plovers. The plans further stated beach maintenance and nourishment, inlet dredging, and artificial structures such as jetties and groins, could eliminate wintering areas and alter sedimentation patterns leading to the loss of nearby habitat.

Priority 1 actions in the 1996 Atlantic Coast and 2003 Great Lakes Recovery Plans identify tasks to protect natural processes that maintain coastal ecosystems and quality wintering piping plover habitat, and to protect wintering habitat from shoreline stabilization and navigation projects. The 1988 Northern Great Plains Plan states as winter habitat is identified, current and potential threats to each site should be determined.

Important components of ecologically sound barrier beach management include perpetuation of natural dynamic coastal formation processes. Structural development along the shoreline or manipulation of natural inlets upsets the dynamic processes and results in habitat loss or degradation (Melvin et al. 1991). Throughout the range of migrating and wintering piping plovers, inlet and shoreline stabilization, inlet dredging, beach maintenance and nourishment activities, and seawall installations continue to constrain natural coastal processes. Dredging of inlets can affect spit formation adjacent to inlets and directly remove or affect ebb and flood tidal shoal formation.

Jetties, which stabilize an island, cause island widening and subsequent growth of vegetation on inlet shores. Seawalls restrict natural island movement and exacerbate erosion. As discussed in more detail below, all these efforts result in loss of piping plover habitat. Construction of these projects during months when piping plovers are present also causes disturbance that disrupts the birds' foraging efficiency and hinders their ability to build fat reserves over the winter and in preparation for migration, as well as their recuperation from migratory flights. Additional investigation is needed to determine the extent to which these factors cumulatively affect piping plover survival and how they may impede conservation efforts for the species.

Any assessment of threats to piping plovers from loss and degradation of habitat must recognize that up to 24 shorebird species migrate or winter along the Atlantic Coast and almost 40 species of shorebirds are present during migration and wintering periods in the Gulf of Mexico region (Helmers 1992). Continual degradation and loss of habitats used by wintering and migrating shorebirds may cause an increase in intra-specific and inter-specific competition for remaining food supplies and roosting habitats. For example, in Florida approximately 825 miles of coastline and parallel bayside flats (unspecified amount) were present prior to the advent of high human densities and beach stabilization projects. We estimate only about 35 percent of the Florida coastline continues to support natural coastal formation processes, thereby concentrating foraging and roosting opportunities for all shorebird species and forcing some individuals into suboptimal habitats. Thus, intra- and interspecific competition most likely exacerbates threats from habitat loss and degradation.

Exotic/invasive vegetation

A recently identified threat to piping plover habitat, not described in the listing rule or recovery plans, is the spread of coastal invasive plants into suitable piping plover habitat. Like most invasive species, coastal exotic plants reproduce and spread quickly and exhibit dense growth habits, often outcompeting native plant species. If left uncontrolled, invasive plants cause a habitat shift from open or sparsely vegetated sand to dense vegetation, resulting in the loss or degradation of piping plover roosting habitat, which is especially important during high tides and migration periods.

Beach vitex (*Vitex rotundifolia*) is a woody vine introduced into the southeastern U.S. as a dune stabilization and ornamental plant (Westbrooks and Madsen 2006). It currently occupies a very small percentage of its potential range in the U.S.; however, it is expected to grow well in coastal communities throughout the southeastern U.S. from Virginia to Florida, and west to Texas (Westbrooks and Madsen 2006). In 2003, the plant was documented in New Hanover, Pender, and Onslow counties in North Carolina, and at 125 sites in Horry, Georgetown, and Charleston counties in South Carolina. One Chesapeake Bay site in Virginia was eradicated, and another site on Jekyll Island, Georgia, is about 95 percent controlled (Suiter 2009). Beach vitex has been documented from two locations in northwest Florida, but one site disappeared after erosional storm events. The landowner of the other site has indicated an intention to eradicate the plant, but follow through is unknown (Farley 2009). Task forces formed in North and South Carolina in 2004 and 2005, have made great strides to remove this plant from their coasts. To date, about 200 sites in North Carolina have been treated, with 200 additional sites in need of treatment. Similar efforts are underway in South Carolina.

Unquantified amounts of crowfootgrass (*Dactyloctenium aegyptium*) grow invasively along portions of the Florida coastline. It forms thick bunches or mats that may change the vegetative structure of coastal plant communities and alter shorebird habitat.

The Australian pine (*Casuarina equisetifolia*) changes the vegetative structure of the coastal community in south Florida and islands within the Bahamas. Shorebirds prefer foraging in open areas where they are able to see potential predators, and tall trees provide good perches for avian predators. Australian pines potentially affect shorebirds, including the piping plover, by reducing attractiveness of foraging habitat and/or increasing avian predation.

The propensity of these exotic species to spread, and their tenacity once established, make them a persistent threat, partially countered by increasing landowner awareness and willingness to undertake eradication activities.

Groins

Groins (structures made of concrete, rip rap, wood, or metal built perpendicular to the beach in order to trap sand) are typically found on developed beaches with severe erosion. Although groins can be individual structures, they are often clustered along the shoreline. Groins act as barriers to longshore sand transport and cause downdrift erosion, which prevents piping plover habitat creation by limiting sediment deposition and accretion (Hayes and Michel 2008). These structures are found throughout the southeastern Atlantic Coast, and although most were in place prior to the piping plover's 1986 Act listing, installation of new groins continues to occur.

Inlet stabilization/relocation

Many navigable mainland or barrier island tidal inlets along the Atlantic and Gulf of Mexico coasts are stabilized with jetties, groins, seawalls, and/or adjacent industrial or residential development. Jetties are structures built perpendicular to the shoreline that extend through the entire nearshore zone and past the breaker zone (Hayes and Michel 2008) to prevent or decrease sand deposition in the channel. Inlet stabilization with rock jetties and associated channel dredging for navigation alter the dynamics of longshore sediment transport and affect the location and movement rate of barrier islands (Camfield and Holmes 1995), typically causing downdrift erosion. Sediment is then dredged and added back to islands which are subsequently widened. Once the island becomes stabilized, vegetation encroaches on the bayside habitat, thereby diminishing and eventually destroying its value to piping plovers. Accelerated erosion may compound future habitat loss, depending on the degree of sea level rise. Unstabilized inlets naturally migrate, reforming important habitat components, whereas jetties often trap sand and cause significant erosion of the downdrift shoreline. These combined actions affect the availability of piping plover habitat (Cohen et al. 2008).

Using Google Earth© (accessed April 2009), Service biologists visually estimated the number of navigable mainland or barrier island tidal inlets throughout the wintering range of the piping plover in the conterminous U.S. that have some form of hardened structure (Table 3). This includes seawalls or adjacent development, which lock the inlets in place.

Tidal inlet relocation can cause loss and/or degradation of piping plover habitat, although less permanent than construction of hard structures where effects can persist for years. For example, a project on Kiawah Island, South Carolina, degraded one of the most important piping plover habitats in the State by reducing the size and physical characteristics of an active foraging site, changing the composition of the benthic community, decreasing the tidal lag in an adjacent tidal lagoon, and decreasing the exposure time of the associated sand flats (Service and Town of Kiawah Island unpublished data). In 2006, preproject piping plover numbers in the project area recorded during four surveys conducted at low tide averaged 13.5 piping plovers. This contrasts with a postproject average of 7.1 plovers during eight surveys (four in 2007 and four in 2008) conducted during the same months (Service and Town of Kiawah Island unpublished data). Service biologists are aware of at least seven inlet relocation projects (two in North Carolina, three in South Carolina, two in Florida), but this number likely under represents the extent of this activity.

Sand mining/dredging

Sand mining, the practice of dredging sand from sand bars, shoals, and inlets in the nearshore zone, is a less expensive source of sand than obtaining sand from offshore shoals for beach nourishment. Sand bars and shoals are sand sources that move onshore over time and act as natural breakwaters. Inlet dredging reduces the formation of exposed ebb and flood tidal shoals considered to be primary or optimal piping plover roosting and foraging habitat. Removing these sand sources can alter depth contours and change wave refraction as well as cause localized erosion (Hayes and Michel 2008). Exposed shoals and sandbars are also valuable to piping plovers, as they tend to receive less human recreational use (because they are only accessible by boat) and therefore provide relatively less disturbed habitats for birds. An accurate estimate of the amount of sand mining that occurs across the piping plover wintering range, or the number of inlet dredging projects that occur is not available. This number is likely greater than the number of total jettied inlets shown in Table 3, since most jettied inlets need maintenance dredging, but non-hardened inlets are often dredged as well.

Sand placement projects

In the wake of episodic storm events, managers of lands under public, private, and county ownership often protect coastal structures using emergency storm berms which are frequently followed by beach nourishment or renourishment activities (nourishment projects are considered "soft" stabilization versus "hard" stabilization such as seawalls). Berm placement and beach nourishment projects deposit substantial amounts of sand along Gulf of Mexico and Atlantic beaches to protect local property in anticipation of preventing erosion and what otherwise will be considered natural processes of overwash and island migration (Schmitt and Haines 2003).

Past and ongoing stabilization projects fundamentally alter the natural dynamic coastal processes that create and maintain beach strand and bayside habitats, including those habitat components that piping plovers rely upon. Although the effects may vary depending on a range of factors, stabilization projects may directly degrade or destroy piping plover roosting and foraging habitat in several ways. Front beach habitat may be used to construct an artificial berm that is densely planted in grass, which can directly reduce the availability of roosting habitat. Over time, if the beach narrows due to erosion, additional roosting habitat between the berm and the water can be lost. Berms can also prevent or reduce the natural overwash that creates roosting habitats by

converting vegetated areas to open sand areas. The vegetation growth caused by impeding natural overwash can also reduce the maintenance and creation of bayside intertidal feeding habitats. In addition, stabilization projects may indirectly encourage further development of coastal areas and increase the threat of disturbance.

Lott et al. (in review) documented an increasing trend in sand placement events in Florida (Figure 4). Approximately 358 miles of 825 miles (43 percent) of Florida's sandy beach coastline were nourished from 1959 to 2006 (Table 4), with some areas being nourished multiple times. In northwest Florida, the Service consulted on first time sand placement projects along 46 miles of shoreline in 2007 to 2008, much of which occurred on public lands (Gulf Islands National Seashore (Service 2007a), portions of St. Joseph State Park (Service 2007b), and Eglin Air Force Base (Service 2008a).

At least 668 of 2,340 coastal shoreline miles (29 percent of beaches throughout the piping plover winter and migration range in the U.S.) are bermed, nourished, or renourished, generally for recreational purposes and to protect commercial and private infrastructure. However, only approximately 54 miles or 2.31 percent of these effects have occurred within critical habitat. In Louisiana, sand placement projects are deemed environmental restoration projects by the Service because without the sediment many areas would erode below sea level.

Seawalls and revetments

Seawalls and revetments are vertical hard structures built parallel to the beach in front of buildings, roads, and other facilities to protect them from erosion. However, these structures often accelerate erosion by causing scouring in front of and downdrift from the structure (Hayes and Michel 2008) which can eliminate intertidal foraging habitat and adjacent roosting habitat. Physical characteristics that determine microhabitats and biological communities can be altered after installation of a seawall or revetment, thereby depleting or changing composition of benthic communities that serve as the prey base for piping plovers. At four California study sites, each comprised of an unarmored segment and a segment seaward of a seawall, Dugan and Hubbard (2006) found armored segments had narrower intertidal zones, smaller standing crops of macrophyte wrack, and lower shorebird abundance and species richness. Geotubes (long cylindrical bags made of high strength permeable fabric and filled with sand) are softer alternatives, but act as barriers by preventing overwash.

Wrack removal and beach cleaning

Wrack on beaches and baysides provides important foraging and roosting habitat for piping plovers (Drake 1999a; Smith 2007; Lott et al. 2009; Maddock et al. 2009) and many other shorebirds on their winter, breeding, and migration grounds. Because shorebird numbers are positively correlated with wrack cover and biomass of their invertebrate prey that feed on wrack (Tarr and Tarr 1987; Dugan et al. 2003; Hubbard and Dugan 2003), beach grooming will lower bird abundance (Defreo et al. 2009).

There is increasing popularity in the Southeast, especially in Florida, for beach communities to carry out "beach cleaning" and "beach raking" actions. Beach cleaning occurs on private beaches, where piping plover use is not well documented, and on some municipal or county

beaches that are used by piping plovers. Most wrack removal on State and Federal lands is limited to poststorm cleanup and does not occur regularly. There is no record that the DEP has issued any field permits for raking along the proposed project area. Typically, if issued, the DEP field permit restricts raking of the beach to the area between 15 feet landward of the MHWL and 15 feet seaward of the dune vegetation line. As the wrack line is usually associated with the MHWL, any wrack on the beach will not be removed by raking.

Manmade beach cleaning and raking machines effectively remove seaweed, fish, glass, syringes, plastic, cans, cigarettes, shells, stone, wood, and virtually any unwanted debris (Barber Beach Cleaning Equipment 2011). These efforts remove accumulated wrack, topographic depressions, and sparse vegetation nodes used by roosting and foraging piping plovers. Removal of wrack also eliminates a beach's natural sand trapping abilities, further destabilizing the beach. In addition, sand adhering to seaweed and trapped in the cracks and crevices of wrack is removed from the beach. Although the amount of sand lost due to single sweeping actions may be small, it adds up considerably over a period of years (Nordstrom et al. 2006; Neal et al. 2007). Beach cleaning or grooming can result in abnormally broad unvegetated zones that are inhospitable to dune formation or plant colonization, thereby enhancing the likelihood of erosion (Defreo et al. 2009).

Tilling beaches to reduce soil compaction, as sometimes required by the Service for sea turtle protection after beach nourishment activities, has similar effects. Recently, the Service improved sea turtle protection provisions in Florida. These provisions now require tilling, when needed, to be conducted above the primary wrack line, not within it.

Currently, the DEP's Beaches and Coastal Management Systems section has issued 117 permits for beach raking or cleaning to multiple entities. The Service estimates 240 of 825 miles (29 percent) of sandy beach shoreline in Florida are cleaned or raked on various (*i.e.,* daily, weekly, monthly) schedules (Teich 2009). Service biologists estimate South Carolina mechanically cleans approximately 34 of its 187 shoreline miles (18 percent), and Texas mechanically cleans approximately 20 of its 367 shoreline miles (5.4 percent). The percentage of mechanical cleaning that occurs in piping plover critical habitat is unknown.

Overutilization for commercial, recreational, scientific or educational purposes

The 1985 final listing rule found no evidence to suggest this factor is a threat to piping plovers while on migration or winter grounds. The various recovery plans state hunting in the late 1800s may have severely reduced piping plover numbers. The plans did not identify hunting as an existing threat to piping plovers wintering in the U.S., as take is prohibited pursuant to the MBTA. No credible information indicates hunting is a threat in the U.S. or in other countries. Based on the current information, overutilization is not a threat to piping plovers on their wintering and migration grounds.

Disease and predation

Disease

Neither the final listing rule nor the recovery plans state disease is an issue for piping plover, and no plan assigns recovery actions to this threat factor. Based on information available to date, West Nile virus and avian influenza are a minor threat to piping plovers (Service 2009).

Predation

The effect of predation on migrating or wintering piping plovers remains largely undocumented. Except for one incident involving a cat in Texas (NY Times 2007), no predation of piping plovers during winter or migration has been noted. Avian and mammalian predators are common throughout the species' wintering range. Predatory birds are relatively common during fall and spring migration, and it is possible raptors occasionally take piping plovers (Drake et al. 2001). It has been noted, however, the behavioral response of crouching when in the presence of avian predators may minimize avian predation on piping plovers (Morrier and McNeil 1991; Drake 1999b; Drake et al. 2001).

The 1996 Atlantic Coast Recovery Plan summarized evidence that human activities affect types, abundance, and activity patterns of some predators, thereby exacerbating natural predation on breeding piping plovers. Nonbreeding piping plovers may reap some collateral benefits from predator management conducted for the primary benefit of other species. In 1997, the U.S. Department of Agriculture implemented a public lands predator control partnership in northwest Florida that included the Department of Defense, NPS, the State of Florida (state park lands), and the Service (National Wildlife Refuges and Ecological Services). The program continues with all partners except Florida. In 2008, lack of funding precluded inclusion of Florida state lands; however, DEP staff do occasionally conduct predator trapping on state lands, although trapping is not implemented consistently.

The NPS and individual state park staff in North Carolina participate in predator control programs (Rabon 2009). The Service issued permit conditions for raccoon eradication to Indian River County staff in Florida as part of a coastal Habitat Conservation Plan (HCP; Adams 2009). Destruction of turtle nests by dogs or coyotes in Indian River County justified the need to amend the permit to include an education program targeting dog owners regarding the appropriate means to reduce affects to coastal species caused by their pets. The Service partnered with Texas Audubon and the Coastal Bend Bays and Estuaries Program in Texas to implement predator control efforts on colonial waterbird nesting islands (Cobb 2009). Some of these predator control programs may provide very limited protection to piping plovers should they use these areas for roosting or foraging (Table 5). The Service is not aware of any current predator control programs targeting protection of coastal species in Georgia, Alabama, Mississippi, or Louisiana.

Regarding predation, the magnitude of this threat to non-breeding piping plovers remains unknown, but given the pervasive, persistent, and serious effects of predation on other coastal reliant species, it remains a potential threat. Focused research to confirm these effects as well as to ascertain effectiveness of predator control programs may be warranted, especially in areas frequented by Great Lakes birds during migration and wintering months. The Service considers predator control on their wintering and migration grounds to be a low priority at this time. The threat of direct predation should be distinguished from the threat of disturbance to roosting and feeding piping plovers posed by dogs off leash.

Other natural or manmade factors affecting its continued existence

Accelerating sea-level rise

Over the past 100 years, the globally-averaged sea level has risen approximately 3.9 to 9.8 inches (Rahmstorf 2007), a rate that is an order of magnitude greater than that seen in the past several thousand years (Hopkinson et al. 2008). The Intergovernmental Panel of Climate Change

(IPCC) suggests by 2080 sea level rise could convert as much as 33 percent of the world's coastal wetlands to open water (IPCC 2007). Although rapid changes in sea level are predicted, estimated time frames and resulting water levels vary due to the uncertainty about global temperature projections and the rate of ice sheets melting and slipping into the ocean (IPCC 2007; Climate Change Science Program [CCSP] 2008).

Potential effects of sea level rise on coastal beaches may vary regionally due to subsidence or uplift as well as the geological character of the coast and nearshore (Galbraith et al. 2002; CCSP 2009). For example, in the last century sea level rise along the U.S. Gulf Coast exceeded the global average by 5.1 to 5.9 inches because coastal lands west of Florida are subsiding (U.S. Environmental Protection Agency [EPA] 2009). Low elevations and proximity to the coast make all nonbreeding coastal piping plover foraging and roosting habitats vulnerable to the effects of rising sea level. Furthermore, areas with small astronomical tidal ranges (*e.g.*, portions of the Gulf Coast where intertidal range is greater than 3.2 feet) are the most vulnerable to loss of intertidal wetlands and flats induced by sea level rise (EPA 2009). Sea level rise was cited as a contributing factor in the 68 percent decline in tidal flats and algal mats in the Corpus Christi area (*i.e.*, Lamar Peninsula to Encinal Peninsula) in Texas between the 1950s and 2004 (Tremblay et al. 2008). Mapping by Titus and Richman (2001) showed that more than 80 percent of the lowest land along the Atlantic and Gulf coasts was in Louisiana, Florida, Texas, and North Carolina, where 73.5 percent of all wintering piping plovers were tallied during the 2006 International Piping Plover Census (Elliott-Smith et al. 2009).

Inundation of piping plover habitat by rising seas could lead to permanent loss of habitat if natural coastal dynamics are impeded by numerous structures or roads, especially if those shorelines are also armored with hardened structures. Without development or armoring, low undeveloped islands can migrate toward the mainland, pushed by the overwashing of sand eroding from the seaward side and being redeposited in the bay (Scavia et al. 2002). Overwash and sand migration are impeded on developed portions of islands. Instead, as sea level increases, the ocean-facing beach erodes and the resulting sand is deposited offshore. The buildings and the sand dunes then prevent sand from washing back toward the lagoons, and the lagoon side becomes increasingly submerged during extreme high tides (Scavia et al. 2002), diminishing both barrier beach shorebird habitat and protection for mainland developments.

Modeling for three sea level rise scenarios (reflecting variable projections of global temperature rise) at five important U.S. shorebird staging and wintering sites predicted a loss of 20 to 70 percent of current intertidal foraging habitat (Galbraith et al. 2002). These authors estimated probabilistic sea level changes for specific sites partially based on historical rates of sea level change (from tide gauges at or near each site) which were then superimposed on projected 50 percent and 5 percent probability of global sea level changes by 2100 of 13.4 inches and 30.3 inches, respectively. The 50 percent and 5 percent probability sea level change projections were based on assumed global temperature increases of 35.6° F (50 percent probability) and 40.5° F (5 percent probability). The most severe losses were projected at sites where the coastline is unable to move inland due to steep topography or seawalls. The Galbraith et al. (2002) Gulf Coast study site, Bolivar Flats, Texas, is a designated critical habitat unit known to host high numbers of piping plovers during migration and throughout the winter (*e.g.*, 275 individuals were tallied during the 2006 International Piping

Plover Census; Elliott-Smith et al. 2009). Under the 50 percent likelihood scenario for sea level rise, Galbraith et al. (2002) projected approximately 38 percent loss of intertidal flats at Bolivar Flats by 2050; however, after initially losing habitat, the area of tidal flat habitat was predicted to increase slightly by the year 2100, because Bolivar Flats lacks armoring, and the coastline at this site can thus migrate inland. Although habitat losses in some areas are likely to be offset by gains in other locations, Galbraith et al. (2002) noted time lags may exert serious adverse effects on shorebird populations. Furthermore, even if piping plovers are able to move their wintering locations in response to accelerated habitat changes, there could be adverse effects on the birds' survival rates or reproductive fitness.

In eight states that support wintering piping plovers, all have the potential for adjacent development and/or hardened shorelines to impede response of habitat to sea level rise (Table 6). Although complete linear shoreline estimates are not readily obtainable, almost all known piping plover wintering sites in the U.S. were surveyed during the 2006 International Piping Plover Census. To estimate effects at the census sites, as well as additional areas where piping plovers have been found outside of the census period, Service biologists reviewed satellite imagery and spoke with other biologists familiar with the sites. Of 406 sites, 204 (50 percent) have adjacent structures that may prevent the creation of new habitat if existing habitat were to become inundated (Table 6). These threats will be perpetuated in places where damaged structures are repaired and replaced, and exacerbated where the height and strength of structures are increased. Data do not exist on the amount or types of hardened structures at wintering sites in the Bahamas, other Caribbean countries, or Mexico.

Sea level rise poses a significant threat to all piping plover populations during the migration and wintering portion of their life cycle. Ongoing coastal stabilization activities may strongly influence the effects of sea level rise on piping plover habitat. Improved understanding of how sea level rise may affect the quality and quantity of habitat for migrating and wintering piping plovers is an urgent need.

Contaminants

Contaminants have the potential to cause direct toxicity to individual birds or negatively affect their invertebrate prey base (Rattner and Ackerson 2008). Depending on the type and degree of contact, contaminants can have lethal and sub-lethal effects on birds, including behavioral impairment, deformities, and impaired reproduction (Rand and Petrocelli 1985; Gilbertson et al. 1991; Hoffman et al. 1996).

The Great Lakes plan states concentration levels of polychlorinated biphenol detected in Michigan piping plover eggs have the potential to cause reproductive harm. They further state analysis of prey available to piping plovers at representative Michigan breeding sites indicated breeding areas along the upper Great Lakes region are not likely the major source of contaminants to this population.

In 2000, mortality of large numbers of wading birds and shorebirds, including one piping plover, at Audubon's Rookery Bay Sanctuary on Marco Island, Florida, occurred following the County's aerial application of the organophosphate pesticide Fenthion for mosquito control purposes (Williams 2001). Fenthion, a known toxin to birds, was registered for use as an avicide by Bayer

chemical manufacturer. Subsequent to a lawsuit filed against the EPA in 2002, the manufacturer withdrew Fenthion from the market, and the EPA declared all uses were to end by November 30, 2004 (American Bird Conservancy 2011). All other counties in the U.S. now use less toxic chemicals for mosquito control. It is unknown whether pesticides are a threat for piping plovers wintering in the Bahamas, other Caribbean countries, or Mexico.

Petroleum products are the contaminants of primary concern, as opportunities exist for petroleum to pollute intertidal habitats that provide foraging substrate. Beach-stranded 55-gallon barrels and smaller containers, which may fall from moving cargo ships or offshore rigs and are not uncommon on the Texas coast, contain primarily oil products (gasoline or diesel), as well as other chemicals such as methanol, paint, organochlorine pesticides, and detergents (Lee 2009). Federal and state land managers have protective provisions in place to secure and remove the barrels, thus reducing the likelihood of contamination. Effects to piping plovers from oil spills have been documented throughout their life cycle (Chapman 1984; Service 1996; Burger 1997; Massachusetts Audubon 2003; Amirault-Langlais et al. 2007; Amos 2009). This threat persists due to the high volume of shipping vessels (from which most documented spills have originated) traveling offshore and within connected bays along the Atlantic Coast and the Gulf of Mexico. Additional risks exist for leaks or spills from offshore oil rigs, associated undersea pipelines, and onshore facilities such as petroleum refineries and petrochemical plants. Lightly oiled piping plovers have survived and successfully reproduced (Chapman 1984; Amirault-Langlais et al. 2007; Amos 2009). Chapman (1984) noted shifts in habitat use as piping plovers moved out of spill areas. This behavioral change was believed to be related to the demonstrated decline in benthic infauna (prey items) in the intertidal zone and may have decreased the direct effects to the species. To date, no plover mortality has been attributed to oil contamination outside the breeding grounds, but latent effects would be difficult to identify.

The Deepwater Horizon oil spill, which started April 20, 2010, discharged into the Gulf of Mexico through July 15, 2010. According to government estimates, the leak released between 100 and 200 million gallons of oil into the Gulf. The U.S. Coast Guard estimates that more than 50 million gallons of oil have been removed from the Gulf, or roughly a quarter of the spill amount. Additional effects to natural resources may be attributed to the 1.84 million gallons of dispersant applied to the spill. As of July 2010, approximately 625 miles of Gulf Coast shoreline was oiled (approximately 360 miles in Louisiana, 105 miles in Mississippi, 66 miles in Alabama and 94 miles in Florida) (Join Information Center 2010). These numbers reflect a daily snapshot of shoreline that experienced effects from oil; however, they do not include cumulative effects to date, or shoreline that has already been cleaned.

Piping plovers have continued to winter within the Gulf of Mexico shorelines. Researchers have and continue to document oiled piping plovers stemming from this spill. Oiling of designated piping plover critical habitat has been documented. Affects to the species and its habitat are expected, but their extent remains difficult to predict. The U.S. Coast Guard, the states, and responsible parties form the Unified Command, with advice from Federal and State natural resource agencies, initiated protective and cleanup efforts per prepared contingency plans to deal with petroleum and other hazardous chemical spills for each state's coastline. The contingency plans identify sensitive habitats, including all federally listed species' habitats, which receive a

higher priority for response actions. Those plans allow for immediate habitat protective measures for cleanup activities in response to large contaminant spills. While such plans usually ameliorate the threat to piping plovers, it is yet unknown how much improvement will result in this case given the breadth of the effects associated with the Deepwater Horizon incident.

Based on all available data prior to the Deepwater Horizon oil spill, the risk of effects from contamination to piping plovers and their habitat was recognized, but the safety contingency plans were considered adequate to alleviate most of these concerns. The Deepwater Horizon incident has brought heightened awareness of the intensity and extent to fish and wildlife habitat from large-scale releases. In addition to potential direct habitat degradation from oiling of intertidal habitats and retraction of stranded boom, effects to piping plovers may occur from the increased human presence associated with boom deployment and retraction, cleanup activities, wildlife response, and damage assessment crews working along shorelines. Research studies are documenting the potential expanse of effects to the piping plover.

Military actions

Twelve coastal military bases are located in the Southeast (Table 7). To date, five bases have consulted with the Service under the Act, on military activities on beaches and baysides that may affect piping plovers or their habitat (Table 7). In 2002, Camp Lejeune in North Carolina consulted formally with the Service on troop activities, dune stabilization efforts, and recreational use of Onslow Beach. The permit conditions require bi-monthly (twice-monthly) piping plover surveys, use of buffer zones, and work restrictions within buffer zones.

Naval Station Mayport in Duval County, Florida, consulted with the Service on U.S. Marine Corps training activities that included beach exercises and use of amphibious assault vehicles. The affected area was not considered optimal for piping plovers and the consultation was concluded informally. Similar informal consultations have occurred with Tyndall Air Force Base (Bay County) and Eglin Air Force Base (Okaloosa and Santa Rosa Counties) in northwest Florida. Both consultations dealt with occasional use of motorized equipment on the beaches and associated baysides. Tyndall Air Force Base has minimal on-the-ground use, and activities, when conducted, occur on the Gulf of Mexico beach, which is not considered the optimal area for piping plovers within this region. Eglin Air Force Base conducts bi-monthly (twice-monthly) surveys for piping plovers, and habitats consistently documented with piping plover use are posted with avoidance requirements to minimize direct disturbance from troop activities. A 2001 consultation with the Navy for training exercises on the beach and retraction operations on Peveto Beach, Cameron Parish, Louisiana, concluded informally.

Overall, project avoidance and minimization actions currently reduce threats from military activities to wintering and migrating piping plovers to a minimal threat level. However, prior to removal of the piping plover from protection of the Act, Integrated Resource Management Plans or other agreements should clarify if and how a change in legal status would affect plover protections.

Recreational disturbance

Intense human disturbance in shorebird winter habitat can be functionally equivalent to habitat loss if the disturbance prevents birds from using an area (Goss-Custard et al. 1996), which can

lead to roost abandonment and local population declines (Burton et al. 1996). Pfister et al. (1992) implicated anthropogenic disturbance as a factor in the long-term decline of migrating shorebirds at staging areas. Disturbance (*i.e.*, human and pet presence) that alters bird behavior can disrupt piping plovers as well as other shorebird species. Disturbance can cause shorebirds to spend less time roosting or foraging and more time in alert postures or fleeing from the disturbances (Johnson and Baldassarre 1988; Burger 1991, 1994; Elliott and Teas 1996; Lafferty 2001a, 2001b; Thomas et al. 2002), which limits the local abundance of piping plovers (Zonick and Ryan 1996; Zonick 2000). Shorebirds that are repeatedly flushed in response to disturbance expend energy on costly short flights (Nudds and Bryant 2000). Shorebirds are more likely to flush from the presence of dogs than people, and birds react to dogs from farther distances than people (Lafferty 2001a, 2001b; Thomas et al. 2002). Dogs off leash are more likely to flush piping plovers from farther distances than dogs on leash. Nonetheless, dogs both on and off leashes disturb piping plovers (Hoopes 1993). Pedestrians walking with dogs often go through flocks of foraging and roosting shorebirds; some even encourage their dogs to chase birds.

Off-road vehicles can significantly degrade piping plover habitat (Wheeler 1979) or disrupt the birds' normal behavior patterns (Zonick 2000). The 1996 Atlantic Coast recovery plan cites tire ruts crushing wrack into the sand, making it unavailable as cover or as foraging substrate (Goldin 1993b; Hoopes 1993). The plan also notes the magnitude of the threat from off-road vehicles is particularly significant because vehicles extend the effects to remote stretches of beach where human disturbance would otherwise be very slight. Lamont et al. (1997) postulated vehicular traffic along the beach may compact the substrate and kill marine invertebrates that are food for the piping plover. Zonick (2000) found the density of off-road vehicles negatively correlated with abundance of roosting piping plovers on the ocean beach. Cohen et al. (2008) found radio-tagged piping plovers using ocean beach habitat at Oregon Inlet in North Carolina were far less likely to use the north side of the inlet where off-road vehicle use is allowed, and recommended controlled management experiments to determine if recreational disturbance drives roost site selection. Ninety-six percent of piping plover detections were on the south side of the inlet even though it was farther away from foraging sites (1.1 miles from the sound side foraging site to the north side of the inlet versus 0.2 mile from the sound side foraging site to the north side of the inlet; Cohen et al. 2008).

Based on surveys with land managers and biologists, knowledge of local site conditions, and other information, the Service estimated the levels of eight types of disturbance at sites in the U.S. with wintering piping plovers. There are few areas used by wintering piping plovers that are devoid of human presence, and just under half have leashed and unleashed dog presence (Smith 2007; Lott et al. 2009; Maddock and Bimbi unpublished data; Table 8). Data are not available on human disturbance at wintering sites in the Bahamas, other Caribbean countries, or Mexico.

Although the timing, frequency, and duration of human and dog presence throughout the wintering range are unknown, studies in Alabama and South Carolina suggest that most disturbances to piping plovers occur during periods of warmer weather, which coincides with piping plover migration (Johnson and Baldassarre 1988; Lott et al. 2009; Maddock et al. 2009). Smith (2007) documented varying disturbance levels throughout the nonbreeding season at northwest Florida sites.

In South Carolina, 33 percent (13 out of 39) of sites surveyed during the 2007 and 2008 season had ≥ 5 birds. Of those 13 sites, 46.2 percent (6 out of 13) had ≥10 people present during surveys, and 61.5 percent (8 out of 13) allow dogs, indicating that South Carolina sites with the highest piping plover density are exposed to disturbance. Only 25.7 percent (9 out of 35) of sites in South Carolina prohibit dogs and restrict public access to the entire site or sections of sites used by piping plovers (Maddock and Bimbi unpublished data). Compliance with the restrictions at these sites is unknown.

LeDee (2008) collected survey responses in 2007 from 35 managers (located in seven states) at sites that were designated as critical habitat for wintering piping plovers. Ownership included Federal, state, and local governmental agencies and nongovernmental organizations managing national wildlife refuges; national, state, county, and municipal parks; state and estuarine research reserves; state preserves; state wildlife management areas; and other types of managed lands. Of 44 reporting sites, 40 allowed public beach access year-round and four sites were closed to the public. Of the 40 sites that allow public access, 62 percent of site managers reported greater than 10,000 visitors during September through March, and 31 percent reported greater than 100,000 visitors. Restrictions on visitor activities on the beach included automobiles (81 percent), all-terrain vehicles (89 percent), and dogs (50 percent) during the winter season. Half of the survey respondents reported funding as a primary limitation in managing piping plovers and other threatened and endangered species at their sites. Other limitations included "human resource capacity" (24 percent), conflicting management priorities (12 percent), and lack of research (3 percent).

Disturbance can be addressed by implementing recreational management techniques such as vehicle and pet restrictions and symbolic fencing (usually sign posts and string) of roosting and feeding habitats. In implementing conservation measures, managers need to consider a range of site specific factors, including the extent and quality of roosting and feeding habitats, and the types and intensity of recreational use patterns. In addition, educational materials such as informational signs or brochures can provide valuable information so that the public understands the need for conservation measures.

In summary, although there is some variability among states, disturbance from human beach recreation and pets pose a moderate to high and escalating threat to migrating and wintering piping plovers. Systematic review of recreation policy and beach management across the nonbreeding range will assist in better understanding cumulative effects. Site specific analysis and implementation of conservation measures should be a high priority at piping plover sites that have moderate or high levels of disturbance, and the Service and state wildlife agencies should increase technical assistance to land managers to implement management strategies and monitor their effectiveness.

Storm events

Although coastal piping plover habitats are storm-created and maintained, the 1996 Atlantic Coast Recovery Plan also noted that storms and severe cold weather may take a toll on piping plovers, and the 2003 Great Lakes Recovery Plan postulated that loss of habitats such as overwash passes or wrack, where birds shelter during harsh weather, poses a threat.

Storms are a component of the natural processes that form coastal habitats used by migrating and wintering piping plovers, and positive effects of storm-induced overwash and vegetation removal have been noted in portions of the wintering range. For example, Gulf Islands National Seashore habitats in Florida benefited from increased washover events that created optimal habitat conditions during the 2004 and 2005 hurricane seasons, with biologists reporting piping plover use of these habitats within 6 months of the storms (Nicholas 2005). In 2005, Hurricane Katrina overwashed the mainland beaches of Mississippi, creating many tidal flats where piping plovers were subsequently observed (Winstead 2008). Hurricane Katrina also created a new inlet and improved habitat conditions on some areas of Dauphin Island, Alabama (LeBlanc 2009). Conversely, localized storms, since Katrina, have induced habitat losses on Dauphin Island (LeBlanc 2009).

Noel and Chandler (2005) suspect changes in habitat caused by multiple hurricanes along the Georgia coastline altered the spatial distribution of piping plovers and may have contributed to winter mortality of three Great Lakes piping plovers. Following Hurricane Ike in 2008, Arvin (2009) reported decreased numbers of piping plovers at some heavily eroded Texas beaches in the center of the storm affected area and increases in plover numbers at sites about 100 miles to the southwest. However, piping plovers were observed later in the season using tidal lagoons and pools that Ike created behind the eroded beaches (Arvin 2009).

The adverse effects on piping plovers attributed to storms are sometimes due to a combination of storms and other environmental changes or human use patterns. For example, four hurricanes between 2002 and 2005 are often cited in reference to rapid erosion of the Chandeleur Islands, a chain of low-lying islands in Louisiana where the 1991 International Piping Plover Census tallied more than 350 piping plovers. Comparison of imagery taken 3 years before and several days after Hurricane Katrina found the Chandeleur Islands lost 82 percent of their surface area (Sallenger et al. in review), and a review of aerial photography prior to the 2006 Census suggested little piping plover habitat remained (Elliott-Smith et al. 2009). However, Sallenger et al. (in review) noted habitat changes in the Chandeleur Islands stem not only from the effects of these storms, but rather from the combined effects of the storms, long-term (greater than 1,000 years) diminishing sand supply, and sea level rise relative to the land.

Other storm-induced adverse effects include poststorm acceleration of human activities such as beach nourishment, sand scraping, and berm and seawall construction. Such stabilization activities can result in the loss and degradation of feeding and resting habitats. Storms can also cause widespread deposition of debris along beaches. Removal of debris often requires large machinery, which can cause extensive disturbance and adversely affect habitat elements such as wrack. Another example of indirect adverse effects linked to a storm event is the increased access to Pelican Island (LeBlanc 2009) due to merging with Dauphin Island following a 2007 storm (Gibson et al. 2009).

Recent climate change studies indicate a trend toward increasing hurricane numbers and intensity (Emanuel 2005; Webster et al. 2005). When combined with predicted effects of sea level rise, there may be increased cumulative effects from future storms.

In summary, storms can create or enhance piping plover habitat while causing localized losses elsewhere in the wintering and migration range. Available information suggests some birds may have resiliency to storms and move to unaffected areas without harm, while other reports suggest birds may perish from storm events. Significant concerns include disturbance to piping plovers and habitats during cleanup of debris, and poststorm acceleration of shoreline stabilization activities which can cause persistent habitat degradation and loss.

Summary

Habitat loss and degradation on winter and migration grounds from shoreline and inlet stabilization efforts, both within and outside of designated critical habitat, remains a serious threat to all piping plover populations. In some areas, beaches that abut private property are needed by wintering and migrating piping plovers. However, residential and commercial developments that typically occur along private beaches may pose significant challenges for efforts to maintain natural coastal processes. The threat of habitat loss and degradation, combined with the threat of sea level rise associated with climate change, raise serious concerns regarding the ability of private beaches to support piping plovers over the long term.

Future actions taken on private beaches will determine whether piping plovers continue to use these beaches or whether the recovery of piping plovers will principally depend on public property. As Lott (2009) concludes, "The combination of development and shoreline protection seems to limit distribution of non-breeding piping plovers in Florida. If mitigation or habitat restoration efforts on barrier islands fronting private property are not sufficient to allow plover use of some of these areas, the burden for plover conservation will fall almost entirely on public land managers."

While public lands may not be at risk of habitat loss from private development, significant threats to piping plover habitat remain on many municipal, state, and federally owned properties. These public lands may be managed with competing missions that include conservation of imperiled species, but this goal frequently ranks below providing recreational enjoyment to the public, readiness training for the military, or energy development projects.

Public lands remain the primary places where natural coastal dynamics are allowed. Of recent concern are requests to undertake beach nourishment actions to protect coastal roads or military infrastructure on public lands. If project design does not minimize impediments to shoreline overwash which are necessary to help replenish bayside tidal flat sediments and elevations, significant bayside habitat may become vegetated or inundated, thereby exacerbating the loss of preferred piping plover habitat. Conversely, if beach fill on public lands is applied in a way that allows for "normal" system overwash processes, and sediment is added back to the system, projects may be less injurious to barrier island species that depend on natural coastal dynamics.

Maintaining wrack for food and cover in areas used by piping plovers may help offset effects that result from habitat degradation due to sand placement associated with berm and beach nourishment projects and ensuing human disturbance. Leaving wrack on private beaches may improve use by piping plovers, especially during migration when habitat fragmentation may have a greater effect on the species. In addition, using recreation management techniques, Great Lakes recovery action 2.14 may minimize the effects of habitat loss. Addressing off-road vehicles and pet disturbance may increase the suitability of existing piping plover habitat.

Analysis of the species/critical habitat likely to be affected

In their letter dated December 20, 2012, the Corps determined the proposed project "may affect" the threatened loggerhead sea turtle, endangered leatherback sea turtle, endangered green sea turtle, endangered hawksbill sea turtle, endangered Kemp's ridley sea turtle, piping plover, and "may affect, but not likely to adversely affect" the endangered West Indian manatee. On August 22, 2011, the Service issued a Statewide Programmatic Biological Opinion (SPBO) to the Corps to address potential adverse effects to nesting sea turtles and the West Indian manatee as a result of sand placement activities proposed along the coast of Florida (Service 2011). The SPBO includes avoidance and minimization measures, Reasonable and Prudent Measures, and Terms and Conditions to ensure adverse effects to the covered species are avoided and minimized to the maximum extent practicable. Since the proposed activities associated with the Collier County sand placement project are covered in the SPBO and the Applicant has agreed to implement the protection measures described in the SPBO, the Service has determined the proposed project is consistent with the SPBO, and the Service concurs with the Corps' determinations. The Reasonable and Prudent Measures and Terms and Conditions in section A of the SPBO will apply to the Corps and Applicant. This concludes our consultation for nesting sea turtles and West Indian manatees. Beach mice are not present in the action area. Based on this information, the Service concurs with the Corps' determinations listed above.

Please note the provisions of this consultation do not apply to sea turtles in the marine environment such as swimming juveniles and adult sea turtles. If applicable, you are required to consult with NOAA Fisheries concerning this project. For further information on Act compliance with NOAA Fisheries, please contact Ms. Cathy Tortorici, Chief of the Interagency Cooperation Branch by e-mail at cathy.tortorici@noaa.gov or by phone at (727) 209-5953. The proposed action has the potential to adversely affect wintering and migrating piping plovers and their habitat from all three populations that may use the action area. The Atlantic Coast nesting population of piping plover is a component of the entity listed as threatened, which encompasses all breeding piping plovers (Great Plains and Atlantic) except the Great Lakes breeding population. Therefore, this Biological Opinion considers the potential effects of this project on this species and its designated critical habitat.

This Biological Opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 C.F.R. 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to critical habitat.

ENVIRONMENTAL BASELINE

Status of the species/critical habitat within the action area

There is no federally designated piping plover critical habitat within the project area. The closest critical habitat units for wintering piping plovers are units FL-26 and FL-27. Unit FL-26 is located on Estero Island in Lee County, approximately 10 miles north of the project area and FL-27 located on Tigertail Beach, at the entrance to Big Marco Pass, approximately 11 miles south of the project area.

Bird populations in and adjacent to the project area are monitored by volunteers. Launched in 2002, by the Cornell Lab of Ornithology and National Audubon Society, eBird provides data concerning bird abundance and distribution at a variety of spatial and temporal scales. eBird is sponsored in part by several Service programs, research groups, non-government offices, and the University of the Virgin Islands. Although not specific to the project area, the number of piping plovers observed in Collier County between 2009 and 2011, was 62, 70, and 90, respectively. The 2006 International Piping Plover Census did not document piping plovers within the project area (Elliott-Smith et al. 2009); however, 49 piping plovers were observed on Big Marco Pass Shoal located approximately 11 miles south of the proposed project area. In addition, piping plover PCEs are present throughout the proposed action area.

Efforts to avoid and reduce adverse effects

The Service often requests post-project surveys and eradication of coastal exotic plant species in Florida as permit conditions for beach berm or nourishment projects to reduce affects to piping plover habitat. Four recent Biological Opinions for sand placement events in Florida included requirements that restricted the removal of wrack to minimize project effects (Service 2007b, 2008c, 2008d, 2008e). A statewide consultation with the Federal Emergency Management Agency to minimize emergency berm repair and construction projects in Florida was completed in 2008 (Service 2008c).

Section 10(a)(2)(A) of the Act requires an applicant for an incidental take permit to submit a conservation plan that specifies, among other things, the effects that are likely to result in the taking and the measures the applicant will undertake to minimize and mitigate such effects.

Coordinated efforts for several large projects are currently underway. Florida Service field offices are engaged in statewide programmatic consultations on Florida coastal Corps projects and permitting (dredging, jetty maintenance, and nourishment). Also, DEP and FWC are drafting a statewide HCP for coastal actions permitted through the DEP. The primary purpose of this plan is to minimize or mitigate habitat affects associated with wrack removal, seawall installation, and geotube placement.

As noted above, some project sponsors have incorporated recommended avoidance and minimization measures. Nonetheless, considerable challenges remain. Other project sponsors have not reacted positively to Service recommendations, citing financial costs and engineering restrictions.

Several projects have resulted in formal consultation for piping plovers or their designated critical habitat in Florida (Table 9).

Factors affecting the species environment within the action area

Collier County's initial beach nourishment project was constructed in November 1995 to restore nearly 6 miles of critically eroded shoreline. Approximately 1,270,000 cy of fill was placed on Vanderbilt, Park Shore, and Naples beaches. Sand was obtained from four offshore borrow areas and supplemented with fill from upland sand sources. The project also included the extension of the north jetty at Doctors Pass by approximately 75 feet, the removal of 36 groins, and the restoration of six rock groins and a pile cluster groin.

The second renourishment was constructed between February and May 2006 along approximately 8.5 miles of Collier County shoreline including Vanderbilt Beach (DEP reference monument R-22 to R-37), Park Shore (DEP reference monument R-45 to R-55), and Naples Beach (DEP reference monument R-58A to R-79). The project placed 668,000 cy of sand from Borrow Area T1 and 53,600 cy of sand from ongoing inlet maintenance at Doctors Pass onto the shoreline. A 1.09-acre artificial reef was constructed for this project as mitigation for anticipated impacts from fill equilibration to nearshore hardbottom; however, no impacts were documented during post-construction monitoring.

Supplemental sand placement projects, such as truck haul, have taken place within the project area since the 1996 project. The most recent truck haul projects took place in summer 2010 and spring 2011 in order to address two erosion hot spots within the County. The summer 2010 project placed approximately 2,650 cy of sand south of Doctors Pass on Naples Beach between DEP reference monuments R-58A-500 feet and R-58A+100 feet. The spring 2011 project placed 2,393 cy of sand on Naples Beach (between DEP reference monuments R-58A-400 feet and R-58) and 7,836 cy along Park Shore (between DEP reference monuments R-45+600 feet and R-46+400 feet).

EFFECTS OF THE ACTION

Factors to be considered

Beach topography and morphology

The geomorphic characteristics of barrier islands, peninsulas, beaches, dunes, overwash fans, and inlets are critical to a variety of natural resources, and the geomorphic characteristics influence a barrier beach's ability to respond to wave action, including storm overwash and sediment transport. However, the protection or persistence of these important natural land forms, processes, and wildlife resources is often in conflict with shoreline projects. The manufactured berms and sand fill may impede overwash thereby causing successional advances in the habitat that will reduce sand flat formation, and therefore, its use by piping plovers in the project area.

Distribution

The Applicant proposes dredging Borrow Area T1 located approximately 33 miles west of Vanderbilt Beach or using an upland sand mine, with sand placement activities along Vanderbilt Beach (between DEP reference monuments R-22+300 feet and R-30+500 feet), Pelican Bay (between DEP reference monuments R-30+500 feet and R-37), Park Shore (between DEP reference monuments R-43+500 feet and R-54+400 feet), and Naples Beach (between DEP reference monuments R-58A-480 feet and R-79). The Service expects the proposed construction activities could directly and indirectly affect the distribution of migrating and wintering piping plovers to roosting and foraging habitat within the action area.

Disturbance frequency and intensity

The proposed action has the potential to adversely affect piping plovers within the proposed action area during sand placement activities. The proposed sand placement project is scheduled to begin in September 2013 and be completed by the end of May 2014.

The Service anticipates construction activities to have short-term and temporary effects on the piping plover populations. Piping plovers located within the action area are expected to move outside of the construction zone due to disturbance.

Duration

The timeframe associated with completion of the sand placement event depends on the sand source utilized. If the proposed project is constructed using the offshore sand source, the project is estimated to take up to 120 days working 24 hours per day, 7 days a week. If the Applicant chooses to use an upland sand source, the project may take between 140 to 237 days to complete. That said, the timeframe may vary depending on the amount of work necessary, weather conditions, and equipment mobilization and maintenance.

Nature of the effect

Although the Service expects short-term effects from disturbance during project construction, we anticipate the action will result in direct, indirect and long term effects to piping plovers. The Service expects there may be morphological changes to piping plover habitat due to the effects to loafing and foraging habitat. Activities that affect or alter the use of optimal habitat, or increase disturbance to the species may decrease the survival and recovery potential of the piping plover.

Timing

The timing of the proposed sand placement project may occur completely or partially during the migration and wintering period for piping plovers (July 15 to May 15). The Service expects indirect effects to occur later in time.

Analyses for effects of the action

The proposed project includes placing approximately 515,000 cy of beach compatible material along 7.5 miles of shoreline. If the material is placed on the beach, it has the potential to elevate the beach berm and widen the beach providing storm protection and increasing recreational space. Sand placement may occur in and adjacent to habitat that appears suitable for roosting and foraging piping plovers or that will become more optimal with time. Project construction may overlap with portions of piping plover winter and migration seasons. Short-term and temporary construction effects to piping plovers will occur if the birds are roosting and feeding in the area during a migration stopover. The deposition of sand may temporarily deplete the intertidal food base along the shoreline and temporarily disturb roosting birds during project construction. Tilling to loosen compaction of the sand (required to minimize sea turtle effects) may affect wrack that has accumulated on the beach. This affects feeding and roosting habitat for piping plovers since they often use wrack for cover and foraging.

Direct effects

The construction window (*i.e.*, sand placement, dredging) for the proposed sand placement event will extend through a portion of one piping plover migration and winter season. If the material is placed on the beach, heavy machinery and equipment (*e.g.*, trucks and bulldozers), location of the pipeline, and sand placement, may adversely affect migrating and wintering piping plovers in

the action area by disturbing and disrupting normal activities such as roosting and feeding, and possibly forcing birds to expend valuable energy reserves to seek available habitat in adjacent areas along the shoreline. In addition, suffocation of invertebrate species will occur. Impacts will affect the entire fill template (7.5 miles) along the project area. Timeframes projected for benthic recruitment and re-establishment following sand placement are between 6 months and 2 years, depending on actual recovery rates. Effects will occur even if sand placement activities occur outside the piping plover migration and wintering seasons.

Indirect effects

The proposed project includes placing beach-compatible material along 7.5 miles of shoreline adjacent to Vanderbilt Beach (between DEP reference monuments R-22+300 feet and R-30+500 feet), Pelican Bay (between DEP reference monuments R-30+500 feet and R-37), Park Shore (between DEP reference monuments R-43+500 feet and R-54+400 feet), and Naples Beach (between DEP reference monuments R-58A-480 feet and R-79).

Indirect effects of reducing the potential for the formation of optimal habitats, especially along the shoreline, pose a concern to piping plover survival and recovery within the action area. Eventually the shoreline within the fill template will reestablish and provide some feeding habitat for piping plovers, but these feeding areas are considered inferior to natural overwash and emergent shoal habitat that is likely to form within sections of the action area absent the proposed project.

Natural barrier islands need storms and overwash in order to maintain the physical and biological environments they support (Young et al. 2006). The removal of overwash processes will accelerate the successional state of the flats such that they will likely become vegetated within a few years (Leatherman 1988), thereby reducing the area's value to foraging and roosting piping plovers. The proposed project will perpetuate and contribute to the widespread activities that prevent the formation of these preferred early successional overwash habitats. The piping plover's rapid response to habitats formed by washovers from the hurricanes in 2004 and 2005 in the Florida panhandle at Gulf Islands National Seashore and Eglin Air Force Base's Santa Rosa Island and similar observations of their preferences for overwash habitats at Phipps Preserve and Lanark Reef in Franklin County, Florida, and elsewhere in their range, demonstrate the importance of optimal habitats for wintering and migrating piping plovers.

At the same time the proposed project limits the creation of optimal foraging and roosting habitat it will likely increase recreational pressures within the project area. Recreational activities that have the potential to adversely affect piping plovers include disturbance by increased pedestrian use, often with dogs. Long-term effects could include a decrease in piping plover use of habitat due to increased disturbance levels.

Sand placement along Vanderbilt, Pelican Bay, Park Shore, and Naples beaches will potentially increase the recreational beach width. Recreational activities, the associated pedestrian and possible domestic canine presence, may adversely affect the foraging and roosting behavior of piping plovers.

Beneficial effects

There are no known beneficial effects to piping plovers or piping plover habitat from the proposed project.

Species' response to the proposed action

The Service bases this Biological Opinion on anticipated direct and indirect effects to piping plovers (wintering and migrating) as a result of sand placement, which prevents the maintenance or formation of habitat that piping plovers consider optimal for foraging and roosting. Heavy machinery and equipment, the placement of pipeline along the beach, and sand disposal may adversely affect migrating and wintering piping plovers in the project area by disturbance and disruption of normal activities such as roosting and foraging, and possibly forcing piping plovers to expend valuable energy reserves to seek available habitat elsewhere. In addition, foraging in suboptimal habitat by migrating and wintering piping plovers may reduce the fitness of individuals.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The Applicant does not anticipate conducting additional activities in the project action area that could affect federally listed species other than the sand placement event outlined in this Biological Opinion. Any other activities in the action area would require a Corps permit. Therefore, no cumulative effects are expected.

CONCLUSION

The 7.5 mile of shoreline represents approximately 0.3 percent of the 2,340 miles of sandy beach shoreline miles available (although not necessarily suitable) throughout the piping plover wintering range within the conterminous U.S. The Service estimates 29 percent (668 miles pre-project) have permits for sand placement events.

After reviewing the current status of the northern Great Plains, Great Lakes, and Atlantic Coast wintering piping plover populations, the environmental baseline for the sand placement, associated construction activities, and the cumulative effects, it is the Service's biological opinion that implementation of the project, as proposed, is not likely to jeopardize the continued existence of the piping plover, and no critical habitat will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an

extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be implemented by the Corps so they become binding conditions of any permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the Terms and Conditions or, (2) fails to adhere to the Terms and Conditions of the incidental take statement through enforceable terms that are added to the permit, the protective coverage of section 7(o)(2) may lapse. In order to monitor the effects of incidental take, the Corps must report the progress of the action and its effects on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

It is difficult for the Service to estimate the exact number of piping plovers that could be migrating through or wintering within the proposed action area at any one point in time or place during project construction. Therefore, the Service considers the disturbance to shoreline miles as a measurable way to estimate take because disturbance to suitable habitat within the action area would affect the ability of any given number of piping plovers to find foraging and roosting habitat throughout the migrating and wintering periods of any given year. The Service anticipates an unspecified number of piping plovers occupying 7.5 miles of shoreline could be taken in the form of harm (*e.g.*, death, injury) and harassment as a result of the proposed project.

The amount or extent of incidental take for piping plovers will be considered exceeded if the frequency of sand placement events over the course of the 2006 Corps permit exceeds more than a one-time event. This incidental take statement will expire in 2016, 10 years after issuance of the Corps permit. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

EFFECT OF THE TAKE

In this Biological Opinion, the Service determined the proposed project is not likely to result in jeopardy to piping plovers or result in destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of nonbreeding piping plovers in the proposed action area.

1. The Applicant shall minimize and monitor the effects of the proposed project on piping plovers.

2. After project completion, the Applicant shall protect wrack and inlet shorelines for roosting and foraging piping plovers.

3. Pre-construction project information collected in Term and Condition #1 shall be submitted to the South Florida Ecological Services Office.

4. Prior to construction, avoidance signs shall be installed around optimal piping plover habitat features.

5. Driving on the beach shall be limited to that necessary and within a travel corridor.

6. Post-construction signage will be placed within the action area to protect piping plover habitat features.

7. The Applicant shall educate the public to minimize disturbance to piping plovers.

8. The Applicant shall comply with the MBTA and FWC's shorebird guidelines.

9. The Applicant shall minimize the presence of predators.

10. The Applicant shall ensure communication between all parties is carried out.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps and Applicant must comply with the following terms and conditions, which implement the reasonable and prudent measures described above, and outline required reporting and monitoring requirements. These terms and conditions are nondiscretionary.

1. Three months prior to construction and for the 1 year following each sand placement event, the Applicant must conduct bi-monthly (twice-monthly) surveys for piping plovers in the beach fill templates within the action area covering the nonbreeding season for plovers (July 15 to May 15 of each year) to monitor and quantify the level of take associated with the project and to evaluate the potential effects of future projects of similar nature. At least one of the bi-monthly surveys should be conducted on a weekend during each of the months of October, November, March and April.

   Piping plover identification, especially when in non-breeding plumage, can be difficult. Qualified professionals with shorebird/habitat survey experience must conduct the required field work.

   The following will be collected and reported:
   a. Negative and positive survey data.
   b. The amount and type of recreational use (*e.g.*, people, dogs on-off leash, vehicles, kite-boarders).
   c. Piping plover locations with a Global Positioning System (decimal degrees preferred).
   d. Habitat feature(s) used by piping plovers when observed (*e.g.*, intertidal, fresh wrack, old wrack, dune, mid-beach, vegetation).

e. Landscape feature(s) where piping plovers are located (*e.g.*, inlet spit, tidal creek, shoals, lagoon shoreline).
f. Substrate used by piping plovers (*e.g.*, sand, mud/sand, mud, algal mat).
g. Behavior of piping plovers (*e.g.*, foraging, roosting, preening, bathing, flying, aggression, walking).
h. Color bands observed on piping plovers.
i. All other shorebirds/waterbirds seen within the survey area.

All information shall be incorporated into a database. Submit pre-and post-construction piping plover monitoring results (datasheets, maps, database) on standard electronic media (*e.g.*, CD, DVD) to the FWC, and to the Service's South Florida Ecological Services Office (1339 20th Street, Vero Beach, Florida 32960-3559; 772-562-3909). All reports will be due by December 1 following the end of the nonbreeding season for plovers (July 15) of each year.

2. To preserve piping plover feeding and roosting habitat, the Applicant will avoid mechanical wrack removal except when it is a health and safety hazard, becomes foul and odorous, blocks safe access between the beach and water, and during clean up after major storms. Trash and litter within the wrack line area may be manually removed. The Applicant will notify the Service via phone or electronic mail when wrack removal is necessary.

3. Prior to construction, the Applicant shall submit to the South Florida Ecological Services Office, a project design which incorporates the information collected in Term and Condition #1 documenting how project impacts have been minimized to the maximum extent practicable without jeopardizing the permitted design intent or construction methods.

4. Prior to construction, the Applicant shall post avoidance signs around any optimal piping plover habitat features identified in Term and Condition #1 within the project area, and protect these areas from sediment fill to the maximum extent practicable. Obvious identifiers (*e.g.*, pink flagging tape on metal poles) shall be used to clearly mark the boundaries to prevent accidental impacts to these areas.

5. If project construction requires driving on the beach outside of the project area, driving on the beach for construction shall be limited to the minimum necessary with a travel corridor established to above the primary wrack line.

6. Post-construction signage shall be placed within the action area to protect the habitat features documented as used by piping plovers. When County pet ordinances are in place, that information shall be integrated into the signage. If possible, warnings and citations will be issued when appropriate to minimize harassment of piping plovers and other shorebirds protected under the MBTA.

7. The Applicant shall produce piping plover and wrack-oriented educational materials to be placed on the County's website and television channel. The goal of these outreach activities is to educate the public about piping plover optimal habitat, the role of natural coastal processes in creating and maintaining piping plover habitat, and the importance of wrack. Some of the educational information will be included in a pre-construction news release.

8. Due to the potential for the proposed project to affect piping plovers, the Applicant shall comply with the MBTA and follow FWC's standard guidelines to protect against effects to nesting shorebirds during implementation of the proposed project from February 15 to August 31. In part, these guidelines include the establishment of buffer zones in locations where shorebirds have been engaged in nesting behavior, including territory defense.

9. The Applicant shall ensure the contractors conducting the work provide predator proof trash receptacles for all construction workers. All contractors and their employees shall be briefed on the importance of not littering and keeping the project area trash and debris free. Predator proof trash receptacles shall be installed and maintained at all access points, eating areas, and restroom areas.

10. The Applicant shall submit a report describing the actions taken to implement the terms and conditions of this incidental take statement to the FWC, Imperiled Species Management Section, Tallahassee office and the Service's South Florida Ecological Services Office, Vero Beach, Florida within 60 days post-construction of each event.

11. The Applicant must arrange a meeting between representatives of the contractor, the Service, the FWC, and the shorebird surveyor(s) prior to the commencement of the project and prior to each future event.

Upon locating a dead, injured, or sick threatened or endangered specimen, initial notification must be made to the Service's Office of Law Enforcement (20501 Independence Boulevard, Groveland, Florida 34736; 352-429-1037). Additional notification must be made to FWC at 1-888-404-3922 and the Service's South Florida Ecological Services Office (1339 20th Street, Vero Beach, Florida 32960-3559; 772-562-3909). Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure evidence intrinsic to the specimen is not unnecessarily disturbed.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

- To further protect piping plover habitat and reduce beach erosion, the Applicant should consider protecting the wrack throughout the project area in perpetuity.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

THE MIGRATORY BIRD TREATY ACT

The MBTA implements various treaties and conventions between the U.S., Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the provisions of the MBTA, it is unlawful "by any means or manner to pursue, hunt, take, capture or kill any migratory bird except as permitted by regulations issued by the Service. The term "take" is not defined in the MBTA, but the Service has defined it by regulation to mean to pursue, hunt, shoot, wound, kill, trap, capture or collect any migratory bird, or any part, nest or egg or any migratory bird covered by the conventions or to attempt those activities.

In order to comply with the MBTA and due to the potential for this project to affect nesting shorebirds, the Corps and Sponsor should follow FWC's standard guidelines to protect against effects to nesting shorebirds during implementation of this project from February 15 to August 31.

The Service will not refer the incidental take of piping plover for prosecution under the MBTA of 1918, as amended (16 U.S.C. 703-712), if such take is in compliance with the terms and conditions specified in the incidental take statement above.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

1. The amount or extent of incidental take is exceeded. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

2. New information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion.

3. The agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion.

4. A new species is listed or critical habitat designated that may be affected by the action.

Thank you for your cooperation in the effort to protect fish and wildlife resources. Should you have additional questions or require clarification, please contact Jeff Howe at 772-469-4283.

Sincerely yours,

Craig Aubrey

for Larry Williams
Field Supervisor
South Florida Ecological Services Office

cc: electronic only
Corps, Fort Myers, Florida (Krista Sabin)
DEP, Tallahassee, Florida (Liz Yongue)
EPA, West Palm Beach, Florida (Ron Miedema)
FWC, Tallahassee, Florida (Robbin Trindell)
NOAA Fisheries, St. Petersburg, Florida (Mark Sramek)
Service, Panama City, Florida (Patty Kelly)
Service, St. Petersburg, Florida (Anne Marie Lauritsen)
Service, Atlanta, Georgia (Ken Graham)
USGS, Gainesville, Florida (Susan Walls)

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Table 1. The number of adult piping plovers and breeding pairs reported in the U.S. Northern Great Plains by the International Piping Plover Census efforts.

Year	Adults	Pairs Reported by the Census
1991	2,023	891
1996	1,599	586
2001	1,981	899
2006	2,959	1,212

Source: Plissner and Haig 1997; Ferland and Haig 2002; Elliot-Smith et al. 2009.

Table 2. Results of the 1991, 1996, 2001, and 2006 International Piping Plover Winter Censuses (Haig et al. 2005; Elliott-Smith et al. 2009).

Location	**1991**	**1996**	**2001**	**2006**
Virginia	Not surveyed	Not surveyed	Not surveyed	1
North Carolina	20	50	87	84
South Carolina	51	78	78	100
Georgia	37	124	111	212
Florida	**551**	**375**	**416**	**454**
Atlantic	70	31	111	133
Gulf	481	344	305	321
Alabama	12	31	30	29
Mississippi	59	27	18	78
Louisiana	750	398	511	226
Texas	1,904	1,333	1,042	2,090
Puerto Rico	0	0	6	Not surveyed
U.S. Total	**3,384**	**2,416**	**2,299**	**3,355**
Mexico	27	16	Not surveyed	76
Bahamas	29	17	35	417
Cuba	11	66	55	89
Other Caribbean Islands	0	0	0	28
GRAND TOTAL	**3,451**	**2,515**	**2,389**	**3,884**
Percent of Total International Piping Plover Breeding Census	62.9	42.4	40.2	48.2

Table 3. Number of hardened inlets by state as of 2009. An asterisk (*) represents an inlet at the state line, in which case half an inlet is counted in each state.

State	Visually estimated number of navigable mainland and barrier island inlets per state	Number of hardened inlets	Percent of inlets affected
North Carolina	20	2.5*	12.5
South Carolina	34	3.5*	10.3
Georgia	26	2	7.7
Florida	82	41	50
Alabama	14	6	42.9
Mississippi	16	7	43.8
Louisiana	40	9	22.5
Texas	17	10	58.8
Overall Total	249	81	32.5

Table 4. Summary of the extent of nourished beaches in piping plover wintering and migrating habitat within the conterminous U.S. From Service unpublished data.

State	Sandy beach shoreline miles available	Sandy beach shoreline miles nourished to date (within critical habitat units)	Percent of sandy beach shoreline affected (within critical habitat units)
North Carolina	301[1]	117[5] (unknown)	39 (unknown)
South Carolina	187[1]	56 (0.6)	30 (0.32))
Georgia	100[1]	8 (0.4)	8 (0.40)
Florida	825[2]	404 (6)[6]	49 (0.72)
Alabama	53[1]	12 (2)	23 (3.77)
Mississippi	110[3]	≥6 (0)	5 (0)
Louisiana	397[1]	Unquantified (usually restoration-oriented)	Unknown
Texas	367[4]	65 (45)	18 (12.26)
Overall Total	2,340 (does not include Louisiana)	≥ 668 does not include Louisiana (54)	29 (≥2.31)

Data from [1]www.50states.com; [2] Clark 1993; [3]Winstead 2008; [4] www.surfrider.org; [5] Hall 2009; [6] partial data from Lott et al. (in review).

Table 5. Summary of predator control programs that may benefit piping plovers on winter and migration grounds.

State	Entities with Predator Control Programs
North Carolina	State Parks, Cape Lookout and Cape Hatteras National Seashores.
South Carolina	As needed throughout the state-targets raccoons and coyotes.
Georgia	No known programs.
Florida	Merritt Island NWR, Cape Canaveral AFS, Indian River County, Eglin AFB, Gulf Islands NS, northwest Florida state parks (up until 2008), St. Vincent NWR, Tyndall AFB.
Alabama	Late 1990's Gulf State Park and Orange Beach for beach mice, none current.
Mississippi	No known programs.
Louisiana	No known programs.
Texas	Aransas NWR (hog control for habitat protection). Audubon (mammalian predator control on colonial waterbird islands that have occasional piping plover use).

Table 6. Number of sites surveyed during the 2006 winter International Piping Plover Census with hardened or developed structures adjacent to the shoreline.

State	Number of sites surveyed during the 2006 winter Census	Number of sites with some armoring or development	Percent of sites affected
North Carolina	37 (+2)[1]	20	51
South Carolina	39	18	46
Georgia	13	2	15
Florida	188	114	61
Alabama	4 (+2)[1]	3	50
Mississippi	16	7	44
Louisiana	25 (+2)[1]	9	33
Texas	78	31	40
Overall Total	406	204	50

[1] Indicates additional piping plovers sites not surveyed in the 2006 Census.

Table 7. Military bases that occur within the wintering/migration range of piping plovers and contain piping plover habitat. Five bases (indicated with an asterisk [*]) conduct activities that may affect piping plovers or their habitat.

State	Coastal Military Bases
North Carolina	Camp Lejeune*
South Carolina	No coastal beach bases
Georgia	Kings Bay Naval Base
Florida	Key West Base, Naval Station Mayport*, Cape Canaveral Air Force Station, Patrick AFB, MacDill AFB, Eglin AFB*, Tyndall AFB*
Alabama	No coastal beach bases
Mississippi	Keesler AFB
Louisiana	U.S. Navy* operations on Peveto Beach
Texas	Corpus Christi Naval Air Station

Table 8. Percent of known piping plover winter and migration habitat locations, by state, where various types of anthropogenic disturbance have been reported.

	Percent by State							
Disturbance Type	**AL**	**FL**	**GA**	**LA**	**MS**	**NC**	**SC**	**TX**
ATVs	0	35	0	25	0	17	25	30
Bikes	0	19	63	25	0	0	28	19
Boats	33	65	100	100	0	78	63	44
Dogs on leash	67	69	31	25	73	94	25	25
Dogs off leash	67	81	19	25	73	94	66	46
Kite surfing	0	10	0	0	0	33	0	0
ORVs	0	21	0	25	0	50	31	38
Pedestrians	67	92	94	25	100	100	88	54

Table 9. Biological Opinions issued for all projects that had adverse effects to the piping plovers on non-breeding grounds in Florida.

SPECIES Piping plover	YEAR	Habitat Impacted (miles or acres)	PROJECT STATUS
East Pass re-opening	2001	2.0 miles	Completed
Amended Biological Opinion for south jetty extension in Ponce De Leon Navigation Inlet.	2003	Shoal habitat	Completed
Terminal groin and nearshore breakwater on the south end of Amelia Island, Nassau, Florida.	2004	Shoal habitat	Completed
Navarre beach nourishment emergency consultation and amendments 1-6.	2005	4.1 miles	Project completed, consultation incomplete.
Eglin AFB INRMP	2007-2011	17 miles (disturbance/ monitoring)	Completed
Tyndall AFB INRMP	2007-2011	18 miles (disturbance/ monitoring)	Completed
St. Joseph Peninsula beach restoration	2007	7.5 miles	Consultation complete, project completed.
Alligator Point beach nourishment	2007	2.9 nourished, add 1.5 disturbed (miles)	Consultation complete, project cancelled.
NAS Pensacola pass dredging and spoil placement	2007	10.6 miles	Consultation ongoing.
FEMA emergency berm repair for Florida coast	2008	50 miles (statewide)	Consultation complete.
Eglin AFB nourishment	2008	7.3 miles	Consultation complete, project pending.
Perdido Key beach nourishment; Escambia County.	2008	6.5 miles	Consultation complete, project pending.
Beach nourishment, Walton County	2008	14.1 miles	Consultation complete, project pending.
East Pass Destin Navigation Project	2009	Inlet dredge and 2.1 miles of shoreline.	Consultation complete, project pending.
Matanzas Pass Re-opening	2009	3.6 acres of Critical Habitat Unit FL-25.	Consultation complete, project pending.
Hideaway Beach Erosion Control Project	2009	2.5 acres of Critical Habitat Unit FL-27.	Consultation and project completed.
St. Lucie Inlet Dredging and Sand Placement	2011	3.8 acres of Critical Habitat Unit FL-33, and 8.5 miles.	Consultation complete.
Panama City Beach Erosion Control and Storm Damage Reduction	2012	18.5 miles of shoreline	Consultation and project completed.
Walton County Beach Hurricane and Storm Damage Reduction Project	2012	26.0 miles of shoreline	Consultation complete.
Matanzas Pass Dredging	2012	3.2 acres of Critical Habitat Unit FL-25 and 1.1 miles of shoreline.	Consultation complete.
Sailfish Point Channel Dredging and Sand Placement		0.95 mile of shoreline.	Consultation complete.
Captiva & Sanibel Islands Sand Placement	2012	6.4 miles of shoreline.	Consultation complete.
Clam Pass Dredging and Sand Placement		0.60 mile of shoreline.	Consultation ongoing.
Hideaway Beach Sand Placement and Groin Construction			Consultation ongoing.
Sebatian Inlet Sand Trap Dredging and Sand Placement			Consultation ongoing.
Lovers Key & Little Hickory Island Sand Placement		1.85 miles of shoreline.	Consultation ongoing.

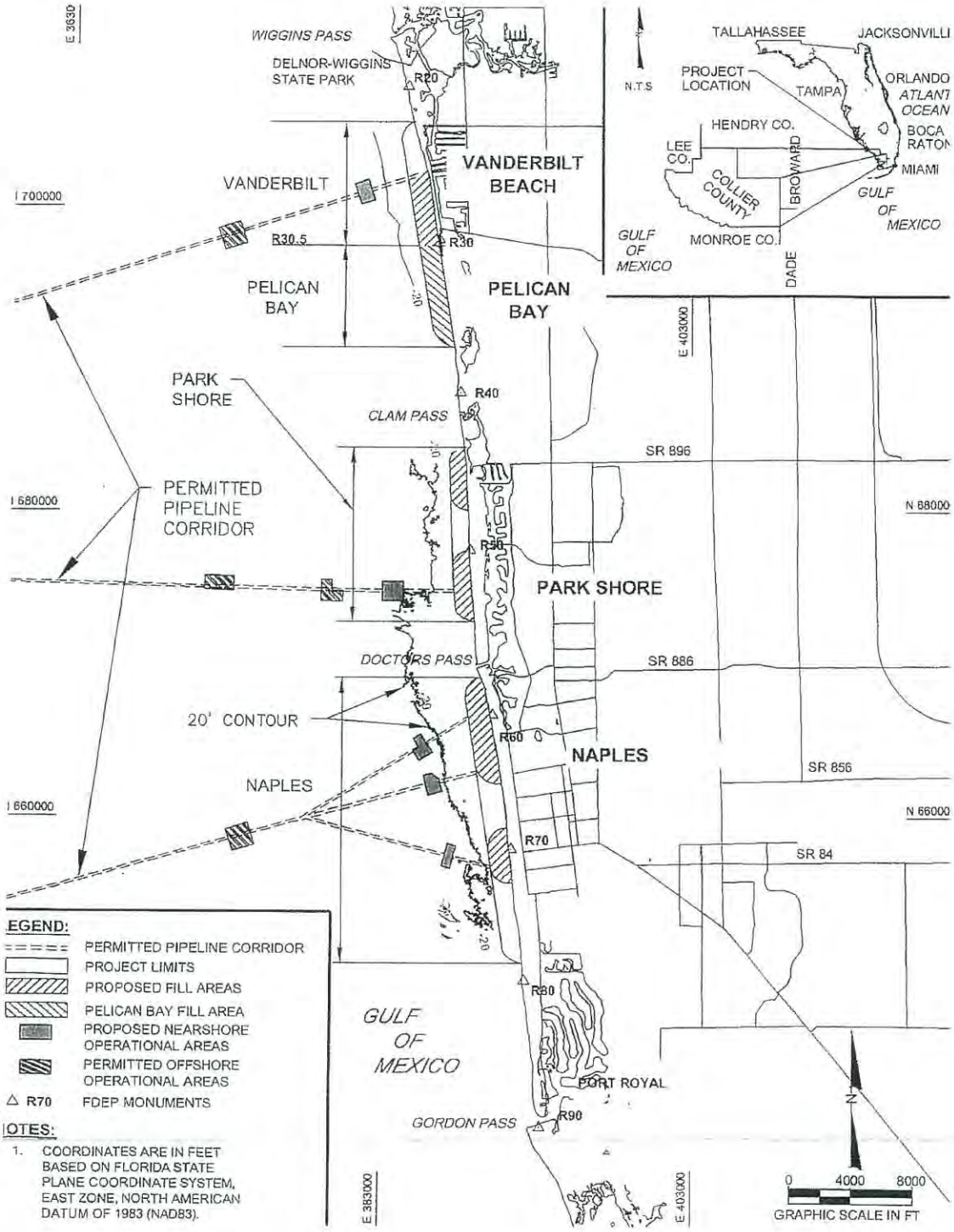


Figure 1. Location of the proposed sand placement project along Vanderbilt, Pelican Bay, Park Shore, and Naples beaches, Collier County, Florida.

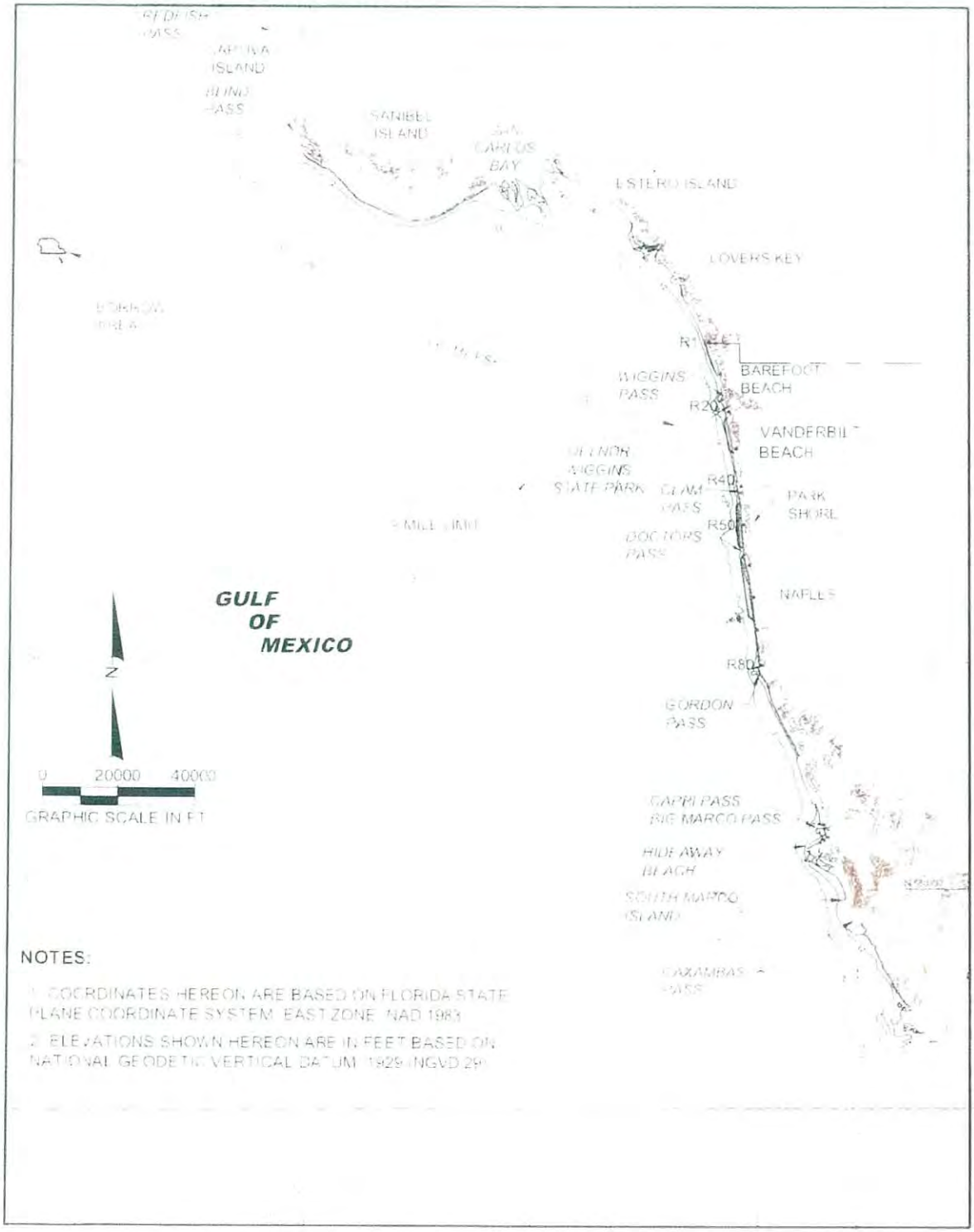


Figure 2. Location of Borrow Area T1.

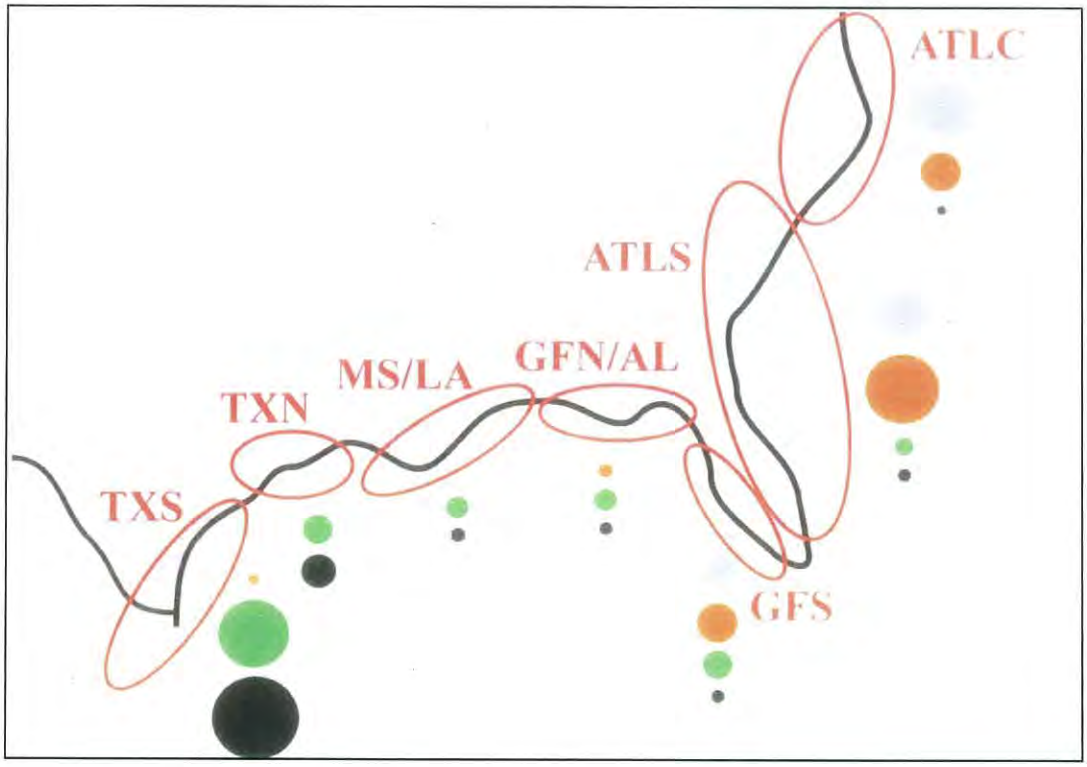


Figure 3. Breeding population distribution in the wintering/migration range. Grey circles represent Eastern Canada birds, Orange U.S. Great Lakes, Green U.S. Great Plains, and Black Prairie Canada. ATLC=Atlantic (eastern) Canada; GFS=Gulf Coast of southern Florida; GFN=Gulf Coast of north Florida; AL=Alabama; MS/LA=Mississippi and Louisiana; TXN=northern Texas; and TXS=southern Texas. From Gratto-Trevor et al. 2009; reproduced by permission.

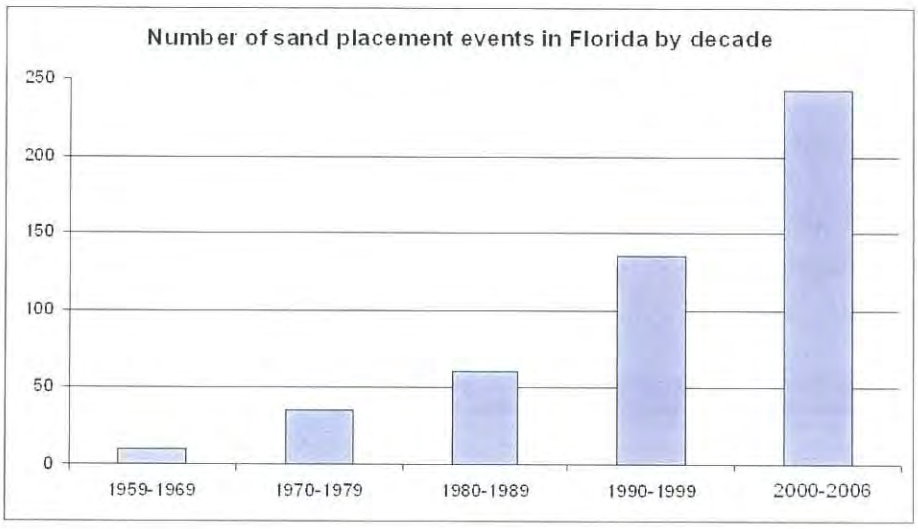


Figure 4. Number of sand placement events in Florida between 1959 and 2006.

APPENDIX I

OPERATIONAL AREA INVESTIGATIONS – FIELD OBSERVATION REPORT (CPE, 2013)

US Army Corps of Engineers
BUILDING STRONG®

SAJ-2003-12405 (SP-KDS)

Posted 1/7/2013

ATTACHMENTS

Graphics

TO WHOM IT MAY CONCERN: The Jacksonville District of the U.S. Army Corps of Engineers (Corps) has received an application for a Department of the Army permit pursuant to Section 404 of the Clean Water Act (33 U.S.C. §1344) and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. §403) as described below:

APPLICANT: Collier County Government

3050 Horseshoe Drive, Suite 218

Naples, Florida 34104

WATERWAY AND LOCATION: The project would affect waters of the United States associated with Gulf of Mexico. The project area encompasses approximately 7.5 miles of coastline between Wiggins Pass and Gordon Pass. Specifically, the project area includes portions of Vanderbilt, Park Shore, and Naples Beach in Sections 29 and 32, Township 48 South, Range 25 East, Sections 5, 8, 16, 21, and 28, Township 49 South, Range 25 East, and Sections 4 and 9, Township 50 South, Range 25 East, Gulf of Mexico, Collier County, Florida.

Directions to the northern limit of the project site are as follows: Take U.S. 41 to Immokalee Road. Head west on Immokalee Road. Continue on Immokalee Road curves as it curves to the right and turns into Park Drive. The northern most limit of the project site is located just south of the entrance to Delnor-Wiggins Pass State Park.

APPROXIMATE COORDINATES:

Begin Nourishment at R-22: 26.2731°, -81.8277°

End Nourishment at R-79: 26.1210°, -81.8046°

PROJECT PURPOSE:

Basic: Beach renourishment

Overall: To conduct a second cycle of beach renourishment authorized by permit SAJ-2003-12405(IP-MN) and modify the existing permit to expand 5 profiles, remove Pelican Bay reach from the 2013-14 cycle, incorporate additional construction method options, and expand the construction window.

EXISTING CONDITIONS: Collier County consists of barrier islands and headland features. Typically, the waterward profile of these islands is composed of a sandy beach backed by vegetated dunes. The majority of the coastline is bordered by condominiums. Subtidal habitat within the project area includes sandy, unvegetated, soft bottom marine habitat. Submerged aquatic vegetation occurs near the project area, within adjacent passes and bays and can occasionally be found in small patches offshore; however, no seagrass resources have been observed within the project area based on FWC's Fish and Wildlife Research Institute 2006 surveys (the most recent survey data available). Soft bottom, subtidal habitats consisting of various percentages of sand, sand-gravel and shell comprise the dominant benthic habitat along both Florida coasts. The fauna is typically dominated by polychaete worms, crustaceans, mollusks and insect larvae.

In 2003 Coastal Planning and Engineering conducted sidescan sonar survey of the nearshore region of Collier County (R-17 to R-81). These surveys documented approximately 500 acres of nearshore hardbottom within 1,000 feet of the shoreline.

PROJECT HISTORY: The original Collier County beach nourishment project was authorized by DA permit SAJ-1994-04092 in 1996 for Naples Beach, Vanderbilt Beach, and Park Shore Beach. On November 17, 2005, Collier County received authorization under DA permit SAJ-2004-12405(IP-MN) to periodically renourish Vanderbilt, Park Shore, Naples, Pelican Bay, and North Park Shore beaches over a 10-year period with 6-8 year renourishment cycles. The permitted borrow area (T1) is located approximately 33 miles to the east northeast of Vanderbilt Beach. The method of sand placement was through hopper dredging. The initial nourishment under DA permit SAJ-2004-12405 (IP-MN) was completed in 2006 using sand from Borrow Area T1. The project began mobilization on January 23, 2006 and completed tilling, grading and removal of equipment from the beach before the end of May 2006. The project placed 664,000 cubic yards of sand on the beach during the period of February 22, 2006 to May 23, 2006. This request is the second renourishment cycle included in the existing permit; however, the County is requesting modifications to the permit as described below.

PROPOSED WORK: The applicant seeks authorization to modify the existing permit to expand 5 profiles, remove Pelican Bay reach, incorporate additional construction method options, and expand the construction window for the 2013-2014 beach renourishment cycle. The 2013-14 cycle proposes mobilization no earlier that September 1 and the start of sand placement on or after September 15. This project is based on the quantity of sand needed to re-establish the design berm and provide six to eight years of advanced nourishment using the 2006 project design. The amount of fill needed to bring the historic project areas back to design standard with a six year design life is less than was constructed in 2006. Based upon the 2012 monitoring survey, 420,000 cubic yards will be

required. The 2006 project will be rebuilt but with a smaller alongshore length and cross shore width and volume, while increasing five profiles' densities with no hardbottom impact. The project will incorporate several gaps in fill along each segment. Vanderbilt Beach will have a gap between R-22+300 and R-25+500, Park Shore will have a gap between R-47+500 and R-50, and Naples Beach will have a gap between R-64+500 and R-68+200 and R-72+600 to R-79. Construction of the Pelican Bay reach from R-32 to R-37 will not be rebuilt. The impacts of Hurricane Isaac have not been factored into the design and may add up to 95,000 cubic yards of the volume. The potential total volume for this 2013-14 renourishment cycle is 515,000 cubic yards.

Table 1: Project Sites and Volume

Project Reach	Project Limits	Gaps	Design Volume (CY)
Vanderbilt	R-22+300 to R-30+500	R-22+300 to R-25+500	59,724
Park Shore	R-43+500 to R-54+400	R-47+500 to R-50	118,246
Naples	R-58A-480 to R-79	R-64+500 to R-68+200, R -72+600 to R-79	241,151
Total			419,121
Maximum total Under 2006 Permitted Template			515,000

The applicant seeks authorization to modify the existing permit to:

Expand the construction window: Expand the construction window to September 15, 2013 to May 31, 2013, with mobilization occurring no earlier than September 1, 2013. The County requests permission to expand the dredging window based on the conditions in the U.S. Fish and Wildlife Service's (USFWS) Statewide Programmatic Biological Opinion (SPBO) for sand placement activities in Florida (April 19, 2011).

Expand select 2006 design profiles: Moderate expansion of the construction template in hot spots is requested.

Add construction methods: The County requests the construction methods include the option of using hopper dredge with standard beach fill placement (like the 2006 project), cutterhead dredge with a spider barge and scows, combination of the first two, or truck haul using an upland sand source.

Add Borrow areas: Two options for sand sources are proposed for the 2013 project – offshore and upland.

Borrow Area T1

Borrow Area T1 is proposed as the sand source utilized by the dredges for use in the upcoming renourishment project. Borrow Area T1 was used for the 2006 renourishment project and is located 33 miles from Vanderbilt Beach in Federal waters. Based on a compatibility analysis, the coarser sand from Borrow Area T1 is the only offshore sand source compatible for use in Vanderbilt, Park Shore, and Naples Beach. Borrow Area T1 is under the sole jurisdiction The Bureau of Ocean Energy Management, Regulation and Enforcement.

Upland Sand Source

An upland sand source will be used if truck haul is the selected construction method. The specific sand mine will be determined at the time of selection. Several sand mines are located near Collier County. The Immokalee Mines in northeast Collier County can provide sand sorted into a variety of characteristics, and has been used successfully on the County beaches. There are other upland sand sources with similar sand quality to the Immokalee sand pit.

Add operational areas and a new pipeline corridor: Additional operational areas and a new pipeline corridor are requested for the 2013-14 renourishment project. Three operational areas that were utilized by hopper dredges were permitted for the 2006 project. The 2013-14 project proposes the use of both hopper and cutterhead dredges for an offshore sand source, and additional operational areas need to be permitted for cutterhead/scow operations. Cutterhead dredges utilizing scows can operate in shallower waters than hopper dredges; therefore, six (6) new nearshore operational areas are requested. If a hopper or cutterhead dredge is utilized, the proposed project would use the pipeline corridors permitted in the 2006 project to the greatest extent possible. An additional pipeline corridor (S6 at P2) is being proposed for access to northern Park Shore reach. Three pipeline corridors with spurs (P1, P2, and P3) were permitted for the 2006 project and may be utilized for the proposed 2013 project (Figure 1). P1 is the northernmost pipeline corridor and comes ashore between R-25 and R-26 on Vanderbilt Beach; P2 comes ashore between R-51 and R-53 on Park Shore; and P3 comes ashore between R-62 and R-64 on Naples Beach. Collared pipelines were installed over hardbottom resources, as approved by FDEP, in order to elevate the pipeline above the substrate and minimize the area of direct contact with the seafloor and avoid physical abrasion to the benthic communities. The collared submerged pipeline consisted of the standard 30-inch dredge pipe with large tractor tires placed around the pipe at 100 foot intervals over the portion of the corridor that crossed hardbottom resources.

If the project is constructed using a hopper or cutterhead dredge, the project is estimated to take up to 120 days (working 24 hours per day, 7 days a week). If the County chooses a truck haul project, the project may take between 140 to 237 days.

AVOIDANCE AND MINIMIZATION INFORMATION: The applicant has provided the following information in support of efforts to avoid and/or minimize impacts to the aquatic environment:

"The proposed project will avoid hardbottom, place less sand than the permitted 2006 template with the exception of five cross-sections, and include gaps in each fill segment where fill is not needed."

COMPENSATORY MITIGATION: The applicant has provided the following explanation why compensatory mitigation should not be required:

"Potential impacts to hardbottom resources that fell within the estimated Equilibrium Toe of Fill (ETOF) of the 2006 project were mitigated through construction of a 1.09-ac artificial reef. The ETOF for the proposed project will not extend any farther seaward than the ETOF for the 2006 project; therefore, no additional compensatory mitigation measures for hardbottom are proposed for this project. While dredge and fill operations sometimes result in burial of hardbottom and corals located there, there are no listed species of corals located within the project vicinity."

CULTURAL RESOURCES: The Corps is not aware of any known historic properties within the permit area. By copy of this public notice, the Corps is providing information for review. Our final determination relative to historic resource impacts is subject to review by and coordination with the State Historic Preservation Officer and those federally recognized tribes with concerns in Florida and the Permit Area.

ENDANGERED SPECIES: A portion of the project is located in manatee critical habitat. The Corps has determined the proposed project may affect the following threatened or endangered species in the marine environment:

Green Sea Turtle Chelonia mydas

Leatherback Sea Turtle Dermochelys coriacea

Kemp's ridley Sea Turtle Lepidochelys kempii

Loggerhead Sea Turtle Caretta caretta

Smalltooth Sawfish Pristis pectinata

Sea turtles have been reviewed under the National Marine Fisheries Service Gulf of Mexico Hopper Dredge Regional Biological Opinion (GRBO) dated November 19, 2003, as amended and modified on January 9, 2007. The GRBO contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with “incidental take” that is also specified in the GRBO. Additional coordination by the Corps for the above species is not required. Borrow Area T1 is not covered under the GRBO. BOEM has independently requested initiation of formal consultation with the National Marine Fisheries Service pursuant to Section 7 of the Endangered Species Act for Borrow Area T1.

The Corps has determined the proposal may affect the following threatened or endangered species on the beaches:

Green Sea Turtle Chelonia mydas

Leatherback Sea Turtle Dermochelys coriacea

Kemp's ridley Sea Turtle Lepidochelys kempii

Loggerhead Sea Turtle Caretta caretta

Piping Plover Charadrius melodus

The Corps has determined the project may affect, but is not likely to adversely affect the following endangered species:

West Indian Manatee Trichechus manatus latirostris

On August 21, 2011, the United States Fish and Wildlife Service (FWS) issued statewide programmatic biological opinion (SPBO) for Corps regulatory sand placement activities and their affect on nesting sea turtles and beach mice (http://www.fws.gov/northflorida/BOs/20110822_bo_USFWS_Statewide_Programmatic_BO_Beach_N The applicant has agreed to implement the Reasonable and Prudent Measures (RPMs) listed in the BO that apply to the project. Based on this information, the Corps is requesting confirmation by separate correspondence from the U.S. Fish and Wildlife Service that the proposed project can be included under the SPBO for nesting sea turtles, which determined that work conducted under the SPBO is not likely to jeopardize the continued existence of the loggerhead, green, leatherback, hawksbill or Kemp’s ridley sea turtles and concurred the project is not likely to adversely affect the manatee. The Corps will request initiation of formal consultation for the piping plover with the U.S. Fish and Wildlife Service pursuant to Section 7 of the Endangered Species Act by separate letter. The Corps is

serving as lead agency for Section 7 consultation with the U.S. Fish and Wildlife Service. BOEM is also participating in the formal consultation.

The project will not affect the manatee's critical habitat. In addition to the above listed species, the Red Knot (Calidris canutus), a candidate species, has been documented in the project area.

ESSENTIAL FISH HABITAT (EFH): This notice initiates consultation with the National Marine Fisheries Service on EFH as required by the Magnuson-Stevens Fishery Conservation and Management Act 1996. The proposal would impact approximately 90 acres of submerged and intertidal sand flats utilized by various life stages of penaeid shrimp complex, reef fish, stone crab, spiny lobster, migratory/pelagic fish, and snapper/grouper complex. Our initial determination is that the proposed action would not have a substantial adverse impact on EFH or Federally managed fisheries in the Gulf of Mexico. Our final determination relative to project impacts and the need for mitigation measures is subject to review by and coordination with the National Marine Fisheries Service.

NOTE: The Bureau of Ocean Energy Management (BOEM) has sole regulatory authority over the use of Outer Continental Shelf (OCS) sand resources from Borrow Area F2 under the OCS Lands Act. The U.S. Army Corps of Engineers (Corps) requires a permit for all other aspects of the project, including dredging of any state water borrow areas, as well as conveyance and placement of sand resources. BOEM and the Corps are working collaboratively to ensure effective implementation of the required National Environment Act (NEPA) process, the required Endangered Species Act (ESA) Section 7 consultations, the Magnuson-Stevens Fishery and Conservation Management Act, Essential Fish Habitat consultation (Section 305); the National Historic Preservation Act Section 106 process; and the Coastal Zone Management Act Section 307 consistency determination.

NOTE: This public notice is being issued based on information furnished by the applicant. This information has not been verified or evaluated to ensure compliance with laws and regulation governing the regulatory program. The jurisdictional line has been verified by Corps personnel.

AUTHORIZATION FROM OTHER AGENCIES: Florida Department of Environmental Protection (FDEP): The FDEP is currently reviewing an Application for Minor Modification. For information, please contact the FDEP Bureau of Beaches and Coastal Systems, 3900 Commonwealth Blvd., Mail Station 300, Tallahassee, Florida 32399-3000. Reference file number 0222355-012-JN. Bureau of Ocean Energy Management (BOEM): A lease for Borrow Area T1 is required from BOEM. If you have any questions concerning the lease application, you may contact Dr. Jennifer Culbertson by electronic mail at jennifer.culbertson@boem.gov, by fax at 703-787-1026, or by telephone at 703-787 -1742.

COMMENTS regarding the potential authorization of the work proposed should be submitted in writing to the attention of the District Engineer through the Fort Myers Permits Section, 1520 Royal Palm Square Boulevard, Suite 310, Fort Myers, Florida 33919 within 15 days from the date of this notice.

The decision whether to issue or deny this permit application will be based on the information received from this public notice and the evaluation of the probable impact to the associated wetlands. This is based on an analysis of the applicant's avoidance and minimization efforts for the project, as well as the compensatory mitigation proposed.

QUESTIONS concerning this application should be directed to the project manager, Krista Sabin, in writing at the Fort Myers Permits Section, 1520 Royal Palm Square Boulevard, Suite 310, Fort Myers, Florida 33919, by electronic mail at Krista.D.Sabin@usace.army.mil, by fax at (239)334-0797, or by telephone at (239)334-1975 extension 31.

IMPACT ON NATURAL RESOURCES: Preliminary review of this application indicates that an

Environmental Impact Statement will not be required. Coordination with U.S. Fish and Wildlife Service, Environmental Protection Agency (EPA), the National Marine Fisheries Services, and other Federal, State, and local agencies, environmental groups, and concerned citizens generally yields pertinent environmental information that is instrumental in determining the impact the proposed action will have on the natural resources of the area. By means of this notice, we are soliciting comments on the potential effects of the project on threatened or endangered species or their habitat

EVALUATION: The decision whether to issue a permit will be based on an evaluation of the probable impact including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits, which reasonably may be expected to accrue from the proposal, must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including cumulative impacts thereof; among these are conservation, economics, esthetics, general environmental concerns, wetlands, historical properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food, and fiber production, mineral needs, considerations of property ownership, and in general, the needs and welfare of the people. Evaluation of the impact of the activity on the public interest will also include application of the guidelines promulgated by the Administrator, EPA, under authority of Section 404(b) of the Clean Water Act of the criteria established under authority of Section 102(a) of the Marine Protection Research and Sanctuaries Act of 1972. A permit will be granted unless its issuance is found to be contrary to the public interest.

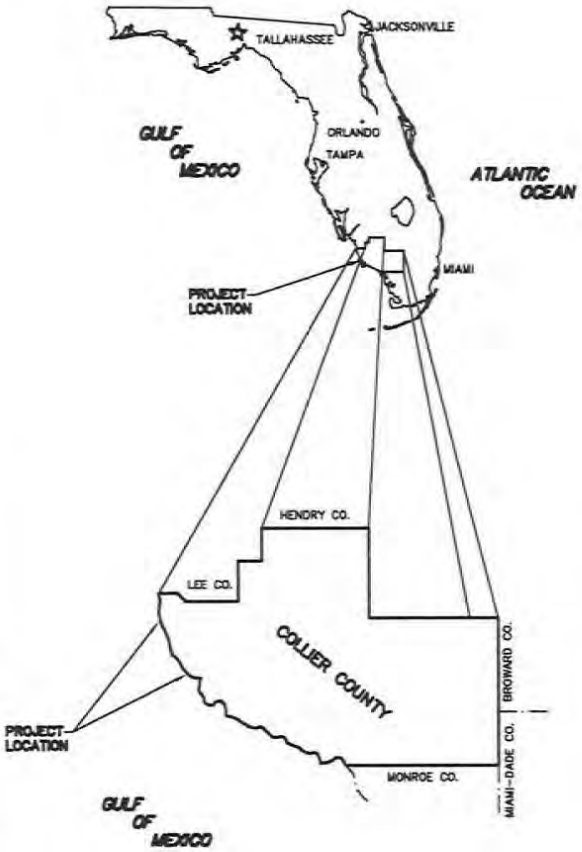
The US Army Corps of Engineers (Corps) is soliciting comments from the public; Federal, State, and local agencies and officials; Indian Tribes; and other Interested parties in order to consider and

evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps to determine whether to issue, modify, condition, or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

COASTAL ZONE MANAGEMENT CONSISTENCY: In Florida, the State approval constitutes compliance with the approved Coastal Zone Management Plan. In Puerto Rico, a Coastal Zone Management Consistency Concurrence is required from the Puerto Rico Planning Board, in the Virgin Islands, the Department of Planning and Natural Resources permit constitutes compliance with the Coastal Zone Management Plan.

REQUEST FOR PUBLIC HEARING: Any person may request a public hearing. The request must be submitted in writing to the District Engineer within the designated comment period of the notice and must state the specific reasons for requesting the public hearing.

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
COLLIER COUNTY, FLORIDA



INDEX TO SHEETS

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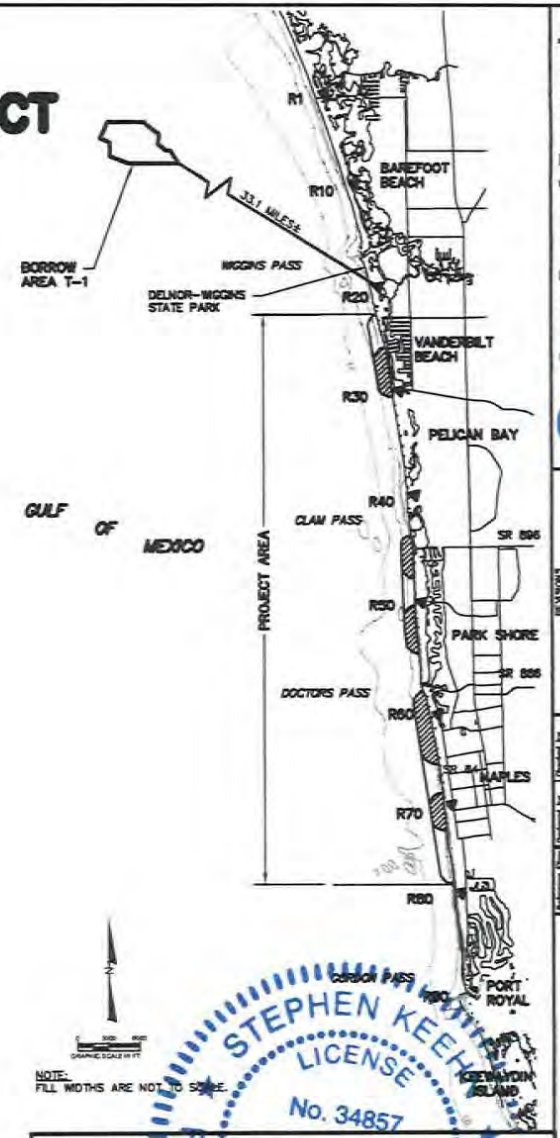
21	BORROW AREA T1 BATHYMETRY
22	BORROW AREA T1 ISOPACH
23	BORROW AREA T1 CROSS SECTIONS
24–29	DREDGE PIPELINE CORRIDORS



NOTE:
FILL WIDTHS ARE NOT TO SCALE.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11-9-12

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-5102
FAX (561) 391-9116
C.O.A. FL 6029
C.O.A. LA 8231
www.CoastalPlanning.net

REVISIONS

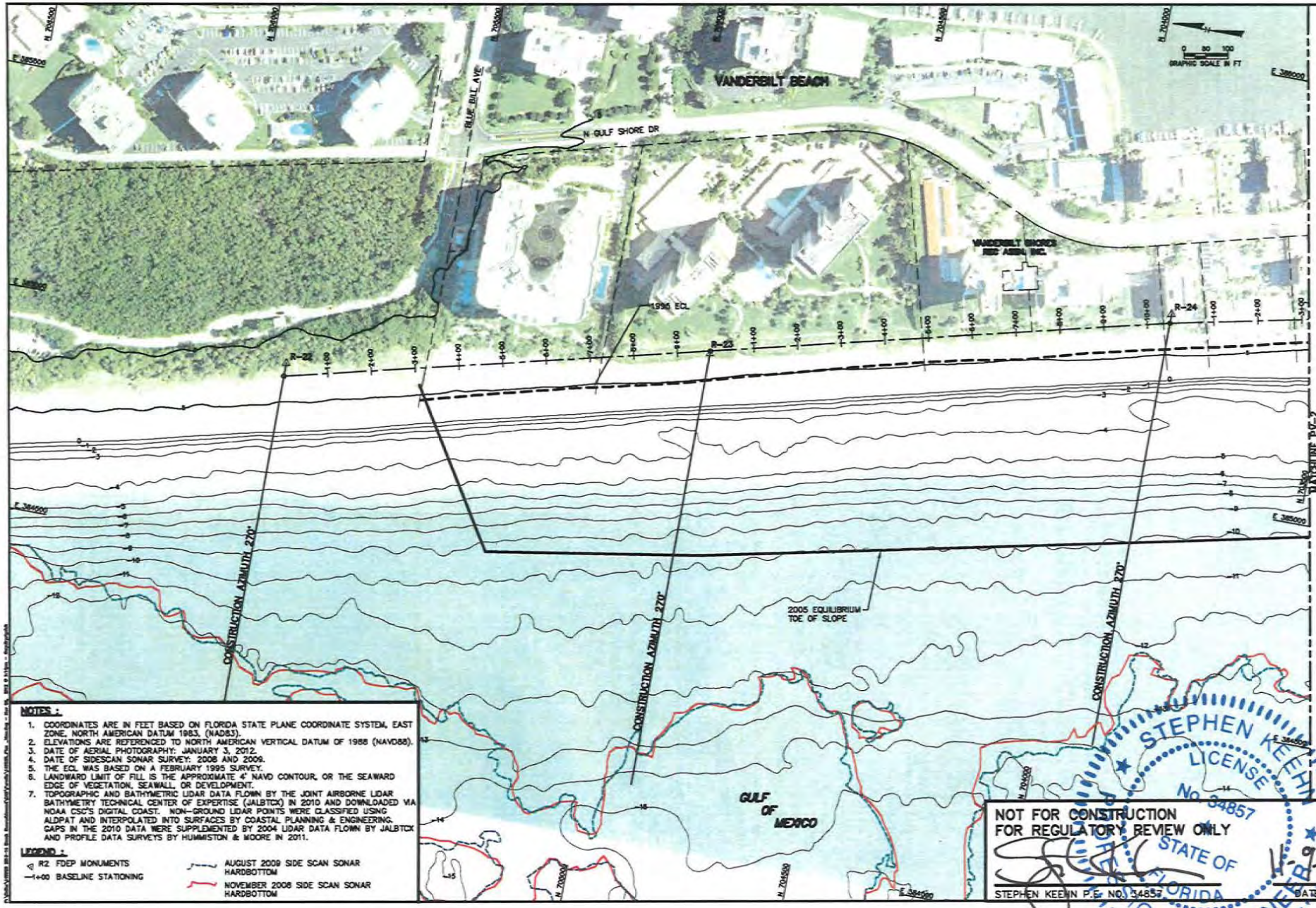
No.	Date	Description

Designed by SK | Drawn by JRC | Date 7/25/12 | Plot Scale AS NOTED | Checked by MJB | Reviewed by HS | Submitted by SK | Comm. No. 1.6023

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
COVER SHEET

DRAWING NO.
CS-1

SHEET 1 OF 29



NOTES :

1. COORDINATES ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD83).
2. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. DATE OF AERIAL PHOTOGRAPHY: JANUARY 3, 2012.
4. DATE OF SIDESCAN SONAR SURVEY: 2008 AND 2009.
5. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
6. LANDWARD LIMIT OF FILL IS THE APPROXIMATE 4' NAVD CONTOUR, OR THE SEAWARD EDGE OF VEGETATION, SEAWALL, OR DEVELOPMENT.
7. TOPOGRAPHIC AND BATHYMETRIC LIDAR DATA FLOWN BY THE JOINT AIRBORNE LIDAR BATHYMETRY TECHNICAL CENTER OF EXPERTISE (JALBTCX) IN 2010 AND DOWNLOADED VIA NOAA CSC'S DIGITAL COAST. NON-GROUND LIDAR POINTS WERE CLASSIFIED USING ALDPAT AND INTERPOLATED INTO SURFACES BY COASTAL PLANNING & ENGINEERING. GAPS IN THE 2010 DATA WERE SUPPLEMENTED BY 2004 LIDAR DATA FLOWN BY JALBTCX AND PROFILE DATA SURVEYS BY HUMMISTON & MOORE IN 2011.

LEGEND :

- R2 FDEP MONUMENTS
- 1+00 BASELINE STATIONING
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

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REVISIONS		
No.	Date	Description

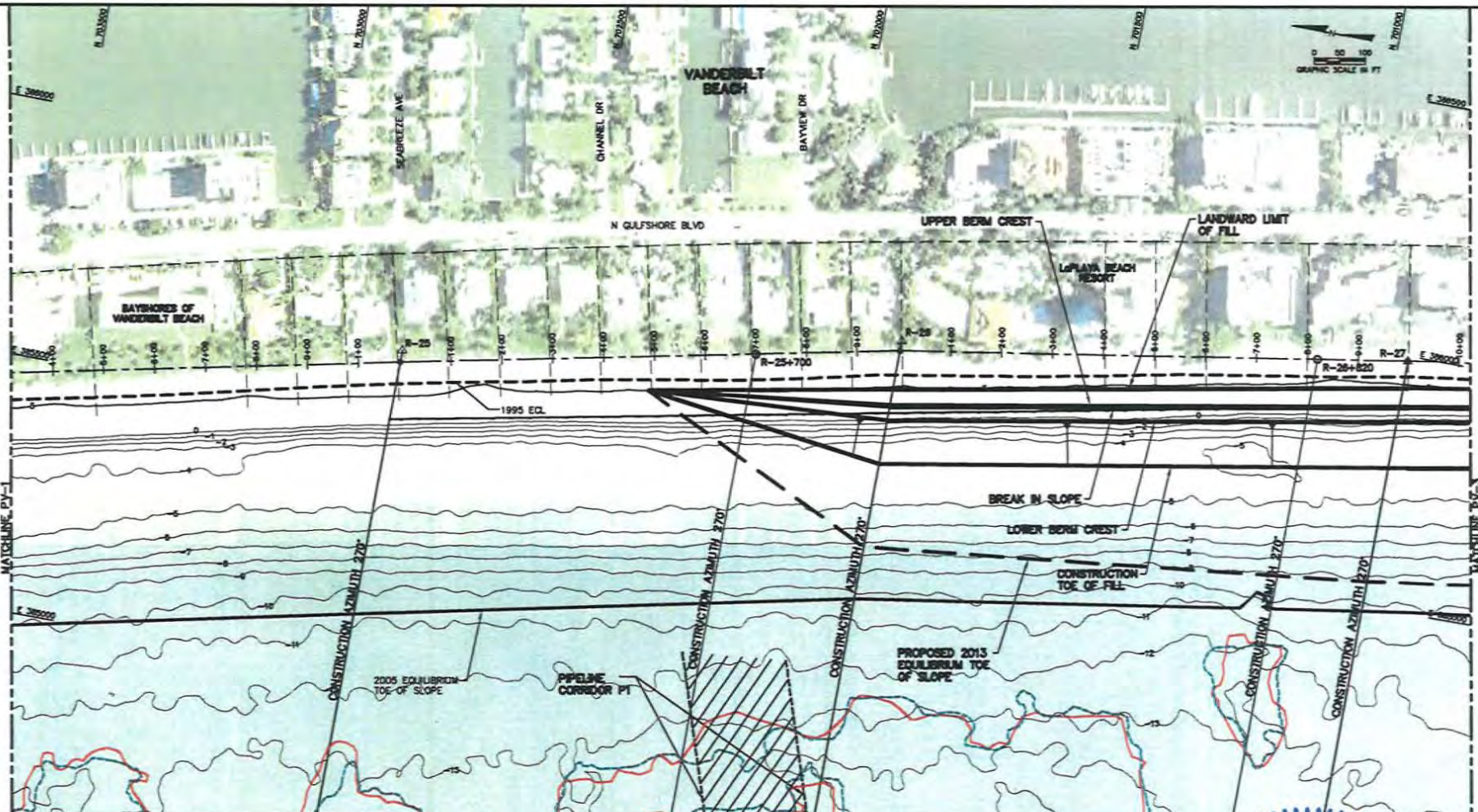
Designed by AMB | Drawn by CK | Date 7/23/12 | Plot Scale 1:5 NOTED | Reviewed by NS | Submitted by SK | Proj. No. 140525

Reference Files: Xref: Image:

COLLIER COUNTY
BEACH REHOURISHMENT PROJECT
PLAN VIEW

DRAWING NO. PV-1

SHEET 2 OF 29



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LEGEND :

- R2 FDEP MONUMENTS
- 1+00 BASELINE STATIONING
- PIPELINE CORRIDOR
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM
- R-58A MAP SPOT

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STEPHEN KEHN P.E. No. 34857 — DATE 11-9-12

STEPHEN KEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

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C.O.A. LA 8251

REVISIONS

No.	Date	Description

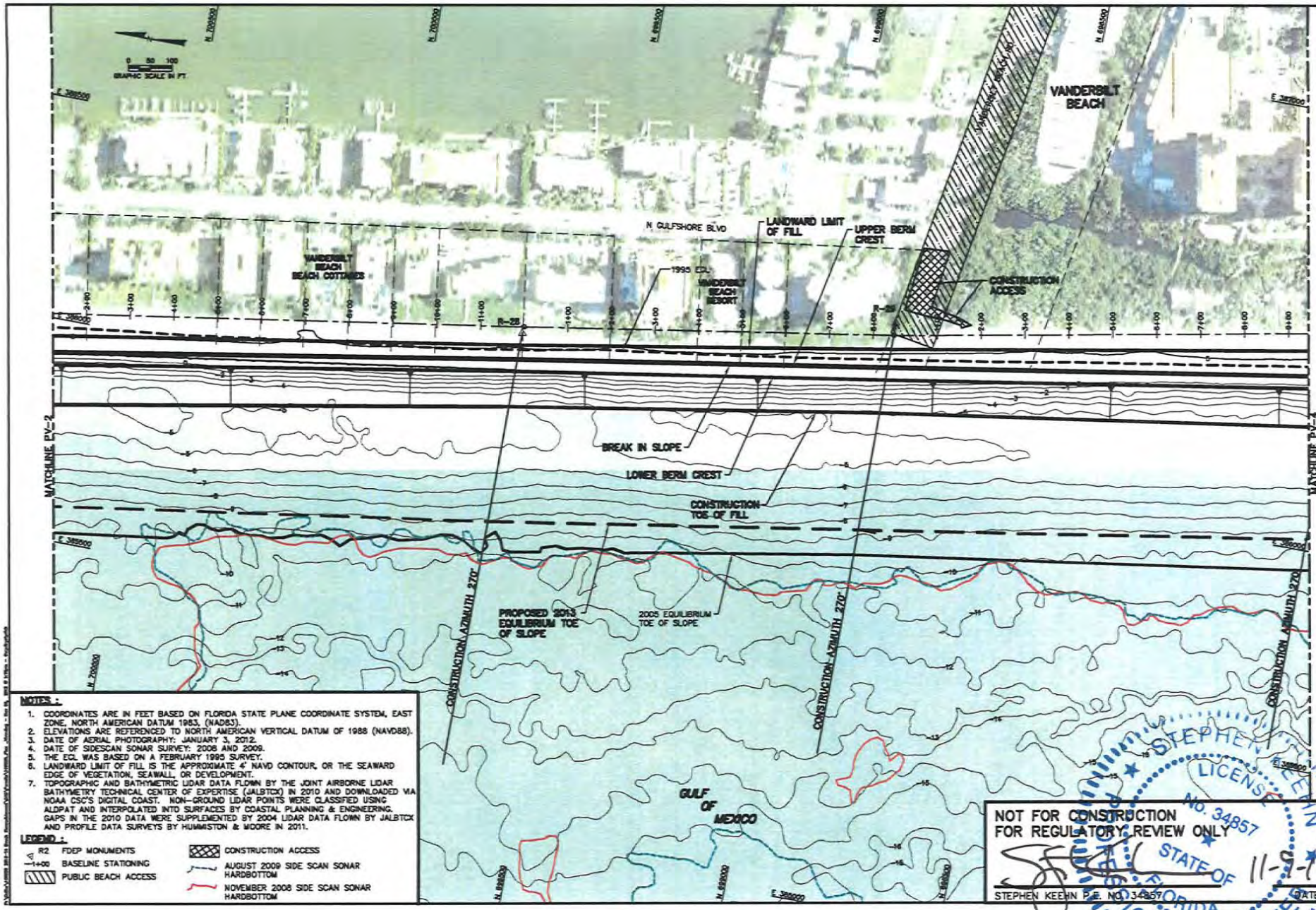
Reference Files (data, production)

Designed by SK | Drawn by DK | Date 7/23/12 | PFN Scale AS NOTED | Checked by AMB | Reviewed by HS | Submitted by SK | Comm. No. 140525

COLLIER COUNTY
BEACH REHABILITATION PROJECT
PLAN VIEW

DRAWING NO. PV-2

SHEET 3 OF 29



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LEGEND :

- R2 FDEP MONUMENTS
- 1+00 BASELINE STATIONING
- PUBLIC BEACH ACCESS
- CONSTRUCTION ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

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FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 DATE: 11-9-12

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REVISIONS		
No.	Date	Description

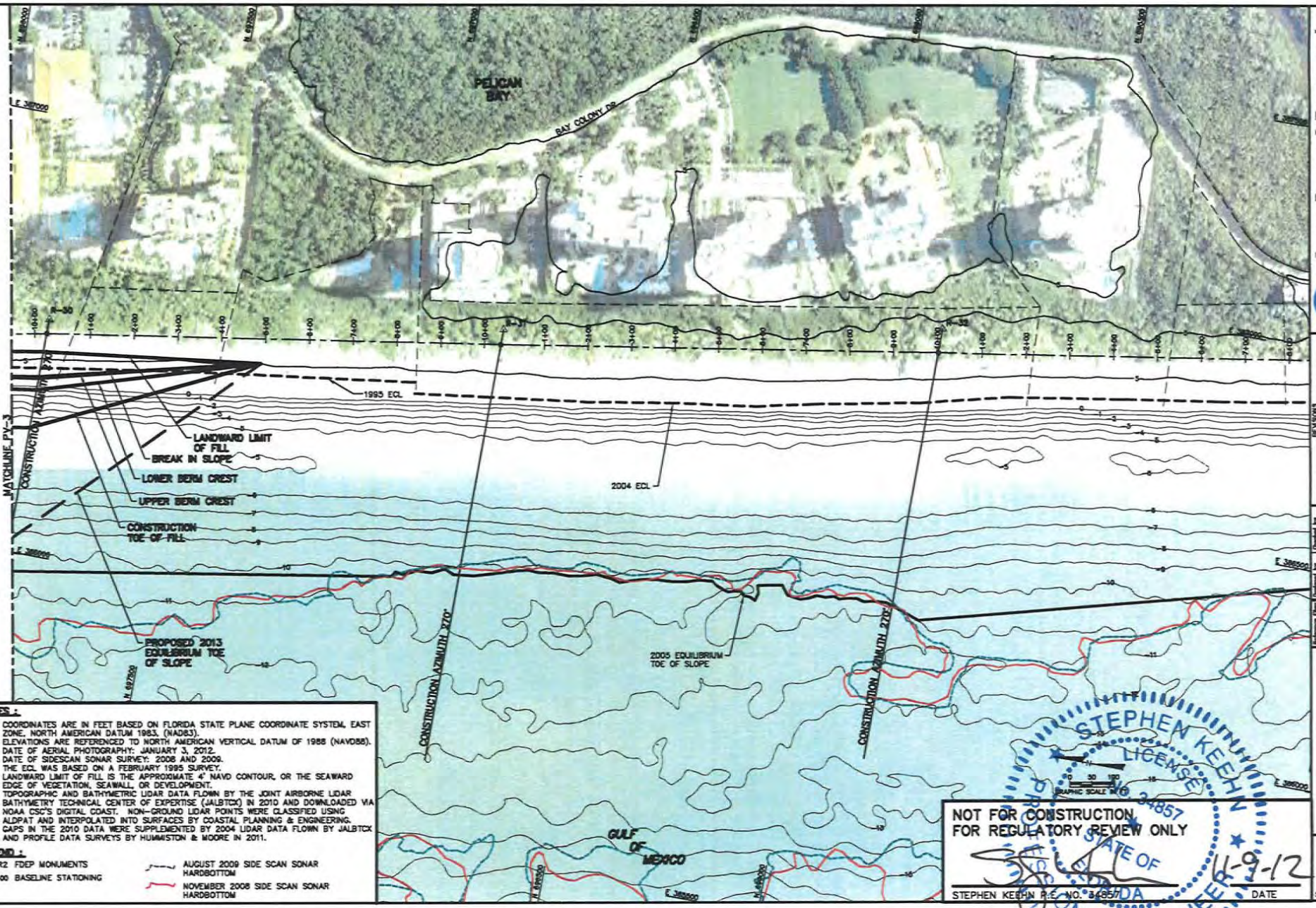
Checked by AMB | Approved by HS | Submitted by SK | Contr. No/ 16925

Designed by SK | Drawn by SK | Date 7/23/12 | Plot Scale AS NOTED

COLLIER COUNTY
BEACH NOURISHMENT PROJECT
PLAN VIEW

DRAWING NO. PV-3

SHEET 4 OF 29



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- 1+00 BASELINE STATIONING
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REVISIONS

No.	Date	Description

Drawn by AMB | Designed by HS | Submitted by SK | Drawing File/ 169235

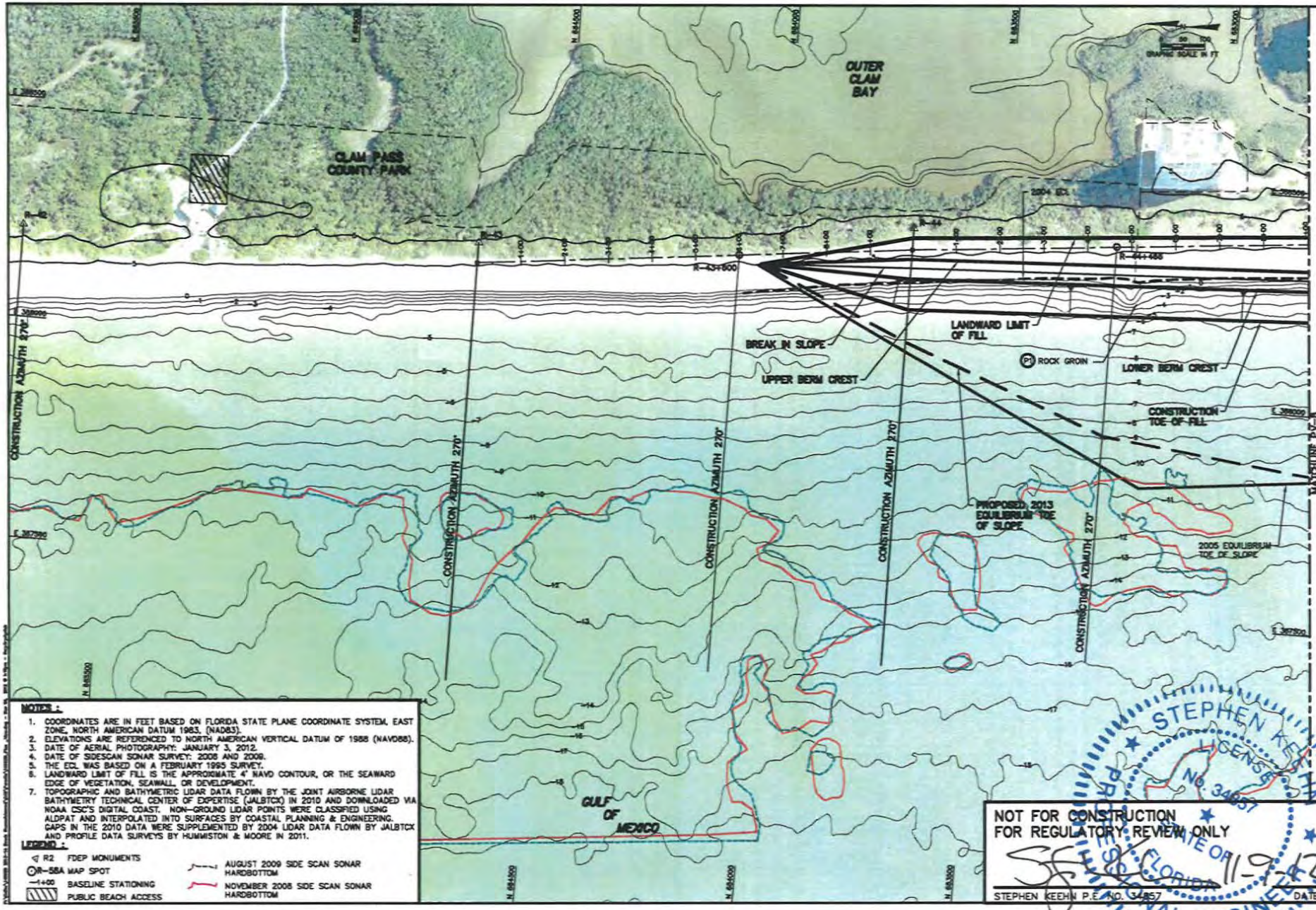
Checked by SK | Date 7/25/13 | Plot Scale AS NOTED

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT

PLAN VIEW

DRAWING NO. PV-4

SHEET 5 OF 29



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LEGEND :

- R2 FDEP MONUMENTS
- R-58A MAP SPOT
- 1+00 BASELINE STATIONING
- PUBLIC BEACH ACCESS
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FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11-9-12

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FAX (561) 391-9116
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C.O.A. - LA #2511
www.CoastalPlanning.net

No.	Date	Description

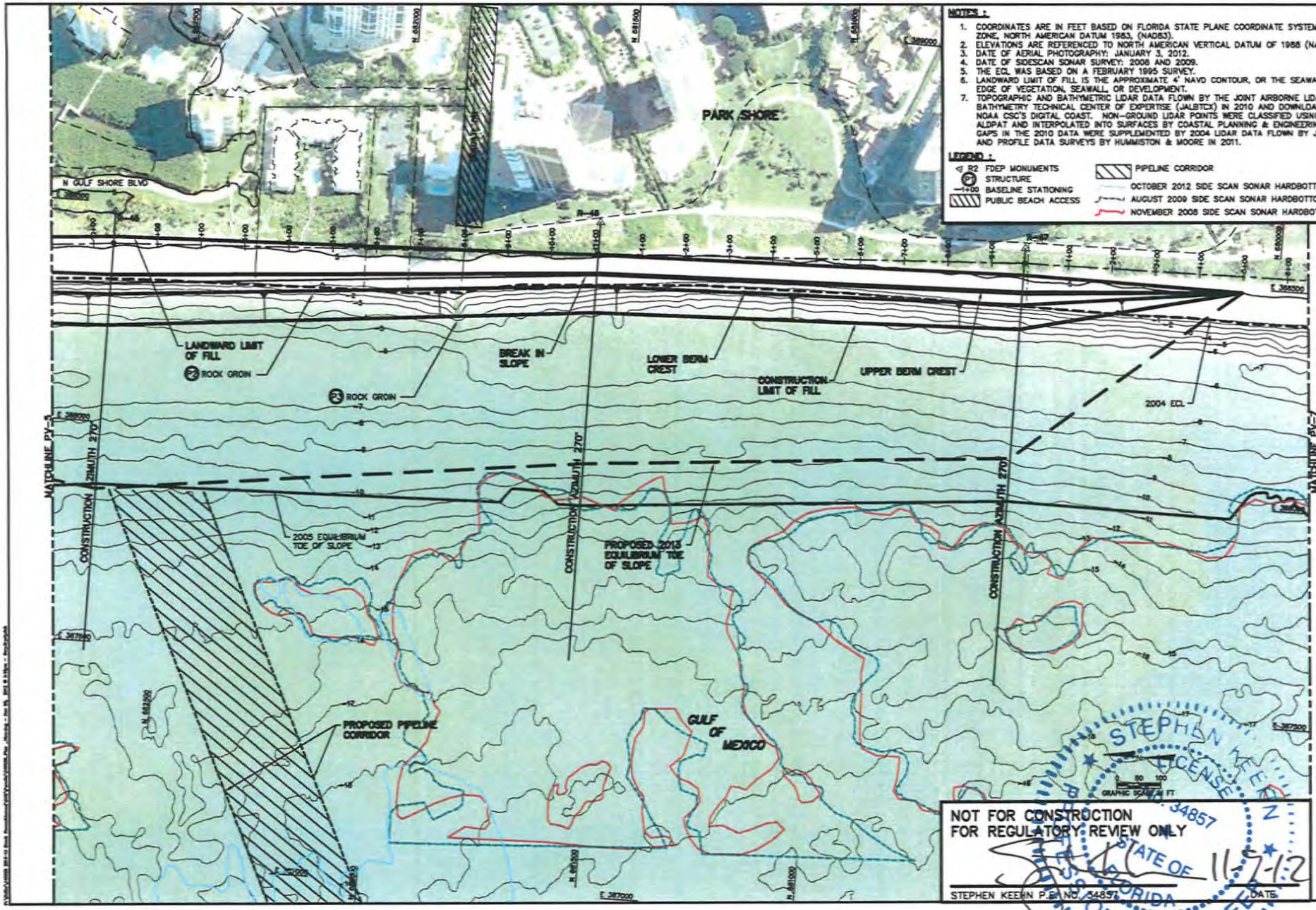
Reference Plans and Documents

Drawn by SK | Checked by AMB
Chk by CM | Reviewed by HS
Date 7/23/12 | Submitted by SK
Plot Scale AS NOTED | Comm. No. 1494.05

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO.
PV-5

SHEET 6 OF 29


PARK SHORE
N GULF SHORE BLVD
R-46
R-47
LANDWARD LIMIT OF FILL
ROCK GROIN
BREAK IN SLOPE
LOWER BERM CREST
CONSTRUCTION LIMIT OF FILL
UPPER BERM CREST
2004 ECL
2005 EQUILIBRIUM TOE OF SLOPE
PROPOSED 2013 EQUILIBRIUM TOE OF SLOPE
PROPOSED PIPELINE CORRIDOR
GULF OF MEXICO
WATCHLINE PV-5
WATCHLINE PV-7
CONSTRUCTION AZIMUTH 270°
GRAPHIC SCALE IN FT
NOTES :
1. COORDINATES ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD83).
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3. DATE OF AERIAL PHOTOGRAPHY: JANUARY 3, 2012.
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5. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
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LEGEND :
R2 FDEP MONUMENTS
STRUCTURE
1+00 BASELINE STATIONING
PUBLIC BEACH ACCESS
PIPELINE CORRIDOR
OCTOBER 2012 SIDE SCAN SONAR HARDBOTTOM
AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM
NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY
STEPHEN KEEHN P.E. NO. 34857
DATE 11-7-12
STATE OF FLORIDA
PROFESSIONAL ENGINEER
COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
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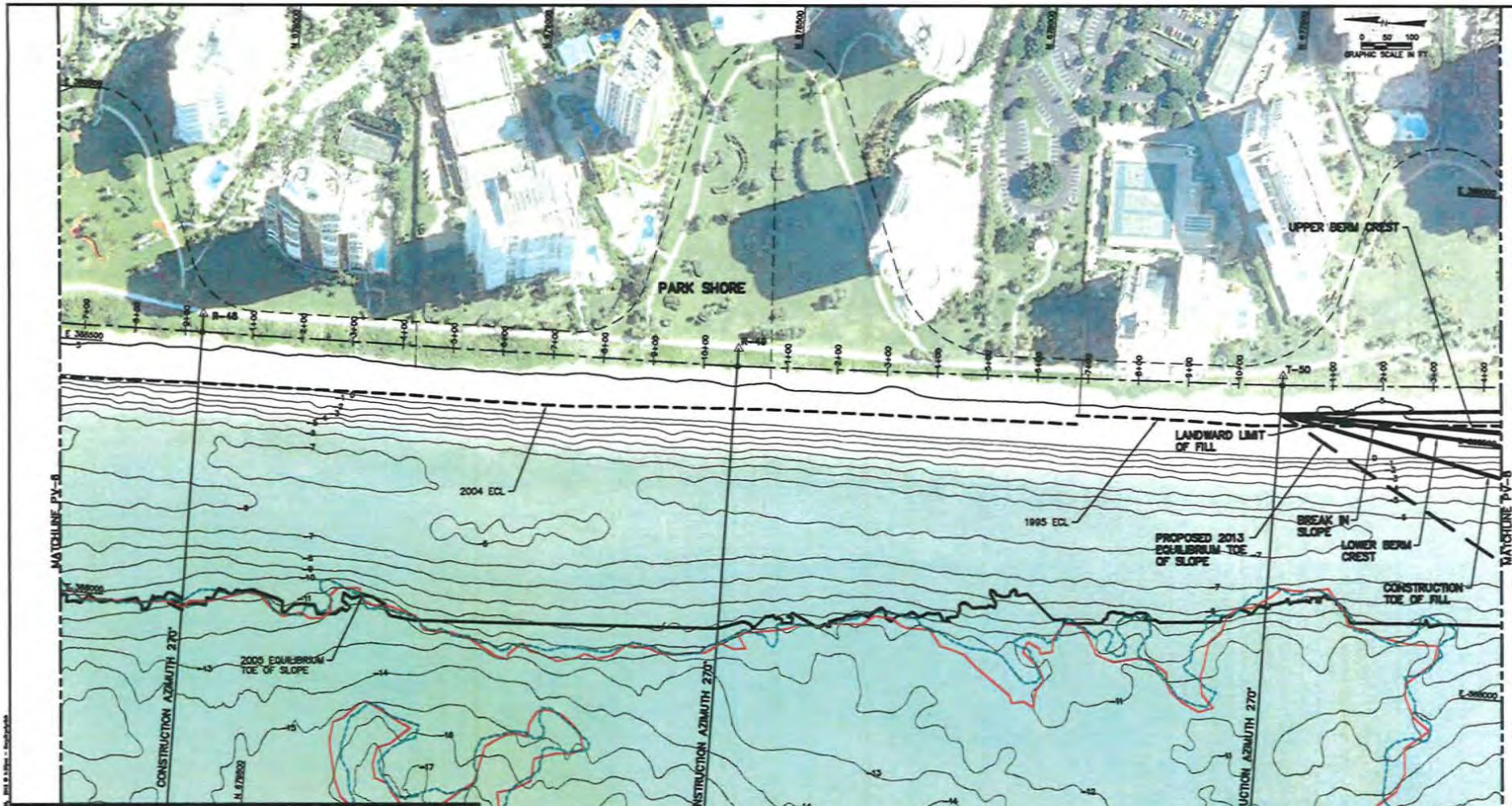
FAX (561) 391-9116
C.O.A. FL 6026
C.O.A. LA 6231
www.CoastalPlanning.net
REVISIONS
COLLIER COUNTY
BEACH REHABILITATION PROJECT
PLAN VIEW
DRAWING NO.
PV-6
SHEET 7 OF 29



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LEGEND :

- R2 FDEP MONUMENTS
- 1+00 BASELINE STATIONING
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11-9-12

STEPHEN KEEHN LICENSE NO. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
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C.O.A. FL #6035
C.O.A. LA. #2531

REVISIONS

No.	Date	Description

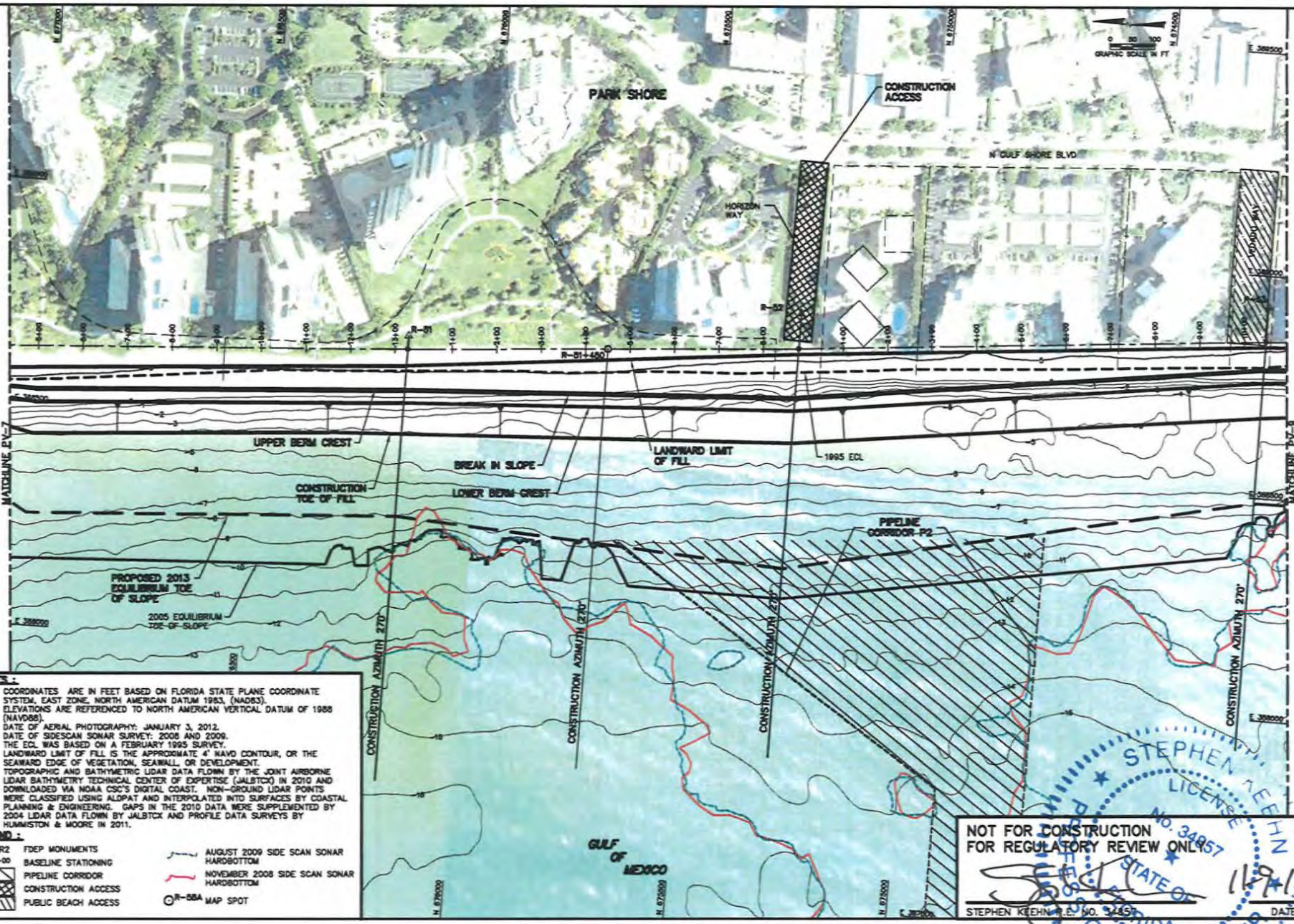
Reference Files: Reference Files

Designed by: JMB | Reviewed by: HS | Submitted by: SK | Drawn by: CK | Date: 7/23/12 | Plot Scale: AS NOTED | Plot Date: 11/09/12

COLLIER COUNTY
BEACH REHABILITATION PROJECT
PLAN VIEW

DRAWING NO. PV-7

SHEET 8 OF 29



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LEGEND :

- R2 FDEP MONUMENTS
- 1+00 BASELINE STATIONING
- PIPELINE CORRIDOR
- CONSTRUCTION ACCESS
- PUBLIC BEACH ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM
- R-58A MAP SPOT

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11/9/12

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

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C.O.A.: LA 2231
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REVISIONS

No.	Date	Description

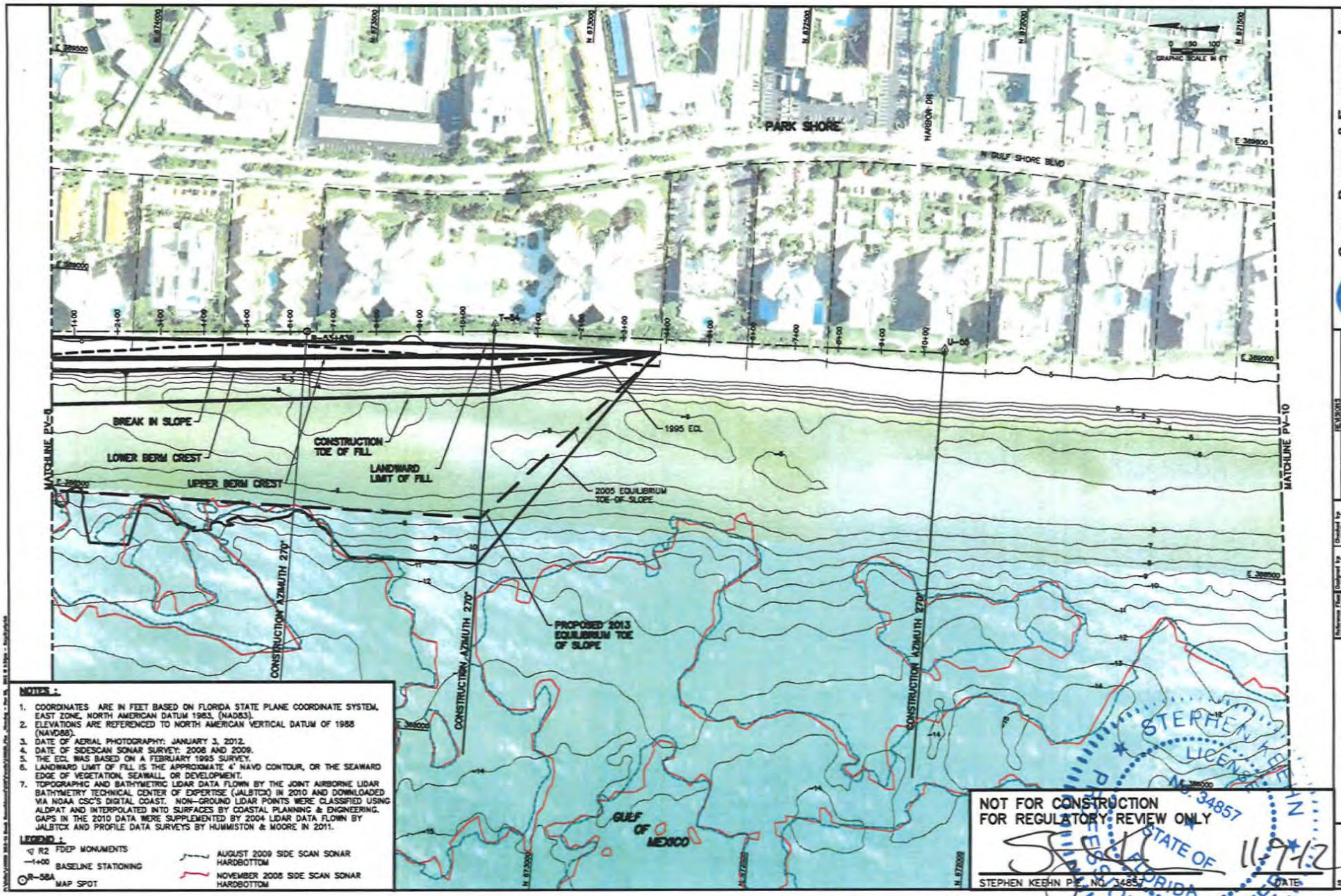
Reference Files (Data Location)

Designed by SK | Drawn by DK | Date 7/23/12 | Plot Scale AS NOTED | Checked by AMB | Reviewed by PEC | Submitted by SK | Comm. No. 14925

COLLIER COUNTY
BEACH REMOURISHMENT PROJECT
PLAN VIEW

DRAWING NO. PV-8

SHEET 9 OF 29



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LEGEND :

- R2 FDEP MONUMENTS
- 1+00 BASELINE STATIONING
- R-58A MAP SPOT
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN PE, NO. 34857 — DATE: 11/7/12

STEPHEN KEEHN LICENSE NO. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

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C.O.A. LA 8251
www.CoastalPlanning.net

No.	Date	Description
	11/7/2013	

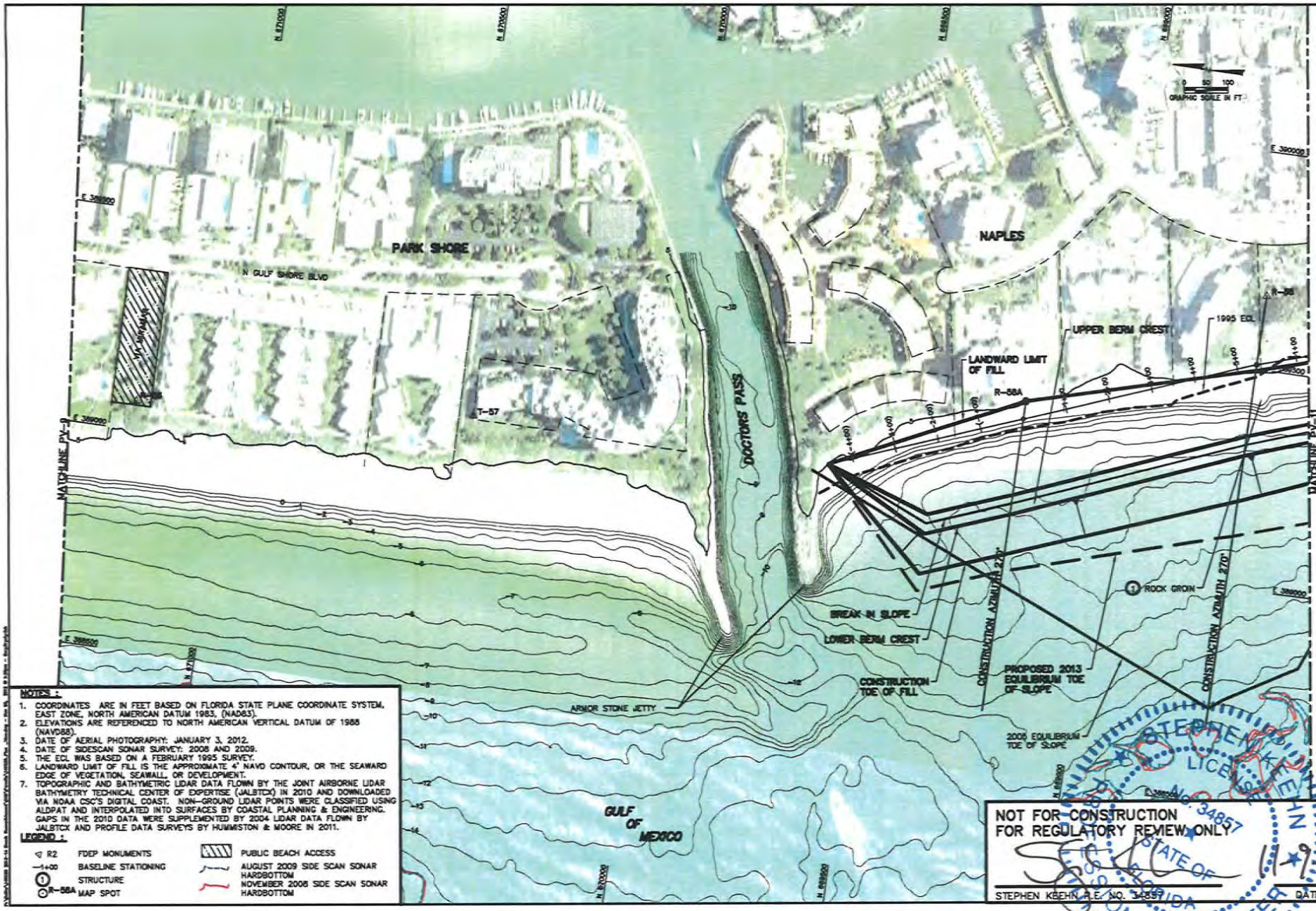
Reference Files: Base Map, Hydrographic Survey

Designed by SK | Drawn by DK | Date 7/23/12 | Plot Scale AS NOTED | Checked by AMB | Reviewed by MS | Submitted by SK | Comm. No. 146925

COLLIER COUNTY
BEACH REHABILITATION PROJECT
PLAN VIEW

DRAWING NO. PV-9

SHEET 10 OF 29



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LEGEND :

- R2 — FDEP MONUMENTS
- 1+00 — BASELINE STATIONING
- 1 — STRUCTURE
- R-58A — MAP SPOT
- PUBLIC BEACH ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11-9-12

STATE OF FLORIDA — STEPHEN KEEHN — LICENSE No. 34857 — PROFESSIONAL ENGINEER

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C.O.A. FL. 8029
C.O.A. LA. 8231
www.CoastalPlanning.net

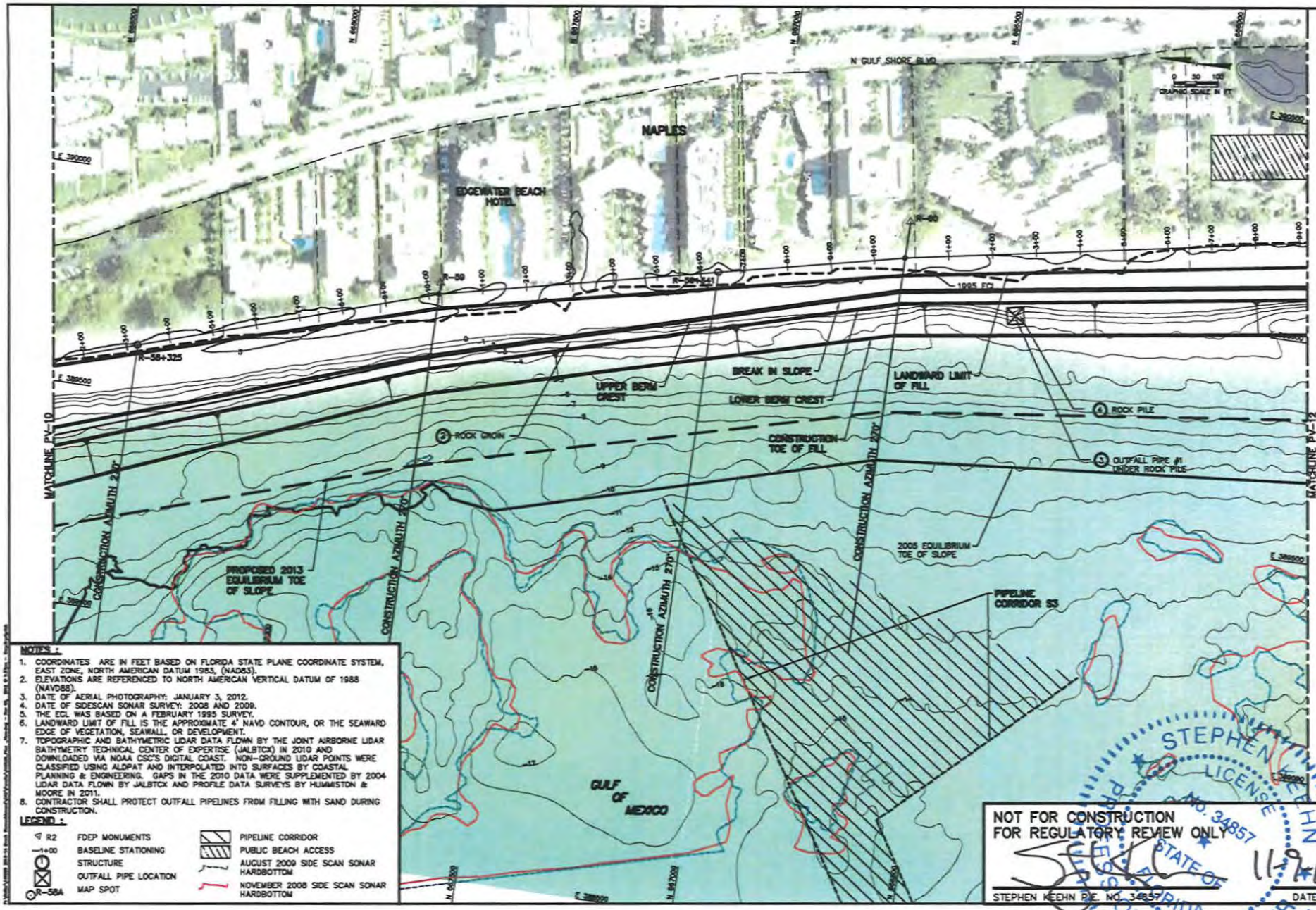
Rev.	Date	Description
1	4/24/14	REVISIONS

Reference Files: [illegible]
Designed by SK
Drawn by SK
Date 7/23/12
Plot Scale AS NOTED
Checked by AAB
Reviewed by HCS
Submitted by SK
Comm. No. 140625

COLLIER COUNTY
BEACH REMOURISHMENT PROJECT
PLAN VIEW

DRAWING NO. PV-10

SHEET 11 OF 29



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8. CONTRACTOR SHALL PROTECT OUTFALL PIPELINES FROM FILLING WITH SAND DURING CONSTRUCTION.

LEGEND :

- R2 — FDEP MONUMENTS
- 1+00 — BASELINE STATIONING
- STRUCTURE
- OUTFALL PIPE LOCATION
- R-58A — MAP SPOT
- PIPELINE CORRIDOR
- PUBLIC BEACH ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11/9/12

STEPHEN KEEHN LICENSE NO. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
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FAX (561) 391-9110
C.O.A. FL 8628
C.O.A. LA 6511
www.CoastalPlanning.net

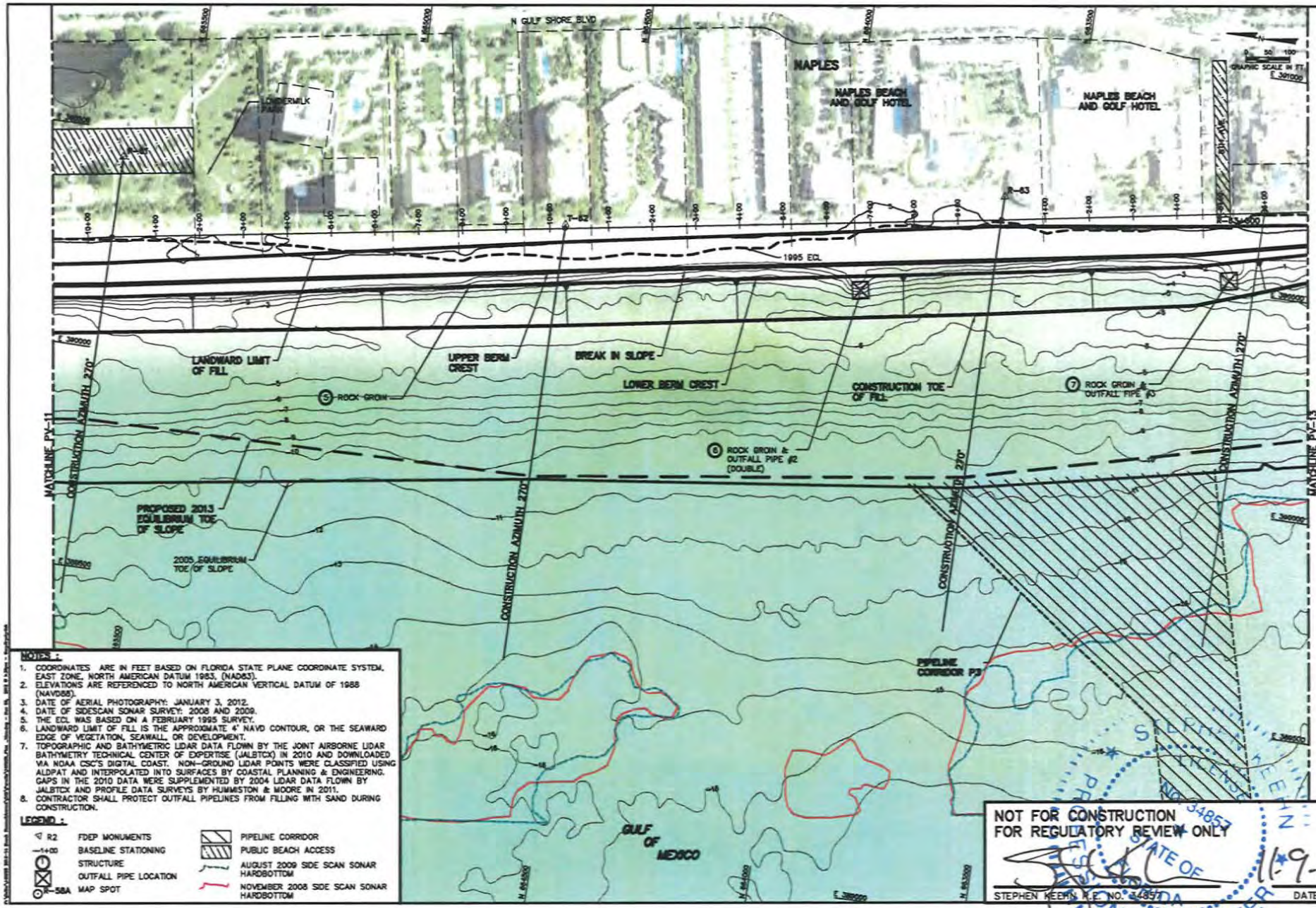
No.	Date	Revision
1	9/26/12	per SVRL res comments

Reference Plan: Reference Plans
Designed by: Avalo
Drawn by: GK
Reviewed by: HS
Submitted by: SK
Date: 7/25/12
Plot Scale: AS NOTED
Contr. No.: 1 16925

COLLIER COUNTY
BEACH REMEDIATION PROJECT
PLAN VIEW

DRAWING NO.
PV-11

SHEET 12 OF 29



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LEGEND :

- R2 — FDEP MONUMENTS
- 1+00 — BASELINE STATIONING
- STRUCTURE
- OUTFALL PIPE LOCATION
- R-58A — MAP SPOT
- PIPELINE CORRIDOR
- PUBLIC BEACH ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

11-9-12

STEPHEN KEENAN P.E. NO. 34857 — DATE

STATE OF FLORIDA — PROFESSIONAL ENGINEER — STEPHEN KEENAN — LICENSE NO. 34857

COASTAL PLANNING & ENGINEERING, INC.
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C.O.A. LA 6251

No.	Date	Description
1	9/5/12	PER REVIEW COMMENTS
2	11/9/12	PER REVISED PIPE LOCATION

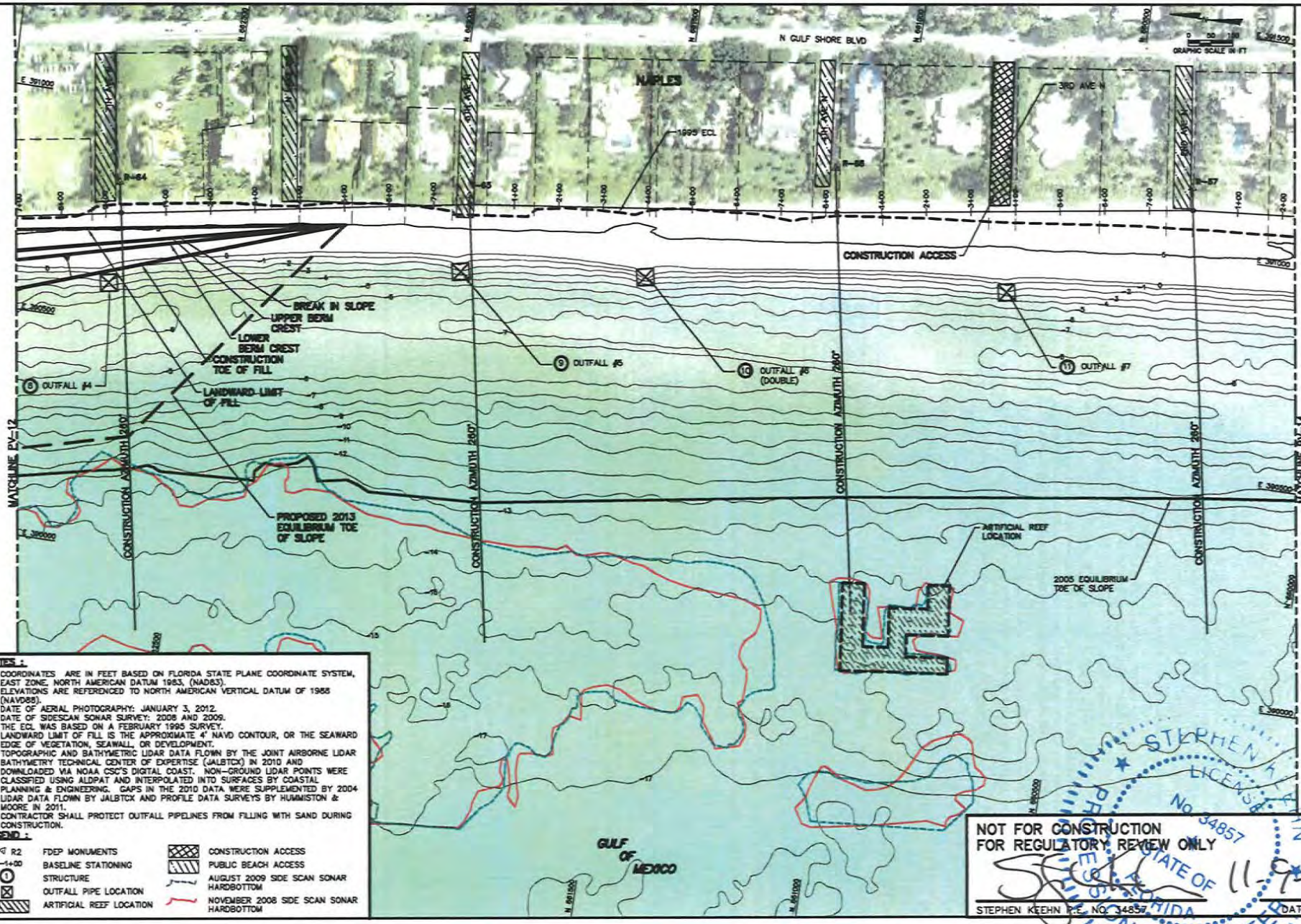
Reference Files: Plots/Layouts

Designed by: SK
Drawn by: GK
Date: 7/25/12
Plot Scale: AS NOTED
Checked by: JMB
Reviewed by: KS
Submitted by: SK
Contract No.: 1-6723

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO.
PV-12

SHEET 13 OF 29



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8. CONTRACTOR SHALL PROTECT OUTFALL PIPELINES FROM FILLING WITH SAND DURING CONSTRUCTION.

LEGEND :

- R2 — FDEP MONUMENTS
- 1+00 — BASELINE STATIONING
- STRUCTURE
- OUTFALL PIPE LOCATION
- ARTIFICIAL REEF LOCATION
- CONSTRUCTION ACCESS
- PUBLIC BEACH ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11-7-12

STATE OF FLORIDA — STEPHEN KEEHN — LICENSE No. 34857 — PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
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C.O.A. FL 8029
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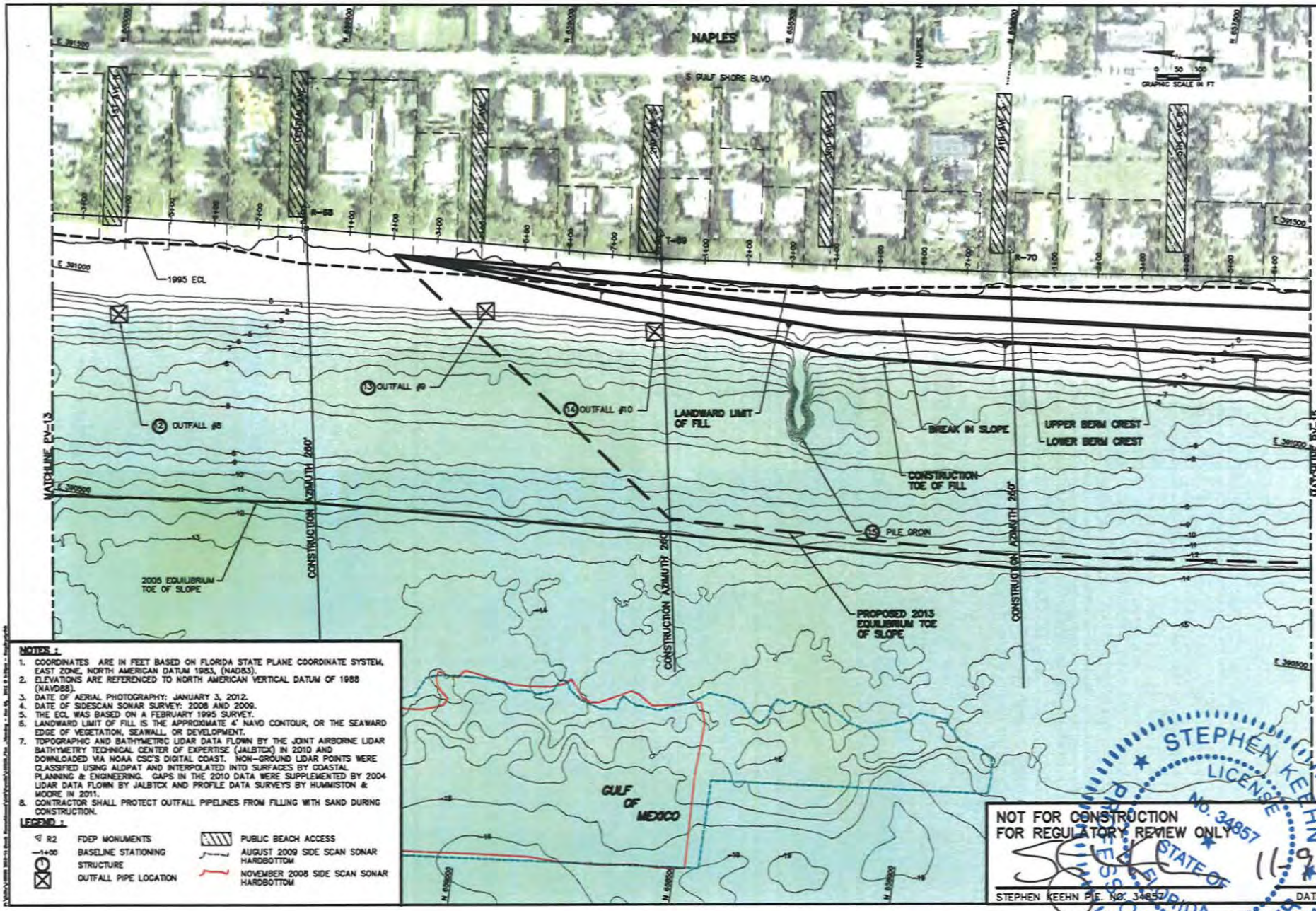
No.	Date	Description
1	10/26/12	Update based on comments, new locations

Designed by: DJM
Drawn by: GK
Date: 7/23/12
Plot Scale: AS NOTED
Checked by: DJM
Reviewed by: HS
Submitted by: SK
Contract No.: 16923

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO. PV-13

SHEET 14 OF 29



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LEGEND :

- R2 — FDEP MONUMENTS
- 1+00 — BASELINE STATIONING
- STRUCTURE
- OUTFALL PIPE LOCATION
- PUBLIC BEACH ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11-9-12

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No.	Revision	Date	Drawn by	Checked by
1	AVM per email 09/28/2012			

Reference Files: Filename

Designed by CK | Drawn by CK | Date 7/23/12 | Plot Scale AS NOTED

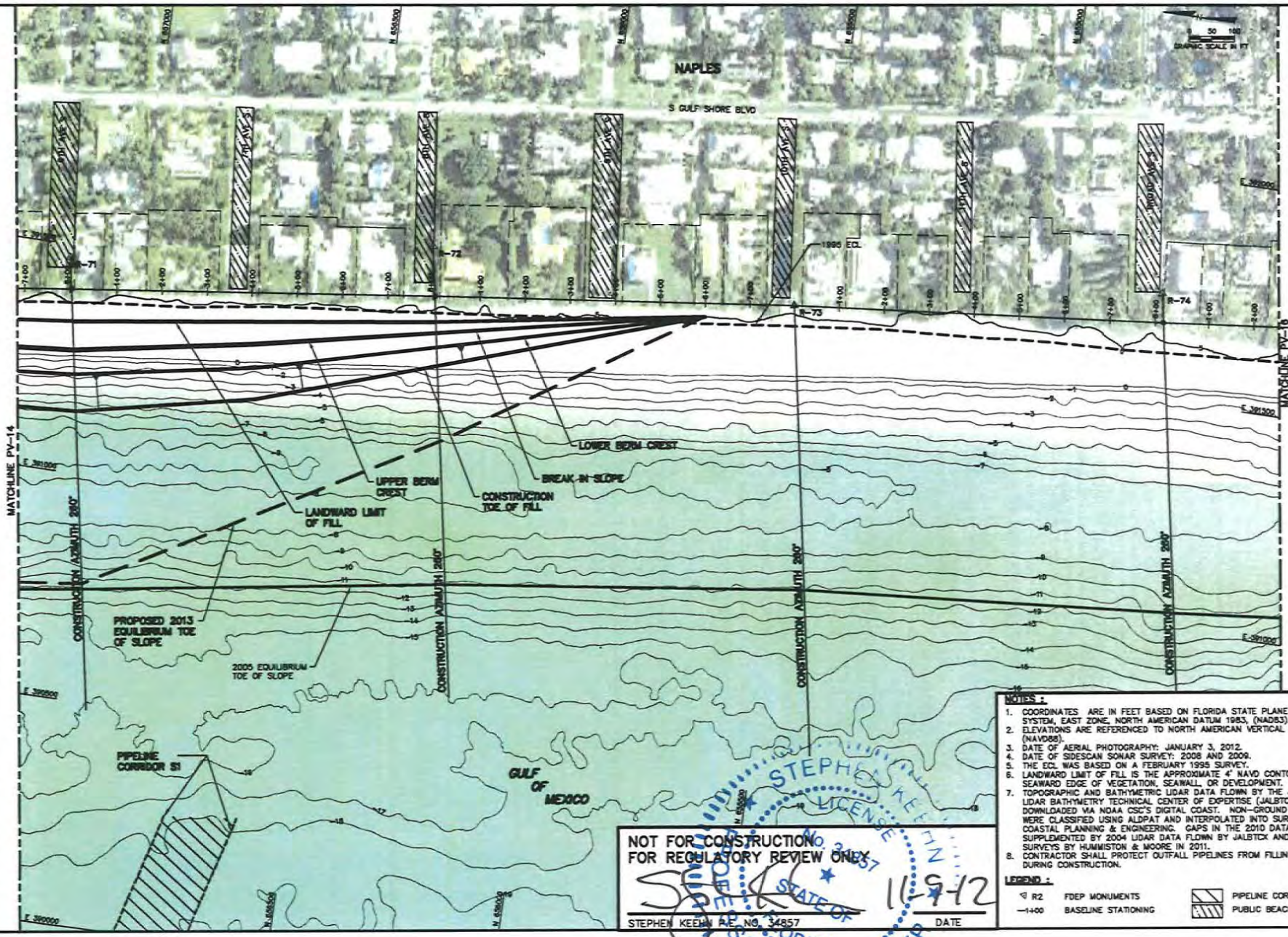
Checked by NS | Reviewed by NS | Submitted by SK | Dwgs. No. 1.9.9.23

File, Date | Description

COLLIER COUNTY
BEACH REHOURISHMENT PROJECT
PLAN VIEW

DRAWING NO. PV-14

SHEET 15 OF 29



NOTES :

1. COORDINATES ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD83).
2. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. DATE OF AERIAL PHOTOGRAPHY: JANUARY 3, 2012.
4. DATE OF SIDESCAN SONAR SURVEY: 2008 AND 2009.
5. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
6. LANDWARD LIMIT OF FILL IS THE APPROXIMATE 4' NAVD CONTOUR, OR THE SEAWARD EDGE OF VEGETATION, SEAWALL, OR DEVELOPMENT.
7. TOPOGRAPHIC AND BATHYMETRIC LIDAR DATA FLOWN BY THE JOINT AIRBORNE LIDAR BATHYMETRY TECHNICAL CENTER OF EXPERTISE (JALBTCX) IN 2010 AND DOWNLOADED VIA NOAA CSC'S DIGITAL COAST. NON-GROUND LIDAR POINTS WERE CLASSIFIED USING ALDPAT AND INTERPOLATED INTO SURFACES BY COASTAL PLANNING & ENGINEERING. GAPS IN THE 2010 DATA WERE SUPPLEMENTED BY 2004 LIDAR DATA FLOWN BY JALBTCX AND PROFILE DATA SURVEYS BY HUMMISTON & MOORE IN 2011.
8. CONTRACTOR SHALL PROTECT OUTFALL PIPELINES FROM FILLING WITH SAND DURING CONSTRUCTION.

LEGEND :

R2	FDEP MONUMENTS		PIPELINE CORRIDOR
1+00	BASELINE STATIONING		PUBLIC BEACH ACCESS

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11-9-12

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
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www.CoastalPlanning.net
C.O.A. FL #6035
C.O.A. LC #26231

REVISIONS

No.	Date	Description

Reference Files: Pipeline.dwg

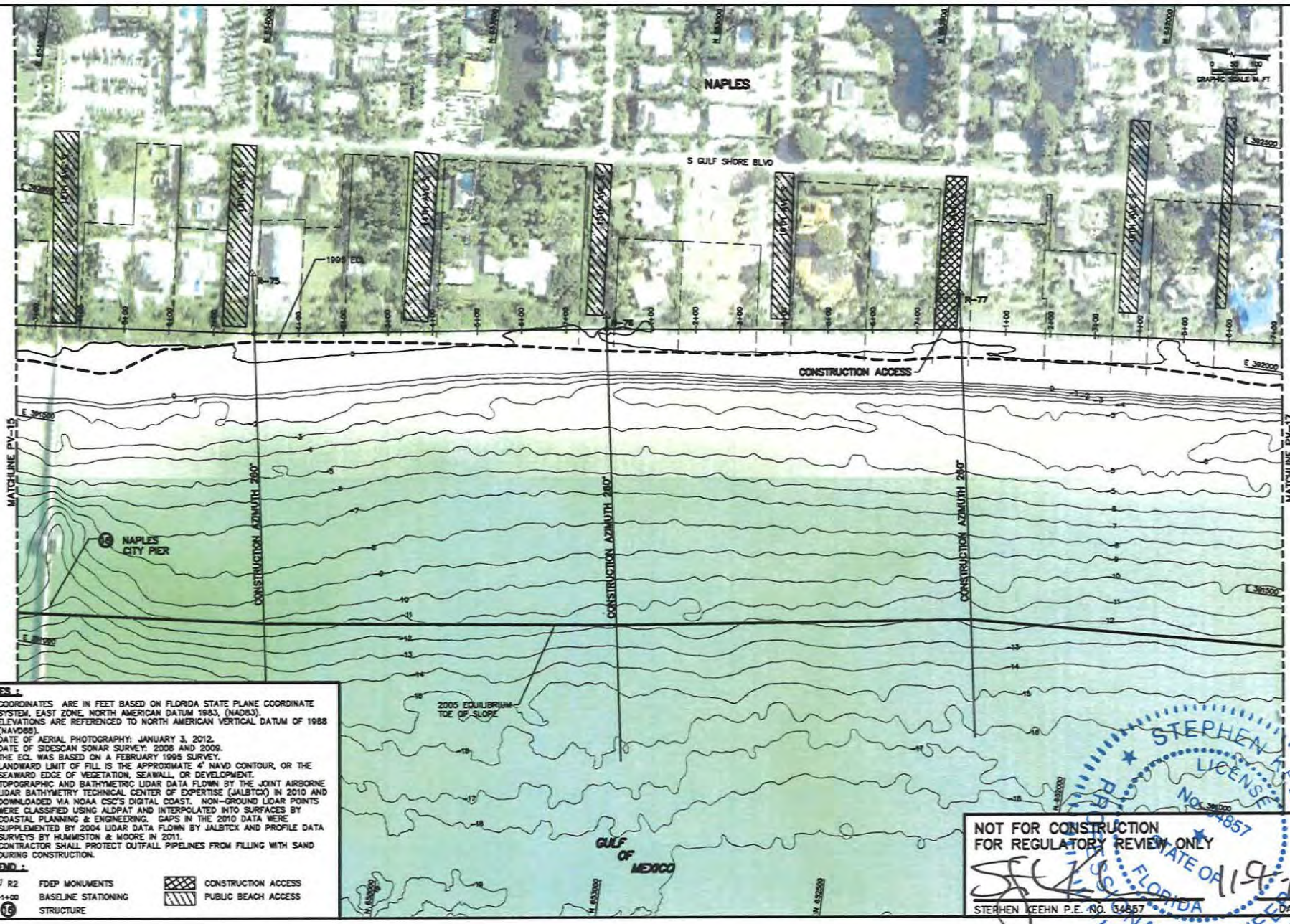
Designed by SK | Drawn by CK | Date 7/25/12 | Plot Scale AS NOTED

Checked by PMB | Reviewed by NS | Submitted by SK | Comm. No. 1 16725

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO.
PV-15

SHEET 16 OF 29



NOTES :

1. COORDINATES ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD83).
2. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. DATE OF AERIAL PHOTOGRAPHY: JANUARY 3, 2012.
4. DATE OF SIDESCAN SONAR SURVEY: 2008 AND 2009.
5. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
6. LANDWARD LIMIT OF FILL IS THE APPROXIMATE 4' NAVD CONTOUR, OR THE SEAWARD EDGE OF VEGETATION, SEAWALL, OR DEVELOPMENT.
7. TOPOGRAPHIC AND BATHYMETRIC LIDAR DATA FLOWN BY THE JOINT AIRBORNE LIDAR BATHYMETRY TECHNICAL CENTER OF EXPERTISE (JALBTCX) IN 2010 AND DOWNLOADED VIA NOAA CSC'S DIGITAL COAST. NON-GROUND LIDAR POINTS WERE CLASSIFIED USING ALDPAT AND INTERPOLATED INTO SURFACES BY COASTAL PLANNING & ENGINEERING. GAPS IN THE 2010 DATA WERE SUPPLEMENTED BY 2004 LIDAR DATA FLOWN BY JALBTCX AND PROFILE DATA SURVEYS BY HUMMISTON & MOORE IN 2011.
8. CONTRACTOR SHALL PROTECT OUTFALL PIPELINES FROM FILLING WITH SAND DURING CONSTRUCTION.

LEGEND :

- R2 — FDEP MONUMENTS
- 1+00 — BASELINE STATIONING
- 15 — STRUCTURE
- CONSTRUCTION ACCESS
- PUBLIC BEACH ACCESS

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11-9-12

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
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C.O.A. FL 8029
C.O.A. LA 6231

REVISIONS

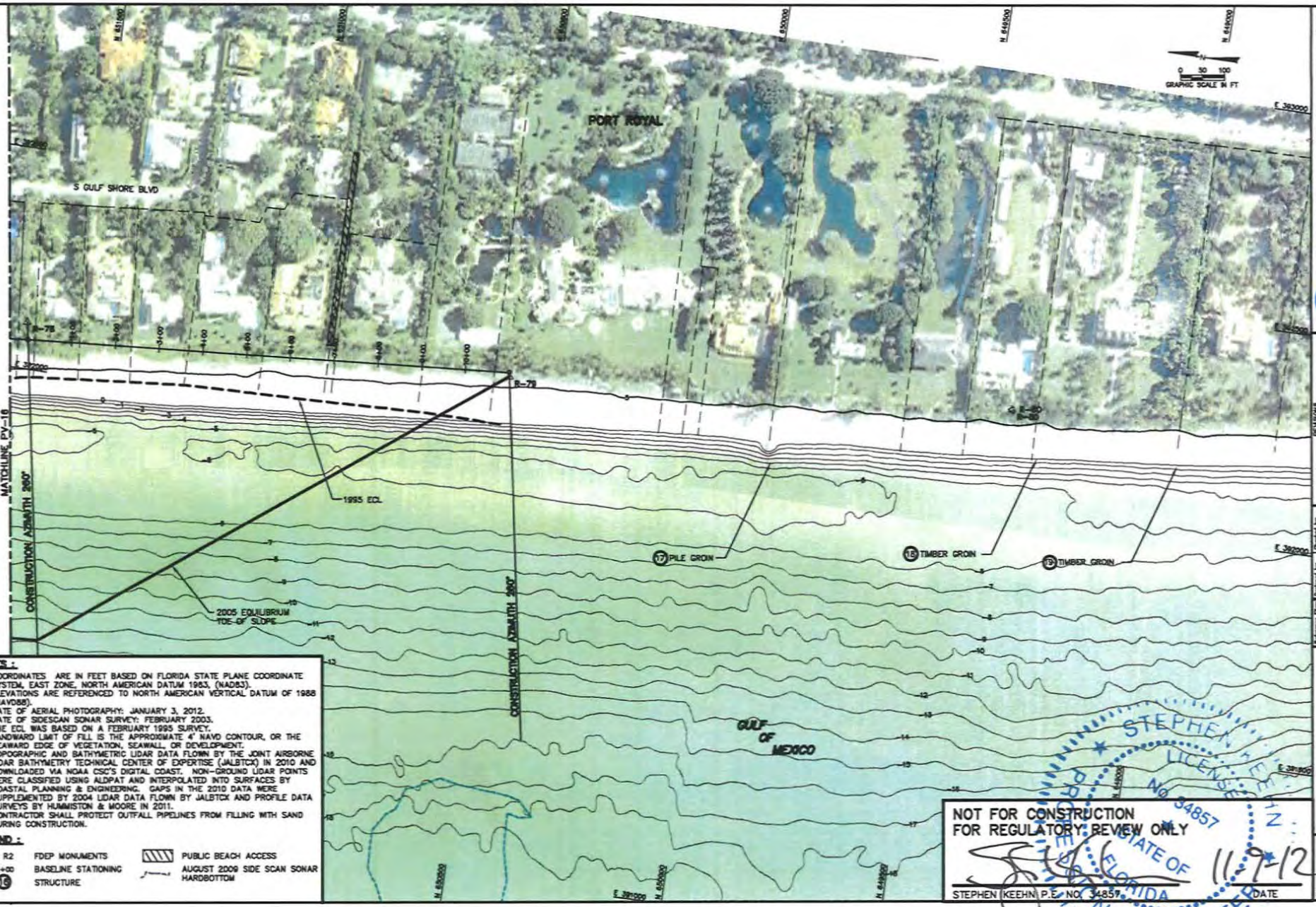
No.	Date	Description

Reference Files: Reference Drawings

Designed by: Checked by: Drawn by: CK Reviewed by: KS Date: 7/25/12 Submitted by: SK Plot Scale: AS NOTED Drawing No.: 1-16123

COLLIER COUNTY
BEACH REHABILITATION PROJECT
PLAN VIEW

DRAWING NO.
PV-16
SHEET 17 OF 29



NOTES :

1. COORDINATES ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD83).
2. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. DATE OF AERIAL PHOTOGRAPHY: JANUARY 3, 2012.
4. DATE OF SIDESCAN SONAR SURVEY: FEBRUARY 2003.
5. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
6. LANDWARD LIMIT OF FILL IS THE APPROXIMATE 4' NAVD CONTOUR, OR THE SEAWARD EDGE OF VEGETATION, SEAWALL, OR DEVELOPMENT.
7. TOPOGRAPHIC AND BATHYMETRIC LIDAR DATA FLOWN BY THE JOINT AIRBORNE LIDAR BATHYMETRY TECHNICAL CENTER OF EXPERTISE (JALBTCX) IN 2010 AND DOWNLOADED VIA NOAA CSC'S DIGITAL COAST. NON-GROUND LIDAR POINTS WERE CLASSIFIED USING ALDPAT AND INTERPOLATED INTO SURFACES BY COASTAL PLANNING & ENGINEERING. GAPS IN THE 2010 DATA WERE SUPPLEMENTED BY 2004 LIDAR DATA FLOWN BY JALBTCX AND PROFILE DATA SURVEYS BY HUMMISTON & MOORE IN 2011.
8. CONTRACTOR SHALL PROTECT OUTFALL PIPELINES FROM FILLING WITH SAND DURING CONSTRUCTION.

LEGEND :

- R2 — FDEP MONUMENTS
- 1+00 — BASELINE STATIONING
- 18 — STRUCTURE
- PUBLIC BEACH ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11/9/12

STATE OF FLORIDA — STEPHEN KEEHN — LICENSE NO. 34857 — PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
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C.O.A. LA. 8531
www.CoastalPlanning.net

REVISIONS

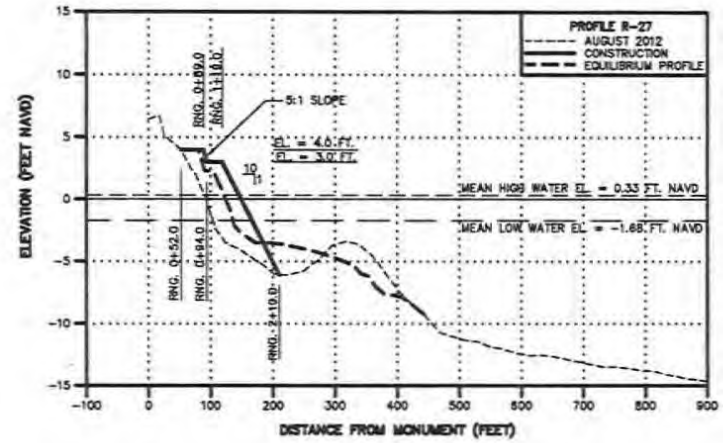
No.	Date	Description

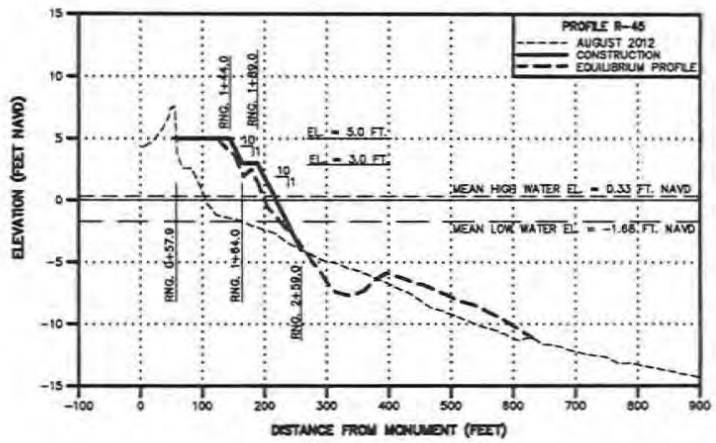
Designed by SK | Drawn by CSC | Date 7/25/12 | Plot Scale AS NOTED | Checked by AMB | Reviewed by HS | Submitted by SK | Contr. No. 1409235

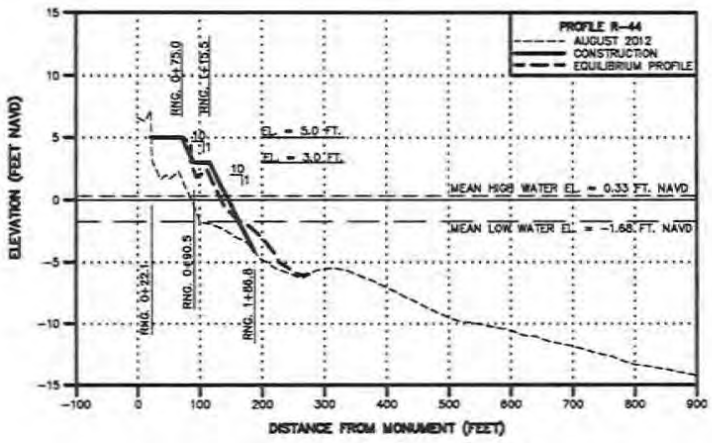
COLLIER COUNTY
BEACH REHABILITATION PROJECT
PLAN VIEW

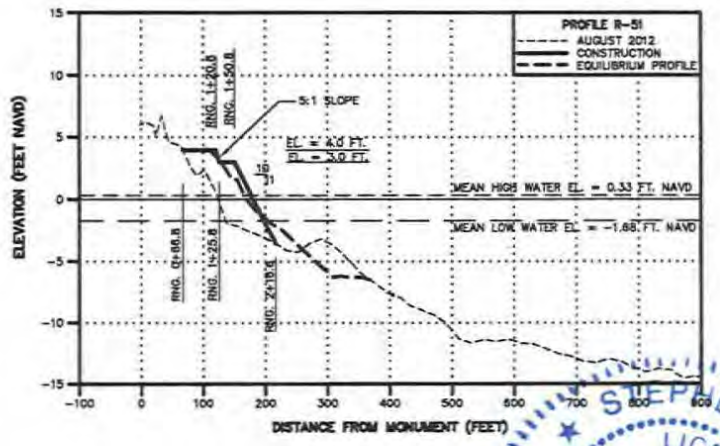
DRAWING NO. PV-17

SHEET 18 OF 29









NOTE:
1. SELECTED CROSS SECTIONS DEPICTED AS EXAMPLES IN EACH REACH.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11-9-12

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
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C.O.A. - PL 6608
C.O.A. - LB 6931
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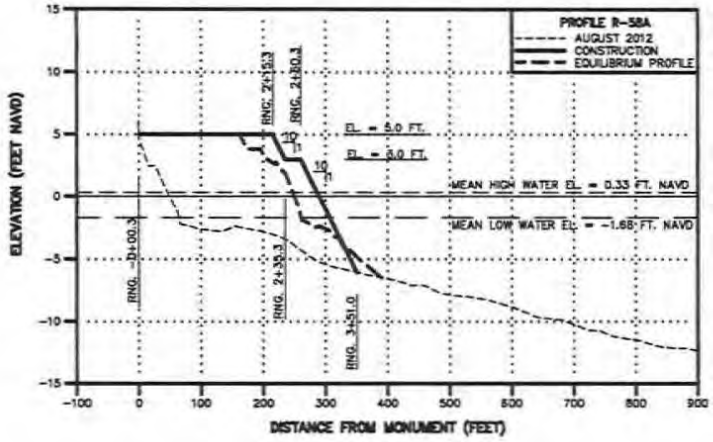
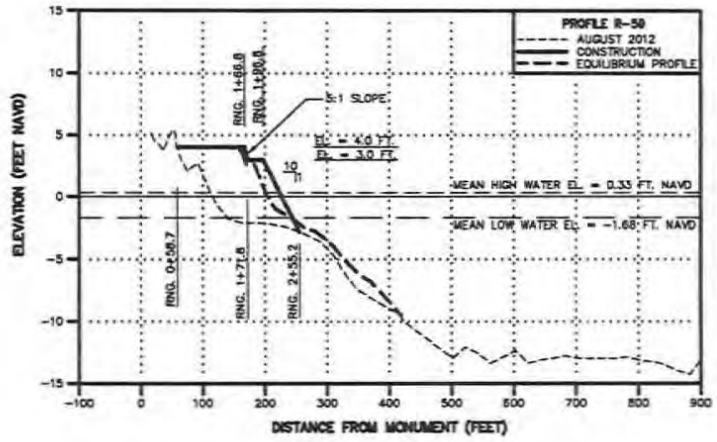
No.	Revision Number Date	Description
1	9/26/12	REVISIONS

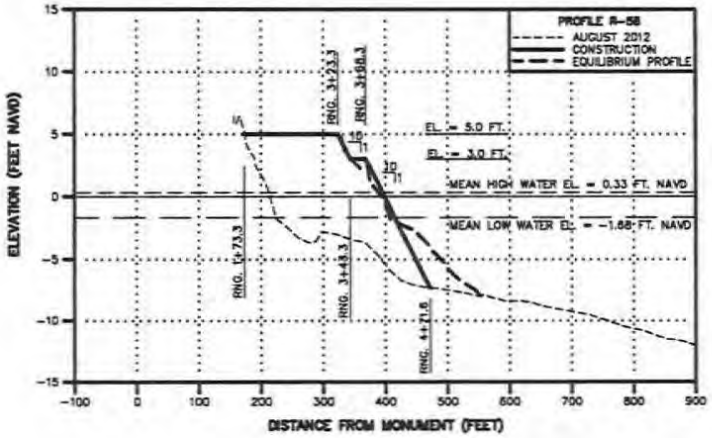
Designed by SK | Drawn by JRC | Date 7/25/12 | Plot Scale AS NOTED
Checked by SK | Reviewed by HS | Submitted by SK | Corps. No. 1 16925

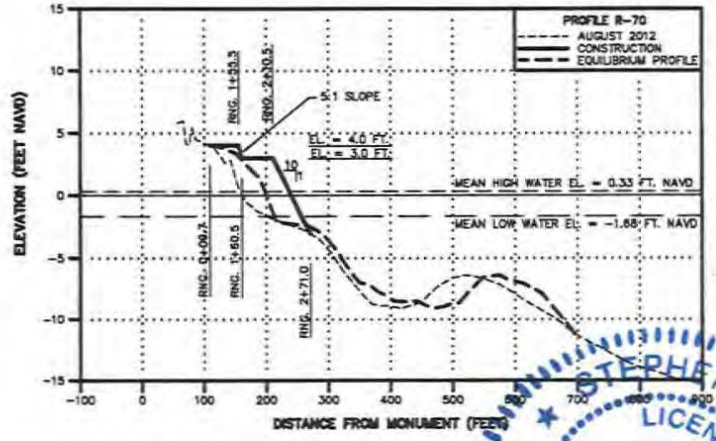
COLLIER COUNTY
BEACH NOURISHMENT PROJECT
TYPICAL
FILL CROSS SECTIONS

DRAWING NO.
PR-1
SHEET 19 OF 29









NOTE:
1. SELECTED CROSS SECTIONS DEPICTED AS EXAMPLES IN EACH REACH.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 DATE 11-9-12

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
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PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL 8103
C.O.A. LA 8231
www.CoastalPlanning.net

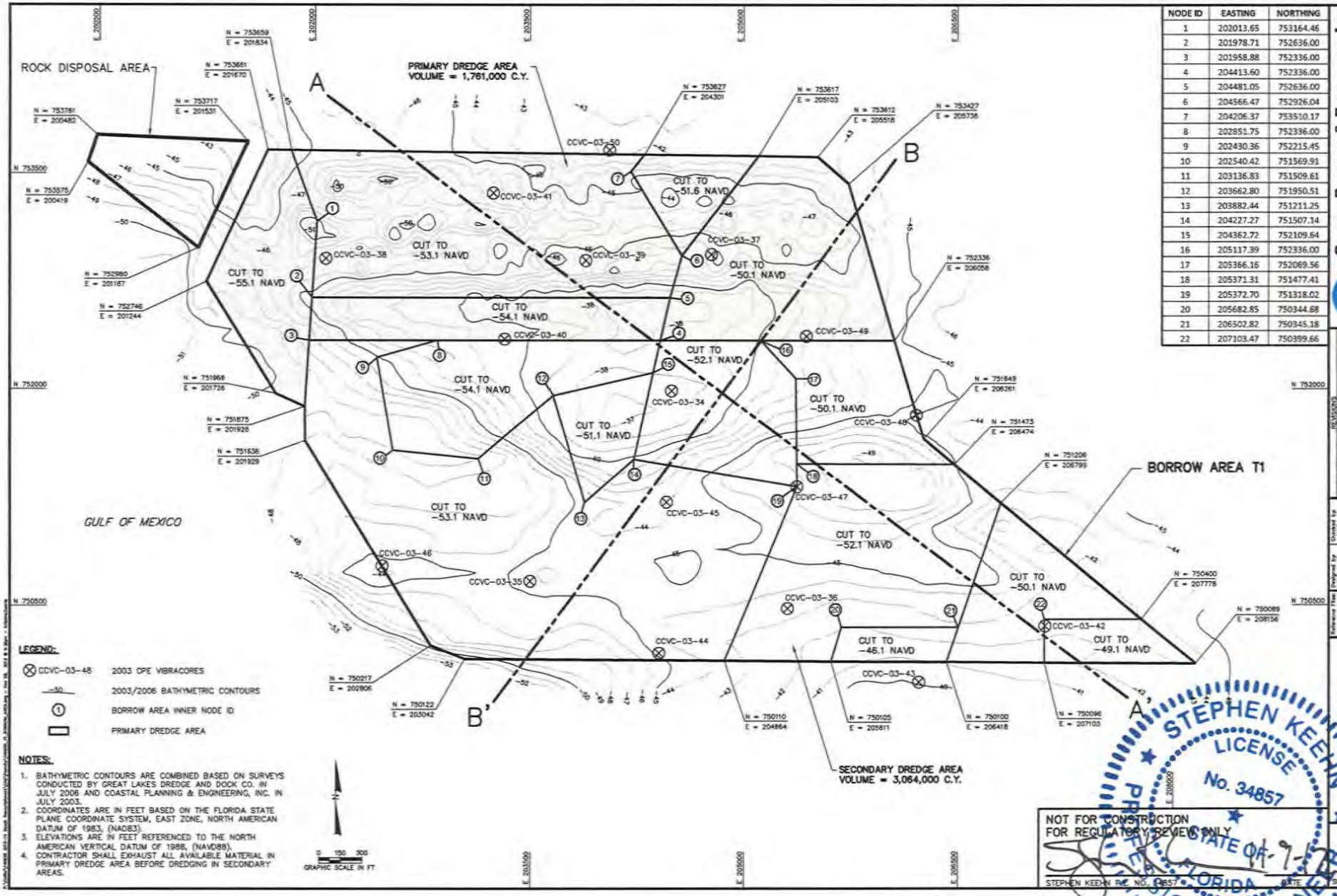
No.	Revision Date	Description	By
1	11/9/2012		

Designed by JMM
Drawn by JRC
Date 7/23/12
Plot Scale AS NOTED
Checked by JMM
Reviewed by HS
Submitted by SK
Contract No. 1103-23
File No. Dwg

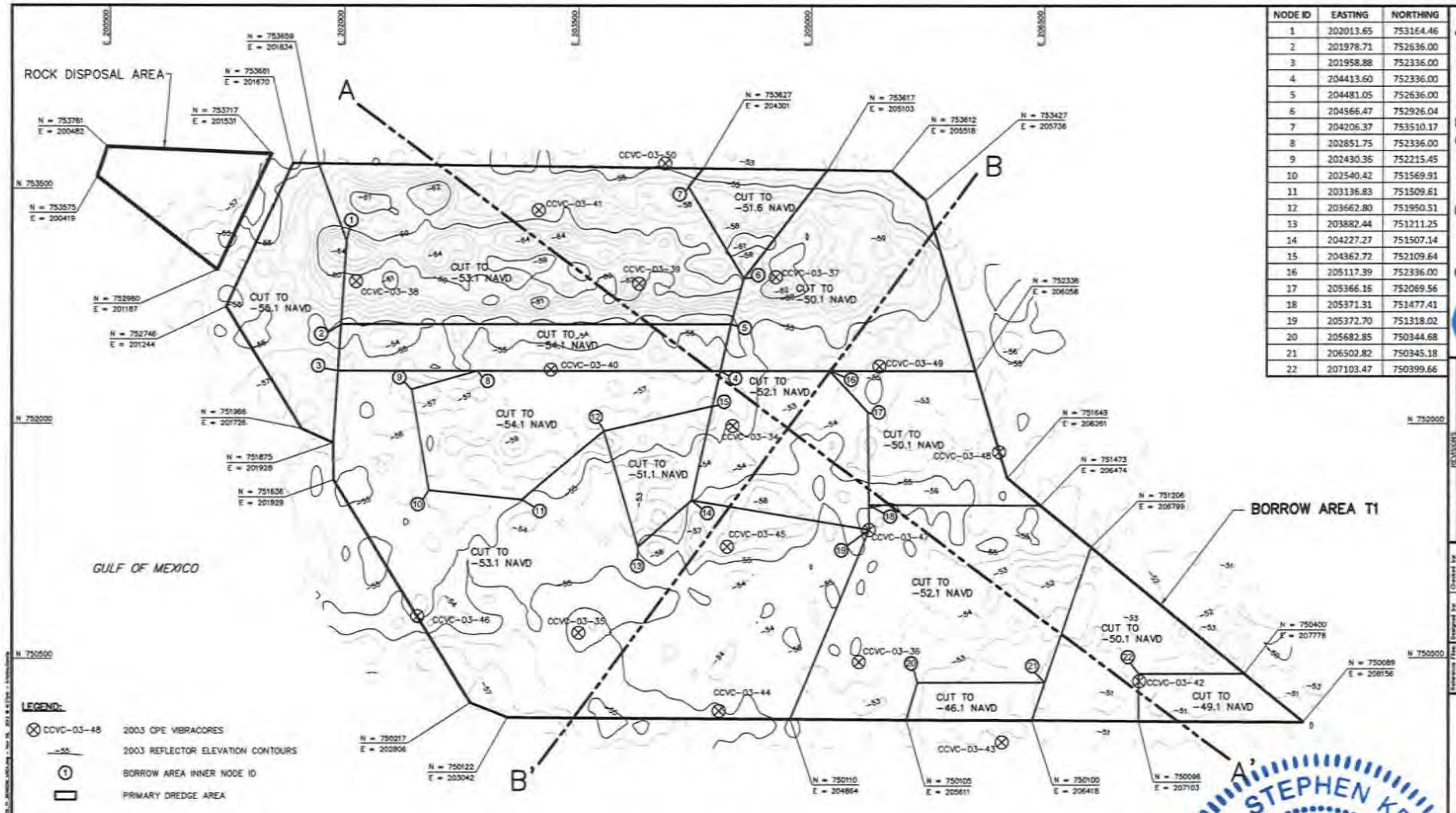
COLLIER COUNTY
BEACH NOURISHMENT PROJECT
TYPICAL
FILL CROSS SECTIONS

DRAWING NO.
PR-2

SHEET 20 OF 29



NODE ID	EASTING	NORTHING
1	202013.65	753164.46
2	201978.71	752636.00
3	201958.88	752336.00
4	204413.60	752336.00
5	204481.05	752636.00
6	204566.47	752926.04
7	204206.37	753510.17
8	202851.75	752336.00
9	202430.36	752215.45
10	202540.42	751569.91
11	203136.83	751509.61
12	203662.80	751950.51
13	203882.44	751211.25
14	204227.27	751507.14
15	204362.72	752109.64
16	205117.39	752336.00
17	205366.16	752069.56
18	205371.31	751477.41
19	205372.70	751318.02
20	205682.85	750344.68
21	206502.82	750345.18
22	207103.47	750399.66



NODE ID	EASTING	NORTHING
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2	201978.71	752636.00
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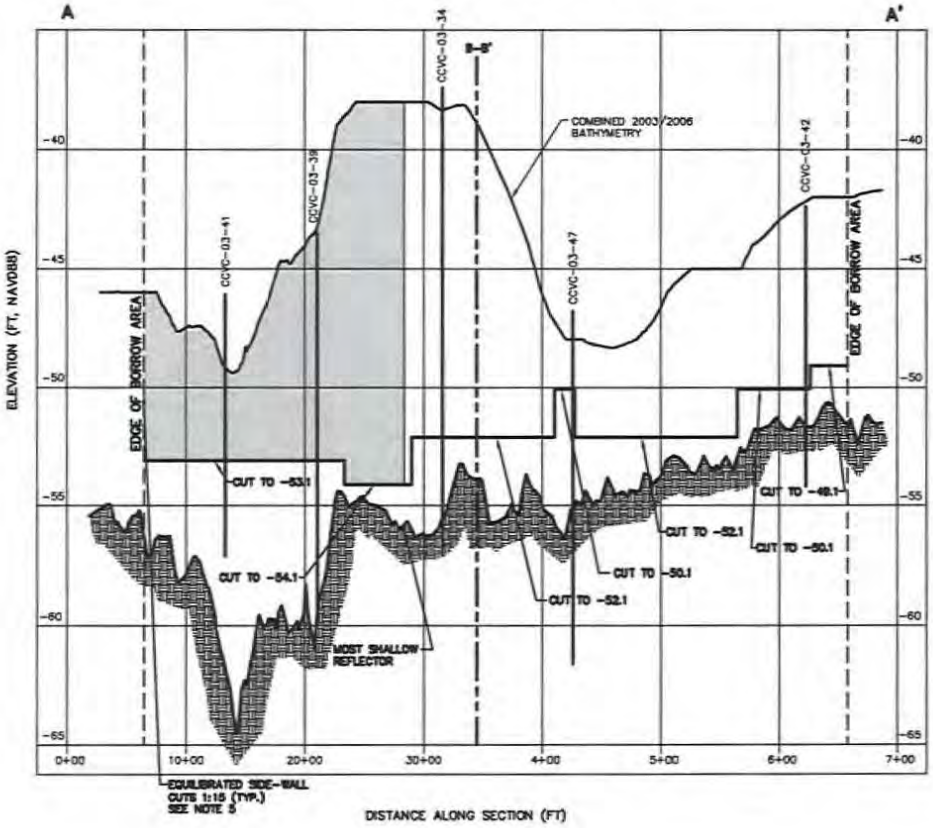
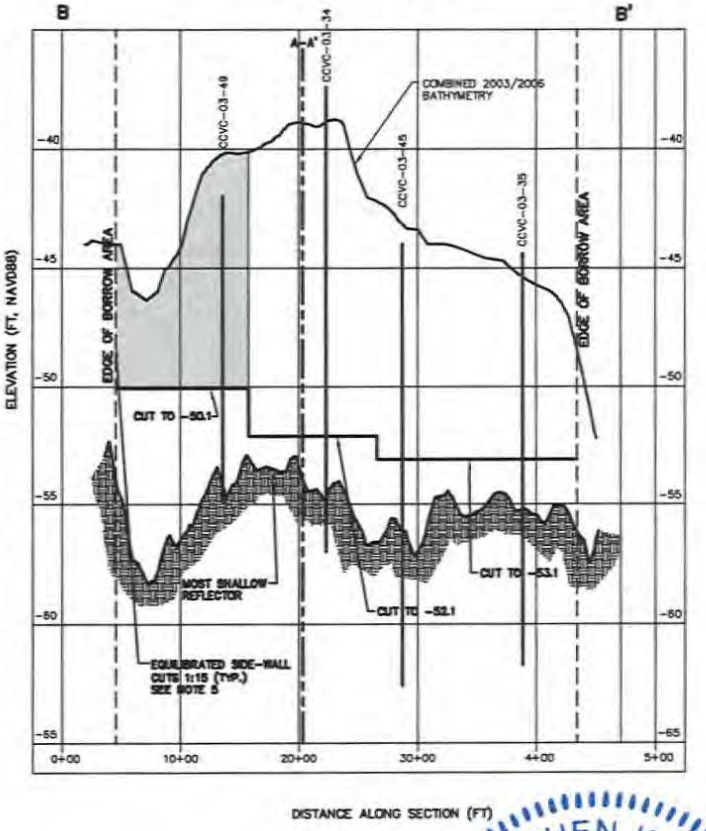
6	204566.47	752926.04
7	204206.37	753510.17
8	202851.75	752336.00
9	202430.36	752215.45
10	202540.42	751569.91
11	203136.83	751509.61
12	203662.80	751950.51
13	203882.44	751211.25
14	204227.27	751507.14
15	204362.72	752109.64
16	205117.39	752336.00
17	205366.16	752069.56
18	205371.31	751477.41
19	205372.70	751318.02
20	205682.85	750344.68
21	206502.82	750345.18
22	207103.47	750399.66

BORROW AREA T1 A–A'



BORROW AREA T1 B–B'



NOTES:

1. ELEVATIONS ARE IN FEET REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, (NAVD88).
2. CORES MAY NOT FALL DIRECTLY ON CROSS SECTION LINE, BUT ARE LOCATED SUFFICIENTLY CLOSE TO REPRESENT SIMILAR MATERIAL.
3. WIDTH OF LAYERS IS REPRESENTATIVE ONLY. ACTUAL MATERIAL MAY VARY.
4. SEE SHEETS 21 AND 22 FOR LOCATION OF CROSS SECTION LINE.
5. SIDE-WALL SLOPE NOT VISIBLE DUE TO EXAGGERATED SCALE.

LEGEND:

- PRIMARY DREDGE AREA
- MOST SHALLOW REFLECTOR AS IDENTIFIED BY SEISMIC SURVEY

0 1.25 2.5 VERTICAL SCALE IN FT

0 250 500 HORIZONTAL SCALE IN FT

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN, PE, NO. 34857 DATE 11-8-12

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
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C.O.A. FL. 8029
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www.CoastalPlanning.net

No.	Date	Description
1	07/06/12	Revised per USACE comments
2	11/08/12	Revised per USACE comments

Submitted to/for: USACE

Designed by: SK
Drawn by: GK
Date: 7/29/12
Pick Number: PCS 1001ED

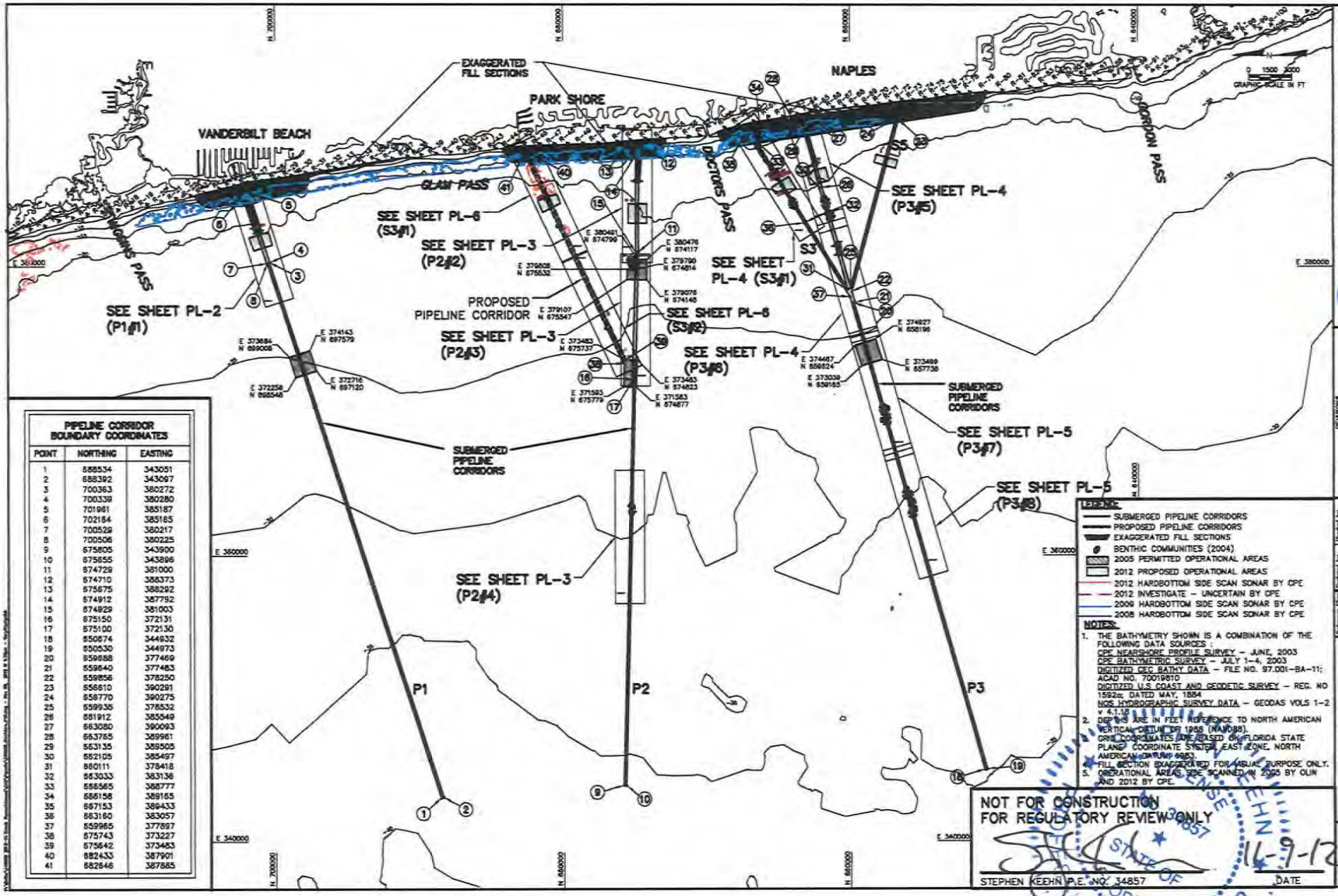
Checked by: AMS
Reviewed by: HS
Submitted by: SK
Contract No.: 1869.00

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT

BORROW AREA T1
CROSS SECTIONS

DRAWING NO.
BA-3

SHEET 23 OF 29



PIPELINE CORRIDOR BOUNDARY COORDINATES		
POINT	NORTHING	EASTING
1	688534	343051
2	688392	343097
3	700363	380272
4	700339	380280
5	701981	385187
6	702164	385165
7	700529	380217
8	700506	380225
9	675805	343900
10	675655	343896
11	674729	381000
12	674710	386373
13	675675	388292
14	674912	387792
15	674929	381003
16	675150	372131
17	675100	372130
18	650674	344932
19	650530	344973
20	659688	377469
21	659640	377463
22	659856	378250
23	656610	390291
24	656770	390275
25	659935	378532
26	661912	385549
27	663080	390093
28	663765	389961
29	663135	389505
30	662105	385497
31	660111	378418
32	663033	383136
33	665565	388777
34	666158	389165
35	667153	389433
36	663160	383057
37	659965	377897
38	675743	373227
39	675642	373483
40	682433	387901
41	682646	387885

LEGEND:
- SUBMERGED PIPELINE CORRIDORS
- PROPOSED PIPELINE CORRIDORS
- EXAGGERATED FILL SECTIONS
- BENTHIC COMMUNITIES (2004)
- 2005 PERMITTED OPERATIONAL AREAS
- 2012 PROPOSED OPERATIONAL AREAS
- 2012 HARDBOTTOM SIDE SCAN SONAR BY CPE
- 2012 INVESTIGATE – UNCERTAIN BY CPE
- 2009 HARDBOTTOM SIDE SCAN SONAR BY CPE
- 2008 HARDBOTTOM SIDE SCAN SONAR BY CPE

NOTES:
1. THE BATHYMETRY SHOWN IS A COMBINATION OF THE FOLLOWING DATA SOURCES :
   CPE NEARSHORE PROFILE SURVEY – JUNE, 2003
   CPE BATHYMETRIC SURVEY – JULY 1–4, 2003
   DIGITIZED CEC BATHY DATA – FILE NO. 97.001–BA–11; ACAD NO. 70019810
   DIGITIZED U.S. COAST AND GEODETIC SURVEY – REG. NO 1592a; DATED MAY, 1884
   NOS HYDROGRAPHIC SURVEY DATA – GEODAS VOLS 1–2 v 4.1.12
2. DEPTHS ARE IN FEET REFERENCE TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. GRID COORDINATES ARE BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983.
4. FILL SECTION EXAGGERATED FOR VISUAL PURPOSE ONLY.
5. OPERATIONAL AREAS SIDE SCANNED IN 2005 BY OLIN AND 2012 BY CPE.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11-9-12

STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
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C.O.A. FL 8409
C.O.A. LB 6851
www.CoastalPlanning.net

REVISIONS

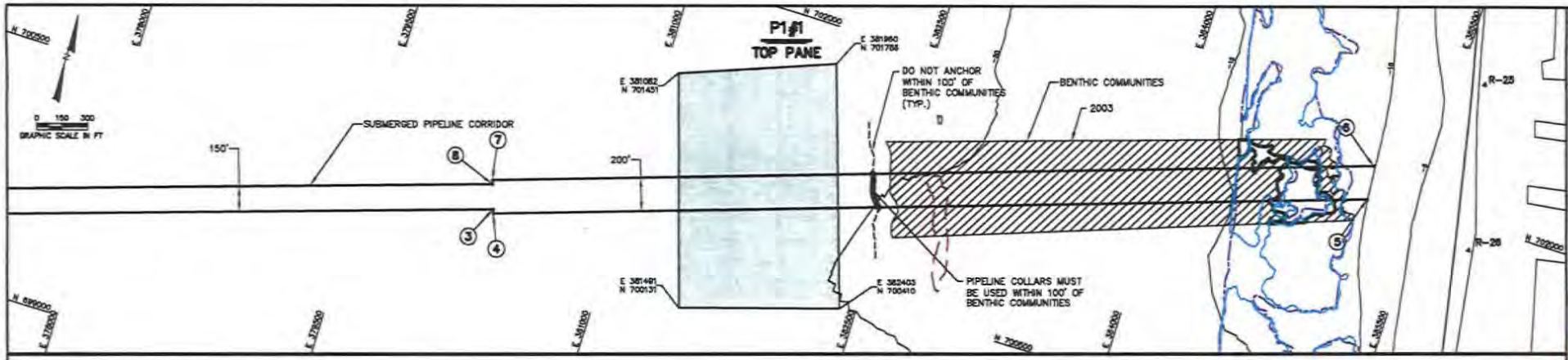
No.	Date	Description

Designed by SK | Drawn by DMR | Date 7/25/13 | Plot Scale AS NOTED | Checked by AMB | Reviewed by NS | Submitted by SK | Dwng. No. 1 of 25

COLLIER COUNTY
BEACH REINOURISHMENT PROJECT
DREDGE PIPELINE CORRIDORS

DRAWING NO. PL-1

SHEET 24 OF 29



LEGEND:

- PIPELINE COLLAR LIMITS
- DO NOT ANCHOR LIMITS
- SUBMERGED PIPELINE CORRIDOR
- 2012 INVESTIGATE – UNCERTAIN BY CPE
- 2009 HARDBOTTOM FINAL SIDE SCAN SONAR BY CPE
- 2008 HARDBOTTOM FINAL SIDE SCAN SONAR BY CPE
- BENTHIC COMMUNITIES (2004)
- (8) PIPELINE CORRIDOR BOUNDARY COORDINATES (SEE PL-1 FOR TABLE)
- PROPOSED OPERATIONAL AREA

NOTES:

1. CONTRACTOR MUST AVOID PLACING PIPELINE ON OR NEAR HARDBOTTOM RESOURCES AND BENTHIC COMMUNITIES WHEREVER POSSIBLE.
2. RADIAL PIPELINE COLLARS MUST BE INSTALLED ON ALL PIPELINES ABOVE OR WITHIN 100' OF BENTHIC COMMUNITIES. COLLARS MUST BE INSTALLED WITH A SPACING NOT TO EXCEED 50 FEET.
3. BENTHIC COMMUNITIES MUST BE CONSIDERED TO EXTEND LATERALLY PARALLEL TO SHORE. NO ANCHORS, CABLES, SPUDS, JACK-UP BARGES OR SIMILAR EQUIPMENT WILL BE PLACED ON OR WITHIN BENTHIC COMMUNITIES OR THEIR BUFFERS.
4. ANCHORS, CABLES, SPUDS, JACK-UP BARGES, ETC. SHOULD BE PLACED WITHIN THE OPERATIONAL AREAS OR PIPELINE CORRIDORS TO THE MAXIMUM EXTENT POSSIBLE.
5. THE CONTRACTOR SHALL CLEAR ANY EXCEPTION TO THE ABOVE WITH THE ENGINEER.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11-9-12

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
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C.O.A. LA. 6231
www.CoastalPlanning.net

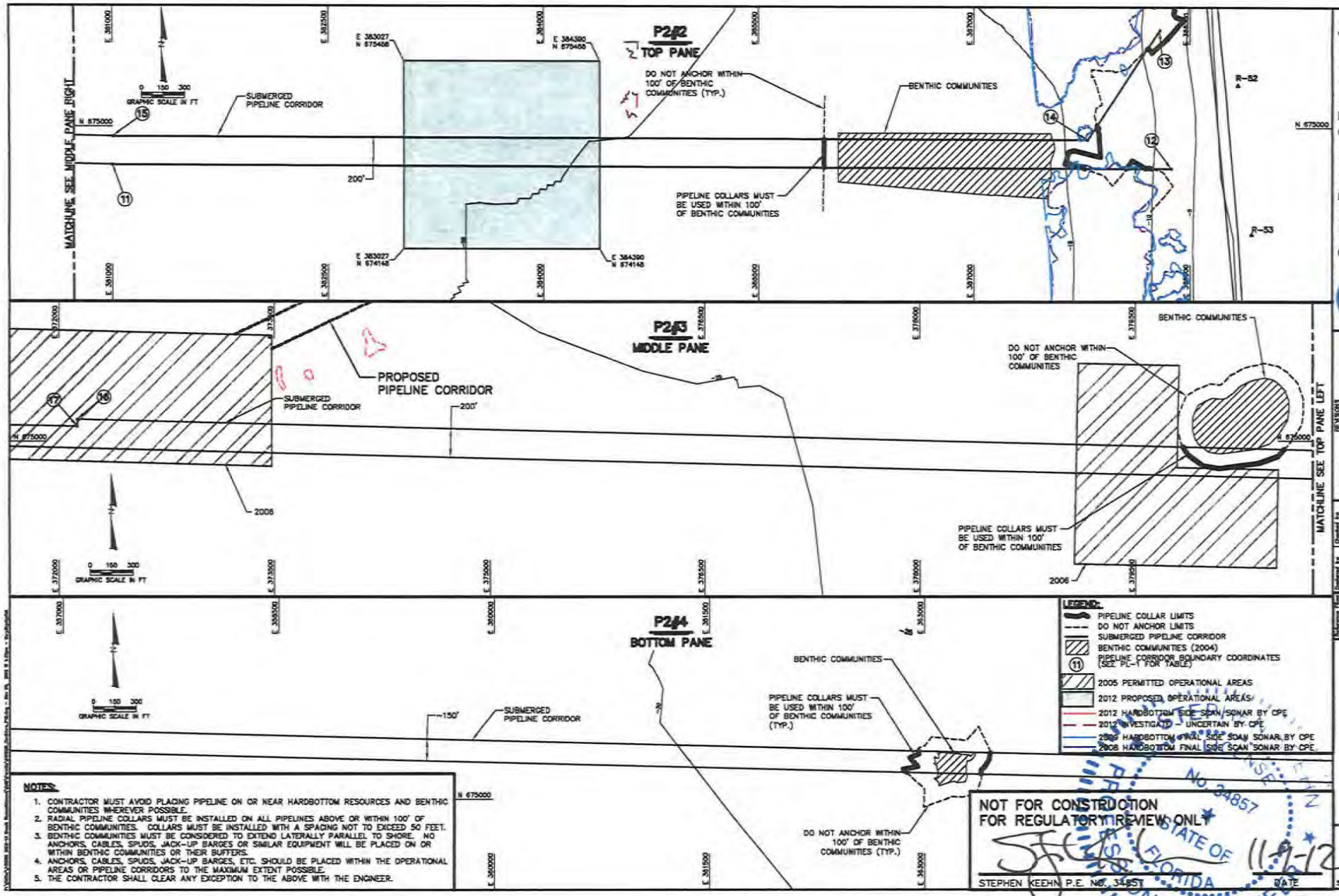
REVISIONS		
No.	Date	Description

Drafted by AMB | Reviewed by KS | Submitted by SK | Comm. No. 14925
Designed by SK | Drawn by RDD | Date 7/25/12 | Plot Scale AS NOTED

COLLIER COUNTY
BEACH REHABILITATION PROJECT
PIPELINE CORRIDOR P1

DRAWING NO. PL-2

SHEET 23 OF 28



NOTES:

1. CONTRACTOR MUST AVOID PLACING PIPELINE ON OR NEAR HARDBOTTOM RESOURCES AND BENTHIC COMMUNITIES WHEREVER POSSIBLE.
2. RADIAL PIPELINE COLLARS MUST BE INSTALLED ON ALL PIPELINES ABOVE OR WITHIN 100' OF BENTHIC COMMUNITIES. COLLARS MUST BE INSTALLED WITH A SPACING NOT TO EXCEED 50 FEET.
3. BENTHIC COMMUNITIES MUST BE CONSIDERED TO EXTEND LATERALLY PARALLEL TO SHORE. NO ANCHORS, CABLES, SPUDS, JACK-UP BARGES OR SIMILAR EQUIPMENT WILL BE PLACED ON OR WITHIN BENTHIC COMMUNITIES OR THEIR BUFFERS.
4. ANCHORS, CABLES, SPUDS, JACK-UP BARGES, ETC. SHOULD BE PLACED WITHIN THE OPERATIONAL AREAS OR PIPELINE CORRIDORS TO THE MAXIMUM EXTENT POSSIBLE.
5. THE CONTRACTOR SHALL CLEAR ANY EXCEPTION TO THE ABOVE WITH THE ENGINEER.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 11-9-12

STATE OF FLORIDA — NO. 34857 — PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
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REVISIONS

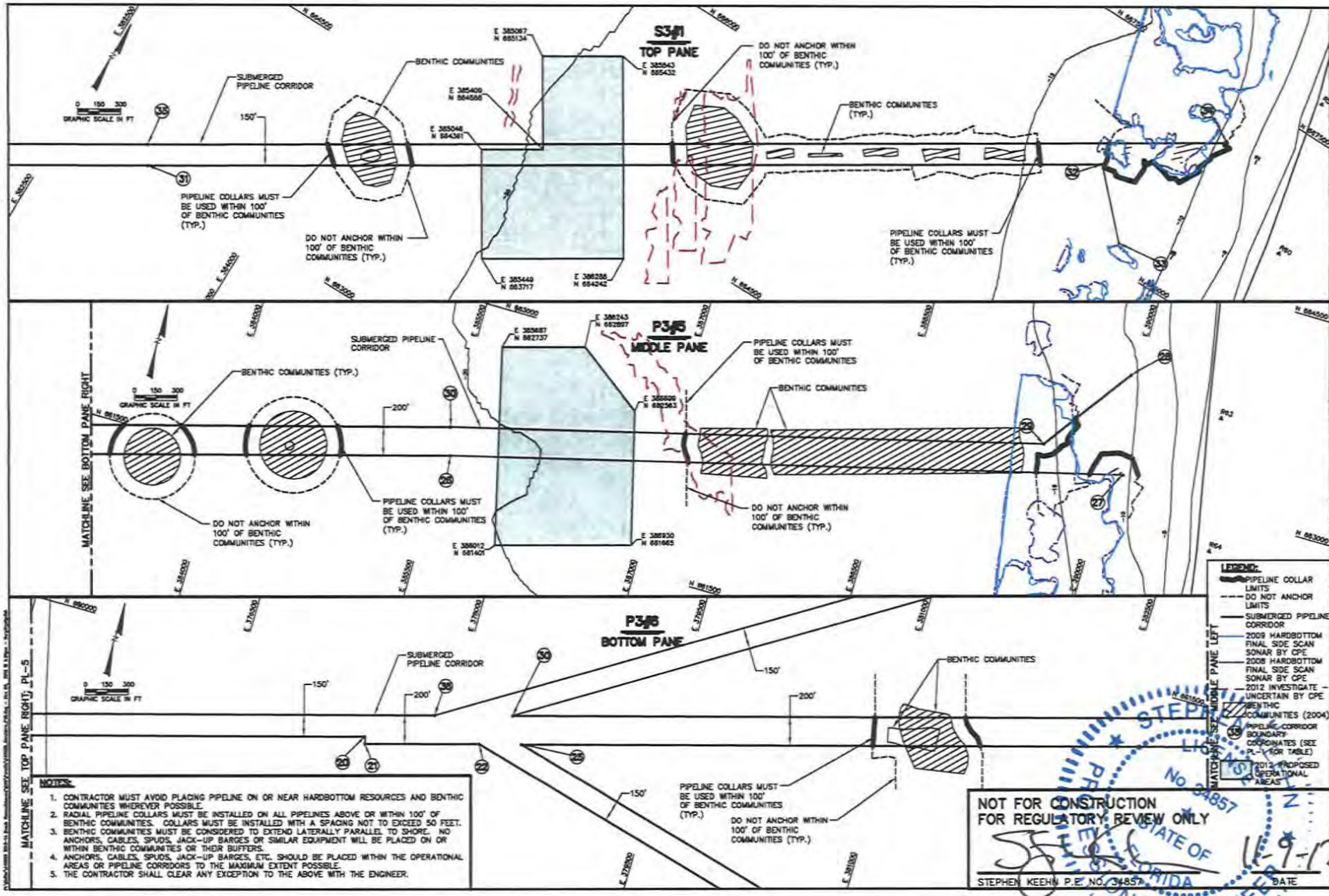
No.	Date	Description

Designed by SK | Drawn by RDG | Date 7/23/12 | Plot Scale AS NOTED | Checked by AMB | Reviewed by HS | Submitted by SK | Dwng. No. 148925

COLLIER COUNTY
BEACH REHABILITATION PROJECT
PIPELINE CORRIDOR P2

DRAWING NO.
PL-3

SHEET 25 OF 29


S3#1
TOP PANE
P3#5
MIDDLE PANE
P3#8
BOTTOM PANE
SUBMERGED PIPELINE CORRIDOR
BENTHIC COMMUNITIES
BENTHIC COMMUNITIES (TYP.)
DO NOT ANCHOR WITHIN 100' OF BENTHIC COMMUNITIES (TYP.)
PIPELINE COLLARS MUST BE USED WITHIN 100' OF BENTHIC COMMUNITIES (TYP.)
GRAPHIC SCALE IN FT
MATCHLINE SEE BOTTOM PANE RIGHT
MATCHLINE SEE MIDDLE PANE LEFT
MATCHLINE SEE TOP PANE RIGHT; PL-5
LEGEND:
PIPELINE COLLAR LIMITS
DO NOT ANCHOR LIMITS
SUBMERGED PIPELINE CORRIDOR
2009 HARDBOTTOM FINAL SIDE SCAN SONAR BY CPE
2008 HARDBOTTOM FINAL SIDE SCAN SONAR BY CPE
2012 INVESTIGATE - UNCERTAIN BY CPE
BENTHIC COMMUNITIES (2004)
PIPELINE CORRIDOR BOUNDARY COORDINATES (SEE PL-1 FOR TABLE)
2012 PROPOSED OPERATIONAL AREAS
NOTES:
1. CONTRACTOR MUST AVOID PLACING PIPELINE ON OR NEAR HARDBOTTOM RESOURCES AND BENTHIC COMMUNITIES WHEREVER POSSIBLE.
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5. THE CONTRACTOR SHALL CLEAR ANY EXCEPTION TO THE ABOVE WITH THE ENGINEER.
NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY
STEPHEN KEEHN P.E. NO. 34857
DATE
11-9-12
STEPHEN KEEHN LICENSED No 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER
COASTAL PLANNING & ENGINEERING, INC.
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C.O.A.: LA 8251
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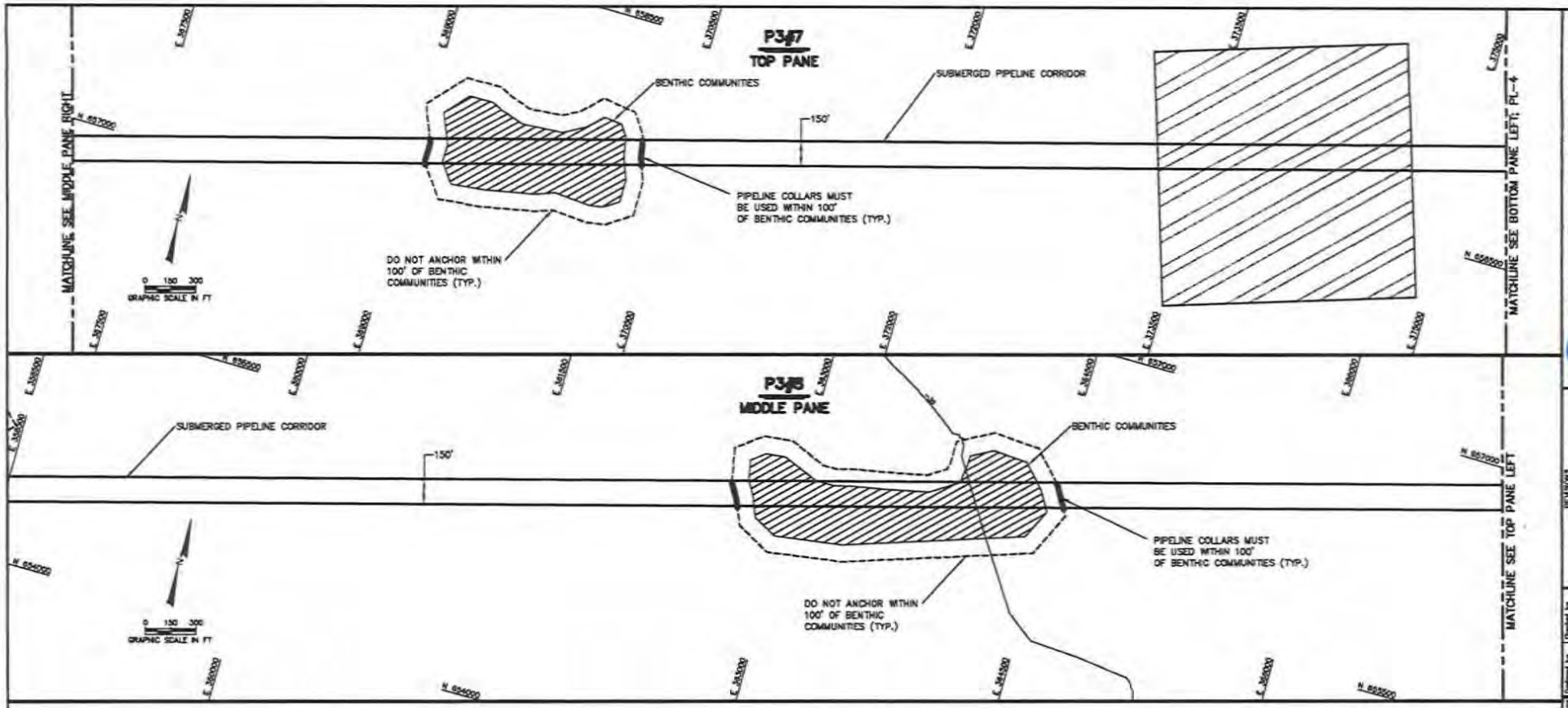
CPE
REVISIONS
No. Date Description
Designed by SK
Drawn by SK
Checked by AMB
Reviewed by SK
Submitted by SK
Date 7/23/12
Scale AS NOTED
Contract No. 14925
COLLIER COUNTY
BEACH REHABILITATION PROJECT
PIPELINE CORRIDOR P3
DRAWING NO.
PL-4
SHEET 27 OF 29



LEGEND:

- PIPELINE COLLAR LIMITS
- DO NOT ANCHOR LIMITS
- SUBMERGED PIPELINE CORRIDOR
- BENTHIC COMMUNITIES (2004)
- 2005 PERMITTED OPERATIONAL AREA

NOTES:

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STEPHEN KEEHN B.E. NO. 34857 — DATE 11-9-12

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

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REVISIONS

No.	Date	Description

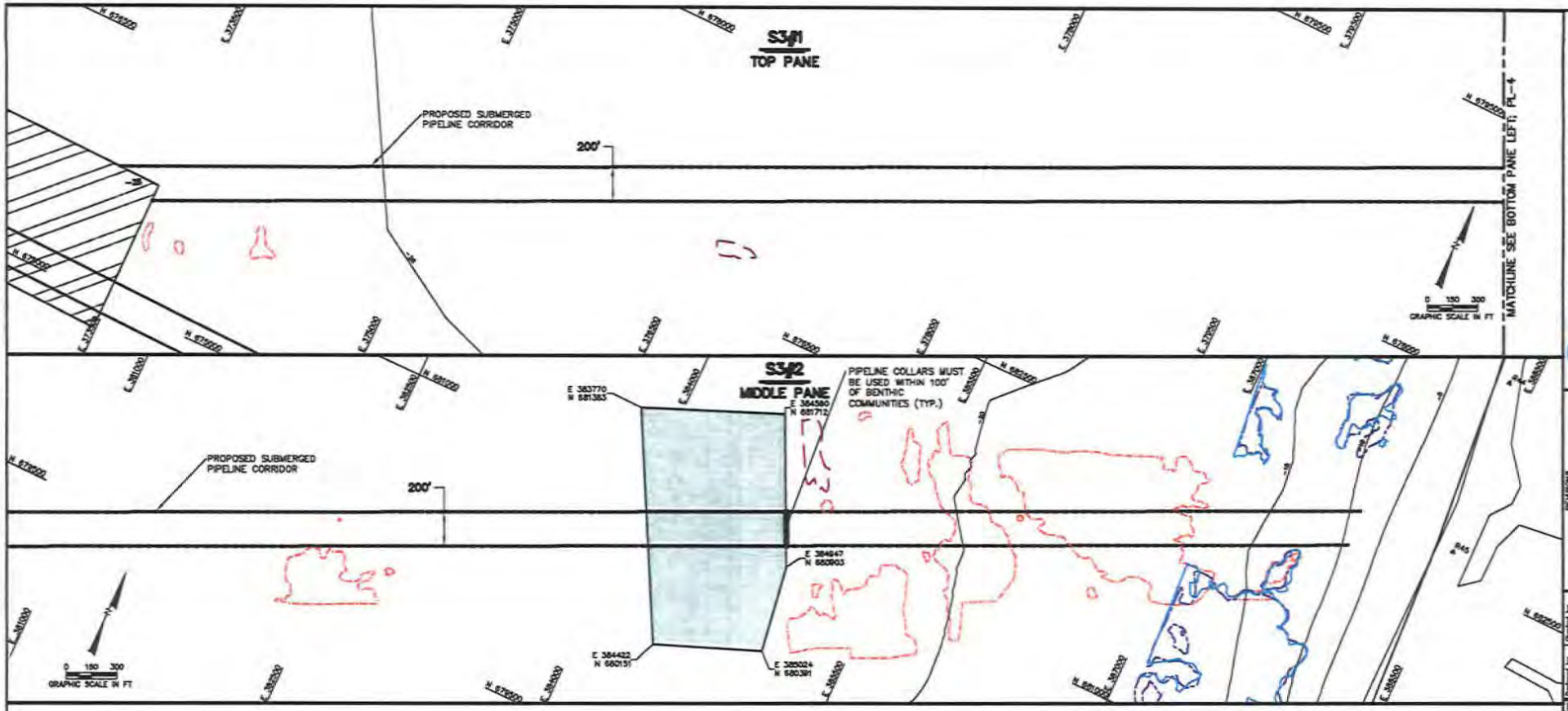
Designed by SK	Checked by AMB	Reviewed by HS	Submitted by SK
Drawn by RDO	Date 11/9/12	Scale As Noted	Contr. No. 10925

Reference Files: Basemap

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PIPELINE CORRIDOR P3 (CONT)

DRAWING NO. PL-5

SHEET 28 OF 29



LEGEND:

- PIPELINE COLLAR LIMITS
- DO NOT ANCHOR LIMITS
- PROPOSED PIPELINE CORRIDOR
- SUBMERGED PIPELINE CORRIDOR
- 2012 HARDBOTTOM SIDE SCAN SONAR BY CPE
- 2012 INVESTIGATE – UNCERTAIN BY CPE
- 2009 HARDBOTTOM FINAL SIDE SCAN SONAR BY CPE
- 2008 HARDBOTTOM FINAL SIDE SCAN SONAR BY CPE
- BENTHIC COMMUNITIES (2004)
- 2005 PERMITTED OPERATIONAL AREAS
- 2012 PROPOSED OPERATIONAL AREAS

NOTES:

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STEPHEN KEEHN P.E. NO. 34857 — DATE 11-9-12

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C.O.A. LA #2631
www.CoastalPlanning.net

No.	Date	Description

Reference Files/Resources

Designed by SK | Drawn by AMR | Checked by BHS | Submitted by SK | Date 7/20/12 | Scale AS NOTED | Dwgs. No/ 14925

COLLIER COUNTY
BEACH REVITALIZATION PROJECT
PIPELINE CORRIDOR S3

DRAWING NO. PL-6

SHEET 29 OF 29

APPENDIX I

OPERATIONAL AREA INVESTIGATIONS – FIELD OBSERVATION REPORT (CPE, 2013)

FIELD OBSERVATION REPORT

Project:	Collier County Beach Nourishment Project Operational Area Investigations
Location:	Collier County, FL
Survey Date:	January 30, 2013; February 5-6, 2013
Commission Number:	146925.03
Field Representatives:	Lauren Floyd (Sr. Marine Biologist), Judd French (Boat Captain), and Ben Alcocer (Marine Technician)

On January 30 and February 5-6, 2013, Coastal Planning & Engineering (CPE) investigated proposed nearshore operational areas for the Collier County 2013-14 Beach Nourishment Project. These operational areas were designed to avoid potential hardbottom resources as indicated by September 2012 sidescan survey results. These investigations involved two phases: Phase I utilized towed video within five (5) proposed operational areas to ensure there were no observed hardbottom resources within the planned areas; Phase II involved diver investigations on potential hardbottom resources in the vicinity of the operational areas to ensure that planned operational areas maintained a 200 ft buffer from any hardbottom resources.

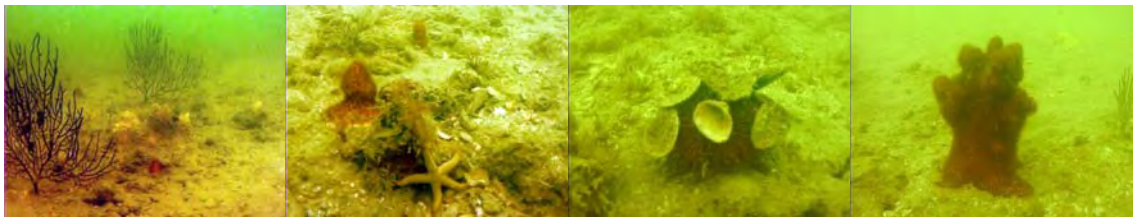
Phase I. Towed Video Surveys of Operational Areas

Towed digital video surveys with DGPS integration (a DGPS-integrated digital video system records the DGPS coordinates on the video footage providing the exact location of the resources being recorded) were conducted in each of the five (5) proposed nearshore operational areas (Figures 1a and 1b). The areas were surveyed in a meandering pattern over each proposed nearshore operational area in order to confirm the absence of any hardbottom resources. Towed video surveys were started on January 30, 2013. Seas were less than 2 ft in the morning, which were conducive to towed video surveys of the operational areas on Pipeline Corridors 1 and 2, but by mid-day the seas had reached 3 ft and the winds were blowing over 20 kts from the south. A small craft advisory was issued, so investigations were discontinued. The survey was resumed on February 6, 2013, when seas were flat and winds negligible; the remaining three operational areas on Pipeline Corridor 3, including on Spurs 3 and 5, were surveyed using the towed video method. Figures 1a and 1b show the path of the towed video surveys conducted within each operational area. As video was recorded in each operational area, a biologist viewed the footage in order to record the location of any observed hardbottom. No hardbottom was observed in any of the five (5) operational areas. The substrate consisted of sand and shell hash, with an occasional observation of a small (less than 10 cm) octocoral emerging from the sediment. These surveys confirmed the September 2012 sidescan survey results, which determined that these areas do not contain hardbottom resources.

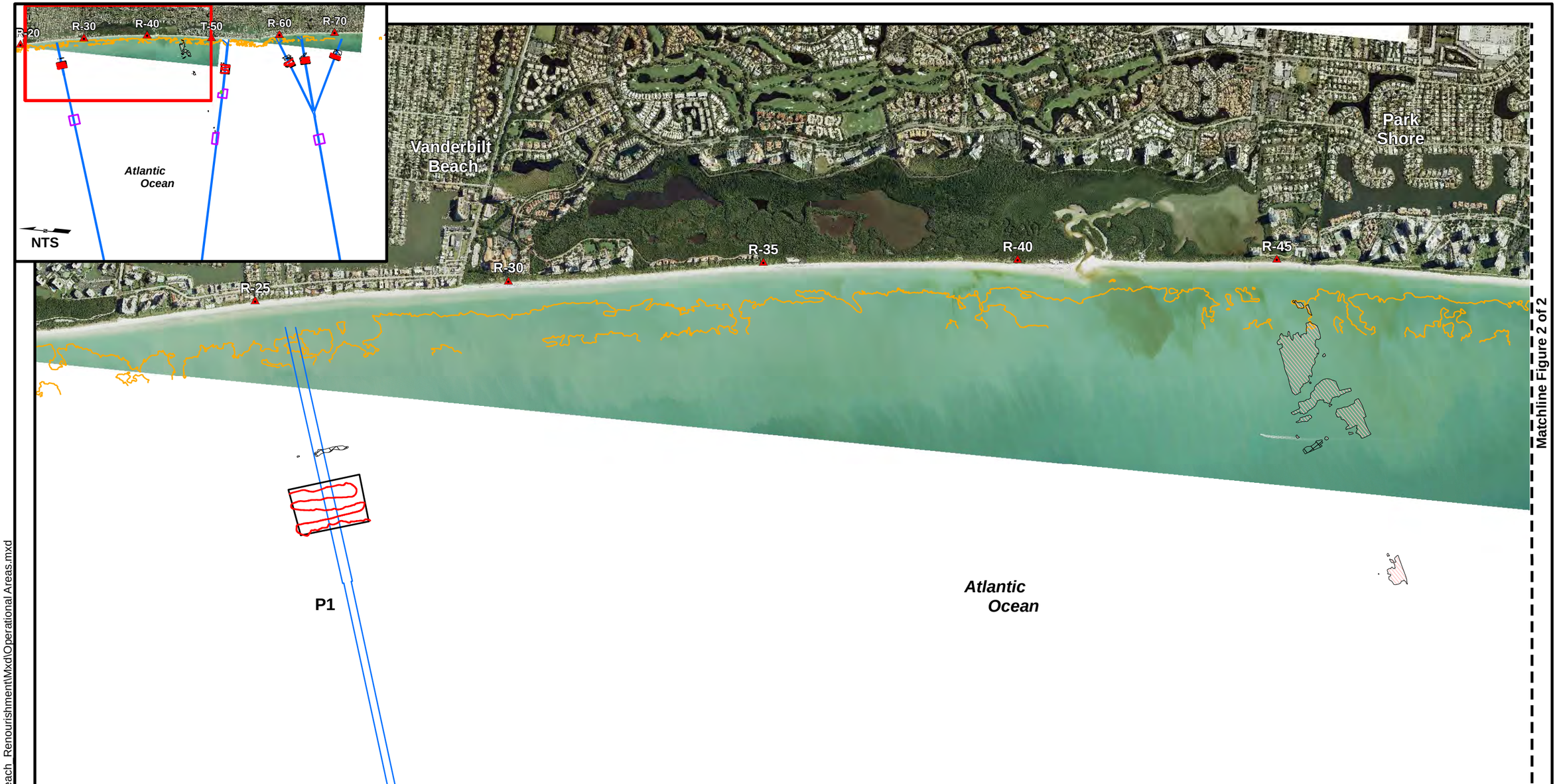
Phase II. Diver Investigations of Potential Hardbottom in Vicinity of Operational Areas

In addition to clearing the operational areas of hardbottom resources, divers conducted dives on areas identified as "investigate-uncertain" based on the September 2012 sidescan survey. The purpose of these dives was to groundtruth areas of potential hardbottom near proposed operational areas. On February 5, 2013, divers conducted investigations of potential hardbottom near the operational areas associated with Pipeline Corridor 2, , Pipeline Corridor 3 and Pipeline Corridor 3 - Spur 3. Small intermittent patches of hardbottom, or octocorals (*Leptogorgia* spp.) emerging from the sand, were observed in all investigated areas; therefore, divers did not investigate the potential hardbottom near the southernmost operational area located on Pipeline Corridor 3 – Spur 5, assuming that this area also contains hardbottom. Based on diver observations, areas identified as "Investigate-Uncertain" based on the September 2012 sidescan survey have been renamed "Patchy Hardbottom" in Figures 1a and 1b. Divers also investigated areas which had been defined as "Hardbottom" based on the September 2012 sidescan survey; on this dive, divers observed a larger area of more continuous hardbottom than what was observed in the other areas. This area was low relief (approximately 20 cm) with larger (> 30 cm) ocotocorals (*Leptogorgia* spp.) and scleractinians (including *Solenastrea hyades*). As this area was more continuous than the patchy areas, it is still categorized as "Hardbottom" in Figures 1a and 1b. Divers also conducted a single dive along Pipeline Corridor 2 near an operational area permitted for the 2006 project to verify 2004 sidescan results that showed potential hardbottom in this area (the operational area was modified for the 2006 project to avoid impacts to that potential habitat). The divers swam 150 ft across the identified resources, but observed no hardbottom in the area (Figure 1b). Photographs taken on the patchy hardbottom and the more continuous hardbottom are shown below. Based on hardbottom confirmation, operational areas have been modified as necessary to maintain a 200 ft buffer between the operational areas and all hardbottom.

"Patchy Hardbottom" Photographs



"Hardbottom" Photographs



Notes:

1. Coordinates are in feet based on the Florida State Plane Coordinate System, East Zone, North American Datum of 1983 (NAD 83).
2. Aerial photography provided by Collier County Property Appraisers Office, date flown January 2012 .
3. Sidescan sonar surveys collected by Coastal Planning & Engineering, Inc, on September 9 & 12, 2012 and August 25 & 26, 2009.

Legend:

- August 2009 SSS Hardbottom Edge
- Submerged Pipeline Corridor
- 2013 Towed Video

2012 SSS Hardbottom

- Hardbottom
- Patchy Hardbottom

Operational Areas

- 2012 Proposed

- FDEP Monuments

0 1,000 2,000 Feet

1 inch = 2,000 feet

TITLE:

Operational Area Investigations Beach Renourishment Project Collier County, Florida

COASTAL PLANNING & ENGINEERING, INC.
A CB&I COMPANY
2481 N. W. BOCA RATON BOULEVARD
BOCA RATON, FL 33431
PH. (561) 391-8102
FAX (561) 391 9116

Date: 02/22/13	By: HMV	Comm No. : 146925	Figure No. 1a

G:\EnterpriseCollier\146925 2013-14 Beach Renourishment\Mxd\Operational Areas.mxd

Notes:

1. Coordinates are in feet based on the Florida State Plane Coordinate System, East Zone, North American Datum of 1983 (NAD 83).
2. Aerial photography provided by Collier County Property Appraisers Office, date flown January 2012 .
3. Sidescan sonar surveys collected by Coastal Planning & Engineering, Inc, on September 9 & 12, 2012 and August 25 & 26, 2009.

Legend:

August 2009 SSS Hardbottom Edge
Submerged Pipeline Corridor
2013 Towed Video

2012 SSS Hardbottom

Patchy Hardbottom
Diver Investigated - No Observed Hardbottom

Operational Areas

2012 Proposed
2005 Permitted

FDEP Monuments

Feet
0 1,000 2,000
1 inch = 2,000 feet

TITLE:

Operational Area Investigations Beach Renourishment Project Collier County, Florida

COASTAL PLANNING & ENGINEERING, INC.
A CB&I COMPANY
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BOCA RATON, FL 33431
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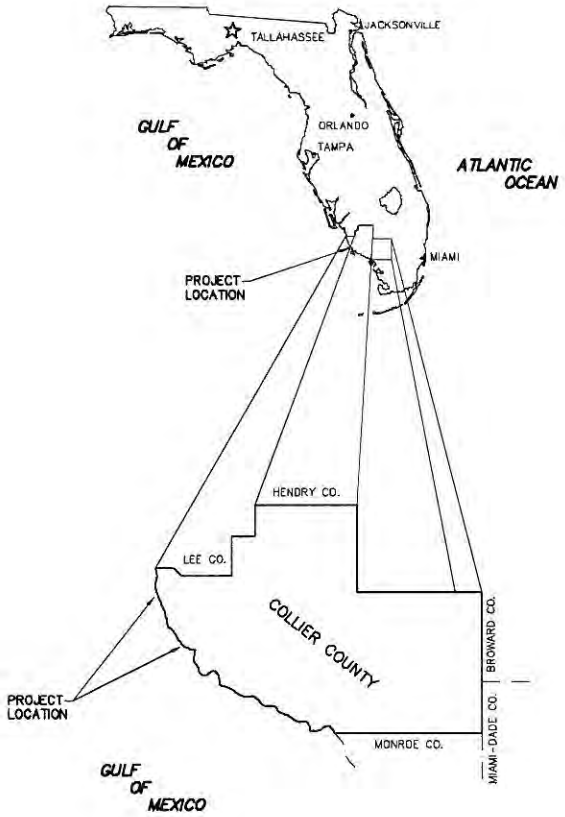
Date: 02/22/13	By: HMV	Comm No. : 146925	Figure No. 1b

G:\EnterpriseCollier\146925 2013-14 Beach Renourishment\Mxd\Operational Areas 2.mxd

APPENDIX J

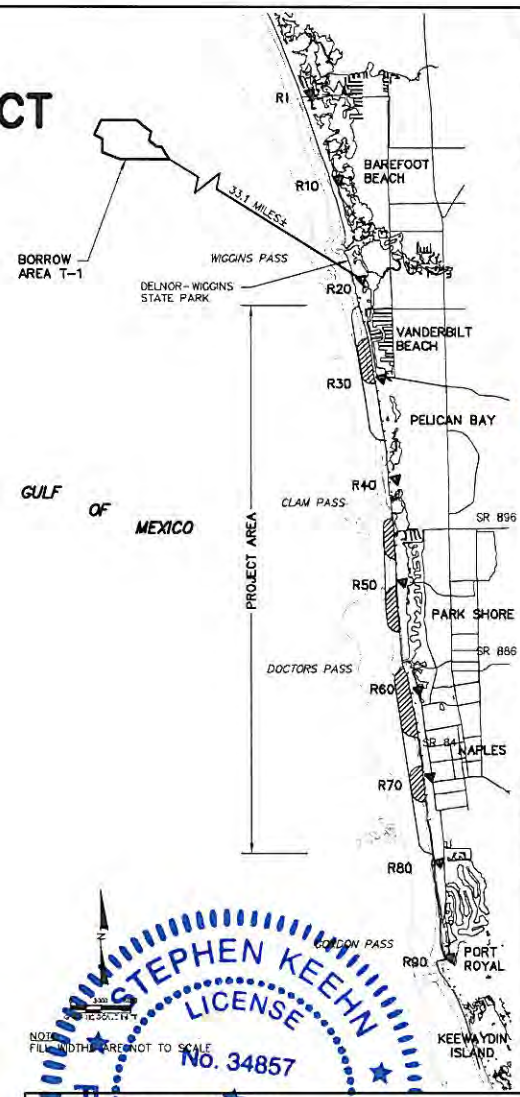
PERMIT SKETCHES

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
COLLIER COUNTY, FLORIDA



INDEX TO SHEETS

1	COVER SHEET
2–20	PROJECT PLAN VIEWS
21–28	TYPICAL FILL CROSS SECTIONS
29	BORROW AREA T1 BATHYMETRY
30	BORROW AREA T1 ISOPACH
31	BORROW AREA T1 CROSS SECTIONS
32–36	DREDGE PIPELINE CORRIDORS



NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN, P.E. NO. 34857

3-19-13
DATE

STEPHEN KEEHN
LICENSE
No. 34857
STATE OF FLORIDA
PROFESSIONAL ENGINEER

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REVISIONS

No.	Date	Description

Reference Files: 6661.Cover.dwg

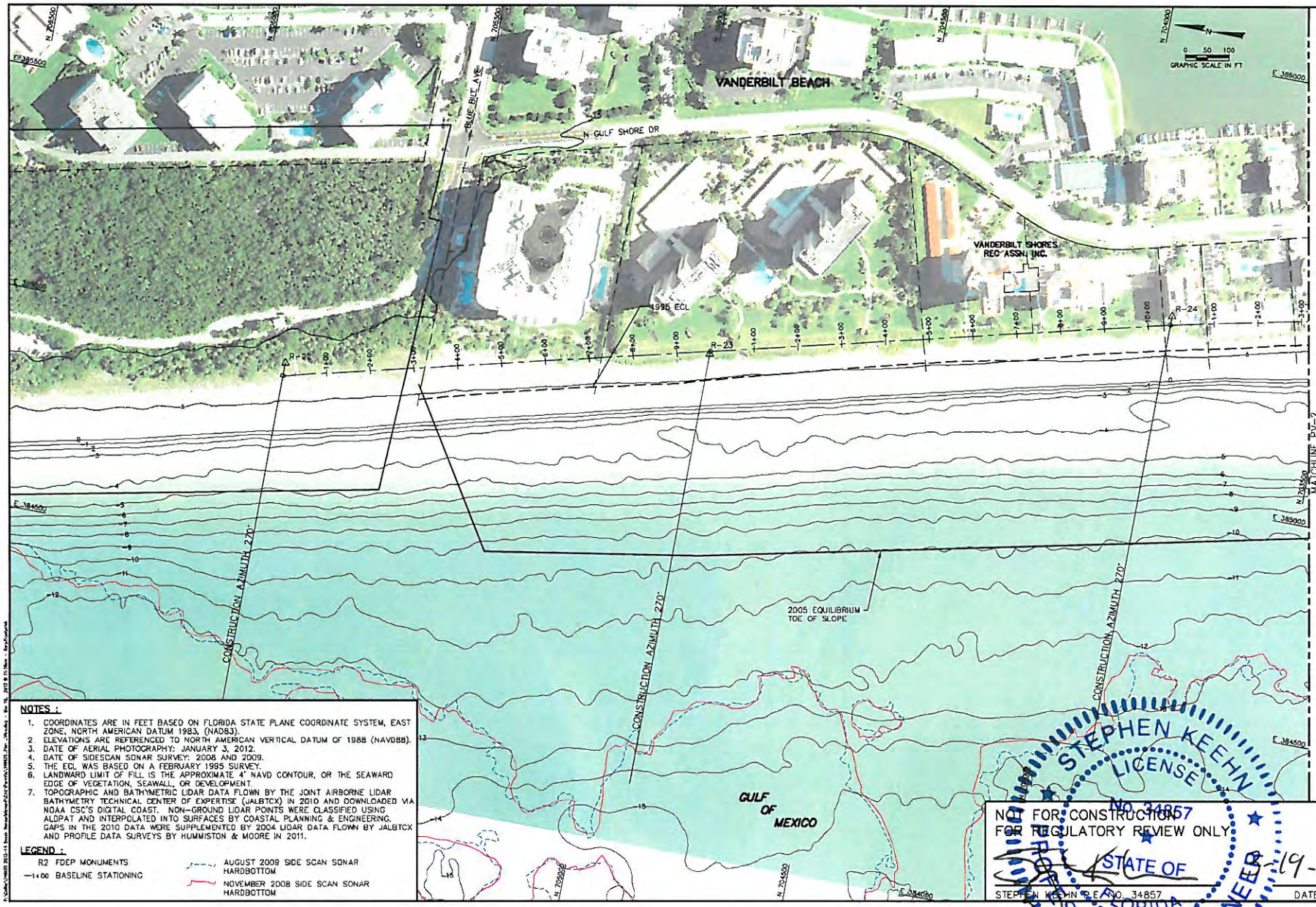
Designed by SK | Drawn by DPC | Date: 1/25/12 | Plot Scale: AS NOTED

Checked by AMB | Reviewed by NS | Submitted by SK | Comm. No.: 1161025

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
COVER SHEET

DRAWING NO.
CS-1

SHEET 1 OF 36



NOTES :

1. COORDINATES ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD83).
2. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. DATE OF AERIAL PHOTOGRAPHY: JANUARY 3, 2012.
4. DATE OF SIDESCAN SONAR SURVEY: 2008 AND 2009.
5. THE ECL WAS BASED ON A FEBRUARY 1995 SURVEY.
6. LANDWARD LIMIT OF FILL IS THE APPROXIMATE 4' NAVD CONTOUR, OR THE SEAWARD EDGE OF VEGETATION, SEAWALL, OR DEVELOPMENT.
7. TOPOGRAPHIC AND BATHYMETRIC LIDAR DATA FLOWN BY THE JOINT AIRBORNE LIDAR BATHYMETRY TECHNICAL CENTER OF EXPERTISE (JALBTCX) IN 2010 AND DOWNLOADED VIA NOAA CSC'S DIGITAL COAST. NON-GROUND LIDAR POINTS WERE CLASSIFIED USING ALDPAT AND INTERPOLATED INTO SURFACES BY COASTAL PLANNING & ENGINEERING. GAPS IN THE 2010 DATA WERE SUPPLEMENTED BY 2004 LIDAR DATA FLOWN BY JALBTCX AND PROFILE DATA SURVEYS BY HUMMISTON & MOORE IN 2011.

LEGEND :

R2 FDEP MONUMENTS

—1+00 BASELINE STATIONING

AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM

NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

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STEPHEN KEEHN, P.E. NO. 34857 — DATE 8-19-13

STATE OF FLORIDA — STEPHEN KEEHN — LICENSE NO. 34857 — PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
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C.O.A. LB #2575

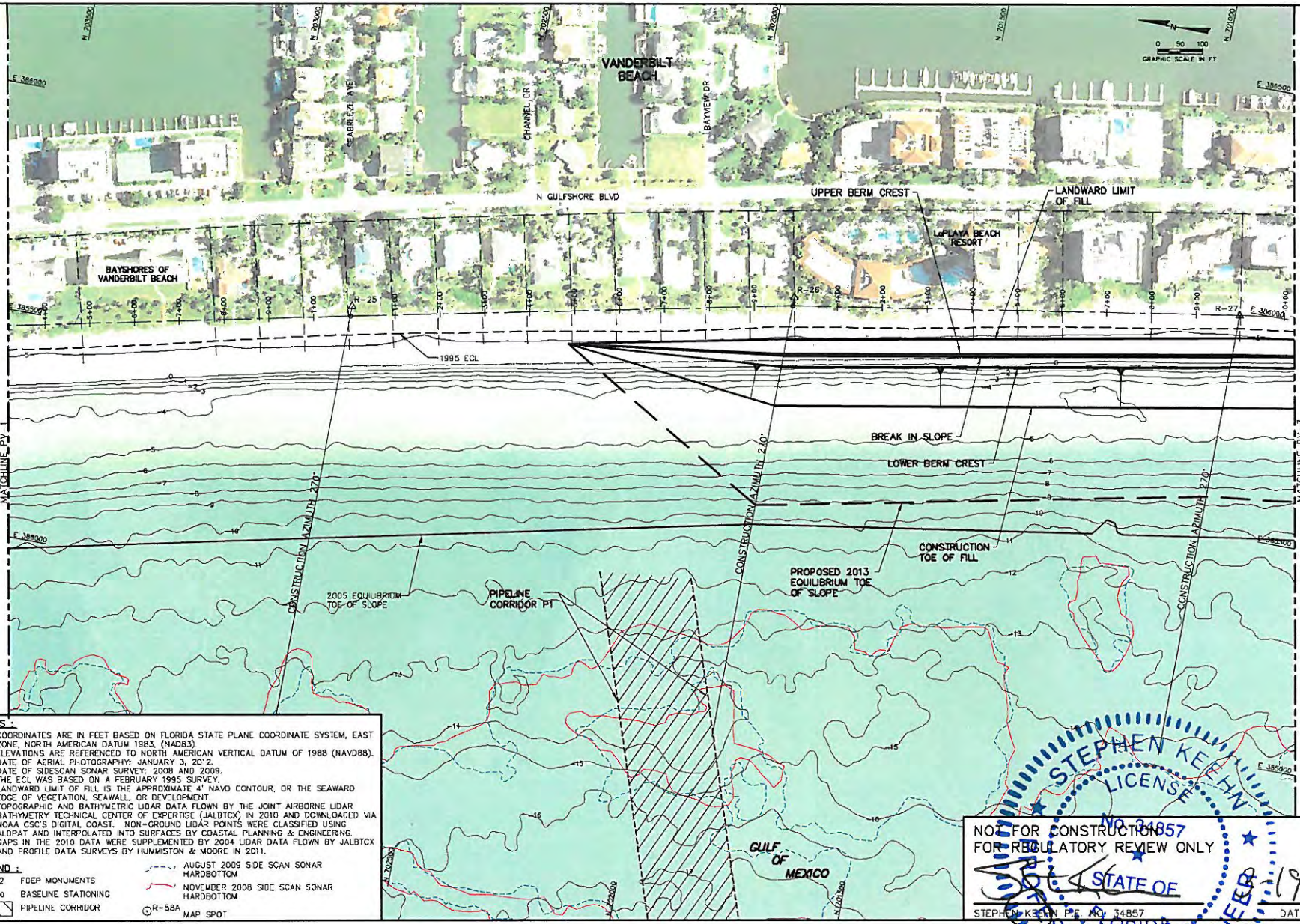
No.	Date	Description
1	12/18/13	REVISIONS

Designed by SK | Checked by AMB
Drawn by SK | Reviewed by KEH
Date 7/23/12 | Submitted by SK
Plot Scale AS NOTED | Contr. No. 14-5275

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO.
PV-1

SHEET 2 OF 38



NOTES :

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LEGEND :

- R2 — FDEP MONUMENTS
- —1+00 — BASELINE STATIONING
- PIPELINE CORRIDOR
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM
- R-58A — MAP SPOT

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STEPHEN KEHN P.E. NO. 34857 — DATE 8-19-13

STEPHEN KEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

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REVISIONS

No.	Date	Description
1	4/24/13	

Reference Files: proto_jumbocam

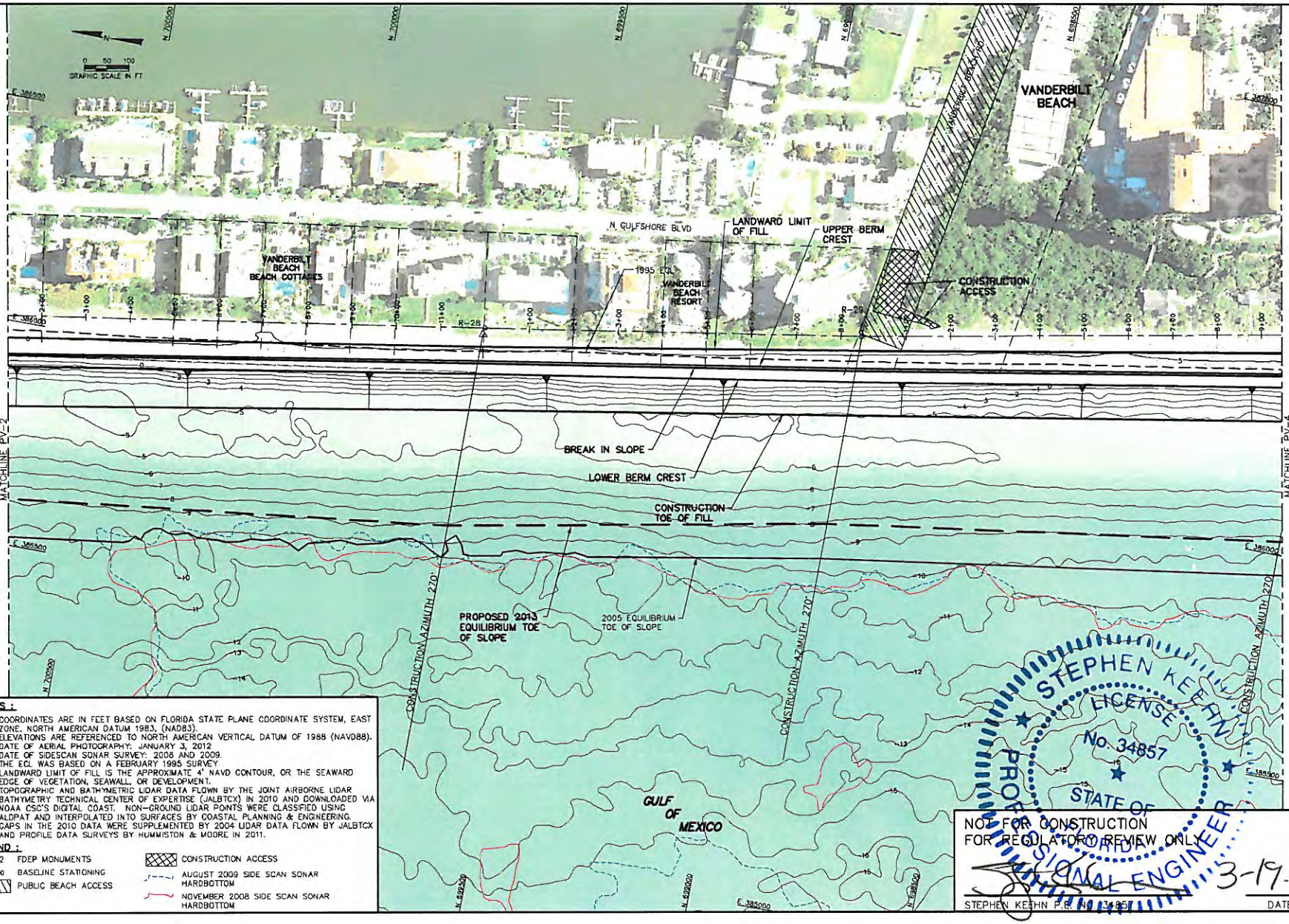
Designed by: SK | Drawn by: SK | Date: 7/25/12 | Pri. Scale: AS NOTED

Checked by: AMB | Reviewed by: AMB | Submitted by: SK | Comm. No.: 145925

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO.
PV-2

SHEET 3 OF 36



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LEGEND :

- R2 FDEP MONUMENTS
- —1+00 BASELINE STATIONING
- PUBLIC BEACH ACCESS
- CONSTRUCTION ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. No. 34857

3-19-13
DATE

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
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REVISIONS

No.	Date	Description
1	3/19/13	Issued for Permit

Reference Files: 2009 Lidar Data

Designed by SK | Drawn by GK | Date 7/25/12 | Plot Scale As 30X11D

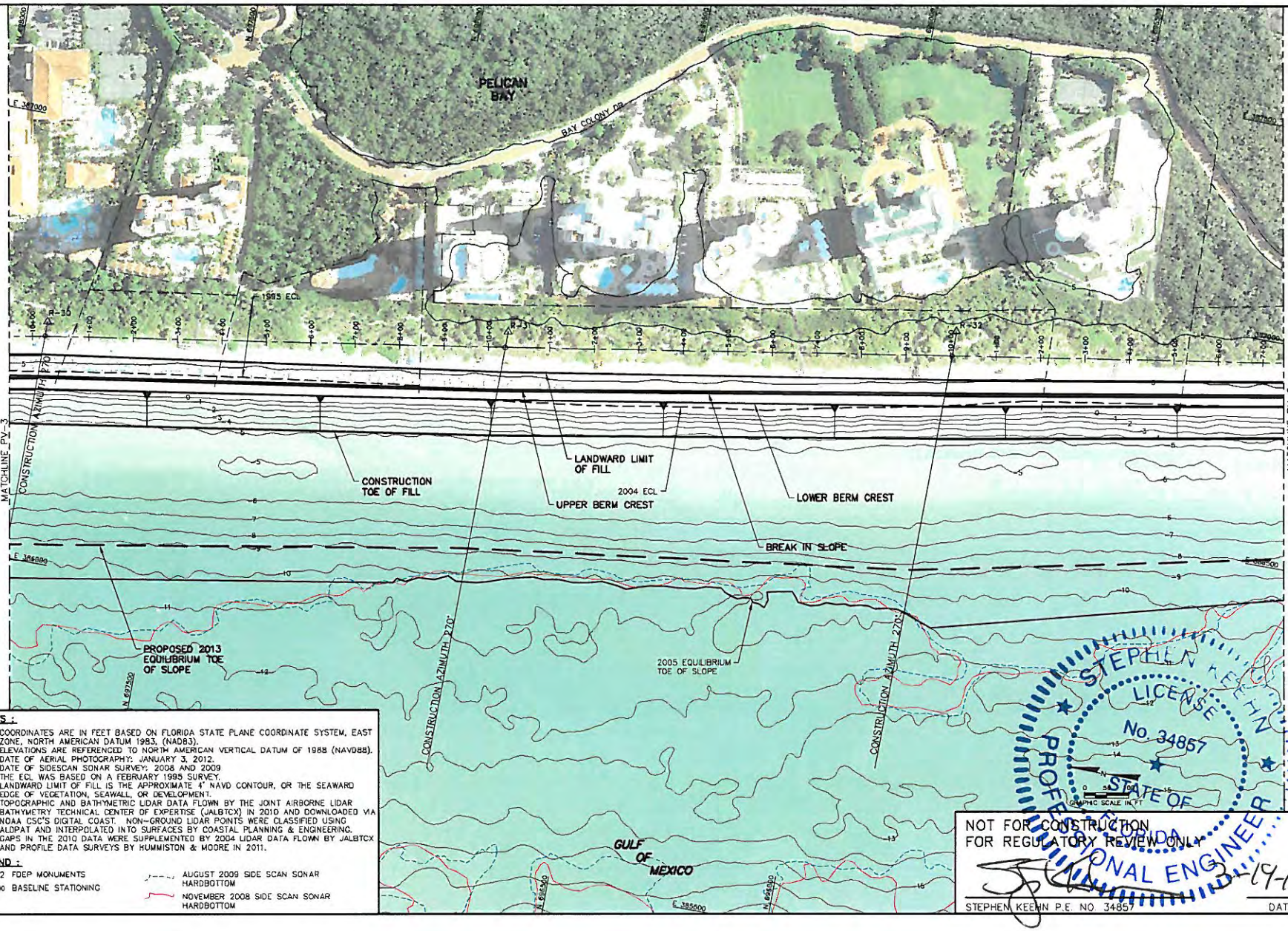
Checked by AMB | Reviewed by MS | Submitted by SK | Comm. No. 1810.03

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT

PLAN VIEW

DRAWING NO.
PV-3

SHEET 4 OF 38



NOTES :

1. COORDINATES ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD83).
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LEGEND :

R2 FDEP MONUMENTS

—1+00 BASELINE STATIONING

AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM

NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857

DATE 3-19-13

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C.O.A. [LA #2531]

REVISIONS			
No.	Date	Description	
1	3/29/13	Set 1	

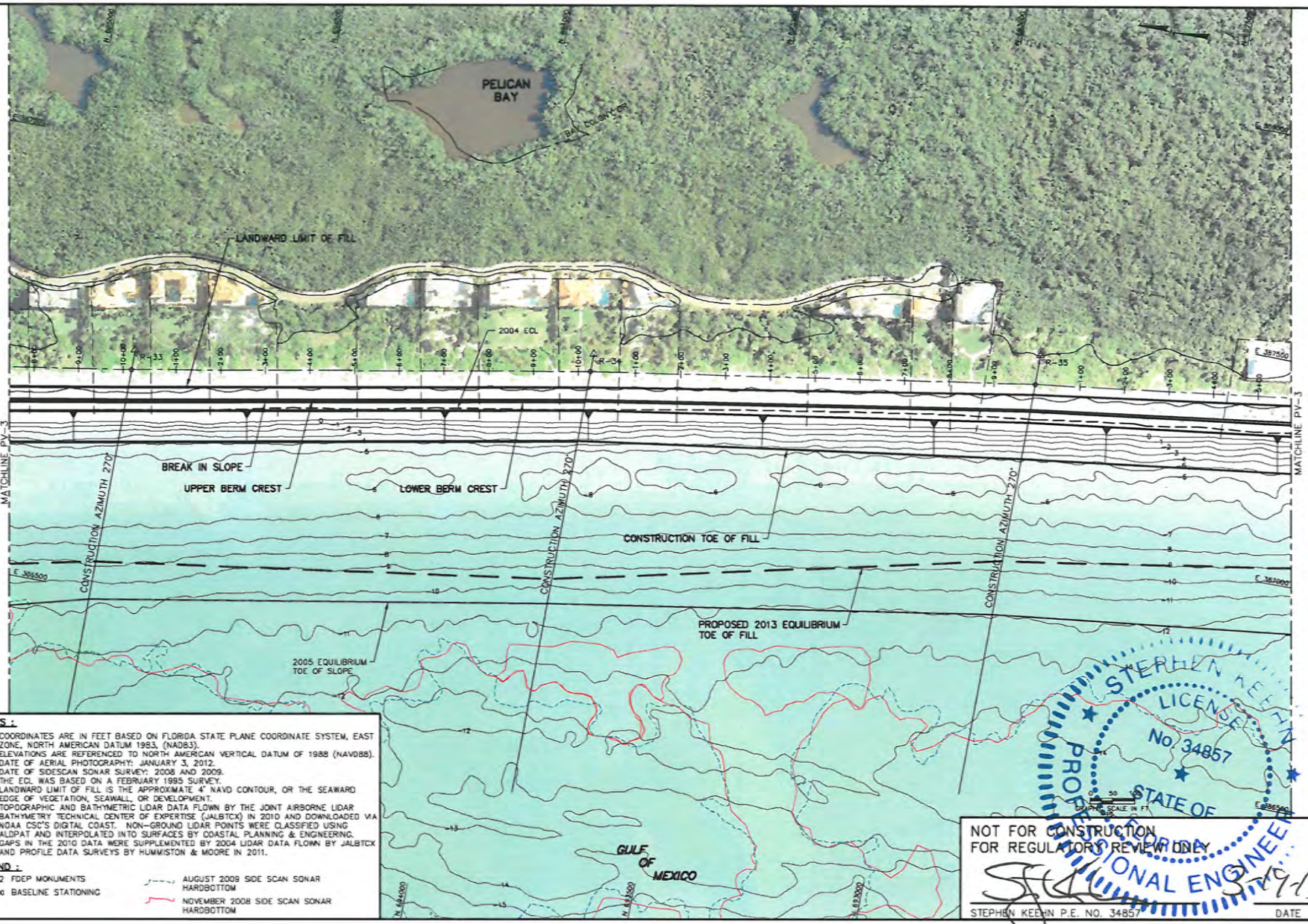
Reference Files: pcsa_jumpcane.dwg

Designed by SK | Checked by AMB
Drawn by SK | Reviewed by HS
Date 7/25/12 | Submitted by SK
Plot Scale AS NOTED | Comm. No. 148925

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO.
PV-4

SHEET 5 OF 35



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LEGEND :

R2 FDEP MONUMENTS

—1+00 BASELINE STATIONING

AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM

NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 3-19-13

STEPHEN KEEHN LICENSED No 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

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C.O.A. LA #2631

No.	Date	Description
1	3/19/13	Issued for Permit

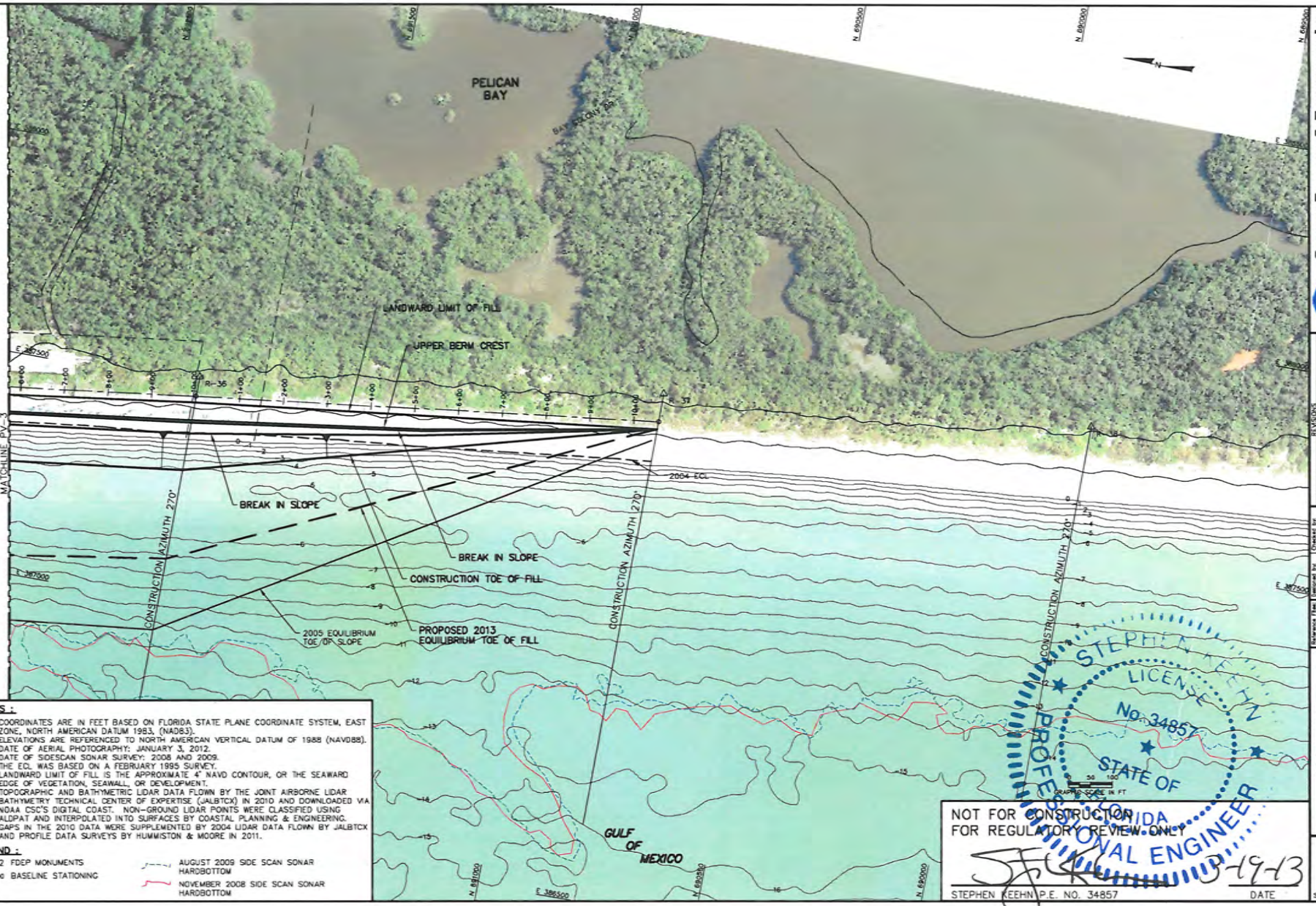
Reference Files: Index, Index-Grid

Designed by SK | Checked by AMB | Drawn by SK | Reviewed by HS | Date 7/25/12 | Submitted by SK | Scale AS NOTED | Comm. No. 146025

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO. PV-5

SHEET 6 OF 36



NOTES :

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LEGEND :

R2 FDEP MONUMENTS

—1+00 BASELINE STATIONING

AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM

NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 3-19-13

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No.	Description	Date
1	Signature	

REVISIONS

Checked by: MB | Reviewed by: HS | Submitted by: SK | Grid No. 14892.75

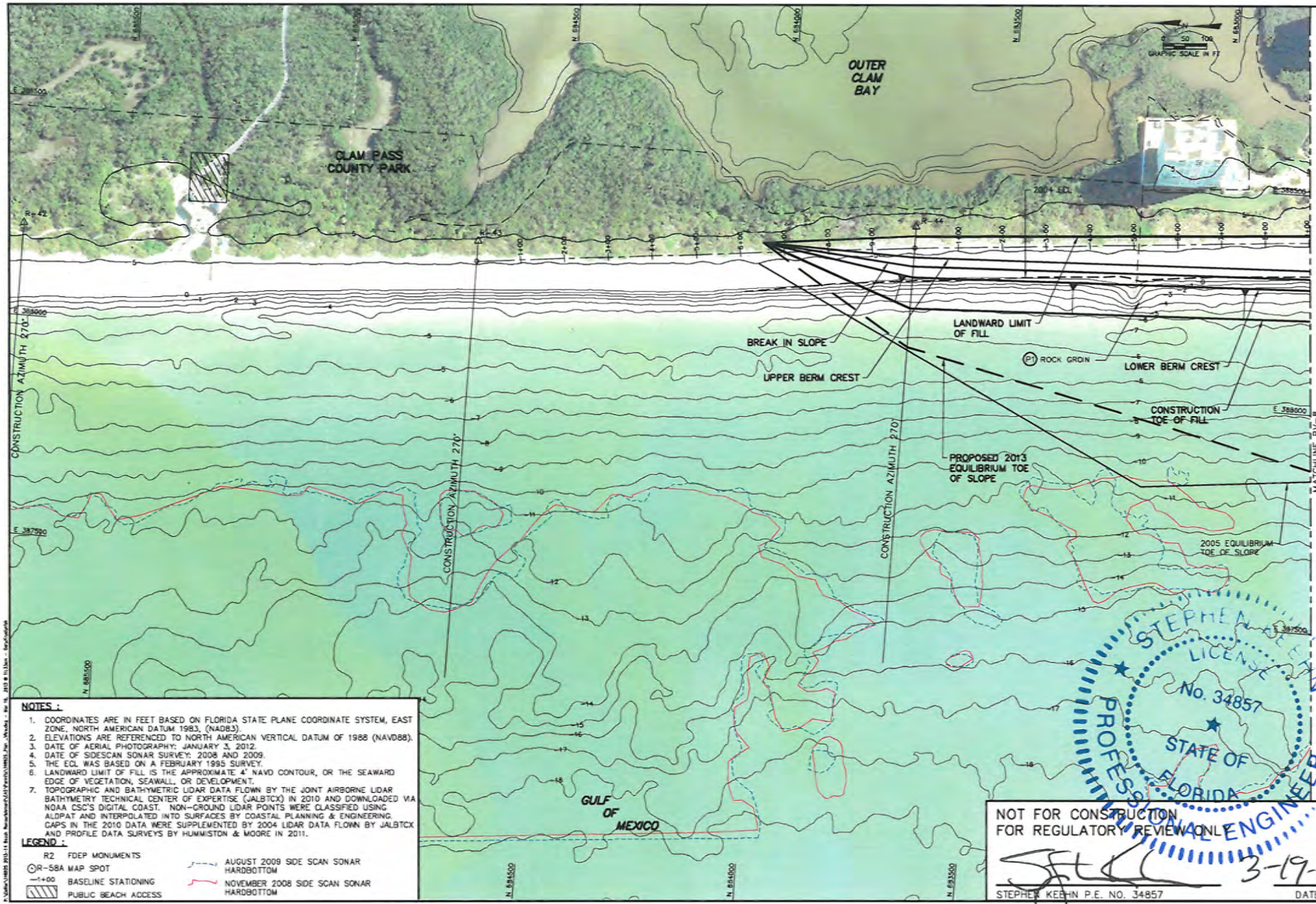
Reference Files: Model, Layout, Xref | Designed by: SK | Drawn by: GK | Date: 7/25/12 | Plot Scale: AS NOTED

COLLIER COUNTY
BEACH RENOURSHMENT PROJECT

PLAN VIEW

DRAWING NO.
PV-6

SHEET 7 OF 36



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LEGEND :

- R2 FDEP MONUMENTS
- R-58A MAP SPOT
- 1+00 BASELINE STATIONING
- PUBLIC BEACH ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

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FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 3-19-13

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REVISIONS

No.	Date	Description
1	3/19/13	Issued for Permit

Checked by AMB | Reviewed by SK | Submitted by SK | Contr. No. 14893S

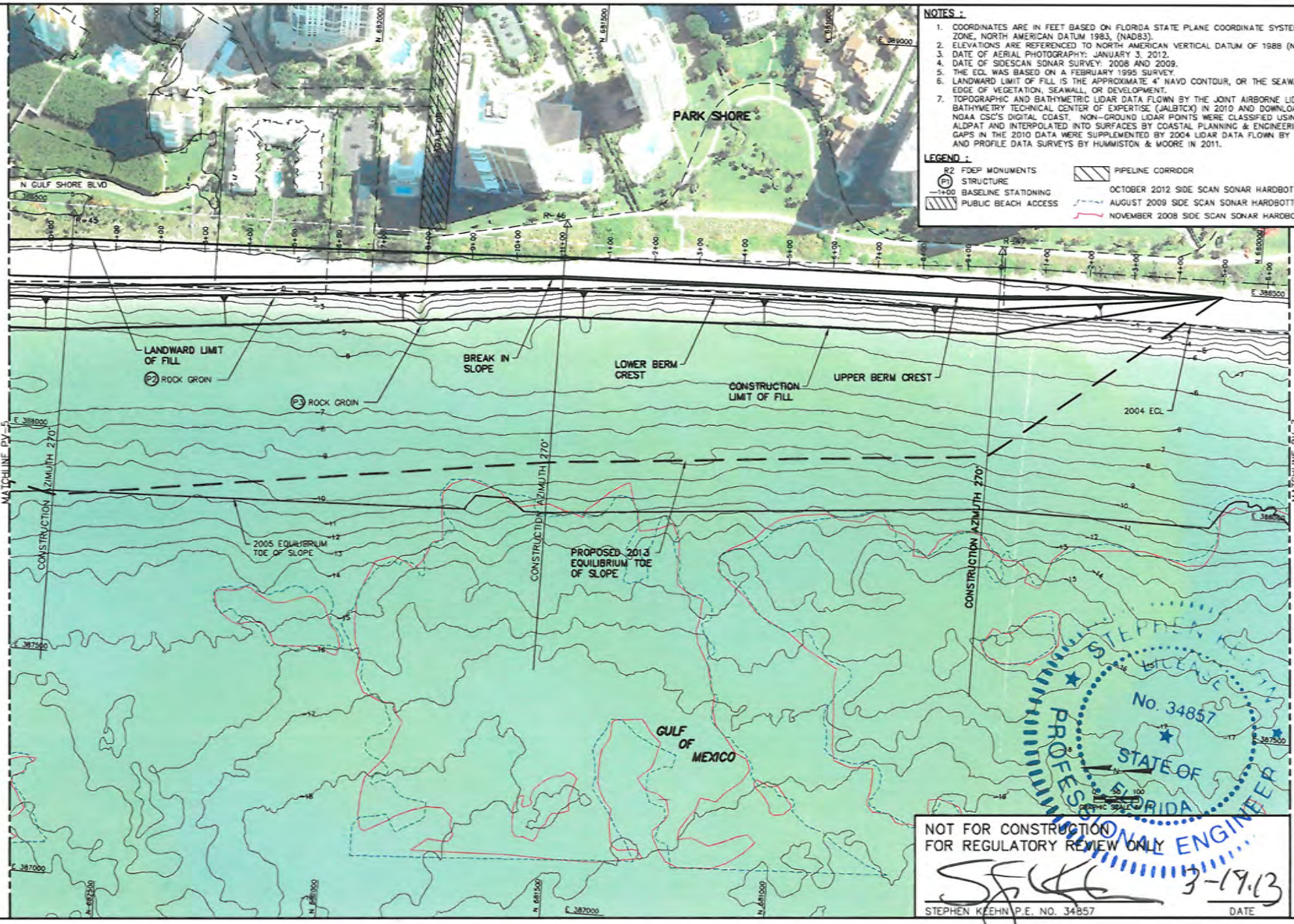
Designed by SK | Drawn by SK | Date 7/25/12 | Plot Scale AS NOTED

Reference Files: 2009 Aerial.dwg

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO. PV-7

SHEET 8 OF 38



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LEGEND :

- R2 FDEP MONUMENTS
- P1 STRUCTURE
- —1+00 BASELINE STATIONING
- PUBLIC BEACH ACCESS
- PIPELINE CORRIDOR
- OCTOBER 2012 SIDE SCAN SONAR HARDBOTTOM
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

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C.O.A. LC #2611
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REVISIONS

No.	Date	Description
1	1/16/14	Rev 1

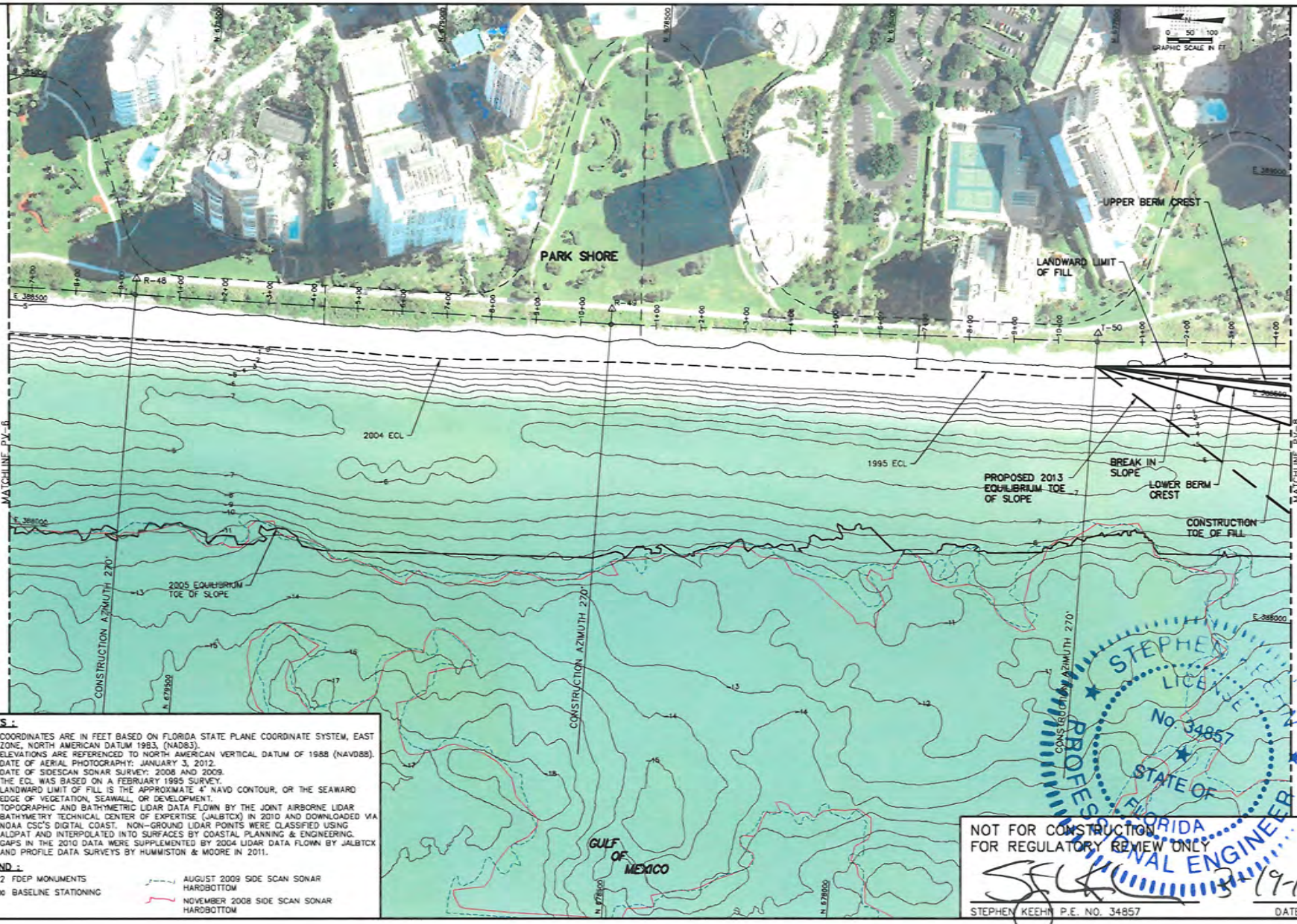
Designed by SK | Checked by AMB | Drawn by SK | Reviewed by SK | Date 7/25/12 | Submitted by SK | Plot Scale AS NOTED | Comm. No. 146935

References: F:\ecp\proj\146935\146935.dwg

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO.
PV-8

SHEET 9 OF 36



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LEGEND :

R2 FDEP MONUMENTS
—1+00 BASELINE STATIONING
AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 3/19-13

STEPHEN KEEHN LICENSED No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
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REVISIONS

No.	Date	Description
1	1/4/13	Rev 1

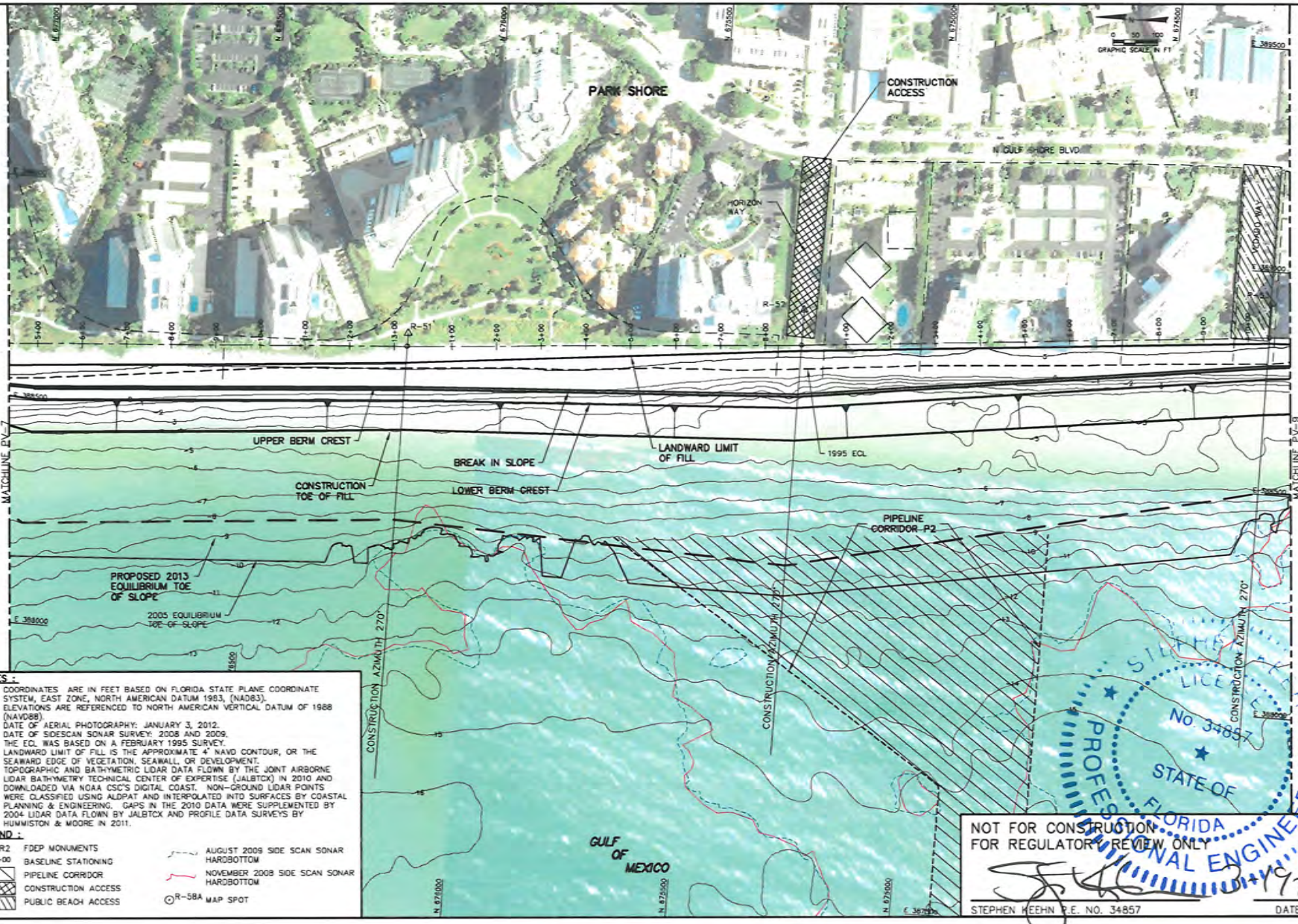
Reference Files: 2009-2010.dwg

Designed by SK | Drawn by SK | Date 7/25/12 | Plot Scale 1" = 40'(D) | Checked by AMB | Reviewed by SK | Submitted by SK | Comm. No. 140925

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO.
PV-9

SHEET 10 OF 36



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LEGEND :

- R2 FDEP MONUMENTS
- —1+00 BASELINE STATIONING
- PIPELINE CORRIDOR
- CONSTRUCTION ACCESS
- PUBLIC BEACH ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM
- R-58A MAP SPOT

COASTAL PLANNING & ENGINEERING, INC.
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www.CoastalPlanning.net
C.O.A. FL 8439
C.O.A. LB 2653

REVISIONS

No.	Date	Description
1	5/14/14	

Reference Files: plans\cadd\dwg

Designed by SK
Drawn by CK
Date 7/25/12
Rev. Scale AS NOTED

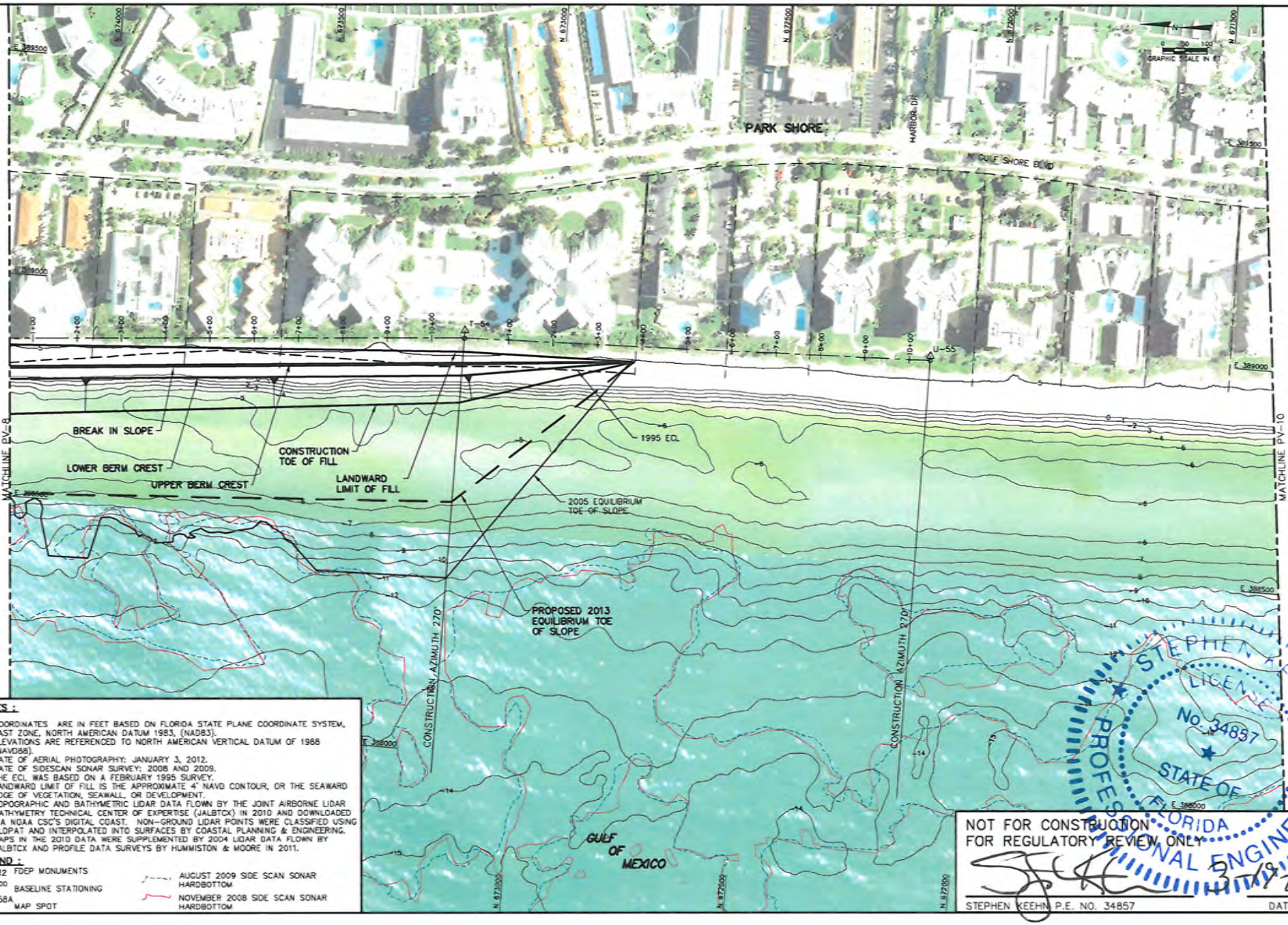
Checked by AMB
Reviewed by HS
Submitted by SK
Contr. No. 14-9125

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT

PLAN VIEW

DRAWING NO.
PV-10

SHEET 11 OF 38



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LEGEND :

R2 FDEP MONUMENTS

—1+00 BASELINE STATIONING

R-58A MAP SPOT

AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM

NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
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STEPHEN KEEHN P.E. NO. 34857 — DATE 3/19/13

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
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C.O.A. FL #2531
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No.	Date	Description
1	3/19/13	REVISIONS

Reference Files: 14923_pv10.dgn

Designed by SK | Checked by AMB
Drawn by SK | Reviewed by SK
Date 7/25/12 | Submitted by SK
Plot Scale AS NOTED | Contr. No. 14923

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO.
PV-11

SHEET 12 OF 36

NOTES :

1. COORDINATES ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD83).
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LEGEND :

R2	FDEP MONUMENTS		PUBLIC BEACH ACCESS
—1+00	BASELINE STATIONING		AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
1	STRUCTURE		NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM
R-58A	MAP SPOT		

NOT FOR CONSTRUCTION
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C.O.A. LA #2511

REVISIONS		
No.	Date	Description
1	6/14/13	Per Comments
2	7/16/13	Per Comments

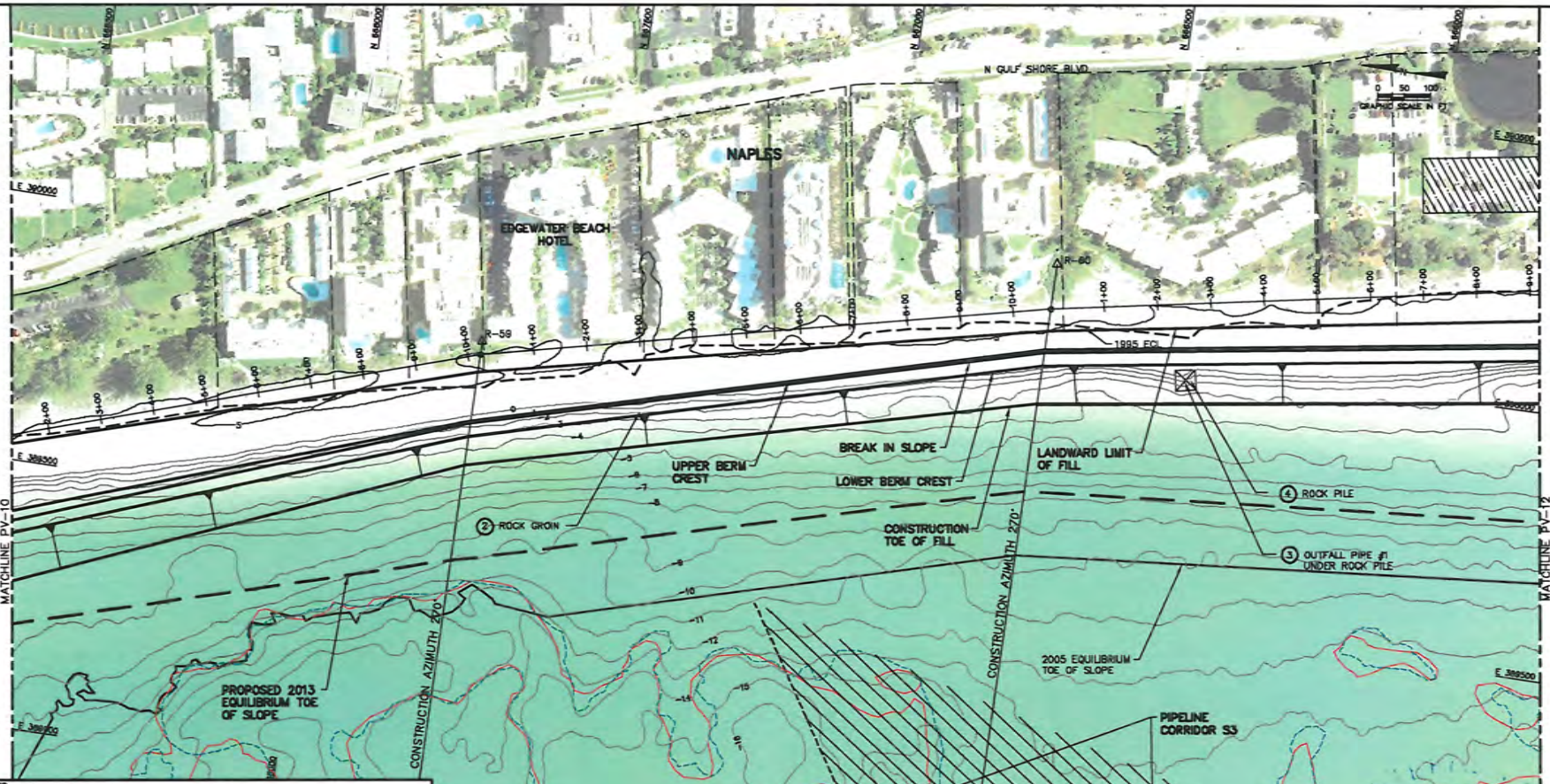
Reference Files: Base, Survey, Xref

Designed by SK | Checked by AMB
Drawn by SK | Reviewed by SK
Date 7/25/12 | Submitted by SK
Plot Scale AS NOTED | Contr. No. 14-6935

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO.
PV-12

SHEET 13 OF 36



NOTES :

1. COORDINATES ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983, (NAD83).
2. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. DATE OF AERIAL PHOTOGRAPHY: JANUARY 3, 2012.
4. DATE OF SIDESCAN SONAR SURVEY: 2008 AND 2009.
5. THE EQL WAS BASED ON A FEBRUARY 1995 SURVEY.
6. LANDWARD LIMIT OF FILL IS THE APPROXIMATE 4' NAVD CONTOUR, OR THE SEAWARD EDGE OF VEGETATION, SEAWALL, OR DEVELOPMENT.
7. TOPOGRAPHIC AND BATHYMETRIC LIDAR DATA FLOWN BY THE JOINT AIRBORNE LIDAR BATHYMETRY TECHNICAL CENTER OF EXPERTISE (JALBTCX) IN 2010 AND DOWNLOADED VIA NOAA CSC'S DIGITAL COAST. NON-GROUND LIDAR POINTS WERE CLASSIFIED USING ALDPAT AND INTERPOLATED INTO SURFACES BY COASTAL PLANNING & ENGINEERING. GAPS IN THE 2010 DATA WERE SUPPLEMENTED BY 2004 LIDAR DATA FLOWN BY JALBTCX AND PROFILE DATA SURVEYS BY HUMMISTON & MOORE IN 2011.
8. CONTRACTOR SHALL PROTECT OUTFALL PIPELINES FROM FILLING WITH SAND DURING CONSTRUCTION.

LEGEND :

R2	FDEP MONUMENTS
—1+00	BASELINE STATIONING
①	STRUCTURE
⊠	OUTFALL PIPE LOCATION
⊙R-58A	MAP SPOT
	PIPELINE CORRIDOR
	PUBLIC BEACH ACCESS
	AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
	NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 3/19/13

PROFESSIONAL ENGINEER — STATE OF FLORIDA — No. 34857

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-6102
FAX (561) 391-6116
C.O.A. FL #4028
C.O.A. LA #2931
www.CoastalPlanning.net

REVISIONS		
Rev.	Date	Description
1	6/24/08	Minor edits, +
2	3/2/09	ADD SERIAL PIPE LOCATION
3	3/19/13	

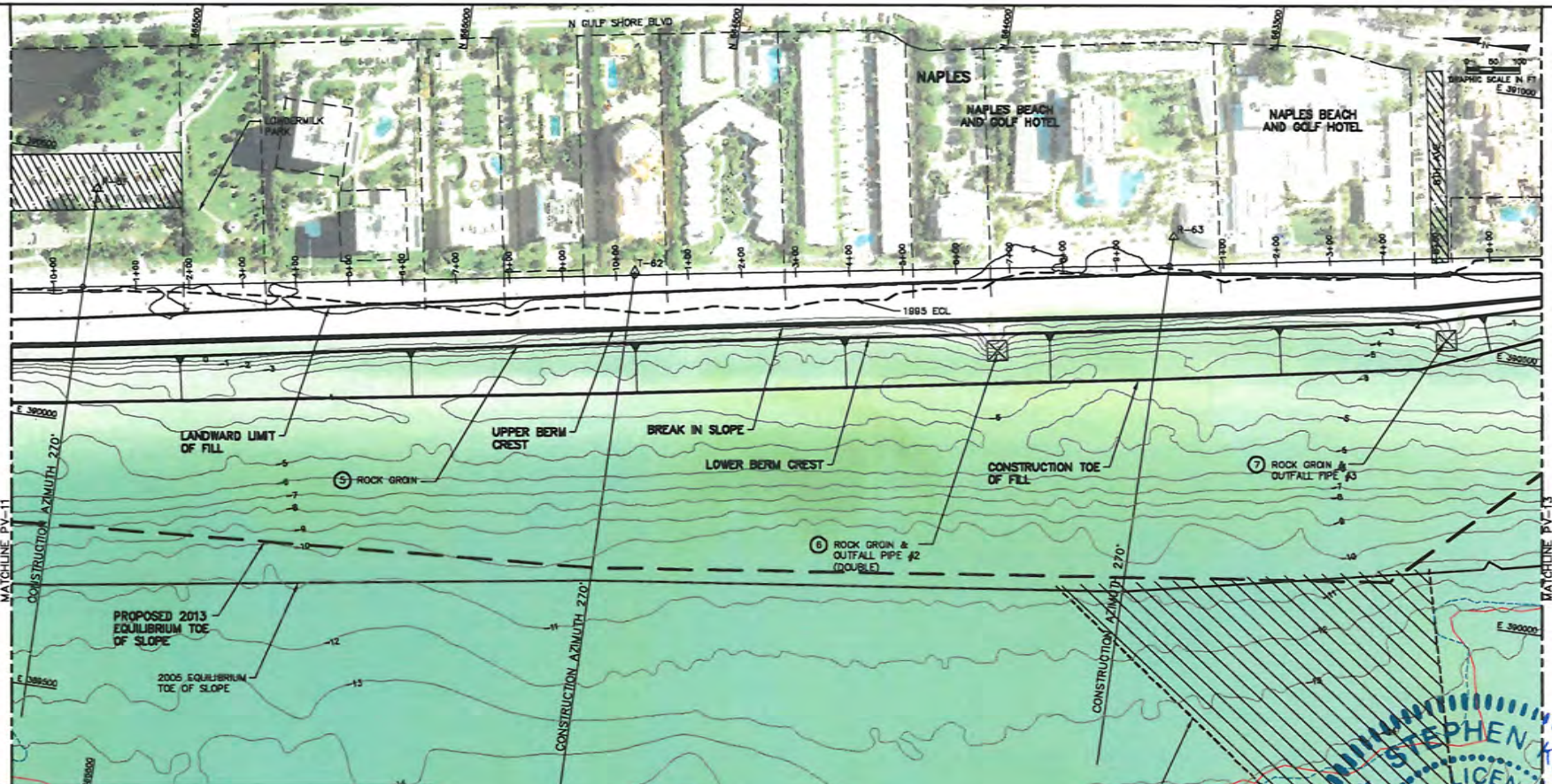
Designed by SK | Drawn by DK | Scale 1" = 250 ft | Ref. Scale AS NOTED | Drawn Rev. 14/01/23 | Checked by AMB | Reviewed by HS | Submitted by SK

Subgroup Plan sheet number

COLLIER COUNTY
BEACH REHOUSEMENT PROJECT
PLAN VIEW

DRAWING NO.
PV-13

SHEET 14 OF 38



NOTES :

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LEGEND :

- R2 — FDEP MONUMENTS
- —1+00 — BASELINE STATIONING
- STRUCTURE
- OUTFALL PIPE LOCATION
- R-58A — MAP SPOT
- PIPELINE CORRIDOR
- PUBLIC BEACH ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2006 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 3-19-13

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
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www.CoastalPlanning.net
C.O.A. FL #6028
C.O.A. LB #2231

No.	Date	Description
1	5/24/12	PERMIT ADD.
2	3/7/13	ADD SURVEY, PIPE LOCATION
3	3/19/13	REV 1

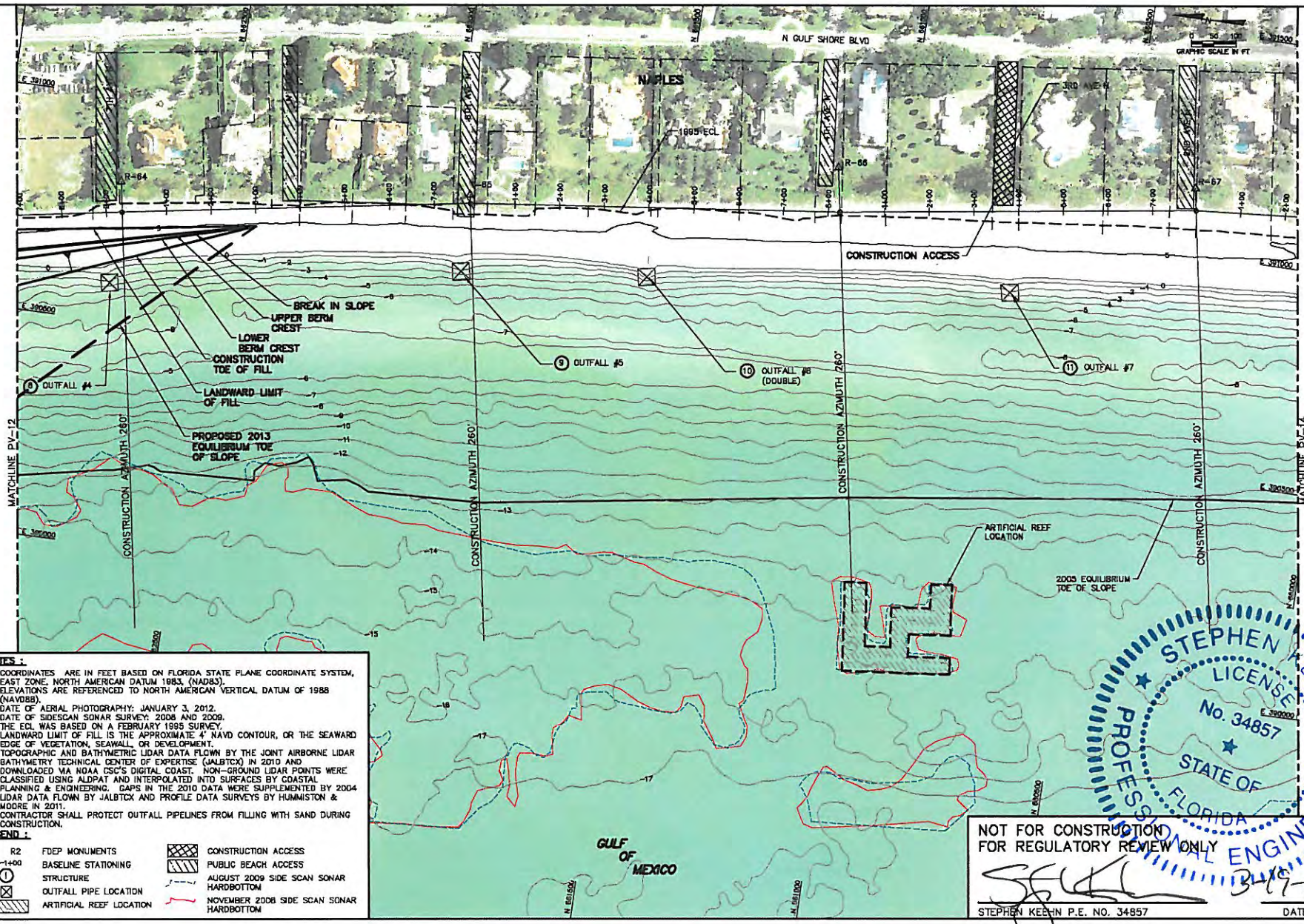
Designed by MAB | Drawn by GK | Date 7/25/12 | Scale AS NOTED | Reviewed by KS | Submitted by SK | Project No. 140923

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT

PLAN VIEW

DRAWING NO. PV-14

SHEET 15 OF 38



NOTES :

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2. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
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LEGEND :

R2	FDEP MONUMENTS
1+00	BASELINE STATIONING
	STRUCTURE
	OUTFALL PIPE LOCATION
	ARTIFICIAL REEF LOCATION
	CONSTRUCTION ACCESS
	PUBLIC BEACH ACCESS
	AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
	NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 3-19-13

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH: (561) 391-8102
FAX: (561) 391-9116
C.O.A. FL #4028
C.O.A. LB #2231
www.CoastalPlanning.net

REVISIONS			
No.	Date	Description	
1	5/14/08	Insert cells, 1	
2	5/14/08	add aerial, per comment	
3	3/14/13	Rev 1	

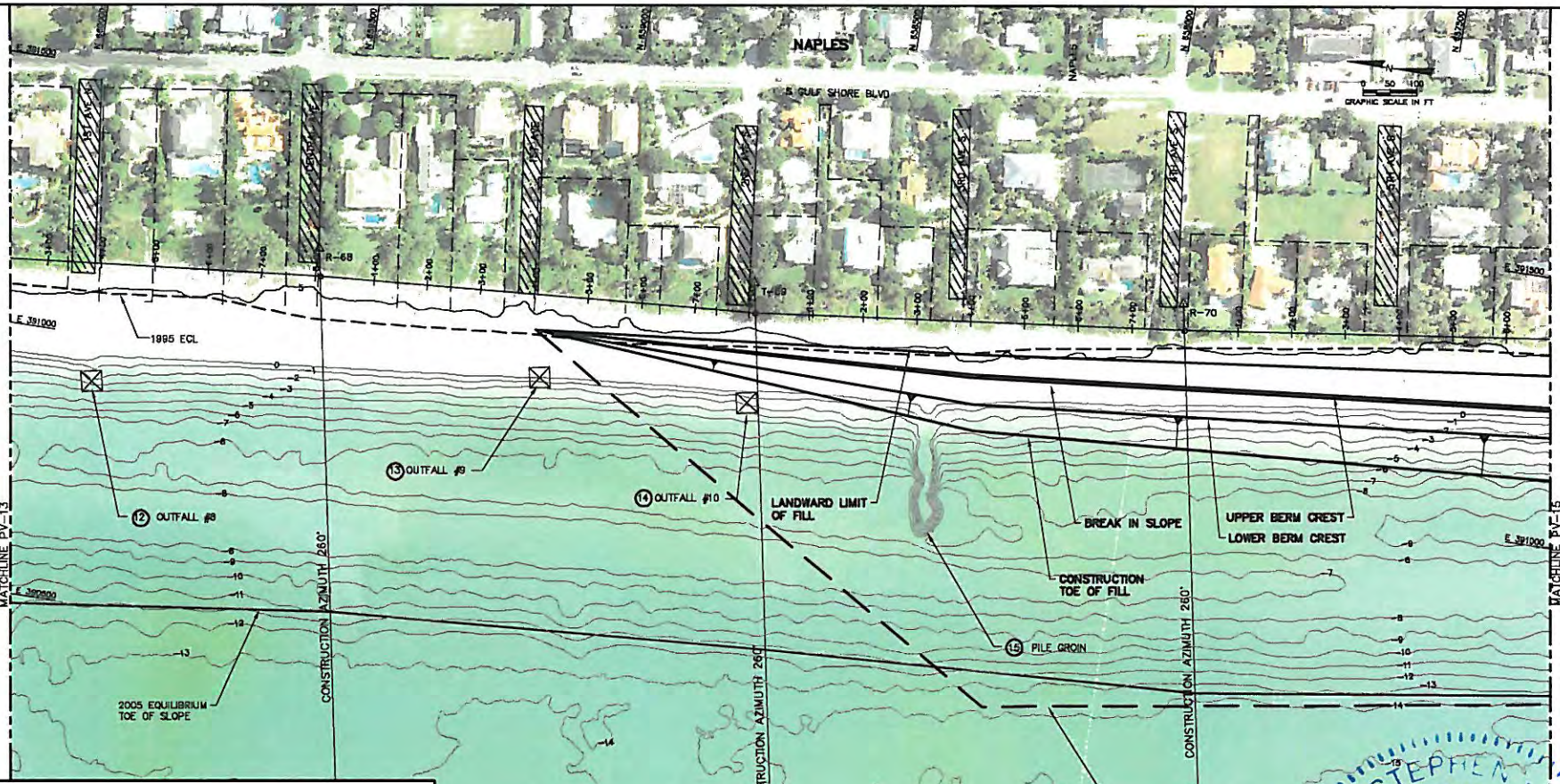
Designed by SK | Drawn by GK | Checked by AMB | Reviewed by NS | Submitted by SK | Date 3/12/13 | Scale AS NOTED | Reference Files | Dwgs. Number 146825

COLLIER COUNTY
BEACH NOURISHMENT PROJECT

PLAN VIEW

DRAWING NO.
PV-15

SHEET 16 OF 36



NOTES :

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2. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
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LEGEND :

- R2 — FDEP MONUMENTS
- 1+00 — BASELINE STATIONING
- STRUCTURE
- OUTFALL PIPE LOCATION
- PUBLIC BEACH ACCESS
- AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
- NOVEMBER 2008 SIDE SCAN SONAR HARDBOTTOM

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 3-19-13

STEPHEN KEEHN — LICENSE No. 34857 — STATE OF FLORIDA — PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 NW. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
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C.O.A. EB-0028
C.O.A. LB-22031
www.CoastalPlanning.net

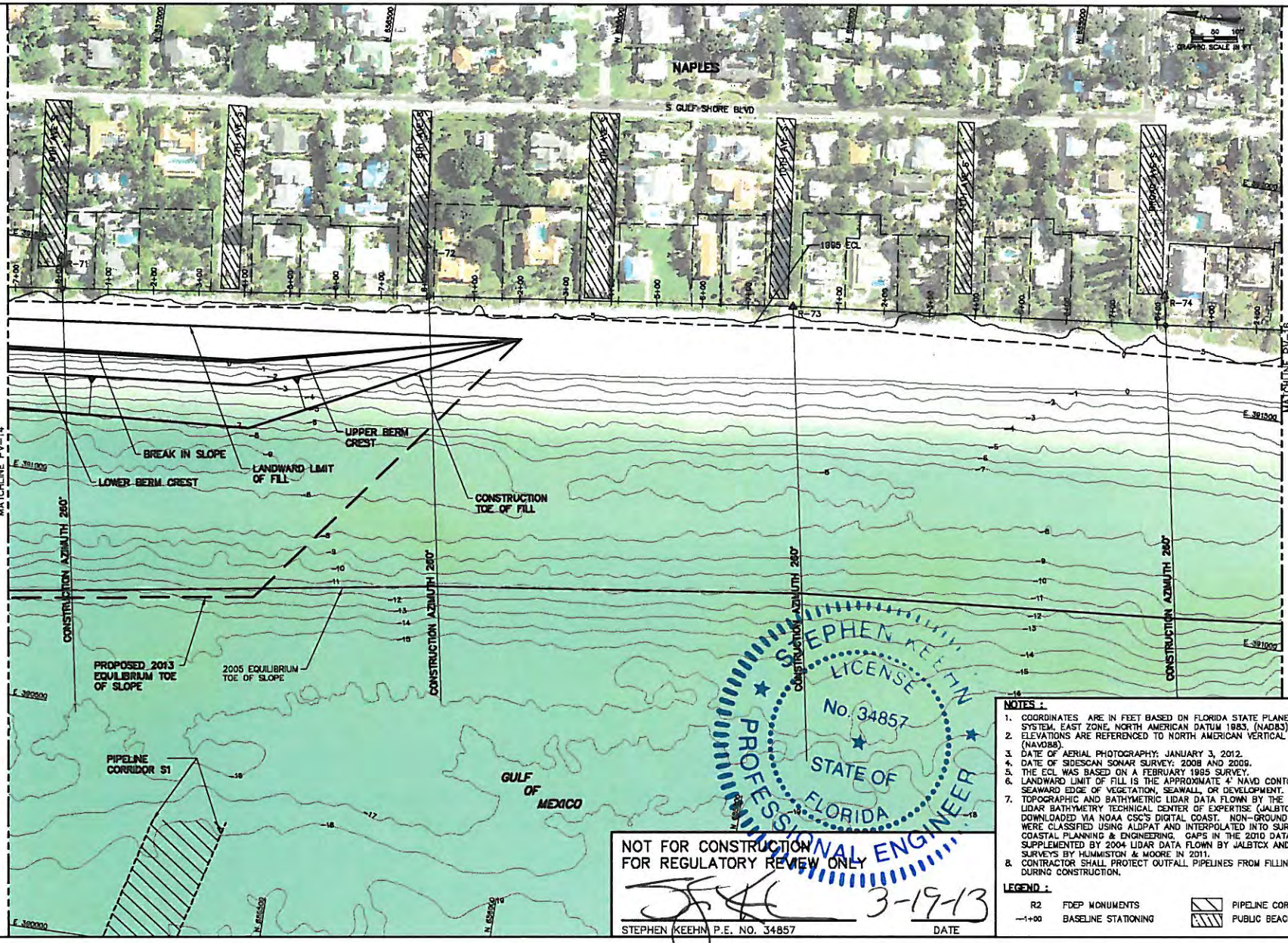
REVISIONS		
Rev.	Date	Description
1	3/4/13	PER AGENCY REVIEWER
0	3/19/13	Issued

Designed by SK | Drawn by DK | Date 7/25/12 | Plot Scale AS NOTED | Checked by AMB | Reviewed by KS | Submitted by SK | Dwg. No. 145923

COLLIER COUNTY
BEACH REVITALIZATION PROJECT
PLAN VIEW

DRAWING NO. PV-16

SHEET 17 OF 36



NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 3-19-13

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

NOTES :

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LEGEND :

R2 — FDEP MONUMENTS
—1+00 — BASELINE STATIONING
PIPELINE CORRIDOR
PUBLIC BEACH ACCESS

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-9102
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www.CoastalPlanning.net
C.O.A. FL #4028
C.O.A. LA #2531

REVISIONS

No.	Description	Date
1	Initial Issue	

Reference Files: Filename

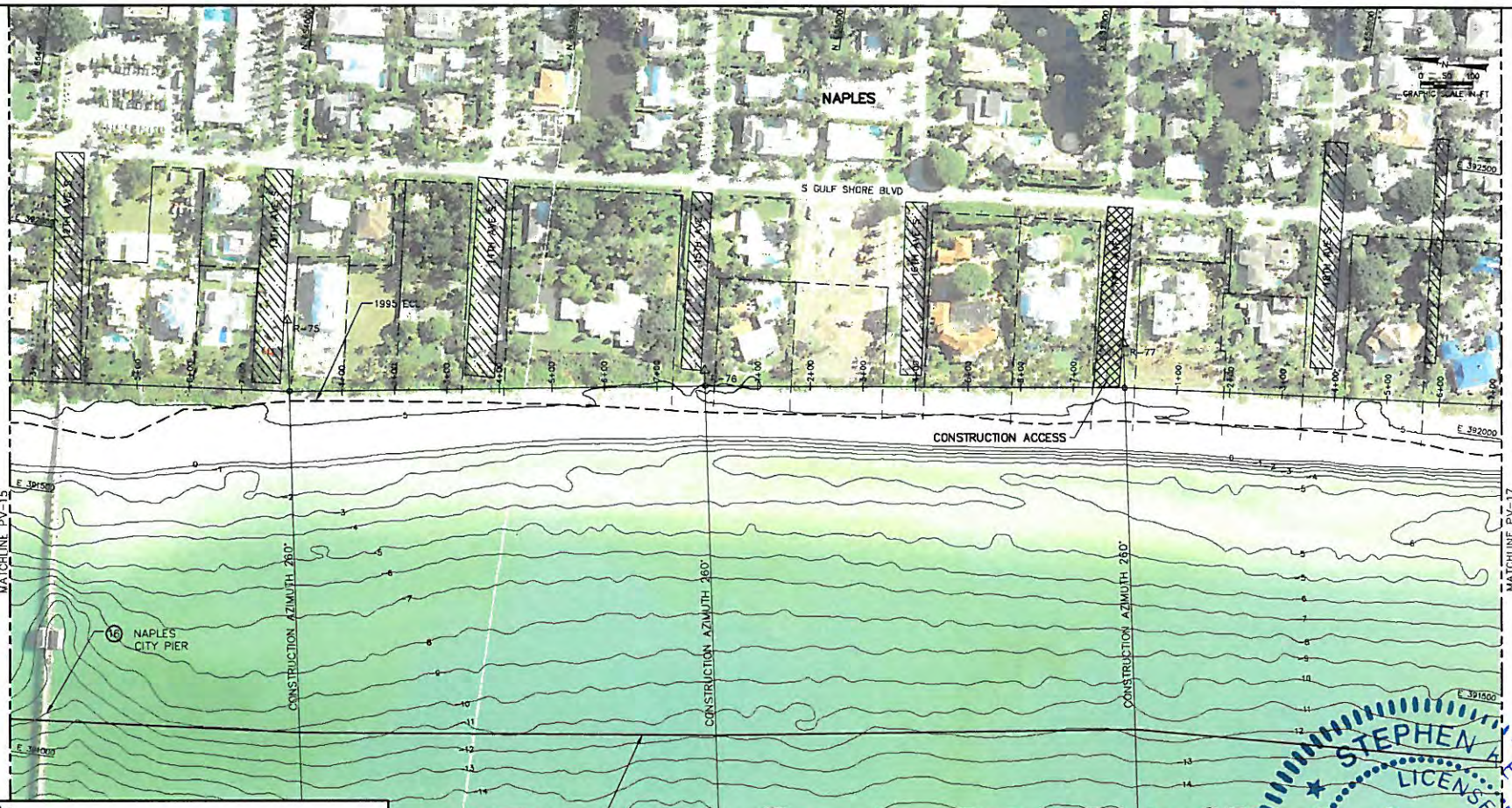
Designed by: JMB
Reviewed by: VS
Submitted by: SK
Date: 7/25/12
Scale: AS NOTED
Dwg. No.: 14892

COLLIER COUNTY
BEACH REINOURISHMENT PROJECT

PLAN VIEW

DRAWING NO.
PV-17

SHEET 18 OF 36



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LEGEND :

R2	FDEP MONUMENTS		CONSTRUCTION ACCESS
—1+00	BASELINE STATIONING		PUBLIC BEACH ACCESS
(16)	STRUCTURE		

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 — DATE 3-19-13

STEPHEN A. KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2401 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
P.H. (561) 391-6132
FAX. (561) 391-9116
C.O.A. FL #4328
C.O.A. LA #2531
www.CoastalPlanning.net

No.	Date	Description
1	3/19/13	Issued

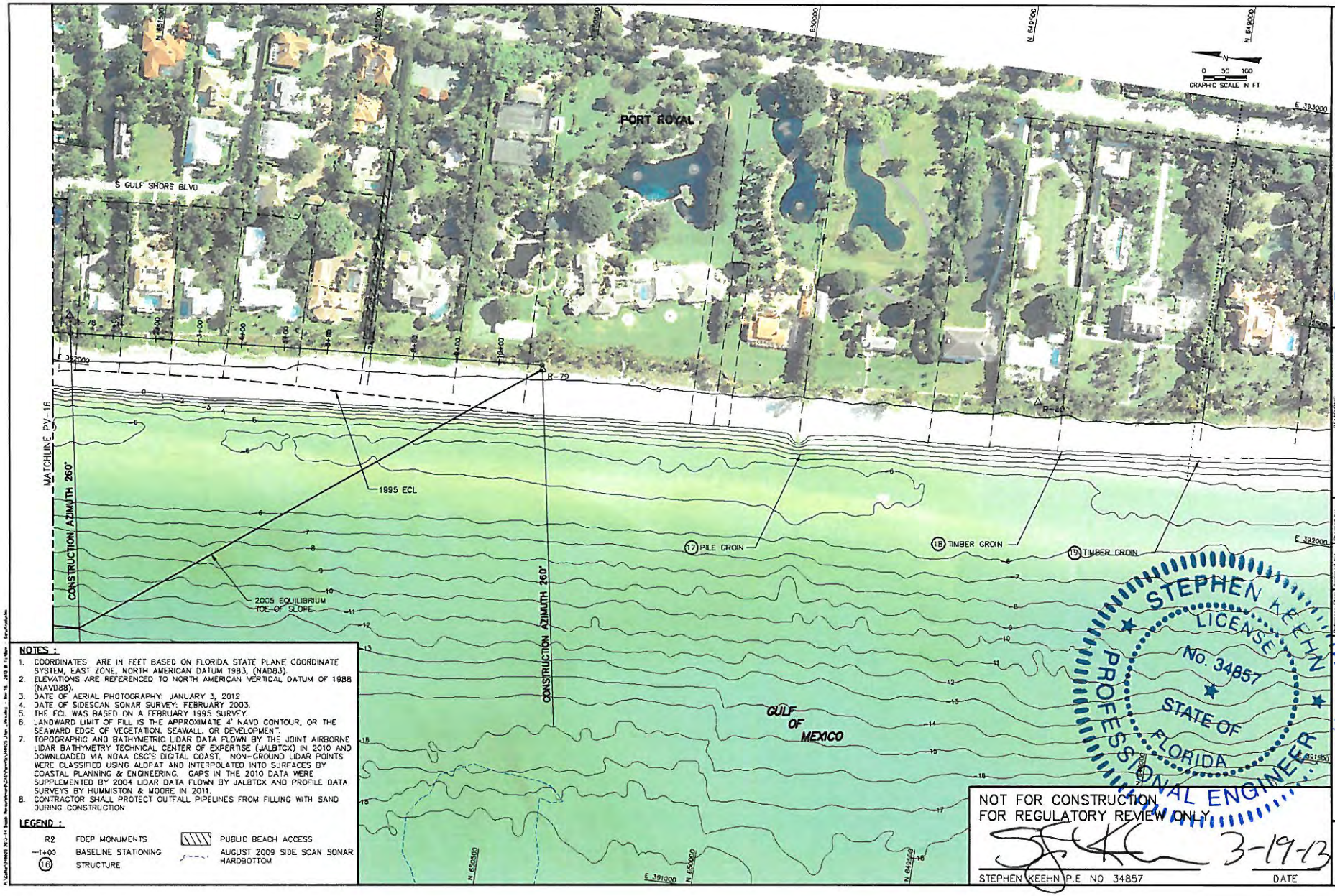
REVISIONS

Designed by SK | Checked by AAB | Reviewed by SK | Submitted by SK | Date 7/25/12 | Comm. No. 1495.35 | Plot Scale AS NOTED | Drawn by SK

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO. PV-18

SHEET 19 OF 38



NOTES :

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LEGEND :

R2	FDEP MONUMENTS		PUBLIC BEACH ACCESS
—1+00	BASELINE STATIONING		AUGUST 2009 SIDE SCAN SONAR HARDBOTTOM
(16)	STRUCTURE		

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E NO 34857 — DATE 3-19-13

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

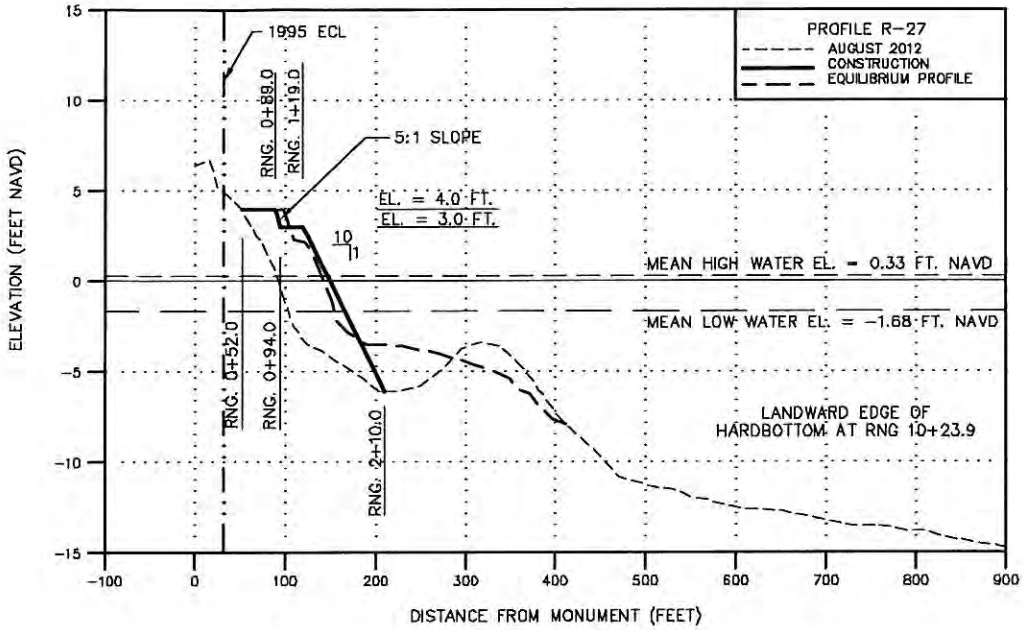
COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 395-8332
FAX (561) 395-8115
C.O.A. FL 8428
C.O.A. FL 42531
www.CoastalPlanning.net

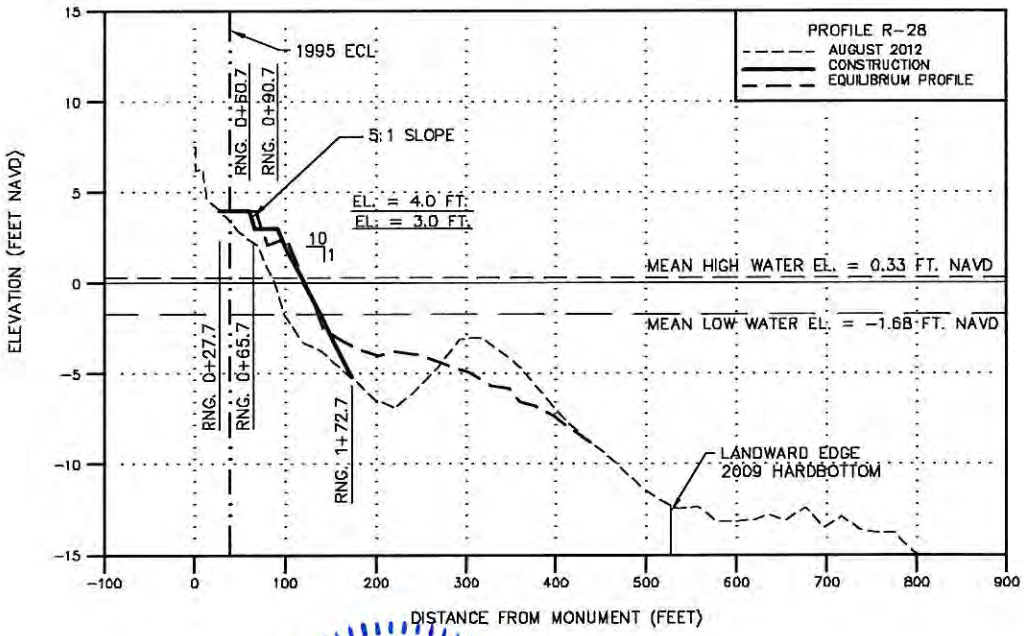
No.	Date	Description
1	3/19/13	REVISIONS

Reference Files: pcsa1,pcsa2.dgn
Designed by SK
Drawn by SK
Date 7/25/12
Plot Scale AS NOTED
Checked by AAB
Reviewed by SK
Submitted by SK
Comm. No. 146375

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PLAN VIEW

DRAWING NO.
PV-19
SHEET 20 OF 36





NOTE:

1. SELECTED CROSS SECTIONS DEPICTED AS EXAMPLES IN EACH REACH.

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. No. 34857

3-19-13
DATE

REVISIONS		
DATE	BY	DESCRIPTION
3/18/13	SK	RAI REVISION 1

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
TYPICAL CROSS SECTIONS

COASTAL PLANNING & ENGINEERING, INC.
A SHAW GROUP COMPANY
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL. #4022
www.CoastalPlanning.net

DATE: 7/25/12
BY: GK
COMM NO.: 146925
SHEET: 21 OF 36

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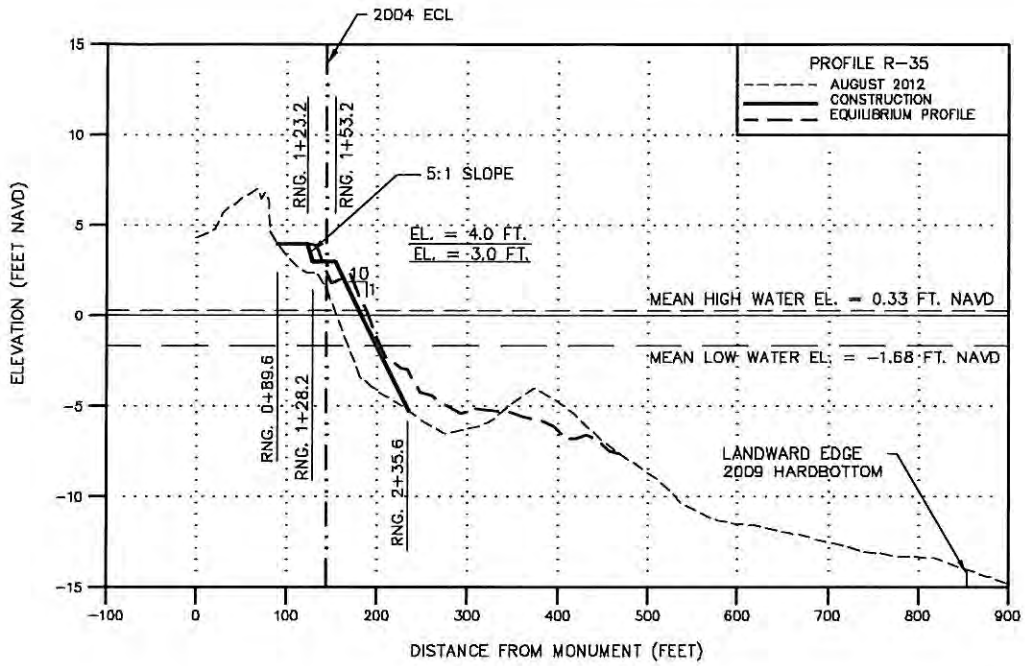

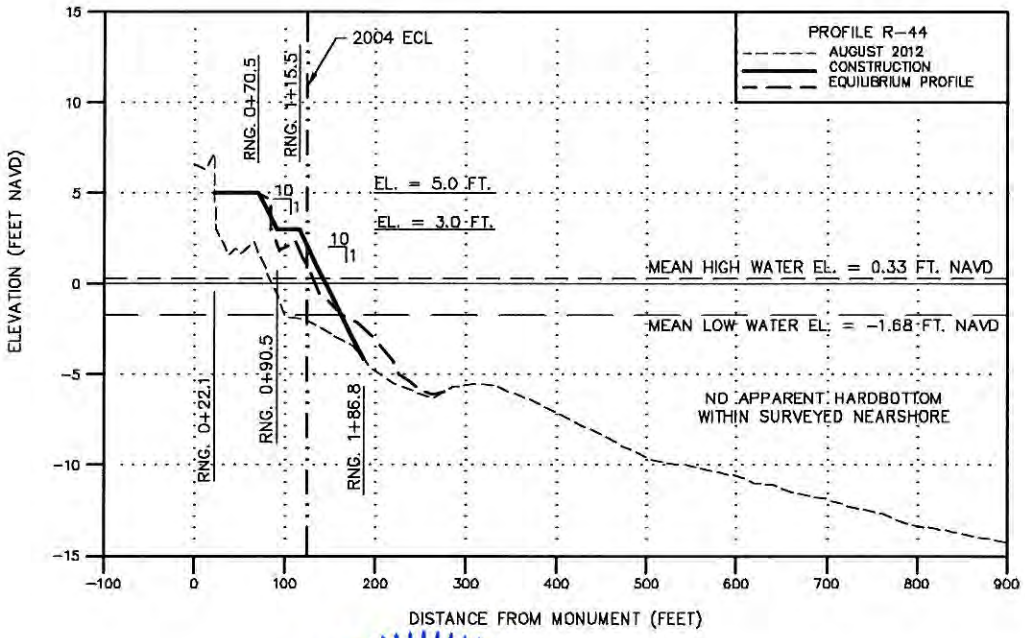

NOTE:

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STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

3-19-13

STEPHEN KEEHN P.E. No. 34857 — DATE

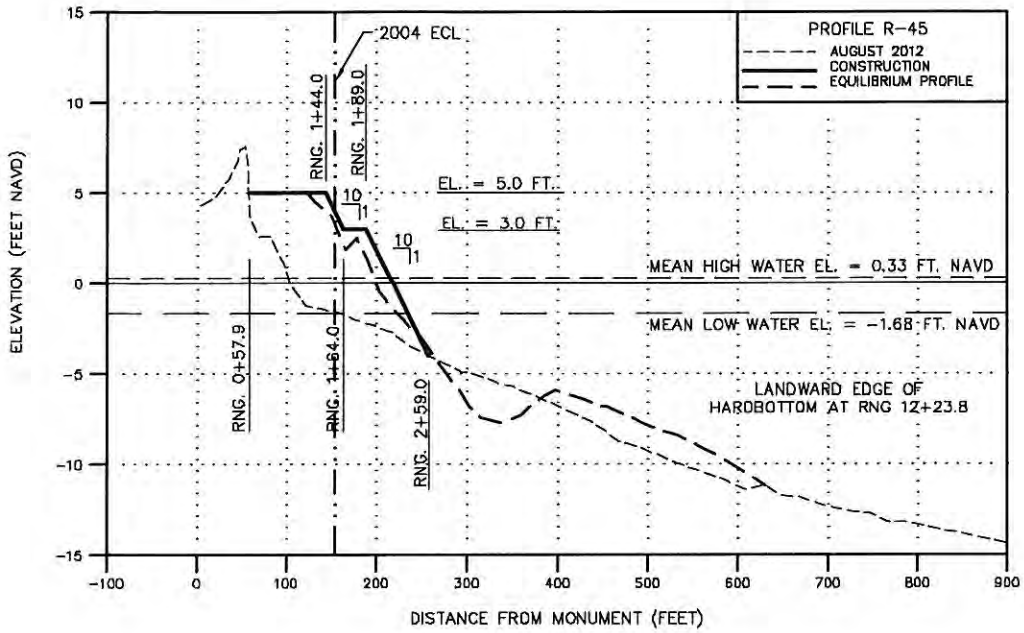
REVISIONS		
DATE	BY	DESCRIPTION
3/18/13	SK	RAI REVISION 1

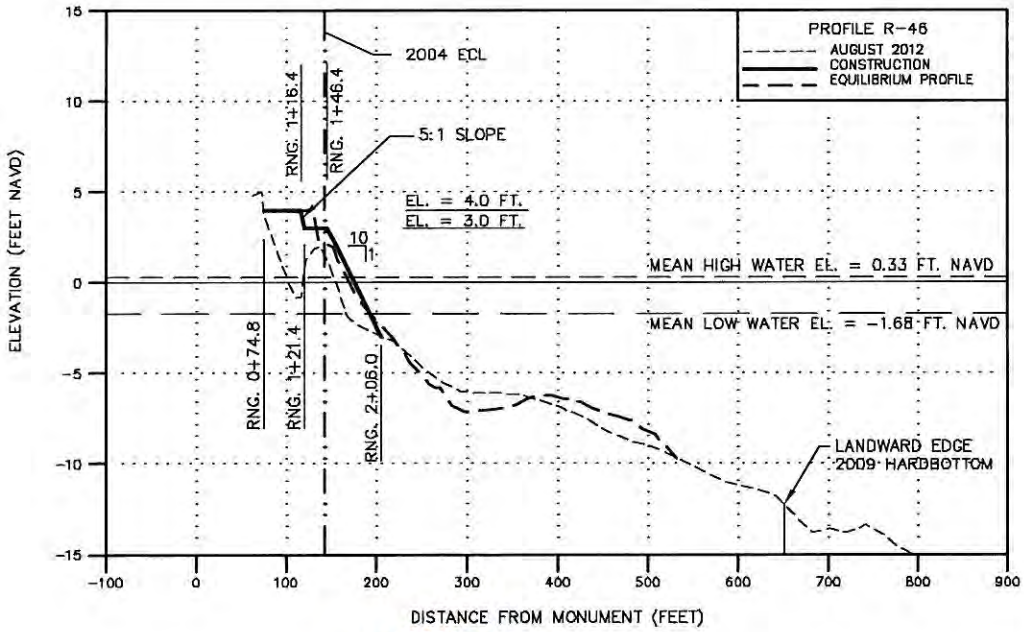
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
TYPICAL CROSS SECTIONS

COASTAL PLANNING & ENGINEERING, INC.
A SHAW GROUP COMPANY
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-5102
FAX (561) 391-6116
C.O.A. FL. #4028
www.CoastalPlanning.net

DATE: 7/25/12
BY: GK
COMM NO.: 146925
SHEET: 22 of 36

P:\Collier\146925 2013-14 Beach Renourishment\CAD\Permits\146925 Fill Cross Sections.dwg - Mar 19, 2013 @ 11:16am - Gary.Krystyniak





NOTE:

1. SELECTED CROSS SECTIONS DEPICTED AS EXAMPLES IN EACH REACH

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

3-19-13

STEPHEN KEEHN P.E. No. 34857 — DATE

REVISIONS		
DATE	BY	DESCRIPTION
3/18/13	SK	RAI REVISION 1

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
TYPICAL CROSS SECTIONS

COASTAL PLANNING & ENGINEERING, INC.
A SHAW GROUP COMPANY
2481 N.W. BOCA RATON BOULEVARD
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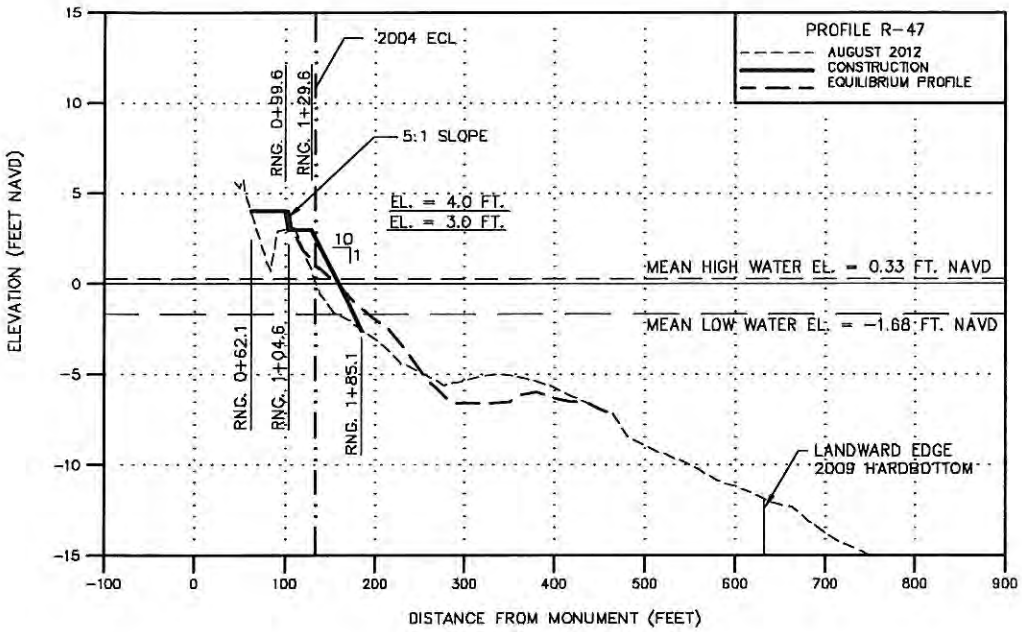
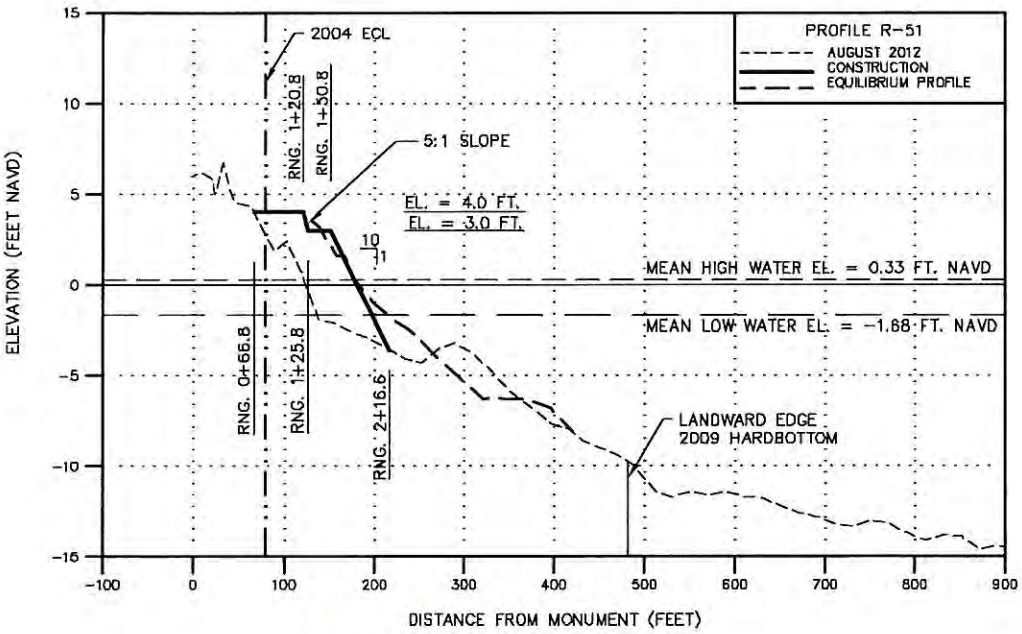
C.O.A. #1 #4023
www.CoastalPlanning.net

DATE: 7/25/12
BY: GK
COMM NO.: 146925
SHEET: 23 OF 36

P:\Collier\146925 2013-14 Beach Renourishment\CAD\Permits\146925_Fill_Cross_Sections.dwg - Mar 19, 2013 @ 11:16am - Gary.Krystyniak





NOTE:

1. SELECTED CROSS SECTIONS DEPICTED AS EXAMPLES IN EACH REACH.

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

3-19-13

STEPHEN KEEHN P.E. No. 34857 — DATE

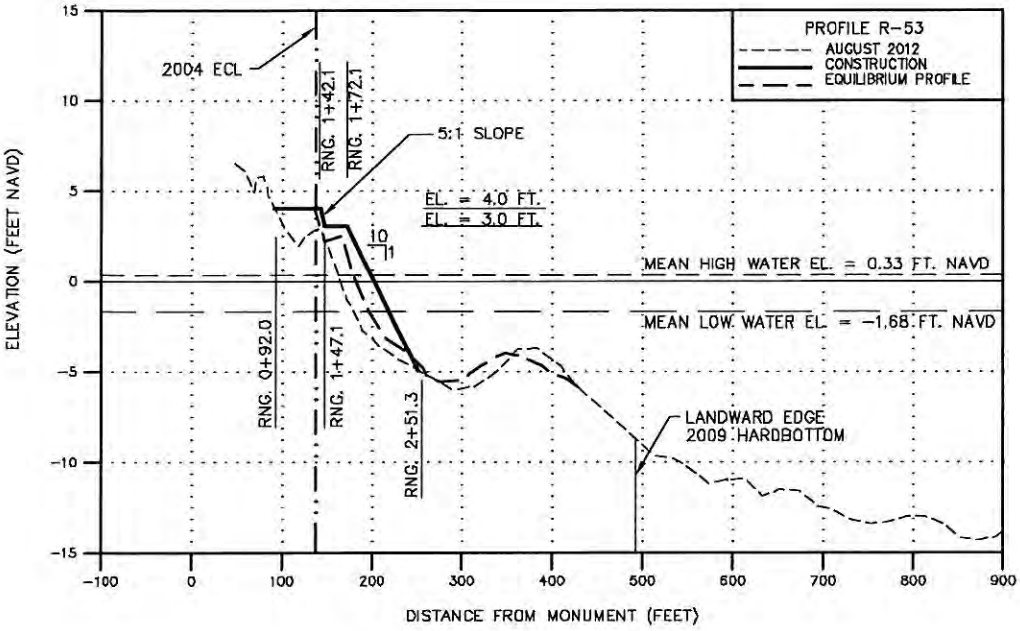
REVISIONS		
DATE	BY	DESCRIPTION
3/18/13	SK	RAI REVISION 1

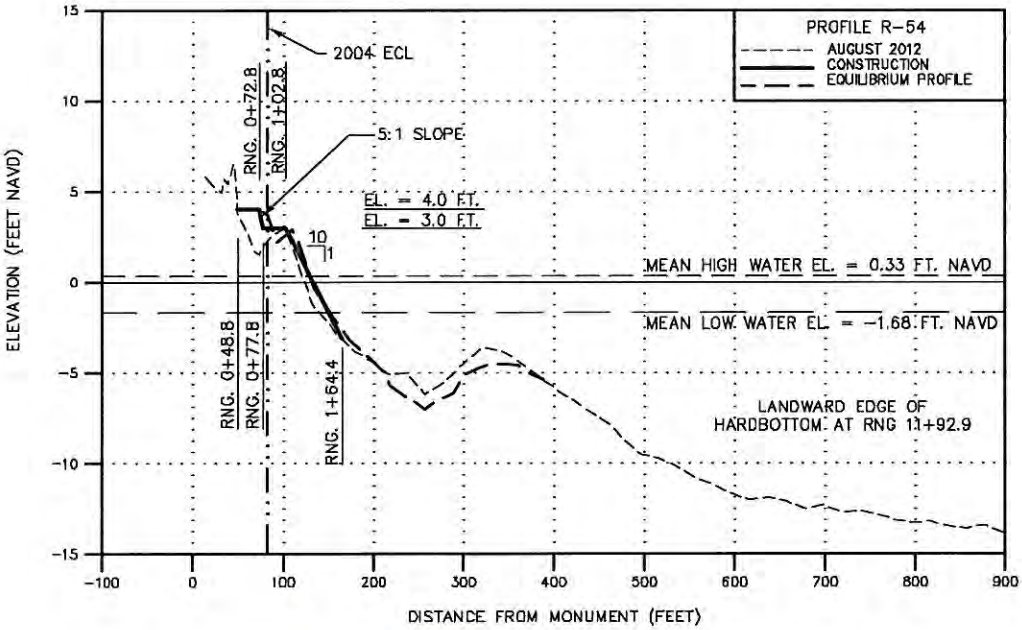
COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
TYPICAL CROSS SECTIONS

COASTAL PLANNING & ENGINEERING, INC.
A SHAW GROUP COMPANY
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL. #4023
www.CoastalPlanning.net

DATE: 7/25/12
BY: GK
COMM NO.: 146925
SHEET: 24 OF 36

P:\Collier\146925 2013-14 Beach Renourishment\CAD\Permits\146925 Fill Cross Sections.dwg-Mar 19, 2013 @ 11:16am-Gary Krystyniak





NOTE:

1. SELECTED CROSS SECTIONS DEPICTED AS EXAMPLES IN EACH REACH.

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

3-19-13

STEPHEN KEEHN P.E. No. 34857 — DATE

REVISIONS		
DATE	BY	DESCRIPTION
3/18/13	SK	RAI REVISION 1

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
TYPICAL CROSS SECTIONS

COASTAL PLANNING & ENGINEERING, INC.
A SHAW GROUP COMPANY
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PH. (561) 391-8102
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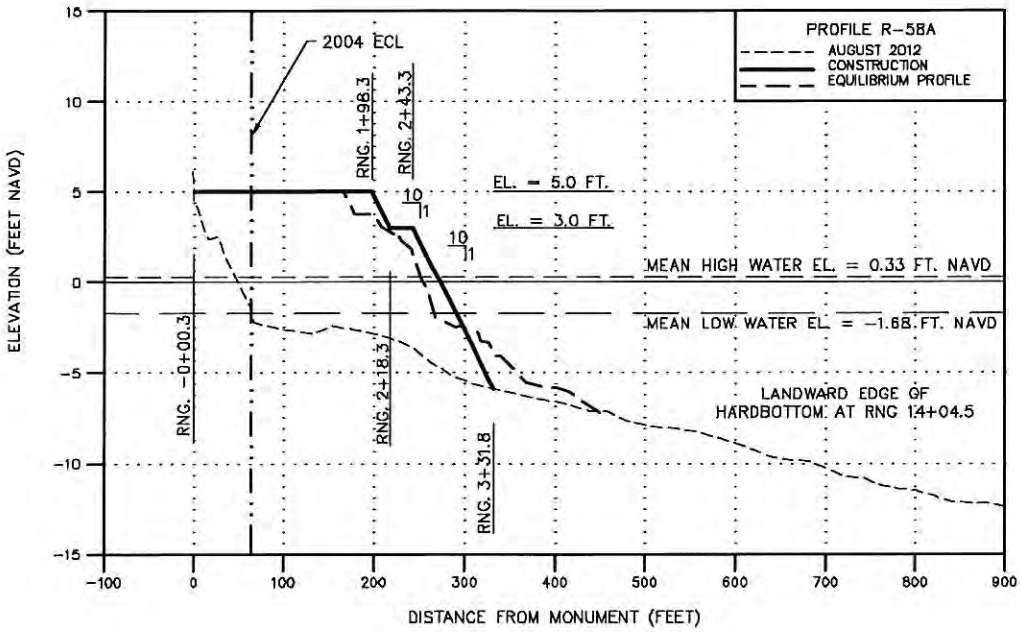
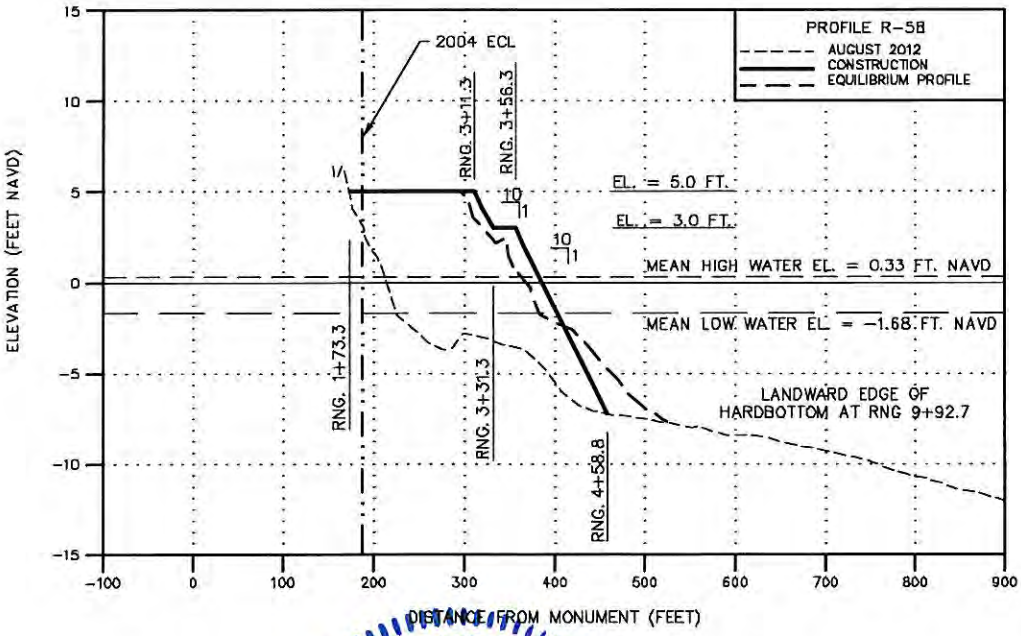
DATE: 7/25/12
BY: GK
COMM NO.: 146925
SHEET: 25 OF 36

P:\Collier\146925 2013-14 Beach Renourishment\CAD\Permits\146925 Fill Cross Sections.dwg - Mar 19, 2013 @ 11:17am - Gary.Krystyniak





NOTE:

1. SELECTED CROSS SECTIONS DEPICTED AS EXAMPLES IN EACH REACH.

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. No. 34857

3-19-13
DATE

REVISIONS		
DATE	BY	DESCRIPTION
3/18/13	SK	RAI REVISION 1

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
TYPICAL CROSS SECTIONS

COASTAL PLANNING & ENGINEERING, INC.
A SHAW GROUP COMPANY
2481 N.W. BOCA RATON BOULEVARD
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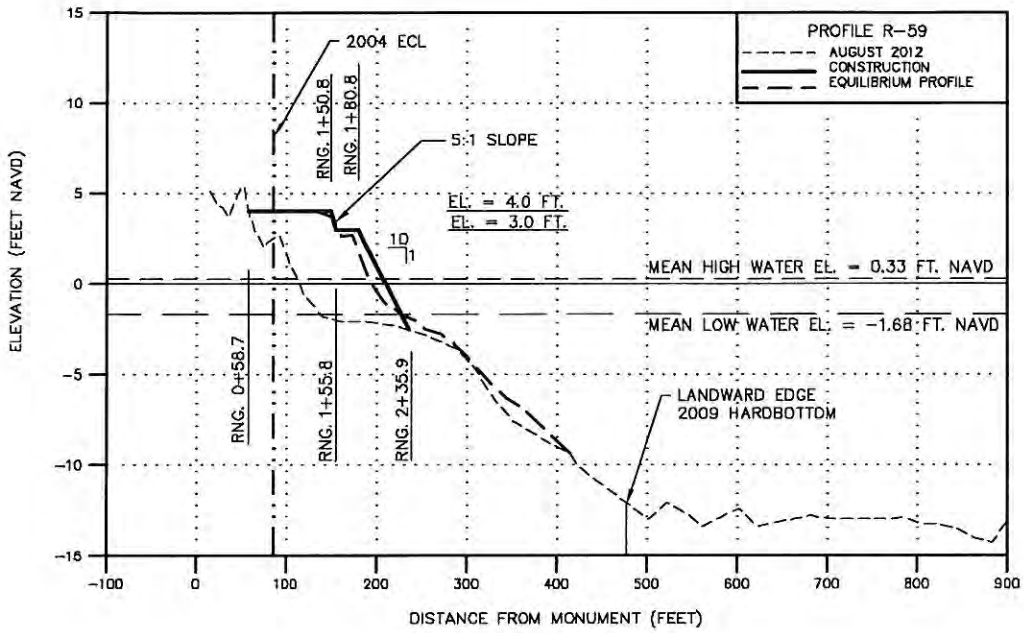
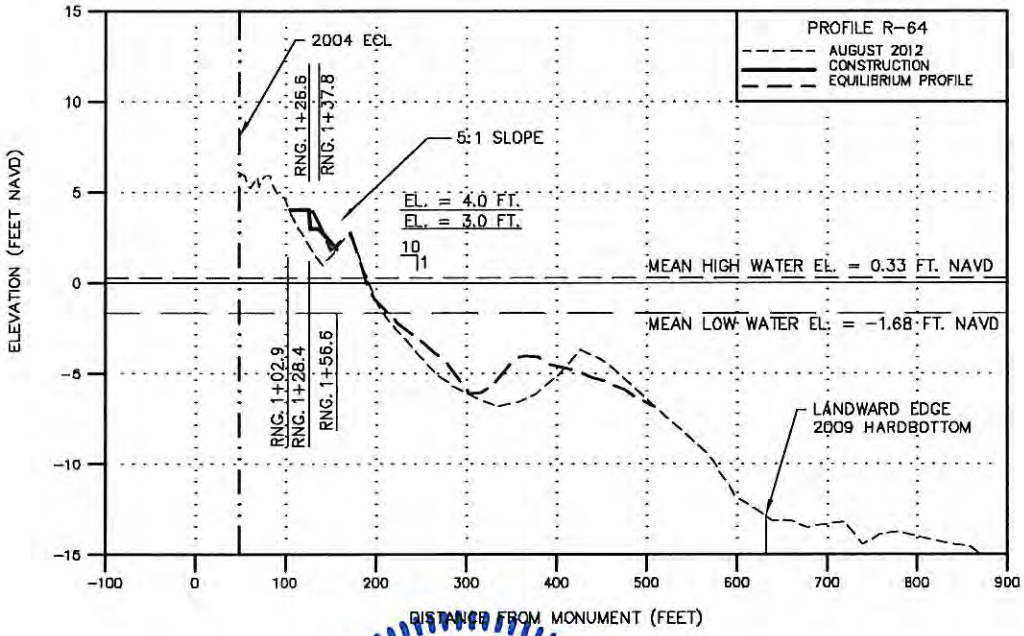
www.CoastalPlanning.net

DATE: 7/25/12
BY: GK
COMM NO.: 146925
SHEET: 26 OF 36

P:\Collier\146925 2013-14 Beach Renourishment\CAD\Permits\146925 Fill Cross Sections.dwg-Mar 19, 2013 @ 11:17am-Gary.Krystyniak





NOTE:

1. SELECTED CROSS SECTIONS DEPICTED AS EXAMPLES IN EACH REACH.

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. No. 34857

3-19-13
DATE

REVISIONS		
DATE	BY	DESCRIPTION
3/18/13	SK	RAI REVISION 1

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
TYPICAL CROSS SECTIONS

COASTAL PLANNING & ENGINEERING, INC.
A SHAW GROUP COMPANY
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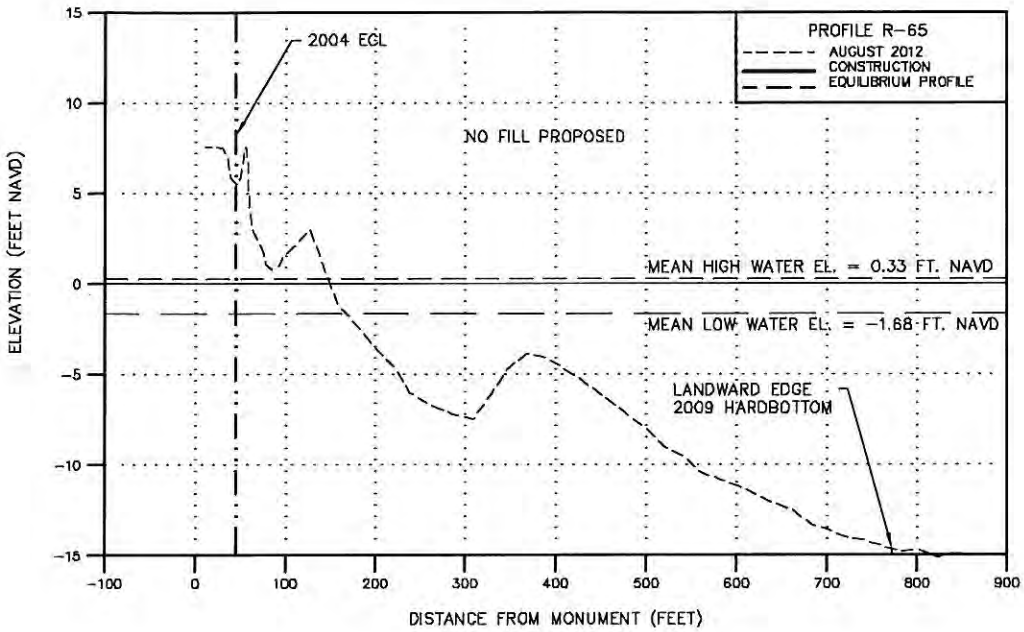
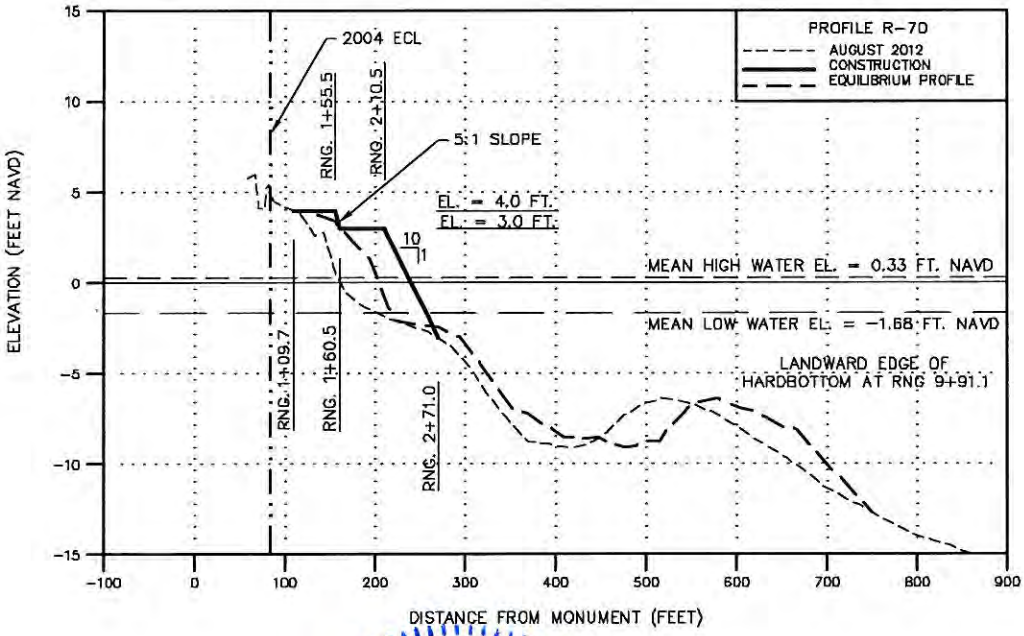
PH. (561) 391-8102
FAX (561) 391-6116
C.O.A. #: EC0000
www.CoastalPlanning.net

DATE: 7/25/12
BY: GK
COMM NO.: 146925
SHEET: 27 OF 36

P:\Collier\146925 2013-14 Beach Renourishment\CAD\Permits\146925_Fill_Cross_Sections.dwg - Mar 19, 2013 @ 11:17am - Gary.Krystyniak





NOTE:

1. SELECTED CROSS SECTIONS DEPICTED AS EXAMPLES IN EACH REACH.

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

3-19-13

STEPHEN KEEHN P.E. No. 34857 — DATE

REVISIONS		
DATE	BY	DESCRIPTION
3/18/13	SK	RAI REVISION 1

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
TYPICAL CROSS SECTIONS

COASTAL PLANNING & ENGINEERING, INC.
A SHAW GROUP COMPANY
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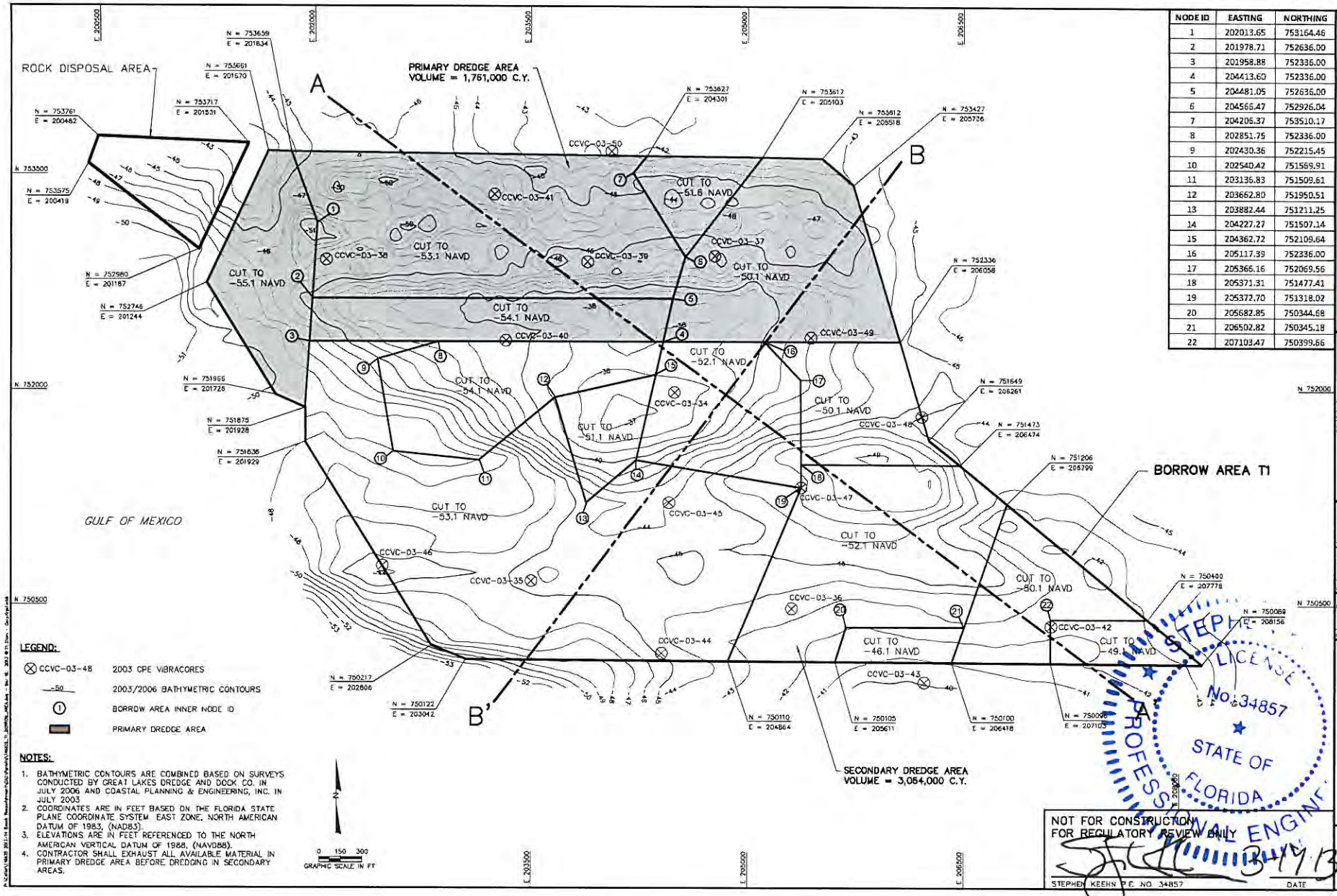
DATE: 7/25/12
BY: GK
COMM NO.: 146925
SHEET: 28 OF 36

P:\Collier\146925 2013-14 Beach Renourishment\CAD\Permits\146925 Fill Cross Sections.dwg - Mar 19, 2013 @ 11:18am - Gary.Krystyniak



NODE ID	EASTING	NORTHING
1	202013.65	753164.46
2	201978.71	752636.00
3	201958.88	752336.00
4	204413.60	752336.00
5	204481.05	752636.00
6	204566.47	752926.04
7	204206.37	753510.17
8	202851.75	752336.00
9	202430.36	752215.45
10	202540.42	751569.91
11	203136.83	751509.61
12	203662.80	751950.51
13	203882.44	751211.25
14	204227.27	751507.14
15	204362.72	752109.64
16	205117.39	752336.00
17	205366.16	752069.56
18	205371.31	751477.41
19	205372.70	751318.02
20	205682.85	750344.68
21	206502.82	750345.18
22	207103.47	750399.66

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
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FAX (561) 391-6118
C.O.A. FL #4078
C.O.A. LA #2531
www.CoastalPlanning.net

No.	Date	Description
1	6/26/03	Issued for review
2	11/07/13	Issued for permit

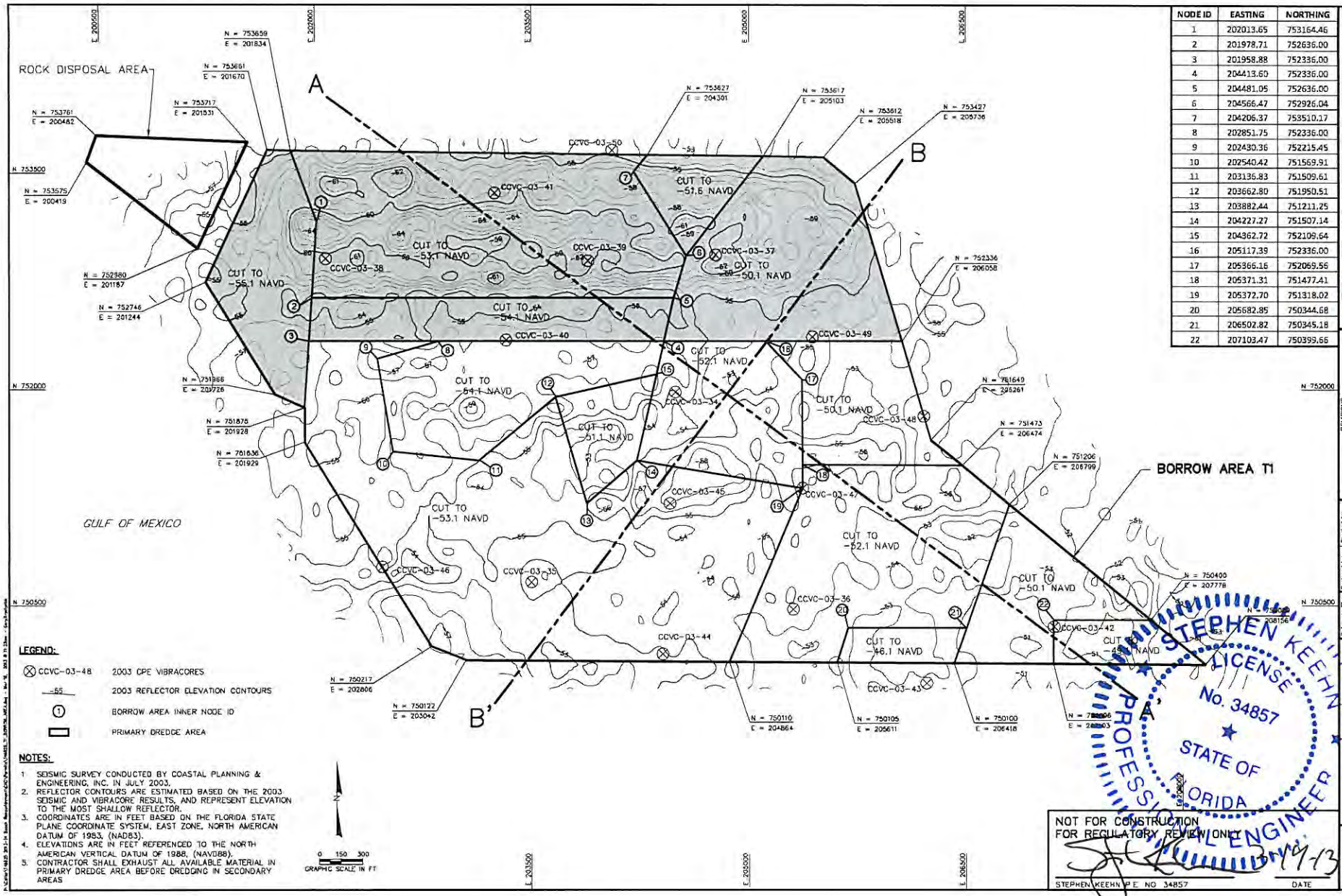
Designed by SK | Checked by AMB | Reviewed by NS | Submitted by SK
Drawn by DK | Date 7/25/12 | Scale AS NOTED | Contr. No. 146325
Reference Files

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT

BORROW AREA T1
BATHYMETRY CONTOURS

DRAWING NO.
BA-1

SHEET 29 OF 36



NODE ID	EASTING	NORTHING
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3	201958.88	752336.00
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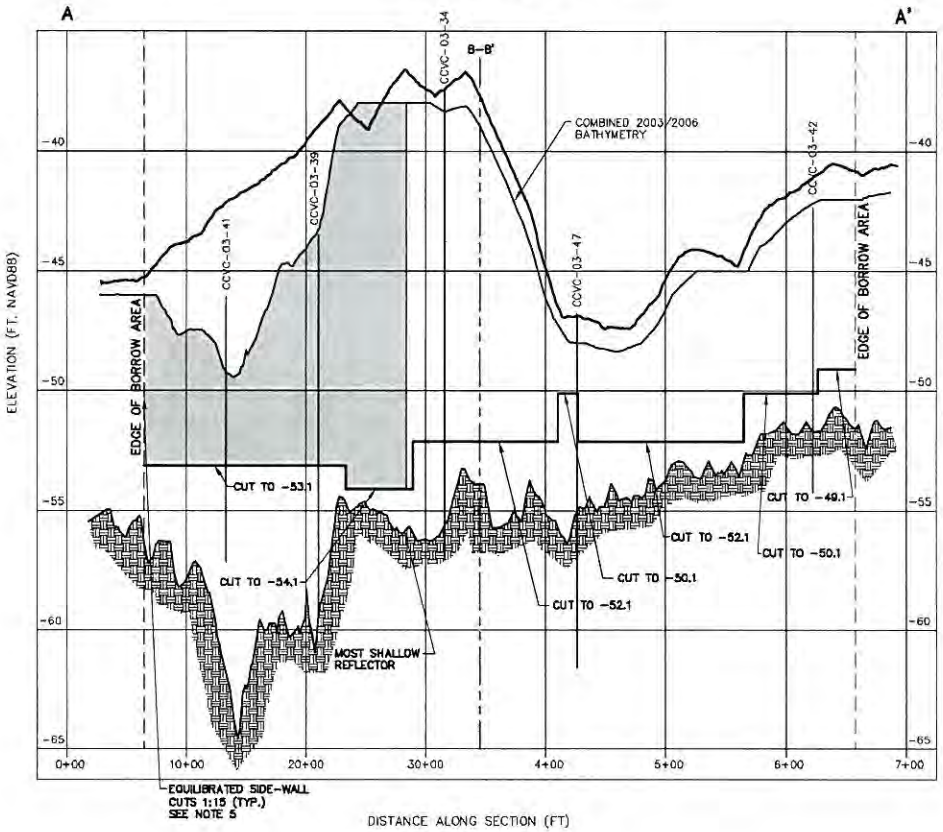
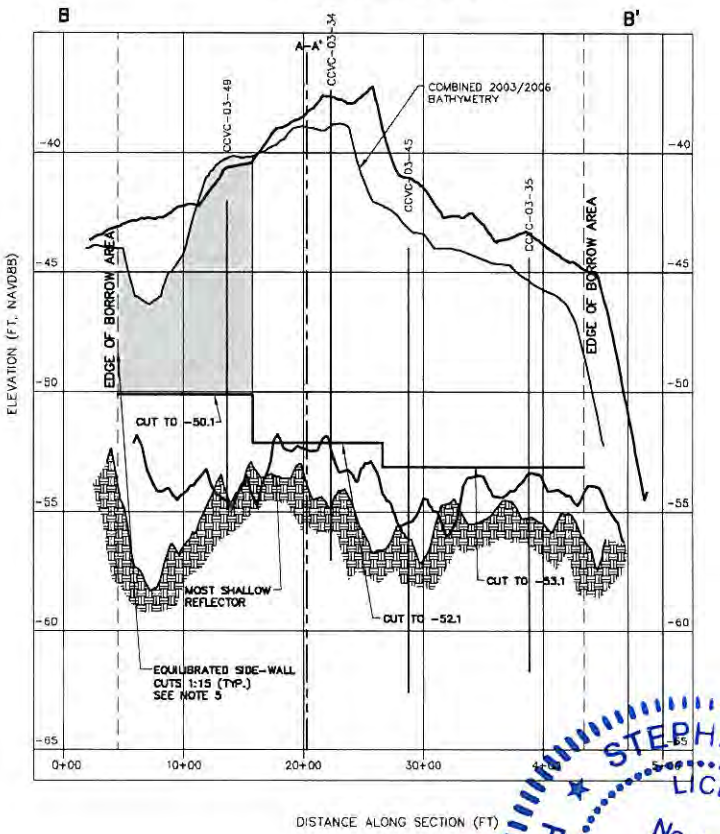
7	204206.37	753510.17
8	202851.75	752336.00
9	202430.36	752215.45
10	202540.42	751569.91
11	203136.83	751509.61
12	203662.80	751950.51
13	203882.44	751211.25
14	204227.27	751507.14
15	204362.72	752109.64
16	205117.39	752336.00
17	205366.16	752069.56
18	205371.31	751477.41
19	205372.70	751318.02
20	205682.85	750344.68
21	206502.82	750345.18
22	207103.47	750399.66

BORROW AREA T1 A–A'



BORROW AREA T1 B–B'



NOTES:

1. ELEVATIONS ARE IN FEET REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, (NAVD88).
2. CORES MAY NOT FALL DIRECTLY ON CROSS SECTION LINE, BUT ARE LOCATED SUFFICIENTLY CLOSE TO REPRESENT SIMILAR MATERIAL.
3. WIDTH OF LAYERS IS REPRESENTATIVE ONLY. ACTUAL MATERIAL MAY VARY.
4. SEE SHEETS 21 AND 22 FOR LOCATION OF CROSS SECTION LINE.
5. SIDE–WALL SLOPE NOT VISIBLE DUE TO EXAGGERATED SCALE.

LEGEND:

- PRIMARY DREDGE AREA
- MOST SHALLOW REFLECTOR AS IDENTIFIED BY SEISMIC SURVEY

0 1.25 2.5 VERTICAL SCALE IN FT

0 250 500 HORIZONTAL SCALE IN FT

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN P.E. NO. 34857 DATE

STEPHEN KEEHN LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 NW. BOCA RATON BOULEVARD
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PH. (561) 391-8102
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www.CoastalPlanning.net
C.O.A. FL #4528
C.O.A. LA #2531

REVISIONS

No.	Date	Description
1	8/20/13	Per Client
2	11/04/13	BA UPDATE 13

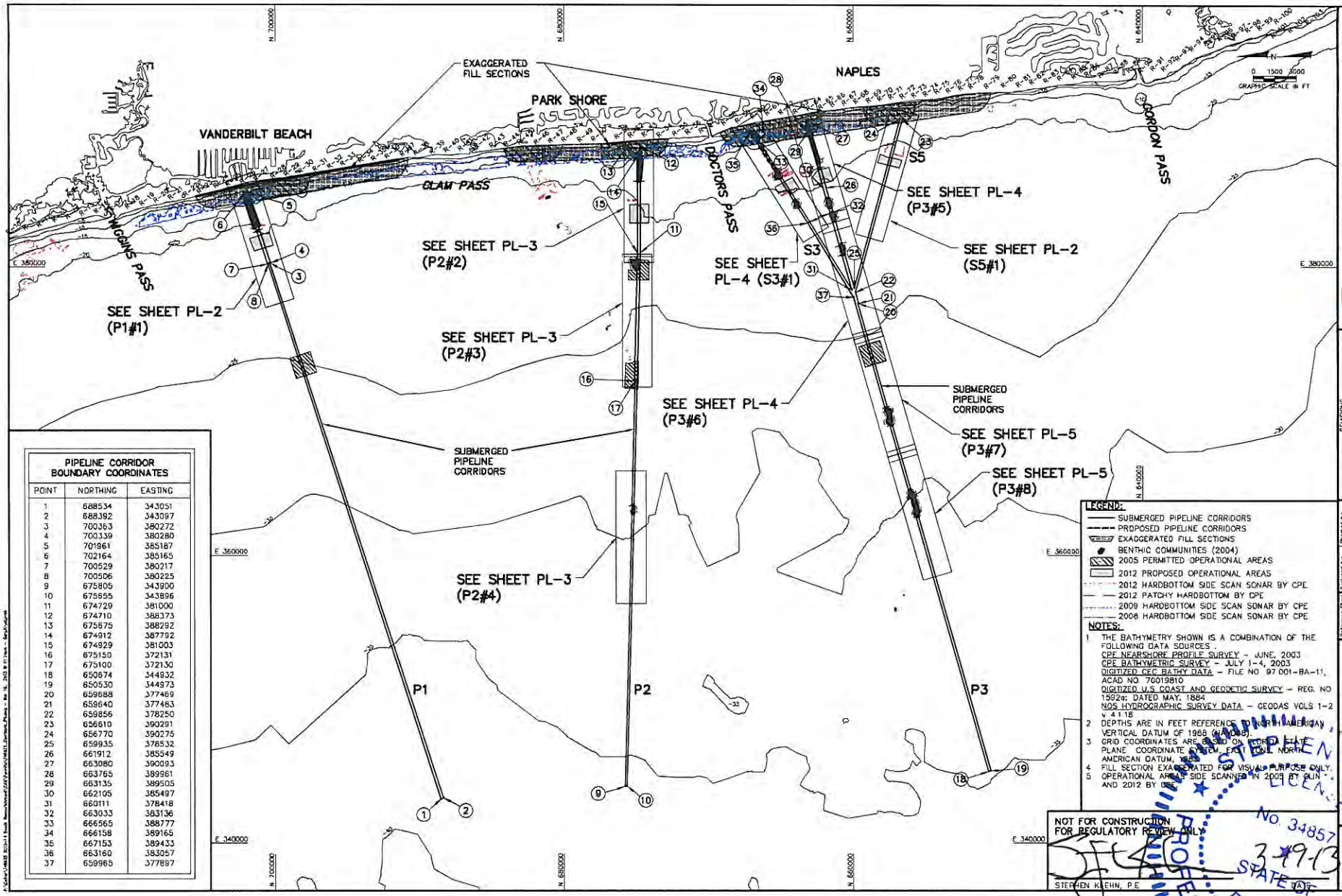
Designed by SK | Checked by AMB | Reviewed by SK | Drawn by SK | Submitted by SK | Date 7/25/12 | Comm. No. 145375 | Plot Scale AS NOTED

Reference Files: BOR_LAYOUT.dwg

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
BORROW AREA T1
CROSS SECTIONS

DRAWING NO. BA–3

SHEET 31 OF 36



PIPELINE CORRIDOR BOUNDARY COORDINATES		
POINT	NORTHING	EASTING
1	688534	343051
2	688392	343097
3	700363	380272
4	700339	380280
5	701961	385187
6	702164	385165
7	700529	380217
8	700506	380225
9	675805	343900
10	675655	343896
11	674729	381000
12	674710	388373
13	675675	388292
14	674912	387792
15	674929	381003
16	675150	372131
17	675100	372130
18	650674	344932
19	650530	344973
20	659888	377469
21	659640	377483
22	659856	378250
23	656610	390291
24	656770	390275
25	659935	378532
26	661912	385549
27	663080	390093
28	663765	389961
29	663135	389505
30	662105	385497
31	660111	378418
32	663033	383136
33	666565	388777
34	666158	389165
35	667153	389433
36	663160	383057
37	659965	377897

LEGEND:

- SUBMERGED PIPELINE CORRIDORS
- PROPOSED PIPELINE CORRIDORS
- EXAGGERATED FILL SECTIONS
- BENTHIC COMMUNITIES (2004)
- 2005 PERMITTED OPERATIONAL AREAS
- 2012 PROPOSED OPERATIONAL AREAS
- 2012 HARDBOTTOM SIDE SCAN SONAR BY CPE
- 2012 PATCHY HARDBOTTOM BY CPE
- 2009 HARDBOTTOM SIDE SCAN SONAR BY CPE
- 2008 HARDBOTTOM SIDE SCAN SONAR BY CPE

NOTES:

1. THE BATHYMETRY SHOWN IS A COMBINATION OF THE FOLLOWING DATA SOURCES .
   CPE NEARSHORE PROFILE SURVEY – JUNE, 2003
   CPE BATHYMETRIC SURVEY – JULY 1-4, 2003
   DIGITIZED CEC BATHY DATA – FILE NO 97 001-BA-11, ACAD NO 76019810
   DIGITIZED U.S COAST AND GEODETIC SURVEY – REG. NO 1592a; DATED MAY, 1884
   NOS HYDROGRAPHIC SURVEY DATA – GEODAS VOLS 1-2 v 4118
2. DEPTHS ARE IN FEET REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. GRID COORDINATES ARE BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM, 1983.
4. FILL SECTION EXAGGERATED FOR VISUAL PURPOSE ONLY.
5. OPERATIONAL AREAS SIDE SCANNED IN 2005 BY QUIN AND 2012 BY CPE.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KIEHN, P.E. 3-19-13 DATE

STEPHEN KIEHN LICENSED No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2481 NW. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
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C.O.A. EL 64028
C.O.A. LA 6931
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REVISIONS

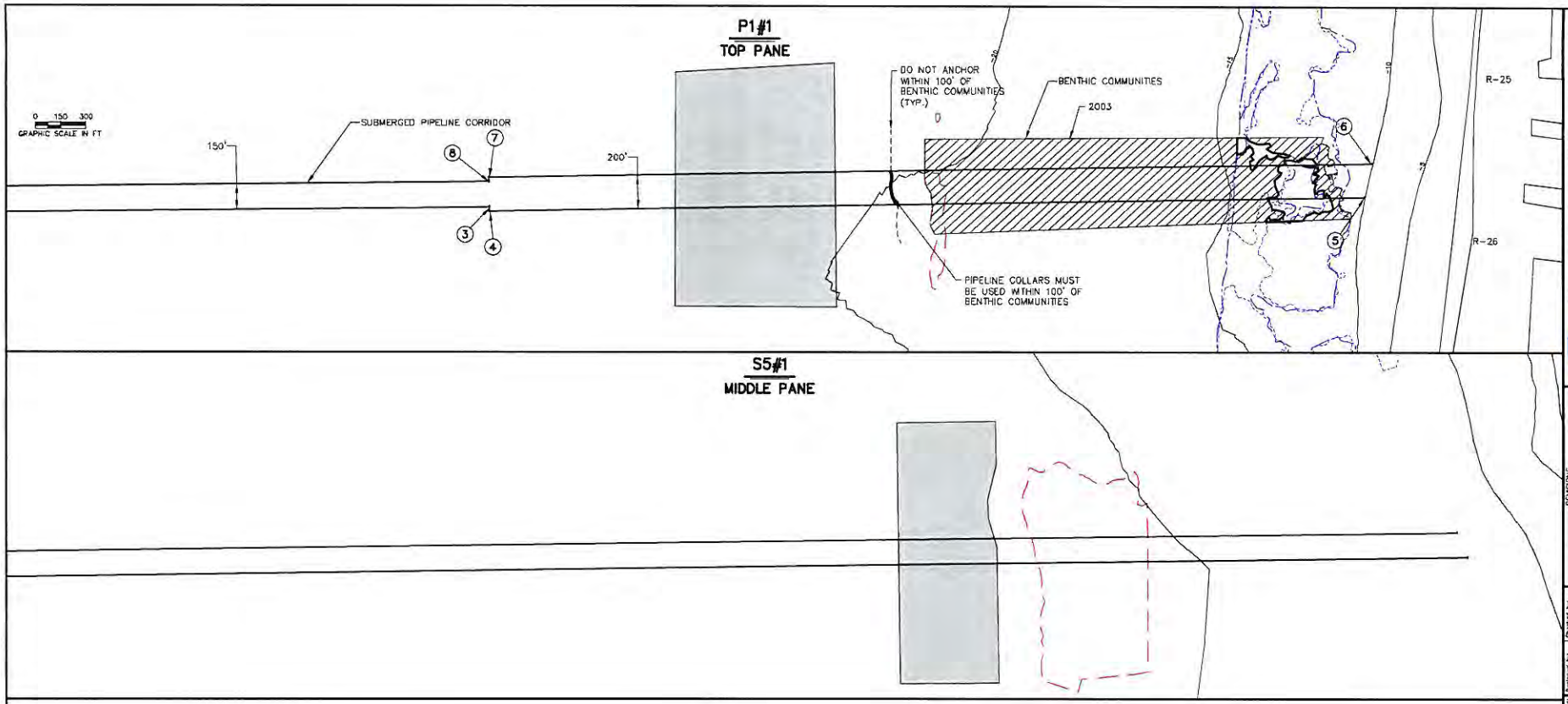
No.	Date	Description

Designed by SK | Checked by AAB | Reviewed by KS | Submitted by SK
Drawn by SK | Date 7/25/12 | Scale Not Scale AS NOTED | Contr. No. 1443925
Reference Files

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
DREDGE PIPELINE CORRIDORS

DRAWING NO. PL-1

SHEET 32 OF 36



LEGEND:

- PIPELINE COLLAR LIMITS
- DO NOT ANCHOR LIMITS
- SUBMERGED PIPELINE CORRIDOR
- 2012 PATCHY HARDBOTTOM BY CPE
- 2009 HARDBOTTOM FINAL SIDE SCAN SONAR BY CPE
- 2008 HARDBOTTOM FINAL SIDE SCAN SONAR BY CPE
- BENTHIC COMMUNITIES (2004)
- (8) PIPELINE CORRIDOR BOUNDARY COORDINATES (SEE PL-1 FOR TABLE)
- PROPOSED OPERATIONAL AREA

NOTES:

1. CONTRACTOR MUST AVOID PLACING PIPELINE ON OR NEAR HARDBOTTOM RESOURCES AND BENTHIC COMMUNITIES WHEREVER POSSIBLE
2. RADIAL PIPELINE COLLARS MUST BE INSTALLED ON ALL PIPELINES ABOVE OR WITHIN 100' OF BENTHIC COMMUNITIES. COLLARS MUST BE INSTALLED WITH A SPACING NOT TO EXCEED 50 FEET.
3. BENTHIC COMMUNITIES MUST BE CONSIDERED TO EXTEND LATERALLY PARALLEL TO SHORE. NO ANCHORS, CABLES, SPUDS, JACK-UP BARGES OR SIMILAR EQUIPMENT WILL BE PLACED ON OR WITHIN BENTHIC COMMUNITIES OR THEIR BUFFERS.
4. ANCHORS, CABLES, SPUDS, JACK-UP BARGES, ETC. SHOULD BE PLACED WITHIN THE OPERATIONAL AREAS OR PIPELINE CORRIDORS TO THE MAXIMUM EXTENT POSSIBLE.
5. THE CONTRACTOR SHALL CLEAR ANY EXCEPTION TO THE ABOVE WITH THE ENGINEER.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KETHNEER, P.E. — DATE 3-19-13

STEPHEN KETHNEER
LICENSE
No. 34857
STATE OF FLORIDA
PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
2401 N.W. BOCA RATON BOULEVARD
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FAX (561) 391-9115
C.O.A. FL #4028
C.O.A. LA #2511
www.CoastalPlanning.net

Rev.	Date	Description

REVISIONS

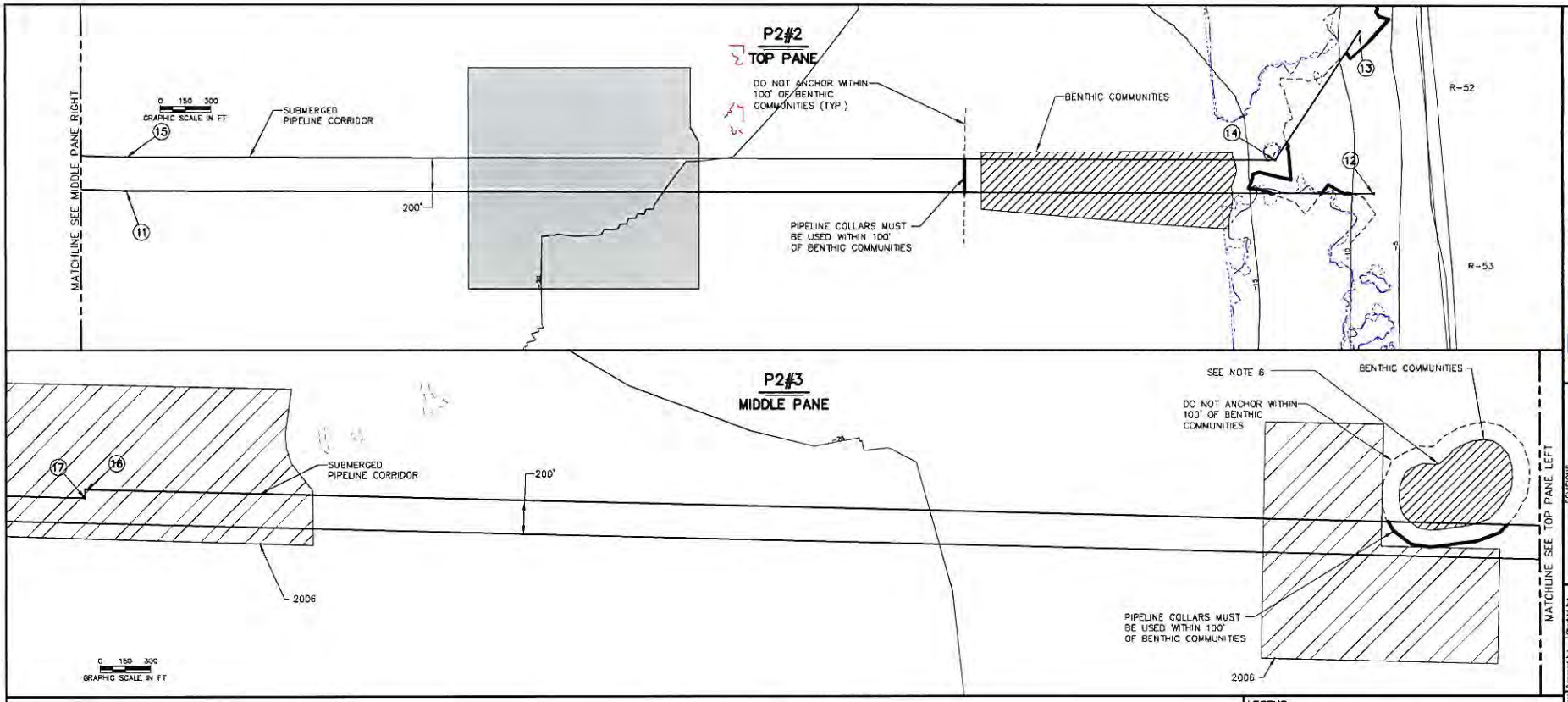
Designed by SK | Checked by AMB
Drawn by RDG | Reviewed by KHS
Date 7/25/12 | Submitted by SK
Pen Scale AS NOTED | Contr. No. 1-46-15

Reference Files attached

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PIPELINE CORRIDOR P1

DRAWING NO. PL-2

SHEET 33 OF 38



LEGEND:

- PIPELINE COLLAR LIMITS
- DO NOT ANCHOR LIMITS
- SUBMERGED PIPELINE CORRIDOR
- BENTHIC COMMUNITIES (2004)
- (11) PIPELINE CORRIDOR BOUNDARY COORDINATES (SEE PL-1 FOR TABLE)
- 2005 PERMITTED OPERATIONAL AREAS
- 2012 PROPOSED OPERATIONAL AREAS
- 2012 HARDBOTTOM SIDE SCAN SONAR BY CPE
- 2012 PATCHY HARDBOTTOM BY CPE
- 2009 HARDBOTTOM FINAL SIDE SCAN SONAR BY CPE
- 2008 HARDBOTTOM FINAL SIDE SCAN SONAR BY CPE

NOTES:

1. CONTRACTOR MUST AVOID PLACING PIPELINE ON OR NEAR HARDBOTTOM RESOURCES AND BENTHIC COMMUNITIES WHEREVER POSSIBLE.
2. RADIAL PIPELINE COLLARS MUST BE INSTALLED ON ALL PIPELINES ABOVE OR WITHIN 100' OF BENTHIC COMMUNITIES. COLLARS MUST BE INSTALLED WITH A SPACING NOT TO EXCEED 50 FEET.
3. BENTHIC COMMUNITIES MUST BE CONSIDERED TO EXTEND LATERALLY PARALLEL TO SHORE. NO ANCHORS, CABLES, SPUDS, JACK-UP BARGES OR SIMILAR EQUIPMENT WILL BE PLACED ON OR WITHIN BENTHIC COMMUNITIES OR THEIR BUFFERS.
4. ANCHORS, CABLES, SPUDS, JACK-UP BARGES, ETC. SHOULD BE PLACED WITHIN THE OPERATIONAL AREAS OR PIPELINE CORRIDORS TO THE MAXIMUM EXTENT POSSIBLE.
5. THE CONTRACTOR SHALL CLEAR ANY EXCEPTION TO THE ABOVE WITH THE ENGINEER.
6. THE 2005 INVESTIGATION WAS USED TO PERMIT A RECTANGULAR OPERATIONAL AREA. THE 2004 SIDE SCAN SURVEY IDENTIFIED SOME HARDBOTTOM LEADING TO A REMOVAL OF A CORNER. A 2012 DIVE FOUND NO HARD BOTTOM FOR 150 FT.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEENY, P.E. DATE 5/9/12

STEPHEN KEENY LICENSE No. 34857 STATE OF FLORIDA PROFESSIONAL ENGINEER

COASTAL PLANNING & ENGINEERING, INC.
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BOCA RATON, FLORIDA 33431
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PH. (561) 391-8102
FAX (561) 391-9115
C.O.A. FL 8435
C.O.A. LA 6293

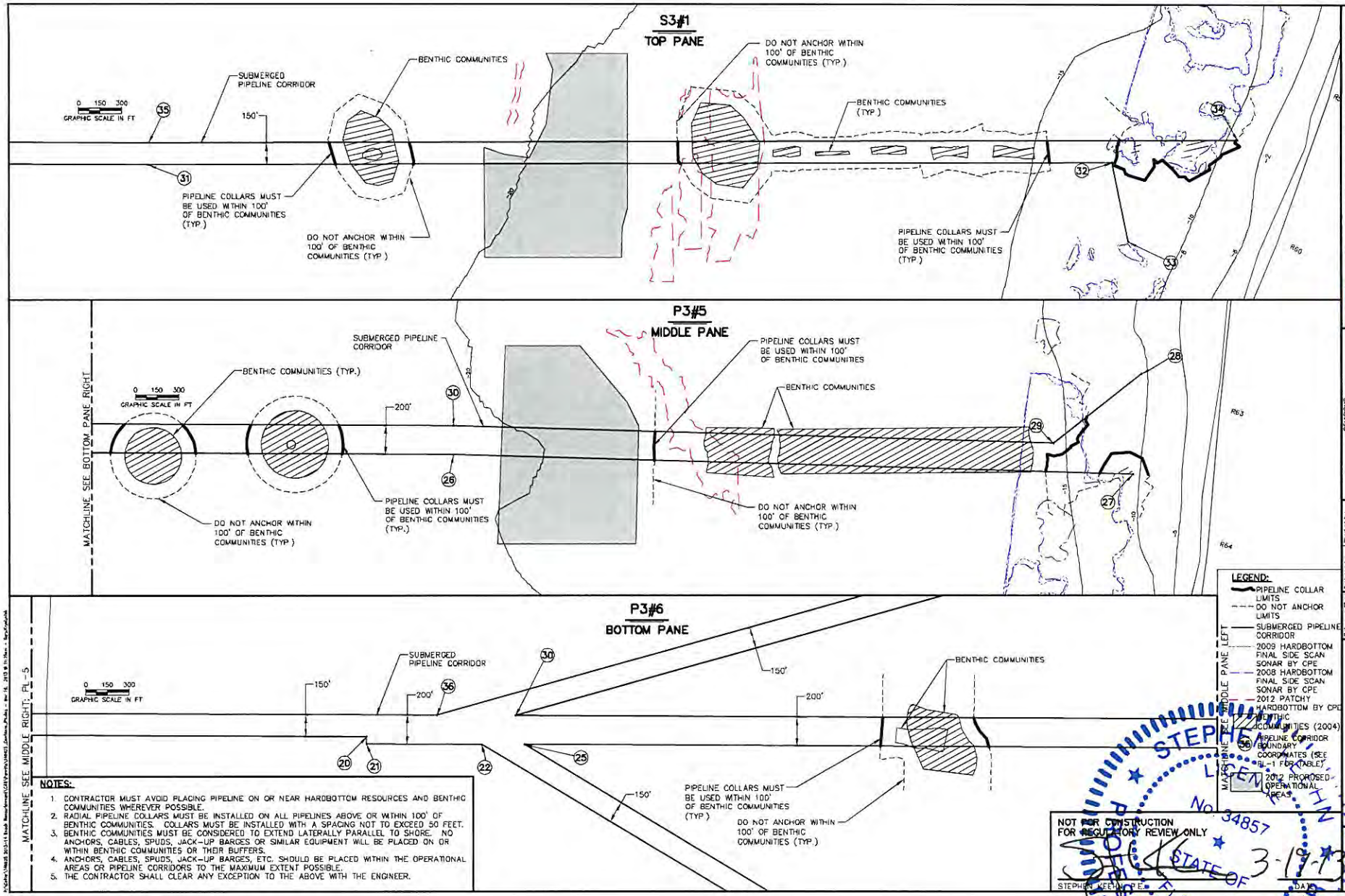
REVISIONS		
No.	Date	Description

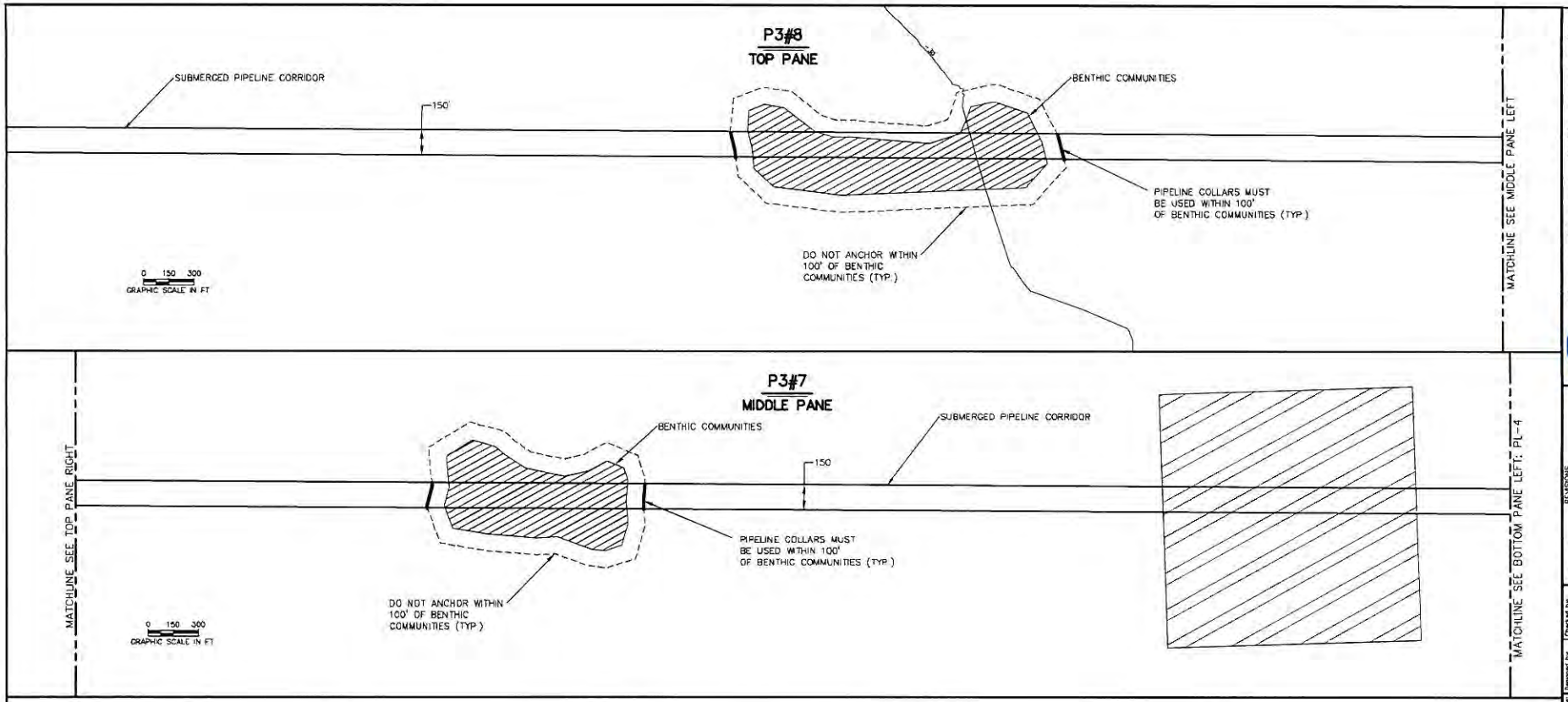
Reference Files: [illegible]
Designed by SK | Checked by AMB
Drawn by [illegible] | Reviewed by [illegible]
Date 7/25/12 | Submitted by SK
Plot Scale AS NOTED | Contr. No. 14-8125

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PIPELINE CORRIDOR P2

DRAWING NO. PL-3

SHEET 34 OF 38


S3#1
TOP PANE
BENTHIC COMMUNITIES
SUBMERGED PIPELINE CORRIDOR
0 150 300
GRAPHIC SCALE IN FT
150'
PIPELINE COLLARS MUST BE USED WITHIN 100' OF BENTHIC COMMUNITIES (TYP.)
DO NOT ANCHOR WITHIN 100' OF BENTHIC COMMUNITIES (TYP.)
DO NOT ANCHOR WITHIN 100' OF BENTHIC COMMUNITIES (TYP.)
BENTHIC COMMUNITIES (TYP.)
PIPELINE COLLARS MUST BE USED WITHIN 100' OF BENTHIC COMMUNITIES (TYP.)
P3#5
MIDDLE PANE
MATCHLINE SEE BOTTOM PANE RIGHT
SUBMERGED PIPELINE CORRIDOR
BENTHIC COMMUNITIES (TYP.)
200'
PIPELINE COLLARS MUST BE USED WITHIN 100' OF BENTHIC COMMUNITIES (TYP.)
DO NOT ANCHOR WITHIN 100' OF BENTHIC COMMUNITIES (TYP.)
PIPELINE COLLARS MUST BE USED WITHIN 100' OF BENTHIC COMMUNITIES
BENTHIC COMMUNITIES
DO NOT ANCHOR WITHIN 100' OF BENTHIC COMMUNITIES (TYP.)
P3#6
BOTTOM PANE
MATCHLINE SEE MIDDLE RIGHT: PL-5
SUBMERGED PIPELINE CORRIDOR
150'
200'
BENTHIC COMMUNITIES
PIPELINE COLLARS MUST BE USED WITHIN 100' OF BENTHIC COMMUNITIES (TYP.)
DO NOT ANCHOR WITHIN 100' OF BENTHIC COMMUNITIES (TYP.)
MATCHLINE SEE MIDDLE PANE LEFT
LEGEND:
PIPELINE COLLAR LIMITS
DO NOT ANCHOR LIMITS
SUBMERGED PIPELINE CORRIDOR
2009 HARDBOTTOM FINAL SIDE SCAN SONAR BY CPE
2008 HARDBOTTOM FINAL SIDE SCAN SONAR BY CPE
2012 PATCHY HARDBOTTOM BY CPE
BENTHIC COMMUNITIES (2004)
PIPELINE CORRIDOR BOUNDARY COORDINATES (SEE SL-1 FOR TABLE)
2012 PROPOSED OPERATIONAL AREAS
NOTES:
1. CONTRACTOR MUST AVOID PLACING PIPELINE ON OR NEAR HARDBOTTOM RESOURCES AND BENTHIC COMMUNITIES WHEREVER POSSIBLE.
2. RADIAL PIPELINE COLLARS MUST BE INSTALLED ON ALL PIPELINES ABOVE OR WITHIN 100' OF BENTHIC COMMUNITIES. COLLARS MUST BE INSTALLED WITH A SPACING NOT TO EXCEED 50 FEET.
3. BENTHIC COMMUNITIES MUST BE CONSIDERED TO EXTEND LATERALLY PARALLEL TO SHORE. NO ANCHORS, CABLES, SPUDS, JACK-UP BARGES OR SIMILAR EQUIPMENT WILL BE PLACED ON OR WITHIN BENTHIC COMMUNITIES OR THEIR BUFFERS.
4. ANCHORS, CABLES, SPUDS, JACK-UP BARGES, ETC. SHOULD BE PLACED WITHIN THE OPERATIONAL AREAS OR PIPELINE CORRIDORS TO THE MAXIMUM EXTENT POSSIBLE.
5. THE CONTRACTOR SHALL CLEAR ANY EXCEPTION TO THE ABOVE WITH THE ENGINEER.
NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY
STEPHEN KEEHNER, P.E.
3-19-13
DATE
STEPHEN KEEHNER
LICENSED
No. 34857
STATE OF FLORIDA
PROFESSIONAL ENGINEER
COASTAL PLANNING & ENGINEERING, INC.
2401 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-6102
FAX (561) 391-9116
C.O.A. FL #4028
C.O.A. LA #2511
www.CoastalPlanning.net
CPE
REVISIONS
No. Date Description
Designed by SK
Drawn by JDD
Date 7/25/12
Plot Scale AS NOTED
Checked by AMB
Reviewed by KS
Submitted by SK
Comm. No. 14-0925
Reference Files
COLLIER COUNTY
BEACH REMOURISHMENT PROJECT
PIPELINE CORRIDOR P3
DRAWING NO.
PL-4
SHEET 35 OF 38



LEGEND:

- PIPELINE COLLAR LIMITS
- DO NOT ANCHOR LIMITS
- SUBMERGED PIPELINE CORRIDOR
- BENTHIC COMMUNITIES (2004)
- 2005 PERMITTED OPERATIONAL AREA

NOTES:

1. CONTRACTOR MUST AVOID PLACING PIPELINE ON OR NEAR HARDBOTTOM RESOURCES AND BENTHIC COMMUNITIES WHEREVER POSSIBLE.
2. RADIAL PIPELINE COLLARS MUST BE INSTALLED ON ALL PIPELINES ABOVE OR WITHIN 100' OF BENTHIC COMMUNITIES. COLLARS MUST BE INSTALLED WITH A SPACING NOT TO EXCEED 50 FEET.
3. BENTHIC COMMUNITIES MUST BE CONSIDERED TO EXTEND LATERALLY PARALLEL TO SHORE. NO ANCHORS, CABLES, SPUDS, JACK-UP BARGES OR SIMILAR EQUIPMENT WILL BE PLACED ON OR WITHIN BENTHIC COMMUNITIES OR THEIR BUFFERS.
4. ANCHORS, CABLES, SPUDS, JACK-UP BARGES, ETC. SHOULD BE PLACED WITHIN THE OPERATIONAL AREAS OR PIPELINE CORRIDORS TO THE MAXIMUM EXTENT POSSIBLE.
5. THE CONTRACTOR SHALL CLEAR ANY EXCEPTION TO THE ABOVE WITH THE ENGINEER.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

STEPHEN KEEHN, P.E. — DATE 3-19-12

STEPHEN KEEHN
LICENSE
No. 34857
STATE OF FLORIDA
PROFESSIONAL ENGINEER

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CGA LA #2313

REVISIONS		
No.	Date	Description

Designed by SK | Checked by AMB
Drawn by RDD | Reviewed by NS
Date 7/23/12 | Submitted by SK
Rev. Scale AS NOTED | Comm. No. 1453.03

Reference Files: xxxxxxxx

COLLIER COUNTY
BEACH RENOURISHMENT PROJECT
PIPELINE CORRIDOR P3 (CONT)

DRAWING NO. PL-5

SHEET 36 OF 38

APPENDIX K

FINAL HARDBOTTOM BIOLOGICAL MONITORING PLAN, APRIL 2013

COLLIER COUNTY, FLORIDA
FINAL HARDBOTTOM BIOLOGICAL MONITORING PLAN

COLLIER COUNTY BEACH NOURISHMENT PROJECT
FDEP PERMIT NO. 0222355-001-JC

DOCTORS PASS MAINTENANCE DREDGING
FDEP PERMIT NO. 0235740-001-JC

WIGGINS PASS MAINTENANCE DREDGING AND NAVIGATION IMPROVEMENT PROJECT
FDEP PERMIT NO. 0142538-008-JC

APRIL 2013

COASTAL PLANNING & ENGINEERING, INC.

COLLIER COUNTY, FLORIDA
FINAL HARDBOTTOM BIOLOGICAL MONITORING PLAN
APRIL 2013

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COLLIER COUNTY, FLORIDA
FINAL HARDBOTTOM BIOLOGICAL MONITORING PLAN
APRIL 2013

1.0 INTRODUCTION

1.1 PURPOSE AND GOALS

The purpose of this monitoring plan is to determine potential nearshore hardbottom impacts resulting from placement of beach compatible sand on the 2013-14 Collier County Beach Nourishment Project shoreline, as well as potential impacts from Doctors Pass Maintenance Dredging and/or the Wiggins Pass Maintenance Dredging and Navigation Improvement Projects. This monitoring plan has been developed in coordination with Florida Department of Environmental Protection (FDEP), and is a modified version of the monitoring plan which was required for the 2006 Collier County Beach Nourishment Project; some transects which were monitored for the 2006 project will continue to be monitored, some transects have been eliminated, some new transects have been added, and methods have been updated since the previous project. As compensation for potential effects from the 2006 project FDEP also required that Collier County construct a 1.09-acre artificial reef. This artificial reef was constructed in 2007, and based on two years of monitoring, FDEP determined the artificial reef as successful mitigation; therefore, no additional artificial reef monitoring is proposed in this monitoring plan.

The 2013-14 Collier County Beach Nourishment Project is essentially a repeat of the 2006 project with minor modifications. Figure 1 shows the project limits for the Vanderbilt, Pelican Bay, Park Shore and Naples Beach segments, which are the same project limits permitted for the 2006 project; however, gaps in fill are proposed within three segments. This project will place a maximum of approximately 430,000 cy of beach compatible fill along approximately 7.5 miles (39,600 ft) of Collier County shoreline, within four segments: Vanderbilt (R-22+300 to R-30+500, with a gap from R-22+300 to R25+500), Pelican Bay (R-30+500 to R-37), Park Shore (R-43+500 to R-54+400, with a gap from R-47+500 to R-50) and Naples (R-58A-480 to R-79, with gaps from R-64+300 to R-68+400 and R-72+200 to R-79) (Figure 1). No new segments have been added. The project will be constructed with beach compatible fill from either an offshore borrow area or an upland sand source. If dredges are selected as the desired construction method, Borrow Area T1 will be utilized for its coarser sand which performed above expectations for the 2006 project. If the project is done by truck haul, an approved upland sand source will be utilized. The project is designed to avoid impacts to hardbottom.

The purpose of this Hardbottom Biological Monitoring Plan is to identify and evaluate potential impacts to the natural nearshore hardbottom resources and hardbottom resources within pipeline corridors resulting from the combined Collier County Beach Nourishment Project (FDEP Permit No. 0222355-001-JC), Doctors Pass Inlet Maintenance Dredging Project (FDEP Permit No. 0235740-001-JC) and the Wiggins Pass Maintenance Dredging and Navigation Improvement Project (FDEP Permit No. 0142538-008-JC). The 2005 Hardbottom Monitoring and Mitigation Plan included both the Collier County Beach Nourishment Project and Doctors Pass Maintenance Dredging, which includes placement of dredged material south of the pass in approved disposal areas.

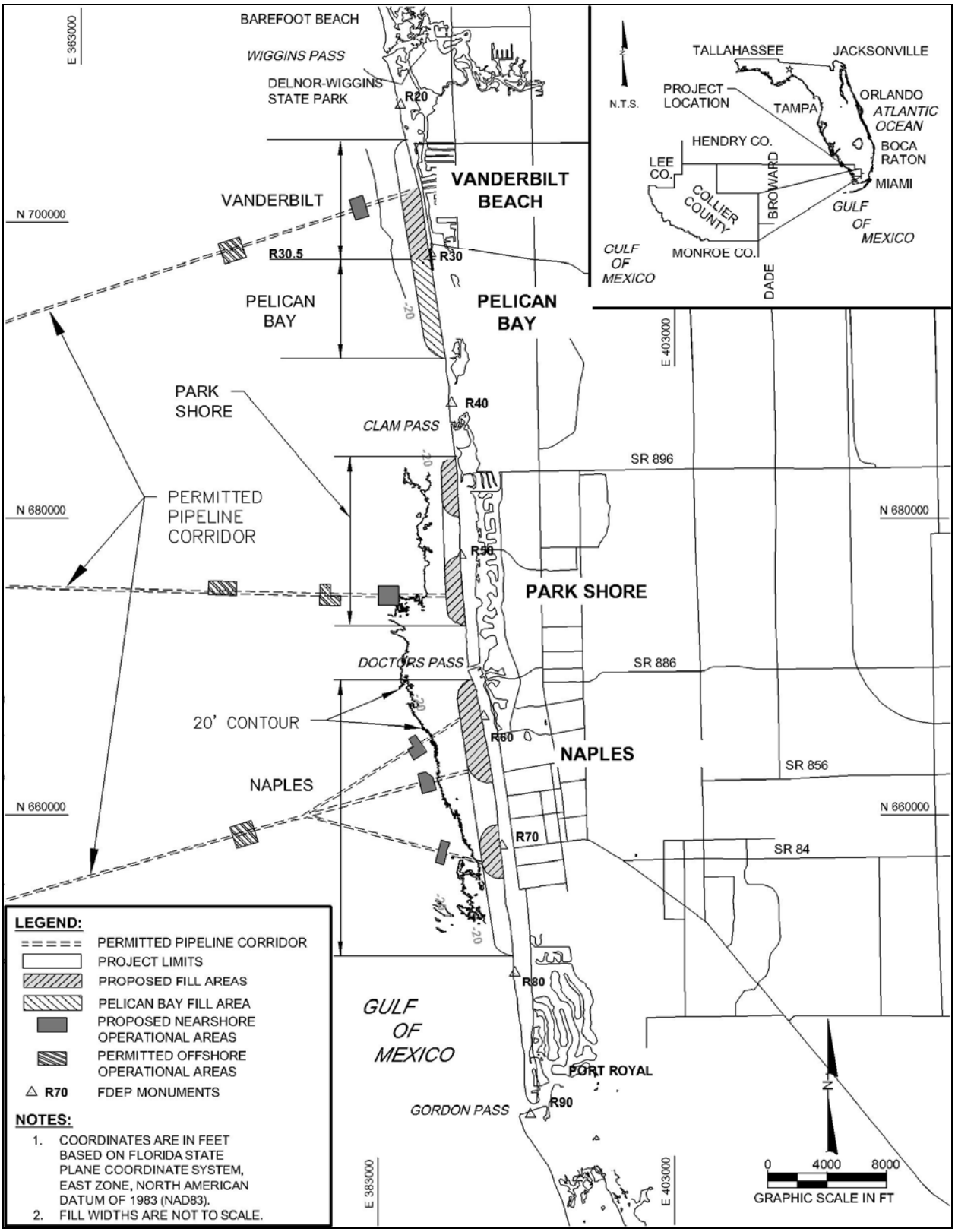


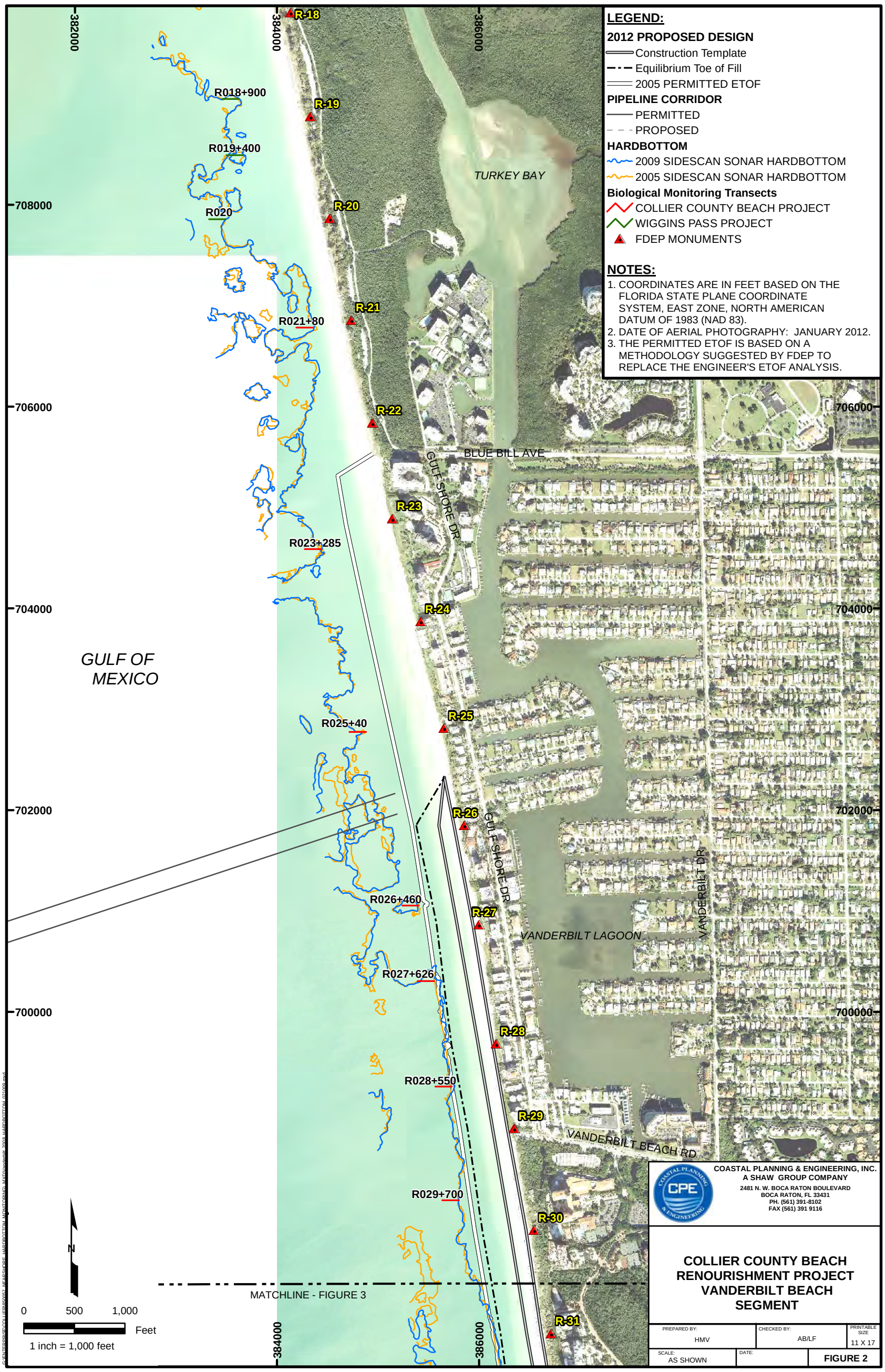
Figure 1. Project Location Map.

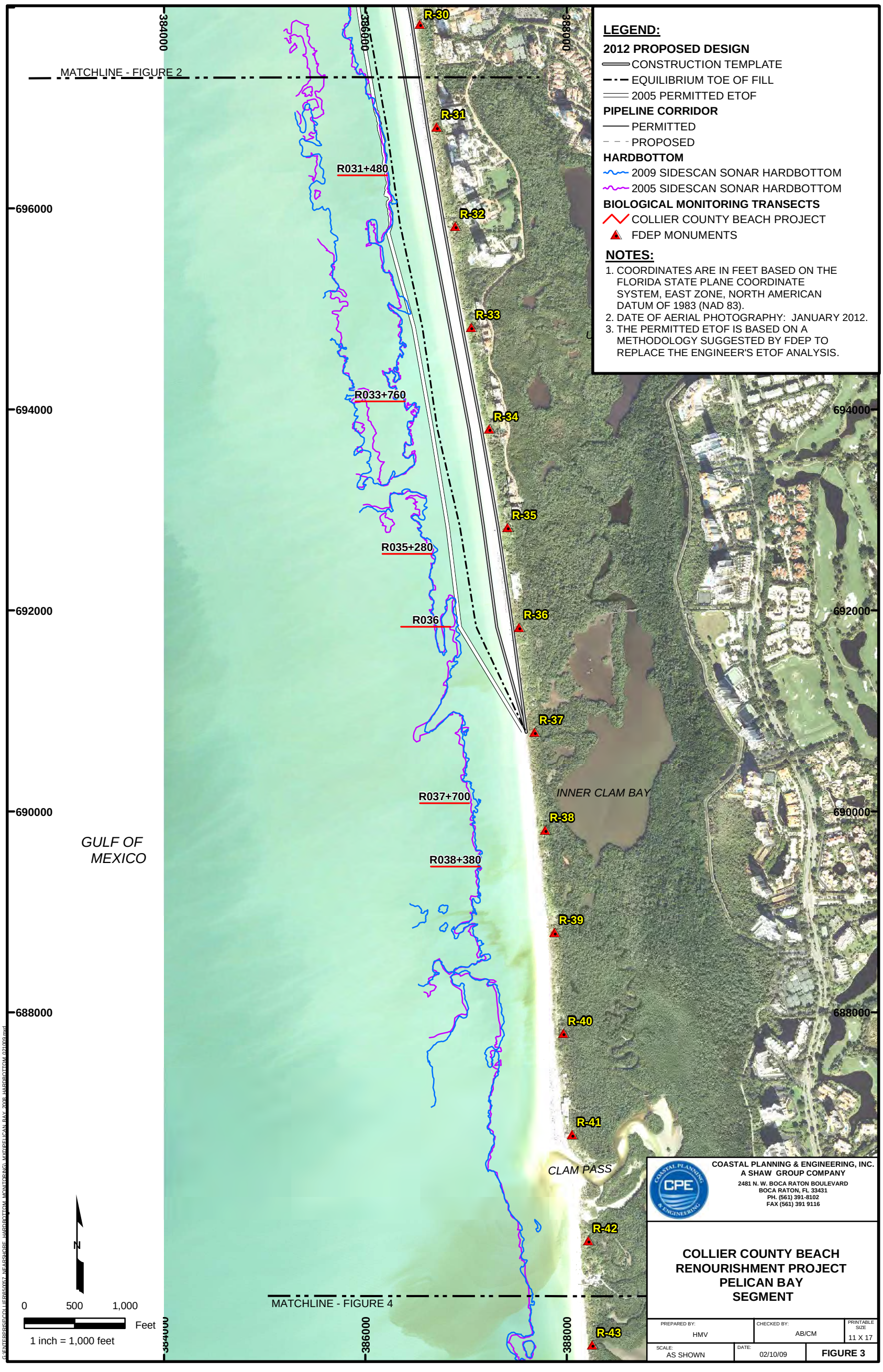
This Hardbottom Biological Monitoring Plan also includes monitoring associated with potential impacts from the Wiggins Pass Maintenance Dredging and Navigation Improvement Project, which includes placement of fill on, or in the nearshore areas adjacent to, Delnor-Wiggins Pass State Park and Barefoot Beach.

This monitoring program has been designed to utilize quantitative and qualitative habitat assessments to determine potential direct and indirect effects from the three projects, including possible cross-shore sand transport beyond the estimated Equilibrium Toe of Fill (ETOF). A pre-construction survey will be conducted in summer 2013, and all post-construction surveys will be compared to the pre-construction survey in order to determine if project-related impacts from the 2013-14 project extend beyond the ETOF. The primary goal of this monitoring plan is to determine if there are any project-related impacts to natural hardbottom resources in excess of the 1.09 acres (ac) of impact area for which mitigation (in the form of artificial reef construction) was required as part of the 2006 project.

1.2 NEARSHORE HARDBOTTOM RESOURCES

Nearshore hardbottom habitat is present along the Collier County shoreline. Hardbottom resources have been identified through sidescan survey and diver verification on several occasions. In February 2003, a sidescan survey was conducted along the Collier County shoreline between R-17 and R-81. The results of this survey documented approximately 500 acres (ac) of low relief nearshore hardbottom formations located within approximately 1,000 ft of the shoreline (CPE, 2004). In summer 2003, biologists conducted dive investigations on these resources to further document and characterize this habitat. Divers documented developed hardbottom communities, consisting of scleractinian coral species (*Siderastrea* spp., *Solenastrea* spp., *Oculina* sp. and *Phyllangia* sp.), gorgonian corals (*Leptogorgia* spp.), macroalgae (primarily *Gracilaria* spp., *Caulerpa* spp. and *Hypnea* spp.) sponges, tunicates and other benthic invertebrates and fish (CPE, 2004). The results of these investigations were used to assist Collier County and FDEP in the development of the hardbottom monitoring plan for the 2006 project. In compliance with the final FDEP-approved monitoring plan, biological monitoring surveys were completed in 2005 as a pre-construction assessment, and post-construction surveys were conducted in 2006, 2007, 2008 and 2009 (CPE 2006, 2007a, 2007b, 2009; Collier County, 2009). Figures 2-5 show the location of the nearshore hardbottom edge based on 2005 (pre-construction of the 2006 project) and 2009 (3-years post-construction) sidescan surveys.


LEGEND:
2012 PROPOSED DESIGN
Construction Template
Equilibrium Toe of Fill
2005 PERMITTED ETOF
PIPELINE CORRIDOR
PERMITTED
PROPOSED
HARDBOTTOM
2009 SIDESCAN SONAR HARDBOTTOM
2005 SIDESCAN SONAR HARDBOTTOM
Biological Monitoring Transects
COLLIER COUNTY BEACH PROJECT
WIGGINS PASS PROJECT
FDEP MONUMENTS
NOTES:
1. COORDINATES ARE IN FEET BASED ON THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD 83).
2. DATE OF AERIAL PHOTOGRAPHY: JANUARY 2012.
3. THE PERMITTED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.
382000
384000
386000
708000
706000
704000
702000
700000
R-18
R-19
R-20
R-21
R-22
R-23
R-24
R-25
R-26
R-27
R-28
R-29
R-30
R-31
R018+900
R019+400
R020
R021+80
R023+285
R025+40
R026+460
R027+626
R028+550
R029+700
TURKEY BAY
GULF OF MEXICO
BLUE BILL AVE
GULF SHORE DR
VANDERBILT DR
VANDERBILT LAGOON
VANDERBILT BEACH RD
MATCHLINE - FIGURE 3
N
0 500 1,000
Feet
1 inch = 1,000 feet
COASTAL PLANNING & ENGINEERING, INC.
A SHAW GROUP COMPANY
2481 N. W. BOCA RATON BOULEVARD
BOCA RATON, FL 33431
PH. (561) 391-8102
FAX (561) 391 9116
COLLIER COUNTY BEACH RENOURISHMENT PROJECT VANDERBILT BEACH SEGMENT
PREPARED BY: HMV
CHECKED BY: AB/LF
PRINTABLE SIZE 11 X 17
SCALE: AS SHOWN
DATE:
FIGURE 2


LEGEND:
2012 PROPOSED DESIGN
CONSTRUCTION TEMPLATE
EQUILIBRIUM TOE OF FILL
2005 PERMITTED ETOF
PIPELINE CORRIDOR
PERMITTED
PROPOSED
HARDBOTTOM
2009 SIDESCAN SONAR HARDBOTTOM
2005 SIDESCAN SONAR HARDBOTTOM
BIOLOGICAL MONITORING TRANSECTS
COLLIER COUNTY BEACH PROJECT
FDEP MONUMENTS
NOTES:
1. COORDINATES ARE IN FEET BASED ON THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD 83).
2. DATE OF AERIAL PHOTOGRAPHY: JANUARY 2012.
3. THE PERMITTED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.
MATCHLINE - FIGURE 2
MATCHLINE - FIGURE 4
384000
386000
388000
696000
694000
692000
690000
688000
R-30
R-31
R-32
R-33
R-34
R-35
R-36
R-37
R-38
R-39
R-40
R-41
R-42
R-43
R031+480
R033+760
R035+280
R036
R037+700
R038+380
INNER CLAM BAY
CLAM PASS
GULF OF MEXICO
N
0 500 1,000 Feet
1 inch = 1,000 feet
COASTAL PLANNING & ENGINEERING, INC.
A SHAW GROUP COMPANY
2481 N. W. BOCA RATON BOULEVARD
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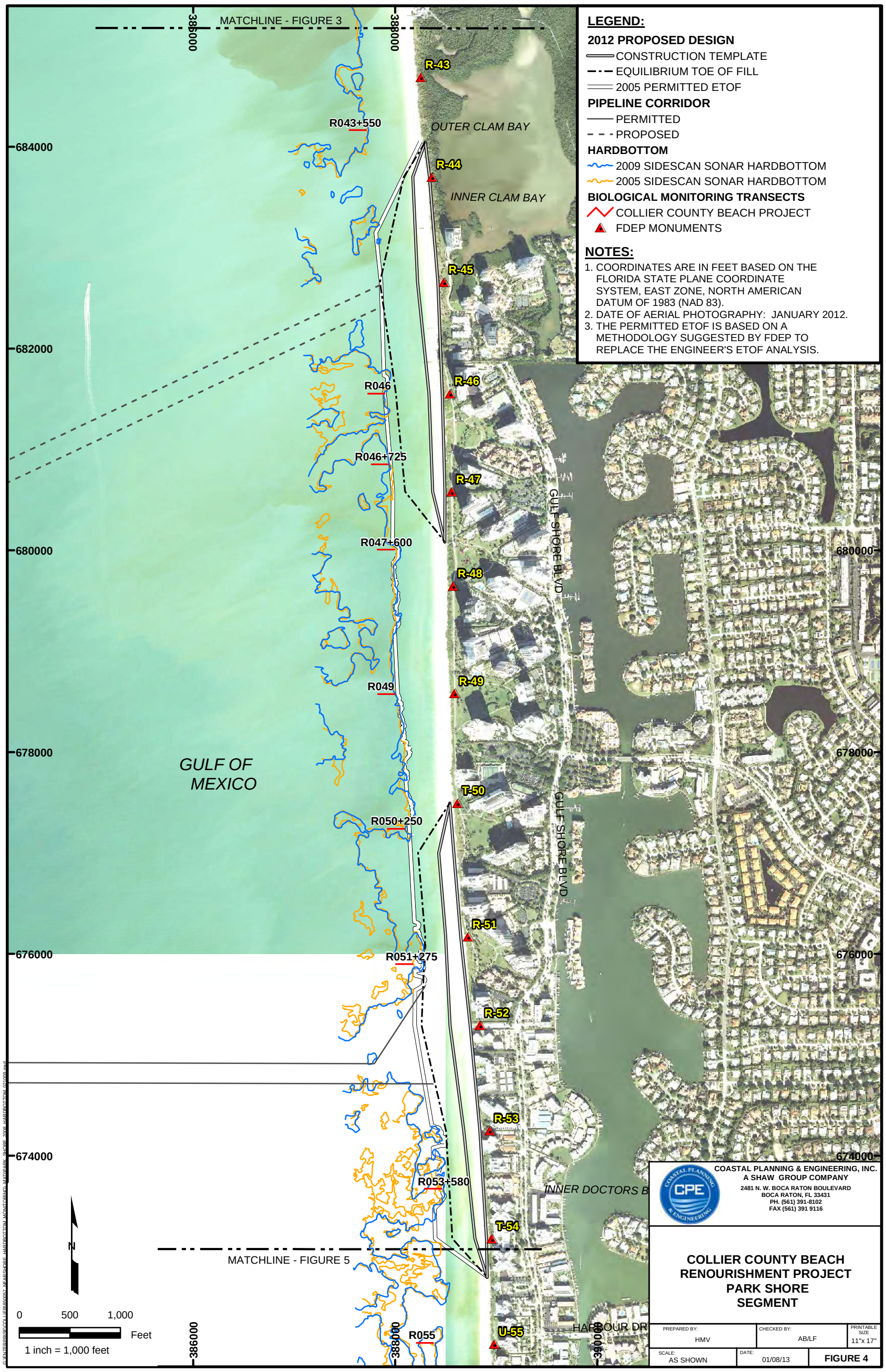
PH. (561) 391-8102
FAX (561) 391 9116
COLLIER COUNTY BEACH RENOURISHMENT PROJECT PELICAN BAY SEGMENT
PREPARED BY: HMV
CHECKED BY: AB/CM
PRINTABLE SIZE 11 X 17
SCALE: AS SHOWN
DATE: 02/10/09
FIGURE 3


MATCHLINE - FIGURE 3
386000
388000
390000
684000
682000
680000
678000
676000
674000
R-43
R-44
R-45
R-46
R-47
R-48
R-49
T-50
R-51
R-52
R-53
T-54
U-55
R043+550
R046
R046+725
R047+600
R049
R050+250
R051+275
R053+580
R055
OUTER CLAM BAY
INNER CLAM BAY
GULF OF MEXICO
GULF SHORE BLVD
INNER DOCTORS B
HARBOUR DR
MATCHLINE - FIGURE 5
N
0 500 1,000
Feet
1 inch = 1,000 feet
LEGEND:
2012 PROPOSED DESIGN
CONSTRUCTION TEMPLATE
EQUILIBRIUM TOE OF FILL
2005 PERMITTED ETOF
PIPELINE CORRIDOR
PERMITTED
PROPOSED
HARDBOTTOM
2009 SIDESCAN SONAR HARDBOTTOM
2005 SIDESCAN SONAR HARDBOTTOM
BIOLOGICAL MONITORING TRANSECTS
COLLIER COUNTY BEACH PROJECT
FDEP MONUMENTS
NOTES:
1. COORDINATES ARE IN FEET BASED ON THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD 83).
2. DATE OF AERIAL PHOTOGRAPHY: JANUARY 2012.
3. THE PERMITTED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.
COASTAL PLANNING & ENGINEERING, INC.
A SHAW GROUP COMPANY
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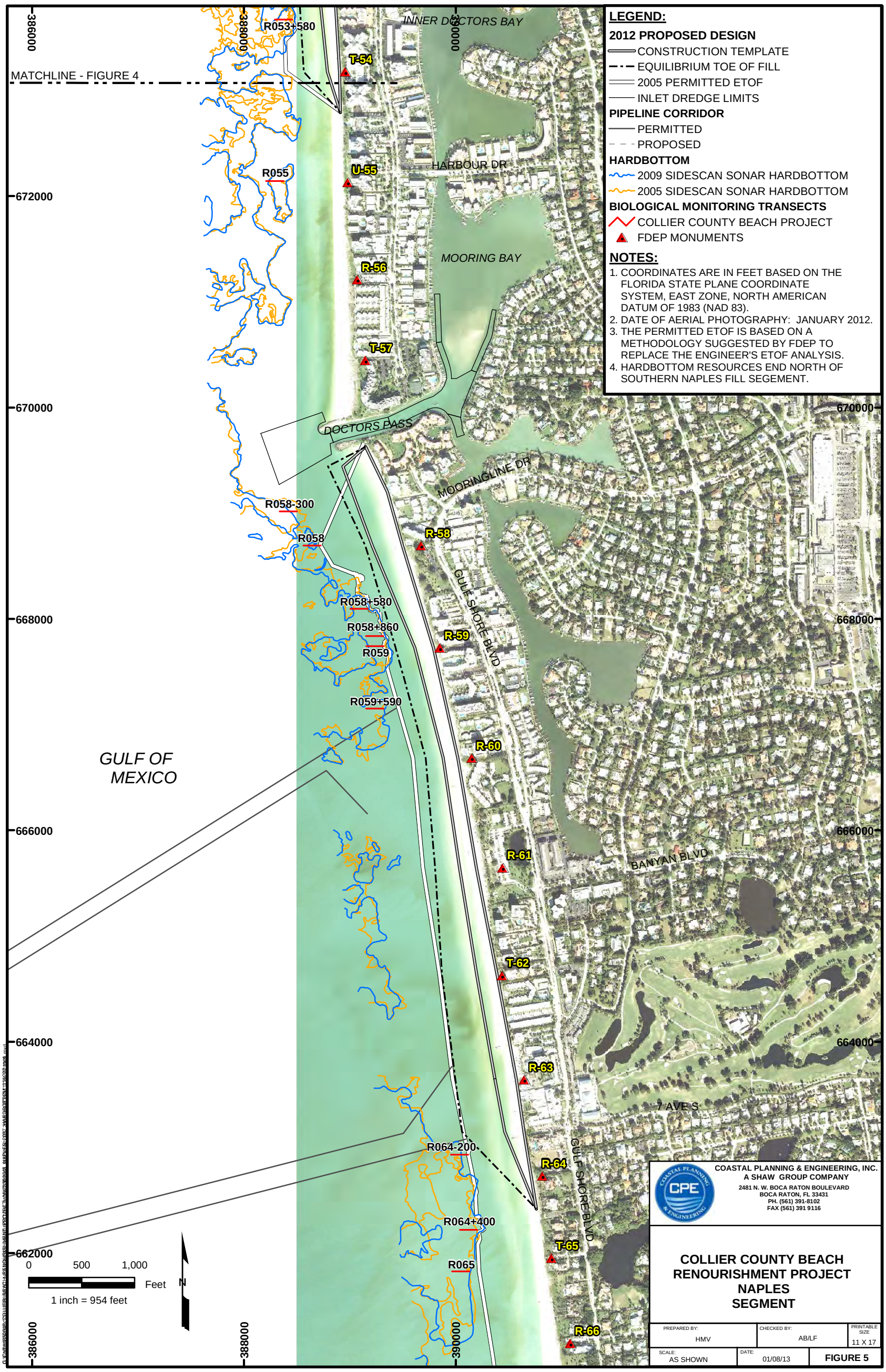
PH. (561) 391-8102
FAX (561) 391 9116
COLLIER COUNTY BEACH RENOURISHMENT PROJECT
PARK SHORE SEGMENT
PREPARED BY: HMV
CHECKED BY: AB/LF
PRINTABLE SIZE 11"x 17"
SCALE: AS SHOWN
DATE: 01/08/13
FIGURE 4


LEGEND:
2012 PROPOSED DESIGN
CONSTRUCTION TEMPLATE
EQUILIBRIUM TOE OF FILL
2005 PERMITTED ETOF
INLET DREDGE LIMITS
PIPELINE CORRIDOR
PERMITTED
PROPOSED
HARDBOTTOM
2009 SIDESCAN SONAR HARDBOTTOM
2005 SIDESCAN SONAR HARDBOTTOM
BIOLOGICAL MONITORING TRANSECTS
COLLIER COUNTY BEACH PROJECT
FDEP MONUMENTS
NOTES:
1. COORDINATES ARE IN FEET BASED ON THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD 83).
2. DATE OF AERIAL PHOTOGRAPHY: JANUARY 2012.
3. THE PERMITTED ETOF IS BASED ON A METHODOLOGY SUGGESTED BY FDEP TO REPLACE THE ENGINEER'S ETOF ANALYSIS.
4. HARDBOTTOM RESOURCES END NORTH OF SOUTHERN NAPLES FILL SEGEMENT.
MATCHLINE - FIGURE 4
INNER DOCTORS BAY
HARBOUR DR
MOORING BAY
DOCTORS PASS
MOORINGLINE DR
GULF SHORE BLVD
BANYAN BLVD
7 AVE S
GULF OF MEXICO
R053+580
R055
R058-300
R058
R058+580
R058+860
R059
R059+590
R064-200
R064+400
R065
T-54
U-55
R-56
T-57
R-58
R-59
R-60
R-61
T-62
R-63
R-64
T-65
R-66
386000
388000
390000
672000
670000
668000
666000
664000
662000
0 500 1,000
Feet
1 inch = 954 feet
N
COASTAL PLANNING & ENGINEERING, INC.
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NAPLES SEGMENT
PREPARED BY: HMV
CHECKED BY: AB/LF
PRINTABLE SIZE 11 X 17
SCALE: AS SHOWN
DATE: 01/08/13
FIGURE 5

2.0 METHODS AND MATERIALS

This section has been developed to address the potential direct and/or indirect impacts to the nearshore hardbottom communities. The goal of this monitoring plan is to determine if there are any project-related impacts to natural hardbottom resources in excess of the 1.09 acres (ac) of impact area for which mitigation was required as part of the 2006 project. Methods and materials have been designed to meet this goal.

2.1 NEARSHORE HARDBOTTOM MONITORING

This monitoring plan is a modification of the 2005 FDEP-approved monitoring plan which was established for the 2006 Collier County Beach Nourishment Project, modified to detect any potential impacts from the 2013-14 project. Table 1 lists the monitoring transects adjacent to each project fill segment and their locations. These transects will be monitored one time pre-construction, and annually for three years post-construction.

Monitoring will be conducted on 31 transects, most of which were established prior to construction of the 2006 project adjacent to the Vanderbilt (Figure 2), Pelican Bay (Figure 3), Park Shore (Figure 4) and Naples Beach (Figure 5) segments. Based on FDEP guidance, control transects have been eliminated from the previous monitoring plan, and three (3) new transects have been added (one adjacent to Park Shore and two adjacent to Naples). There are no hardbottom resources adjacent to the southern fill area along the Naples shoreline; therefore, no monitoring transects were established in this area. Transects begin at the shoreward edge of the hardbottom and extend for 50 meters (164 ft) offshore (west). To ensure biological monitoring station permanence, stainless steel pins were installed at 5.0 m (16.4 ft) spacing along each of transects as part of the monitoring associated with the 2006 project. New pins will be installed if previously established pins cannot be located during the pre-construction survey in summer 2013, and three (3) new transects will be established and pins installed during the pre-construction survey. Based on a request by FDEP, divers will assess the hardbottom offshore of R-44+400 during the pre-construction survey, and if hardbottom is observed in this area then FDEP may require that an additional monitoring transect be established there. Nearshore hardbottom transect locations are provided in Table 1 and shown in Figures 2-5; the locations of the three (3) new transects will be established and recorded during the pre-construction survey. Monitoring reports will include coordinates of the start (east) and end (west) points of all monitoring transects and the depth at these points. During each survey, the current position and the relief (cm) of the nearshore hardbottom edge of each transect will be recorded. Methods for nearshore hardbottom monitoring surveys are described below in Sections 2.1.1 through 2.1.6.

Table 1. Hardbottom Biological Monitoring Transect Locations.

Vanderbilt Beach Segment		
Transect	**Northing**	**Easting**
R21+080	706783.37	384359.90
R23+285	704587.71	384403.83
R25+040	702775.26	384862.31
R26+460	701055.10	385391.61
R27+626	700324.00	385598.32
R28+550	699271.80	385727.81
R29+700	698135.90	385779.55
Pelican Bay Segment		
Transect	**Northing**	**Easting**
R31+480	696337.35	386200.31
R33+760	694071.28	386561.77
R35+280	692556.49	386650.31
R36	691837.30	386855.09
R37+700	690091.91	387097.28
R38+380	689434.82	387139.69
Park Shore Segment		
Transect	**Northing**	**Easting**
R43+550	684145.03	387686.95
R46*	TBD	TBD
R46+725	680833.39	387956.79
R47+600	679992.9	388008.32
R49	678579.13	387979.67
R50+250	677242.48	388055.01
R51+275	675891.9	388264.41
R53+580	673669.53	388457.38
R55	672131.69	388380.97
Naples Beach Segment		
Transect	**Northing**	**Easting**
R58-300	669304.71	388458.36
R58XX*	TBD	TBD
R58+580	668095.73	389310.67
R58+860	667843.17	389328.06
R59	667729	389329.46
R59+590	667145.67	389295.03
R64-200*	TBD	TBD
R64+400	662218.58	390208.63
R65	661832.38	390194.09

*New transects, location to be determined (TBD)

2.1.1 Line-Intercept for Sediment Cover

Line-intercept for sediment cover is an efficient method to assess sediment versus non-sediment cover and the location of each transition. These data provide greater spatial resolution than most methods and are readily employed along transects. This method will be used to monitor sediment coverage on the 31 transects (Figures 2-5, Table 1). During each survey, a biologist will swim the length of each transect and note the location along the transect tape, and linear extent, of each sand patch that is at least 0.5 m in length and uninterrupted by benthic biota. Two substrate designations will be considered: hardbottom and sand. Hardbottom is clearly exposed consolidated substrate with the potential for recruitment of benthic organisms and sand is defined as sediment with a depth of greater than 1 cm with no emerging biota.

2.1.2 Interval Sediment Depth Measurements

Sediment depth data will be collected along each monitoring transect (Figures 2-5, Table 1) during each survey. During these surveys, divers will collect standing sediment depth measurements (to the nearest cm) at 1-m intervals along each monitoring transect. These data will be collected first during each survey, immediately after setting up the transect, to measure sediment depth in sediments undisturbed by divers. The vertical relief of the hardbottom edge and the sediment depth at its base will also be measured (cm) at the easternmost hardbottom-sand border adjacent to each 50-m transect and at each ledge (≥10 cm in vertical relief) encountered along each 50-m transect. Ledges along the transect will be noted during the pre-construction survey, with their location recorded and marked with a nail, and the height measured from the nail to the foot of the ledge. The change in distance from the nail to the foot of the ledge will demonstrate if sediment is accumulating at the foot of the ledges due to cross-shore transport.

2.1.3 Benthic Characterization: BEAMR

Benthic communities will be evaluated along each of the monitoring transects (Figures 2-5, Table 1) using the Coastal Planning & Engineering, Inc. Benthic Ecological Assessment for Marginal Reef (BEAMR) method (Lybolt and Baron, 2006). This method will be used to monitor benthic communities on the 25 transects (Figures 2-4, Table 1). Each BEAMR sample will be collected from a 0.5-m^2 quadrat, sampled every 5.0 meters along the length of each transect, for a total of 11 quadrats (5.5 m^2) per transect (a total sample area of 170.5 m^2 over 31 transects). The location of each permanent quadrat will be recorded on each quadrat datasheet.

BEAMR datasheets have a standardized layout, and prompt biologists to enter data in all fields (Figure 6). BEAMR samples three core characteristics in each quadrat: physical, percent cover and coral density. Physical characteristics recorded include maximum relief (nearest cm) and maximum sediment depth (nearest cm, with a minimum depth of 1 cm).

Project Name **Site Name / Transect Name**

Date **Data Collector**

Quad Label: Sample Name or #		List indiv coral sp. size (cm), Macroalgae Genus %, Clionaid spg sp. % + Cyano %	% cover or max size (cm)
Max Relief (cm)			
Max Sediment Depth (cm)			
Sessile Benthos...	**% Cover**		
Sediment- (circle all: sand shell mud)			
Macroalgae- Fleshy+Calcareous			
Turf-algae+cyanobacteria			
Encrusting Red Algae			
Sponge			
Hydroid			
Octocoral			
Stony Coral			
Tunicate			
Bare Hard Substrate			
Clionaid sponge present?	Y or N		
other-...			

Total Must = 100%

Standard Abbreviations: and abbreviation formats

Macroalgae: Pool to Genus = Genu or Genus: Avra, Bryopsis, Bryothamnion, Caul, Codi, Dasya, Dasycladus, Grac, Hali, Hypn, Sarg
Octocoral: Genus of each colony = Genu: Gorg, Lept, Plex... except Pseudopterogorgia=Pspt, Plexaurella=Plla, Pseudoplexaura=Pspl
Stony Coral: Genus species of each colony = G spe: Acer, Aaga, C nat, M ann, M cav, P ame, O dif, S rad, S sid, S bou, S hya, S int
Coral condition: W=white disease(s), O=other disease(s), B=bleaching, Coral Stress Index # 0, 1, 2, 3
Other- includes: Anemone, Wormrock, Annelid (excluding wormrock), Barnacle, Bivalve, Bryozoan, Millepora sp, Seagrass, Zoanthid

Figure 6. Sample BEAMR data entry form

Visual estimates of planar percent cover of all sessile benthos are pooled to 19 major functional groups. Functional groups are: sediment, macroalgae, turf algae, encrusting red algae, sponge, hydroid, octocoral, scleractinian coral, tunicate, bare hard substrate, seagrass, anemone, zoanthid, *Millepora* sp., sessile worm, wormrock (*Phragmatopoma* spp.), bivalve, bryozoan, and sessile arthropod. Each functional group is given a percent cover value (0-100%, minimum 1% if present) and the total cover of all functional groups is 100%. Biologists augment data collection for sediment and turf algae by circling all descriptors that apply for sediment (sand, shell-hash, mud). Presence of any clionaid sponges (*e.g.*, *Pione lampa*, *Cliona delitrix*, *Cliona celata)* is also noted. The macroalgae percent cover data are augmented by a genus-level breakdown of macroalgae percent cover (for all genera with at least 1% cover). As with all non-consumptive surveys, BEAMR is necessarily constrained to visually conspicuous organisms with well-defined identifying characteristics.

Each colony of octocoral and scleractinian coral is identified and the maximum height or width is measured to the nearest centimeter. Octocoral individuals are identified to genus. Scleractinian coral individuals are identified to species whenever possible. The smallest size recorded is one centimeter for individuals less than or equal to one centimeter. Photographs will be taken to supplement BEAMR data along each transect.

2.1.4 Scleractinian Coral Census and Photo Quadrat Monitoring

In addition to collecting sediment and BEAMR data along all transects (Figures 2-5, Table 1), a biologist will conduct a census of all scleractinian coral colonies ≥ 5 cm located within a 1-m wide belt (0.5 m to the north and 0.5 m to the south) along each 50-m transect. During these belt-

transect surveys, species, size and the location on the transect of each qualifying scleractinian coral will be recorded.

In order to quantify colony condition (i.e. stress), a subset of corals ≥ 15 cm (large) will be monitored through all surveys using a photo quadrat. Two (2) large corals will be located along each of the 31 transects (for a total of 64 colonies) during the pre-construction survey, and their location recorded and marked with a nail. If no corals ≥ 15 cm are observed within a 1-m wide belt along the transect, divers may look outside the belt for large corals to monitor along the transect. Photographs will be taken using a camera in underwater housing mounted on a 0.25-m^2 framer. Use of a framer will provide calibrated photo-documentation at a set distance from the substrate during each sampling event. Each photograph will be analyzed using the analytical software Coral Point Count with Excel extensions (CPCe) to calculate planar area of live tissue on each large coral colony (Kohler and Gill, 2006). The time-series photographs will provide a clear visual representation of any changes in the condition of each colony (e.g., disease, sedimentation, change in color) and the CPCe calculations will quantify any changes in live tissue (growth or die-off) taking place over time.

2.1.5 Video Documentation

Video will be collected along all monitoring transects (Figures 2-5, Table 1) using a video camera in an underwater housing. Divers will collect video by swimming from the inshore hardbottom edge west to the end of each 50-m transect, maintaining a height of approximately 40 cm above the substrate and a rate of approximately 5 m per minute. Video will supplement the sediment, BEAMR and coral census data to help assess any potential project-related impacts. Transect video is intended as a qualitative aid in transect comparison among surveys; quantitative video analysis is not included in this monitoring plan, but video may be analyzed at a later date if desired.

2.1.6 *In-situ* Hardbottom Delineation

In order to document changes in hardbottom exposure, divers will delineate the nearshore hardbottom edge along each of the four (4) monitoring segments: Vanderbilt (R-21+080 to R-29+700), Pelican Bay (R-30+500 to R-37), Park Shore (R-43+550 to R-55) and Naples (R-58-300 to R-65). Hardbottom edge delineation will be conducted along each segment during each survey. Divers will follow the inshore edge of the community while towing a buoy equipped with a Differential Global Positioning System (DGPS) antenna linked to a topside laptop computer running HYPACK navigational software. The positioning data will be recorded, and results of each hardbottom investigation will be compared to the pre-construction hardbottom mapping survey to show changes in hardbottom exposure over time.

2.2 WIGGINS PASS – CONTINGENCY MONITORING PLAN

One component of the Wiggins Pass Maintenance Dredging and Navigation Improvement Project (FDEP Permit No. 0142538-008-JC) involves placement of suitable fill removed from Wiggins Pass on the shoreline of, or in the nearshore environment adjacent to, Delnor-Wiggins Pass State Park (R-18 to R-20) south of the Pass, and Barefoot Beach (R-12 to R-15+500), north of the Pass. Based on coordination with FDEP, it was determined that the three (3) control

monitoring transects between R-18 and R-20, which were established and monitored in association with the 2006 project (Figure 2, Table 2), can be monitored as part of the Collier County Hardbottom Biological Monitoring Plan to determine potential impacts from fill placement if nearshore or onshore fill placement will be conducted along the Delnor-Wiggins shoreline. If fill is placed south of the pass on or in the nearshore area adjacent to Delnor-Wiggins Pass State Park, three (3) transects will be monitored (Figure 2, Table 2).

Table 2. Wiggins Pass Contingency Monitoring Transect Locations.

Delnor-Wiggins Pass State Park		
Transect	**Northing**	**Easting**
R18+900	709037.27	383572.79
R19+400	708484.17	383699.82
R20	707864.78	383498.82

Based on previous hardbottom investigations north of Wiggins Pass, the County modified the Barefoot Beach fill placement area in order to avoid hardbottom impacts. Sidescan sonar and diver groundtruthing surveys conducted in 1993 and 1994 documented hardbottom resources located approximately 5600 ft north of Wiggins Pass, approximately 700 ft offshore of R-11 (CPE, 1994). Collier County divers conducted an investigation of this area in 2010 which confirmed the presence of hardbottom between R-10 and R-11, but did not find hardbottom south of R-11. Based on these sidescan sonar and diver investigations, Collier County and FDEP determined that limited placement of fill on or adjacent to Barefoot Beach to the area south of R-12 would avoid impacts to the hardbottom located between R-10 and R-11. Therefore, placement of fill on or in the nearshore area adjacent to Barefoot Beach south of R-12 would not require any hardbottom monitoring. A recent September 2012 CPE sidescan sonar survey north of Wiggins Pass showed additional potential hardbottom located between R-12 and R-13; however diver investigations in February 2013 did not locate hardbottom resources in this area. Divers observed large areas of mud deposit with occasional small patches of emergent rock and/or octocorals. Based on these investigations, FDEP determined that there is no hardbottom which may be impacted by placement of fill on or in the nearshore environment of Barefoot Beach as part of the Wiggins Pass Maintenance Dredging and Navigation Improvement Project.

2.3 PIPELINE CORRIDOR SURVEYS

Pipeline corridors shall be video surveyed immediately after pipeline placement and immediately after removal of each pipeline. The pipeline corridor transect locations will be marked with buoys by the selected dredge contractor immediately prior to pipeline placement. Divers will swim the length of the pipeline transects collecting video with a camera in an underwater housing. Any observed damage to hardbottom resources will be documented with video and still photography, the location of the damage will be recorded and damage assessments will be provided to FDEP. In the event that remediation and/or mitigation efforts are required, Collier County will coordinate program details with FDEP.

3.0 MONITORING SCHEDULE

Monitoring for the 2013-14 Collier County Beach Nourishment Project will follow the schedule presented in Table 3. All nearshore hardbottom monitoring surveys will be conducted in summer months (June through September). Pipeline corridor surveys will be conducted during construction of the project to assess any impacts caused by the placement of pipeline over hardbottom resources.

Table 3. Collier County Hardbottom Biological Monitoring Schedule

Survey	Nearshore Hardbottom Monitoring[1]	Pipeline Corridors[2]
Pre-Construction	2013	
Mid-Construction		2013-14
1-Year Post-Construction	2015	
2-Year Post-Construction	2016	
3-Year Post-Construction	2017	

[1]Nearshore hardbottom surveys include transect monitoring and hardbottom edge delineation

[2]Pipeline corridors will be video surveyed immediately following placement and removal of pipelines

4.0 REPORTING

4.1 NEARSHORE HARDBOTTOM MONITORING REPORTS

FDEP will be informed when each survey will begin; monitoring progress shall be reported weekly until the completion of each survey, at which point the JCP compliance officer shall be notified that the survey is complete. Raw data, including copies of data sheets and shapefiles of the hardbottom edge, will be submitted to FDEP within 30 days of the completion of each survey. A first annual, second annual and third annual post-construction nearshore hardbottom monitoring report will be prepared and submitted to the FDEP for review within 90 days of the completion of each monitoring event, but no later than December 1st, for three years post-construction. The post-construction reports will compare data to pre-construction results and to

each previous post-construction report. A final report will be prepared following the conclusion of the third year of post-construction monitoring and will summarize and compare data of all reports. Reports will analyze and discuss any observed burial, sedimentation, or changes to benthic communities. Data will be analyzed to determine any potential direct and secondary impacts due to the Collier County Beach Nourishment Project. Videos collected along monitoring transects will be submitted on DVDs with each annual report. Each annual report will also include the results of the hardbottom delineation and a comparison of the location of the inshore hardbottom edge delineated during each survey.

Annual monitoring reports will include:

- A map including the Collier County Beach Nourishment Project area and adjacent hardbottom resources and monitoring transects overlaid onto recent, clear aerial photographs;
- Analysis of line-intercept data and interval sediment depth measurements, illustrated with linear and bar graphs demonstrating sediment dynamics on the transects ;
- Multivariate analysis of quantitative BEAMR data with subsequent analysis of benthic biological components on the monitoring transects (*e.g.*, percent cover by scleractinian corals, octocorals, sponges, and algae);
- Comparison of coral density based on coral census data;
- Comparison of large (≥ 15 cm) coral condition based on photo quadrat analyses;
- A comparison of post-construction monitoring results to pre-construction monitoring results;
- A figure comparing the most recent annual hardbottom edge delineation and all previous hardbottom delineations;
- Copies of all transect video submitted on DVDs;
- A comprehensive Collier County Environmental GIS Database will be updated after each monitoring event.

4.2 PIPELINE CORRIDOR OBSERVATION REPORTS

Observation reports documenting pipeline surveys will be submitted within 60 days following removal of each pipeline. Reports will include observations following placement and removal of each pipeline, and a DVD will be provided with a copy of all video surveys. In cases where damage to hardbottom resources is observed, FDEP will be notified and remediation efforts, if required, will be coordinated.

5.0 REFERENCES

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