FINDING OF NO SIGNIFICANT IMPACT

Use of Outer Continental Shelf Sand from Borrow Area L in the Sand Key Beach Nourishment in the Pinellas County (Florida) Beach Erosion Control Project

Introduction

Pursuant to the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500-1508), the U.S. Army Corps of Engineers (USACE), Jacksonville District, in coordination with the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), prepared an environmental assessment (EA) to determine whether authorizing use of Outer Continental Shelf (OCS) sand from Borrow Area L in the Sand Key Beach Nourishment in the Pinellas County (Florida) Beach Erosion Control Project would have a significant effect on the human environment and whether an environmental impact statement (EIS) should be prepared. Pursuant to the Department of the Interior (DOI) regulations implementing NEPA (43 CFR 46), the BOEMRE has independently reviewed the EA and has determined that the potential impacts of the proposed action have been adequately addressed.

Proposed Action

The BOEMRE's proposed action is the issuance of a negotiated agreement to authorize use of Borrow Area L so that the project proponents, the USACE and local sponsor, Pinellas County, can obtain the necessary sand resources for a beach nourishment project for Sand Key Beach. The USACE's connected action is the construction of the project. The project is needed to provide storm protection along the coastline in Pinellas County, Florida, which includes Sand Key (Clearwater), Belleair Beach, Indian Rocks Beach, Indian Shores, Redington Shores and North Redington Beach. The Pinellas County Beach Erosion Control Project was authorized by the Rivers and Harbors Act of 1966 and the subsequent Water Resources Development Act of 1986 (Public Law 99-662).

The purpose of the BOEMRE 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). The legal authority for the issuance of negotiated noncompetitive leases for OCS sand and gravel is provided by OCSLA (43 U.S.C. 1337(k)(2)).

Alternatives to the Proposed Action

In past environmental analyses for this beach nourishment project, a number of alternatives related to sand sources have been considered. The alternatives have narrowed over time due to lack of sufficient volume in many of the previously analyzed sand sources. Borrow Area L was identified after an extensive geophysical, geotechnical, and economic evaluation of state-water borrow area alternatives. The only practical alternative to the BOEMRE's proposed action is to not issue the negotiated agreement. The potential impacts resulting from the BOEMRE's no action actually depend on the course of action subsequently pursued by the USACE and local sponsor, which could include identification of a different offshore or upland sand source. In the case of the no project option, coastal erosion would continue, sea turtle and shorebird nesting habitat would deteriorate, and the likelihood and frequency of property and storm damage would increase. The USACE also analyzed within the EA a status quo (No Action) alternative which is the continued use of Egmont Channel Shoal. This shoal area has enough material to supply the current needs of the authorized project. However, the distance from Egmont Channel Shoal to the northern end of Sand Key makes the use of this area cost-prohibitive, especially given increasing state and local budgetary constraints.

Environmental Effects

In 1984, the USACE evaluated potential environmental effects resulting from the proposed action in *Beach Erosion Control Project Review Study and Environmental Impact Statement (EIS) for Pinellas County, Florida*. The USACE has also prepared two other Environmental Assessments that evaluate the potential effects of the beach nourishment project: *Florida, Beach Erosion Control Project 1st Renourishment Sand Key Segment, Design Memorandum with Environmental Assessment (EA)* (USACE 1997 and *The Final Environmental Assessment: Alternative Sand Source Utilization for the Pinellas County Beach Erosion Control Project* (USACE 2002). The 1997 and 2002 EAs tiered from the 1984 EIS and were used to support subsequent nourishments. The proposed use of Borrow Area L is the first time the project has proposed using OCS sand resources for nourishment activities. The connected actions of the conveyance and placement of the sand moved from Borrow Area L have been addressed in the documents that are incorporated by reference in the current EA and are summarized in Appendix A of the current EA.

Based on the effects analysis presented in the attached EA (Attachment 1), no significant impacts were identified. The EA identifies all mitigation and monitoring that is necessary to avoid, minimize, and/or reduce and track any foreseeable adverse impacts that may result from all phases of construction. A subset of mitigation, monitoring, and reporting requirements, specific to activities under BOEMRE jurisdiction, will be incorporated into the negotiated agreement to avoid, minimize, and/or reduce and track any foreseeable adverse impacts. These requirements are included in Appendix A of the FONSI.

Significance Review

Pursuant to 40 CFR 1508.27, the BOEMRE evaluated the significance of potential environmental effects considering both CEQ context and intensity factors. The potential significance of environmental effects has been analyzed in both spatial and temporal context. Potential effects are generally considered reversible because they will be minor to moderate, localized, and short-lived. No long-term significant or cumulatively adverse effects were identified. The ten intensity factors were considered in the EA and are specifically addressed below:

1. Impacts that may be both beneficial and adverse.

Potential adverse effects to the physical environment, biological resources, cultural resources, and socioeconomic resources have been considered. Adverse effects to benthic habitat and communities in the borrow area are expected to be reversible. Adverse effects on fish habitat and fishes are expected within the dredged area due to reduction of benthic habitat and changes in shoal topography and in the fill placement area due to burial of existing benthic habitat. Potential effects to sea turtles, migratory birds, marine mammals, and cultural resources in the vicinity of operations have been reduced through tested mitigation.

Effects to sea turtles, marine mammals, nesting and courting shorebirds, and water quality will be monitored. No impacts to hardbottom communities near Borrow Area L are anticipated due to the establishment of a 400-ft buffer around the resources. Temporary displacement of birds near the shoal site or beach placement could occur. Birds may be attracted to feeding near the hopper as it is being filled at the borrow area or near discharge pipelines on the beach. Impacts would be short-term, localized and temporary and should have no lasting effects on bird populations in the area. Temporary reduction of water quality is expected due to turbidity during dredging and placement operations. Small, localized, temporary increases in concentrations of air pollutant emissions are expected but the short-term impact by emissions from the dredge or the tugs would not affect the overall air quality of the area. A temporary increase in noise level and a temporary reduction in the aesthetic value offshore during construction in the vicinity of the dredging would occur. For safety reasons, navigational and recreational resources located in the vicinity of the dredging operation would temporarily be unavailable for public use. Archaeological resources will be avoided during dredging operations by a 200-m buffer. A dredge with GPS-positioning equipment would be used to ensure the dredge is operating in the authorized location. An unexpected finds clause would be implemented in the case an archaeological resource is discovered during operations.

2. The degree to which the proposed action affects public health or safety.
The proposed activities are not expected to significantly affect public health. Construction noise will temporarily increase ambient noise levels and equipment emissions would decrease air quality in the immediate vicinity of placement activities. The public is typically prevented from entering the segment of beach under construction, so recreational activities will not be occurring in close proximity to operations.

3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
No prime or unique farmland, designated Wild and Scenic reaches, or wetlands would be impacted by implementation of this project. No critical habitat for the listed species is located within the project area. Borrow Area L has been designated as Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for 31 species (see Table 1, Appendix C of the EA). Due to required mitigation efforts, not all of Borrow Area L will be used and similar habitat is adjacent to Borrow Area L. Dredging may affect feeding success of EFH species due to turbidity and loss of benthic organisms. Impacts to EFH would occur in Borrow Area L, but the limited spatial and temporal extent of dredging suggests these impacts will not adversely affect EFH on a broad scale. Potential impacts to nearshore hardbottom and benthic communities will be minimized by using established pipeline corridors. The USACE and local sponsor have previously constructed artificial reefs offshore the construction beaches to compensate for potential deleterious effects on these important resources. The pipeline corridors will be monitored for effects during pump-out, placement, and beach shaping operations.

4. *The degree to which the effects on the quality of the human environment are likely to be highly controversial.*

No effects are expected that are scientifically controversial. Effects from beach nourishment projects, including dredging on the OCS, are well studied. The effects analyses in the EA has relied on the best available scientific information, including information collected from previous dredging and nourishment activities in and adjacent to the project area. Numerous studies and monitoring efforts have been undertaken along the western coast of Florida evaluating the effects of dredging and beach nourishment on shoreline change, benthic communities, nesting and swimming sea turtles, and shorebirds.

5. *The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.*

Beach nourishment is a common solution to coastal erosion problems along the Florida coast. Federally-authorized beach nourishment in Pinellas County has been ongoing since 1988. No significant adverse effects have been documented during or as a result of past operations. The project design is typical of beach nourishment activities. Mitigation and monitoring efforts are similar to that undertaken for past projects and have been demonstrated to be effective. The effects of the proposed action are not expected to be highly uncertain, and the proposed activities do not involve any unique or unknown risks.

6. *The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.*

No precedent for future action or decision in principle for future consideration is being made in BOEMRE's decision to authorize re-use of Borrow Area L. The BOEMRE considers each use of a borrow area on the OCS as a new Federal action, despite the fact that Congress has authorized the USACE to design, construct, and maintain the beach nourishment project at necessary intervals over 50 years. The Bureau's authorization of the use of the borrow area does not dictate the outcome of future leasing decisions. Future actions will also be subject to the requirements of NEPA and other applicable environmental laws.

7. *Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.*

Significance may exist if it is reasonable to anticipate cumulatively significant impacts that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. The EA identifies those actions and potential impacts related to underlying activities. The EA and previous NEPA documents conclude that the activities related to the proposed action are not reasonably anticipated to incrementally add to the effects of other activities to the extent of producing significant effects. Because the seafloor is expected to equilibrate and moving sand will slowly accumulate in Borrow Area L, the proposed project provides an incremental, but localized effect on the reduction of offshore sand resources. Although there will be a short-term and local decline in benthic habitat and populations, both are expected to recover within a few years. No significant cumulative impacts to benthic habitat are expected from the use of the borrow site.

8. *The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.*

The proposed action is not expected to adversely affect historic resources. Seafloor-disturbing activities (e.g., dredging, anchoring, pipeline emplacement and relocation) may occur during proposed construction activities. The greatest risk to cultural resources exists in the borrow area where dredging will occur. An archaeological clearance survey was performed and no cultural resources were identified within the borrow area. A single target was identified outside of the authorized borrow area and will be avoided during dredging operations by a 200-m buffer. A dredge with GPS-positioning equipment and an unexpected finds clause would be implemented. Exclusionary buffers (400 ft) have been established around documented hardbottom features adjacent to Borrow Area L in order to avoid any direct or indirect impacts to these features from dredge plant disturbances. Attachment 2 shows a map of Borrow Area L highlighting the 200-m buffer for cultural resources and 400-ft. hardbottom buffer.

Coordination will continue with the Florida's State Historic Preservation Officer (SHPO) and the Seminole Tribe of Florida's Tribal Historic Preservation Office (STOF-THPO). Archival research, channel surveys, and consultation with the Florida SHPO have been conducted for the Sand Key dredging project. All of these activities have been completed in accordance with the National Historic Preservation Act (NHPA), as amended; the Archeological and Historic Preservation Act (AHPA), as amended; and Executive Order 11593. The project is in full compliance with the NHPA as well as the AHPA and E.O. 11593.

9. *The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.*

Nesting and swimming sea turtles, manatees, and gulf sturgeons present in the project area during and after construction operations may be adversely affected. The USACE will comply with all requirements of biological opinions associated with this project provided under the Endangered Species Act (ESA) from either U.S. Fish and Wildlife Service (U.S. FWS) or National Marine Fisheries Service (NMFS). USACE will implement the Standard Manatee Construction Protection Specifications to ensure manatee protection. Placement of material on Sand Key from the Borrow Area L Alternative may affect, but is not likely to adversely affect, the piping plover. Impacts would be short-term and temporary and should have no lasting effects on the wintering piping plover population of Pinellas County. Dredging will not occur within a minimum of 400 ft from any significant hardbottom areas or bottom structures that serve as attractants to sea turtles for foraging or shelter. These buffers and any other turtle safety precautions would be maintained to comply with the NMFS Gulf Regional Biological Opinion (GMRBO) (November 19, 2003; Revision No 1. June 24, 2005; Revision No. 2. January 9, 2007). Additional documents that affect the proposed project and would be complied with include the NMFS Biological Opinion (October 1, 1996) and the U.S. FWS Fish and Wildlife Coordination Act Report (November 4, 1996). If a hopper dredge is used for the dredging operations, potential impacts to sea turtles could occur. To minimize the risk to sea turtles, standard sea turtle protection conditions will be implemented such as the use of a state-of-the-art rigid deflector draghead at all times, inflow screens, and/or monitoring of the operation. According to the NMFS Biological Opinion, smalltooth sawfish, sperm whales, North Atlantic right whales, blue whales, fin whales, sei whales, and humpback whales occur only rarely in the project area and therefore the likelihood of adverse impacts are very low and the chances of the proposed action affecting them are discountable.

This project was fully coordinated under the ESA and is in full compliance with the Act. USACE has consulted with the U.S. FWS and NMFS and the USACE prepared and submitted a Biological Assessment to the U.S. FWS. The U.S. FWS has issued a biological opinion which is included in Appendix E of the EA. NMFS-PRD (Protected Resources Division) concurred that, should the USACE use a hopper dredge for the new borrow site, the project would be covered by the NMFS Regional Biological Opinion (GMRBO) (Appendix B of the EA). NMFS-PRD also recognizes and acknowledges that the administrative portion of the project concerning the issuance of a lease of the offshore borrow area to the USACE and Pinellas County for the nourishment material, will be provided by the BOEMRE. The GMRBO analyzes and accounts for the effects of federally permitted or federally sponsored hopper dredging of all U.S. Gulf of Mexico sand mining areas for beach (borrow sites) and virgin (previously unused) sand mining areas for beach nourishment, restoration, and protection projects, on listed species. Thus, any effects to sea turtles or Gulf sturgeon from the proposed project have been analyzed in the GMRBO, are included in that opinion's incidental take statement, and are subject to the terms and conditions of that opinion. If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action, consultation will need to be reinitiated.

10. *Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.*

As a Federal agency, the USACE must comply with all applicable Federal, State, and local laws and requirements. The USACE has acquired authorizations for ESA and MSA from NMFS and U.S. FWS. A Joint Coastal Permit (JCP) and consistency concurrence from the Florida Department of Environmental Protection (FDEP) is required for the proposed action. The development of the JCP is ongoing and once finalized will be available online at http://www.dep.state.fl.us/beaches/permitting/pinellas.htm. The JCP will include mitigation and monitoring requirements that are applicable to the connected state activities but not to BOEMRE's proposed action. The USACE will implement their Migratory Bird Protection Policy (Attachment 3) to avoid and monitor for potential effects on migratory birds. The proposed action is in compliance with the Marine Mammal Protection Act. Marine mammals are not likely to be adversely affected by the project and incorporation of safeguards to protect threatened and endangered species during project construction would also protect marine mammals in the area. Water quality will be monitored to ensure state water quality standards are not violated.

Consultations and Public Involvement

The Draft EA was made available to the public on July 14, 2010 for a 60-day comment period. The USACE, serving as the lead Federal agency, and the BOEMRE, in a consulting role, has coordinated with the U.S. FWS, NMFS, U.S. EPA, FDEP, Florida State Clearinghouse, Florida SHPO, and Seminole Tribe in support of this leasing decision. The local sponsor's 2010 application for a modification to its Joint Coastal Permit was also noticed to the public. Pertinent correspondence with Federal and state agencies are provided in Appendix E of the EA. After signature of this Finding of No Significant Impact (FONSI), a Notice of Availability of the FONSI and EA will be prepared and published by the BOEMRE in the Federal Register or by other appropriate means. The EA and FONSI will be posted to the BOEMRE web site [http://www.boemre.gov/sandandgravel/MarineMineralProjects.htm].

Conclusion

The BOEMRE has considered the consequences of issuing a negotiated agreement to authorize use of OCS sand from Borrow Area L. The BOEMRE jointly prepared and independently reviewed the attached EA (Attachment 1) and finds that it complies with the relevant provisions of the CEQ regulations implementing NEPA, DOI regulations implementing NEPA, and other Marine Mineral Program requirements. Based on the NEPA and consultation process coordinated cooperatively by the USACE and BOEMRE, appropriate terms and conditions enforceable by the BOEMRE will be incorporated into the negotiated agreement to avoid, minimize, and/or mitigate any foreseeable adverse impacts.

Based on the evaluation of potential impacts and mitigating measures discussed in the EA, the BOEMRE finds that entering into a negotiated agreement, with the implementation of the mitigating measures, does not constitute a major Federal action significantly affecting the quality of the human environment, in the sense of NEPA Section 102(2)(C), and will not require preparation of an EIS.

James F. Bennett Acting Chief, Environmental Division	6/16/11 Date

Appendix A
Mitigation, Monitoring, and Reporting Requirements

The following mitigation measures, monitoring requirements, and reporting requirements are proposed by the BOEMRE to avoid, reduce, or eliminate environmental impacts associated with the Proposed Action (herein referred to as the "Project"). Mitigation measures, monitoring requirements, and reporting requirements in the form of terms and conditions are added to the negotiated agreement and are considered enforceable as part of the agreement.

Plans and Performance Requirements

USACE will provide the BOEMRE with a copy of the Project's "Construction Solicitation and Specifications Plan," including final Project drawings, prior to construction (herein referred to as the "Plan"). No activity or operation authorized by the negotiated agreement (herein referred to as the Memorandum of Agreement or MOA) at Borrow Area L shall be carried out until the BOEMRE has had an opportunity to review the Plan, thus ensuring that each activity or operation is conducted in a manner that is in compliance with the provisions and requirements of the MOA. USACE will ensure that all operations at Borrow Area L are conducted in accordance with the final approved Plan and all terms and conditions in this MOA, as well as all applicable regulations, orders, guidelines, and directives specified or referenced herein.

The dredging method from BAL will be consistent with the NEPA and authorizing documents, as well as the project permits. USACE will allow BOEMRE to review and comment on modifications to the Plan that may affect the project area, including the use of submerged or floated pipelines to directly convey sediment from the borrow area to the placement site. Said comments shall be delivered in a timely fashion in order to not delay the USACE's construction contract or schedule.

If dredging and/or conveyance methods are not wholly consistent with that evaluated in relevant NEPA documents and environmental and cultural resource consultations, described in Title IV. C. 2, and authorized by the Joint Coastal Permit, additional environmental review may be necessary. If the additional NEPA consultations or permit modifications would impact or otherwise supplement the provisions of the MOA, an amendment may be required.

USACE, at the reasonable request of the BOEMRE, shall allow access, at the site of any operation subject to safety regulations, to any authorized Federal inspector and shall provide the BOEMRE any documents and records that are pertinent to occupational or public health, safety, or environmental protection as may be requested.

Environmental Responsibilities and Environmental Compliance

USACE is the lead agency on behalf of the Federal government to ensure the Project complies with applicable environmental laws, including but not limited to the Endangered Species Act, Magnuson-Stevens Fishery Management and Conservation Act, Migratory Bird Treaty Act, National Historic Preservation Act, and Coastal Zone Management Act.

USACE will serve as the lead Federal agency for Endangered Species Act (ESA) Section 7 consultation concerning protected species under the purview of U.S. Fish and Wildlife Service

(USFWS) and National Marine Fisheries Service (NMFS). USACE will instruct its contractor(s) to implement the mitigation terms, conditions, and measures required by the USFWS, NMFS, Florida Department of Environmental Protection (FDEP), and the BOEMRE pursuant to applicable Federal and State laws and regulations. The required terms and conditions are reflected in the attached Biological Opinions and pending Joint Coastal Permit Final Order No.: 0238664-001-JC and 002-BV.

USACE is responsible for compliance with the Specific Conditions of the Joint Coastal Permit, including implementation of water quality monitoring, shorebird monitoring, the Pipeline Corridor and Nearshore Hardbottom Monitoring and Contingency Mitigation Plans, the Sediment Quality Control/Quality Assurance Plan, and the Physical Monitoring Plan. Construction shall not commence until the pre-construction requirements have been completed. Copies of all relevant correspondence, monitoring, and reporting shall be provided to the BOEMRE at dredgeinfo@boemre.gov.

Notification of Activity in or near the Borrow Area

USACE will notify the BOEMRE at dredgeinfo@boemre.gov of the commencement and termination of operations at Borrow Area L within 24 hours after USACE receives such notification from its contractor(s) for the Project. The BOEMRE will notify USACE in a timely manner of any OCS activity within the jurisdiction of the DOI that may adversely affect USACE's ability to use OCS sand for the Project.

Dredge Positioning

During all phases of the Project, USACE 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. An exclusionary buffer of 400 ft has been established around documented hardbottom features adjacent to the proposed borrow area. The final borrow area design reflects the required buffer. During dredging operations, USACE will immediately notify the BOEMRE at dredgeinfo@boemre.gov if dredging occurs outside of the approved borrow area. Anchoring, spudding, or other bottom disturbing activity is to be avoided outside the authorized borrow area on the OCS.

USACE will provide the BOEMRE all Dredging Quality Management (DQM) data acquired during the project using procedures jointly developed by the USACE's National Dredging Quality Management Data Program Support Center and the BOEMRE. USACE will submit the DQM data, including draghead depth, to dredgeinfo@boemre.gov biweekly. A complete DQM dataset will be submitted within 45 days of completion of the Project.

Submittal of Production and Volume Information

USACE, in cooperation with the dredge operator, shall submit to the BOEMRE on a biweekly basis a summary of the dredge track lines, outlining any deviations from the original Plan. A color-coded plot of the cutterhead or drag arms will be submitted, showing any horizontal or vertical dredge violations. The dredge track lines shall show dredge status: hotelling, dredging, transiting, or unloading. This map will be provided in PDF format.

USACE will provide at least a biweekly update of the construction progress including estimated volumetric production rates to the BOEMRE. The biweekly deliverables will be provided electronically to dredgeinfo@boemre.gov. The project completion report, as described below, will also include production and volume information, including Daily Operational Reports.

Local Notice to Mariners

USACE 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.

Marine Pollution Control and Contingency Plan

USACE will require its contractor(s) and subcontractor(s) to prepare for and take all necessary precautions to prevent discharges of oil and releases of waste and hazardous materials that may impair water quality. In the event of an occurrence, notification and response will be in accordance with applicable requirements of 40 C.F.R. 300. All dredging and support operations shall be compliant with U.S. Coast Guard regulations and the Environmental Protection Agency's Vessel General Permit, as applicable. USACE will notify the BOEMRE of any occurrences and remedial actions and provide copies of reports of the incident and resultant actions at dredgeinfo@boemre.gov.

Encounter of Ordinance

If any ordinance is encountered while conducting dredging activities at Borrow Area L, USACE will report the discovery within 24 hours to Ms. Renee Orr, Chief, BOEMRE Leasing Division, at (703) 787-1215 and dredgeinfo@boemre.gov.

Bathymetric Surveys

USACE will provide the BOEMRE with pre- and post-dredging bathymetric surveys of Borrow Area L. The pre-dredging survey will be conducted within 30 days prior to dredging. The post-dredging survey will be conducted within 30 days after the completion of dredging. BOEMRE will evaluate the appropriateness of bathymetric surveys at 1 year and 3 years following the completion of dredging. Hydrographic surveys will be performed in accordance with the USACE Hydrographic Surveying Manual EM 1110-2-1003 unless specified otherwise. One hundred percent coverage using interferometric swath or multibeam bathymetry data is preferred over single-beam data. All bathymetric data shall be roll, pitch, heave, and tide corrected. Survey lines of the specific dredge area, within Unnamed Shoal A, will be established at no greater than 50 m intervals perpendicular to a baseline. Three equidistant cross-tie lines will be established parallel to the same baseline. Survey lines will extend at least 50 m beyond the edge of the dredge areas. All data shall be collected in such a manner that post-dredging bathymetry surveys are compatible with the pre-dredging bathymetric survey data to enable the latter to be subtracted from the former to calculate the volume of sand removed, the shape of the excavation, and nature of post-dredging bathymetric change.

Copies of pre-dredging and post-dredging hydrographic data will be submitted to the BOEMRE via dredgeinfo@boemre.gov within thirty (30) days after each survey is completed. The delivery format for data submission is an ASCII file containing x,y,z data. The horizontal data will be provided in the North American Datum of 1983 (NAD ’83) Florida State Plane, U.S. survey feet. Vertical data will be provided in the North American Vertical Datum of 1988 (NAVD ’88), U.S. survey feet. An 8.5x11” plan view plot of the pre- and post-construction data will be provided showing the individual survey points, as well as contour lines at appropriate elevation intervals. These plots will be provided in PDF format.

Archaeological Resources

Onshore Prehistoric or Historic Resources
If USACE discovers any previously unknown historic or archeological remains while accomplishing activity on Sand Key, USACE will notify the BOEMRE of any finding. USACE 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.

Offshore Prehistoric or Historic Resources
Magnetic anomaly L-2, located at Easting 322376.5 and Northing 1319800.8 (Florida West State Plane Coordinate System, U.S. Survey Foot, NAD 83), shall be avoided during dredging operations by at least 200 m. The final borrow area design reflects the required buffer. In the event that the dredge operators discover any archaeological resource while conducting dredging operations in BAL or in the vicinity of pump-out operations, USACE shall require that the dredge and/or pump-out operator follow procedures outlined in the USACE specifications for unanticipated finds. USACE shall then immediately report the discovery to Ms. Renee Orr, Chief, BOEMRE Leasing Division, at (703) 787-1215. If investigations determine that the resource is significant, the parties shall together determine how best to protect it.

Project Completion Report

A project completion report will be submitted by USACE to the BOEMRE within 120 days following completion of the activities authorized under this MOA. This report and supporting materials should be sent to Ms. Renee Orr, Chief, BOEMRE Leasing Division, 381 Elden Street, MS 4010, Herndon, Virginia 20170 and dredgeinfo@boemre.gov. The report shall contain, at a minimum, the following information:

- the names and titles of the project managers overseeing the effort (for USACE, the engineering firm (if applicable), and the contractor), including contact information (phone numbers, mailing addresses, and email addresses);
- the location and description of the project, including the final total volume of material extracted from the borrow area 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);
- ASCII files containing the x,y,z and time stamp of the cutterhead or drag arm locations;
- 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	Final Quantity
1	Mobilization and Demobilization			
2	Beach Fill			
3	Any beach or offshore hard structure placed or removed			

- a listing of construction and construction oversight information, including the prime and subcontractor(s), 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 solutions;
- a list and description of any construction change orders issued, if applicable;
- 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 or efforts associated with the project and costs associated with these surveys or efforts;
- a table listing significant construction dates beginning with bid opening and ending with final acceptance of the project by USACE;
- digital appendices containing the as-built drawings, beach-fill cross-sections, and survey data; and any additional pertinent comments.

Attachment 1

Environmental Assessment and Appendices

May 2011

FINAL SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

SUPPLEMENTAL SAND SOURCE FOR SAND KEY BEACH RENOURISHMENT

PINELLAS COUNTY BEACH EROSION CONTROL PROJECT PINELLAS COUNTY, FLORIDA

Prepared for

U.S. Army Corps of Engineers
Jacksonville District
Jacksonville, Florida

Prepared by

Gulf Engineers & Consultants
Baton Rouge, Louisiana

FINAL
SUPPLEMENTAL
ENVIRONMENTAL ASSESSMENT

SUPPLEMENTAL SAND SOURCE
FOR SAND KEY BEACH RENOURISHMENT

PINELLAS COUNTY BEACH
EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA

Contract No. W912EP-09-D-0005
Delivery Order No. 014
GEC Project No. 27307714

Prepared by

Gulf Engineers & Consultants
9357 Interline Avenue
Baton Rouge, Louisiana 70809
Phone – 225/612-3000

U.S. ARMY CORPS OF ENGINEERS **May 2011**
JACKSONVILLE DISTRICT
JACKSONVILLE, FLORIDA

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

Section **Page**

TABLE OF CONTENTS (cont'd)

TABLE OF CONTENTS (cont'd)

Section **Page**

TABLE OF CONTENTS (cont'd)

TABLE OF CONTENTS (cont'd)

Section **Page**

LIST OF TABLES

Number **Page**

LIST OF FIGURES

Figure **Page**

ENVIRONMENTAL ASSESSMENT

SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

SUPPLEMENTAL SAND SOURCE FOR SAND KEY BEACH RENOURISHMENT

PINELLAS COUNTY BEACH EROSION CONTROL PROJECT PINELLAS COUNTY, FLORIDA

1.0 PROJECT PURPOSE AND NEED

1.1 INTRODUCTION

Florida's barrier island beaches need regular nourishment due to frequent storms and everyday waves and currents. Pinellas County protects the county's barrier island beaches with the Pinellas County Beach Erosion Control Project. Sand is placed along the shorelines of Sand Key, Treasure Island, and Long Key to control shoreline erosion and provide storm protection. Numerous studies have demonstrated that wide beaches provide significantly more storm damage reduction than narrow beaches.

Typically, the sand to nourish and renourish Sand Key has been obtained from the Egmont Channel Shoal borrow area. However, because of the shallow nearshore waters, barges from the Egmont Shoal borrow area have to travel nearly 22.5 miles along appropriate depth contours to reach the northern portion of Sand Key (CP&E 2009). The high cost of fuel has greatly increased the cost of renourishment of Sand Key using the Egmont Channel Shoal.

Borrow Area L, a closer (approximately 12 miles offshore) borrow area in Outer Continental Shelf (OCS) waters, has been identified for use to renourish Sand Key. Previous documents (detailed in Section 1.9) have examined the environmental effects of the beach renourishment and pipeline corridors for this project. This Environmental Assessment (EA) evaluates the use of this alternate borrow area, Borrow Area L.

1.2 PROJECT AUTHORITY

The Rivers and Harbors Act of 1966 and the subsequent Water Resources Development Act of 1986 (Public Law 99-662) authorized the beach erosion control project for Pinellas County, Florida. This EA has been prepared to comply with the National Environmental Policy Act (NEPA).

1.2.1 Initial Authorization

The project was authorized by Section 101 of Public Law (PL) 89-789, Rivers and Harbors Act of 1966, passed November 1966. The authorized project is described in HD 519/89/2.

1.2.2 Supplemental Authorizations

Supplemental authorizations for the renourishment of Pinellas County beaches have been issued several times. The *Beach Erosion Control Project Review Study and Environmental Impact Statement for Pinellas County, Florida* (USACE 1984), July 1984, revised in December 1984, was the first re-examination of the program since its inception. This document was prepared in compliance with resolutions adopted 4 March 1976 by the Committee on Public Works of the United States Senate and 23 September 1976 by the Committee on Public Works and Transportation of the House of Representatives, United States. The Water Resources Development Act of 1986 reauthorized the project for construction and periodic nourishment for the 50-year economic life.

1.2.3 BOEMRE Authority

The proposed borrow area for the Sand Key renourishment project will involve the use of sand resources located beyond the State of Florida's jurisdictional boundary on the Outer Continental Shelf (OCS). The United States Government, and specifically, the Department of the Interior's Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), formerly known as the Minerals Management Service (MMS), has jurisdiction over all mineral resources on the Federal OCS. Public Law 103-426, enacted 31 October 1994, gave the MMS (now the BOEMRE) the authority to convey, on a noncompetitive basis, the rights to OCS sand, gravel, or shell resources for shore protection, beach or wetlands restoration projects, or for use in construction projects funded in whole or part or authorized by the Federal government. Those resources fall under the purview of the Secretary of the Interior, who oversees the use of OCS sand and gravel resources, and the BOEMRE as the agency charged with this oversight by the Secretary. After an evaluation required by NEPA, the BOEMRE may issue noncompetitive negotiated agreements for the use of OCS sand to the requesting entities.

1.3 PROJECT LOCATION

Borrow Area L is located in OCS waters approximately 12 miles west of Clearwater Pass. The sites evaluated in this document include Borrow Area L and Egmont Channel Shoal, the borrow area that had been used in most previous nourishments and renourishments (Figure 1).

1.4 COOPERATING AGENCIES

The U.S. Army Corps of Engineers (USACE) is the lead agency for this project. The U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement is a cooperating agency. The proposed Federal action for the BOEMRE is to enter into a Memorandum of Agreement to authorize the use of a borrow area located in OCS waters.


Alabama
Georgia
Florida
Gulf of Mexico
Map Extent
Brooksville
Hernando County
Pasco County
Hillsborough County
Tampa--St. Petersburg
Area L
North Limit of Fill
Sand Key
Gulf of Mexico
Pinellas County
South Limit of Fill
Tampa Bay
Egmont Ebb Shoal Borrow Area
Manatee County
Sarasota--Bradenton
Sarasota County
Legend
Borrow Area L
Egmont Ebb Shoal Borrow Area
State/Federal Boundary
0 2.5 5 10 15 20 Miles
BORROW AREA L AND EGMONT EBB SHOAL BORROW AREA LOCATION
Sand Key Renourishment Project
Base Map: ESRI 9.3 Data CD
GEC
Figure: 1
Date: February 2010
Scale: 1:650,000
Source: USACE/GEC/ESRI
Map ID: 27307714-1892

1.5 PROJECT HISTORY

The barrier islands in Pinellas County have a history of shoreline erosion caused by storms, wave action and currents. Except for the north and south ends, most of Sand Key is critically eroded. The 11.3-mile-long critically eroded area on Sand Key extends from Florida Department of Environmental Protection (FDEP) reference monuments R-56 to R-115.4. This erosion threatens development and recreational interests in the communities of Belleair Beach, Belleair Shores, Indian Rocks Beach, Indian Shores, Redington Shores, North Redington Beach, Redington Beach and the north end of Madeira Beach (Florida Department of Environmental Protection 2009).

A restoration plan for Sand Key was developed in 1983, and several segments of Sand Key have been nourished and renourished since the 1980s. A nearshore emergent breakwater was constructed at the Redington Shores Beach Access in 1985. Additionally, sand dredged from the John's Pass tidal shoal was placed on the beach. In 1987, the jetty on the north side of John's Pass was reconstructed and a walkway in Madeira Beach was built. During the 1988 Sand Key Phase I project, 1.5 miles of Redington Shores and North Redington Beach were nourished with over 300,000 cubic yards of sand. The 1990 Sand Key Phase II project renourished 2.6 miles of Indian Rocks Beach with 1.3 million cubic yards of sand. In 1992, a conveyor belt system was used to place 850,000 cubic yards of sand on three miles of Indian Shores beach during the Sand Key Phase III project. In 1998-1999, the Sand Key Phase IV project included the renourishment of North Redington Beach, Redington Shores, Indian Shores, and Indian Rocks Beach, and the initial nourishment of the Clearwater section of Sand Key and Belleair Beach. During the Phase IV project, 2.6 million cubic yards of sand were placed along almost nine miles of beach. Except for the Phase I project, the primary source of sand for these past nourishment projects has been the Egmont Channel Shoal Borrow Area.

Prior to the 1983 restoration plan development, protective structures and sand were placed on Sand Key at various times (USACE 1984). The city built 37 groins at Madiera Beach in 1957. In 1961, a curved jetty was constructed on the north side of John's Pass and 30,000 cubic yards of fill was placed north of the jetty. In 1975, the city of Clearwater Beach completed a curved jetty on the south side of Clearwater Pass; in 1977, 186,000 cubic yards of material dredged from Clearwater Pass was placed just south of this jetty. To repair damage from Hurricane Agnes, 400,000 cubic yards of sand was placed on approximately 5 miles of Indian Rocks Beach and its south shore in 1973. In 1969, about 143,000 cubic yards of sand was placed along one mile of the south shore of Indian Rocks Beach to repair damage by Hurricane Gladys. The City of Clearwater Beach placed 600,000 cubic yards of sand on the beach south of Clearwater Pass during 1982 and 1983 (USACE 1984).

After a beach is nourished, continued erosion may decrease the sand volume within the project area and the beach may need to be renourished. The project life or design lifetime is the time it takes for erosion to reduce the sand volume to the minimum volume. The projected project life of the beach renourishment on Sand Key is seven years. Davis *et al*. (2000a) measured beach-nearshore volume loss from Sand Key beaches renourished from 1988 to 1996 and determined that except for a few erosional hotspots, the project performance had exceeded or was likely to exceed the design lifetime.

The beach renourishment area is located on Sand Key, along the coast of Pinellas County in West Central Florida, approximately 25 miles west of Tampa. The renourishment area includes the Sand Key portion of Clearwater Beach, Belleair Beach, Indian Rocks Beach, Indian Shores, Redington Shores, and North Redington Beach (figures 1 and 2). The five pipeline corridors that will be used in this renourishment will be same corridors permitted for the 2006 renourishment.

1.6 PROJECT PURPOSE AND NEED

Sand Key beaches are critically eroded due to a combination of factors, some of which include jetties, inlets, and sea level rise. The significant erosion of the barrier islands in Pinellas County reduces their ability to provide storm protection. There is a need to restore the level of storm protection provided by the barrier islands through beach renourishment. The Pinellas County Beach Erosion Control Project has historically obtained beach-quality sand from inlet ebb shoals and the Egmont Channel Shoal to renourish Pinellas County beaches. The continued use of the Egmont Channel Shoal borrow area to renourish the northern portion of Sand Key has become cost-prohibitive due to transportation costs.

The purpose of the proposed project is to use Borrow Area L to renourish Sand Key beaches with beach-quality sand. It is not the intent of this project to replace or supersede the existing authorization for renourishing Sand Key using sand from the Egmont Channel Shoal borrow area.

The beach renourishment has been detailed in previous EAs (USACE 1997. 2002) that tiered off an EIS (USACE 1984). In summary, an 8.7-mile section of Sand Key beach along the shoreline of the Gulf of Mexico in Pinellas County, Florida (Figure 1) will be renourished. This beach would be renourished with approximately 800,000 cubic yards of sand between FDEP reference monuments R-56 and R-108 (a one-mile section at Belleair Shore between reference monuments R-66 and R-72 will not be renourished). Due to hydraulic losses experienced during the dredging process, up to 1.2 million cubic yards of sand would be dredged from the borrow area. Construction of the project is expected to take from 10 to 14 months.

1.7 DESCRIPTION OF THE USACE PROPOSED ACTION

The connected Federal action undertaken by the USACE is the dredging of sand from Borrow Area L for the renourishment of Pinellas County beaches, with a potential need for additional renourishment every five to seven years. Borrow Area L consists of approximately 286.5 acres of sand patches and sand waves located in depths of approximately 45 ft (13.7 m) NAVD; however, due to mitigation efforts, not all the area will be used. Construction of the project is expected to take from 10 to 14 months. The borrow area would be cut to a depth ranging from 45.7 to 51.5 ft (13.9 to 15.7 m) NAVD, and the resulting maximum depth of cut would not exceed four (4) feet. The borrow cut of Borrow Area L is expected to reduce the depth by 0.7 to

6.5 ft (0.2 to 2 m). Dredging may alter the topography of Borrow Area L for a long period. This EA details the use of Borrow Area L, an alternative offshore borrow area.

The Corps does not normally specify the type of dredging equipment to be used. Generally, this is left to the dredging industry to enable them to offer the most appropriate and competitive equipment available at the time. However, certain types of dredging equipment may be considered more appropriate than others based on the type of material, the depth of the borrow area, the depth of access to the renourishment site, the amount of material, the distance to the renourishment site, the wave-energy environment, etc. A more detailed description of types of dredging equipment and their characteristics can be found in Engineer Manual, EM 1110-2-5025, *Engineering and Design - Dredging and Dredged Material Disposal*. This Engineer Manual is available on the internet at http://www.usace.army.mil/publications/eng-manuals/em1110-2-5025/toc.htm.

Dredging equipment uses either hydraulic or mechanical means to transport material from the substrate to the surface. Hydraulic dredges use water to pump the dredged material as slurry to the surface and mechanical dredges use a bucket-type device to excavate and raise the material from the channel bottom. The most common hydraulic dredges include suction, cutter-suction, and hopper dredges; the most common mechanical dredges include clamshells, backhoes, and marine excavator dredges. Public Law 100-329 requires dredges working on U.S. government projects to have U.S. built hulls, which can limit the options for equipment types if a new type of dredge is developed overseas.

Various project elements influence the selection of the dredge type and size. These factors include the type of material to be dredged (rock, clay, sand, silt, or combination); the water depth; the dredge cut thickness, length, and width; the sea or wave conditions; vessel traffic conditions; environmental restrictions; other operating restrictions; and the required completion time. In addition, all of these factors impact dredge production and, as a result, costs. Multiple dredges of the same or different types may be used to expedite work or to accommodate varying conditions within the dredging areas. The project scale limits potential equipment to large-scale dredges. Potential equipment must be able to reach project depths and excavate large volumes of material.

The USACE prepared and submitted to the USFWS a BA for species under the USFWS jurisdiction to initiate consultation under the Act. The USFWS issued a biological opinion on December 3, 2010 based on their review of the BA that specified the use of a clamshell dredge for sand extraction. The proposed project will more likely require a hopper dredge and this correction had been coordinated with USFWS. Additionally, the placement and relocation of the nearshore mooring buoys used during pump-out may involve up to two tender tugboats, a pumpout booster, two work barges, a pipeline hauler/crane and a crew/supply vessel. The five pipeline corridors that will be used in this renourishment will be same corridors permitted for the 2006 renourishment (Appendix A, Figure A-1).

1.8 DESCRIPTION OF THE BOEMRE PROPOSED ACTION

The BOEMRE, as a cooperating Federal agency, is undertaking a connected action (40 CFR 1508.25) that is related, but unique from the USACE proposed action. The proposed action of the BOEMRE is the issuance of a negotiated agreement pursuant to its authority under the Outer Continental Shelf Lands Act. The purpose of that action is to authorize the use of OCS sand resources from Borrow Area L. In parallel with the USACE decision-making process, the BOEMRE will evaluate whether or not to authorize the use of the offshore borrow area, Borrow Area L. The No Action Alternative for the BOEMRE proposed action is not to issue a negotiated agreement.

1.9 RELATED STUDIES

Pursuant to NEPA, the USACE described the affected environment, developed and described structural and non-structural alternatives, and evaluated potential environmental effects resulting from the proposed action in *Beach Erosion Control Project Review Study and Environmental Impact Statement (EIS) for Pinellas County, Florida*, USACE, July 1984 (revised December 1984). The study area of this EIS included the shoreline of Pinellas County. The selected plan called for the use of two offshore shoals (Egmont Channel and Cabbage Key shoals) and four passes (Blind, John's, Clearwater, and Hurricane passes) as borrow areas (USACE 1984).

In November 1996 (revised March 1997), the USACE evaluated potential environmental effects resulting from the proposed action and alternatives to the proposed action in the *Pinellas County, Florida, Beach Erosion Control Project 1st Renourishment Sand Key Segment, Design Memorandum with Environmental Assessment (EA).* The study area on Sand Key included Redington Shores, North Redington Beach, Indian Rocks Beach, Indian Shores, Clearwater Beach, and Belleair Beach. The alternatives included no action (no renourishment) and the Egmont Channel Shoal Borrow Area. The No Action Alternative did not meet the planning objectives and was determined to be unacceptable (USACE 1997). This EA detailed the effects of the beach placement activities and the effects of dredging the Egmont Channel Shoal borrow area.

The *Final Environmental Assessment: Alternative Sand Source Utilization for the Pinellas County Beach Erosion Control Project* in May 2002 compared the use of nine offshore borrow areas (Borrow Areas A through I) and four ebb tidal shoals (John's Pass, Blind Pass, Pass-A-Grille North, and Pass-A-Grille South) to the No Action Alternative (the continued use of Egmont Channel Shoal). This EA detailed the effects of the beach placement, the effects of dredging the alternative borrow areas and the Egmont Channel Shoal, and the effects of nearshore pipeline placement and staging areas (USACE 2002).

The 1997 and 2002 EAs tiered from the 1984 EIS and were used to support subsequent renourishments. This EA incorporates by reference those analyses that have been determined to still be valid, and it includes new analyses based on additional information. The environmental effects determined in these documents are summarized in Appendix A, in addition to other supplemental information on the Sand Key beach renourishment.

The following is a list of additional environmental documents related to the Sand Key project:

- *Limited Re-evaluation Report and Environmental Summary for Pinellas County, Florida Beach Erosion Control Project*. USACE. April 1994 (Rev. August 1994) (USACE 1994).
- *Supplemental Limited Reevaluation Report (LRR) to the Beach Erosion Control Project Review Study*. USACE. April 1994 (USACE 1994).
- *Pinellas County, Florida Beach Erosion Control Project, Feature Design Memorandum, Northern Treasure Island*. USACE. April 1995 (USACE 1995).
- *Pinellas County Beach Nourishment Project, Final Fish and Wildlife Coordination Act Report.* South Florida Ecosystem Office, U.S. Fish and Wildlife Service. June 1996 (USFWS 1996).
- *Sand Resource Survey Offshore Sand Key, Pinellas County, Florida*. U.S. Geological Survey. 1995 (USGS 1995).
- *Pinellas County Sand Key Segment, Side Scan Sonar Hardbottom Mapping Survey, St. Petersburg Beach, Florida, Survey No. 01-149*. Sea Systems Corporation. August 2001 (Sea Systems Corporation 2001).
- *Pinellas County Treasure Island and Long Key Segment, Side Scan Sonar Hardbottom Mapping Survey, St. Petersburg, Florida, Survey No. 01-247*. Sea Systems Corporation. July 2002 (Sea Systems Corporation 2002).
- *Marine Biological Survey, Pinellas County Shore Protection Project, Comprehensive Borrow Area Study*. Dial Cordy and Associates. February 2002 (Dial Cordy and Associates 2002).
- *Pinellas County Shore Protection Project, Comprehensive Borrow Area Study, Borrow Area Resource Identification and Impact Assessment*. Dial Cordy and Associates. May 2002 (Dial Cordy and Associates, Inc. 2002).
- *Nearshore Marine Biological Survey and Assessment, Pinellas County Shore Protection Project, Comprehensive Borrow Area Study*. Dial Cordy and Associates, Inc. December 2002 (Dial Cordy and Associates, Inc. 2002).
- *Biological Opinion Based on Proposed Beach Nourishment Project, Sand Key Segment Pinellas County, Florida*. U.S. Fish and Wildlife Service. February 2005 (USFWS 2005).
- *Baseline Nearshore Hardbottom Survey, Pinellas County Beach Erosion Control Project*. Dial Cordy and Associates, Inc. October 5, 2006. (Dial Cordy and Associates, Inc. 2006).
- *Geophysical and Geotechnical Investigations to Identify Sand Sources for Beach Nourishment on Sand Key, Pinellas County, Florida*. Coastal Planning & Engineering, Inc. December 2009 (Prepared for Pinellas County) (Coastal Planning & Engineering, Inc. 2009).
- *Compatibility Analysis Sand Key Beaches and Off-shore Borrow Area L.* USACE, February 2010 (USACE 2010).
- *Pinellas County-Sand Key Beach Renourishment Project FDEP Permit No. 52-2923209, Artificial Reef & Natural Hardbottom Biological Monitoring Report.* Coastal Planning & Engineering, Inc. September 2007. (Prepared for Pinellas County) (Coastal Planning & Engineering, Inc. 2007).

- *Pinellas County-Sand Key Beach Renourishment Project, Hardbottom Edge Mapping and Historic Data Evaluation, RAI Response to File No. 0238664-001-JC.* Coastal Planning & Engineering, Inc. (Prepared for Pinellas County). December 2007 (Coastal Planning & Engineering, Inc. 2007)

1.10 DECISIONS TO BE MADE

This EA evaluates the impacts of using the offshore borrow area, Borrow Area L, as an alternative sand source for renourishing the beaches at Sand Key. The findings of this EA will be considered in the decision on whether to use Borrow Area L in lieu of/in addition to the currently authorized borrow area of Egmont Channel Shoal.

1.11 PERMITS, LICENSES, AND ENTITLEMENTS

Permits and licenses required include a Joint Coastal Permit from FDEP for the sand placement site. The USACE, BOEMRE, and the local sponsor will enter into a Memorandum of Agreement for use of the borrow area located in OCS waters. Compliance with environmental requirements is presented in Section 6.0.

2.0 ALTERNATIVES

This section describes the No Action Alternative (the continued use of the Egmont Channel Shoal), the Borrow Area L Alternative, and other sand sources that were considered and eliminated during reconnaissance level investigations. Based on the information and analysis presented in Section 3.0, Affected Environment, and Section 4.0, Environmental Effects, this section presents the beneficial and adverse environmental effects of all alternatives in comparative form, providing a clear basis for choice among the options for the decision maker and the public.

2.1 RECONNAISSANCE LEVEL SAND SOURCE INVESTIGATIONS

In 1994, the USACE conducted a sand resource survey (Gelfenbaum *et al*. 1995) offshore of Sand Key in an attempt to identify closer, less costly sand resources to be used as borrow areas for future Sand Key renourishment projects. Nine study areas (Study Areas A through I) that contained potentially beach compatible material were initially identified (Figure 2). Upon further investigation, the USACE developed 20 potential borrow areas within these nine study areas. Four additional inlet ebb shoals borrow areas were also examined: John's Pass, Blind Pass, Pass-A-Grille North, and Pass-A-Grille South. These borrow areas were eliminated from consideration due to a lack of sufficient volume of material needed for the Sand Key beach renourishment. In addition, the John's Pass area was already scheduled to be used to nourish the Sunshine and Sunset Beaches of Treasure Island, and Blind Pass was already scheduled to be used to renourish the Upham Beach Segment of Long Key.

In 2007, Study Areas A through I were reevaluated and only C, D, and H were found to contain sufficient volumes of sand. The sand ridges in the other areas were not substantial enough to allow the removal of sufficient sand volumes with the appropriate hardbottom buffers. More detailed investigation indicated that D and H contained approximately 889,400 cubic yards of potentially beach compatible material. This quantity was insufficient for the proposed Sand Key renourishment, which requires 800,000 cubic yards of beach-quality sand. Due to hydraulic losses during the dredging process, up to 1.2 million cubic yards would have to be dredged. In 2009, a search for additional borrow areas led to the discovery of three additional Study Areas (J, K, and L). Area K was less likely to produce sand of sufficient quality and quantity than Study Areas J and L, and was subsequently eliminated. Study Areas D, H, J, and L were further investigated using seismic reflection profiles, sidescan sonar imagery, magnetometer surveys, and vibracores (CP&E 2009). Preliminary borrow area boundaries and excavation elevations were developed for eight borrow areas within the four remaining study areas.

Individually, sand resources in borrow areas D, H, and J do not meet the volumetric or qualitative requirements for use at Sand Key. However, the combined sediments in these three borrow areas would be suitable for an emergency fill project. Borrow Area L includes sufficient material for the Sand Key project, and is aesthetically the closest to the existing beach material (CP&E 2009).


Gulf of Mexico
Map Extent
North Limit of Fill
Sand Key
South Limit of Fill
Johns Pass
Blind Pass
Pass-A-Grille N
Pass-A-Grille S
Egmont
Tampa--St. Petersburg
Sarasota--Bradenton
Legend
State/Federal Boundary
Borrow Area L
Egmont Ebb Shoal Borrow Area
Other Borrow Areas
Other Ebb Shoal Borrow Areas
0 1 2 4 6 Miles
BORROW AREAS A THROUGH L
AND EBB SHOAL BORROW AREAS
Sand Key Renourishment Project
Base Map: ESRI 9.3 Data CD
Figure: 2
Date: February 2010
Scale: 1:350,000
Source: USACE/GEC/ESRI
Map ID: 27307714-1981

2.2 ALTERNATIVES RETAINED FOR EVALUATION

Borrow Area L, the only borrow area determined to have sufficient volume and compatible sand for use in this project, and the continued use of Egmont Channel Shoal (the No Action Alternative) were retained for evaluation.

2.2.1 Borrow Area L Alternative

The Borrow Area L Alternative would involve the use of one offshore borrow area (Area L) as a supply of material for the renourishment of Sand Key. This borrow area is relatively close to Sand Key, making renourishment activities more cost-effective by shortening transportation distances. The use of Borrow Area L would also allow for a variety of dredging methods to be employed, potentially reducing construction costs.

2.2.2 Status Quo – Continued Use of Egmont Channel Shoal (No Action Alternative)

Evaluation of the No Action Alternative is a requirement of NEPA regulations (40 CFR Part 1500 *et seq*.) and the USACE Guidance for Conducting Civil Works Planning Studies (ER 1105-2-100, Appendix E). The No Action Alternative assumes no changes to the current shore protection measures that are currently authorized and approved within Pinellas County. The authorized borrow area for the current project is the Egmont Channel Shoal. This shoal area has enough material to supply the current needs of the authorized project. However, the distance from Egmont Channel Shoal to the northern end of Sand Key makes the use of this area cost-prohibitive. Projects along the northern reaches of Pinellas County require that contractors move material needed for the project about 22.5 miles. The long transportation distance limits the methods available for construction and results in higher construction costs. Under the No Action Alternative, authorization from BOEMRE would not be required.

2.3 COMPARISON OF ALTERNATIVES

The major features and consequences of the proposed project (use of Borrow Area L) and the continued use of Egmont Channel Shoal (No Action Alternative) are described in Table 1. Section 4.0, Environmental Effects, includes a more detailed discussion of the impacts of the alternatives. The Borrow Area L Alternative and the continued use of Egmont Shoals Borrow Area (No Action Alternative) would have similar effects on the coastal environment, threatened and endangered species, fish and invertebrates, hardbottom and livebottom resources, benthic habitat, wildlife, Essential Fish Habitat, water quality, noise, aesthetics, recreation, and public safety.

Table 1. Comparison of Alternatives

Environmental Factor	Borrow Area L Alternative	Egmont Shoal Borrow Area (No Action Alternative)
Coastal Environment - Bathymetry	Long-term, significant changes in bottom bathymetry.	Long-term, significant changes in bottom bathymetry.
Coastal Environment - Wave Patterns	May affect wave conditions at the shoreline during extreme storm conditions.	Dredging of the Egmont ebb-tidal delta appears to have no influence on the waves breaking on the coast of Egmont Key.
Coastal Environment - Sediment Transport	May affect net sediment transport at the borrow area because of local changes in physical processes related to changing water depth. May affect sediment transport at the placement site due to equilibrium and spreading processes associated with beach fill.	May temporarily affect net longshore sediment transport at the borrow area. May affect sediment transport at the placement site due to equilibrium and spreading processes associated with beach fill.
Sand Resources	Likely depletion of sand resources at Borrow Area L.	Additional sand resources at Egmont Channel Shoal for future renourishments.
Sediment Characteristics	Native sediment characteristics would be maintained with only minor variations in shell content and color.	The native sediment characteristics would remain unchanged.
Fish and Invertebrates - Soft Bottom Communities	Impacts to infaunal benthic communities due to entrainment, increased turbidity and sedimentation; and changes to the soft bottom bathymetry.	Impacts to infaunal benthic communities due to entrainment, increased turbidity and sedimentation; and changes to the soft bottom bathymetry.
Fish and Invertebrates - Hardbottom Communities	Exclusionary buffers (400 ft) have been established around documented hardbottom features adjacent to the proposed borrow area to eliminate any direct or indirect impacts to these features from dredge plant disturbances. Sedimentation from overflow, etc. is not expected because of the exclusion buffers.	The Egmont shoal borrow area does not contain hardbottom, therefore no impacts to nearshore hardbottom communities would be expected in the borrow area.

Table 1. Comparison of Alternatives

Environmental Factor	Borrow Area L Alternative	Egmont Shoal Borrow Area (No Action Alternative)
Fish and Invertebrates - Fish and Macroinvertebrates	Impacts could include entrainment of organisms during dredge operation; vessel strike; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; changes to soft bottom bathymetry in the borrow area during dredging; and temporary loss of prey items and foraging habitat. Effects would be short-term and localized; similar undisturbed habitat is adjacent to the borrow area.	Impacts could include entrainment of organisms during dredge operation; vessel strike; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; changes to soft bottom bathymetry in the borrow area during dredging; and temporary loss of prey items and foraging habitat. Effects would be short-term and localized; similar undisturbed habitat is adjacent to the borrow area.
Wildlife - Marine Mammals	Impacts could include entrainment of organisms during dredge operation; vessel strike; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; and changes to soft bottom bathymetry in the borrow area during dredging.	Impacts could include entrainment of organisms during dredge operation; vessel strike; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; and changes to soft bottom bathymetry in the borrow area during dredging.
Wildlife - Birds	Temporary displacement of birds near the shoal site could occur. Terns and other birds may fish in the scow as it is being filled. The mixture of water and slurry could bog birds down until they are unable to fly from the scow; this may result in drowning. Fishing birds, particularly plunge-diving terns, could potentially drown during dredging operations. Impacts would be short-term and temporary and should have no lasting effects on bird populations in the area.	Temporary displacement of birds near the shoal site could occur. Terns and other birds may fish in the scow as it is being filled. The mixture of water and slurry could bog birds down until they are unable to fly from the scow; this may result in drowning. Fishing birds, particularly plunge-diving terns, could potentially drown during dredging operations. Impacts would be short-term and temporary and should have no lasting effects on bird populations in the area.

Table 1. Comparison of Alternatives

Environmental Factor	Borrow Area L Alternative	Egmont Shoal Borrow Area (No Action Alternative)
Threatened and Endangered Species	Impacts to threatened and endangered species due to dredging could include potential lethal and sub-lethal effects to sea turtles, marine mammals, Gulf sturgeon, effects on hardbottom foraging habitat.	Impacts to threatened and endangered species due to dredging could include potential lethal and sub-lethal effects to sea turtles, marine mammals, Gulf sturgeon, effects on hardbottom foraging habitat.
Essential Fish Habitat (EFH)	Impacts could include entrainment of organisms during dredge operation; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; and changes to soft bottom bathymetry in the borrow area during dredging. No impacts to hardbottom communities near borrow area L are anticipated due to the establishment of a 400-ft buffer around the resources. Temporary loss of prey items and foraging habitat.	Impacts could include entrainment of organisms during dredge operation; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; and changes to soft bottom bathymetry in the borrow area during dredging. The Egmont shoals borrow area does not contain hardbottom; therefore, no impacts to nearshore hardbottom communities would be expected in the borrow area. Temporary loss of prey items and foraging habitat.
Water Quality	Temporary reduction of water quality due to turbidity from the dredging operation.	Temporary reduction of water quality due to turbidity from the dredging operation.
Hazardous, Toxic, and Radioactive Waste (HTRW)	No evidence of contamination by hazardous or toxic wastes at Borrow Area L was noted during prior surveys or site investigations. Accidental spills and releases of waste/fuel, although remote, are possible.	No evidence of contamination by hazardous or toxic wastes at Egmont Shoal was noted during prior surveys or site investigations. Accidental spills and releases of waste/fuel, although remote, are possible.
Air Quality	Small, localized, temporary increases in concentrations of air pollutant emissions. The short-term impact from emissions by the dredge or the tugs would not affect the overall air quality of the area.	Small, localized, temporary increases in concentrations of air pollutant emissions. The short-term impact from emissions by the dredge or the tugs would not affect the overall air quality of the area.

Table 1. Comparison of Alternatives

Environmental Factor	Borrow Area L Alternative	Egmont Shoal Borrow Area (No Action Alternative)
Noise	A temporary increase in the noise level during construction in the vicinity of the dredging would occur.	A temporary increase in the noise level during construction in the vicinity of the dredging would occur.
Aesthetic Resources	During construction, equipment used for dredging would be visible, resulting in a temporary reduction in the aesthetic value offshore.	During construction, equipment used for dredging would be visible, resulting in a temporary reduction in the aesthetic value offshore.
Recreation Resources	During dredging activities, the use of the area in the immediate vicinity of construction would be restricted for public safety (temporarily).	During dredging activities, the use of the area in the immediate vicinity of construction would be restricted for public safety (temporarily).
Navigation and Public Safety	During dredging activities, the use of the area in the immediate vicinity of construction would be restricted for public safety (temporarily).	During dredging activities, the use of the area in the immediate vicinity of construction would be restricted for public safety (temporarily).
Cultural Resources	No impact. Avoidance buffers will be applied to identified targets.	No impact. Avoidance buffers will be applied to identified targets.
Energy Requirements and Conservation	12 miles from Borrow Area L to the northern portion of Sand Key at a cost of approximately $20 million.	22.5 miles from Egmont Channel shoal to the northern portion of Sand Key at a cost of approximately $45 million.

3.0 AFFECTED ENVIRONMENT

The Affected Environment section describes the existing environmental resources of the areas that would be affected if either alternative were implemented. This section describes only those environmental resources that are relevant to the decision to be made. It does not describe the entire existing environment, but only those environmental resources that would affect or that would be affected by the alternatives if they were implemented. This section, in conjunction with the description of the No Action Alternative, forms the baseline conditions for determining the environmental impacts of the reasonable alternatives.

3.1 COASTAL ENVIRONMENT

The project area is on the coast of the Gulf of Mexico in Pinellas County, Florida. Pinellas County has a subtropical climate with an average annual rainfall of 53 inches (1.34 m) per year. Damaging storms with winds up to hurricane strength can occur throughout the year. Seven elongated, low-profile barrier islands or keys roughly parallel the mainland. The beaches along these barrier islands are subject to very dynamic conditions and are eroding at varying rates by waves, winds, and currents.

Waves are influenced by wind direction, and wind direction in this region is more often from the east. The estimated mean wave height off Sand Key is 0.33 to 1.15 ft (10 to 35 cm) and the spring-tidal range in this area is less than 3 ft (1 m) (Hines *et al*. 2003). The longshore current created by waves breaking at an angle to the shore is the main current that affects the surf zone. The magnitude of the longshore current depends on characteristics of the breaking wave, including the breaking angle, and local bottom and shore configurations. Longshore currents are responsible for sand transport along the coast. South of the Indian Rocks headland, the net longshore transport is generally toward the south. North of Indian Rocks headland, the net longshore drift is toward the north. The net southerly drift rate along Pinellas County is estimated to range from 10,000 cubic yards of sand per year at the northern end to 50,000 cubic yards of sand per year at the southern end.

Extratropical winter storms have a major influence on the modern west Florida coastline; tropical storms and hurricanes strongly affect the coast but occur far less frequently (Hines *et al*. 2003). During storms and hurricanes, the wind, waves, currents, and littoral transport patterns can differ markedly from normal conditions. Severe erosion caused by increased water level, wind, and wave forces can occur in a very short period. The rise or fall of the astronomical tide influences wave action on the dune or beach face, and it can be an important factor in flooding and beach-dune erosion during storms and hurricanes. Tides in the area are a mixture of diurnal and semi-diurnal. The mean diurnal tidal range at Indian Rocks Beach and Clearwater is 2.6 ft (0.79 m) (Beaches and Shores Research Center 2000).

The coastline of Pinellas County has a very low profile. The beachfront of the study area is in danger of flooding and wave overtopping as a result of a severe storm and/or hurricane. The 100-year frequency combined total storm tide of 9.9 to 11.5 ft (3.0 to 3.5 m) would cause almost the entire study area to be flooded or overtopped by waves (Beaches and Shores Research Center

2000). Although coastal protective structures provide a level of protection from lower intensity storms, the protective structures will not prevent damage from a 100-year frequency event.

Beach erosion has been a serious problem in Pinellas County for many years. The beaches are sandy and narrow, and consist of fine sand and shell fragments that are easily moved by currents and wave action. The presence of seven passes between the islands and a major navigation channel contribute to erosion (USACE 1984).

3.1.1 COASTAL OCEANOGRAPHY

The West Florida Continental Shelf is broad and gently sloping; the 328-ft (100-m) isobath is generally about 93.2 to 124.2 mi (150 to 200 km) offshore. The isobaths are typically parallel to the coastline, except near the DeSoto Canyon off Northwest Florida.

The Loop Current is the most important current system in the Gulf of Mexico and is a highly variable current in terms of location and velocity. The core of the Loop Current has velocities ranging from 4 nm per hour (2.06 m/s) during the summer to 1 nm per hour (0.51 m/s) during the winter. The Loop Current forms a clockwise loop west off the Yucatan Current, which flows through the Yucatan straits into the Gulf of Mexico. The Loop Current generates a series of gyres that circulate in a counterclockwise direction. One gyre is typically located off the west coast of Florida in the Middle Grounds area (northwest of Borrow Area L). In the summer, some of these gyres disappear or converge, creating a single gyre. River inflow and other freshwater inputs, and other factors, result in variations in the location of the Loop Current. The Loop Current rejoins the Yucatan Current to form the Florida Current, which exits the Straits of Florida at speeds as high as 2.92 nm per hour (1.5 m/s).

Wind, surface fluxes, coastal river inflows, and the offshore loop currents and gyres influence shelf circulation. Previous research suggested that the steep shelf break confined much of the effects of the Loop Current to the deep water. Middle and inner shelf circulation is determined primarily by local forcing (wind, heat flux, and river inflows); deep-ocean forcing is secondary. The influence of the Loop Current on the West Florida Shelf increases as the current extends north and east. The Loop Current generally does not flow onto the shelf; however, Ekman transport or the formation of smaller scale filaments may transport waters from the Loop Current onto the shelf. The Loop Current may be an important factor influencing shelf circulation. Seasonal winds may play a dominant role in the seasonal variability of shelf circulation in water depths less than 164 ft (50 m) on the West Florida Shelf; however, in deeper waters, seasonal density-related effects may also be a factor (Yang and Weisberg 1999). Temperature exerts a primary control on density (Liu *et al.* 2006).

Seasonal reversals occur in the circulation on the West Florida Shelf (Yang and Weisberg 1999). During the winter (from October to March), modeling indicates that a shore-parallel flow from the northwest dominates the west-central Florida shelf. In contrast, during the summer (April to September) the inner shelf is influenced by a shore-parallel flow from the southeast. During fall through the spring (October-April), the circulation is primarily upwelling; downwelling occurs during the summer months (June-September). These upwelling and downwelling regimes have important implications in the cross-shelf transportation of nutrients and other water properties (Liu and Weisberg 2007).

During the spring, the West Florida Shelf experiences transitional circulation due to winds and surface heat flux. The seasonal mean circulation field is an upwelling type; a southeastward jet is located on the mid-shelf. Associated with the southeastward jet is an annually occurring low temperature, low salinity tongue of water due to the effect of surface shear causing current advection of river water. Associated with this tongue of water is an annual spring chlorophyll plume on the mid shelf called the *green river*. The nutrient rich Mississippi, Mobile, and Apalachicola river water is transported to the midshelf producing the chlorophyll plume. The Loop Current does not appear to affect to factor in the creation of the low temperature tongue (He and Weisberg 2002).

Important biological occurrences in the West Florida Shelf region may be related to the circulation, including seasonal formations of red tide toxic dinoflagellate blooms, high-concentration pigment plumes near the shelf break, and succession of recruitment of fisheries (Yang and Weisberg 1999).

3.2 SAND RESOURCES

Three general types of offshore sand resources are found along the West Florida shelf: ebb-tidal shoals, nearshore sands, and sand ridges (Finkl *et al*. 2006, 2007). Ebb-tidal shoals are large sand deposits along the southwest coast associated with inlets. These shoals accumulate sediments transported by longshore currents in the surf zone and generally consist of beach-compatible material with little fine and organic material (Finkl *et al.* 2007). Without the presence of the inlet, the sediments located in ebb-tidal shoals would be transported to the adjacent shoreline. Therefore, it is logical to utilize these sediments for beach placement activities.

Nearshore sands occur in relatively shallow water and are typically thin and discontinuous. Because the west coast is sediment starved and extensive hardgrounds are present in this area, these nearshore sand deposits are limited (Finkl *et al*. 2007). Longshore sand bars are frequently found in nearshore waters and contain beach quality sand. However, most longshore sand bars are close to the shoreline and cannot be dredged without creating erosional hot spots along the shoreline. Erosional hot spots are areas that erode more rapidly than predicted and can occur on natural and renourished beaches.

The third type of sand resource is the sand ridge. The west-central Florida sand ridges are generally oriented parallel to the shoreline in the area just off the Indian Rocks headland (Harrison *et al*. 2003). Further offshore the orientation changes to oblique angles. This ridge field extends from within 1.2 mi (2 km) of the beach to over 15.5 mi (25 km) offshore (Hine *et al*. 2001). The Sand Key ridge field is located offshore from the Indian Rocks headland in Pinellas County and contains well-developed sand waves that are as wide as 0.93 mi (1.5 km), 6.2 mi (10 km) long, and 13.1 ft (4 m) high (Finkl *et al*. 2007).

The sediments that primarily make up these sand ridges are mixed quartz and carbonate sand. Black, phosphate-rich sediments are locally abundant in this area and patchily distributed (Hine *et al*. 2001). Sediment grain size of sand ridges is correlated to the crest-trough topography. Dune crests and the southwestern faces of the dunes consist of clean, fine (less than 0.25 mm) sand whereas the topographic lows and northeastern dune faces consist of coarse (greater than 2.0 mm) shell and limestone gravel (Harrison *et al*. 2003). Hayes and Nairn (2004) noted that the pattern of coarser sediments in the swales and the shoreward flanks of ridges appears to be typical for ridges in water depths less than 65.6 ft (20 m).

Further offshore, these sand ridges generally become thicker (greater than 13.1 ft [4 m] relief) and more widely spaced (Edwards *et al*. 2003; Harrison *et al*. 2003; Finkl *et al*. 2007). The carbonate percentage generally increases with distance offshore (Finkl *et al*. 2006).

The origins of the west-Florida sand ridges are not fully understood and many theories have been proposed to explain how these ridges are formed and maintained (Hayes and Nairn 2004; Zarillo *et al*. 2008). Studies have suggested that the ridges originated from shoreline transgression, modern shelf hydrodynamic processes, or a combination of these processes. Locker *et al*. (2003) suggested that both mechanisms are important, although the reworking by open shelf hydrodynamics appears to dominate. The development of sand ridges in offshore areas not influenced by barrier islands suggests that hydrodynamic processes on the shelf have an important role in the formation and maintenance of the ridge deposits (Zarillo *et al*. 2008).

The sand ridges in west Florida, particularly off the Indian Rocks headland, are also smaller than ridges in other locations. This appears to be due to a combination of reduced sediment supply and mild wave climate (Harrison *et al*. 2003). Side-scan mosaics of the nearshore sand ridges off the Indian Rocks headland of Sand Key revealed that the nearshore sand-ridge field is detached from the modern shoreface by a gap of several kilometers (Harrison *et al*. 2003; Edwards *et al*. 2003). This gap, coupled with a higher carbonate content of the sand ridges compared to nearby beaches, suggests that little sediment is exchanged between these two environments (Hine *et al*. 2001; Edwards *et al*. 2003).

Nearshore sand ridges have been investigated more frequently than ridges that are further offshore such as Borrow Area L. Edwards *et al*. (2003) reported that net sediment transportation within the nearshore sand ridges off the Indian Rocks headland occurs actively and does not appear to be in any particular direction although there is little to no lateral migration. Small-scale south-southwest movements of nearshore sand ridges have been recorded in shallow water (less than 13.1 to 19.7 ft [4 to 6 m)]). Current meter data recorded for shallow water sand ridges in 22 to 28 ft (6.7 to 8.5 m) water depths off Sand Key (Harrison *et al*. 2003) indicated a pronounced bi-directional shore-parallel flow. Crest velocities (which frequently exceeded 20 cm/s) were slightly higher than trough velocities. Storm passages generated increased water velocities at the sand-ridge crest. Mature benthic communities are present in the topographic lows between the sand ridges, suggesting that these areas have had long-term exposure. Hine *et al*. (2001) suggested that the inner shelf off the Indian Rocks headland appears to be the most active area on the west-central Florida shelf in terms of sediment transport and that the sand ridges in this area formed within the past 1,300 years on relatively low-energy inner shelves. Donahue *et al*. (2003) reported that sand ridges southeast of Borrow Area L, located offshore of the Egmont Channel shoal were relict and sediment starved, and influenced by modern shelf hydraulics.

The sand ridges that are further offshore are less complex and the bedform distribution does not appear to be similar to the nearshore ridges (Harrison *et al*. 2003). The sand ridges that are detached from the coast on the OCS in water depths of less than 65.6 ft (20 m) have not been researched extensively (Hayes and Nairn 2004). It is therefore unclear how much these sand ridges are subject to influence from wave- or tide-generated currents. Hayes and Nairn (2004) suggested that waves shoaling and refracting over the crest of a ridge can maintain the ridge, even if the ridge is detached from the shoreface processes.

The two borrow areas examined in this document represent two of these sand resources. Egmont Channel Shoal is an ebb-tidal shoal located approximately 3.5 miles west of Mullet Key. This shoal is located approximately 22.5 miles south of the northern portion of Sand Key and is north of the entrance to Tampa Bay Harbor. The shoal covers 1,596 acres and contains an estimated 19 to 23 million cubic yards of sand suitable for beach nourishment.

Borrow Area L is located in a sand ridge in OCS waters approximately 12 miles west of Clearwater Pass. Water depths in Borrow Area L are approximately 45 ft (13.7 m) NAVD88. Borrow Area L is divided into five cuts with excavation elevations ranging from -45.7 ft (-13.9 m) to -51.5 ft (-15.7 m) NAVD88. Borrow Area L is characterized by sixteen vibracores (PCVC-09-10, 11, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36). These vibracores indicate that sediment within Borrow Area L is typically fine-grained sand with trace silt, trace shell hash, trace shell fragments and whole shell. This area contains an estimated 2.1 million cubic yards of potentially beach compatible material. This borrow area has not been used previously. Borrow Area L encompasses approximately 286.5 acres; however, due to mitigation efforts not all the area will be used.

3.3 SEDIMENT CHARACTERISTICS OF BORROW AREAS AND BEACH

Compatibility of the native beach sand and borrow area sand is critical in maintaining nourished and renourished beaches. Beaches renourished with sand that is compatible with the native beach sand have a planform centroid that is relatively insensitive to wave direction. However, nourishment sand that is finer or coarser than the native sand may cause the nourishment planform centroid to migrate downdrift or updrift. In addition, sand sources with a high percentage of fines (silt/clay material) generally are avoided because they are unsuitable as beach material and increased turbidity and sedimentation has adverse effects on biota in adjacent habitats (Committee on Beach Nourishment and Protection 1995). An overfill factor is typically used to evaluate the compatibility of sediments and to relate the volume of borrow area fill required so that it would perform similarly to the native beach sand. An overfill factor of 1.0 indicates the sand is perfectly compatible; factors over 1.0 indicate the percentage of additional volume necessary.

Core boring and sampling has been used to assess sand compatibility of beaches and borrow areas for the Pinellas County Beach Erosion Control Project since 1960. A detailed description of the history of the sampling and testing for this project is contained in the project General

Design Memorandum, Addendum IV and the 1st Renourishment Sand Key General Design Memorandum (USACE 1984, 1996). A compatibility analysis of Borrow Area L and Sand Key beach sediments was conducted by the USACE (2010). Previous studies assessed the compatibility of the Egmont Channel Shoal sediments (USACE 1997).

3.3.1 Sediment Compatibility Analysis

The sediments of Sand Key beaches and Borrow Area L are similar and compatible (USACE, 2010), and the Borrow Area L sediment meets the requirements of FDEP's *Sand Rule* guidelines (Chapter 62B-41.007(2)j). The compatibility analysis concluded that the material from the beach consists of poorly graded, fine-grained quartz sand with a mean grain size of 0.20 mm, an average carbonate content of 22 percent, and an average silt content of 1.3 percent. The material from the borrow area consists of poorly-graded, fine-grained quartz sand with a mean grain size of 0.18 mm, an average carbonate content of 24 percent, and an average silt content of 3.01 percent. The Munsell color of the dredging material has the same value as the color of the beach. The overfill ratio for the project was determined to be 1.32 and the nourishment factor was 1.28 (USACE 2010).

The composite mean grain size of the sediments within the Egmont Shoal Borrow Area ranges from 0.17 to 0.42 mm. These grain sizes are compatible with the sediment grain sizes historically found along the beaches at Sand Key. The Sand Key grain size ranges from 0.19 to 0.29 mm. The total percentage of fine sediments found within the core samples were less than seven percent.

3.4 FISH AND INVERTEBRATES

3.4.1 Soft Bottom Communities

Habitat structure is important for ecosystem function of marine benthic communities (Lundquist *et al.* 2010). Borrow Area L generally contains fine-grained sand with trace silt, trace shell hash, trace shell fragments, and whole shell (CP&E 2009). Softbottom habitats in the western Gulf of Mexico include areas with little or no rock, limestone, or hard coral structure, and generally consist of sand, shelly sand, mud, and silt substrates. Where sand is the primary substrate and vegetation is lacking, the most diverse portion of the biota is the benthic infauna. The most consistent animals within these communities are polychaetes, oligochaetes, mollusks, sipunculans, peracarid crustaceans, flatworms, and nemerteans. Other frequent occupants of these habitats include demersal fishes (e.g., flounders), bivalves, decapod crustaceans, and certain shrimps.

Bottom grab samples in borrow areas in OCS waters off Siesta Key and Sanibel Island (south of Tampa Bay approximately 58.2 to 65.3 miles from Borrow Area L) in 2005 and 2006 collected 378 taxa of infauna (Zarillo *et al*. 2008). These infauna taxa in decreasing order of abundance were crustaceans, polychaetes, gastropods, and bivalves. Numerically dominant taxa included *Prionospio* annelids, a gastropod *Caecum johnsoni*, hemichordate *Branchiostoma floridae*, polychaetes *Spio pettiboneae* and *Travisia hobsonae*, the bivalve *Semele nuculoide*, and marine worms of the Sipuncula Phylum.

3.4.2 Hardbottom Communities

Borrow area L primarily consists of sand patches and sand waves. Scattered and continuous hardbottom located adjacent to Borrow Area L is at least 400 ft away and at an average depth of -54 ft with average relief of 2 ft (up to -52 ft) and maximum relief of 4 ft (up to -50 ft). All hardbottom, possible hardbottom, scattered hardbottom, and secondary unknown feature areas that were identified during geophysical investigations in 2008 and 2009 were avoided by a 400 ft buffer during borrow area design (CP&E 2009). A sidescan sonar mosaic of Borrow Area L from CP&E (2009) is presented in Appendix A, Figure 12. Many hardbottom habitats in the area are typically scattered or patchy and are generally ephemeral, alternately covered and uncovered by shifting sands. The Egmont Channel Shoal Borrow Area does not contain hardbottom.

Hardbottom in nearshore waters of Sand Key generally consists of mixed benthic communities of epifaunal organisms such as algae, sponges, octocorals, stony corals, hydroids, anemones, barnacles, bryozoans, decapods crustaceans, and gastropods. Many of these organisms are attached directly to the substrate. Hardbottom areas of the nearshore waters of Sand Key were surveyed by Dial Cordy (2006) and CP&E (2007). Hardbottom surveys from CP&E (2007) of nearshore waters where the renourishment, pipeline corridors, and staging areas would be located are presented in Appendix A, Figures 1 through 11.

3.4.2.1 Marine Algae

The marine algae in areas offshore of Pinellas County are highly diverse. Macroalgae observed in nearshore waters of Sand Key by CP&E (2007) included *Codium, Dityota, Hypnea, Dasya, Sargassum, Halymenia, Gracilaria, Ceramium, Spyridia, Caulerpa, Chondria,* and *Laurencia*. Phillips *et al*. (1960) identified 95 taxa of algae within areas of similar depth in this area. Dominant algal species observed during this and other studies include *Caulerpa* sp., *Halimeda* sp., *Udotea flabellum, Sargassum* sp., and *Rhipocephalus phoenix* (Phillips *et al*. 1960; EPA 1981; CZR 1991). Algae reported from sampling south of Charlotte Harbor included *Dictyopteris jamaicensis, Udotea conglutinate, Lithophyllum, Lithothamnium, Anadyomene menziesii, Peyssonnelia, Halimeda,* and *Dictyota* (Continental Shelf Associates 1987).

3.4.2.2 Benthic Invertebrates

Many of the benthic invertebrates associated with hardbottom habitats along the eastern Gulf of Mexico are similar to species found in the tropical waters of the Caribbean and the south Florida reef tract. Lyons and Collard (1974) characterized the shallow shelf habitat offshore of Pinellas County as an area with sediments dominated by quartz sand and biogenically derived carbonates with exposed rock substrate. The exposed rock provides habitat for attached organisms, such as corals, and associated free-living invertebrates. Previous studies have identified species common to habitats offshore of Pinellas County (EPA 1981; CZR 1991; Child 1992; Posey *et al*. 1996). The species listed in these previous studies compare closely to species observed during recent nearshore surveys (Dial Cordy and Associates 2002a, 2002b, 2002c, 2006; CP&E 2007) (Table 2). At least 45 invertebrate species were observed from diver and video surveys. Many more cryptic and less abundant species are present within these complex habitats.

Table 2. Invertebrate Species Observed During Nearshore Hardbottom Surveys

Scientific Name	Common Name
Sponges	
Cribrochalina vasculum	brown bowl sponge
Xestospongia muta	giant barrel sponge
Spheciospongia vesparium	loggerhead sponge
Ircinia sp.	ball sponge
Calyx podatypa	dark volcano sponge
Anthosigmella varians	brown variable sponge
Amphimedon compressa	erect rope sponge
Cliona celata	yellow boring sponge
Cinachyra sp.	moon sponge
Scleractinian Corals	
Cladocora arbuscula	tube coral
Stephanocoenia mitchelinii	blushing star coral
Isophyllia sinuosa	cactus coral
Siderastrea sp.	starlet coral
Solenastrea hyades	knobby star coral
Solenastrea bournoni	smooth star coral
Scolymia lacera	mushroom coral
Phyllangia americana	hidden cup coral
Manicina aereolata	rose coral
Montastrea annularis	boulder star coral
Oculina robusta	robust ivory tree coral
Oculina diffusa	diffuse ivory bush coral
Millepora alcicornis	branching fire coral
Octocorals	
Eunicea succinea	shelf-knob sea rod
Eunicea calyculata	warty sea rod
Plexaurella nutans	giant slit-pore sea rod
Muricea laxa	delicate spiny sea rod
Muricea elongata	orange spiny sea rod
Pseudoterogorgia sp.	sea plume
Pterogorgia citrina	yellow sea whip
Leptogorgia hebes	regal sea fan
Leptogorgia virgulata	colorful sea whip
Leptogorgia hebes	regal sea fan
Pseudoceratina crassa	branching tube sponge
Echinoderms	
Linckia guildingii	common comet star
Astropecten articulatus	beaded sea star

Table 2. Invertebrate Species Observed During Nearshore Hardbottom Surveys

Scientific Name	Common Name
Echinaster spinulosus	orange-ridged sea star
Luidia clathara	striped sea star
Luidia sp.	sea star
Luidia alternata	banded sea star
Echinometra lucunter	rock-boring urchin
Lytechinus variegates	variegated urchin
Mollusks	
Pinna carnea	penshell
Charonia variegata	tritons trumpet
Busycon contrarium	lightning whelk
Pleuroploca gigantea	Florida horse conch
Crustaceans	
Menippe mercenaria	Florida stone crab
Callinectes sapidus	blue crab
Menippe menippe	stone crab
Lytechinus variegatus	variegated urchin
Tunicates	
Clavelina sp.	colonial tunicates
Family Didemnidae	overgrowing tunicates
Eudistoma sp.	condominium tunicate

Source: Dial Cordy and Associates 2002a, 2002b, 2002c, 2006; CP&E 2007.

The most abundant features of the nearshore hardbottom habitats in the eastern Gulf of Mexico include the octocorals, sponges, and scleractinian corals. Eleven species of octocorals and 13 species of scleractinian (hard) corals were observed in the Dial Cordy and Associates surveys (2002a, 2002b, 2002c, 2006). Sponges were among the most visible phyla present within the hardbottom habitats. Nine species of sponges were identified within the project area and, of these, the loggerhead (*Spheciospongia vesparium*) and barrel sponges (*Xestospongia muta*) were the most abundant species during the Dial Cordy surveys.

Typical epifaunal species observed during these nearshore surveys include the sea stars, *Astropecten articulatus* and *Luidia clathar*; the lightning whelk *(Busycon contrarium)* and the Florida horse conch *(Pleuroploca gigantean)*. CZR (1991) and EPA (1981) also found these species to be some of the most common encountered. In the EPA (1981) study, dominant species in these habitats included sand dollars (*Encope emarginata*), sea stars, and urchins (*Echinocardium cordatum)*. Similar species were observed during this study. Sand dollars, scallops, and various marine snail species were common in ephemeral habitat (CP&E 2007).

Past surveys also collected polychaetes, oligochaetes, pycnogonids, bivalves, and arthropods in epifaunal habitats (CZR 1991; Child 1992; Posey *et al*. 1996).

3.4.3 Fish and Macroinvertebrates

The type of bottom substrate can affect fish and macroinvertebrate community structure. This may be especially true for juvenile fish; small changes in habitat quality can affect juvenile growth and survival and subsequently have large impacts on the number of fish produced by a specific habitat (Diaz *et al.* 2003). Fisheries studies have been conducted on detached sand ridges offshore of the Middle Atlantic Bight (Diaz *et al.* 2003; Vasslides and Able 2007; Slacum *et al.* 2010). Similarly, in the western Gulf, Brooks *et al.* (2003) concluded that the sand bank, in particular the interior of the sand bank, is important habitat for demersal fish habitat.

Diaz *et al.* (2003) examined fish usage with bedform size and density of biogenic structure such as polychaete tubes, megafauna, pits, or fecal mounds. Changes in physical relief (from large to small bedforms), resulted in a significant decline in the incidence of fishes. Habitats with the highest incident of fishes had large bedforms with some biogenic structure. Slacum *et al.* (2010) also found a trend of greater abundance at shoals with a steeper grade; however, flat-bottom habitats were found to have greater abundance, species richness, and species diversity than shoal habitats. They suggested that the greater availability of benthic forage at flat-bottom habitats may be a factor. Several studies have shown that the troughs between the sand ridges contained more benthic invertebrates than the shoals themselves (Virginia Institute of Marine Science 2000).

Smaller and younger fishes, and species that bury themselves, may prefer the ridge top habitat. Vasslides and Able (2007) found that the selection of habitat, particularly the sandy substrate found at the top of the ridge, changed with ontogentic stage. Smaller and younger individuals had greater species richness and abundances on the ridge top than did the larger individuals and adults. Ridge top habitat was also important for species that bury themselves.

The fish species most frequently observed while diving on artificial and natural nearshore hardbottom off Sand Key were sheepshead *(Archosargus probatocephalus)*, gag grouper *(Mycteroperca microlepus)*, and sand perch *(Diplectrum formosum)*. Grey snapper *(Lutjanus griseus)* and spottail pinfish *(Diplodus holbrooki)* were also frequently seen (CP&E 2007). Other species observed included belted sand fish *(Serranus subligarius)*, black seabass *(Centropristis striata)*, hogfish *(Lachnolaimus maximus)*, lined seahorse *(Hippocampus erectus)*, and snook *(Centropomus undecimalis)*.

Otter trawl sampling over OCS borrow areas off Siesta Key and Sanibel Island (south of Tampa Bay approximately 58.2 to 65.3 miles from Borrow Area L) in 2005 and 2006 (Zarillo *et al*. 2008) collected 2,317 fishes from 59 taxa. The most abundant demersal fish species collected were barred searobin *(Prionotus martis)*, leopard searobin *(P. scitulus)*, sand seabass *(Diplectrum formosum)*, juvenile grunts (Haemulidae), and twospot flounder *(Bothus robinsi)*. Common pelagic species included Atlantic bumper *(Chloroscombrus chrysurus)* and Atlantic thread herring *(Opisthonema oglinum)*. Abundant macroinvertebrates included iridescent swimming crab *(Portunus gibbesii)*, five-notched sand dollar *(Encope michelini)*, white shrimp *(Litopenaeus setiferus)*, pink shrimp *(Farfantepenaeus duorarum)*, and blotched swimming crab *(P. spinimanus)*.

The West Florida Shelf is an important spawning and larval nursery ground for many taxa of fishes (Houde and Chitty 1976; Lyczkowski-Shultz *et al.* 2004). Ichthyoplankton sampling collected 621 fish larvae over OCS borrow areas off Siesta Key and Sanibel Island south of Borrow Area L (Zarillo *et al*. 2008). Larval gobies and striped anchovy *(Anchoa hepsetus)* were most abundant in the ichthyoplankton samples.

3.5 WILDLIFE

3.5.1 Marine Mammals

The marine mammals of the Gulf of Mexico are represented by members of the taxonomic order Cetacea, which is divided into the suborders Mysticeti (i.e., baleen whales) and Odontoceti (i.e., toothed whales), as well as the order Sirenia, which includes the manatee. Within the Gulf of Mexico, there are 28 species of cetaceans (7 mysticete and 21 odontocete species) and 1 sirenian species, the manatee (Jefferson *et al.* 1992; Davis *et al.* 2000b). Bottlenose dolphins (*Tursiops truncatus)* and Atlantic spotted dolphins (*Stenella frontalis*) are common in shallow Gulf waters [up to 656 ft (200 m) deep]. Bottlenose dolphins are frequently observed in the study area and are a common inhabitant of the continental shelf and upper slope waters of the northern Gulf of Mexico. Bottlenose dolphins are opportunistic feeders, taking a wide variety of fishes, cephalopods, and shrimp (Davis and Fargion 1996; Jefferson and Schiro 1997; Wells and Scott 1999). There appears to be two ecotypes of bottlenose dolphins, a coastal form and an offshore form (Hersh and Duffield 1990; Mead and Potter 1990). The Atlantic spotted dolphin is endemic to the Atlantic Ocean in tropical to temperate waters (Perrin *et al.* 1987, 1994a). They are known to feed on a wide variety of fishes, cephalopods, and benthic invertebrates (Leatherwood and Reeves 1983; Jefferson *et al.* 1993; Perrin *et al.* 1994a). In the Gulf of Mexico they are commonly found in continental shelf waters less than 6,556.2 ft (200 m) in depth. The sperm whale is common in oceanic waters of the northern Gulf of Mexico and may be a resident species, whereas the baleen whales are considered rare or extralimital in the Gulf (Würsig *et al.* 2000). The Florida manatee (*Trichechus manatus latirostris*) inhabits only coastal marine, brackish, and freshwater areas. Threatened and endangered marine mammals are discussed further in Section 3.6.

3.5.2 Sea Turtles

Five species of sea turtles are found in the Gulf of Mexico. These species include the leatherback *(Dermochelys coriacea)*, hawksbill *(Eretmochelys imbricate)*, green *(Chelonia mydas)*, loggerhead *(Caretta caretta)*, and Kemp's ridley *(Lepidochelys kempii)*. These species are discussed in more detail in Section 3.6.

3.5.3 Birds

More than 70 species of birds have been observed in the Gulf of Mexico and the coastal regions of southwest Florida during studies from 1996 to 2005 (Davis 1996; Davis *et al.* 2000; Avent 2004; Russell 2005). The population status and movements of pelagic bird species are difficult to determine because surveys must be conducted offshore under marine field conditions and bird movement is weather dependent. Very few surveys solely dedicated to bird behavior and populations are conducted in the Gulf of Mexico. Many marine mammal surveys contain ancillary pelagic and migratory bird observations. In the Gulf of Mexico, marine mammal movements and pelagic bird species are often associated with the increased primary productivity of the Loop eddies and cold core currents (Ribic *et al.* 1997; Wursig *et al.* 2000; Russell 2005).

Bird species observed in the Gulf are predominantly trans-migrant shorebirds, wading birds, and waterfowl that may occupy the project area briefly, if ever. This section addresses seabirds and transmigrants that may pass through the offshore habitats of the project area.

3.5.3.1 Seabirds

Federal regulatory protection of birds may fall under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712) and/or the U.S. Endangered Species Act (ESA) 9(a) (1) (B). All birds listed in the Gulf studies are protected under the MBTA. These include members of the seabird guild, which represents a wide range of species dependent on the resources of the pelagic zone in the Gulf of Mexico. Much of their time is spent in or over water and they are capable of staying far from land for long periods. Most of these birds have adaptive salt glands that allow them to regulate the salt content in their blood (Ehrlich *et al.* 1998). Most species in this guild are colonial nesters that leave the nest to venture far from natal areas. Some seabirds spend significant portions of their life cycle offshore and may occur in the project area, such as the magnificent frigatebird (*Fregata magnificens*), greater shearwater (*Puffinus gravis*), sooty shearwater (*P. grisseus*), Audubon's shearwater (*P. lherminieri*), manx shearwater (*P. puffiinus*), masked booby (*Sula dactylatra*), northern gannet (*Morus bassanus*), Wilson's storm-petrel (*Oceanites oceanicus*), and band-rumped storm-petrel (*Oceanodrama castro*). Gulls and terns, pelicans, and cormorants divide their time more or less equally between offshore and coastal waters (Ehrlich *et al.* 1988) and may occur in the project area.

3.5.3.2 Migratory Landbirds

The west Florida coast serves as a principal route of the Atlantic Flyway for more than 60 migratory landbird species. Many of the birds that breed east of the Allegheny Mountains move southward in fall, through northwestern Florida, crossing the Gulf to the coastal regions of central Mexico where they follow a land route for the remainder of the journey to Cuba or South America (Lincoln *et al.* 1998). Many of the migrants that could pass through the project area are unlikely to stop except to rest on a dredge or boat during migration. Under this condition, all are protected by MBTA.

The dredging activity may attract some seabirds to an area. Activities such as exploring for oil have been shown to attract large numbers of seabirds to an area, possibly because of an increase in food availability as bottom sediments are stirred up by drilling, potentially resulting in an algal bloom, and attracting species preyed on by seabirds (Tasker *et al.* 1986; Herron Baird 1990). Similar processes may occur during the initial stages of aggregate dredging. In addition, some species groups, notably gulls, are attracted by increases in shipping activity, especially at the low speeds associated with dredging (Garthe and Hüppop 1999; Skov and Durinck 2001; Christensen *et al.* 2003).

Vision has been shown to be an important component in the foraging activity of a number of seabird species (Essink 1999; Garthe *et al.* 2000; Gaston 2004; Thaxter *et al.* 2010). As a result, water clarity may play an important role in the foraging success of these, and other, species. It is likely, therefore, that the changes to water clarity resulting from the re-suspension of sediments during dredging operations would negatively affect the foraging capabilities of some species. However, the impact of increases in turbidity is likely to be dependent (both in scale and spatial extent) on initial background levels (Cook 2010).

Impacts of beach placement to migratory landbirds were addressed in earlier NEPA documents (see Appendix A). Shorebird activity includes feeding, resting, and over-wintering. Some species also nest along the shoreline. Migratory shorebirds may be affected by human disturbance, domestic animals (dogs and cats), and wildlife (raccoons, foxes, predatory birds, territorial birds, ghost crabs, fire ants, etc.). While most of these disturbances to migratory shorebirds are not the result of beach placement, measures taken during beach placement to reduce impacts to migratory shorebirds include monitoring during construction and establishing buffer zones (see Appendix A).

3.6 THREATENED AND ENDANGERED SPECIES

This section describes the biology of protected species potentially affected by the project. The USACE has determined that the species listed in Table 3 may be present in the area, and they may be affected by the project. Biological Opinions that affect the proposed project include NMFS Biological Opinion (October 1, 1996); NMFS Biological Opinion (October 1, 1996); NMFS Gulf of Mexico Regional Biological Opinion (GMRBO) (November 19, 2003; Revision No 1. June 24, 2005; Revision No. 2. January 9, 2007). The NMFS Gulf of Mexico Regional Biological Opinion and revisions are presented in Appendix B.

No critical habitat for the species in Table 3 is located within the project area.

Table 3. Listed Species from Pinellas County that Could be Affected By the Proposed Project

Species	Scientific Name	Federal Status
SEA TURTLES		
Loggerhead turtle	*Caretta caretta*	T
Kemp's ridley turtle	*Lepidochelys kempii*	E
Green turtle	*Chelonia mydas*	T
Hawksbill turtle	*Eretmochelys imbricate*	T

Table 3. Listed Species from Pinellas County that Could be Affected By the Proposed Project

Species	Scientific Name	Federal Status
Leatherback turtle	*Dermochelys coriacea*	T
MARINE MAMMALS		
Florida manatee	*Trichechus manatus latirostris*	E
FISHES		
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T

E=Endangered; T=Threatened

Other threatened and endangered species [and Federal status] under the jurisdiction of the NOAA Fisheries Service that can be found in the Gulf of Mexico include the blue whale *(Balaenoptera musculus)* [E]; fin (finback) whale *(B. physalus)* [E]; humpback whale *(Megaptera novaeangliae)* [E]; sei whale *(B. borealis)* [E]; sperm whale *(Physeter macrocephalus)* [E]; smalltooth sawfish *(Pristis pectinata)* [E]; elkhorn coral *(Acropora palmata)* [T]; and staghorn coral *(A. cervicornis)* [T].

The 2003 NMFS GMRBO states that:

> *Sperm whales (Physeter macrocephalus) occur in the Gulf of Mexico but are rare in inshore waters. Other endangered whales, including North Atlantic right whales (Eubalaena glacialis) and humpback whales (Megaptera novaeangliae), have been observed occasionally in the Gulf of Mexico. The individuals observed have likely been inexperienced juveniles straying from the normal range of these 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 by projects in the Gulf. NOAA Fisheries believes 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. Based on the unlikelihood of their presence, feeding habits, and very low likelihood of hopper dredge interaction, the above-mentioned cetaceans are not considered further in this Opinion.*

One smalltooth sawfish was captured during USACE-authorized relocation trawling during Tampa Harbor Entrance Channel maintenance dredging on August 12, 2006. However, the NMFS 2003 GMRBO states that:

> *. . .NOAA Fisheries has determined that there has never been a reported take of a smalltooth sawfish by a hopper dredge, and such take is unlikely to occur because of smalltooth sawfishes' affinity for shallow, estuarine systems. Only hopper dredging of Key West channels would have the potential to impact smalltooth sawfish but those channels are not considered in this Opinion. Therefore, NOAA*

> *Fisheries believes that smalltooth sawfish are rare in the action area, the likelihood of their entrainment is very low, and that the chances of the proposed action affecting them are discountable. This species will not be discussed further in this Opinion.*

According to the GMRBO (NMFS 2003):

> *Of the above-listed threatened and endangered species of sea turtles, whales, and sturgeon potentially present in the action area, NOAA Fisheries believes that only loggerhead, green, hawksbill, and Kemp's ridley sea turtles, and Gulf sturgeon, are vulnerable to being taken as a result of the use of hopper dredges to maintain, or deepen and widen navigation channels and harbors, or to dredge sand mining areas for beach nourishment in the U.S. Gulf of Mexico. Hopper dredging activities also have the potential to destroy or adversely affect Gulf sturgeon critical habitat.*

3.6.1 Florida Manatee

The Florida manatee is a subspecies of the West Indian manatee (*Trichechus manatus*) and can be found in tropical and subtropical coastal waters of the southeastern United States, the Gulf of Mexico, and the Caribbean Sea (Reeves *et al.* 1992; Jefferson *et al.* 1993; O'Shea *et al.* 1995), including waters near the project area. Manatees may travel great distances during warm months and have been spotted in Massachusetts and Texas (USFWS 2007). Manatees are a sub-tropical species and are cold intolerant. In Florida, they prefer warm-water sites during the winter, only leaving to feed during warming trends. Manatees congregate near warm water sites, such as natural springs, power plants, and deep canals, when temperatures drop. Florida manatees are found in freshwater, brackish, and marine environments, including coastal tidal rivers and streams, mangrove swamps, salt marshes, freshwater springs, and vegetated bottoms. Manatees are herbivores and feed on aquatic vegetation. Preferred feeding areas in coastal and riverine habitats appear to be shallow grass beds near deep channels. Primary threats include watercraft-related strikes, entanglement in fishing lines and crab pot lines, exposure to cold and red tide (USFWS 2007).

Several Federal and state manatee protection areas are located in Tampa Bay, including around several power plants. Manatees inhabit both fresh and salt water and have been observed in canals, rivers, estuaries, bays, and on rare occasion have been seen as far as 6 km off the Florida Gulf coast (USFWS 1996). Aerial surveys indicate that as many as 190 manatees may use Tampa Bay (Ackerman 1995). The Florida Gulf Coast population of manatees is estimated to be approximately 1,520 individuals (USFWS 2001). The highest concentrations of manatees along Florida's Gulf coast exist in Citrus, Levy, Lee, and Collier counties. The data suggest that most of the manatees living in the Tampa Bay area occur within the bay where water temperatures are more stable year round. Only 15 manatees were surveyed in the eastern portion of Tampa Bay during aerial surveys in 1992 (Ackerman 1995).

3.6.2 Sea Turtles

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

Loggerhead turtles occur throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian oceans and are widely distributed within their range. They can be found hundreds of miles offshore or inshore in bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers (USFWS 2010). Loggerheads primarily feed on mollusks, crustaceans, fish, and other marine animals. Feeding areas often include coral reefs, rocky areas, and shipwrecks. Adult loggerheads may migrate considerable distances between foraging areas and nesting beaches. Loggerheads reach sexual maturity at about 35 years of age. No critical habitat has been designated.

Green turtles are found in tropical and sub-tropical waters around the world. In the U.S. Atlantic waters, green turtles are found from Texas to Massachusetts, the U.S. Virgin Islands, and Puerto Rico. Green turtles are generally found over shallow flats, seagrasses, and algae areas inside bays and inlets. Resting areas include rocky bottoms, oyster, worm, and coral reefs. Post-hatchling pelagic-stage turtles may be omnivorous. Adult turtles are herbivores and consume algae and seagrasses. Critical habitat consists of waters surrounding Culebra Island, Puerto Rico.

Kemp’s ridley turtles inhabit shallow nearshore and inshore waters of the northern Gulf of Mexico, particularly in Louisiana. During the winter, turtles in the northern Gulf of Mexico may migrate to deeper water. Kemp’s ridley turtles found in the northwestern Atlantic Ocean feed in coastal waters as far north as New England during the summer and migrate southward during the winter (NMFS and USFWS 1992). Kemp’s ridleys are often found in salt marsh waterbodies. Neonatal Kemp’s ridleys feed on *Sargassum* and infauna or other epipelagic species. Post-pelagic turtles are benthic feeders over sand and mud bottoms and primarily consume crabs, particularly portunid crabs, and other crustaceans. Hatchlings may become entrained in Gulf of Mexico eddies, are dispersed by oceanic surface currents, then enter coastal shallow water habitats when they reach about 20 cm in length. No critical habitat has been designated.

Hawksbill turtles occur in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans. In the continental U.S., hawksbills have been found in the Gulf of Mexico and along the eastern seaboard as far north as Massachusetts. However, this species is rare north of Florida. Hawksbill turtles are frequently found along rocky areas, coral reefs, shallow coastal areas, lagoons or oceanic islands, and narrow creeks and passes. Post-hatchlings are pelagic and occupy convergence zones, floating among *Sargassum* and debris. Pelagic turtles may eat fish eggs, *Sargassum*, and debris (NOAA and USFWS 1993). Once they transition to a benthic existence, hawksbill sea turtles feed on specific species of sponges. Critical habitat has been designated at Isla Mona, Culebra Island, Cayo Norte, and Island Culebrita, Puerto Rico.

Leatherback turtles are highly migratory and pelagic. Leatherbacks can be found in deeper water than most other sea turtle species and due to their ability to regulate the core body temperature have been found in cold waters, such as Alaska. Leatherbacks primarily feed on jellyfish, but also consume sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. In the Gulf of Mexico, leatherbacks are frequently associated with cabbage head *Stomolophus* and *Aurelia* jellyfish. The distribution and food habits of post-hatchling and juvenile leatherbacks are unknown, although they may be pelagic and associate with *Sargassum* weed. Critical habitat is designated in the U.S. Virgin Islands. According to the NMFS 2003 GMRBO:

> *Leatherback sea turtles (Dermochelys coriacea) are generally found in deep, pelagic, offshore waters though they occasionally may come into shallow waters to feed on aggregations of jellyfish….there has never been a reported take by a hopper dredge. The typical leatherback turtle would be as large or larger than the large, industry-standard California-type hopper dredge draghead. Leatherback sea turtles will not be considered further in this Opinion based on the unlikelihood of their presence nearshore and their non-benthic feeding habits which combine to produce a very low likelihood of hopper dredge entrainment.*

3.6.3 Gulf Sturgeon

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

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

3.7 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH). This EA is prepared consistent with guidance provided by the NMFS Southeast Regional Office to USACE, Jacksonville District regarding coordinating EFH consultation requirements with NEPA (NMFS

1999). EFH is defined as *those waters and substrate necessary to fish for spawning, breeding, or growth to maturity* (SAFMC 1998).

Essential Fish Habitat in Borrow Area L is assessed in Appendix C and summarized in this section. Borrow Area L has been designated as EFH for 31 species or species groups (Table 4). The managed species include coral and four species of crustaceans from the Shrimp, Stone Crab and Spiny Lobster Fishery Management Plans and 27 species of fishes from the Red Drum, Reef Fish, Coastal Migratory, and Highly Migratory Fishery Management Plans. The Gulf of Mexico Fisheries Management Council (GMFMC 1998) has designated marine areas of non-vegetated bottoms, live bottoms, and water columns within the study area as EFH.

Table 4. Summary of EFH Designation for the Sand Key Beach Renourishment Project

Species	Scientific Name	Young of Year or Neonate	Juveniles	Adults
Coral Species		X	X	X
Shrimp Fishery				
brown shrimp	*Farfantepenaeus aztecus*	X	X	X
pink shrimp	*F. duorarum*	X	X	X
Stone Crab Fishery				
Florida stone crab	*Menippe mercenaria*	X	X	X
Spiny Lobster Fishery				
spiny lobster	*Panulirus argus*	X	X	X
Red Drum Fishery				
red drum	*Sciaenops ocellatus*	X	X	X
Reef Fish Fishery				
gag grouper	*Mycteroperca microlepis*	X	X	X
gray snapper	*Lutjanus griseus*	X	X	X
gray triggerfish	*Balistes capriscus*	X	X	X
greater amberjack	*Seriola dumerili*	X	X	X
lane snapper	*L. synagris*	X	X	X
lesser amberjack	*S. fasciata*	X	X	X
red grouper	*Epinephelus morio*	X	X	X
red snapper	*L. campechanus*	X	X	X
scamp grouper	*M. phenax*	X	X	X
yellowtail snapper	*Ocyurus chrysurus*	X	X	X
Coastal Migratory Pelagic Fishery				
bluefish	*Pomatomus saltatrix*			X
dolphin	*Coryphaena hippurus*			X
cobia	*Rachycentron canadum*	X	X	X
king mackerel	*Scomberomorus cavalla*	X	X	X
little tunny	*Euthynnus alletteratus*	X	X	X
Spanish mackerel	*S. maculatus*	X	X	X
Highly Migratory Pelagic Fishery				
blacknose shark	*Carcharinus acronotus*			X
blacktip shark	*C. limbatus*	X	X	X
bonnethead shark	*Sphyrna tiburo*		X	
bull shark	*C. leucas*	X	X	X
great hammerhead shark	*S. mokarran*			X

Table 4. Summary of EFH Designation for the Sand Key Beach Renourishment Project

Species	Scientific Name	Young of Year or Neonate	Juveniles	Adults
lemon shark	*Negaprion brevirostris*		X	X
sandbar shark	*C. plumbeus*	X	X	X
spinner shark	*C. brevipinna*	X		
nurse shark	*Ginglymostoma cirratum*		X	X
tiger shark	*Galeocerdo cuvieri*		X	

No Habitat Areas of Particular Concern (HAPCs) are located within or near the project site.

An EFH assessment (Dial Cordy and Associates 2003) was conducted for the nearshore area, including the pipeline corridors and Egmont shoal borrow area, in association with a previous environmental assessment (USACE 2002) on the previous Sand Key renourishment. This EFH Assessment is incorporated by reference.

3.8 WATER QUALITY

The waters in the project area are used for swimming, SCUBA diving, fishing, boating, and other recreation. The State of Florida lists waters in the area as Class III, suitable for *Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife*. The waters of Pinellas County were designated as an *Outstanding Florida Water* (OFW) on March 1, 1979 by the FDEP [Section 403.061(27)]. These waters are located in an aquatic preserve and are worthy of special protection because of natural attributes. This designation is applied to certain waters and is intended to protect existing good water quality.

3.9 HAZARDOUS, TOXIC AND RADIOACTIVE WASTE

The coastline within the project area is located adjacent to predominantly residential, commercial, and recreational areas. The project area contains high-energy littoral zones and the materials used for renourishment contain particles with large grain sizes that do not normally absorb contaminants. No contamination due to hazardous and toxic waste is known to be in the project area.

3.10 AIR QUALITY

The Outer Continental Shelf Lands Act (OCSLA) (43 U.S.C. 1334(a)(8)) requires the Secretary of the Interior to promulgate and administer regulations that comply with the National Ambient Air Quality Standards (NAAQS) pursuant to the Clean Air Act (42 U.S.C. 7401 *et seq*.) and to the extent that authorized activities significantly affect the air quality of any state. OCS sources within 25 miles of the state's boundaries are subject to the same Federal and state requirements as those that would apply if the source were located onshore. The criteria pollutants include carbon monoxide, nitrogen oxides, sulphur dioxide, suspended particulates, total hydrocarbons, and volatile organic compounds. However, dredging activities are considered to be temporary; therefore, they are not considered OCS sources.

Pinellas County is currently in attainment. Air quality in the project area is good due to either onshore or offshore breezes.

3.11 NOISE

Ambient noise levels offshore are generally low. Noise in this area is limited to that of the vessels passing through the area. Recreational boaters contribute minimally to the amount of noise in the area.

Noise levels in the area are typical of recreational and beach activities. Noise levels fluctuate during the year, the highest levels usually occur during the spring and summer months due to increased coastal activities. The project vicinity does not encompass any noise-sensitive institutions, structures, or facilities.

In recent years, concerns have been raised regarding underwater noise of anthropogenic origin and potential impacts on aquatic organisms. Hypothetically, underwater sounds may interrupt or impair communication, foraging, migratory, and other behaviors of aquatic organisms. To obtain data to address this concern, field investigations were undertaken to characterize underwater sounds typical of bucket, hydraulic cutterhead, and hopper dredging operations (Dickerson *et al.* 2001). Preliminary findings indicate that cutterhead dredging operations are relatively quiet as compared to other sound sources in aquatic environments. Hopper dredges produce somewhat more intense sounds similar to those generated by vessels of comparable size. Bucket dredges create a more complex spectrum of sounds, very different than either cutterhead or hopper dredges. Hopper dredge noise consist of a combination of sounds emitted from two relatively continuous sources: engine and propeller noise similar to that of large commercial vessels, and sounds of dragheads moving in contact with the substrate.

Marine dredging is commonly conducted in coastal waters to deepen channels and harbors, reclaim land, and mine seabed resources. Reported source levels for dredging operations range from 160 to 180 dB re 1 uPa @ 1 m for 1/3 octave bands with peak intensity between 50 and 500 Hz (Greene and Moore 1995). The intensity, periodicity, and spectra of emitted sounds differ greatly among dredge types. Components of underwater sounds produced by each type are influenced by a host of factors including substrate type, geomorphology of the waterway, site-specific hydrodynamic conditions, equipment maintenance status, and skill of the dredge plant operator (Dickerson *et al.* 2001). There is no conclusive evidence to confirm or refute the negative impacts of underwater noise from humans on marine mammal populations (MMS 2007).

3.12 AESTHETIC RESOURCES

The area offshore of Pinellas County possesses visually pleasing attributes (such as the coastal views into the waters of the Gulf of Mexico) that supports a strong tourist industry.

3.13 RECREATION RESOURCES

Pinellas County is a heavily populated county and a major tourist destination. Pinellas County is in the Southwest Beach Region of Florida. Approximately 13.4 million tourists visited the St. Petersburg-Clearwater area in 2009 and spent $6.34 billion. Beach tourism created 81,430 jobs in the area during 2009, generating wages of $2.97 billion (VSPC 2010). Beaches that can be accessed by the general public are heavily used year-round. Beaches adjacent to condominiums, apartments, and hotels may have more restricted use. The waters offshore of Pinellas County are used for swimming, fishing, scuba diving, and boating.

3.14 NAVIGATION AND PUBLIC SAFETY

Recreational and commercial navigation and fishing commonly occur along the waterways and offshore of Pinellas County. On the bay side of many barrier islands such as Sand Key are numerous marinas and boat launch facilities that are utilized year round. Federally maintained navigational channels in Pinellas County include Clearwater Pass and John's Pass (located on either end of Sand Key), Pass-a-Grille Channel, the entrance channel to Tampa Bay, and the Intracoastal Waterway (ICWW).

Navigation in the project area is generally limited to small craft. These include watercraft used for commercial enterprises (e.g., deep-sea fishing and other charters) and recreational activities (fishing, sailing, jet skiing, pleasure boating, etc.). The nearby Port of Tampa is the largest tonnage cargo port in Florida; numerous cargo vessels and cruise ships use the shipping channel.

3.15 CULTURAL RESOURCES

Currently no known cultural resources exist within the project area. However, the potential for submerged resources does exist within the project area. Historically, the project area was once part of the exposed continental shelf where there are a growing number of archeological finds relating to early habitation sites associated with Native American groups. These groups moved into, what is now, the southeastern United States at the end of the last glaciations period. Typically, such submerged sites have been identified along relict landforms such as old river channels. In addition to prehistoric sites, the west coast of Florida has been the site of many shipwrecks over the last few centuries. Starting in the 1500s and the exploration of the New World, many ships have been lost along the Gulf Coast. These resources vary from small wooden sailing vessels to large steel-hulled ships sunk off the coast during World War II.

4.0 ENVIRONMENTAL EFFECTS

This section is the scientific and analytic basis for the comparisons of the alternatives. It summarizes changes that may occur to the existing environment including direct, indirect, and cumulative effects and compares these effects for the No Action and Borrow Area L alternatives.

As previously noted, this Environmental Assessment is a supplement to several previous EAs (USACE 1997, 2002) and an EIS (USACE 1984). Environmental effects of the beach renourishment and pipeline corridors were examined in these previous documents. The same pipeline corridors will be used in this renourishment and the same section of beach, with minor variations, will be renourished. These evaluations have been determined to be still valid since the project limits and construction methodologies, scope, and timing have remained the same, the information presented in these evaluations is otherwise valid, and relevant Federal laws have not changed in a manner that would require re-evaluation of these resources. The existing analyses adequately address the potential environmental effects of the proposed beach renourishment and pipeline corridors, and they are incorporated by reference and summarized in Table A-1, Appendix A. The following sections only address the impacts of the proposed dredging on environmental resources.

4.1 COASTAL ENVIRONMENT

Dredging creates bathymetry changes, which can affect wave patterns and sediment transportation. The physical effects of offshore sand mining on the incident wave field and sediment transportation can alter local shoreline change (Kelley *et al*. 2004).

4.1.1 Changes in Bathymetry

Physical removal of sediments at the borrow areas can alter the topography of the seabed, creating pits. Bathymetry changes can locally reduce currents, lower dissolved oxygen levels, and increase the accumulation of fine sediments. Depending on natural sediment transportation in the area, borrow pits may either refill rapidly or may remain for extended periods.

4.1.1.1 Borrow Area L Alternative

The borrow cut of Borrow Area L is expected to reduce the depth by 0.7 to 6.5 ft (0.2 to 2 m). Dredging may alter the topography of Borrow Area L for a long period. Byrnes *et al*. (2004) predicted infilling times of sand ridge borrow sites following dredging to vary from 54 to 303 years. These sites were located within about 20 km (12.4 miles) of the shoreline and between the roughly 33- to 66-ft (10- and 20-m) depth contours.

4.1.1.2 No Action Alternative (Egmont Channel Shoal)

Egmont Channel Shoal is located in a depositional area. Egmont Channel shoal has been used for previous beach renourishments. A post-dredging study of Egmont Channel Shoal noted that changes in the bottom topography after dredging persisted almost two years after dredging ceased (Blake *et al*. 1996). Locating borrow areas in areas with higher depositional rates will decrease infilling times.

4.1.2 Changes in Wave Patterns

The excavation of an offshore borrow site can alter wave heights and the direction of wave propagation (Kelley *et al*. 2004). These changes can intensify wave energy at the shoreline and create erosional hotspots (Byrnes *et al*. 2004). Modeling has predicted major erosion due to offshore dredging (Committee on Beach Nourishment and Protection 1995). Hartog *et al*. (2008) modeled the effects of borrow pits in Delray Beach on the south-Atlantic coast of Florida and concluded the presence of nearshore borrow pits significantly influenced nearshore waves (resulting in fluctuations of up to 50 percent of the original wave height) and resulted in alongshore variation in sediment transport that was twice as large as the bathymetry without borrow pits.

The distance a borrow area is located from the shore may determine the length of shoreline and the magnitude of the effect on wave patterns. Borrow sites that are further offshore influence a longer length of shoreline; however, the actual magnitude of the impact is reduced because the affected wave field has a longer distance over which to diffuse energy. Wave modeling on the effects of a borrow area on wave height for a small (2.3 million cubic meter dredged to about 3 m) borrow area off Siesta Key in west-central Florida predicted that the detectible influence of the cut on wave height reduction during a winter storm was limited to approximately 6.2 mi (10 km) to the east. Beyond this distance, predicted changes in wave height were reduced to zero (Zarillo *et al*. 2008). The influence on wave fields propagating across Siesta Shoal could only be detected under the most extreme wave conditions, such as tropical storms. Zarillo *et al.* (2008) suggested that the influence of borrow areas located in OCS waters more than 9 nm from the nearest shoreline are masked by refraction and shoaling effects over the irregular topography and decreasing depths of the inner continental shelf.

The amount of sediment removed from a borrow area, the number of borrow sites in an area, and the shape of borrow areas can potentially have greater effects on wave fields. In general, borrow areas with larger extraction volumes offshore of New Jersey had a greater impact on the wave field and regions with multiple borrow areas had a greater potential for wave modifications (Byrnes *et al*. 2004). Deeper and steeper borrow pits had a large influence on the waves compared to shallower and less steep borrow pits (Hartog *et al*. 2008). Similarly, the detectible influence of deeper excavation areas (multiple borrow cuts) off Sanibel Island was predicted to extend to the east of the shoal system by approximately 6.2 mi (10 km). However, these effects were greater under tropical storm conditions (Zarillo *et al*. 2008).

4.1.2.1 Borrow Area L Alternative

Dredging Borrow Area L would be unlikely to affect wave heights at the shore due to its distance (12 miles) from the shore, except possibly under extreme storm conditions.

4.1.2.2 No Action Alternative (Egmont Channel Shoal)

The Egmont Channel shoal has been used for previous renourishments. A wave refraction study was conducted on Egmont Ebb-Tidal Shoal and surrounding areas using the USACE RCPWAVE (Regional Coastal Processes Monochromatic WAVE) Model (Wang *et al*. 1996). RCPWAVE is a 2-D, steady state, monochromatic short wave model for simulating wave propagation over arbitrary bathymetry. Typical fair weather wave angles and heights (from both north and south) as well as wave conditions representing hurricanes and winter storms were simulated. The northern end of Egmont Key was found to always have a concentration of high wind energy; this concentration is likely due to the natural topography of the ebb-tidal delta and the associated Egmont Channel. Dredging of the Egmont Channel or the Egmont ebb-tidal delta has no influence on the wave approach or the force at which the waves strike Egmont Key. The natural channel depth appears to negate any effect that dredging may have on wave influence (Kling 1997).

4.1.3 Changes in Sediment Transport

Sand dredging can also affect net longshore sediment transport. Longshore transport depends on a number of factors, including wave height and direction in relation to the shoreline and sediment size. Wave- and current-generated sediment transport away from the shoreface is weak under most wave and wind simulations; however, higher energy storm events can transport sediment on portions of the inner shelf (Zarillo *et al*. 2008). Models on sand transport indicated that little or no influence on the wave field would occur in the nearshore and littoral zone landward of the shoal even if most of the shoal were removed for beach fill. Strong nearshore circulation and transport were only predicted during storms and periods of higher wave energy. Differences in sand transport (less than 100 cubic meters) observed during the model runs were below the predicted variability in transport rates.

Dredging can also affect sediment transportation within the sand ridges. One concern with dredging is that removal of sand from a ridge and swale feature may lead to the deflation or disappearance of the feature (Hayes and Nairn 2004). Causes for this disappearance could be the reduction in the converging wave pattern or the diminishment or elimination of non-linear orbital velocities that create the converging sand transport pattern. Hayes and Nairn (2004) further suggested that a critical threshold depth should be identified below which these ridges should not be dredged to insure these features are maintained. However, Dibajnia and Nairn (2010) noted that the shoals got smaller due to the dredging, but there did not appear to be a critical threshold for dredging that caused the ridge and shoal features to deflate and lose their integrity.

Dredging a borrow site multiple times may increase the effect on sand transport. Shoals are often expected to serve as long-term or continual sources of borrow material for beach renourishment and to repair storm damage (Byrnes *et al*. 2003). Cumulative effects of multiple dredging events at one site or at nearby sites in relationship to alterations of the local wave and sediment transport processes were examined by Byrnes *et al*. (2003). Borrow sites located in close proximity appeared to have a simple additive effect on sediment transport. As a borrow site is excavated to greater depths through multiple dredging events, the impact it will have on sediment transport along the shoreline will increase.

4.1.3.1 Borrow Area L Alternative

Dredging of Borrow Area L would be unlikely to affect sediment transport along the shoreline, except possibly under extreme storm conditions. The dredging may affect sediment transport within the sand ridge from which it is dredged. However, this would be unlikely to affect the maintenance of the sand ridge.

4.1.3.2 No Action Alternative (Egmont Channel Shoal)

The Egmont Channel Shoal has been used for previous beach renourishments. Previous dredging of the Egmont Channel Shoal borrow area was suspected to remove the sediments from the natural sediment transport system, expediting erosion on the northern portion of Egmont Key. However, analysis conducted for a previous renourishment indicated that this erosion was not caused by dredging the borrow area and that future dredging would not cause erosion to Egmont Key (USACE 1997).

4.2 SAND RESOURCES

4.2.1 Borrow Area L Alternative

The use of sand from Borrow Area L for beach renourishment is likely to deplete the sand supply at Borrow Area L. Because the depth of closure for measurable sand movement is further inshore, offshore borrow sites tend to fill in with fine-grained material that is not suitable for beach renourishment. It is unlikely that deepwater borrow sites return to their pre-disturbed position. Once a borrow site is used, other sand sources would likely need to be found (Committee on Beach Nourishment and Protection 1995). Dibajnia and Nairn (2010) modeled 11 dredging scenarios over a 10 to 15 year period. They found that after removal of material from a shoal, the shoal reformed itself with a smaller volume, due to material removal. The volume removed by dredging was not compensated by transport of sediment from outside the shoal.

4.2.2 No Action Alternative (Egmont Channel Shoal)

The No Action Alternative retains the use of Egmont Channel Shoal as a source for renourishing the beach at Sand Key. The Egmont Channel Shoal has been used for numerous beach nourishment projects in Pinellas County since the 1980’s. Most recently, the shoal was used for the 2005 Sand Key Beach Renourishment. Prior to that project, the borrow area held approximately 7.1 million cubic yards of sand. After the project, approximately 4.6 million cubic yards remains (Nicole Elko, personal communication, October 7, 2010).

4.3 SEDIMENT CHARACTERISTICS OF BORROW AREAS AND BEACH

4.3.1 Borrow Area L Alternative

The sand at Borrow Area L is compatible with the Sand Key beach sand and only minor variability in the sand characteristics would occur.

4.3.2 No Action Alternative (Egmont Channel Shoal)

The sand at the Egmont Channel Shoal is compatible with the Sand Key beach sand and has been used in previous renourishments. This borrow area is not expected to cause variability in the sand characteristics.

4.4 FISH AND INVERTEBRATES

4.4.1 Soft Bottom Communities

4.4.1.1 Borrow Area L Alternative

Dredging Borrow Area L would have direct and indirect effects on benthic infauna. Direct effects of dredging on benthic infauna include the actual removal of the infaunal organisms in the immediate area, changes in grain size, bathymetry, and shear stress that may alter the community. Indirect effects include changes in sediment grain size and organic content, and sediment resuspension, which can bury nearby organisms or interfere with feeding (Brooks *et al*. 2004). Since very little fine material (silt/clay) is present within Borrow Area L, recovery should occur more rapidly. It is anticipated that infaunal assemblages would become reestablished within one to two years after dredging. Brooks *et al.* (2006) reviewed the existing scientific literature on offshore benthic assemblages along the eastern U.S. and the Gulf of Mexico continental shelf and it appeared that the benthic assemblages on the continental shelf *recovered* from anthropogenic disturbance within three months to 2.5 years. They noted that it was difficult to draw conclusions about the approximate benthic faunal recovery times following anthropogenic activities such as sand mining and/or disposal operations because of the lack of studies.

Dredging the bottom destroys the organisms within the dredged area; however, the best sands for beach nourishment have a comparatively low resource value. The benthic fauna of those areas are likely to recolonize fairly rapidly especially if small *islands* are left untouched within the otherwise dredged area. Care should be taken to minimize disturbance of the substrate between shoals that will be the targets for dredging (Virginia Institute of Marine Science 2000). The undisturbed areas between dredged locations may provide an important source of colonizing species and enable the dredged area to recover faster than the recovery that may occur only due to larval settlement and growth (Newell *et al.* 1998). Lundquist *et al.* (2010) concluded that the rate of disturbance interacts in a complex way with the processes of succession through habitat connectivity.

Larger, deeper dredging may have more of an effect on benthic infauna and may increase recolonization times. Palmer *et al.* (2008) showed that sand mining in coastal Louisiana caused significant declines in macrofaunal abundance, biomass, and diversity.

4.4.1.2 No Action Alternative (Egmont Channel Shoal)

The Egmont Channel Shoal borrow area is believed to support organisms similar to the benthic organisms found offshore along the project area. Species of non-motile infaunal invertebrates, as well as epifaunal invertebrates may inhabit this inlet ebb shoal borrow area. These communities would be disturbed during dredging. The effects of the project and the recovery of the community would be similar to the effects described for Borrow Area L.

4.4.2 Hardbottom Communities

Potential impacts to hardbottom communities from dredging include physical disturbance due to dredge operation, dredge or support vessel anchoring, and sedimentation related to turbidity from dredging and overflow.

4.4.2.1 Borrow Area L Alternative

Hardbottom impacts are not anticipated from dredging in Borrow Area L. Exclusionary buffers (400 ft) have been established around documented hardbottom features adjacent to the proposed borrow area to eliminate any direct or indirect impacts to these features from dredge plant disturbances. Sedimentation from overflow, etc. is not expected because of the exclusion buffers.

4.4.2.2 No Action Alternative (Egmont Channel Shoal)

No hardbottom impacts associated with the No Action Alternative are anticipated (USACE 1997). Hardbottom is not present in the Egmont Channel Shoal borrow area.

4.4.3 Fish and Macroinvertebrates

4.4.3.1 Borrow Area L Alternative

Some of the possible short-term and localized effects of dredging in Borrow Area L on fish and macroinvertebrates include entrainment of organisms during dredge operation; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; and changes to the soft bottom bathymetry in the borrow area during dredging. Similar nearby undisturbed habitat could serve as a refuge for mobile organisms during dredging and provide recruitment following dredging. Long-term impacts can include reduction of food supply, mortality of eggs and larvae, and changes in habitat. Many of the fish species found in the area feed on invertebrate infauna or epifauna; dredging may affect the food supply of some species temporarily.

The very small size of the areas likely to be dredged relative to the large geographic ranges of transitory fishes indicates that sand mining would have very little impact on the fish populations (Virginia Institute of Marine Science 2000). Effects of sand dredging are not only short term, but also localized. Similar undisturbed habitat is adjacent to the borrow area.

4.4.3.2 No Action Alternative (Egmont Channel Shoal)

Construction activities associated with the No Action Alternative would have similar effects to fish and macroinvertebrates as described for the Borrow Area L Alternative.

4.5 WILDLIFE

4.5.1 Marine Mammals

4.5.1.1 Borrow Area L Alternative

Dredging may affect marine mammals due to collisions, noise, and turbidity plumes. Collisions with marine mammals and the alteration of migratory patterns (due to noise in the water column) are potential effects of dredging (Hammer *et al*. 2003). Physical injury can result from collisions with the dredge and dredge support vessels. Reducing boat speeds in areas of known or suspected concentrations of marine mammals could significantly reduce or eliminate collisions. Laist *et al*. (2001) suggested that maintaining vessel speeds below 14 knots might reduce the impact of vessel collisions on large whales. The operating speed of dredge operations does not pose a significant strike risk and direct physical injury from the drag head (for hopper dredging) is unlikely.

Potential impacts to endangered marine mammals are minimal. Sperm whales and right whales are not likely to occur in the project area. The danger of strike impacts with these species is very low. The risk of a vessel strike with a manatee one mile or more from the shore is considered very low (Zarillo *et al.* 2008). Since the Special Manatee Protection Conditions will be followed, the likelihood of adversely affecting this species is very low.

Some of the concerns about the effects of dredging noise on marine mammals include animals avoiding intense sounds, some mammals may be attracted to sounds, mammals may change their behavior in response to sound, and habituation may occur where the response of mammals wanes when exposed repeatedly to sounds (Ocean Studies Board 2005). Reduction of dredge noises by proper maintenance of equipment could help reduce effects of noise (Hammer *et al*. 2003).

Suspended sediment generated by the dredging could temporarily interfere with marine mammal feeding or other activities; however, marine mammals could leave the area and turbidity is unlikely to have a significant effect. The Virginia Institute of Marine Science (2000) study suggested that sand mining poses no foreseeable threat to migratory and highly mobile marine mammals.

The short-term impact of the dredging of Borrow Area L could result in the temporary modification in the behavior of bottlenose dolphins. While behavioral modifications, including temporarily vacating the area, may be made by this species and other marine mammals to avoid the resultant visual and acoustic disturbance from dredging, this action is expected to have a negligible impact on the animals. In addition, no take by injury and/or death is anticipated, and the USACE does not anticipate any incidental harassment of bottlenose dolphins. Impacts would be short-term and temporary and should have no lasting effects on marine mammal populations in the area.

4.5.1.2. No Action Alternative (Egmont Channel Shoal)

Similarly, the No Action Alternative may affect marine mammal populations in the area. Impacts would be short-term and temporary and should have no lasting effects on marine mammal populations in the area.

4.5.2 Sea Turtles

Effects of the project on sea turtles are discussed in Section 4.6.

4.5.3 Birds

4.5.3.1. Borrow Area L Alternative

The main impact of the dredging process on seabirds would be a temporary displacement of birds near Borrow Area L. Terns and other birds may fish in the scow as it is being filled. The mixture of water and slurry could bog birds down until they are unable to fly from the scow; this may result in drowning. Fishing birds, particularly plunge-diving terns, could potentially drown during dredging operations (Zarillo *et al.* 2008). Impacts would be short-term and temporary and should have no lasting effects on bird populations in the area.

If disposal activities take place from April 1 to August 31, daily monitoring will be conducted along the shoreline for migratory bird usage of the placement area. If nesting is observed within the construction area, a temporary 200-ft buffer shall be created around the nests (see also Appendix A and Sections 3.5.3.2, 6.18, and 6.25 of this document).

4.5.3.2. No Action Alternative (Egmont Channel Shoal)

Construction activities associated with the No Action Alternative would have similar effects to birds as described for the Borrow Area L Alternative. Impacts would be short-term and temporary and should have no lasting effects on bird populations in the area.

4.6 THREATENED AND ENDANGERED SPECIES

4.6.1 Florida Manatee

4.6.1.1 Borrow Area L Alternative

The Borrow Area L Alternative would have no effect on the Florida manatee. Manatees typically use nearshore waters for migration. Zarillo *et al.* (2008) suggest that the risk of a vessel strike with a manatee one mile or more from the shore is very low. The use of dredges and construction equipment associated with the dredging of sand from an offshore borrow area should not directly or indirectly impact manatee populations in the area. Protective measures would be taken during dredging to insure that no manatees would be harmed due to construction activity. Section 5.0, Environmental Commitments, outlines some of the measures to be taken. Additionally, the contractor would supply the USACE with an Environmental Protection Plan prior to construction. It is the determination of USACE that while the project may affect manatees under the jurisdiction of the USFWS, the project is not likely to adversely affect Florida manatees.

4.6.1.2 No Action Alternative (Egmont Channel Shoal)

The No Action Alternative would also not affect manatee populations within the area. Previous environmental documents for beach nourishment projects in Pinellas County determined no impacts to the manatee would occur (USACE 1984, 1996).

4.6.2 Sea Turtles

4.6.2.1 Borrow Area L Alternative

The Borrow Area L Alternative and associated activities may affect sea turtles depending on the type of dredge utilized. The use of Borrow Area L may impact sea turtles due to entrainment, benthic foraging and resting habitat disturbance, noise disruption, and injury from vessel and dredges. Monitoring for incidental takes of sea turtles began as soon as the earliest incidents were reported from the hopper dredging activities at Canaveral Harbor, Florida in 1980 (Rudloe 1981, Joyce 1982). Incidental takes of sea turtles have only been documented from hopper dredge operations that use trailing suction dragheads. Thus far, no incidental takes of sea turtles have been reported from clamshell, pipeline cutterhead, or other types of dredges operating in southeastern coastal channels. Operational differences between these dredge types contribute to the differences in potential impacts to sea turtles (Dickerson *et al.* 2004).

The use of hopper dredges within offshore borrow areas may entrain sea turtles during construction. Deflector dragheads would be used with hopper dredges to decrease the likelihood of entrainment should this method be utilized. Noise impacts on sea turtles are unknown and may vary with species and cannot be assessed or mitigated (Zarillo *et al.* 2008). Collisions with vessels are a concern for marine turtles because they mate, bask, and forage on the surface (NCR 1990).

The National Marine Fisheries Service has prepared an Endangered Species Act, Section 7 Consultation Regional Biological Opinion, *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/2001/01287* (as supplemented) . The Borrow Area L Alternative would be within the scope of the NMFS 2003 GMRBO (NMFS (2003 [Rev. 2005, 2007]); Appendix B) if hopper dredges are used. Mechanical dredging is slower, and may have less of an effect on sea turtles than hopper dredging. Avoidance of hardbottom habitats where sea turtles forage would also decrease the likelihood of entrainment. USACE believes that the use of a mechanical and/or cutterhead dredge for dredging, may affect, but is not likely to adversely affect listed sea turtles.

Indirect impacts on sea turtles due to dredging in the project area include alteration of behavior. For example, daily movements of sea turtles may be impeded or altered. These effects would be temporary, only lasting as long as the dredging activities. Noise impacts to marine mammals are a concern in ocean and coastal operations. However, only a few marine dredging noise studies have been conducted. These studies suggest no indication that marine mammals would be killed or harmed by the noise produced during dredging operations (Zarillo *et al.* 2008).

With respect to effects of hopper dredging on sea turtles, the 2003 GMRBO states:

> *. . .it is NOAA Fisheries' biological opinion that the COE's hopper dredging activities, as proposed and described in the Proposed Action section of this Opinion, are not likely to jeopardize the continued existence of any listed species…*

The 1991 South Atlantic Regional Biological Opinion (SARBO) (NMFS 1991) states:

> *Clamshell dredges are the least likely to adversely affect sea turtles because they are stationary and impact very small areas at a given time. Any sea turtle injured or killed by a clamshell dredge would have to be directly beneath the bucket. The chances of such an occurrence are extremely low, although the take of a live turtle by a clamshell dredge has been documented at Canaveral. On the basis of the best available information, NMFS has determined that dredging with a clamshell dredge is unlikely to result in the take of sea turtles…. Pipeline dredges are relatively stationary and only influence small areas at a given time. For a turtle to be taken with a pipeline dredge, it would have to approach the cutterhead and be caught in the suction. This type of behavior would appear unlikely, but may be possible. Presently, NMFS has determined that pipeline dredges are unlikely to adversely affect sea turtles….the special purpose split-hull hopper dredge and sidecast dredges are used in a limited basis in the southeast. These dredges are not believed harmful to sea turtles because of the small size of dragheads (roughly 2' by 2'). For the present consultation, NMFS has determined that these dredges are unlikely to adversely affect sea turtles.*
>
> *Of the three major dredge types, only the hopper dredge has been implicated in the mortality of endangered and threatened species. Thus, this biological opinion concentrates on the adverse impacts of hopper dredging in the southeastern United States.*

The NMFS GMRBO prepared reasonable and prudent measures to protect sea turtles, which were summarized:

> *NOAA Fisheries believes that seasonal dredging windows, deflector dragheads, observer and screening requirements, and relocation trawling have proved convincingly over the last decade to be an excellent combination of reasonable and prudent measures for minimizing the number and impact of sea turtle takes, enabling NOAA Fisheries to assess the quantity of turtles being taken, and*

> *allowing the affected COE Districts (Wilmington, Charleston, Savannah, Jacksonville, New Orleans, and Galveston) to meet their essential dredging requirements to keep Federal navigation channels open.*

As part of the standard plans and specifications for the project, the USACE has agreed to implement the *Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS 2006).

4.6.2.2 No Action Alternative (Egmont Channel Shoal)

The No Action Alternative would have similar effects on sea turtles to those described for Borrow Area L.

4.6.3 Gulf Sturgeon

4.6.3.1 Borrow Area L Alternative

The Borrow Area L Alternative may affect, but is not likely to adversely affect, the Gulf sturgeon. No reliable data exists for the distribution and abundance of the Gulf sturgeon for the areas offshore of Pinellas County. Direct impacts leading to the take of sturgeon during dredging are unlikely and should any impacts occur the NMFS would be contacted immediately. Indirect impacts to sturgeon moving from dredging areas may occur and would be short-term and temporary and should have no lasting effects on the Gulf sturgeon population of Pinellas County.

4.6.3.2 No Action Alternative (Egmont Channel Shoal)

Similarly, the No Action Alternative may affect Gulf sturgeon populations in the area. Impacts would be short-term and temporary and should have no lasting effects on the Gulf sturgeon population of Pinellas County.

4.7 ESSENTIAL FISH HABITAT

4.7.1 Borrow Area L Alternative

Borrow Area L primarily consists of sand patches and sand waves and encompasses approximately 286.5 acres; however, due to mitigation efforts not all the area will be used. Construction of the project is expected to take from 10 to 14 months. Borrow Area L is located in depths of approximately 45 ft (13.7 m) NAVD. The sediment within Borrow Area L is typically fine-grained sand with trace silt, trace shell hash, trace shell fragments and whole shell. Borrow Area L is within a ridge field and similar habitat is adjacent to this borrow area.

Dredging activities associated with the Borrow Area L Alternative would affect non-vegetated bottoms, live bottoms, and water columns within the study area designated as EFH. The proposed dredging would likely have minimal adverse impacts on EFH, some of which would be temporary. Although the habitat will change from existing conditions, the modified habitat will have EFH value.

Many of the EFH species are associated with hardbottom areas. Scattered and continuous hardbottom is at least 400 ft away from Borrow Area L due to the 400 ft exclusionary buffer. This buffer was established around documented hardbottom features adjacent to the proposed borrow area to eliminate direct impacts and reduce indirect impacts to these features from dredging activities. Therefore, reef fish are less likely to be affected.

Impacts on EFH species could include entrainment of organisms during dredge operation; vessel strike; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; changes to soft bottom bathymetry in the borrow area during dredging; and temporary loss of prey items and foraging habitat. Effects on EFH species would be short-term and localized; similar undisturbed habitat is adjacent to the borrow area. Injury or entrainment due to dredging would most likely affect demersal or less mobile species, such as shellfish. Dredging may also affect feeding success of EFH species due to turbidity and loss of benthic organisms; however, this would be temporary and adjacent similar habitat is available for feeding.

Impacts to EFH would occur in the proposed borrow area but the limited spatial and temporal extent of dredging suggests these impacts will not adversely affect EFH on a broad scale.

No HAPCs are located within or near the project site; therefore, no HAPCs would be affected.

4.7.2 No Action Alternative (Egmont Channel Shoal)

Construction activities associated with the No Action Alternative would have similar effects to EFH as described for the Borrow Area L Alternative.

4.8 WATER QUALITY

4.8.1 Borrow Area L Alternative

Dredging operations would produce temporary minor changes in water quality. Turbidity levels in the areas of dredging would be elevated above normal during dredging within the mixing zone. Visible plumes at the water surface are expected in the immediate vicinity of the dredging operation. Elevated turbidity levels are expected to dissipate rapidly, returning to background levels in a short period. Borrow Area L is located in Federal Waters, and is therefore exempt from state water quality standards. The USACE contractor will implement a spill contingency plan for hazardous, toxic, or petroleum material for the borrow area. No long term adverse impact on water quality is expected to occur as a result of the Borrow Area L Alternative.

4.8.2 No Action Alternative (Egmont Channel Shoal)

Construction activities associated with the No Action Alternative would have similar effects to water quality as described for the Borrow Area L Alternative.

4.9 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)

4.9.1 Borrow Area L Alternative

Borrow Area L has not had any activities associated with it that would be expected to produce any hazardous or toxic wastes. No evidence of contamination by hazardous or toxic wastes at Borrow Area L was noted during prior surveys or site investigations. Accidental spills and releases of waste/fuel, although remote, are possible. The USACE Contractor will prevent oil, fuel, or other hazardous substances from entering the air or water. This will be accomplished by design and procedural controls. All wastes and refuse generated by project construction would be removed and properly disposed. The USACE contractor will implement a spill contingency plan for hazardous, toxic, or petroleum material for the borrow area. Compliance with U.S. EPA Vessel General Permits would be ensured, as applicable. The Borrow Area L Alternative would not affect HTRW within the project area.

4.9.2 No Action Alternative (Egmont Channel Shoal)

Construction activities associated with the No Action Alternative would have similar effects to HTRW as described for the Borrow Area L Alternative.

4.10 AIR QUALITY

4.10.1 Borrow Area L Alternative

The USACE prepared an air quality analysis using project-specific parameters to estimate emissions for the Borrow Area L Alternative. The USACE estimated criteria air pollutant emissions for the Borrow Area L Alternative using estimates of power requirements, duration of operations, and emission factors for the various equipment types. Multiplying horsepower (hp) rating, activity rating factor (percent of total power), and operating time yields the energy used. The energy used multiplied by an engine-specific emission factor yields the emission estimate. Operational data from past USACE dredging events were used to estimate power requirements and duration for the proposed dredging activity with the expectation that a hopper dredge would be utilized for project construction. The hp rating of the dredge plant was assumed for each activity as follows: propulsion (3,500 hp), dredging (2,000 hp), pumping (2,000 hp), and auxiliary (1,165 hp). Different rating or loading factors were used for dredging, propulsion, and pumping. The estimated duration of dredging was approximately 201 days. The estimated time to each complete dredge cycle, including idle time, was approximately 8.89 hours per load. Due to hydraulic losses anticipated during dredging, the volume required for placement (800,000 cy) is multiplied by a factor of 1.5 to determine the sand volume dredged. It was assumed that about 2,206 cy of material would be moved in each cycle, requiring about 544 loads to excavate 1.2 million cy of sand. The placement and relocation of the nearshore mooring buoys used during pump-out may involve up to two tender tugboats, a pumpout booster, two work barges, and pipeline hauler/crane. It was assumed that the buoy would need to be moved at most five times during the project, with each move taking approximately 12 hours. In addition, a crew/supply vessel would operate daily for four hours.

The USACE analysis assumed all dredging would occur on the OCS and 25 percent of hopper transport and crew/supply vessel activities were assumed to occur over state waters. Emission factors for the diesel engines on the hopper dredge, barge, and tugboats were obtained from EPA's *Compilation of Air Pollutant Emissions Factors, AP-42, Volume 1* (2002). Table 5 provides the total project emissions of nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOCs), and particulate matter (PM).

The proposed action may result in small, localized, temporary increases in concentrations of nitrogen oxides, SO_2, CO, VOCs, and PM. The USACE totaled the portion of total emissions that would occur within state limits, which are shown in Table 5. The USACE calculated the increase in emissions that may occur within state limits by subtracting out the dredging-related emissions and 75 percent of transport emissions, since those activities would take place entirely over federal waters.

The short-term impact from emissions by the dredge and other construction equipment would not affect the overall air quality of the area. Emissions from the proposed action would not adversely affect air quality given the relatively low level of emissions compared to the total county-wide emissions and the likelihood for prevailing offshore winds. Vehicles and machines used during project construction will be well maintained to reduce the unnecessary release of airborne pollutants into the atmosphere. Ocean-generated breezes are likely to disperse any project-related toxicants released into the atmosphere away from the project area. Pinellas County is designated as an attainment area for Federal air quality standards under the Clean Air Act (CAA). With the proposed action, the criteria pollutant levels would be well within the national ambient air quality standards (NAAQs). No air quality permits would be required for this project.

4.10.2 No Action Alternative (Egmont Channel Shoal)

Construction activities associated with the No Action Alternative would have similar effects on Air Quality as described for the Borrow Area L Alternative.

4.11 NOISE

4.11.1 Borrow Area L Alternative

Dredging noise can affect marine mammals, sea turtles, and fisheries. Possible effects can vary depending on a variety of internal and external factors, and can be divided into masking (obscuring of sounds of interest by interfering sounds, generally at similar frequencies); response; and discomfort, hearing loss, and injury (MALSF 2009). Deeper water operations may propagate sound over greater distances than those in confined nearshore areas (Hildebrandt 2004).

Table 5. Estimated Emissions for the Borrow Area L Alternative (tons per year)

Activity	Emissions (tons)					
	NO_x	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$
Dredge Plant (Hopper)						
Dredging/Operations	18.7	0.5	0.3	4.3	0.3	0.3
Hauling/Return	59.4	1.6	1.0	13.6	1.0	1.0
Pumpout	26.6	0.7	0.4	6.1	0.4	0.4
Idle/Connect-Disconnect	15.5	0.4	0.3	3.5	0.3	0.3
Supporting Offshore Activities	12.9	0.2	0.2	3.0	0.2	0.3
Total Emissions	133.1	3.4	2.2	30.5	2.2	2.2
Total Emissions within State	67.3	1.7	1.1	15.4	1.1	1.1
Total Emissions within OCS	65.8	1.8	1.1	15.1	1.1	1.1
2002 Countywide Emissions Nonpoint + Mobile (Point and Nonpoint + Mobile)	31,188 (37,992)	47,216 (48,221)	27,884 (52,694)	265,038 (265,621)	8,677 (9,349)	2,365 (2,886)
Pinellas County 2002 Emissions from EPA National Emission Inventory at http://www.epa.gov/air/data/geosel.html						

Dredging to create new waterways or channels or to extract marine aggregates produces broadband and continuous sound, mainly at lower frequencies (MALSF 2009). Noise associated with dredging is predominately of low frequency (below 1 kilohertz). Estimated source sound pressure levels range between 168 and 186 dB re 1 uPa at 1 m. In most cases, the noise is continuous. The little available data indicates that dredging is not as noisy as seismic surveys, pile driving, and sonar; but it is louder than most shipping, operating, offshore wind turbines, and drilling. Studies of the effects of dredging on noise have been few, undertaken on a few dredges, and at a limited number of sites.

Noise associated with dredging activities can be placed into five categories (MALSF 2009):

1. Collection noise - This noise arises from the collection of material from the sea-floor, for example, the scraping of the buckets on a bucket ladder dredge or the operation of the drag head. This is dependent on the structure of the sea floor and the type of dredge used.

2. Pump noise - This noise arises from the pump driving the suction through the pipe.

3. Transport noise - This is the noise of the material being lifted from the sea floor to the dredge. For trailing suction hopper and cutter suction dredges, this would be the noise of the material as it passes up the suction pipe. For bucket ladder dredges, it would consist of the noise from the rotation of the buckets. For grab dredges, it would be the sound of the crane dropping/lifting the grabber.

4. Deposition noise - This noise is associated with the placement of the material within the barge or hopper.

5. Ship/machinery noise - This is the noise associated with the dredging ship itself. For stationary dredges, the primary source will be the onboard machinery, most of the energy from which will appear in discrete spectral lines. Mobile dredges will also have propeller and thruster noise.

A temporary increase in noise levels during construction would occur in the vicinity of the dredge. Dredging equipment would be properly maintained to limit noise production. Increases in noise beyond ambient levels would be localized, minor, and limited to the time of dredging. All hauling and excavating equipment will be equipped with standard noise control devices (e.g. mufflers) that meet manufacturers' specifications. The contractor will conduct operations to comply with all Federal, state, and local laws pertaining to noise.

4.11.2 No Action Alternative (Egmont Channel Shoal)

Construction activities associated with the No Action Alternative would have similar effects to noise as described for the Borrow Area L Alternative.

4.12 AESTHETIC RESOURCES

4.12.1 Borrow Area L Alternative

During dredging, equipment used for dredging would be visible, resulting in a temporary reduction in the aesthetic value offshore.

4.12.2 No Action Alternative (Egmont Channel Shoal)

Construction activities associated with the No Action Alternative would have similar effects to aesthetic resources as those described for the Borrow Area L Alternative.

4.13 RECREATIONAL RESOURCES

4.13.1 Borrow Area L Alternative

During dredging operations, the use of the area immediately surrounding the borrow area would be temporarily restricted due to public safety. These restrictions would be of short duration and are expected to be minor to recreational interests.

4.13.2 No Action Alternative (Egmont Channel Shoal)

Construction activities associated with the No Action Alternative would have similar effects on recreational resources as those described for the Borrow Area L Alternative.

4.14 NAVIGATION AND PUBLIC SAFETY

4.14.1 Borrow Area L Alternative

During dredging operations, it may be necessary to temporarily restrict watercraft access to the construction area in the interests of public safety. These restrictions would be of short duration and are expected to be minor to boat operators.

4.14.2 No Action Alternative (Egmont Channel Shoal)

Construction activities associated with the No Action Alternative would have similar effects on navigation and public safety as those described for the Borrow Area L Alternative.

4.15 CULTURAL RESOURCES

4.15.1 Borrow Area L Alternative

To study the effects of the potential use of the borrow area, a cultural resource survey was conducted. The study area of the survey, entitled, *Sand Key Submerged Cultural Resource Survey, Offshore Sand Key, Pinellas County* encompassed a larger area than the current project area (Figure 3; Watts 2010). The area was examined through the use of remote sensing equipment that included a side scan sonar, a magnetometer, and a sub bottom profiler. The survey identified two potential targets, L-1 and L-2. Of these sites, only L-2 was determined to be potentially significant and as such potentially eligible for inclusion in the National Register of Historic Places. However, this target currently falls outside the project area and thus no diver identification was warranted. This target will be buffered against impacts with a 200-meter buffer. The Corps has determined that this project will not adversely affect any significant cultural resources. This determination was coordinated with the Florida State Historic Preservation Officer (SHPO) (DHR Project File No. 2010-02874-B) and the appropriate federally recognized tribes, the Seminole Tribe of Florida, Tribal Historic Preservation Office (THPO# 006303).

4.15.2 No Action Alternative (Egmont Channel Shoal)

The No Action Alternative would also not affect known significant cultural resources. Previous environmental investigations for beach nourishment projects in Pinellas County determined that no impacts to significant cultural resources would occur (DHR Project No. 2003-2216B).

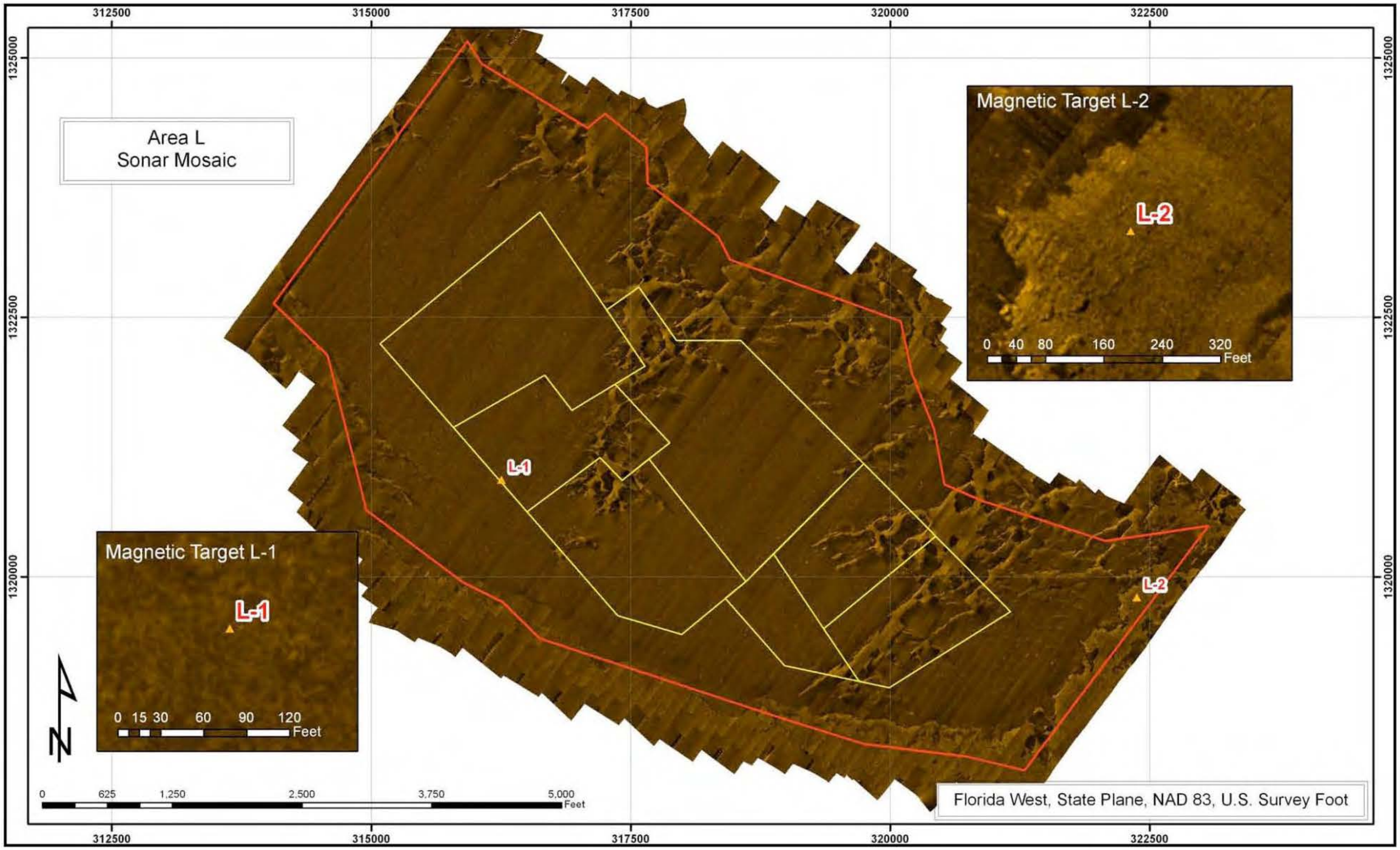


Figure 3. Sonar Mosaic of Borrow Area. Red outline is the study area for Borrow Area L. Borrow Area L is outlined by the yellow lines. Of the two potential target areas, only L-2 was determined to be potentially significant; however, this target currently falls outside the project area.

4.16 ENERGY REQUIREMENTS AND CONSERVATION

4.16.1 Borrow Area L Alternative

The energy requirements for this construction activity would be confined to fuel for the dredge, labor transportation, and other construction equipment. Transportation costs for a given material increase with increased distance. Because the transportation distance from Borrow Area L to the northern portion of Sand Key is shorter (12 miles) than that from the Egmont Channel Shoal Borrow Area (22.5 miles), the use of Borrow Area L would require less energy than that required for the No Action Alternative.

4.16.2 No Action Alternative (Egmont Channel Shoal)

Due to the increased distance, construction activities associated with the No Action Alternative would require more energy than that required for the Borrow Area L Alternative.

4.17 NATURAL OR DEPLETABLE RESOURCES

4.17.1 Borrow Area L Alternative

Because sand resources at offshore sites, including Borrow Area L, appear to be replenished by natural forces slowly, it is anticipated that the use of Borrow Area L would result in the depletion of its sand supply.

4.17.2 No Action Alternative (Egmont Channel Shoal)

The No Action Alternative (Egmont Channel Shoal) appears to contain enough sand for future renourishments. Section 4.2 discusses sand replenishment at the two borrow areas in more detail.

4.18 CUMULATIVE EFFECTS

Cumulative effects are defined in 40 CFR 1508.7 as those effects 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 nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

Cumulative environmental effects for the proposed project were assessed in accordance with guidance provided by the President's Council on Environmental Quality (CEQ).

4.18.1 Methodology

A six-step process was followed to assess cumulative effects on resources affected by the Borrow Area L Alternative. The first step was to identify which resources to consider in the analysis. All impacts on affected resources can be called cumulative. However, according to CEQ guidance, "*the role of the analyst is to narrow the focus of the cumulative effects analysis to important issues of national, regional, or local significance* (CEQ 1997, p. 12)." In addition to this *relevancy* criterion, only those resources expected to be directly or indirectly affected by the Borrow Area L Alternative as well as by other actions within the same geographic scope and time frame were chosen for the analysis. Based on these criteria, the following resources were identified as target resources for the cumulative effects analysis: sand resources, marine habitats, and protected species.

The next steps of the cumulative effects analysis included:

- Defining the study area for each resource.
- Describing the historical context and existing condition of each resource. Descriptions of affected resources are summarized in more detail in Chapter 3.0 of this report.
- Summarizing the direct and indirect effects of each alternative on each identified resource. Environmental effects of each alternative are presented in more detail in Chapter 4.0 of this EA.
- Identifying the accumulated effects on each resource from the Borrow Area L Alternative and other actions.
- Summarizing the magnitude of the cumulative effects of the projects and actions on the affected resources.

The information derived from these steps of the cumulative effects assessment is presented below for each resource.

4.18.2 Sand Resources

Resource Study Area: The study area for assessing cumulative effects on sand resources in this EA includes Borrow Area L. Previous documents (USACE 1997, 2002) discussed the cumulative impacts of the renourishment and pipeline corridors on sand resources.

Historic Context and Current Health: This information is detailed in Section 1.5.

Summary of Direct and Indirect Effects: Because sand resources at offshore sites such as Borrow Area L appear not to be replenished very quickly by natural forces, it is anticipated that the use of Borrow Area L would result in the depletion of its sand supply. The No Action Alternative (Egmont Channel shoal) contains sand for the Sand Key renourishment and future renourishments.

Other Reasonably Foreseeable Effects: There is a potential need for additional renourishment of Pinellas County beaches every five to seven years. Sand resources would be incrementally affected in a manner similar to that described above.

Results of the Cumulative Effects Analysis: The continued use of sand resources for future renourishments could deplete sand resources.

4.18.3 Marine Habitats

Resource Study Area: The study area for assessing cumulative effects on marine habitats in this EA includes Borrow Area L. Previous documents (USACE 1997, 2002) discussed the cumulative impacts of the renourishment and pipeline corridors on marine habitats.

Historical Context and Current Condition: This information is detailed in Section 1.5.

Summary of Direct and Indirect Effects: Dredging of Borrow Area L to construct the beach fill project would have temporary impacts to the benthic infaunal communities. Exclusionary buffers would be established around documented hardbottom features within the proposed borrow areas to eliminate any direct or indirect impacts to these features from dredging activities. The proposed action would likely have minimal, temporary adverse impacts to Essential Fish Habitat.

Other Reasonably Foreseeable Effects: There is a potential need for additional renourishment of Pinellas County beaches every five to seven years. Marine habitats would be periodically affected in a manner similar to that described above.

Results of the Cumulative Effects Analysis: With the replenishment interval expected to be five to seven years, and the recovery time of the affected benthic community after sand removal anticipated to be within one to two years, the potential for significant cumulative benthic biological impacts is remote. Borrow Area L appears to only contain enough sand for one renourishment of the 8.7-mile section of beach. Additional renourishments would have to be dredged from a different borrow area. No significant cumulative impacts to the pelagic environment, including zooplankton, fishes, sea turtles, and marine mammals, are expected from the use of the borrow site.

4.18.4 Protected Species

Resource Study Area: The study area for assessing cumulative effects on protected species in this EA includes Borrow Area L. Previous documents (USACE 1997, 2002) discussed the cumulative impacts of the renourishment and pipeline corridors on protected species.

Historical Context and Current Condition: This information is detailed in Section 1.5.

Summary of Direct and Indirect Effects: No significant adverse impacts on protected species are anticipated. A beneficial aspect is that the project would restore beach used for nesting by sea turtles.

Other Reasonably Foreseeable Effects: There is a potential need for additional renourishment of Pinellas County beaches every five to seven years. Protected species would be periodically affected in a manner similar to that described in Section 4.6 of this EA.

Results of the Cumulative Effects Analysis: Because the proposed project is not likely to affect protected species, with the exception of listed sea turtle should a hopper dredge be utilized, the project would not contribute to adverse cumulative impacts on protected species. Through the ESA Section 7 consultation process, NMFS has determined that utilization of a hopper dredge is not likely to lead to the extinction of listed sea turtles, providing the reasonable and prudent measures and implementing terms and conditions are followed. The project would restore beach used for nesting by sea turtles, which may result in an increase in nesting and a positive effect on the long-term populations of sea turtles that nest in the project area.

4.18.5 Conclusion

The proposed project would not have significant adverse effects on marine communities or protected species due to protective conditions developed in coordination and consultation with the resource agencies. The proposed project would not provide any known incremental result that would contribute to adverse cumulative impacts of biological resources.

Because sand resources such as the resources in Borrow Area L appear to be replenished slowly, the proposed project provides an incremental effect on the depletion of offshore sand resources.

4.19 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The use of sand from Borrow Area L may deplete its supply of sand suitable for beach renourishment. Offshore sand resource areas, including Borrow Area L, are not naturally replenished at a rate that would enable their use for future nourishment and renourishment projects. However, there would be sufficient sand remaining in the dredged areas for re-colonization of benthic organisms. Sand from the Egmont Channel Shoal appears to be replenished more frequently; therefore, the sand from this area is not an irreversible/irretrievable commitment of resources.

4.20 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

The Borrow Area L Alternative and the No Action Alternative have unavoidable adverse direct and indirect environmental effects that are discussed in this document. However, many of these effects are temporary and minor.

4.21 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Long-term benefits and short-term adverse environmental impacts represent tradeoffs between local short-term use and long-term stability and productivity of the environment. Long-term enhancements in productivity result from the storm protection provided to the general public by the restoration of beaches and barrier islands. Direct and indirect effects of the project include disruption of the soft-bottom benthic community and increased turbidity in construction areas. These indirect impacts would be short-term in duration and may cause minor temporary impacts.

4.22 COMPATIBILITY WITH FEDERAL, STATE, AND LOCAL OBJECTIVES

The project is compatible with Federal, state, and local objectives. Both alternatives supply compatible sediment to the beaches in Pinellas County. The Borrow Area L Alternative provides the most cost-effective option.

4.23 CONFLICTS AND CONTROVERSY

No conflicts or controversy regarding this project have been identified.

4.24 UNCERTAIN, UNIQUE, OR UNKNOWN RISKS

The direct site-specific impacts of the Borrow Area L Alternative and the No Action Alternative can be predicted with a high degree of certainty; therefore, uncertainty in minimized. However, predictions of cumulative and indirect impacts are, to a degree, inherently uncertain. This project is based on the best available scientific and engineering information, and although no significant adverse impacts are expected, a low probability is always present. The project design is not unique; thus, it should not create unique risks.

4.25 PRECEDENT AND PRINCIPLE FOR FUTURE ACTIONS

This project would not establish a precedent for future actions with significant effects or represent a decision in principle for future considerations.

5.0 ENVIRONMENTAL COMMITMENTS

The USACE commits to avoiding, minimizing, or mitigating for adverse effects during construction activities by including the following commitments in the contract specifications. Mitigation and monitoring has been derived through consultation and coordination with Federal and state agencies. The environmental commitments for the beach renourishment and pipeline corridors were discussed in previous documents (USACE 1984, 1997, 2002) and are summarized in Appendix A.

5.1 PROTECTION OF FISH AND WILDLIFE RESOURCES

The Contractor shall keep construction activities under surveillance, management, and control to minimize interference with, disturbance to, and damage of fish and wildlife. Species that require specific attention along with measures for their protection shall be listed in the Contractor's Environmental Protection Plan prior to the beginning of construction operation.

Monitoring, reporting, consultation, mitigation, and avoidance of nesting activities by migratory birds will conducted according to Mitigation and Compliance measures outlined in Table A-1, Appendix A.

If a hopper dredge is used for the dredging operations, potential impacts to sea turtles could occur. To minimize the risk to sea turtles, standard sea turtle protection conditions will be implemented such as deflector dragheads, inflow screens, and/or monitoring of the operation.

Dredging will not occur within 400 ft of any significant hard-ground areas; therefore, hardbottom resources near Borrow Area L will not be impacted. This project is not anticipated to result in hardbottom impacts.

5.2 ENDANGERED SPECIES PROTECTION

The USACE will comply with all requirements of any consultation documents associated with this project provided under the Endangered Species Act from either USFWS or NMFS. USACE will implement the Standard Manatee Construction Protection Specifications to ensure manatee protection.

Dredging will not occur within a minimum of 400 ft from any significant hard-ground areas or bottom structures that serve as attractants to sea turtles for foraging or shelter. These buffers and any other turtle safety precautions would be maintained to comply with the NMFS Gulf Regional Biological Opinion (GMRBO) (November 19, 2003; Revision No 1. June 24, 2005; Revision No. 2. January 9, 2007). Additional documents that affect the proposed project and would be complied with include the NMFS Biological Opinion (October 1, 1996) and the USFWS Final CAR (November 4, 1996). If a hopper dredge is used for the dredging operations, potential impacts to sea turtles could occur. To minimize the risk to sea turtles, standard sea turtle protection conditions will be implemented such as the use of a state-of-the-art rigid deflector draghead at all times, inflow screens, and/or monitoring of the operation.

5.3 WATER QUALITY

The USACE Contractor will prevent oil, fuel, or other hazardous substances from entering the air or water. This will be accomplished by design and procedural controls. All wastes and refuse generated by project construction would be removed and properly disposed. The USACE contractor will implement a spill contingency plan for hazardous, toxic, or petroleum material for the borrow area. Compliance with U.S. EPA Vessel General Permits would be ensured, as applicable. The USACE will secure a Section 401 Water Quality Certification prior to construction.

5.4 CULTURAL RESOURCES

Archaeological area L-2 discovered during cultural resources surveys will be avoided during dredging operations by a 200-m buffer. A dredge with GPS-positioning equipment would be implemented. An unexpected finds clause would be implemented. Coordination will continue with SHPO and the Seminole Tribe of Florida's Tribal Historic Preservation Office (STOF-THPO).

5.5 OFFSHORE CHANCE FINDS CLAUSE

In the event that the dredge operators discover any archaeological resource while conducting dredging operations in Borrow Area L, dredge operations will be halted immediately within the borrow area. The discovery would then be reported to the BOEMRE Leasing Division. If investigations determine that the resource is significant, both agencies would determine how best to protect it.

5.6 DREDGE AND BORROW AREA MONITORING REQUIREMENTS

Electronic positioning information, production, and volume data would be collected. Pre- and post-dredging hydrographic surveys will be conducted to monitor physical changes in the borrow area. The dredge would be equipped with an on-board global positioning system capable of maintaining or recording the location of the dredge, dragarms, and/or cutterhead.

6.0 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

6.1 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

Environmental information on the project has been compiled, and this Environmental Assessment has been prepared. The project is in compliance with the National Environmental Policy Act (NEPA).

6.2 ENDANGERED SPECIES ACT OF 1973

This project was fully coordinated under the Endangered Species Act and is in full compliance with the Act. Consultation was initiated with the USFWS and NMFS on March 10, 2010. Additionally, the USACE prepared and submitted to the USFWS a Biological Assessment (BA) for species under the USFWS jurisdiction to initiate consultation under the Act. The BA specified the use of a clamshell dredge for sand extraction. The proposed project would more likely require a hopper dredge and this correction had been coordinated with USFWS. The USFWS issued a biological opinion on December 3, 2010, which is included in Appendix E.

The USACE received an email from NMFS-PRD on April 22, 2010 concurring that should the USACE use a hopper dredge for the new borrow site, the project would be covered by the NMFS November 19, 2003 Regional Biological Opinion (GMRBO) and following revisions to the GMRBO (Appendix B). The GMRBO analyzes and accounts for the effects of *federally permitted or federally sponsored hopper dredging of all U.S. Gulf of Mexico sand mining areas for beach (borrow sites) and virgin (previously unused) sand mining areas for beach renourishment, restoration, and protection projects,* on listed species. Thus, any effects to sea turtles or Gulf sturgeon from the proposed project have been analyzed in the GMRBO, are included in that opinion's incidental take statement, and are subject to the terms and conditions of that opinion. If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action, consultation will need to be reinitiated.

6.3 FISH AND WILDLIFE COORDINATION ACT OF 1958

This project has been coordinated with the U.S. Fish and Wildlife Service (USFWS) in accordance with the Fish and Wildlife Coordination Act. The Final Fish and Wildlife Coordination Act Report (November 4, 1996) for the renourishment of Pinellas County Beaches adequately addresses the issues regarding the proposed project (USFWS 1996). No further coordination is necessary for compliance with this Act.

6.4 NATIONAL HISTORIC PRESERVATION ACT OF 1966 (INTER ALIA)

Archival research, channel surveys, and consultation with the Florida State Historic Preservation Officer (SHPO) have been conducted for the Sand Key dredging project. All of these activities have been completed in accordance with the National Historic Preservation Act, as amended; the

Archeological and Historic Preservation Act, as amended; and Executive Order 11593. The project is in full compliance with the NHPA as well as the AHPA and E.O. 11593. USACE received a letter from the Florida SHPO dated August 25, 2010 stating that no historic properties eligible for listing in the National Register will be affected by the proposed dredging. USACE also received a letter from the STOF-THPO on August 5, 2010 stating that the STOF-THPO has no objection to the findings at this time (reference THPO-006303). However, the STOF-THPO would like to be informed if cultural resources that are potentially ancestral or historically relevant to the Seminole Tribe of Florida are inadvertently discovered during the construction process.

6.5 CLEAN WATER ACT OF 1972

The project is in compliance with this Act.

Sec. 311: The USACE will complete a standard spill control plan for the borrow area prior to construction.

Sec. 401: The USACE secured a Section 401 Water Quality Certification for the beach renourishment portion of the project through ongoing coordination with the Florida Department of Environmental Protection. A new Section 401 Water Quality Certification is not needed because this project would only relocate the borrow area to OCS waters and a new Section 404 permit is not required.

Sec. 404: A Section 404(b)(1) evaluation was previously completed for the beach renourishment portion of the project and should still be valid. A new Section 404(b)(1) is not needed because this project would only relocate the borrow area to OCS waters and *incidental fallback* from the dredge is not regulated under Section 404. The dredging operation under this proposed borrow area change would not place fill in waters of the U.S.; *incidental fallback* does not constitute fill. Only excavation would occur with the borrow area change, no placement of fill.

6.6 CLEAN AIR ACT OF 1972

The project is in compliance with this Act.

Sec. 176: No permanent sources of air emissions are part of the Borrow Area L Alternative or the No Action Alternative. No air quality permits would be required for this project.

Sec. 309: The EA will be coordinated with the public and agencies.

6.7 COASTAL ZONE MANAGEMENT ACT OF 1972

Borrow Area L is located in Federal waters. A Federal consistency determination in accordance with 15 CFR 930 Subpart C was included with the previous FDEP permit regarding the pipeline corridors and beach impacts of the proposed action. A Federal consistency determination is included in this report as Appendix D for the use of the borrow area. The USACE has determined that no unacceptable impacts would occur as a result of the project and it would be consistent with the Florida Coastal Zone Management program. In accordance with the Memorandum of Understanding (1979) and the Addendum to the Memorandum (1983) concerning acquisition of Water Quality Certifications and other state authorizations, the preliminary SEA and Section 404 (b)(1) Evaluation have been submitted to the state in lieu of a summary of environmental impacts to show consistency with the Florida Coastal Zone Management Plan. In a letter dated October 20, 2010, the FDEP found the proposed use of the Federal waters/lands borrow area to be consistent with the Florida Coastal Zone Management Plan (Appendix E). Regarding the state waters/lands portion of the proposed Sand Key project, the FDEP, Bureau of Beaches and Coastal Systems is currently processing the Joint Coastal Permit application for the Sand Key Project. The final agency action on this required permit will serve as the State of Florida's Coastal Zone Management Act consistency decision for the state lands/water portion of the proposed project in accordance with Section 373.428, *Florida Statutes.*

6.8 FARMLAND PROTECTION POLICY ACT OF 1981

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

6.9 WILD AND SCENIC RIVER ACT OF 1968

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

6.10 MARINE MAMMAL PROTECTION ACT OF 1972

Marine mammals are not likely to be adversely affected by the project. Incorporation of safeguards to protect threatened and endangered species during project construction would also protect marine mammals in the area. The Borrow Area L Alternative is in compliance with the Act.

6.11 ESTUARY PROTECTION ACT OF 1968

No designated estuary would be affected by project activities.

6.12 FEDERAL WATER PROJECT RECREATION ACT

There is no cost-shared recreation proposed for this project.

6.13 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976, AS AMENDED

An assessment of the effects of the project on essential fish habitat is located in Section 4.0 and Appendix C concluded that the Borrow Area L Alternative would have minimal adverse impacts on essential fish habitat of the species managed under this Act, some of which would be temporary. The NMFS provided comments on the project in an email dated November 12, 2010, stating that they anticipated any adverse effects to be minimal and they did not object to this project. Therefore, the project is in compliance with this Act.

6.14 SUBMERGED LANDS ACT OF 1953

Borrow Area L is located in Federal waters. Beach nourishment on submerged lands of the State of Florida was coordinated with the state in the previous EA (USACE 2002) and the project is in compliance with the Act.

6.15 COASTAL BARRIER RESOURCES ACT AND COASTAL BARRIER IMPROVEMENT ACT OF 1990

There are no designated coastal barrier resources in the project area that would be affected by this project.

6.16 RIVERS AND HARBORS ACT OF 1899

The proposed work would not obstruct navigable waters of the United States. The Borrow Area L Alternative is in full compliance.

6.17 ANADROMOUS FISH CONSERVATION ACT

Anadromous fish species are not likely to be affected. The project has been coordinated with both NOAA Fisheries and the U.S. Fish and Wildlife Service, and it is in compliance with this Act.

6.18 MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT

Migratory birds would be minimally affected by borrow activities. Disposal activities (which are addressed in earlier NEPA documents) will include specific monitoring and mitigation efforts during construction with regard to migratory birds (see also Appendix A and Sections 3.5.3.2, 4.5.3, and 6.25 of this document). The project is in compliance with these Acts.

6.19 MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT

The term *dumping* as defined in the Act (3[33 U.S.C. 1402](f)) does not apply to the disposal of material for beach nourishment or to the placement of material for a purpose other than disposal (i.e., placement of rock material as an artificial reef or the construction of artificial reefs as mitigation). Therefore, the Marine Protection, Research and Sanctuaries Act does not apply to this project. The disposal activities addressed in this EA have been evaluated under Section 404 of the Clean Water Act.

6.20 E.O. 11990, PROTECTION OF WETLANDS

No wetlands would be affected by project activities. This project is in compliance with the goals of this Executive Order.

6.21 E.O. 11988, FLOOD PLAIN MANAGEMENT

No activities associated with the Borrow Area L Alternative would take place within a floodplain; therefore, this project is in compliance with the goals of this Executive Order.

6.22 E.O. 12898, ENVIRONMENTAL JUSTICE

The project would not result in adverse human health or environmental effects, nor would it affect subsistence consumption of
or wildlife. The project is in compliance.

6.23 E.O. 13089, CORAL REEF PROTECTION

The project may affect U.S. coral reef ecosystems as defined in this Executive Order. Precautions would be implemented during construction to minimize impacts. The project is in compliance.

6.24 E.O. 13112, INVASIVE SPECIES

The project would have no effect on invasive species. This E.O. is not applicable.

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

This Executive Order requires, among other things, a Memorandum of Understanding (MOU) between the Federal Agency and the U.S. Fish and Wildlife Service concerning migratory birds. The BOEMRE (then the MMS) entered into a MOU with the U.S. Fish and Wildlife Service on June 4, 2009. This document includes the obligations made by BOEMRE in their MOU to ensure the protection of migratory birds pursuant to this Executive Order. These measures are outlined in more detail in the MOU, but those applicable to this project are summarized below and include:

- Integrating migratory bird conservation principles, as well as reasonable and feasible conservation measures and management practices into MMS approvals, procedures and practices consistent with the Council on Environmental Quality's (CEQ) regulations, and Departmental and Bureau guidelines and procedures;
- Avoiding or minimizing, to the extent practicable, negative impacts on migratory bird resources by proposed actions, in compliance with and/or supporting the intent of the MBTA, EO 13186, the Bald and Golden Eagle Protection Act, ("BGEPA"), the ESA, NEPA, and other applicable statutes;
- Expanding the current MMS practice of including migratory birds in the scope of environmental reviews, with emphasis on species of concern;

- Incorporating data, analyses, results, and management implications of migratory bird inventory, monitoring, and research studies conducted by FWS into MMS environmental reviews of proposed activities, as appropriate; and
- Addressing, as appropriate, the potential introduction, establishment, and spread of non-native plants and animals as a result of resource development and energy production in the OCS.

No final MOU exists between the USACE and the USFWS pursuant to this Executive Order; however, there is an MOU between the Department of Defense and the USFWS, and there is a draft MOU between the USACE and the USFWS. Neither the Department of Defense MOU nor the USACE Draft MOU clearly address migratory birds on lands not owned or controlled by the USACE, as is the case with the project area. For many Corps civil works projects, the real estate interests are provided by the non-Federal sponsor. Control and ownership of the project lands remain with a non-Federal interest. The Corps will include our standard migratory bird protection requirements in the project plans and specifications and will require the contractor to abide by those requirements. Measures to avoid the destruction of migratory birds and their eggs or hatchlings and meet agency responsibilities under E.O. 13186 are described in Appendix A.

7.0 PUBLIC/AGENCY COORDINATION

7.1 SCOPING AND DRAFT EA

The draft EA and Finding of No Significant Impact (FONSI) were made available to the public by letter and publication on the USACE – SAJ Environmental Branch, Online Environmental Documents and Notices website on July 14, 2010 for a 60-day comment period. (http://www.saj.usace.army.mil/Divisions/Planning/Branches/Environmental/DOCS/OnLine/Pinellas/BeachErosion/Sand_Key_Draft_EA.pdf)

The EA has been coordinated with the following agencies: USFWS, NMFS, USEPA, Florida State Clearinghouse, Florida SHPO, Seminole Tribe of Florida Historic Preservation Officer, and the FDEP.

7.2 AGENCY COORDINATION

Consultation with the USFWS was initiated on July 14, 2010, under Section 7 of the ESA. The USACE prepared and submitted to the USFWS a BA for species under the USFWS jurisdiction to initiate consultation under the Act. The USFWS issued a biological opinion on December 3, 2010 based on their review of the BA that specified the use of a clamshell dredge for sand extraction. The proposed project would more likely require a hopper dredge and this correction had been coordinated with USFWS. The release of the draft version of this EA on July 14, 2010, served as coordination with NMFS for EFH under the Magnuson-Stevens Fishery Conservation and Management Act of 1976. Additional pertinent correspondence with Federal and state agencies are provided in Appendix E.

8.0 LIST OF PREPARERS

Name	Organization	Role in Preparation
Aubree Hershorin	USACE	Document Reviewer
Daniel Hughes	USACE	Document Preparation
Geoffrey Wikel	BOEMRE	Document Reviewer
Eddy Carter, P.E.	G.E.C., Inc.	Supervision/Management
Michael Loden, Ph.D.	G.E.C., Inc.	Document Preparation
Donna Rogers, Ph.D.	G.E.C., Inc.	Document Preparation
Mary Bourgoyne, E.I.	G.E.C., Inc.	Document Preparation
Quinton Daigre	G.E.C., Inc.	Document Preparation

9.0 REFERENCES

Ackerman, B.B. 1995. Aerial surveys of manatees: A summary and progress report. In O'Shea, T.J., Ackerman, B.B., and Percival, H.F. Population Biology of the Florida Manatee. 13-33 pp.

Beaches and Shores Resource Center. 2000 (rev.). Coastal construction control line review and reestablishment study for Pinellas County. Beaches and Shores Resource Center Institute of Science and Public Affairs, Florida State University, Tallahassee, Florida.

Blake, N.J., L.J. Doyle, and J.J. Culter. 1996. Impacts and direct effects of sand dredging for beach renourishment on the benthic organisms and geology of the West Florida Shelf, Final Report. OCS Report MMS 95-0005. U.S. Department of the Interior, Minerals Management Service, Office of International Activities and Marine Minerals, Herndon, VA. 109 pp.

Brooks, R.A., A.J. Quaid, and K.J. Sulak. 2003. Assessment of fish communities associated with offshore sand banks and shoals in the Northwestern Gulf of Mexico. U.S. Geological Survey Minerals Management Service. Cruise Sabine 2003-01.

Brooks, R.A., S.S. Bell, C.N. Purdy, and K.J. Sulak. 2004. The benthic community of offshore sand banks: a literature synopsis of the benthic fauna resources in potential MMS OCS sand mining areas. USGS Outer Continental Shelf Studies Ecosystem Program Report USGSSIR- 2004-5198 (CEC NEGOM Program Investigation Report No. 2004-01, February 2004); Minerals Management Service, OCS Study MMS-2004.

Bullock, L.H, Godcharles, M.F., and Crabtree, R.E. 1996. Reproduction of yellowedge grouper, *Epinephelus flavolimbatus*, from the eastern Gulf of Mexico. Bull. Mar. Sci. 59(1): 216-224.

Byrnes, M.R., S.W. Kelley, and J.S. Ramsey. 2003. Numerical modeling evaluation of the cumulative effects of offshore sand dredging for beach renourishment. Executive Summary. U.S. Department of the Interior, Minerals Management Service, International Activities and Marine Minerals Division (INTERMAR), Herndon, VA. OCS Report MMS 2001-098. 16 pp.

Byrnes, M.R., R.M. Hammer, T.D. Thibaut, and D.B. Snyder. 2004. Effects of sand mining on physical processes and biological communities offshore New Jersey, U.S.A. Journal of Coastal Research 20(1): 25-43.

Child, C.A. 1992. Shallow water Pycnogonida of the Gulf of Mexico. Mem. Hourglass Cruises 9(1): 86 pp.

Christensen, T.K., Clausager, I. & Petersen, I.K. 2003. Base-line investigations of birds in relation to an offshore wind farm at Horns Rev, and results from the year of construction. NERI Report.

Coastal Zone Resources, Inc. (CZR). 1991. Indian Shores Beach Nourishment Project side-scan mosaic and biological report. Prepared for Pinellas County Board of County Commissioners, Clearwater, FL.

Coastal Planning and Engineering (CP&E). 2007. Pinellas County-Sand Key Beach Renourishment Project FDEP Permit No. 52-2923209, Artificial Reef & Natural Hardbottom Biological Monitoring Report. Coastal Planning & Engineering, Inc., Boca Raton, FL (Prepared for Pinellas County). 31 pp.

Coastal Planning and Engineering (CP&E). 2009. Geophysical and geotechnical investigations to identify sand resources for beach nourishment on Sand Key, Pinellas County, Florida.

Committee on Beach Nourishment and Protection. 1995. Beach nourishment and protection. National Research Council, National Academy Press, Washington, D.C.

Continental Shelf Associates, Inc. 1987. Southwest Florida Shelf regional biological communities survey. A final report submitted to the U.S. Department of the Interior, Minerals Management Service, New Orleans, LA. Contract No. 14-12-0001-29036. 3 vol.

Cook, A.S.C.P. & Burton, N.H.K. 2010. A review of the potential impacts of marine aggregate extraction on seabirds. Marine Environment Protection Fund (MEPF) Project 09/P130.

Davis, R.W., and G.S. Fargion (eds.). 1996. Distribution and abundance of Cetaceans in the North-Central and Western Gulf of Mexico: Final Report. Volume II: Technical report. OCS Study MMS 96-0027. Prepared by the Texas Institute of Oceanography and the National Marine Fisheries Service. New Orleans, LA: USDOI/MMS, Gulf of Mexico OCS Region. 357 p.

Davis, R.A., P. Wang, and B.R. Silverman. 2000a. Comparison of the performance of three adjacent and differently constructed beach nourishment projects on the Gulf peninsula of Florida. Journal of Coastal Research 16(2): 396-407.

Davis, R.W., W.E. Evans, and B. Würsig (eds.). 2000b. Cetaceans, sea turtles and seabirds in the Northern Gulf of Mexico: Distribution, abundance and habitat associations. Volume II: Technical Report. Prepared by Texas A&M University at Galveston and the National Marine Fisheries Service. USDOI/USGS/BRD, USGS/BRD/CR-1999-005 and OCS Study MMS 2000-003. New Orleans, LA: USDOI/MMS, Gulf of Mexico OCS Region.

Dial Cordy and Associates, Inc. 2002a. Marine biological survey, Pinellas County Shore Protection Project, Comprehensive borrow area study. Prepared for U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL. 45 pp.

Dial Cordy and Associates, Inc. 2002b. Pinellas County Shore Protection Project, Comprehensive Borrow Area Study, Borrow Area Resource Identification and Impact Assessment. Prepared for the U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL. 30 pp.

Dial Cordy and Associates, Inc. 2002c. Nearshore marine biological survey and assessment, Pinellas County Shore Protection Project, Comprehensive borrow area survey. Prepared for the U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL. 30 pp.

Dial Cordy and Associates, Inc. 2003. Essential fish habitat assessment for the alternative sand source utilization, Pinellas County Shore Protection Project, Pinellas County, Florida. Prepared for the U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL. 25 pp.

Dial Cordy and Associates, Inc. 2006. Baseline nearshore hardbottom survey, Pinellas County Beach Erosion Control Project. Prepared for U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL. 32 pp.

Diaz, R.J., G.R. Cutter, Jr., and K.W. Able. 2003. The importance of physical and biogenic structure to juvenile fishes on the shallow inner continental shelf. Estuaries 26(1): 12-20.

Dibajnia, M. and R.B. Nairn. 2010. Draft investigation of dredging guidelines to maintain and protect the geomorphic integrity of offshore ridge and shoal regimes, U.S. Dept. of the Interior, Minerals Management Service, (In Press) OCS Region, (In Press). OCS Study 2010-(In Press). 150 pp. + appendices.

Dickerson, C., Reine, K.J., and Clarke, D.G. 2001. Characterization of underwater sounds produced by bucket dredging operations, DOER Technical Notes Collection (ERDC TN-DOER-E14), U.S. Army Engineer Research and Development Center, Vicksburg, MS. www.wes.army.mil/el/dots/doer.

Ehrlich, P.R., D.S. Dobkin, and D.Wheye. 1988. The birder's handbook. Simon and Schuster. New York, NY.

EMC Surveying and Mapping. 1998. Pinellas County Beach Erosion Control Project hardground survey Area "A" Through "I." Prepared for U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL. 25 pp.

Edwards, J.H., S.E. Harrison, S.D. Locker, A.C. Hine, D.C. Twichell. 2003. Stratigraphic framework of sediment-starved sand ridges on a mixed siliciclastic/carbonate inner shelf; west-central Florida. Marine Geology 200 (2003) 195-217.

Environmental Protection Agency (EPA). 1981. Marine sampling and measurement program off northern Pinellas County, Florida. A Technical Report, S. Mahadevan, ed. Vol. 1: 306 pp.

Essink, K. 1999. Ecological effects of dumping of dredged sediments; options for management. Journal of Coastal Conservation, 5, 69-80.

Featherstone, C., J.R. Proni, T.P. Carsey, *et al*. 2009. Spatial distribution of petroleum hydrocarbons in Blind Pass sediment cores. NOAA Report 2009.

Finkl, C.W., J.L. Andrews, and L. Benedet. 2006. Assessment of offshore sand resources for beach nourishment along the southwest coast of Florida. Tallahassee, Florida: Florida Shore and Beach Preservation Association, In: Proceedings of the 19th Annual National Conference on Beach Preservation Technology (Sarasota, Florida).

Finkl, C.W., L. Benedet, J.L. Andrews, B. Suthard, and S.D. Locker. 2007. Sediment ridges on the West Florida inner continental shelf: sand resources for beach nourishment. Journal of Coastal Research 23(1):143-159.

Fish and Wildlife Research Unit. 2010. Sea turtle nesting. Florida Fish and Wildlife Conservation Commission. http://research.myfwc.com/features/category_sub.asp?id=2309

Florida Department of Environmental Protection (FDEP). 2009. Critically eroded beaches in Florida. Bureau of Beaches and Coastal Systems, Division of Water Resource Management, Florida Department of Environmental Protection. 75 pp.

Garthe, S., Benvenuti S., and Montevecchi, W.A. 2000. Pursuit diving in northern gannets feeding on capelin. Proceedings of the Royal Society of London: Series B, 267**,** 1717-1722.

Garthe, S. and Hüppop, O. 1999. Effect of ship speed on seabird counts in areas supporting commercial fisheries. Journal of Field Ornithology, 70, 28-32.

Gaston, A. J. 2004. Seabirds a natural history. Helm, London.

Gelfenbaum, G., S. Locker, and G. Brooks. Sand source survey offshore Sand Key Pinellas County, Florida. Jacksonville District U.S. Army Corps of Engineers. U.S. Geological Survey Open File Report 94-565.

Greene, C.R.J. and S.E. Moore. 1995. Man-made noise. Pp 101-158 in Marine Mammals and Noise. W.J. Richardson, C.R.J. Greene, C.I. Malme and D.H. Thomson (ed.), Academic Press, San Deigo.

Grippo, M.A., Cooper, S., and Massey, G.M. 2007. Effect of beach renourishment projects on waterbird and shorebird communities. Journal of Coastal Research, 23(5), 1088-1096. West Palm Beach (Florida), ISSN 0749-0208.

Gulf of Mexico Fishery Management Council (GMFMC). 1998. Generic amendment for addressing essential fish habitat requirements of the Gulf of Mexico. Available from GMFMC 3018 U.S. Highway 301 North, Suite 1000. Tampa, FL 33619-2266. 237 pp.

Hammer, R.M., B.J. Balcom, M.J. Cruickshank, and C.L. Morgan. 1993. Synthesis and analysis of existing information regarding environmental effects of marine mining. Continental Shelf Associates, Inc., Prepared for U.S. Department of the Interior, Minerals Management Service. OCS Study MMS 93-0005.

Harrison, S.E., S.D. Locker, A.C. Hine, J.H. Edwards, D.F. Naar, D.C. Twitchell, and D.J. Mallinson. 2003. Sediment-starved sand ridges on a mixed carbonate/siliciclastic inner shelf of west-central Florida. Marine Geology 200(2203): 171-194.

Hartog, W.M., L. Benedett, D.R. Walstra, M. Van Koningsveld, M.J. Stive, and C.W. Finkl. 2008. Mechanisms that influence the performance of beach nourishment a case study in Delray Beach, Florida, U.S.A. Journal of Coastal Research, September 1, 2008.

Hayes, M.O. and R.B. Nairn. 2004. Natural maintenance of sand ridges and linear shoals on the U.S. Gulf and Atlantic continental shelves and potential impacts of dredging. Journal of Coastal Research 20(1): 138-148.

Herron Baird, P. 1990. Concentrations of seabirds at oil-drilling rigs. Condor, 92, 768-771.

Hersh, S.L., and D.A. Duffield. 1990. Distinction between Northwest Atlantic offshore and coastal bottlenose dolphins based on hemoglobin profile and morphometry. *In:* The Bottlenose Dolphin. S. Leatherwood and R.R. Reeves (eds.). San Diego, CA: Academic Press. p. 129-139.

Hildebrand, J. 2004. Sources of anthropogenic sound in the marine environment. In E. Vos and R.R. Reeves (eds.) Report of an International Workshop: Policy on Sound and Marine Mammals, 28–30 September 2004, London, England 23 December 2005. U.S. Marine Mammal Commission, London, England.

Hine, A.C., G.R. Brooks, R.A. Davis, Jr., L.J. Doyle, G. Gelfenbaum, S.D. Locker, D.C. Twitchell, and R. H. Weisberg. 2001. A summary of findings of the west-central Florida coastal studies project. USGS Open File Report 01-303. December 10, 2001. 41 pp.

Hine, A.C., G.R. Brooks, R.A. Davis, Jr., D.S. Duncan, S.D. Locker, D.C. Twitchell, and G. Gelfenbaum. 2003. The west-central Florida inner shelf and coastal system: a geologic conceptual overview and introduction to the special issue. Marine Geology 200 (2003): 1-17.

Houde, E.D., and N. Chitty. 1976. Seasonal abundance and distribution of zooplankton, fish eggs, and fish larvae in the eastern Gulf of Mexico, 1972-74. NOAA Technical Report NMFS SSRF-701.

Jefferson, T.A., and A.J. Schiro. 1997. Distributions of Cetaceans in the offshore Gulf of Mexico. Mammal Rev. 27(1): 27-50.

Jefferson, T.A., S. Leatherwood, L.K.M. Shoda, and R.I. Pitman. 1992. Marine mammals of the Gulf of Mexico: A field guide for aerial and shipboard observers. College Station, TX: Texas A&M University Printing Center. 92 p.

Jefferson, T.A., S. Leatherwood, and M.A. Webber. 1993. FAO species identification guide: marine mammals of the world. Rome: Food and Agriculture Organization.

Jochens, A.E., L.C. Bender, S.F. DiMarco, J.W. Morse, M.C. Kennicutt II, M.K. Howard, and W.D. Nowlin, Jr. 2005. Understanding the processes that maintain the oxygen levels in the deep Gulf of Mexico: Synthesis Report. OCS Study MMS 2005-032. New Orleans, LA: USDOI/MMS, Gulf of Mexico OCS Region. 7-50.

Joyce, J.C. (1982). Protecting sea turtles. The Military Engineer, July-August, No. 481, pp. 282-5.

Laist, D.W., A.R. Knowlton, J.G. Mead, *et al*. 2001. Collisions between ships and whales, Marine Mammal Science, 17(1): 35–75

Leatherwood, S., and R.R. Reeves. 1983. The Sierra Club handbook of whales and dolphins. San Francisco, CA: Sierra Club Books. 302 p.

Lincoln, F.C., S.R. Peterson, and J.L. Zimmerman. 1998. Migration of birds. U.S. Dept. of Interior, U.S. Fish and Wildlife Service, Washington D.C. Circular 16, Jamestown, ND: Northern Prairie wildlife research center Home Page.
http://www.npwrc.usgs.gov/resource/othrdata/migratio.htm(Version 02APR2002)

Liu, Y., R.H. Weisberg, and R. He (2006), Sea surface temperature patterns on the West Florida Shelf using growing hierarchical self-organizing maps, J. Atmos. Oceanic Technol., 23(2), 325– 338.

Lundquist C.J., S.F. Thrush, G. Coco, J.E. Hewitt. 2010. Interactions between disturbance and dispersal reduce persistence thresholds in a benthic community. Marine Ecology Progress Series 413: 217–228.

Lyons, W.G. and Collard, S.B. 1974. Benthic invertebrate communities of the Eastern Gulf of Mexico. In R.E. Smith, ed. Proceedings of marine environmental implications of offshore drilling in the eastern Gulf of Mexico. State Univ. Syst. Fla. Inst. Oceanogr., St. Petersburg, FL. 157-166 pp.

Mead, J.G., and C.W. Potter. 1990. Natural history of bottlenose dolphins along the central Atlantic coast of the United States. *In:* The Bottlenose Dolphin. S. Leatherwood and R.R. Reeves (eds.). San Diego, CA: Academic Press. p. 165-195.

Meylan, A., Redlow, A., Mosier, A., Moody, K., and Foley, A. 1998. Occurrence and distribution of sea turtles in Tampa Bay, Florida. Chapter 13. Pp. 13-1-13-15 in J.R. Pribble, A. J. Janicki, and H. Greening (eds.). Baywide Environmental Monitoring Report, 1993-1998, Tampa Bay, Florida. Tampa Bay Estuary Program, Technical Publication 07-99. St. Petersburg, Florida.

Minerals Management Service. 2007. Gulf of Mexico OCS Oil and Gas Lease Sale 224 Eastern Planning Area Sale Draft Supplemental Environmental Impact Statement Report OCS EIS/EA 2007-036, U.S. Department of the Interior Mineral Management Service Gulf of Mexico OCS Region, New Orleans, LA.

Minerals Management Service. 2007. Outer Continental Shelf Oil & Gas Leasing Program: 2007-2012 Final Environmental Impact Statement Volume 1 2007-003. U.S. Department of the Interior Mineral Management Service Gulf of Mexico OCS Region, New Orleans, Louisiana.

National Marine Fisheries Service (NMFS). 2003 (Rev. 2005, 2007). Gulf Regional Biological Opinion (GMRBO) on 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). National Oceanic and Atmospheric Administration (NOAA), NMFS, Southeast Regional Office, Protected Resources. Issued November 19, 2003; Revision No. 1 June 24, 2005; Revision No. 2, January 9, 2007.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1992. Recovery Plan for the Kemp’s Ridley Sea Turtle. National Marine Fisheries Service, Washington, D.C. pp. 40.

NOAA Fisheries. 2010. Gulf sturgeon *(Acipenser oxyrinchus desotoi)*. NOAA Fisheries Office of Protected Resources http://www.nmfs.noaa.gov/pr/species/fish/gulfsturgeon.htm.

Newell, R.C., L.J. Seiderer, D.R. Hitchcock. 1998. The impact of dredging works in coastal waters: A review of the sensitivity to disturbance and subsequent recovery of biological resources on the sea bed. Oceanography and Marine Biology: an Annual Review 1998, 36, 127-78.

Ocean Studies Board. 2005. Marine mammal populations and ocean noise, determining when noise causes biologically significant effects. National Research Council of the National Academies. The National Academies Press, Washington, DC. 125 pp.

O’Shea, T.J., B.B. Ackerman, and H.F. Percival eds.. 1995. Population biology of the Florida Manatee. National Biological Service, Information and Technology Report 1.

Palmer, T.A., P.A. Montagna, and R.B. Nairn. 2008. The effects of a dredged excavation pit on benthic macrofauna in offshore Louisiana. *Environmental Management* 41: 573-583.

Perrin, W.F., D.K. Caldwell, and M.C. Caldwell. 1994a. Atlantic spotted dolphin. *In:* Handbook of Marine Mammals. Vol. 5: The First Book of Dolphins. S.H. Ridgway and R. Harrison (eds.). London: Academic Press. p. 173-190.

Perrin, W.F., E.D. Mitchell, J.G. Mead, D.K. Caldwell, M.C. Caldwell, P.J.H. van Bree, and W.H. Dawbin. 1987. Revision of the spotted dolphins, *Stenella spp*. Mar. Mamm. Sci. 3(2): 99-170.

Phillips, R.C. and Springer, V.G. 1960. Observations on the offshore benthic flora in the Gulf of Mexico off Pinellas County, Florida. The Amer. Midland Nat. 64(2): 362-381.

Pierce, D.J., Wallin, J.E., and Mahmoudi, B. 1998. Spatial and temporal variations in the species composition of bycatch collected during a striped mullet (*Mugil cephalus*) survey. Gulf of Mexico Science 1998(1): 15-27 pp.

Poulakis, G.R. and J.C. Seitz. 2004. Recent occurrence of the smalltooth sawfish, *Pristis pectinata* (Elasmobranchiomorphi: Pristidae), in Florida Bay and the Florida Keys, with comments on sawfish ecology. Florida Scientist 67: 27–35.

Powell, J.A., and G.B. Rathbun. 1984. Distribution and abundance of manatees along the Northern coast of the Gulf of Mexico. Northeast Gulf Sci. 7: 1-28.

Rathbun, G.B., J.P. Reid, and G. Carowan. 1990. Distribution and movement patterns of manatees (*Trichechus manatus*) in Northwestern Peninsular Florida. FL Mar. Res. Publ. No. 48, 33 p.

Research Planning, Inc., Tidewater Atlantic Research, Inc., and W.F. Baird & Associates Ltd. 2004. Archaeological damage from offshore dredging: recommendations for pre-operational surveys and mitigation during dredging to avoid adverse impacts. Prepared for Leasing Division, Sand and Gravel Unit Minerals Management Service, U.S. Department of Interior, Herndon, Virginia.

Ribic, C.A.R. Davis, N. Hess, and D. Peak. 1997. Distribution of seabirds on the northern Gulf of Mexico in relation to mesoscale features: initial observations. ICES Journal of Marine Science 54: 545-551.

Richardson, W.J., B. Wursig, and C.R. Greene, Jr. 1987. Reactions of bowhead whales to drilling and dredging noise in the Canadian Beaufort Sea. J. Acoust. Soc. Am. 82, S98.

Rudloe, J. 1981. From the jaws of death. Sports Illustrated, 54:13, pp. 60-70.

Russell, R.W. 2005. Interactions between migrating birds and offshore oil and gas platforms in the Northern Gulf of Mexico: Final Report. U.S. Department of Interior. Minerals Management Service. Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2005-009. 348 pp.

Sea Systems Corporation. 2001. Pinellas County Sand Key segment, side scan sonar hardbottom mapping survey, St. Petersburg Beach, Florida, Survey Number 01-149. Sea Systems Corporation, August 2001.

Sea Systems Corporation. 2002. Pinellas County Treasure Island and Long Key segment side scan sonar hardbottom mapping and survey St. Petersburg, Florida. Survey No.01-247. Prepared for U.S. Army Corps of Engineers, Jacksonville District.

Skov, H. & Durinck, J. 2001. Seabird attraction to fishing vessels is a local process. Marine Ecology Progress Series, 214, 289-298.

Slacum, H.W., W.H. Burton, E.T. Methratta *et al.* 2010. Assemblage structure in shoal and flat-bottom habitats on the inner continental shelf of the Middle Atlantic Bight, USA. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 2:277-298.

South Atlantic Fishery Management Council (SAFMC). 1998. Final Habitat Plan for the South Atlantic Region: Essential Fish Habitat Requirements for Fishery Management Plans of the South Atlantic Fishery Management Council: The Shrimp Fishery Management Plan, The Red Drum Fishery Management Plan, The Snapper Grouper Fishery Management Plan, The Coastal Migratory Pelagics Fishery Management Plan, The Golden Crab Fishery Management Plan, The Spiny Lobster Fishery Management Plan, The Coral, Coral Reefs, and Live/Hard Bottom Habitat Fishery Management Plan, The Sargassum Habitat Fishery Management Plan, and the Calico Scallop Fishery Management Plan. SAFMC. Charleston, SC, 457 pp.

Stucker, J.H. and F.J. Cuthbert. 2004. Piping plover breeding biology and management in the Great Lakes, 2004. A report submitted to East Lansing Field Office of the U.S. Fish and Wildlife Service, East Lansing, MI, and the Natural Heritage and Endangered Species Programs, Michigan Department of Natural Resources, Lansing, MI. 30 pp.

Tasker, M. L., Hope-Jones, P., Dixon, T. & Wallis, A. W. 1986. Seabirds associated with oil production platforms in the North Sea. Ringing and Migration, 7, 7-14.

Thaxter, C.B., Wanless, S., Daunt, F., Harris, M.P., Benvenuti, S., Watanuki, Y., Gremillet, D. & Hamer, K. C. 2010. Influence of wing loading on the trade-off between pursuit-diving and flight in Common Guillemots and Razorbills. Journal of Experimental Biology, 213, 1018-1025.

USACE. 1984 (Revised December 1984). Beach Erosion Control Project Review Study and Environmental Impact Statement for Pinellas County, Florida. U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL.

USACE. 1994 (Revised August 1994). Limited Re-evaluation Report and Environmental Summary for Pinellas County, Florida Beach Erosion Control Project. U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL.

USACE. 1995. Feature Design Memorandum Northern Treasure Island Pinellas County, Florida Beach Erosion Control Project. U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL.

USACE. 1996. (Revised March 1997. 1st Renourishment Sand Key Segment Design Memorandum with Environmental Assessment Pinellas County, Florida Beach Erosion Control Project. U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL.

USACE. 2002. Final Environmental Assessment: Alternative Sand Source Utilization for the Pinellas County Beach Erosion Control Project. U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL.

USACE. 2010. Compatibility Analysis. Sand Key beaches and off-shore Borrow Area L. U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL. 3 pp.

U.S. Fish and Wildlife Service and Gulf States Marine Fisheries Commission. 1995. Gulf Sturgeon Recovery Plan. Atlanta, Georgia. 170 pp.

U.S. Fish and Wildlife Service. 1996. Pinellas County Beach Nourishment Project, Final Fish and Wildlife Coordination Act Report. South Florida Ecosystem Office, U.S. Fish and Wildlife Service, Vero Beach, Florida. June 1996.

U.S. Fish and Wildlife Service. 2004. North Florida Field Office Sea Turtle Quickfacts. http://www.fws.gov/northflorida/SeaTurtles%20Factsheets/loggerhead-sea-turtle.htm.

U.S. Fish and Wildlife Service. 2007. West Indian Manatee (*Trichechus manatus*) 5-Year Review: Summary and Evaluation. Prepared by the U.S. Fish and Wildlife Service Southeast Region, Jacksonville Ecological Services Office.

Vasslides, J.M. and K.W. Able. 2008. Importance of shoreface sand ridges as habitat for fishes off the northeast coast of the United States. Fishery Bulletin 106:93-107.

Virginia Institute of Marine Science, 2000. Environmental survey of potential sand resource sites offshore Delaware and Maryland. Final Report to the U.S. Department of the Interior, Minerals Management Service, International Activities and Marine Minerals Division, Herndon, VA. Contract No. 1435-01-97-CT-30853.

Wang, P., Kling, J.A., and Davis, R.A., Jr., 1996. Regional wave analysis at Egmont Ebb-Tidal Shoal and surrounding areas using RCPWAVE. Technical Report, Coastal Research Laboratory, Department of Geology, University of South Florida, Tampa, FL.

Watts, Gordon P., 2010. Sand Key submerged cultural resources survey, offshore Sand Key, Pinellas County, Florida. Ms on file at the USACE Jacksonville District.

Wells, R.S. and M.D. Scott. 1999. Bottlenose Dolphin–*Tursiops truncatus* (Montagu, 1821). *In:* Handbook of Marine Mammals. Vol. 6: Second Book of Dolphins. S.H. Ridgway and R. Harrison (eds.). San Diego, CA: Academic Press. p. 137-182.

Würsig, B., T.A. Jefferson, and D.J. Schmidly. 2000. The marine mammals of the Gulf of Mexico. College Station, TX: Texas A&M University Press. 232 p.

Yang, H and R.H. Weisberg (1999). Response of the West Florida continental shelf circulation to climatological wind forcing, J. Geophys. Res., 104, 5301-5320.

Zarillo, G.A., J.A. Reidenauer, K.A. Zarillo, *et al*. 2008. Biological characterization/numerical wave model analysis within borrow sites offshore West Florida Coast Final Report. Offshore Sand and Gravel Program and Alternative Energy Branch, Herndon, VA. OCS Study, MMS 20008-005, Volume I: Main Text 224 pp., Volume II: Appendices, 300 pp.

10.0 INDEX

P

R

S

T

U

V

W

Appendix A

SUPPLEMENTAL INFORMATION FOR BEACH RENOURISHMENT

Appendix A

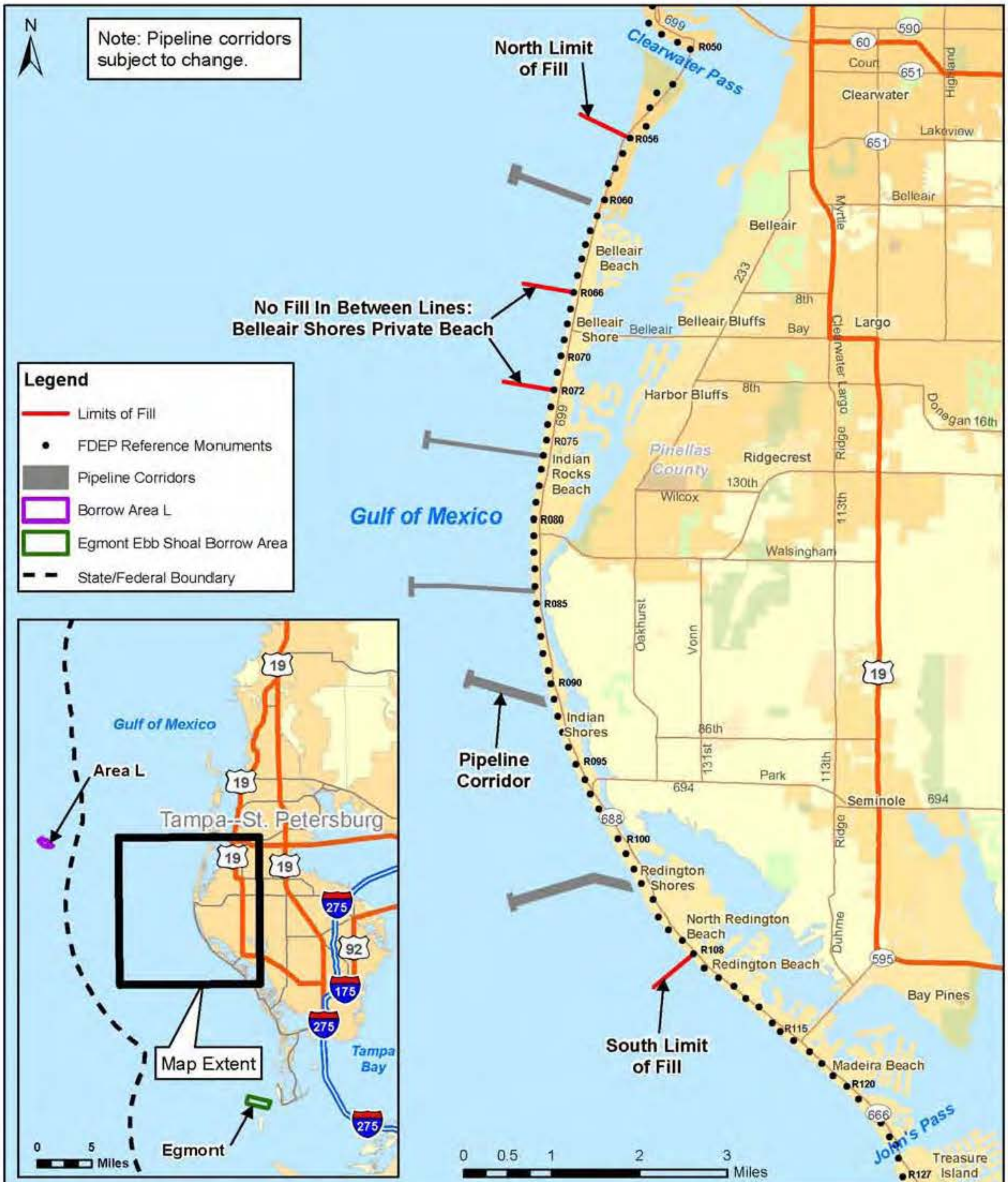
SUPPLEMENTAL INFORMATION FOR BEACH RENOURISHMENT

A1.0 PIPELINE CORRIDORS

The limits of fill and proposed pipeline corridors for the beach renourishment are shown in Figure A-1. A sidescan sonar mosaic of Borrow Area L from CP&E (2009) is presented in Appendix A, Figure 12.

A2.0 COMPARISON OF EFFECTS IN PREVIOUS DOCUMENTS

A comparison of impacts on resources reported from previous environmental documents and the current EA for the Sand Key Beach Renourishment is presented in Table A-1.



LIMITS OF FILL AND PIPELINE CORRIDORS

Sand Key Renourishment Project

Base Map: ESRI 9.3 Data CD

Figure: A-1	
Date: February 2010	
Scale: 1:96,000	
Source: USACE/GEC/ESRI	
Map ID: 27307714-1944	

Table A-1. Comparison of Impacts Reported From Previous Environmental Documents and the Current EA for the Sand Key Beach Renourishment

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
BEACHES	Selected plan would restore the eroded beaches where needed and maintain the restored and/or existing beaches at an acceptable cost (4.03).	Restore some of beach's ability to provide protection against storms and flooding (5.1).	Placement of sand would restore some of the beach's ability to provide storm protection (4.1).	Not evaluated.	
COASTAL ENVIRONMENT	Two offshore shoals would be dredged no deeper than the surrounding contours; therefore, an adverse effect on water quality that may occur when a pit is formed and a loss of area-type habitat is not expected to be severe or last long enough to be significant (4.07.03).	Wave analysis conducted to determine effects of removing sand from the Egmont Channel Shoal Borrow Area showed that the erosion on the northern part of Egmont Key is not caused by dredging the borrow area and dredging the borrow area would not cause erosion to Egmont Key in the future (3.1).	No changes in wind, tides or waves are expected from the renourishment or dredging.	Dredging would alter the bathymetry of the borrow area. Dredging is unlikely to affect wave heights at the shore due to its distance from the shore. Dredging would be unlikely to affect sediment transport along the shoreline, except possibly under extreme storm conditions. However, it may affect sand transport within the sand ridge from which it is dredged (4.1).	Electronic positioning information, production, and volume data would be collected. Pre- and post-dredging hydrographic surveys will be conducted to monitor physical changes in the borrow area. The dredge would be equipped with an on-board global positioning system capable of maintaining or recording the location of the dredge (5.0).
SAND RESOURCES	Not evaluated.	Sand is the depletable resource. Using sand from the borrow area will deplete the sand source at that site. Eventually sand will	The use of sand from the proposed borrow area will deplete the area of sand (4.14).	The use of sand from the borrow area will likely deplete the area of sand (4.2).	

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
		return to offshore areas and be redistributed over nearshore areas. It is unlikely that the redistributed sand will return to where it was removed from, resulting in a depletion of resources in the borrow area (5.10).			
SEDIMENT CHARACTER-ISTICS	Blind Pass shoal has a very low silt-clay fration and is predominantly sand and shell. Both of the selected shoals are expected to have a similar composition. Further analysis of these shoals should be performed prior to beginning dredging (3.06).	Mean grain size of sand and percent visual shell content of sand at the Egmont Channel Shoal Borrow Area is comparable to that recorded for Sand Key in 1980 (3.1).	With preferred alternative, native sediment characteristics will be maintained with only minor variations in shell content and color (2.2).	The compatibility analysis concluded that the material from the beach consists of poorly graded, fine-grained quartz sand with a mean grain size of 0.20 mm, an average carbonate content of 22 percent, and an average silt content of 1.3 percent. The material from the borrow area consists of poorly-graded, fine-grained quartz sand with a mean grain size of 0.18 mm, an average carbonate content of 24 percent, and an average silt content of 3.01 percent. The Munsell colors of the dredging material have the same Munsell Value as the color of the beach. The	

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
				overfill ratio for the project was determined to be 1.32 and the nourishment factor was 1.28 (3.3).	
VEGETATION	Not evaluated.	No adverse impacts to marine or terrestrial vegetation expected on the beach or in the borrow area (5.2).	Not evaluated.	Not evaluated.	
BIRDS	Not evaluated.	Shorebirds that rest or forage on the beach may avoid the construction site. Impact limited to area of construction. Elevated turbidity may interfere with sight feeder foraging. However, this would be limited to a small area, not significant (5.2).	Not evaluated.		As is standard with all USACE upland disposal operations, monitoring will be conducted for migratory bird usage of the disposal area. If disposal activities take place from April 1 to August 31, the contractor shall be required to hire a qualified observer to conduct daily monitoring of the disposal area for any signs of nesting by migratory birds. Any nesting activity observed by the contractor shall be reported immediately to the Contracting Officer, who has sole authority for work stoppages, creation of a 200-ft buffer area, or restart of construction activities. If nesting should begin within the construction area, a temporary 200-ft buffer shall be created around the nests and marked to avoid entry with signs provided by the Contracting Officer. The area shall be left undisturbed until

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
					nesting is completed or terminated and the chicks fledge. The decision to allow construction in a former nesting site will be determined by the Contracting Officer in consultation with USACE environmental, USFWS and FFWCC staff. The Contractor is authorized to modify areas that are potentially suitable for nesting to discourage nesting. Modification methods include placement of stakes at 10 to 15 ft intervals and tie flagging between the stakes in a web fashion. Additionally, the disposal area can be flooded prior to the beginning of nesting season to the elevation required for displacement from the disposal of dredged material in order to make the basin undesirable for bird nesting.
WILDLIFE - MARINE MAMMALS				Impacts could include entrainment of organisms during dredge operation; vessel strike; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; and changes to soft bottom bathymetry in the borrow area during dredging. (4.5.1).	Incorporation of safeguards to protect threatened and endangered species during project construction would also protect marine mammals in the area.

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
NVERTEBRATES-BENTHIC RESOURCES	Not evaluated.	Temporary impacts to macrofaunal community. Some organisms buried and lost, others will relocate. Amphipods, isopods and polychaetes have high fecundity and rapid turnover rates and can replace within a short time. Egmont shoal not assumed to support significant benthic population due to changing conditions (5.2).	Temporary impacts to infaunal communities within the offshore borrow area and beach fill area (2.2). Some organisms may be buried and lost, but many organisms would burrow up and survive. Expected to recolonize within days of the end of dredging. Very little fine material is present within the borrow area. Re-establishment within one or two years following dredging (4.4).	Dredging Borrow Area L would have direct and indirect effects on benthic infauna. Direct effects of dredging on benthic infauna include the actual removal of the infaunal organisms in the immediate area, changes in grain size, bathymetry, and shear stress that may alter the community. Indirect effects include changes in sediment grain size and organic content, and sediment resuspension, which can bury nearby organisms or interfere with feeding (4.5).	
INVERTEBRATES -HARDGROUNDS	Not evaluated.	Impacts to scattered hardground on previously unnourished beaches when project reaches equilibrium. Corrected estimates of hardgrounds within the toe of equilibrium approx. 7.9 acres (includes 7.8 acres for areas that had been previously constructed and 0.1 acres for new	No impacts to hardbottom resources within the borrow area are anticipated (2.2).	Hardbottom impacts are not anticipated within the borrow area. Exclusionary buffers (400 feet) have been established around documented hardbottom features within the proposed borrow area to eliminate any direct or indirect impacts to these features from dredging activities (4.5).	Dredging will not occur within a minimum of 400 feet from any significant hard-ground areas. Compensatory mitigation was provided previously to offset direct burial and beach construction equilibrium toe of fill (ETOF) impacts to hardbottom habitat associated with the beach placement activities. Pre-placement surveys would be conducted at the pipeline corridors and divers will assist with the placement of the pipes to minimize hardbottom impacts. Physical monitoring of the construction

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
		construction at Indian Rocks Beach) (5.2). No impacts to nearshore hardbottom communities expected in the borrow area (5.2)			profile and the pipeline corridors would be conducted. The construction would be monitored to ensure that the project stays within the design template. Therefore, there will be no additional impacts to nearshore hardbottom. Whenever possible, pipelines would be placed within the pipeline corridors to minimize impacts to hardbottom. Pipelines would be monitored for leaks.
THREATENED AND ENDANGERED SPECIES	Selected plan would restore potential sea turtle nesting beach (Table 2-2). Coordination with the NMFS revealed no significant concerns (4.02). Coordination with the USFWS resulted in an agreement on a set of protective measures that would be used to protect manatees and sea turtles (Summary; 4.02). Potential for causing injuries	Beach nourishment has potential to impact sea turtles due to: scarp development hindering or blocking nesting habitat; adverse alteration of moisture or temperature in beach due to modified nesting material; compaction and cementation of beach sediments reducing nesting success; potential for nest destruction if carried out during nesting season and nests not identified and relocated; diminished nesting activities could lead to poor	No impacts to threatened and endangered species are expected as most of the construction activities are scheduled outside of the sea turtle nesting season. Additional beach will increase sea turtle nesting habitat and enhance the potential nesting and foraging areas of shorebirds (2.2). Potential to impact sea turtles by hopper dredging, changes in beach characteristics following renourishment; scarp development, moisture levels, compaction may alter nesting success. No impact on manatees. Gulf sturgeon may be	The dredging may affect, but is not likely to adversely affect sea turtles. The dredging may impact sea turtles due to entrainment, benthic foraging and resting habitat disturbance, noise disruption, and injury from vessel and dredges. The dredging will have no effect on the Florida manatee. The dredging may affect, but is not likely to adversely affect, the Gulf sturgeon (4.4).	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. These buffers and any other turtle safety precautions would be maintained to comply with the NMFS Gulf Regional Biological Opinion (GRBO) (November 19, 2003; Revision No 1. June 24, 2005; Revision No. 2. January 9, 2007. Additional documents that affect the proposed project and would be complied with include the NMFS Biological Opinion (October 1, 1996) and the USFWS Final CAR (November 4, 1996). If a hopper dredge is used for the dredging operations, potential impacts to sea turtles could occur. To minimize the risk to sea turtles, standard sea turtle protection conditions will be

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
	to manatees during vessel movement and fill material discharge activities (4.02.01). Dredging portion is unlikely to endanger sea turtles since this work would occur in the open sea or in fast-water passes. Periodic filling, if performed from April to September could cover nests and interfere with or prevent hatching (4.02.02).	nest selection and diminished egg production; disorientation or misorientation of hatchlings. Unlikely that draghead would come into direct contact with a sea turtle. No action would result in loss of sea turtle nesting habitat and/or poor site selection (5.2).	affected-direct impacts unlikely, indirect impacts may occur sturgeon may move away, short term and temporary (4.3).		implemented such as deflector dragheads, inflow screens, and/or monitoring of the operation. *Sea Turtle and Smalltooth Sawfish Construction Conditions* would be implemented.
FISH AND ESSENTIAL FISH HABITAT	Temporary disruption of aquatic ecosystem during construction and future renourishment (Table 11).	Minor impact to organisms inhabiting the disposal site zone. Motile organisms (fish, crabs and sand dwelling organisms) should be able to escape dredging area. Relatively nonmotile infaunal invertebrates expected to recolonize. Erosion would impact beach and nearshore	Temporary impacts include displacement of fishes from nearshore areas during dredging and fill placement, temporary reduction of water quality due to turbidity, and decreased primary productivity until the completion of nourishment (2.2), sediments settling on adjacent habitats. Loss of benthic infauna. May	Dredging would affect non-vegetated bottoms, live bottoms, and water columns within the study area designated as EFH. The proposed dredging would likely have minimal adverse impacts on EFH, some of which would be temporary. Some of the possible short-term effects include entrainment of	Dredging will not occur within a minimum of 400 feet from any significant hard-ground areas. Physical monitoring of the construction profile and the pipeline corridors would be conducted. The construction would be monitored to ensure that the project stays within the design template. Therefore, there will be no additional impacts to nearshore hardbottoms.

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
		infauna under no action (5.2.4.1).	alter paths of migratory fishes and baitfish. Impacts to larval fishes in water column due to entrainment in dredge. However, many species have very high reproductive capacity (4.4).	organisms during dredge operation; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; and changes to the soft bottom bathymetry in the borrow area during dredging. Long-term impacts can include reduction of food supply due, mortality of eggs and larvae, and changes in habitat (4.6).	
WATER QUALITY	Short-term increase in turbidity at borrow site and along project shoreline. Short-term turbidity at breakwater construction site (Table 2-2). Temporary turbidity and low oxygen conditions would occur at the dredging and fill sites; however, no significant adverse effects on water quality are expected	Temporary increase in turbidity levels along the disposal site. Project located within Pinellas County Aquatic Preserve, an Outstanding Florida Water (OFW) where turbidity levels generated by work cannot exceed ambient levels. Not possible and requested a variance from State Water Quality Standards (will not exceed 29 NTUs above background with a 150 m mixing zone)	Temporary increase turbidity levels along the disposal site. Project located within Pinellas County Aquatic Preserve, an Outstanding Florida Water (OFW) where turbidity levels generated by work cannot exceed ambient levels. Not possible and requested a variance from State Water Quality Standards (will not exceed 29 NTUs above background with a 150 m mixing zone) or work will cease (4.6).	Impacts to water quality are expected to be localized and short term; discharges would occur over relatively short periods of time. The primary impact on water quality from the dredging will be due to sediment resuspension (4.7).	

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
	(Summary). Temporary decrease during construction and during future periodic renourishment (Table 11).	or work will cease (5.3).			
HTRW	Not evaluated.	No evidence of contamination by hazardous or toxic wastes (5.6).	No impact (2.2). No evidence of contamination by hazardous or toxic wastes was noted during prior surveys or site visits (4.7).	No evidence of contamination by hazardous or toxic wastes at the borrow area was noted during prior surveys or site investigations. All wastes and refuse generated by project construction would be removed and properly disposed (4.8).	The USACE will implement a standard spill control plan for the borrow area. Compliance with U.S. EPA Vessel General Permits would be ensured, as applicable.
AIR QUALITY	Decrease with increasing crowds and traffic (Table 11).	Short-term impact from engine exhaust emissions from the dredge and other construction equipment associated with the project will not significantly impact air quality. No air quality permits required (5.7).	No impact (2.2). Short-term impact of emissions by dredge and other construction equipment associated with the project will not significantly impact air quality in the area. No air quality permits are required for this project (4.8).	The proposed action may result in small, localized, temporary increases in concentrations of air pollutant emissions, including nitrogen oxides (NO_X), sulfur dioxide (SO^2), carbon monoxide (CO), volatile organic compounds (VOC) and particulate matter (PM). The short-term impact from emissions by the dredge or the tugs would not affect the	

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
				overall air quality of the area (4.9).	
NOISE	Increase during construction and during future periodic renourishment (Table 11).	Temporary increase in noise level during construction. Increases to the current levels of noise as a result of this project would be localized and minor, and limited to the time of construction (5.8).	A temporary impact in the noise level during construction in the vicinity of the discharge point on the beach will occur (2.2).	A temporary increase in noise levels during construction would occur in the vicinity of the dredge. Dredging equipment would be properly maintained to limit noise production. Increases in noise beyond ambient levels would be localized, minor, and limited to the time of dredging (4.10).	
AESTHETICS	Selected plan would enhance the shoreline's appeal (Summary). Temporarily unsightly during construction and maintenance; aesthetically pleasing afterwards (Table 11).	Temporary decline in aesthetics during renourishment due to presence, noise and exhaust from equipment and presence of dredge pipe and turbidity from discharge. Offset to an extent by some individual's natural curiosity. After renourishment, will enhance the appearance due to enlarged beachfront (5.5).	Construction of beach fill project will benefit aesthetic resources through increased beach width, vegetated habitat, and dune enhancement (2.2). Impact to aesthetic value of the beaches during construction (4.10).	During construction, equipment used for dredging would be visible, resulting in a temporary reduction in the aesthetic value offshore (4.11).	
ECONOMY	Reduced potential for property damage and enhanced	Temporary impacts due to noise and decreased aesthetics during	Not evaluated.	Not evaluated.	

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
	tourist and retiree attraction characteristics (Table 2-2). The selected plan would provide the most desired results at an acceptable cost. The plan would enhance those characteristics that attract tourists and retirees; therefore, the local economy would receive significant support (Summary).	renourishment. After construction, improved visual impacts and activity (5.5).			
RECREATION AND TOURISM	Selected plan would enhance the shoreline's ability to provide beach type re-creation. The plan would en-hance those characteristics that attract tour-ists and retirees. Selected plan would increase recreational use (Table 2-2).	Temporary drop in usage or temporary restriction of usage of beaches due to public safety during renourishment (5.5). Enhanced suitability for recreation along the beach (5.1).	The improved beaches will provide enhanced opportunities for recreational activities. During nourishment activities, the use of the beach in the immediate vicinity of construction would be temporarily restricted for public safety (2.2, 4.11).	During dredging operations, use of the area immediately surrounding the borrow area would be temporarily affected. Use of the waters in the immediate area of the dredge would be restricted due to public safety (4.12).	

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
NAVIGATION AND PUBLIC SAFETY	Not evaluated.	Not evaluated.	No impact (2.2).	During dredging operations, it may be necessary to restrict watercraft access to the construction area in the interests of public safety. These restrictions would be of short duration and are expected to be minor to boat operators (4.13).	
CULTURAL RESOURCES	No known potential impact (Table 2-2). No significant sites have been identified in the study area except for Fort DeSoto at the southern end of Mullet Key. The selected plan would prevent the Fort from being undermined and damaged by erosion (Summary).	No potentially significant historic properties recorded for or likely to be located in the beach fill area. With the use of 500-foot radius, no work zones established around potentially significant sites in Egmont Shoals, the project will have no effect (5.4).	No impact expected (2.2). A number of remote sensing surveys and diver evaluations of targets have been conducted for a number of project borrow areas (4.12).	No adverse effect to historic properties. Two magnetic targets were noted during cultural resource surveys. With the use of 200-meter radius work zones established around potentially significant sites in the borrow area, the project will have no adverse effect (4.14) due to a redesign of the project area to avoid a potentially significant site.	Archaeological areas discovered during cultural resources surveys would be avoided during dredging operations by at least a 200-foot buffer. A dredge with GPS-positioning equipment would be implemented. A chance find clause would be implemented.
ENERGY REQUIREMENTS AND CONSERVATION	Not evaluated.	Energy requirements confined to fuel for dredge, labor transportation, and other construction equipment. Use of more distant or	Energy requirements confined to fuel for dredge, labor transportation, and other construction equipment. Use of more distant borrow areas or no-	The energy requirements for this construction activity would be confined to fuel for the dredge, labor transportation, and other construction	

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
		upland borrow areas or no-action alternative would likely require the expenditure of more energy (5.9).	action alternative would likely require the expenditure of more energy (4.13).	equipment. Less energy would be required for this borrow area than no action due to the shorter transportation difference (4.16).	
CZMP CONSISTENCY	Consistent with State CZMP Chapter 161 (Coastal Construction) (4.01).	Study is in full compliance (6.0).	Study is in full compliance with CZMA (6.7).	Study is in full compliance with CZMA (6.7).	
COASTAL BARRIER RESOURCE UNITS (CBRU)	No impact (4.01).	No impact (4.3.1).	No impact (2.2).	Not evaluated.	
CUMULATIVE IMPACTS	The selected plan would incorporate up-to-date environmental protection measures. Predicted cumulative effect of perpetuation of coastline erosion-rebuilding cycle is that no significant adverse effects on the environment will occur (4.08).	The use of sand from the proposed borrow area will deplete the area of sand and species of relatively nonmotile infaunal invertebrates. However, many of those species that are not able to escape the construction area are expected to recolonize after project completion (5.11).	No cumulative impacts to the pelagic environment, including zooplankton, fishes, sea turtles, and marine mammals are expected from multiple beach nourishment borrow site operations from the 9 offshore borrow sites. Pipeline corridors would impact relatively small areas of hardbottom. Once established, should continue to be utilized to avoid impacts to areas not previously impacted. Very insignificant overall impact to hardbottom features due	The proposed project would have no net adverse effects on marine communities or protected species. The proposed project would not provide any known incremental contributions to significant adverse effects on biological resources. Because offshore sand resources such as resources in the borrow area appear to be finite and may not be replenishable, the proposed project provides an incremental effect on the depletion	

Environmental Resource	1984 Review Study and EIS Impacts	1997 EA Impacts	2002 EA Impacts	2010 EA Impacts	Mitigation and Compliance
			to small area impacted and long renourishment intervals, coupled with artificial reef creation (4.15).	of nearshore sand resources (4.18).	

A3.0 SEA TURTLE NESTING UPDATE

Three species of sea turtles regularly nest in Florida: the loggerhead, green, and leatherback. Kemp's ridley turtles have historically nested on the Gulf coast. Nests on Pinellas County beaches are primarily those of loggerhead turtles (Table A-2). Most nesting in the Tampa Bay area is reported from Pinellas County beaches (Table A-3).

Table A-2. Sea Turtle Nests reported on Pinellas County Beaches from 2004-2008

	Loggerhead	Green	Leatherback
2004	154	0	0
2005	156	0	0
2006	165	0	0
2007	78	0	0
2008	196	0	0
Source: Fish and Wildlife Research Institute, 2010			

Table A-3. Sea Turtle Nesting in the Tampa Bay Area in 2009

County	Survey Length (km)	Loggerhead		Green		Leatherback	
		No. of Nests	No. of False Crawls	No. of Nests	No. of False Crawls	No. of Nests	No. of False Crawls
Manatee	21.7	265	242	0	0	0	0
Hillsborough	4.8	33	41	0	0	0	0
Pinellas	72.0	212	181	0	0	0	0
Gulf Totals	692.4	5,303	5,272	28	29	1	0
State Totals	1,324.1	52,374	55,721	4,462	5,802	1,747	360
Source: FFWCC (http://research.myfwc.com/features/view_article.asp?id=11812).							

A4.0 PIPING PLOVER

Table A-4. Additional Listed Species from Pinellas County that Could be Affected by the Beach Placement

Species	Scientific Name	Federal Status
BIRDS		
Piping plover	*Charadrius melodus*	T
T=Threatened		

A4.1 Affected Environment

The piping plover (*Charadrius melodus*) is a shorebird that inhabits coastal sandy beaches and mudflats in the Tampa Bay area for wintering grounds. The plover breeds during the late spring and summer in three discrete areas of North America: The Northern Great Plains, the Great Lakes, and the Atlantic Coast. They winter in coastal areas of the United States from North Carolina to Texas. The density of wintering Great Lakes individuals was observed to be highest between St. Catherine's Island, Georgia, and Jacksonville, Florida, and the Gulf coast of Florida, particularly in the Tampa Bay region (Stucker and Cuthbert 2006). Piping plovers begin arriving on the wintering grounds in July, with some late-nesting birds arriving in September. Migration is poorly understood, but most plovers appear to migrate non-stop from interior breeding areas to wintering grounds. Individual plovers tend to return to the same wintering sites year after year (Nicholls and Baldassarre 1990). In late February, piping plovers begin leaving the wintering grounds to migrate back to breeding sites. Northward migration peaks in late March, and by late May most birds have left the wintering grounds (Eubanks 1994).

The piping plover has a patchy distribution along the coasts of Florida that is correlated with the availability of suitable, open habitat. The numbers and distribution of plovers are vulnerable to declines with loss and degradation of habitat. Habitats used by piping plover during the winter include beaches, mud flats, sand flats, algal flats, and washover passes (Doonan *et al*. 2006). Surveys have found that the plover is most often observed at the accreting ends of barrier islands, along sandy peninsulas, and near coastal inlets (USFWS 1995). Piping plovers use the sandy shore as a feeding area. Behavioral observations of piping plovers on the wintering grounds suggest that they spend most of their time foraging (Nicholls and Baldassarre 1990). Primary prey for wintering plovers includes polychaete marine worms, various crustaceans, insects, and occasionally bivalve mollusks (Nicholls 1989).

The piping plover is currently in decline and listed as endangered in the Great Lakes watershed and as threatened throughout the rest of its range. It is endangered as a result of historic hunting pressure, and loss and degradation of habitat (Ehrlich *et al*. 1992). The USFWS designated 142 units along the Gulf and Atlantic coasts as critical habitat for the wintering population of the piping plover; several units are located north and south of Sand Key. The Federal Register, Vol. 66, No. 132, July 11, 2001 included critical habitat in the area as: Unit FL–19: Caladesi Island; Unit FL–20: Shell Key and Mullet Key; and Unit FL–21: Egmont Key.

Grippo *et al.* (2007) examined the effects of beach renourishment projects over a two-year study on waterbird and shorebird communities in Brunswick County, North Carolina. No significant effects on total waterbird and shorebird abundance were found, and waterbirds actually increased in number due to the creation of additional beach habitat. Although less food resources were present while the benthic communities recovered, no significant differences in feeding activity were observed, although this could have been due to the highly transient nature of the birds.

A4.2 Environmental Effects

4.2.1 Borrow Area L Alternative

Placement of material on Sand Key from the Borrow Area L Alternative may affect, but is not likely to adversely affect, the piping plover. Impacts would be short-term and temporary and should have no lasting effects on the wintering piping plover population of Pinellas County.

4.2.2 No Action Alternative (Egmont Channel Shoal)

Similarly, the No Action Alternative may affect, but is not likely to adversely affect, the piping plover. Impacts would be short-term and temporary and should have no lasting effects on the wintering piping plover population of Pinellas County.

Appendix A

REFERENCES

Coastal Planning and Engineering (CP&E). 2009. Geophysical and geotechnical investigations to identify sand resources for beach nourishment on Sand Key, Pinellas County, Florida.

Doonan, T.J., K.M. Lamonte, and N. Douglass. 2006. Distribution and abundance of piping plovers and snowy plovers in Florida (abstract), Proceedings of the symposium on the wintering ecology and conservation of Piping Plovers, February 1-2, 2005, Raleigh, NC, U.S. Fish and Wildlife Service.

Fish and Wildlife Research Institute. 2010. Sea turtle nesting. Florida Fish and Wildlife Conservation Commission. http://research.myfwc.com/features/category_sub.asp?id=2309.

Grippo, M.A., Cooper, S., and Massey, G.M. 2007. Effect of beach renourishment projects on waterbird and shorebird communities. *Journal of Coastal Research*, 23(5), 1088-1096. West Palm Beach (Florida), ISSN 0749-0208.

Nicholls, J.L. 1989. Distribution and other ecological aspects of piping plovers (Charudrius mefodus) wintering along the Atlantic Gulf coasts of the United States. M.S. Thesis, Auburn Univ., Alabama.

Nicholls, J.L. and G.A. Baldassarre. 1990. Wintering distribution of piping plovers along the Atlantic and Gulf coasts of the United States. Wilson Bull. 102:400-412.

Stucker, J.H. and F.J. Cuthbert. 2004. Piping Plover breeding biology and management in the Great Lakes, 2004. A report submitted to East Lansing Field Office of the U.S. Fish and Wildlife Service, East Lansing, MI, and the Natural Heritage and Endangered Species Programs, Michigan Department of Natural Resources, Lansing, MI. 30 pp.

USACE. 1995. Feature Design Memorandum Northern Treasure Island Pinellas County, Florida Beach Erosion Control Project. U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL.

Appendix B

NMFS GULF REGIONAL BIOLOGICAL OPINION (GMRBO)

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency:	United States Army Corps of Engineers (COE)
Activity	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)
Consulting Agency:	National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida
Approved by:	Roy E. Crabtree, Ph.D., Regional Administrator NOAA Fisheries, Southeast Regional Office St. Petersburg, Florida
Date Issued:	NOV 19 2003

Contents

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*), requires that each Federal agency shall ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When the action of a Federal agency may affect a protected species, that agency is required to consult with either the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) or the U.S. Fish and Wildlife Service (FWS), depending upon the protected species that may be affected.

This document represents NOAA Fisheries' biological opinion (Opinion) based on our review of the regular maintenance hopper dredging of navigation channels, and offshore sand mining for beach restoration/nourishment activities, in the U.S. Gulf of Mexico by the COE's Jacksonville, Mobile, New Orleans, and Galveston Districts, and its effects on green sea turtles *(Chelonia mydas)*, leatherback sea turtles (*Dermochelys coriacea*), hawksbill sea turtles *(Eretmochelys imbricata)*, loggerhead sea turtles (*Caretta caretta*), Kemp's ridley sea turtles *(Lepidochelys kempii)*, Gulf sturgeon (*Acipenser oxyrinchus desotoi*), and Gulf sturgeon critical habitat, in accordance with section 7 of the ESA.

Formal consultations are required when action agencies determine that a proposed action "may affect" listed species or designated critical habitat. Formal consultations on most listed marine species are conducted between the action agency and NOAA Fisheries. Consultations are concluded after NOAA Fisheries' issuance of an Opinion that identifies whether a proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify critical habitat. The Opinion also states the amount or extent of incidental taking that may occur. Non-discretionary measures ("reasonable and prudent measures" - RPMs) to reduce the likelihood of takes are developed, and conservation recommendations are made. Notably, there are no reasonable and prudent measures associated with critical habitat, only reasonable and prudent alternatives.

This Opinion is based on dredging schedules and biological assessments provided by the various Gulf of Mexico COE Districts for channel dredging and beach nourishment projects involving the use of hopper dredges, meetings between NOAA Fisheries and the COE, annual take reports, dredge observer reports, dredging project completion reports, and annual dredging project summary reports provided by the COE Districts. Draft versions of this Opinion were provided to the COE Districts for input and comments, and resulted in significant revisions to the final draft.

1.0 Consultation History

This Opinion is a result of reinitiation of consultation on the September 22, 1995, Regional Biological Opinion (RBO) issued to the U.S. Army Corps of Engineers, New Orleans and Galveston Districts, on hopper dredging of channels in Texas and Louisiana. At the time that the Galveston and New Orleans Districts requested reinitiation of consultation on the RBO, NOAA Fisheries' Southeast Regional Office requested that the Mobile District and the Jacksonville District–the other two COE Districts that conduct hopper dredging operations in the Gulf of Mexico–also enter into formal ESA consultation with NOAA Fisheries and provide biological assessments (BA) on the effects of their Districts' maintenance dredging projects and beach nourishment projects on threatened and endangered species under NOAA Fisheries' purview in the Gulf of Mexico. This allowed NOAA Fisheries to prepare the present comprehensive regional biological opinion to cover all hopper dredging activities in the Gulf of Mexico which involve maintenance dredging or sand mining by or under the auspices of the U.S. Army Corps of Engineers.

The Galveston District's BA and request for reinitiation of formal consultation were submitted on October 11, 2000.

The New Orleans District's BA and request for reinitiation of formal consultation were received on April 9, 2001.

The COE's Mobile District provided information on hopper dredging projects within its area of jurisdiction on December 21, 2001, and additional information was provided at a meeting between NOAA Fisheries and COE representatives in Mobile on April 15, 2002. The Mobile District's BA was received on June 12, 2002.

The Jacksonville District submitted a BA dated April 29, 1999, on the Lee County Shore Protection Project, Estero Island Segment (Gasparilla Island) hopper dredging; additional information on this project was received on April 4, 2000. The Jacksonville District requested formal consultation and submitted a BA on their Florida west coast hopper dredging projects on November 28, 2000. On July 17, 2001, the Jacksonville District submitted a separate BA and request for formal consultation on the Lido Key Shore Protection Project. NOAA Fisheries requested additional information on the Lido Key project on August 9, 2001, which was provided by the COE on September 7, 2001. In their letter, the COE agreed to NOAA Fisheries' request to include the Lido Key project in the present Opinion. On August 22, 2001, the COE provided information on the Pinellas County Shore Protection Project; a BA and request for formal consultation was provided on October 30, 2002. That consultation is included in the present Opinion. In March 2002, NOAA Fisheries received a request for formal consultation from the COE on the Pensacola Beach Restoration Project and decided to include and evaluate the proposed action in the present Opinion, since the project called for hopper dredge use. Ultimately, the latter project was consulted on separately from the present Opinion, in a biological opinion issued in October 2002. On May 9, 2003, and again on August 8, 2003, NOAA Fisheries received a request for formal consultation on the proposed Sarasota County, Venice Beach Shoreline Protection Project since hopper dredging of offshore sand mining sites may be involved. That project is included in this Opinion.

The COE's Mobile District provided information on hopper dredging projects within its area of jurisdiction on December 21, 2001, and additional information was provided at a meeting between NOAA Fisheries and COE representatives in Mobile on April 15, 2002. The Mobile District's BA was received on June 12, 2002.

The Mobile District provided written comments on draft versions of this Opinion on September 6, 2002, and October 30, 2002.

The COE's South Atlantic Division provided comments on the draft Opinion on October 1, 2002, (e-mail, Barnett to Nitta) and on November 14, 2002 (e-mail, Small to Hawk).

The COE's Wilmington District provided comments on the draft Opinion on September 11 and 13, 2002 (e-mails, Adams to Hawk).

The COE's Jacksonville District provided comments on the draft Opinion on September 13, 2002 (Jordan to Adams). Additional comments (Haberer to Hawk) were received on April 29, 2003.

The COE's South Atlantic Division (SAD) compiled comments received from the COE's South Atlantic, Mississippi Valley, and Southwest Divisions, and the Jacksonville, Mobile, New Orleans, and Galveston Districts on the August 24, 2003, final draft Opinion, and provided these to NOAA Fisheries on September 9, 2003. NOAA Fisheries responded to these comments verbally to South Atlantic Division staff on September 25, 2003, made revisions to the final draft, and provided revised copies to the COE on October 15, 2003 for final comment. NOAA Fisheries requested that comments be submitted by October 21, 2002, although comments received through October 29, 2003 were considered.

A complete administrative record of this consultation is on file at the NOAA Fisheries' Southeast Regional Office, St. Petersburg, Florida.

Background to Proposed Action

<u>Consultation History of Channel Dredging in the United States</u>

The construction and maintenance of Federal navigation channels have been identified as a source of turtle mortality since turtle takes were first documented during hopper dredging operations in Canaveral Channel, Florida, in 1980. A total of 71 turtle takes by hopper dredge was documented in the Canaveral Channel over the period of July 11 through November 13, 1980 (NMFS 1991a). Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore sand mining areas, move relatively rapidly and can entrain and kill sea turtles, presumably as the drag arm of the moving dredge overtakes the slower moving turtle. In contrast to hopper dredges, pipeline dredges are relatively stationary, and therefore act on only small areas at any given time. In the 1980s, observer coverage was required by NOAA Fisheries at pipeline outflows during several dredging projects deploying pipeline dredges along the Atlantic coast. No turtles or turtle parts were observed in the outflow areas. Additionally, the COE's South Atlantic Division (SAD) office in Atlanta, Georgia, charged with overseeing the work of the individual COE Districts along the Eastern Seaboard from North Carolina through Florida, provided documentation of hundreds of hours of informal observation by COE inspectors during which no takes of listed species were observed. Additional monitoring by other agency personnel, conservation organizations, and the general public has never resulted in reports of turtle takes by pipeline dredges (NMFS 1991a).

U.S. Gulf of Mexico

Historically, section 7 consultations conducted on dredging impacts in the Gulf of Mexico were limited by the paucity of information available on the seasonal and spatial distribution of sea turtles; information was also lacking on adverse impacts of hopper dredging on local species under NOAA Fisheries' jurisdiction. Studies conducted by the COE (Dickerson et al. 1994) documented turtle distribution and abundance in 6 channels along the Atlantic seaboard but there was no evidence that indicated that sea turtles in Gulf channels aggregate like those along the southeast U.S. Atlantic coast.

A brief history (beginning 1990) of section 7 consultations conducted on dredging activities in the northern and western Gulf of Mexico follows. All of these consultations concluded that dredging was not likely to jeopardize listed species in the Gulf of Mexico.

New Orleans District

Beginning in 1991, the COE New Orleans District has held annual dredging conferences and has compiled a conference notebook requesting section 7 consultation on anticipated dredging projects for the upcoming fiscal year. Information on the proposed maintenance dredging dates, anticipated dredge types, and amount of material to be dredged is included within the conference notebook. The annual consultations resulting from the projects within the conference notebook were generally concluded informally, with a concurrence from NOAA Fisheries that hopper dredging in these channels was not likely to adversely affect any listed species or critical habitat. Since 1990, reporting conditions have been implemented that required precautionary measures to improve the information available on interactions between sea turtles and hopper dredge activities in the Gulf. The COE New Orleans District was asked to (1) advise inspectors, operators, and vessel captains about the prohibitions on taking, harming, or harassing sea turtles, and the civil penalties that apply; (2) instruct the captain of the hopper dredge to avoid any turtles encountered while traveling between the dredge site and offshore disposal area, and to immediately contact the COE if sea turtles were seen in the vicinity; and (3) notify NOAA Fisheries if sea turtles were observed in the dredging area in order to coordinate further precautions to avoid impacts to turtles.

A COE-funded research program was conducted during 1993 and 1994 to assess the occurrence of sea turtles in the vicinity of Calcasieu Pass, Louisiana. The COE New Orleans District suggested that ongoing research assessing sea turtle occurrence in the vicinity of the channel during the dredging period, and observations by dredge workers and COE observers, were sufficient to preclude the need for NOAA Fisheries-approved observers.

The COE requested consultation in summer 1994 for FY 1995 channel dredging within the New Orleans District where a hopper dredge was likely to be used. Dredging areas included Calcasieu Pass, Mississippi River - Gulf Outlet (MR-GO), and the Mississippi River - Southwest Pass (MR-SWP). Preliminary studies of sea turtle occurrence in Calcasieu and Sabine passes suggested that sea turtles may congregate in the vicinity of some passes along the northern Gulf of Mexico at specific times of the year. Also, high levels of sea turtle strandings had been documented over the past few years on Louisiana beaches, despite the lack of a dedicated, organized stranding network.

In response to the COE New Orleans District's request for consultation, NOAA Fisheries issued a letter dated January 30, 1995, indicating that NOAA Fisheries-approved observers were necessary to verify the reported absence of dredging impact in these channels on listed sea turtle species. The letter also suggested that formal consultation would be required in 1995 incorporating the results of the Calcasieu sea turtle study and observer reports. NOAA Fisheries also suggested that the newly-developed rigid deflector draghead be immediately deployed on the dredges if possible.

During FY 1995, the COE New Orleans District determined that observers would not be deployed in the MR-SWP since the channel consisted primarily of fresh, high flow waters. Additionally, the complexity of dredging operations in MR-SWP results in up to seven hopper dredges operating at any time in any part of the MR-SWP, often with less than ten days notice, making deploying observers difficult. Dredging effort and location are dependant on weather, resultant flow, and siltation from up-river (International Dredging Review 1995). Variable dredging demands make it difficult to obtain 100% observer coverage at the appropriate extents of the MR-SWP.

However, NOAA Fisheries-approved observers were deployed on a hopper dredge operating in Calcasieu Pass during maintenance dredging operations between April 27 and July 8, 1995. No sea turtle takes were observed. Reports indicated that sufficient screening and observer effort were present to have observed a potential take. NOAA Fisheries-approved endangered species observers also attended maintenance dredging operations in the MR-GO between March 18 and May 10, 1995. No sea turtles were taken nor observed in the vicinity. Very little biological material was observed in the dredge spoil.

COE New Orleans District requested formal consultation in March 1995 on the effects of the proposed District-wide dredging and submitted a BA in July 1995. The resulting RBO on the use of hopper dredges to conduct maintenance dredging in Texas and Louisiana channels, issued on September 22, 1995 (NMFS 1995a), concluded that hopper dredging in the northern Gulf of Mexico was likely to adversely affect listed sea turtles, but was not likely to jeopardize the continued existence of sea turtle populations.

While the RBO authorized the New Orleans District an annual incidental take, lethal or injurious, by hopper dredge of 15 loggerhead, three green, seven Kemp's ridley, and one hawksbill sea turtle (NMFS 1995a), this take limit has not been reached for any species since the RBO was issued. In most years, New Orleans District takes have been <u>far</u> fewer than authorized (except in May 2002, when loggerhead takes in the MR-GO reached 75% of the authorized loggerhead limit). For example, from May 11, 1995, to September 13, 2003, June 1, 2003, a total of only 41 sea turtles (including 32 loggerheads, seven Kemp's ridleys, and two unidentified) has been reported lethally taken by hopper dredges in the New Orleans District. However, ten turtles, all loggerheads, were taken by the New Orleans District in FY2003, all in the MR-GO.

One of the measures implementing the RBO Incidental Take Statement (ITS) required observer presence in the seaward extent of MR-SWP between April 1 and November 30. A study proposed and conducted by COE New Orleans District in 1996 further characterized the habitat of the MR-SWP and helped identify the likelihood of turtle presence. Results indicated that the MR-SWP was an area not likely utilized by sea turtles. The 1996 sea turtle observer reports confirmed the absence of sea turtles, and the scarcity of sea turtle prey species found in hopper dredge inflow screens during dredging in the MR-SWP. On January 13, 1997, after reviewing their BA and MR-SWP habitat characterization study, NOAA Fisheries advised COE New Orleans District that further observer deployment in MR-SWP, as per the sea turtle observer monitoring requirements outlined in the ITS, was no longer required. There have been no documented takes of sea turtles in MR-SWP since the September 22, 1995, Opinion was issued.

Galveston District

Before the 1995 RBO, consultations had been conducted on a channel-by-channel basis within the COE's Galveston District. During a consultation conducted on the Sabine-Neches Waterway, NOAA Fisheries concurred on May 14, 1992, with COE Galveston District's finding that hopper dredging in the Waterway was not likely to adversely affect listed species. The conclusion for the Sabine-Neches Waterway was based on the lack of documented takes in the project area. However, NOAA Fisheries noted that the preliminary data collected in the project area suggested sea turtle presence in the channel area. As a precaution, NOAA Fisheries suggested that the COE Galveston District implement identical measures (1-3 above) as those required by the COE New Orleans District. These measures were followed on most hopper dredging projects conducted within the Galveston District between 1992 and May 1995.

Formal consultation conducted on hopper dredging in the Port Mansfield Channel resulted in an Opinion issued on September 12, 1992, restricting the use of hopper dredges during December through March. During these winter months, sea turtle observations by dredge personnel and COE dredge inspectors were required. The Opinion recommended the use of pipeline or bucket dredges during all months of the year as an alternative to hopper dredging in this channel. The Opinion also recommended that the COE adhere to National Park Service recommendations regarding dredge operations and disposal activities, and conduct studies to determine the seasonal abundance of sea turtles in the channel.

Informal consultation conducted on winter dredging of the Galveston Harbor and Channel in early 1995 indicated that formal consultation should be conducted for northern Gulf of Mexico hopper dredging projects between April and November due to new information collected by COE-funded research suggesting sea turtles were abundant in waters adjacent to channels. The need for formal consultation and requirements beyond COE observers was further demonstrated during take in a project within Brazos Pass, south Texas. Dredging began in February 1995, a time of year when historical information suggests that the relative abundance of sea turtles is low. On February 7 and 8, 1995, anterior portions of sea turtles were discovered on beaches adjacent to the Pass. Inquiries to the COE's Galveston District revealed two unreported observations by COE inspectors of live green turtles onboard the dredge the day after dredging began. Four additional strandings of green turtles with injuries indicative of dredging, and two lethal takes of green turtles were observed before dredging operations were halted on February 26. A Kemp's ridley lethal take was also observed. Total sea turtle take for the Brazos Pass project was 5 lethal and four non-lethal during 19 days, recording the first documentation of sea turtle takes by hopper dredges in Gulf of Mexico channels. The COE Galveston and New Orleans Districts were subsequently requested to initiate formal consultation as a result of both these documented takes and the new data describing the abundance of sea turtles near Gulf channels. Formal consultation was requested by Galveston on March 23, 1995, and by New Orleans on March 31, 1995, and a BA was submitted by the New Orleans District on July 20, 1995. The COE New Orleans District identified annual maintenance dredging needs and anticipated hopper dredge use for the lower Mississippi River, the bar channel of the

MR-GO, and the bar channel of the lower Calcasieu River. The COE Galveston District identified the Sabine-Neches Waterway, the Galveston Harbor Channel, Freeport Harbor, the Matagorda Ship Channel, the Corpus Christi Ship Channel, Port Mansfield, and the Brazos Island Harbor as maintenance dredging project areas requiring the use of hopper dredges.

September 22, 1995, Regional Biological Opinion (RBO)
NOAA Fisheries' RBO (NMFS 1995a) responded to both the New Orleans and Galveston Districts' consultation requests jointly and considered the effects of annual maintenance dredging by hopper dredges on listed sea turtles. Seasonal observers, screening, and deflector draghead requirements were instituted for most channel dredging. An incidental take level for each COE District by fiscal year was established. For the COE Galveston District, incidental take, by injury or mortality, was set at seven documented Kemp's ridleys, five green turtles, one hawksbill, and 15 loggerhead turtles. This take allotment represented a total allowable take per fiscal year for all channel dredging in the Galveston District. As noted previously, the RBO authorized the New Orleans District an annual incidental take, lethal or injurious, by hopper dredge of 15 loggerhead, three green, seven Kemp's ridley, and one hawksbill sea turtle. The Galveston District was allocated two additional green turtles in their incidental take statement due to their greater abundance in south Texas waters. Reasonable and prudent measures recommended were: (1) temporal windows for hopper dredge operation to reduce the probability of sea turtle interaction, (2) the use of shipboard endangered species observers to document incidental take when water temperatures were 12°C (53.6°F) or greater, (3) inflow and overflow screening of dredged materials to enable observers to identify take, and (4) use of the rigid turtle deflector dragheads in all channel areas of the Gulf of Mexico where take had either been documented or during periods of known sea turtle concentrations. After a Kemp's ridley was lethally taken on May 14, 2002, NOAA Fisheries reinitiated consultation with the New Orleans District COE and required that the sea turtle deflecting draghead be installed for Calcasieu River and Pass navigational channel dredging and during all hopper dredging projects in the New Orleans District, excepting MR-SWP (the COE had not previously been using the deflecting draghead at Calcasieu Pass).

Because relocation trawling had shown limited success in east coast channels (e.g., Canaveral and Brunswick) at temporarily reducing the abundance of sea turtles during periods in which dredging is required, a conservation recommendation was included in the RBO for the COE to consider conducting sea turtle relocation trawling in advance of hopper dredging in certain circumstances. Specifically, the RBO recommended that relocation trawling "should be considered if takes are documented early in a project that requires the use of a hopper dredge during a period in which large numbers of sea turtles may occur."

Since 1995, all Galveston and New Orleans District hopper dredging projects in the Gulf of Mexico, with the exception of the Houston-Galveston Navigation Channels (H-GNC) (which was the subject of a separate Opinion and corresponding ITS for widening and deepening of existing channels, and cutting of new channels), have been conducted under the authority and subject to the take limits of the RBO. Hopper dredging projects under the jurisdiction of the Mobile and Jacksonville Districts were consulted on by individual project requiring individual Opinions and ITS's (e.g., Tampa Bay and Charlotte Harbor, Florida); or in the case of the Mobile District, every five years under informal section 7 consultation procedures.

<u>COE Jacksonville District, Florida West Coast</u>
Informal consultation on the proposed dredging of 750,000 cubic yards (CY) of shoal material and biannual maintenance dredging of 265,000 CY of shoal material in Boca Grande Pass, Charlotte Harbor Entrance Channel (located about 60 miles south of Tampa Bay), was initiated on March 31, 1992, by the

Planning Division, Jacksonville District COE. A BA was transmitted pursuant to section 7 of the ESA. On April 29, 1992, NOAA Fisheries determined that the proposed maintenance dredging action by hopper, hydraulic pipeline, or mechanical dredge would not adversely affect listed species under NOAA Fisheries' purview.

On February 6, 1995, the COE Planning Division, Jacksonville District informed NOAA Fisheries that, as a result of positive testing results, the new turtle excluder "rigid deflector" draghead would be utilized both in Boca Grande Pass and on all other hopper dredging projects. The rigid deflector was developed under controlled conditions by the COE's Waterways Experimental Station (WES), now known as the Engineering Research and Development Center (ERDC).

NOAA Fisheries issued an Opinion to the COE on June 2, 1995, regarding the effects of hopper dredging of approximately 13.3 miles of channels leading into and within Tampa Bay. The Tampa Harbor Navigation Channel Opinion required the COE to (1) conduct pre-dredge trawling surveys for turtles prior to commencement of dredging operations, (2) utilize the newly developed turtle excluder rigid deflector on all dragheads, (3) provide 100% screening of the overflows, and the maximum possible screening of the inflows, (4) disengage dredging pumps when dragheads were not firmly on the bottom, and (5) provide NOAA Fisheries-approved observer monitoring of dredging operations at all (100%) times. The Opinion established an incidental take limit of two documented Kemp's ridley, hawksbill, leatherback or green turtles, in any combination, or three loggerheads, for maintenance hopper dredging of Egmont Bar Channel (Cut 1 and 2), Mullet Key Cut, and Cut A in the navigation channel to Tampa Bay.

The COE reinitiated formal consultation with NOAA Fisheries for the Tampa Harbor Navigation Channel hopper dredging project on April 2, 1996, following the lethal take of two Kemp's ridleys. The resultant Opinion, signed April 9, 1996, suggested additional conservation measures and established an additional incidental take level (in addition to the two Kemp's previously taken), and the deflecting draghead position was adjusted. Additional incidental take was designated as eight sea turtles, however no more than five sea turtles could be Kemp's ridley, hawksbill, leatherback, or green (i.e., up to eight loggerheads could be taken, but no more than five of the other four species combined, NMFS 1996c). Immediately after this new Opinion was issued, three sea turtles (two loggerheads and one Kemp's ridley) were lethally taken by the hopper dredge STUYVESANT during March 3-April 18, 1997 maintenance dredging of the Egmont Bar Channel. These takes occurred despite a pre-dredge trawl survey (conducted from February 13-18, encompassing approximately 30 hours of trawling) that captured, tagged, and relocated three Kemp's ridleys. Subsequent dragging (trawling) operations conducted from March 16 - April 26 during the dredging period resulted in three loggerhead sightings, but no sea turtle captures. In retrospect, it is likely that the pre-dredge trawling occurred too long before the actual hopper dredging to be of maximum benefit.

On October 30, 1998, a loggerhead sea turtle was taken by a hopper dredge conducting maintenance dredging of Charlotte Harbor Entrance Channel (Boca Grande Pass). On November 3, 1998, the COE requested formal consultation on periodic maintenance dredging of Charlotte Harbor Entrance Channel using a hopper dredge to remove approximately 265,000 CY of shoal material every two or three years. Maintenance dredging of Charlotte Harbor Entrance Channel, between October 20, 1998, and January 13, 1999, resulted in one loggerhead (non-lethal) take and three loggerhead surface sightings within 300 yards of the operating hopper dredge.

On June 8, 1999, during consultation on Charlotte Harbor Entrance Channel hopper dredging, NOAA Fisheries requested that the COE-Jacksonville District submit dredging schedules for all District projects to be performed over the next five years, and suggested that the District request initiation of consultation for a Regional Biological Opinion (RBO) to include *all* potential dredging sites within the Jacksonville District, including Tampa Bay and the ongoing Charlotte Harbor consultation. Subsequently, an Opinion for maintenance dredging of Charlotte Harbor Entrance Channel was issued on October 26, 1999, authorizing the incidental take of two loggerheads or Kemp's ridleys or greens or hawksbill sea turtles, and one Gulf sturgeon, per biennial dredging cycle. The Charlotte Harbor Opinion, because of reported incidental take of Gulf sturgeon by gill net fishermen in Boca Grande Pass, was the first Gulf of Mexico hopper dredging Opinion to anticipate dredge interactions with Gulf sturgeon. Previously, NOAA Fisheries had addressed hopper dredging impacts on Gulf sturgeon in section 7 consultations for channel maintenance dredging, believing that the projects were not likely to adversely affect the species given either the project's limited scope and/or the unlikely presence of Gulf sturgeon. While no Gulf sturgeon takes by hopper dredges have been reported since, allopatric sturgeon species on the Atlantic Seaboard have been taken occasionally by hopper dredge. The existing SAD RBO for hopper dredging between North Carolina through Florida limits the incidental take of shortnose sturgeon to five. Recent reports confirm the take of five shortnose sturgeon by a hopper dredge operating in the Kennebec River, Maine (Julie Crocker, NMFS NER, October 15, 2003, pers. comm. to Stephania Bolden, NMFS SER). Thus, NOAA Fisheries considers it prudent to address potential Gulf sturgeon takes by hopper dredges operating in the Gulf of Mexico as we presume the species can be taken given the evidence from two morphologically and ecologically similar Atlantic sturgeon species.

On September 5, 2000, the COE requested consultation on maintenance dredging of St. Petersburg Harbor Entrance Channel, within Tampa Bay, using a hopper dredge. NOAA Fisheries concluded that the ITS and conclusions of the 1996 Tampa Harbor Navigation Channel Opinion remained valid and included this within-bay maintenance dredging. A pre-dredging assessment trawl survey from September 21-28 (approximately 29 hours of trawling) in the proposed dredging area resulted in the capture, tagging, and relocation of two adult loggerheads and one subadult green turtle. Subsequent dredging operations conducted from late September to October 2000, resulted in surface sightings of three turtles, but no captures.

2.0 Description of the Action Area and Proposed Action

The action area (defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action") for this action is the coastal waters, navigation channels, and sand mining areas in the U.S. Gulf of Mexico, from the Texas-Mexico marine border to Key West, Florida.

The proposed action includes:

1) Federal, federally-permitted, or federally-sponsored hopper dredging for maintenance of all U.S. Gulf of Mexico navigation channels within all of the COE's Gulf of Mexico Districts (Galveston, New Orleans, Mobile, and Jacksonville), including intracoastal waterways, maintenance dredging associated

with the Houston-Galveston navigation channels,[1] and maintenance dredging associated with the Corpus Christi Ship Channel Improvement Project.[2]

2) Federal, federally-permitted, or federally-sponsored hopper dredging of all U.S. Gulf of Mexico sand mining areas ("borrow sites") and virgin (previously unused) sand mining areas for beach nourishment, restoration, and protection projects, outside of designated Gulf sturgeon critical habitat, in state waters.

3) Hopper dredging projects including Federal civil works projects, Federal non-civil works projects authorized by COE regulatory permits, and non-Federal projects authorized by COE regulatory permits including privately-sponsored projects and cost-shared projects (part private, part Federal funding).

4) Maintenance (maintenance dredging is defined as keeping channels at specified depths and widths; improving means making them deeper or wider) hopper dredging of Gulf of Mexico navigation channels previously dredged by non-hopper type dredges.

5) Hopper dredging tests, in state waters, to determine a site's sand characteristics and suitability for future sand mining and beach restoration activities.

6) Emergency hopper dredging necessary due to disasters, storms, hurricanes, floods, etc., and national defense.

7) Disposal of hopper-dredged material in approved disposal areas. The COE has stated that economic concerns (e.g., time-of-transit to disposal sites versus time spent actually dredging) dictate that disposal of dredged materials occurs in the vicinity of the dredge sites, usually alongside or downdrift of the channels being dredged in designated placement areas or nearby designated ocean placement sites, often just off barrier island passes. Descriptions of dredged material disposal/placement sites are included herein by reference to charts and figures provided by the Gulf of Mexico COE Districts.

8) Hopper dredging of channels and turning basins <u>beyond</u> previously authorized depths and dimensions (i.e., "new material" dredging) <u>if</u> the action is described in the following project descriptions by COE District (e.g., Jacksonville District's Alafia River project) <u>and</u> only when the project is located outside of designated Gulf sturgeon critical habitat.

9) "New material" hopper dredging including widening, deepening, and extending of existing navigation channels and turning basins to previously authorized dimensions for channels and turning basins outside of designated Gulf sturgeon critical habitat.

10) Bed-leveler mechanical dredging of channels, turning basins, dredged material disposal areas, etc., located outside of designated Gulf sturgeon critical habitat using plows, I-beams, or other bed-leveling mechanical dredging devices used during or after hopper dredging or by themselves to lower high spots in the channel bottom or dredged material deposition areas.

[1] A separate Opinion for the Houston-Galveston navigation channels was previously issued to cover takes during widening, extending, and deepening.

[2] A separate Opinion was finalized in December 2002 on this project to cover takes during widening, extending, and deepening.

Except as noted in 8) and 9) above, "new material"dredging, i.e., hopper dredging to build, deepen, widen, or extend channels and turning basins, is not considered part of the proposed action evaluated in this Opinion and must be consulted on individually by the appropriate COE Districts.

This Opinion does NOT include:

1. Improvement (maintenance dredging is defined as keeping channels at specified depths and widths; improving means making them deeper or wider) of channels to depths or widths not previously authorized throughout the project area.

2. Dredging in areas within designated Gulf sturgeon critical habitat. Such dredging is limited to maintaining the current dimensions of channels at the time of this consultation (i.e., length, width, and depth) regardless of previous authorization. As addressed throughout the rule designating Gulf sturgeon critical habitat, dredging is an activity that may adversely modify critical habitat and therefore must be evaluated on a case-by-case basis.

3. Disposal in areas within designated Gulf sturgeon critical habitat. Such disposal is not authorized nor considered within this Opinion. As addressed throughout the rule designating Gulf sturgeon critical habitat, dredging is an activity that may destroy or adversely modify critical habitat and therefore must be evaluated on a case-by-case basis.

4. Hopper dredging permitted by other Federal agencies (e.g., Minerals Management Service - MMS) for characterizing or obtaining sand for beach renourishment projects in the Gulf of Mexico; although disposal of said sand obtained from outside state waters (i.e., from waters under the permitting purview of MMS, not the COE) is considered part of the proposed action, except for sand disposal within designated Gulf sturgeon critical habitat. Note: Although the COE may issue permits for the disposal in state waters of hopper dredged sand obtained from outside state waters (i.e., from Federal waters under MMS permitting authority), this Opinion does not consider (or hold the COE responsible for) any threatened or endangered species takes arising from non-COE permitted hopper dredging of sand sources outside of the COE's permitting authority.

New Orleans District

The COE New Orleans District has identified the following channels where regular maintenance dredging is required and use of hopper dredges is anticipated.

1. Mississippi River, Baton Rouge to the Gulf of Mexico, Southwest Pass - the lower Mississippi River (mile 4.0 above Head of Passes to mile 22.0 below Head of Passes, Southwest Pass): Maintenance dredging is required, conducted by private (contract) and government-owned hopper dredges for 8-12 months each year. Last dredged in 2002, the FY2004 dredging conference notebook indicates that maintenance dredging of the MR-SWP and the associated bar channel will be conducted by a cutterhead, hopper, and dustpan dredge beginning December 2003 continuing for approximately 8 months to remove approximately 18.8 million CY of material (25% sand, 50% silt, 25% clay). Authorized channel depth is 55 feet. Currently the channel is maintained to 45 feet. Disposal will occur in open water by agitation, placement in a designated ocean placement site, wetland creation and bank nourishment.

2. Mississippi River, Deep Draft Crossings - New Orleans Harbor to Baton Rouge: Maintenance dredging is required, conducted by government-owned hopper dredge and contract dustpan dredge for six months each year. The FY2004 dredging conference notebook, submitted in May 2003 indicates that maintenance dredging of the 45-ft deep x 500-ft wide channel will be conducted by both hopper and

dustpan dredge beginning June 2004 and continuing for approximately 6 months, to remove approximately 16.5 million CY of material (100% sand) between miles 230.7 and 114.8. Open water disposal is proposed in the deep water in vicinity of the crossings.

3. Mississippi River - Gulf Outlet: Maintenance dredging of the MR-GO channel involves non-continuous work from mile -66.0 to mile -9.0, and requires both hopper and cutterhead dredges. Routine maintenance dredging and disposal plans (non-emergency status) by cutterhead dredge can be performed throughout the entire project reach; hopper dredging is utilized in the bar channel reach only. Normally, the reach of the bar channel between mile -3.3 and -9.0 is maintained by hopper dredge. Maintenance dredging is conducted for approximately three months annually by both contract and government-owned hopper dredges. Last dredged in FY 2002, during FY2004 maintenance dredging on the MR-GO bar channel between mile -4.0 and -9.38 is anticipated to begin in September 2004 and continue for approximately 60 days, to remove approximately 1.5-2.5 million CY of material (33% sand, 57% silt, 10% clay). Open water dredged material placement is proposed between miles -4.0 and -9.38 in the ocean dredged material disposal site alongside the channel or on Breton Island. Additionally, hopper dredging work may occur between miles 23.0 and 12.0. Last dredged in 2002, approximately 2.0-6.0 million CY of material is proposed to be dredged, by cutterhead and hopper, starting in June 2004, for 90 days. Unconfined disposal is planned for wetland development behind South Jetty.

The COE New Orleans District requested on April 8, 2002, that hopper dredges be permitted to remove shoal material in the MR-GO navigational channel between mile 27.0 and -9.38 in the event that emergency maintenance dredging is required, only when cutterhead dredges are either unable to perform such work or are unable to provide project dimensions in a timely manner. On April 29, 2003, the District requested that hopper dredges be permitted to remove shoal material in the MR-GO navigational channel between mile 27.0 and -0 under the same conditions as previously noted. Conditions noted by the District that would precipitate emergency hopper dredge sidecasting of dredged material within authorized channel dimensions for later cutterhead dredge removal and disposal include: (a) extreme weather working conditions that prevent safe and timely operation of a cutterhead dredge to restore safe passage in the most expeditious manner, (b) lack of cutterhead dredge availability, (c) unacceptable cutterhead dredge mobilization/start-up response time, (d) excess project cost, and (e) inadequate estimated or actual cutterhead dredging production rates.

4. The Calcasieu River and Pass navigation channel and bar channel (miles 0.0 to -32.0, with the majority of dredging occurring between mile 0.0 to -10.0): Maintenance dredging is required for 2-3 months per year. During FY 2004, this project is scheduled to begin November 2003 and take approximately 60-90 days to remove eight million CY of material (9% sand, 45% silt, 46% clay) and maintain the 40-ft x 400-ft channel between jetties and the 42-ft x 800-ft channel to the 42-ft contour depth in the Gulf. The proposed disposal method is open water disposal at the ocean dredged material disposal sites located from mile 0 to mile -32.0 alongside the channel.

No sea turtle takes have ever been reported from the MR-SWP. A habitat characterization study conducted in 1996 by the New Orleans District COE, including endangered species observer deployment from April through November 1996, indicates that the strength and speed of the Mississippi River's current in Southwest Pass, which causes severe shoaling and resultant constant dredging demand, also preclude the establishment of benthic communities of sea turtle forage species. On January 17, 1997, NOAA Fisheries agreed with the New Orleans District COE's study assessment that sea turtles were not likely to occur within the Southwest Pass of the Mississippi River, and notified the new Orleans District COE that further deployment of sea turtle deflecting dragheads and sea turtle observers in Southwest Pass was unnecessary as the habitat is believed to be unsuitable for sea turtles. NOAA Fisheries has no new evidence that would alter the conclusions of the previous assessment.

The Atchafalaya River and Bayous Chene, Boeuf, and Black are dredged for about 40 days each annually, usually by cutterhead, and between 2-3 million CY of mostly sand (80% sand; 20 % silt) is removed to maintain a channel 20 feet wide by 400 feet long. The project area includes both a bay and a bar channel. A hopper dredge was first used during 2002 (January 30-February 9) in an attempt to better remove "fluff." "Fluff" is fluid mud that returns to channel shortly after dredging and interferes with the passage of certain types of vessels. NOAA Fisheries is not aware of any previously documented take of either sea turtles or Gulf sturgeon during dredging in this channel. Hopper dredging may again occur at these locations in the future.

Galveston District

Hopper dredges are used for maintenance dredging in the Galveston District channels listed below. To date, all beach nourishment projects in the Galveston District have been with dredge materials associated with channel dredging (i.e., sand mining sites were not used) and Galveston District does not anticipate any change to this scenario (Hauch, e-mail comm. to Hawk, Nov. 15, 2000). Hopper dredges deployed since May 1995 have had 100% observer coverage, 100% inflow/overflow screening, rigid deflector dragheads, and dragarm operators have attempted to disengage dredge pumps when dragheads were suspended in the water column. Galveston District also attempts to schedule all hopper dredging during the December 1- March 31 recommended window. During FY02, four maintenance hopper dredging projects were completed: Port Mansfield Channel and Brazos Island Harbor, March; Freeport Harbor, July-August; and Sabine-Neches Waterway, July-August. During FY2003, maintenance dredging was accomplished at Brownsville Entrance Channel (December) and Aransas Pass (April-July).

The COE Galveston District has identified the following channels where maintenance dredging is or will be required and use of hopper dredges is anticipated.

1. The Sabine-Neches Waterway: Annual maintenance dredging is required in this channel, conducted by both contract and government-owned hopper dredges. In FY2003, the COE plans to commence dredging in May for about three months. The last reported takes in this waterway were a Kemp's ridley in March 1997, and a loggerhead in August 2002 during COE dredging of 2.88 million CY of material from July 27-August 13, 2002.

2. Galveston Harbor and Channel: This project was subsumed by the Houston-Galveston Navigation Channels (H-GNC) widening and deepening project which was the subject of a December 7, 1998, Opinion (F/SER/1998/00010). Although incidental take associated with *new material* dredging (i.e., non-maintenance type dredging such as widening and deepening) at H-GNC is covered by the Incidental Take Statement of the December 7, 1998, Opinion, regular maintenance dredging will be required at the Entrance Channel with Extension, Outer Bar Channel, Inner Bar Channel, Bolivar Roads Channel, and the Anchorage Basin and is included in the present Opinion. Authorized channel dimensions are: Entrance Channel (49 ft by 800-1,239 ft); Outer Bar Channel (47-49 ft by 800-1,239 ft); Inner Bar Channel (47 ft by 800-1,189 ft); Bolivar Roads Channel (47 ft by 800-1,000 ft); and Anchorage Basin (36 ft by 2,870-9,760 ft). The total length of these channels is 76,000 feet. Frequency of dredging along this project is expected to average approximately 1.5 years. Although it is not presently known what shoaling patterns will emerge, if the entire project were to be maintained under a single contract, approximately 3.5 million CY of material would need to be excavated requiring about six months of dredging. A more reasonable expectation would be that the project would be broken down into sections that would be dredged with varying frequencies. Maintenance operations will be performed by either contract or

government-owned hopper dredges. One Kemp's ridley and one green were taken during FY99 and one Kemp's ridley was taken in FY2003 in H-GNC dredging. The Houston-Galveston Entrance and Jetty Channel dredging work was scheduled to begin in June 2003 and continue for about three months. In addition, the Galveston District reinitiated consultation with NOAA Fisheries on December 3, 2002, on new material dredging for a proposed new barge channel within the H-GNC system but not considered by the December 7, 1998, Opinion. NOAA Fisheries completed consultation informally on the barge channel dredging (I/SER/2002/01438) on December 8, 2003, since non-hopper type dredges will be used.

3. Freeport Harbor: Dredging frequency has increased since the last consultation, from annual to biannual maintenance dredging by contract hopper requiring about two months of work. The average volume of material removed per contract has increased to about 1.6 million CY. A total of eight sea turtles (all loggerheads) has been taken at this site: one in October 1995, four in June-July 1996, one in October 1998, and two in August 2000. The COE dredged 2.0 million CY of material from July 13-September 24, 2002. FY03 dredging is scheduled to start in June 2003, for about four months.

4. Matagorda Ship Channel: Maintenance dredging is conducted for about 1.5 months every four years using contract hopper dredge. The last lethal take at this site was a loggerhead in October 1996.

5. Corpus Christi Ship Channel: Maintenance dredging is conducted every 1.5 years by contract or government-owned hopper dredge and requires approximately two months. One loggerhead was lethally taken during clean-up in the Port Aransas entrance channel area in September1995; three additional turtles (all loggerheads) were lethally taken in June 1999. Aransas Pass Entrance Channel dredging began in April 9, 2003 and was completed on July 7, 2003, after moving ca 1,153,000 CY of material. Four loggerheads and one Kemp's ridley turtle were taken by the dredge during the project; 71 turtles (55 loggerheads, 15 Kemp's ridleys, and one leatherback) were safely removed from the action area by relocation trawlers.

6. Corpus Christi Ship Channel Improvement Project: Deepening of the Corpus Christi Ship Channel and nearshore approaches to Corpus Christi Bay from about 6 miles offshore. The proposed deepening of the Corpus Christi Shipping Channel (CCSC) from Viola Basin in the Inner Harbor to the end of the jetties in the Gulf of Mexico to –52 ft from –45 ft mean low tide (MLT), plus advanced maintenance and allowable overdepth; deepening the remainder of the channel into the Gulf of Mexico to 54 ft (depths will be increased roughly 10,000 ft into the Gulf of Mexico to the –56 ft isobath); widening of the Upper bay and Lower Bay reaches (from Port Aransas to Harbor Bridge) to 530 ft (existing widths are 500 ft between Port Aransas and La Quinta Junction and 400 ft between La Quinta Junction and the Harbor Bridge); construction of 200-ft wide barge shelves (-12 ft MLT) on both sides of the ship channel from La Quinta Junction to the Harbor Bridge, across the Upper bay portion of the CCSC; and extending La Quinta Channel 7,200 ft to a depth of –40 ft MLT and a width of 400 ft and including a turning basin. It is estimated that approximately 40 million cubic yards of new work will require seven separate dredging contracts to complete. NOAA Fisheries completed formal consultation on this project, and issued an Incidental Take Statement, in December 2002. To date, no turtles have been taken. Any takes associated with future maintenance dredging associated with this project are included in the present Opinion's ITS.

7. Brazos Island Harbor (includes Brazos Santiago Pass - the Brownsville Entrance Channel): Maintenance dredging is conducted every two years by contract hopper dredge and requires approximately 1.5 months. Brazos was dredged in February 1995 and two green turtles and one Kemp's ridley were observed to be taken lethally. A Kemp's ridley and a loggerhead were lethally taken in late April and mid-June of 1997, respectively. Two greens were taken between mid-February and early March 1999. Two greens were taken in a 24-hour period between March 18-19, 2002, causing the COE to terminate the dredging before project completion. The dredge returned in December when waters

temperatures were slightly cooler. Two green turtles were taken between December 15-19, 2002, and work was again suspended due to the lethal takes.

8. Port Mansfield: Maintenance dredging is required every three years by hopper or pipeline dredge, except for the channel seaward of the jetties which requires approximately one month of hopper dredging during maintenance years. Dredging in FY02 occurred from March 4-20, 2002. The first ever reported takes at this site were March 19-20, 2002, when two green turtles were lethally taken within 24 hours. The COE decided to forego additional dredging during FY02 at this site since four of their five green turtles allotted for the COE fiscal year had been taken while two additional major navigation projects remain to be dredged (Freeport Harbor Entrance and Jetty Channels; Sabine Pass Outer Bar and Sabine Bank Channels).

Mobile District

The Mobile District COE has responsibility for civil works activities in the Florida Panhandle west of (but not including) the Aucilla River Basin (including the St. Marks River, Florida) to the Rigolets, Louisiana (up to but not including the Mississippi River). Hopper dredges are routinely used to maintain ocean bar and entrance pass channels leading from the Gulf of Mexico through passes between offshore barrier islands into Mobile Bay, Mississippi Sound, and Pensacola Bay. However, prior to the present Opinion, consultations with the Mobile District on hopper dredging activities were concluded informally every five years, as NOAA Fisheries did not believe until recently that protected species were likely to be impacted as COE observers aboard dredges in Mobile Bay in the early 1990s did not detect evidence of sea turtle entrainment (Henwood, pers. comm. 2002).

The COE Mobile District has identified the following channels in which regular maintenance dredging is required and use of hopper dredges is anticipated.

1. Gulfport Harbor, Mississippi: The Mississippi Sound portion of the project is maintained on a roughly 18-24 month basis. The Mississippi Sound portion of the channel (includes the Sound Channel, Gulfport Ship Channel, Commercial Small Craft Harbor Entrance Channel, and Anchorage Basin) is maintained by pipeline dredge, though the Anchorage Basin may be rarely dredged by hopper dredge. Average yearly dredged material removed from the Anchorage Basin has been about 376,000 CY. The Pass (Ship Island Pass bar channel) and the Gulf entrance channel are maintained on a 12-month basis. Prior to 1992, the majority of this material was removed by hopper dredge and placed in the ocean disposal sites; since 1992 the material from the bar channel has been removed by pipeline dredge and placed downdrift. About 400,000-450,000 CY are removed annually from each entrance channel (Pass and Gulf). The Gulf entrance channel is maintained by hopper dredge with the material placed in ocean sites located on either side of the entrance channel. Currently the Gulf Channel, Bar Channel, Sound Channel, and Gulfport Ship Channel are maintained at their authorized depths of 38, 38, 36, and 36 feet, respectively. The COE Mobile District has initiated a study to investigate potential improvements to the Gulfport Harbor project, including widening and deepening.

2. Pascagoula Harbor, Mississippi: The Mississippi Sound portion of this project is maintained on an 18-24 month basis, typically by pipeline dredge. On occasion, a hopper dredge is utilized within the Mississippi Sound, Bayou Casotte, and Pascagoula River portions of the navigation project, including Pascagoula Naval Station channels. The bar channels (includes the Gulf entrance channel and Horn Island Pass) are maintained on an approximate annual basis. The Pass portion of the project is maintained with a pipeline dredge; the Gulf entrance channel leading to the Pass, and the Horn Island impoundment basin, is usually maintained by hopper dredge with about 538,000 CY removed in each annual dredging cycle. Dredged material is typically disposed of in designated disposal areas alongside the entrance

channel within Mississippi Sound near the Pass, and just outside and southwest of the Pass in nearby designated offshore disposal areas.

3. Mobile Harbor, Alabama: Prior to 1986, all material from the Mobile Bay portion of the project (Mobile Harbor Channel) was dredged by pipeline and sidecast adjacent to the channel. Since 1986 this area (Mobile Bay Ship Channel) has been typically dredged annually by hopper dredge on a continuous basis. Theodore Ship Channel, located about mid-way down the Mobile Harbor Channel, is typically maintained by pipeline dredge but occasionally, when the required dredging is in the vicinity of the juncture with the Mobile Ship Channel, this area will be dredged by hopper dredge. Dredging of the entrance channel leading from the Gulf to Mobile Pass is typically on a 24-month basis. Due to the hydrodynamics of the Mobile Pass, very little dredging is required between Miles 30 and 34, which encompasses the Pass (bar channel) into Mobile Bay between Fort Morgan and Fort Gaines. However, required dredging in the southern portion of the project (Pass and Gulf entrance channel) is typically performed by deep-draft hopper dredges. Annually, an average of 6.1 million CY of material are dredged from Mobile Bay channels; 888,000 CY are dredged from the bar channel; and 1.2 million CY are dredged (by pipeline dredge) from Mobile River channels.

4. Orange Beach and Gulf Shores Beach Nourishment Project: The District has received a proposal from the cities of Orange Beach and Gulf Shores to nourish 11 miles of Gulf beaches, in four segments. The easternmost segment occupies 1.1 miles of Perdido Key from the Alabama/Florida state line westward to the Florida Point unit of Alabama Gulf State Park, Orange Beach, Alabama. The central segment occupies the western 3.6 miles of shoreline in Orange Beach and the eastern 1.9 miles of shoreline in the Gulf State Park, east of the park fishing pier. The western segment lies along 3.3 miles of west Gulf Shores, beginning approximately 0.25 mile west of the entrance to Little Lagoon. The final segment is approximately one mile in length and lies immediately west of the entrance to Little Lagoon in Gulf Shores. Segments 1, 2, and 3 will receive 50-100 cubic yards per linear foot of shoreline, which is expected to advance the shoreline over 200 feet seaward in most areas. Segment 4 is a dune restoration only; no more than 10 cubic yards of sand will be placed per linear foot of shoreline and all fill will be placed above the mean high tide line. A total of seven million cubic yards of sand would be dredged from four offshore sand mining sites. The sites are located approximately 1-3 miles offshore, between Gulf Highlands and Perdido Pass.

5. Pensacola Harbor, Florida: COE Mobile District is currently developing a long-term maintenance plan for civil works projects in Pensacola Bay. In the past COE Mobile District has not routinely maintained these civil works projects, instead they have typically acted as an agent for the U.S. Navy whose channel subsumes the Federal channel at Pensacola. Hopper dredge use is common in Pensacola Bay. The Pensacola Pass Channel (also called Perdido Key Pass) between Santa Rosa Island and Perdido Key has been dredged by pipeline and hopper dredge. Dredged materials are typically disposed of in a nearby designated disposal area just seaward and west of Pensacola Pass, alongside the entrance channel (Caucus Channel).

It is expected that occasional emergencies will arise necessitating limited hopper dredge use in Perdido Key Pass or Pensacola Harbor, including the Navy Channel, Inner Harbor Channel, and Approach Channels to accommodate national defense needs or to deal with unexpected, hazardous shoaling caused by major storms, floods, hurricanes, etc. An emergency hopper dredging project was required in Perdido Key Pass in 2000. NOAA Fisheries also consulted in February 2001 with the COE Jacksonville District, Regulatory Division on a U.S. Navy-requested emergency hopper dredging project to remove approximately 130,000 CY of sandy material from the entrance channel to the Pensacola Harbor and Pensacola Naval Air Station. Although this work requested by the U.S. Navy was under the regulatory responsibility of the Jacksonville District, it was actually performed by the Mobile District, which acted as the Navy's agent and was therefore responsible for obtaining all the required permits (e.g., a regulatory permit from the Jacksonville District, and a permit from the state of Florida). NOAA Fisheries recently completed a formal consultation with the Mobile District on dredging of Pensacola Pass in the U.S. Gulf of Mexico and the deposition of the dredging spoil in the littoral zone off Perdido Key to the west of Pensacola Pass by hopper dredge (F/SER/2003/00053; August 4, 2003). The COE Jacksonville District was the permitting authority; the Mobile District COE, acting as an agent for the U.S. Navy (specifically, Naval Air Station Pensacola), contracted for the hopper dredging/relocation trawling work.

The Mobile District began voluntarily putting endangered species observers on civil works hopper dredging projects within the District in late-summer 2002, following meetings and numerous discussions with NOAA Fisheries. Prior to this, observers were not routinely placed aboard hopper dredges within the District. The Mobile District to date has not required hopper dredges in their District to operate with sea turtle deflectors on their dragheads ("deflector dragheads"), citing lack of evidence of significant sea turtle presence in District waters, and also stating their belief that to prove this it is necessary to dredge without deflecting dragheads in order to gather unbiased evidence that sea turtles are not present in District waters. Hopper dredges operating in the District are required to have hopper inflow screening (4-inch mesh).

Jacksonville District (Florida West Coast - Aucilla River Basin, Florida to Key West, Florida)
Jacksonville District's civil works boundaries generally follow river basins and drainage areas rather than state lines. Jacksonville District is responsible for all of Florida, with the following two exceptions: Mobile District is responsible for the area west of the Aucilla River basin in Florida's panhandle, and Savannah District maintains the St. Mary's River watershed in northeast Florida except for the Fernandina entrance channel that is maintained by Jacksonville District. In addition, Jacksonville District is also responsible for the watersheds of the Suwannee, Withlacoochee, and Alapaha rivers in southern Georgia. Jacksonville District also constructs civil works projects in Puerto Rico and the U.S. Virgin Islands.

Of the numerous navigation projects along the Gulf coast under the Jacksonville District's purview, only the navigation channels in Tampa Bay and Charlotte Harbor are likely to be dredged by hopper dredge; however, there are several beach nourishment projects along the Gulf coast in Pinellas, Collier, Manatee, Sarasota, Escambia, and Lee Counties where hopper dredges may be used. Hopper dredges may be used in the larger nourishment projects where offshore sand mining sites are involved, including but not limited to the Johns Pass, Pass-a-Grille, Egmont Shoal, Estero Island, Pensacola Beach, Venice Beach, Pinellas County, and Lido Key sand mining areas. It is likely that new sand mining sites will soon be required, located, and identified as beach nourishment needs grow and old sites are depleted.

The COE Jacksonville District has identified the following channels and beach restoration projects in which regular maintenance dredging is required and use of hopper dredges is anticipated.

1. Tampa Harbor Navigation Project: Egmont Key (Tampa Bay Entrance Channel) is typically dredged every ten years, and was last dredged in the spring of 1997. Since 1995, three Kemp's ridleys and two loggerheads have been taken by hopper dredges maintaining Tampa Bay navigation channels.

2. St. Petersburg Harbor and Entrance Channel: Last dredged in fall of 2000, a pre-dredging risk assessment trawl survey over eight days (approximately 29 hours of trawling) in the proposed dredging area resulted in capture, tagging, and relocation of two adult loggerheads and one subadult green turtle. Hopper dredging (September-October 2000) resulted in surface sightings of three turtles but no takes. Dredged material was used for renourishment of Egmont Key beaches.

3. Boca Grande Pass (Charlotte Harbor Entrance Channel): Since 1992, the Pass has been dredged every 2-3 years, with about 265,000 CY of shoal material removed during each dredging event. Maintenance dredging between October 20, 1998, and January 13, 1999, resulted in one loggerhead (non-lethal) take

and three loggerhead surface sightings within 300 yards of the operating hopper dredge. Dredged materials are typically used to renourish Gasparilla Island beaches.

The Jacksonville District COE has stated that the Boca Grande Pass will not likely require continued maintenance dredging. Although Florida Power and Light (FPL) previously maintained a coal-unloading pier on the southeast side of Gasparilla Island, which was used to offload coal-laden barges pulled by tugboats through the Pass, as a result of FPLs conversion from coal to natural gas, the dock is no longer utilized and therefore dredging is not required. Currently, the majority of boat traffic through the Pass consists of shallow draft recreational vessels. Nevertheless, economic and other considerations may at some point cause FPL to revert to coal, thus re-establishing COEs requirement to dredge the Pass for tugs and barge traffic.

4. Lido Key Shore Protection Project: Three proposed new sand mining areas located approximately 8-10 miles offshore have been identified for the project. Side scan sonar deployed near the sand mining areas provided some evidence of low-relief hardground communities. Sand mining areas will be designated to ensure that dredging will not occur within a minimum of 200 feet from any hardground area.

5. Lee County Shore Protection Project, Gasparilla and Estero Islands: The COE proposes to nourish 2.8 miles of shore on Gasparilla Island with approximately 803,000 CY of material from the Gasparilla Island sand mining area located in the Gulf approximately 3,000 feet offshore of the south end of Gasparilla Island; and 4.7 miles of shore on Estero Island with about 1,023,000 CY of material dredged from the Estero Island sand mining area located approximately 16 miles west of the island. Gasparilla Island would be renourished every seven years; Estero Island every three years.

6. Sarasota County, Manasota Key, Shore Protection Project: The Jacksonville District proposes to conduct a periodic renourishment of Venice Beach using sand taken from one or more of four sand mining sites located from 6-10 miles offshore of Venice Inlet. The proposed action, scheduled to commence in early-winter 2003 will last approximately 3-6 months and will involve placement of sand on 3.2 miles of shoreline using an estimated 800,000 to 1,000,000 cubic yards of material. Due to the distance to the mining sites, a hopper dredge may be used.

7. Pinellas County Shore Protection Project: This project has historically obtained beach quality fill from inlet borrow areas and the Egmont Channel Shoal for nourishment of Pinellas County beaches including, but not limited to, Sand Key, Long Key, and Treasure Island. To accommodate future nourishment needs, alternative mining sites which are closer to the beach fill sites have been identified. Nine new offshore mining sites located between 2-6 miles offshore of Pinellas County and four ebb-tidal shoals, as well as a segment of Egmont Channel Shoal and an area within Passe-a-Grille Channel, are being investigated.

8. Pensacola Beach Restoration Project: The COE Jacksonville District Regulatory Division initiated section 7 consultation with NOAA Fisheries and issued a regulatory permit to the Santa Rosa Island Authority to restore Pensacola Beach shoreline with approximately four million CY of sand dredged from an offshore (~3.5 miles) mining site with either a hopper or pipeline dredge, starting in winter 2002. A biological opinion (F/SER/2002/00091) issued by SERO on October 11, 2002, analyzed project effects and authorized potential takes associated with this project. The present Opinion only considers future periodic maintenance dredging requirements for the Pensacola Beach Restoration Project, not the placement of sand into designated critical habitat, once the initial restoration project is completed.

9. Alafia River Channel and Turning Basin Expansion (Hillsborough Harbor, Tampa Bay): The Alafia River Channel branches off from the main ship channel about 28 miles from the Gulf entrance, and

extends 3.6 miles easterly to terminals at the mouth of the Alafia River. It has an authorized depth of 32 feet Mean Lower Low Water (MLLW) over a bottom width of 200 feet. The turning basin has an authorized depth of 32 feet over a bottom area 700 feet wide and 1,200 feet long. The Tampa Port Authority desires to modify the existing project by deepening and widening the Federal channel and turning basin. In May 2002, the COE submitted an environmental assessment (EA) for a plan for expansion of the Alafia River channel and turning basin.

The preferred alternative in the EA involves widening the channel 50 feet to the south and deepening the channel to a project depth of 42 ft MLLW, and recommends that the turning basin be widened to provide a 1,200-ft diameter area at the channel depth of 42 feet. Disposal of dredged materials (approximately 5.5 million CY) would be at the designated Offshore Dredged Material Disposal site, with some material going into beneficial use areas. Although it is anticipated that material will be removed with a clamshell/scow operation, hopper dredge use is not excluded. Explosives will likely be used, therefore the COE will need to consult separately with NOAA Fisheries on that aspect of the project, since this Opinion only addresses use of hopper dredges.

10. Manatee Harbor (Port Manatee) Navigation and Berth Improvements (Phase 2): NOAA Fisheries received a draft EA on April 1, 2002, for the proposed work. The recommended plan includes construction of wideners along both the north and south sides of the channel at the intersection with the Tampa Harbor Channel, and construction of a 900-ft diameter turning basin at the eastern end of the Manatee Harbor Channel. The project features would be dredged to the existing authorized depth of 40 feet. NOAA Fisheries consulted with the COE on this project on December 22, 1999, concluding that no adverse effects were expected if hopper dredges were not used.

11. Stump Pass Channel Realignment and Beach Nourishment Project: The Charlotte County Board of County Commissioners, via regulatory permit from the COE's Jacksonville District, proposes to realign Stump Pass, at the southern tip of Manasota Key, from its current configuration to its 1980 configuration. The creation of a new channel will require dredging of approximately 500,000 CY of material of nearshore submerged areas in the Gulf of Mexico, beach dune, and inshore submerged areas in Lemon Bay. The newly-aligned channel will be 400 feet wide, 1 mile long. The 500,000 CY of spoil material will be placed on 2.7 miles of beach at two separate areas. The County proposes to periodically maintenance dredge Stump Pass' realigned channel (every 3-5 years) and deposit the spoil material on Don Pedro Island.

12. Naval Air Station Pensacola, Channel Maintenance Dredging: The Mobile District acted as an agent for the Navy to conduct maintenance hopper dredging operations in a portion of the Pensacola Channel in 2003, via regulatory permit issued by the COE's Jacksonville District. The hopper dredging activity was limited to a small area of the channel between Santa Rosa Island and Perdido Key, which is where the most shoaling has occurred. About 150,000-200,000 CY was dredged, with thin layer disposal in the littoral zone to the west of the Pensacola Pass and south of Perdido Key. NOAA Fisheries issued a biological opinion for this activity on August 4, 2003 (F/SER/2003/00053). Future maintenance dredging activities of this channel using hopper dredges are included in the present Opinion, but not dredge spoil deposition in Gulf sturgeon critical habitat.

Scheduling

The Galveston, New Orleans, Mobile, and Jacksonville Districts shall attempt to schedule hopper dredging operations between December 1 and March 31 ("hopper dredging window"), wherever feasible. A 1991 jeopardy Opinion to the COE's SAD on hopper dredging of southeastern U.S. channels first identified this window as necessary to minimize sea turtle interactions. Subsequent studies by the COE (Dickerson et al. 1994) in six southeastern channels suggested that the existing windows were accurate. Sea turtles are generally less abundant in coastal waters of both the Southeast and the Gulf of Mexico during this time period compared to other times of the year since water temperatures are coolest. However, it is unlikely that the COE Districts can schedule all of their hopper-dredging projects during this time frame due to the lack of availability of the hopper dredge fleet, safety considerations, and unforseen emergencies such as those created by hurricanes and flooding which may cause sudden, hazardous shoaling of navigation channels; therefore, projects may need to occur outside of the window. Hopper dredging priorities are developed by COE Districts that utilize these dredges along both the Atlantic and Gulf coasts. Priorities are determined after considering the dredging requirements, and resident sea turtle populations within the Districts. Additionally, shoaling patterns in some channels and bays (e.g., Freeport Harbor, Mobile Bay, MR-GO, and MR-SWP) preclude the option of dredging only during the cooler months.

Inflow Screen Mesh
Since 1995, all maintenance hopper dredges working in the Galveston, New Orleans, and Jacksonville Districts, and South Atlantic Districts, have been equipped with 100% inflow/overflow screening. The standard mesh size used during maintenance dredging operations is 4-inch by 4-inch. One hundred percent inflow screening is required, unless waived by NOAA Fisheries because it would otherwise be impossible to implement and still carry out the project, and 100% overflow screening is recommended. If conditions prevent 100% inflow screening, inflow screening may be reduced, but 100% overflow screening is then required. Whenever the clay or debris content of dredged materials causes excessive clogging, as verified by onboard endangered species observers, the COE consults with NOAA Fisheries and inflow screening is usually waived (often, inflow screen mesh size is gradually increased) until the substrate changes and clogging is no longer a problem. Whenever the inflow screening is removed due to potential clogging difficulties, 100% overflow screening is mandatory. Due to differences in overflow screen design, some hopper dredge vessels have overflow screens which are more efficient (i.e., easier to sample, more effective at retaining fragments of dismembered protected species) than others; e.g., horizontal overflow screens are much more efficient than vertical overflow screens. On the hopper dredge EAGLE 1, vertical overflow screening makes sampling for protected species' remains difficult and inconclusive.

For the Galveston District's H-GNC Entrance and Jetty Channels deepening and widening project, new material with high clay concentrations would be dredged. Taking this potential clogging problem into consideration, NOAA Fisheries' December 7, 1998, Opinion allowed successive modifications (increasing mesh size) to be made to hopper inflow screens if the standard 4-inch screens proved unworkable due to excessive clogging. NOAA Fisheries agreed that if the dredge operator, in consultation with observers and any onboard COE or NOAA Fisheries' personnel, determined that the draghead was clogging and reducing production substantially, the inflow screen mesh size could be gradually increased, and even eliminated entirely if necessary.

Occasionally, inflow screens are damaged by the pressure of the dredge slurry on the clogged mesh, requiring screens to be either opened or removed for repairs. When screens are removed, effective monitoring for sea turtle and sturgeon parts is not possible. As a result, COE Galveston District has suggested that in the present regional Opinion, a graduated mesh option–as was previously authorized for the H-GNC deepening and widening project–be authorized Gulf-wide. Graduated mesh would be permitted when clogging of the smaller mesh becomes excessive. Mesh size could then be increased incrementally. This provision for graduated mesh would allow better, more effective monitoring (compared to screen opening or removal), particularly in Freeport and Galveston channels where clogging is a problem during maintenance dredging.

3.0 Status of Listed Species and Critical Habitat

Much of the information for this section, as well as additional detailed information relating to the species biology, habitat requirements, threats, and recovery objectives, can be found in the recovery plan for each species (see "References Cited" section). The following listed species under the jurisdiction of NOAA Fisheries are known to occur in the Gulf of Mexico:

Endangered	
Green sea turtle[3]	*Chelonia mydas*
Leatherback sea turtle	*Dermochelys coriacea*
Hawksbill sea turtle	*Eretmochelys imbricata*
Kemp's ridley sea turtle	*Lepidochelys kempii*
Sperm whale	*Physeter catodon*
Humpback whale	*Megaptera novaeangliae*
Fin whale	*Balaenoptera physalus*
Blue whale	*Balaenoptera musculus*
Sei whale	*Balaenoptera borealis*
Northern right whale	*Eubalaena glacialis*
Smalltooth sawfish	*Pristis pectinata*
Threatened	
Loggerhead sea turtle	*Caretta caretta*
Gulf sturgeon	*Acipenser oxyrinchus desotoi*

Critical Habitat

Within the Gulf of Mexico, critical habitat has only been designated for the Gulf sturgeon.

Species Not Likely to Be Affected

Leatherback sea turtles (*Dermochelys coriacea*) are generally found in deep, pelagic, offshore waters though they occasionally may come into shallow waters to feed on aggregations of jellyfish. Leatherbacks are unlikely to be found associated with ship channels and thus are unlikely to be impacted by hopper dredging activity. There has only been one reported instance of a take of a leatherback sea turtle by a relocation trawler in a shipping channel, approximately 1.5 miles offshore of Aransas Pass, Texas (April 28, 2003, pers. comm. T. Bargo to E. Hawk), and there has never been a reported take by a hopper dredge. The typical leatherback turtle would be as large or larger than the large, industry-standard California-type hopper dredge draghead. Leatherback sea turtles will not be considered further in this Opinion based on the unlikelihood of their presence nearshore and their non-benthic feeding habits which combine to produce a very low likelihood of hopper dredge entrainment.

Smalltooth sawfish (*Pristis pectinata*) are tropical marine and estuarine fish that have the northwestern terminus of their Atlantic range in the waters of the eastern U.S. Currently, their distribution has contracted 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 historic range; however, such bycatch is now rare due to population declines and population extirpations. Between 1990 and 1999, only four documented takes of smalltooth

---

[3]Green turtles in U.S. waters are listed as threatened except for the Florida breeding population which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters.

sawfish occurred in shrimp trawls in Florida (Simpendorfer 2000). After consultation with individuals with many years in the business of providing qualified observers to the hopper dredge industry to monitor incoming dredged material for endangered species remains (C. Slay, Coastwise Consulting, pers. comm. August 18, 2003) and a review of the available scientific literature, NOAA Fisheries has determined that there has never been a reported take of a smalltooth sawfish by a hopper dredge, and such take is unlikely to occur because of smalltooth sawfishes' affinity for shallow, estuarine systems. Only hopper dredging of Key West channels would have the potential to impact smalltooth sawfish but those channels are not considered in this Opinion. Therefore, NOAA Fisheries believes that smalltooth sawfish are rare in the action area, the likelihood of their entrainment is very low, and that the chances of the proposed action affecting them are discountable. This species will not be discussed further in this Opinion.

Sperm whales (*Physeter macrocephalus*) occur in the Gulf of Mexico but are rare in inshore waters. Other endangered whales, including North Atlantic right whales (*Eubalaena glacialis)* and humpback whales (*Megaptera novaeangliae*), have been observed occasionally in the Gulf of Mexico. The individuals observed have likely been inexperienced juveniles straying from the normal range of these 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 by projects in the Gulf. NOAA Fisheries believes 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. Based on the unlikelihood of their presence, feeding habits, and very low likelihood of hopper dredge interaction, the above-mentioned cetaceans are not considered further in this Opinion.

Species and Critical Habitat Likely to Be Affected

Of the above-listed threatened and endangered species of sea turtles, whales, and sturgeon potentially present in the action area, NOAA Fisheries believes that only loggerhead, green, hawksbill, and Kemp's ridley sea turtles, and Gulf sturgeon, are vulnerable to being taken as a result of the use of hopper dredges to maintain, or deepen and widen navigation channels and harbors, or to dredge sand mining areas for beach nourishment in the U.S. Gulf of Mexico. Hopper dredging activities also have the potential to destroy or adversely effect Gulf sturgeon critical habitat. Descriptions follow for each of these five species and for the designated critical habitat.

A. Species/critical habitat description

<u>Loggerhead Sea Turtle</u>

The loggerhead sea turtle was listed as a threatened species on July 28, 1978. This species 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. The major nesting areas include coastal islands of Georgia, South Carolina, and North Carolina, and the Atlantic and Gulf coasts of Florida, with the bulk of the nesting occurring on the Atlantic coast of Florida. Developmental habitat for small juveniles is the pelagic waters of the North Atlantic and the Mediterranean Sea (NMFS and USFWS 1991b).

Life history

In the western Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf coast of Florida. There are five western Atlantic subpopulations, divided geographically as follows: (1) a northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29° N; (2) a south Florida nesting subpopulation, occurring from 29° N on the east coast to Sarasota on the west coast; (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (Márquez 1990 and TEWG 2000); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (NMFS SEFSC 2001). The fidelity of nesting females to their nesting beach is the reason these subpopulations can be differentiated from one another. This nest beach fidelity will prevent recolonization of nesting beaches with turtles from other subpopulations.

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/individual (Murphy and Hopkins 1984). Nesting migrations for an individual female loggerhead are usually on an interval of 2-3 years, but can vary from 1-7 years (Dodd 1988). Generally loggerhead sea turtles originating from the western Atlantic nesting aggregations are believed to lead a pelagic existence in the North Atlantic Gyre for as long as 7-12 years or more. Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm straight-line carapace length they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the United States Atlantic and Gulf of Mexico. Benthic immature loggerheads (turtles that have come back to inshore and near shore waters), the life stage following the pelagic immature stage, have been found from Cape Cod, Massachusetts, to southern Texas, and occasionally strand on beaches in northeastern Mexico.

Past literature gave an estimated age at maturity of 21-35 years (Frazer and Ehrhart 1985; Frazer et al. 1994) with the benthic immature stage lasting at least 10-25 years. However, based on new data from tag returns, strandings, and nesting surveys NMFS SEFSC (2001) estimates ages of maturity ranging from 20-38 years and benthic immature stage lasting from 14-32 years.

Pelagic and benthic juveniles are omnivorous and forage on crabs, mollusks, jellyfish, and vegetation at or near the surface (Dodd 1988). Sub-adult and adult loggerheads are primarily coastal and typically prey on benthic invertebrates such as mollusks and decapod crustaceans in hard bottom habitats.

Population dynamics and status

A number of stock assessments (TEWG 1998, TEWG 2000, and NMFS SEFSC 2001) have examined the stock status of loggerheads in the waters of the United States, but have been unable to develop any reliable estimates of absolute population size. Based on nesting data, of the five western Atlantic subpopulations, the south Florida nesting subpopulation and the northern nesting subpopulation are the most abundant (TEWG 2000 and NMFS SEFSC 2001). The Turtle Expert Working Group (TEWG) (2000) was able to assess the status of these two better-studied populations and concluded that the south Florida subpopulation is increasing, while no trend is evident (at that time considered stable but possibly declining) for the northern subpopulation. Another consideration adding to the vulnerability of the northern subpopulation is that NOAA Fisheries' scientists estimate that the northern subpopulation produces 65% males (NMFS SEFSC 2001).

The latest and most extensive stock assessment (NMFS SEFSC 2001) was successful in assembling the best available information on loggerhead turtle life history and developing population models that can be used to predict the response of the loggerhead populations to changes in their mortality and survival. The new turtle excluder device rule (68 FR 8456, February 21, 2003) requiring larger openings is expected to reduce trawl related loggerhead mortality by 94% (Epperly et al. 2002). Based on the loggerhead population models in NMFS SEFSC (2001) this change in the mortality rate is expected to move the northern nesting population from stable to increasing.

The southeastern United States nesting aggregation is second in size only to the nesting aggregation on islands in the Arabian Sea off Oman (Ross 1979, Ehrhart 1989, NMFS and USFWS 1991b). The southeast United States nesting aggregation is especially important because the status of the Oman colony has not been evaluated recently. It is located in an area of the world where it is highly vulnerable to disruptive events such as political upheavals, wars, catastrophic oil spills, and lack of strong protections (Meylan et al. 1995).

Ongoing threats to the western Atlantic populations include incidental takes from dredging, commercial trawling, longline fisheries, and gill net fisheries; loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and disease.

Green Sea Turtle

Federal listing of the green sea turtle occurred on July 28, 1978, with all populations listed as threatened except for the Florida and Pacific coast of Mexico breeding populations, which are endangered. The complete nesting range of the green turtle within the NOAA Fisheries' Southeast Region includes sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands between Texas and North Carolina and the Unite States Virgin Islands (U.S.V.I.) and Puerto Rico (NMFS and USFWS 1991a). Principal United States nesting areas for green turtles are in eastern Florida, predominantly Brevard through Broward Counties (Ehrhart and Witherington 1992). Green turtle nesting also occurs regularly on St. Croix, U.S.V.I., and on Vieques, Culebra, Mona, and the main island of Puerto Rico (Mackay and Rebholz 1996).

Life history

Green sea turtle mating occurs in the waters off the nesting beaches. Each female deposits 1-7 clutches (usually 2-3) during the breeding season at 12-14 day intervals. Mean clutch size is highly variable among populations, but averages 110-115 eggs/nest. Females usually have 2-4 or more years between breeding seasons, while males may mate every year (Balazs 1983). After hatching, green sea turtles go through a post-hatchling pelagic stage where they are associated with drift lines of algae and other debris.

Green turtle foraging areas in the southeastern United States include any coastal shallow waters having macroalgae or sea grasses near mainland coastlines, islands, reefs, or shelves, and any open-ocean surface waters, especially where advection from wind and currents concentrates pelagic organisms (Hirth 1997, NMFS and USFWS 1991a). Principal benthic foraging areas in the southeastern United States include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Doughty 1984, Hildebrand 1982, Shaver 1994), the Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Caldwell and Carr 1957, Carr 1984), Florida Bay and the Florida Keys (Schroeder and Foley 1995), 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). Adults of both sexes are presumed to migrate between nesting and foraging habitats along corridors adjacent to coastlines and reefs. Age at sexual maturity is estimated to be between 20-50 years (Balazs 1982, Frazer and Ehrhart 1985).

Green sea turtles are primarily herbivorous, feeding on algae and sea grasses, but also occasionally consume jellyfish and sponges. The post-hatchling, pelagic-stage individuals are assumed to be omnivorous, but few data are available.

Population dynamics and status

The vast majority of green turtle nesting within the southeastern United States occurs in Florida (Meylan et al. 1995, Johnson and Ehrhart 1994). Marine turtle populations have been monitored on Florida nesting beaches for nearly four decades. Currently, the Florida Wildlife Commission (FWC) coordinates the collection of nesting survey data on 180 survey areas comprising 1,300 km of nesting beach. Thirty-three of these beaches, chosen to represent the state geographically, participate in FWC's Index Nesting Beach Survey Program by following a standardized methodology for data collection that allows for statistically valid trend evaluation. It is unclear how greatly green turtle nesting in the whole of Florida has been reduced from historical levels (Dodd 1981). However, based on 1989-2002 nesting information, green turtle nesting in Florida has been increasing (Florida Marine Research Institute Statewide Nesting 2002, Database). Total nest counts and trends at index[4] beach sites during the past decade suggest that green turtles that nest within the southeastern United States are increasing.

There are no reliable estimates of the number of immature green turtles that inhabit coastal areas (where they come to forage) of the southeastern United States. However, information on incidental captures of immature green turtles at the St. Lucie Power Plant (average 215 green turtle captures per year since 1977) in St. Lucie County, Florida (on the Atlantic coast) indicates that the annual number of immature green turtles captured has increase significantly in the past 26 years (FPL 2002). At the power plant, the annual number of immature green turtle captures has increased significantly in the past 26 years. It is not known whether or not this increase is indicative of local or Florida east coast populations.

It is likely that immature green turtles foraging in the southeastern United States come from multiple genetic stocks; therefore, the status of immature green turtles in the southeastern United States might also be assessed from trends at all of the main regional nesting beaches, principally Florida, Yucatán, and Tortuguero. Trends at Florida beaches are presented above. Trends in nesting at Yucatán beaches cannot be assessed because of a lack of consistent beach surveys over time. Trends at Tortuguero (ca. 20,000-50,000 nests/year) show a significant increase in nesting during the period 1971-1996 (Bjorndal et al. 1999). Therefore, it seems reasonable that there is an increase in immature green turtles inhabiting coastal areas of the southeastern United States; however, the magnitude of this increase is unknown.

The principal cause of past declines and extirpations of green turtle assemblages has been the over-exploitation of green turtles for food and other products. Although intentional take of green turtles and their eggs is not extensive within the southeastern United States, green turtles that nest and forage in the region may spend large portions of their life history outside the region and outside United States jurisdiction, where exploitation is still a threat. However, there are still significant and ongoing threats to green turtles from human-related causes in the United States. These threats include beach armoring, erosion control, artificial lighting, beach disturbance (e.g., driving on the beach), pollution, foraging habitat loss as a result of direct destruction by dredging, siltation, boat damage, other human activities and fishing gear. There is also the increasing threat from occurrences of green turtle fibropapillomatosis disease. Presently, this disease is cosmopolitan and has been found to affect large numbers of animals in some areas, including Hawaii and Florida (Herbst 1994, Jacobson 1990, Jacobson et al. 1991).

<u>Kemp's Ridley Sea Turtle</u>

---

[4]Indexed beaches are those where survey effort to monitor annual nesting has been standardized and is constant from year to year and therefore nesting trends may be determined with statistical confidence; at non-indexed beaches, survey effort may, and often does, vary from year to year.

The Kemp's ridley was listed as endangered on December 2, 1970. Internationally, the Kemp's ridley is considered the most endangered sea turtle (Zwinenberg 1977, Groombridge 1982, TEWG 2000). Kemp's ridleys nest primarily at Rancho Nuevo, a stretch of beach in Mexico, Tamaulipas State. The species occurs mainly in coastal areas of the Gulf of Mexico and the northwestern Atlantic Ocean. Occasional individuals reach European waters (Brongersma 1972). 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.

Life history

Females return to their nesting beach about every two years (TEWG 1998). 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. The mean clutch size for Kemp's ridleys is 100 eggs/nest, with an average of 2.5 nests/female/season.

Benthic immature Kemp's ridleys have been found along the east coast Seaboard of the United States and in the Gulf of Mexico. 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). Little is known of the movements of the post-hatching stage (pelagic stage) within the Gulf. Studies have shown the post-hatchling pelagic stage varies from 1-4 or more years, and the benthic immature stage lasts 7-9 years (Schmid and Witzell 1997). The TEWG (1998) estimates age at maturity from 7-15 years.

Stomach contents of Kemp's ridleys taken from the lower Texas coast consisted of mainly nearshore crabs and mollusks, as well as fish, shrimp, and other foods considered to be shrimp fishery discards (Shaver 1991). Pelagic stage Kemp's ridleys presumably feed on the available sargassum and associated infauna or other epipelagic species found in the Gulf of Mexico.

Population dynamics and status

Of the seven extant species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. Most of the population of adult females nest on the Rancho Nuevo beaches (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the mid-1980s nesting numbers were below 1,000 (with a low of 702 nests in 1985). However, recent observations of increased nesting (with 6,277 nests recorded in 2000) suggest that the decline in the ridley population has stopped and the population is now increasing (USFWS 2000).

A period of steady increase in benthic immature Kemp's ridleys has been occurring since 1990 and appears to be due to increased hatchling production and an apparent increase in survival rates of immature turtles beginning in 1990. The increased survivorship of immature turtles is due in part to the introduction of turtle excluder devices (TEDs) in the United States and Mexican shrimping fleets. As demonstrated by nesting increases at the main nesting sites in Mexico adult Kemp's ridley numbers have grown. The population model used by TEWG (2000) projected that Kemp's ridleys could reach the intermediate recovery goal identified in the Recovery Plan, of 10,000 nesters by the year 2015.

The largest contributor to the decline of the Kemp's ridley in the past was commercial and local exploitation, especially poaching of nests at the Rancho Nuevo site, as well as the Gulf of Mexico shrimp trawl fisheries. The advent of TED regulations for trawlers and protections for the nesting beaches have allowed the species to begin to rebound. Many threats to the future of the species remain, including interactions with fishery gear, marine pollution, foraging habitat destruction, illegal poaching of nests and potential threats to the nesting beaches from such sources as global climate change, development, and tourism pressures.

Hawksbill Sea Turtle

The hawksbill turtle was listed as endangered on June 2, 1970, and is considered Critically Endangered by the International Union for the Conservation of Nature (IUCN). The hawksbill is a medium-sized sea turtle with adults in the Caribbean ranging in size from approximately 62.5 to 94.0 cm straight carapace length. The species occurs in all ocean basins although it is relatively rare in the Eastern Atlantic and Eastern Pacific, and absent from the Mediterranean Sea. Hawksbills are the most tropical of the marine turtles, ranging from approximately 30°N to 30°S. They are closely associated with coral reefs and other hard-bottom habitats, but they are also found in other habitats including inlets, bays and coastal lagoons (NMFS and USFWS 1993).

Life History

There are five regional nesting populations with more than 1,000 females nesting annually. These populations are in the Seychelles, Mexico, Indonesia, and two in Australia (Meylan and Donnelly 1999). Reproductive females undertake periodic (usually non-annual) migrations to their natal beach to nest. Movements of reproductive males are less well known, but are presumed to involve migrations to the nesting beach or to courtship stations along the migratory corridor (Meylan 1999b). Females nest an average of 3-5 times per season (Meylan and Donnelly 1999, Richardson et al. 1999). Clutch size is higher on average (up to 250 eggs) than that of other turtles (Hirth 1980). Reproductive females may exhibit a high degree of fidelity to their nest sites.

The life history of hawksbills consists of a pelagic stage that lasts from the time they leave the nesting beach as hatchlings until they are approximately 22-25 cm in straight carapace length (Meylan 1988, Meylan and Donnelly 1999), followed by residency in developmental habitats (foraging areas where immatures reside and grow) in coastal waters. Adult foraging habitat, which may or may not overlap with developmental habitat, is typically coral reefs, although other hard-bottom communities and occasionally mangrove-fringed bays may be occupied. Hawksbills show fidelity to their foraging areas over periods of time as great as several years (van Dam and Díez 1998).

Their diet is highly specialized and consists primarily of sponges (Meylan 1988) although other food items, notably corallimorphs and zooanthids, have been documented to be important in some areas of the Caribbean (van Dam and Díez 1997, Mayor et al. 1998, Leon and Díez 2000).

Population Dynamics, Status, and Distribution

There has been a global population decline of over 80% during the last three generations (105 years) (Meylan and Donnelly 1999).

In the Western Atlantic, the largest hawksbill nesting population occurs in the Yucatán Península of Mexico, where several thousand nests are recorded annually in the states of Campeche, Yucatán, and Quintana Roo (Garduño-Andrade et al. 1999). Important but significantly smaller nesting aggregations are documented elsewhere in the region in Puerto Rico, the U.S. Virgin Islands, Antigua, Barbados, Costa Rica, Cuba, and Jamaica (Meylan 1999a). Estimates of the annual number of nests for each of these areas are of the order of hundreds to a few thousand. Nesting within the southeastern U.S. and U.S. Caribbean is restricted to Puerto Rico (>650 nests/yr), the U.S. Virgin Islands (~400 nests/yr), and, rarely, Florida (0-4 nests/yr)(Eckert 1995, Meylan 1999a, Florida Statewide Nesting Beach Survey database 2002). At the two principal nesting beaches in the U.S. Caribbean where long-term monitoring has been carried out, populations appear to be increasing (Mona Island, Puerto Rico) or stable (Buck Island Reef National Monument, St. Croix, USVI) (Meylan 1999a).

Gulf Sturgeon

NOAA Fisheries and the FWS listed the Gulf sturgeon, also known as the Gulf of Mexico sturgeon, as a threatened species on September 30, 1991 (56 CFR 49653). The present range of the Gulf sturgeon extends from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi east 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, Reynolds 1993).

Life history

The Gulf sturgeon is 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, bays, and the Gulf of Mexico to the coastal rivers in early spring (i.e., March through May) when river water temperatures range from 16 to 23°C (Huff 1975, Carr 1983, Wooley and Crateau 1985, Odenkirk 1989, Clugston et al. 1995, Foster and Clugston 1997, Fox and Hightower 1998, Sulak and Clugston, 1999, Fox et al. 2000). Fall downstream migration from the river into the estuary/Gulf of Mexico begins in September (at water temperatures around 23°C) and continues through November (Huff 1975, Wooley and Crateau 1985, Foster and Clugston 1997).

Most subadult and adult Gulf sturgeon spend cool months (October or November through March or April) in estuarine areas, bays, or in the Gulf of Mexico (Odenkirk 1989, Foster 1993, Clugston et al. 1995, and Fox et al. 2002). Research indicates that in the estuary/marine environment both subadult and adult Gulf sturgeon show a preference for sandy shoreline habitats with water depths less than 3.5 m and salinity less than 6.3 parts per thousand (Fox and Hightower 1998, Parauka et al. in press). The majority of tagged fish have been located in areas lacking seagrass (Fox et al. 2002, Parauka et al. in press), in shallow shoals 1.5 to 2.1 m and deep holes near passes (Craft et al. 2001), and in unvegetated, fine to medium-grain sand habitats, such as sandbars, and intertidal and subtidal energy zones (Menzel 1971, Abele and Kim 1986). These shifting, predominantly sandy, areas support a variety of potential prey items including estuarine crustaceans, small bivalve mollusks, ghost shrimp, small crabs, various polychaete worms, and lancelets (Menzel 1971, Abele and Kim 1986, AFS 1989, and M. Brim, USFWS pers. comm. 2002).

Once subadult and adult Gulf sturgeon migrate from the river to the estuarine/marine environment, having spent at least 6 months in the river fasting, it is presumed that they immediately begin foraging. Upon exiting the rivers, Gulf sturgeon are found in high concentrations near their natal river mouths; these lakes and bays at the mouth of the river are important because they offer the first opportunity for Gulf sturgeon to forage. Specifics regarding Gulf sturgeon diet items and foraging are discussed within Section IV (Effects of the Action) of this Opinion.

Gulf sturgeon are long-lived, with some individuals reaching at least 42 years in age (Huff 1975). Age at sexual maturity for females ranges from 8 to 17 years, and for males from 7 to 21 years (Huff 1975). Chapman et al. (1993) estimated that mature female Gulf sturgeon weighing between 29 and 51 kg produce an average of 400,000 eggs.

Based on the fact that male Gulf sturgeon are capable of annual spawning, and females require more than one year between spawning events (Huff 1975, Fox et al. 2000), we assume that the Gulf sturgeon are similar to Atlantic sturgeon (*A. o. oxyrhinchus*); that is, they exhibit a long inter-spawning period, with females spawning at intervals ranging from every 3 to 5 years, and males every 1 to 5 years (Smith 1985).

Spawning occurs in the upper river reaches in the spring when water temperature is around 15° to 20°C. While Sulak and Clugston (1999) suggested that sturgeon spawning activity is related to moon phase, other researchers have found little evidence of spawning associated with lunar cycles (Slack et al. 1999, Fox et al. 2000). Fertilization is external; females deposit their eggs on the river bottom and males fertilize them. Gulf sturgeon eggs are demersal, adhesive, and vary in color from gray to brown to black (Vladykov and Greeley 1963, Huff 1975, Parauka et al. 1991).

Genetic studies conclude that Gulf sturgeon exhibit river-specific fidelity. Stabile et al. (1996) analyzed tissue taken from Gulf sturgeon in eight drainages along the Gulf of Mexico for genetic diversity; they noted significant differences among Gulf sturgeon stocks, and suggested region-specific affinities and likely river-specific fidelity. Five regional or river-specific stocks (from west to east) have been identified: (1) Lake Pontchartrain and Pearl River, (2) Pascagoula River, (3) Escambia and Yellow Rivers, (4) Choctawhatchee River, and (5) Apalachicola, Ochlockonee, and Suwannee Rivers (Stabile et al. 1996).

Tagging studies also indicate that Gulf sturgeon exhibit a high degree of river fidelity (Carr 1983). Of 4,100 fish tagged, 21% (860/4100 fish) were later recaptured in the river of their initial collection, eight fish (0.009%) moved between river systems, and the remaining fish (78%) have not yet been recaptured (USFWS et al. 1995). There is no information documenting the presence of spawning adults in non-natal rivers. However, there is some evidence of inter-riverine (from natal rivers into non-natal) movements by both male and female Gulf sturgeon (n=22) (Wooley and Crateau 1985, Carr et al. 1996, Craft et al. 2001, Ross et al. 2001b, Fox et al. 2002). It is important to note that gene flow is low in Gulf sturgeon stocks, with each stock exchanging less than one mature female per generation (Waldman and Wirgin 1998).

A full discussion of the life history of this subspecies may be found in the September 30, 1991, final rule listing the Gulf sturgeon as a threatened species (56 FR 49653), the Recovery/Management Plan approved by NOAA Fisheries and the U.S. Fish and Wildlife Service in September 1995, and the final rule designating Gulf sturgeon critical habitat (68 FR 13370).

Population dynamics and status

Gulf sturgeon occur in most major tributaries of the northeastern Gulf of Mexico, from the Mississippi River east to Florida's Suwannee River, and in the central and eastern nearshore Gulf waters as far south as Charlotte Harbor (Wooley and Crateau 1985). In Florida, Gulf sturgeon are present in the Escambia, Yellow, Blackwater, Choctawhatchee, Apalachicola, Ochlockonee, and Suwannee Rivers (Reynolds 1993). While little is known about the abundance of Gulf sturgeon throughout most of its range, population estimates have been calculated for the Apalachicola, Choctawhatchee, and Suwannee Rivers. The USFWS calculated an average (from 1984-1993) of 115 individuals (> 45 cm TL) over-summering in the Apalachicola River below Jim Woodruff Lock and Dam (USFWS et al. 1995). Preliminary estimates of the Gulf sturgeon subpopulation in the Choctawhatchee River system are 2,000 to 3,000 fish over 61 cm TL. The Suwannee River Gulf sturgeon population (i.e., fish > 60 cm TL and older than age 2) has recently been calculated at approximately 7,650 individuals (Sulak and Clugston 1999). Although the size of the Suwannee River population is considered stable, the population structure is highly dynamic as indicated by length frequency histograms (Sulak and Clugston 1999). Strong and weak year classes coupled with the regular removal of larger fish (by natural mortality) limits the growth of the Suwannee River population but stabilizes the average population size (Sulak and Clugston 1999).

Gulf Sturgeon Critical Habitat

Gulf sturgeon critical habitat was jointly designated by the NOAA Fisheries and FWS in 2003 (68 FR 13370). Critical habitat is defined in section 3(5)(A) of the ESA as (i) the specific areas within the geographic area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographic area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation" is defined in section 3(3) of the ESA as the use of all methods and procedures that are necessary to bring any endangered or threatened species to the point at which listing under the ESA is no longer necessary.

Gulf sturgeon critical habitat includes areas within the major river systems that support the seven currently reproducing subpopulations (USFWS et al. 1995) and associated estuarine and marine habitats. Gulf sturgeon use the rivers for spawning, larval and juvenile feeding, adult resting, and staging, and to move between the areas that support these components. Gulf sturgeon use the lower riverine, estuarine, and marine environment during winter months primarily for feeding and, more rarely, for inter-river migrations. Estuaries and bays adjacent to the riverine units protect unobstructed passage of sturgeon from feeding areas to spawning grounds.

Fourteen areas (units) are designated as Gulf sturgeon critical habitat. Critical habitat units encompass approximately 2,783 river kilometers (rkm) and 6,042 km^2 of estuarine and marine habitats and include portions of the following Gulf of Mexico rivers, tributaries, estuarine and marine areas:

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 = the 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

Critical habitat determinations focus on those physical and biological features (primary constituent elements = PCEs) that are essential to the conservation of the species (50 CFR 424.12). Federal agencies must insure that their activities are not likely to result in the destruction or adverse modification of the PCEs within defined critical habitats. Therefore, proposed actions that may impact designated critical habitat require an analysis of potential impacts to each PCE.

PCEs identified as essential for the conservation of the Gulf sturgeon consist of :

(1) Abundant food items, such as detritus, aquatic insects, worms, and/or molluscs, within riverine habitats for larval and juvenile life stages; and abundant prey items, such as amphipods, lancelets, polychaetes, gastropods, ghost shrimp, isopods,

molluscs and/or crustaceans, within estuarine and marine habitats and substrates for subadult and adult life stages;

(2) Riverine spawning sites with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone, or hard clay;

(3) Riverine aggregation areas, also referred to as resting, holding, and staging areas, used by adult, subadult, and/or juveniles, generally, but not always, located in holes below normal riverbed depths, believed necessary for minimizing energy expenditures during fresh water residency and possibly for osmoregulatory functions;

(4) A flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) necessary for normal behavior, growth, and survival of all life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging, and for maintaining spawning sites in suitable condition for egg attachment, egg sheltering, resting, and larval staging;

(5) Water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages;

(6) Sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; and

(7) Safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (e.g., an unobstructed river or a dammed river that still allows for passage).

As stated in the final rule designating Gulf sturgeon critical habitat, the following activities, among others, when authorized, funded or carried out by a Federal agency, may destroy or adversely modify critical habitat:

(1) Actions that would appreciably reduce the abundance of riverine prey for larval and juvenile sturgeon, or of estuarine and marine prey for juvenile and adult Gulf sturgeon, within a designated critical habitat unit, such as dredging; dredged material disposal; channelization; in-stream mining; and land uses that cause excessive turbidity or sedimentation;

(2) Actions that would appreciably reduce the suitability of Gulf sturgeon spawning sites for egg deposition and development within a designated critical habitat unit, such as impoundment; hard-bottom removal for navigation channel deepening; dredged material disposal; in-stream mining; and land uses that cause excessive sedimentation;

(3) Actions that would appreciably reduce the suitability of Gulf sturgeon riverine aggregation areas, also referred to as resting, holding, and staging areas, used by adult, subadult, and/or juveniles, believed necessary for minimizing energy expenditures and possibly for osmoregulatory functions, such as dredged material disposal upstream or directly within such areas; and other land uses that cause excessive sedimentation;

(4) Actions that would alter the flow regime (the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) of a riverine critical habitat unit such that it is appreciably impaired for the purposes of Gulf sturgeon migration, resting, staging, breeding site selection, courtship, egg fertilization, egg deposition, and egg development, such as impoundment; water diversion; and dam operations;

(5) Actions that would alter water quality within a designated critical habitat unit, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, such that it is appreciably impaired for normal Gulf sturgeon

behavior, reproduction, growth, or viability, such as dredging; dredged material disposal; channelization; impoundment; in-stream mining; water diversion; dam operations; land uses that cause excessive turbidity; and release of chemicals, biological pollutants, or heated effluents into surface water or connected groundwater via point sources or dispersed non-point sources;

(6) Actions that would alter sediment quality within a designated critical habitat unit such that it is appreciably impaired for normal Gulf sturgeon behavior, reproduction, growth, or viability, such as dredged material disposal; channelization; impoundment; in-stream mining; land uses that cause excessive sedimentation; and release of chemical or biological pollutants that accumulate in sediments;

(7) Actions that would obstruct migratory pathways within and between adjacent riverine, estuarine, and marine critical habitat units, such as dams, dredging, point-source-pollutant discharges, and other physical or chemical alterations of channels and passes that restrict Gulf sturgeon movement (68 FR 13399).

4.0 Environmental Baseline

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the action area. The environmental baseline is a "snapshot" of a species' health at a specified point in time and includes state, tribal, local, and private actions already affecting the species or that will occur contemporaneously with the consultation in progress. Unrelated Federal actions affecting the same species or critical habitat that have completed formal or informal consultation are also part of the environmental baseline, as are Federal and other actions within the action area that may benefit listed species or critical habitat.

Status of Species and Critical Habitat Within the Action Area

Sea Turtles

The species of sea turtles that occur in the action area and that might be affected by the proposed action are all highly migratory. The nearshore and inshore waters of the northern and eastern Gulf, including the upper Texas and Florida coast and estuaries such as Galveston Bay and Apalachee Bay, may be used by these species as post-hatchling developmental habitat or foraging habitat. NOAA Fisheries believes that no individual members of any of the species are likely to be permanent residents of the action area, although some individuals may be present at any given time, with minimum local abundance in winter and maximum local abundance in summer. These same individuals will migrate into offshore waters, as well as other areas of the Gulf of Mexico, Caribbean Sea, and North Atlantic Ocean when water temperatures drop and thus be impacted by activities occurring there; therefore, the species status is considered to be range-wide and supported by the species accounts in Section 2.0. Because they travel widely throughout the Atlantic, Gulf of Mexico, and Caribbean Sea, individuals in the action area are impacted by activities that occur in other areas within their geographic range.

Gulf Sturgeon

The Gulf sturgeon is found in the Gulf of Mexico primarily from Tampa Bay, Florida west to the mouth of the Mississippi River. The action area includes the entire geographic range of the species, all five genetically distinct Gulf sturgeon river-specific stocks, and winter habitat for all known (seven) reproducing riverine populations.

Gulf sturgeon will be present in the project area from about September through May; they are not likely to be present in the project area in the summer (approximately May to September) when they are upstream at spawning areas. Upstream migration from the estuarine/marine area to riverine spawning areas occurs in early spring (i.e., March through May) when river water temperatures range from 16° to 23°C (Huff 1975, Carr 1983, Wooley and Crateau 1985, Odenkirk 1989, Clugston et al. 1995, Foster and Clugston 1997, Fox and Hightower 1998, Sulak and Clugston 1999, Fox et al. 2000). Fall downstream migration from the river into the estuary/marine environment is cued by water temperature (around 23°C), generally beginning in September and continuing through November (Huff 1975, Wooley and Crateau 1985, Foster and Clugston 1997).

Gulf sturgeon use the lower riverine, estuarine, and marine environment from about September through May for feeding and migration. Following a period of fasting in the river, the Gulf sturgeon are presumed to begin foraging as soon as they enter suitable brackish and marine habitat; they have been located in seagrass and sand in depths of 1.5 to 5. 9 m (Fox and Hightower 1998, Craft et al. 2001, Parauka et al. in press) which supports a variety of potential prey items including estuarine crustaceans, small bivalve mollusks, and lancelets (Menzel 1971, Abele 1986, AFS 1989). In the estuarine/marine environment, Gulf sturgeon must consume sufficient prey to not only regain the body weight lost during the summer in the riverine environment, they must also obtain enough energy necessary for growth and reproduction (Fox et al. 2002, Murie and Parkyn pers. comm.). In addition to foraging, the Gulf sturgeon are migrating within the project area between habitats and, more rarely, between rivers.

Gulf Sturgeon Critical Habitat

NOAA Fisheries and FWS have designated 14 units as Gulf sturgeon critical habitat. Discussion in this Opinion will be limited to the marine/estuarine habitats (units #8-14) that are under the purview of NOAA Fisheries. The defining boundary between the riverine (FWS) and estuarine (NOAA Fisheries) units is rkm 0 (68 FR 13454). Regulatory jurisdiction in coastal areas extends to the line on the shore reached by the plane of the mean (average) high water (MHW) (33 CFR 329.12(a)(2)). All bays and estuaries within units #8-14, therefore, lie below the MHW lines. The term "72 COLREGS" delineates those waters where mariners shall comply with the International Regulations for Preventing Collisions at Sea, 1972 and those waters where mariners shall comply with the Inland Navigation Rules (33 CFR 80.01). The waters inside (landward) of these lines are Inland Rules waters and the waters outside (seaward) of the lines are COLREGS (International Rules) waters. These lines are defined in 33 CFR 80, and have been used for identification purposes to delineate boundary lines of the estuarine and marine habitat unit's 8, 9, 11, and 12. The following table, taken from the Gulf sturgeon critical habitat final rule (68 FR 13390), details areal coverage within each unit under NOAA purview.

Table 1. Approximate Area of the Estuarine and Marine Critical Habitat Units for the Gulf Sturgeon.

Critical Habitat Unit Estuarine and Marine Systems	State	Kilometers^2	Miles^2
# 8. Lake Borgne	Louisiana/	718	277
	Mississippi/	8	3
Little Lake	Alabama	763	295
Lake Pontchartrain		26	10
Lake St. Catherine		13	5
The Rigolets		1,879	725
Mississippi Sound		160	62
MS near shore Gulf			
#9. Pensacola Bay	Florida	381	147

Critical Habitat Unit Estuarine and Marine Systems	State	Kilometers^2	Miles^2
#10. Santa Rosa Sound	Florida	102	39
#11. Near shore Gulf of Mexico	Florida	442	171
#12. Choctawhatchee Bay	Florida	321	124
#13. Apalachicola Bay	Florida	683	264
#14. Suwannee Sound	Florida	546	211
Total		6,042	2,333

Individual critical habitat unit (#8-14 only) boundaries are summarized below and a functional description is provided.

Unit #8 (Lake Pontchartrain, Lake St. Catherine, The Rigolets, Little Lake, Lake Borgne, and Mississippi Sound) encompasses Lake Pontchartrain east of the Lake Pontchartrain Causeway, all of Little Lake, The Rigolets, Lake St. Catherine, and Lake Borgne, including Heron Bay, and the Mississippi Sound. Critical habitat follows the shorelines around the perimeters of each included lake. The Mississippi Sound includes adjacent open bays including Pascagoula Bay, Point aux Chenes Bay, Grand Bay, Sandy Bay, and barrier island passes, including Ship Island Pass, Dog Keys Pass, Horn Island Pass, and Petit Bois Pass. The northern boundary of the Mississippi Sound is the shoreline of the mainland between Heron Bay Point, Mississippi and Point aux Pins, Alabama. Critical habitat excludes St. Louis Bay, north of the railroad bridge across its mouth; Biloxi Bay, north of the U.S. Highway 90 bridge; and Back Bay of Biloxi. The southern boundary follows along the broken shoreline of Lake Borgne created by low swamp islands from Malheureux Point to Isle au Pitre. From the northeast point of Isle au Pitre, the boundary continues in a straight north-northeast line to the point one nautical mile (nmi) seaward of the western most extremity of Cat Island (30°13'N, 89°10'W). The southern boundary continues one nmi offshore of the barrier islands and offshore of the 72 COLREGS lines at barrier island passes (defined at 33 CFR 80.815 c)), (d) and (e)) to the eastern boundary. Between Cat Island and Ship Island there is no 72 COLREGS line. NOAA Fisheries has therefore defined that section of the unit southern boundary as one nmi offshore of a straight line drawn from the southern tip of Cat Island to the western tip of Ship Island. The eastern boundary is the line of longitude 88°18.8'W from its intersection with the shore (Point aux Pins) to its intersection with the southern boundary. The lateral extent of unit #8 is the MHW line on each shoreline of the included water bodies or the entrance to rivers, bayous, and creeks. Pascagoula Channel, a major shipping channel, as identified on standard navigation charts and marked by buoys, is excluded.

Unit #8 provides juvenile, subadult and adult feeding, resting, and passage habitat for Gulf sturgeon from the Pascagoula and the Pearl River subpopulations; fish are consistently located both inshore and around/between the barrier islands (i.e., Cat, Ship, Horn, and Petit Bois) within this unit (Reynolds 1993, Ross et al. 2001a, and Rogillio et al. 2002). Gulf sturgeon have also been documented within one nmi off the barrier islands of Mississippi Sound. Substrate in this unit range from sand to silt, all of which contain known Gulf sturgeon prey items, including lancelets (Menzel 1971, Abele and Kim 1986, American Fisheries Society 1989, Heise et al.1999b, Ross et al. 2001a, and Rogillio et al.2002). Four PCEs are present in critical habitat unit #8: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

Unit #9 (Pensacola Bay) includes Pensacola Bay and its adjacent main bays and coves. These include Big Lagoon, Escambia Bay, East Bay, Blackwater Bay, Bayou Grande, Macky Bay, Saultsmar Cove, Bass Hole Cove, and Catfish Basin. The western boundary is the Florida State Highway 292 Bridge crossing Big Lagoon to Perdido Key. The southern boundary is the 72 COLREGS line between Perdido Key and Santa Rosa Island (defined at 33 CFR 80.810 (g)). The eastern boundary is the Florida State Highway 399 Bridge at Gulf Breeze, Florida. The lateral extent of unit #9 is the MHW line on each shoreline of the included waterbodies.

Unit #9 includes five interconnected bays, including Escambia Bay, Pensacola Bay, Blackwater Bay, East Bay, and the Santa Rosa Sound. The Santa Rosa Sound is addressed separately in unit #10. The Escambia River and its distributaries (Little White River, Dead River, and Simpson River) empty into Escambia Bay, including Bass Hole Cove, Saultsmar Cove, and Macky Bay. The Yellow River empties into Blackwater Bay. The entire system discharges into the Gulf of Mexico, primarily through a narrow pass at the mouth of Pensacola Bay.

Unit #9 provides winter feeding and migration habitat for Gulf sturgeon from the Escambia River and Yellow River subpopulations. Migratory movement is generally along the shoreline area of Pensacola Bay. During midwinter, sturgeon are commonly found in deep holes located north of the barrier island at Ft. Pickens, south of the Pensacola Naval Air Station, and at the entrance of Pensacola Pass; the depth in these areas ranges from 6-12.1 m. Four PCEs are present in critical habitat unit #9: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

Unit #10 (Santa Rosa Sound) includes the Santa Rosa Sound, bounded on the west by the Florida State Highway 399 bridge in Gulf Breeze, Florida and the east by U.S. Highway 98 bridge in Fort Walton Beach, Florida. The northern and southern boundaries of unit #10 are formed by the shorelines to the MHW line or by the entrance to rivers, bayous, and creeks.

Unit #10 provides a continuous migratory pathway for Gulf sturgeon between Choctawhatchee Bay, Pensacola Bay and the Gulf of Mexico for feeding and genetic exchange (Wakeford 2001, Fox et al. 2002, and F. Parauka pers. comm. 2002). Gulf sturgeon from the Choctawhatchee, Escambia, and Yellow Rivers utilize unit #10 for migration and foraging. Four PCEs are present in critical habitat unit #10: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

Unit #11 (Nearshore Gulf of Mexico): The western boundary is the line of longitude 87°20.0'W (approximately one nmi west of Pensacola Pass) from its intersection with the shore to its intersection with the southern boundary. The northern boundary is the mean high water (MHW) line of the mainland shoreline and the 72 COLREGS lines at passes as defined at 30 CFR 80.810 (a-g). The southern boundary of the unit is one nmi offshore of the northern boundary; the eastern boundary is the line of longitude 85°17.0'W from its intersection with the shore (near Money Bayou between Cape San Blas and Indian Peninsula) to its intersection with the southern boundary. Pensacola Channel, a major shipping channel, as identified on standard navigation charts and marked by buoys, is excluded.

Unit #11 includes winter feeding and migration habitat for Gulf sturgeon from the Yellow, Escambia, Blackwater, Choctawhatchee, and Apalachicola River subpopulations; the unit includes nearshore (1.6 km) waters from just west of Pensacola Pass to Money Bayou, Florida. Four PCEs are present in critical habitat unit #11: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

Unit #12 (Choctawhatchee Bay): includes the main body of Choctawhatchee Bay, Hogtown Bayou, Jolly Bay, Bunker Cove, and Grassy Cove. The western unit boundary is the U.S. Highway 98 bridge at Fort

Walton Beach, Florida; the southern boundary is the 72 COLREGS line across East (Destin) Pass as defined at 33 CFR 80.810 (f). The lateral extent of unit #12 is the MHW line on each shoreline of the included water bodies.

Unit #12 provides important habitat for overwintering subadults and adults from the Yellow, Escambia, Blackwater and Choctawhatchee Rivers (USFWS 1997 and 1998, Fox et al. 2002, Parauka et al. in press). Four PCEs are present in critical habitat unit #12: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

Unit #13 (Apalachicola Bay): includes the main body of Apalachicola Bay and its adjacent sounds, bays, and the nearshore waters of the Gulf of Mexico. The southern unit boundary includes water extending into the Gulf of Mexico one nmi from the MHW line of the barrier islands and from 72 COLREGS lines between the barrier islands (defined at 33 CFR 80.805 (e-h)); the western boundary is the line of longitude 85°17.0'W from its intersection with the shore (near Money Bayou between Cape San Blas and Indian Peninsula) to its intersection with the southern boundary. The eastern boundary of the unit is formed by a straight line drawn from the shoreline of Lanark Village at 29°53.1'N, 84°35.0'W to a point that is one nmi offshore from the northeastern extremity of Dog Island at 29°49.6'N, 84°33.2'W. The lateral extent of unit #13 is the MHW line on each shoreline of the included water bodies or the entrance of excluded rivers, bayous, and creeks.

Unit #13 provides winter feeding migration habitat for the Apalachicola River Gulf sturgeon subpopulation. Gulf sturgeon are believed to migrate from Apalachicola Bay into the Gulf of Mexico following prevailing currents and exiting primarily through the two most western passes (Indian and West) (Odenkirk, 1989). Four PCEs are present in critical habitat unit #13: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

Unit #14 (Suwannee Sound): includes Suwannee Sound and a portion of adjacent Gulf of Mexico waters extending nine nmi from shore out to the State territorial water boundary. Its northern boundary is formed by a straight line from the northern tip of Big Pine Island (at approximately 29°23'N, 83°12'W) to the Federal-State boundary at 29°17'N, 83°21'W; the southern boundary is formed by a straight line from the southern tip of Richards Island (at approximately 29°11'N, 83°04'W) to the Federal-State boundary at 29°04'N, 83°15'W. The lateral extent of unit #14 is the MHW line along the shorelines and the mouths of the Suwannee River (East and West Pass), its tributaries and other rivers, creeks, or water bodies.

Unit #14 provides foraging habitat for Gulf sturgeon from the Suwannee River and a pathway for the fish to migrate from the river to the estuarine/marine environment. Four PCEs are present in critical habitat unit #14: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

For the complete, legal description of Gulf sturgeon critical habitat unit boundaries, and a synopsis of biological information per unit, please refer to the final rule designating Gulf sturgeon critical habitat (68 FR 13370).

Factors Affecting the Species Environment Within the Action Area

As previously explained, sea turtles found in the action area are not year-round residents of the area, and may travel widely throughout the Atlantic, Gulf of Mexico, and Caribbean Sea. Therefore, individuals found in the action area can potentially be affected by activities anywhere else within their wide range of distribution.

Gulf sturgeon are present seasonally in a large portion of the project area; they are anadromous and spend the summer upriver at spawning habitat and the winter (about September through May) in estuarine/marine areas foraging and migrating. The action area includes the entire geographic range of the Gulf sturgeon and all habitats utilized for winter foraging and migration.

Gulf sturgeon critical habitat is found within the project area (from the Mississippi River east through the Suwannee Sound): seven of the 14 critical habitat units are within the project area and four of the seven PCEs may be impacted by the action. Upland activities could impact water quality in the unit.

1. Federal Actions

Sea Turtles

In recent years, NOAA Fisheries has undertaken several ESA section 7 consultations to address the effects of federally-permitted fisheries and other Federal actions on threatened and endangered sea turtles. Each of those consultations sought to develop ways of reducing the probability of adverse effects of the action on sea turtles. Similarly, recovery actions NOAA Fisheries has undertaken under the ESA are addressing the problem of takes of sea turtles in both the fishing and oil and gas industries, and vessel operations. The following summary of anticipated sources of incidental takes of turtles includes only those Federal actions which have undergone formal section 7 consultation. The incidental takes authorized in the biological opinions completed on the following actions are described in Table 2.

Adverse effects on threatened and endangered species from several types of fishing gear occur in the action area. Efforts to reduce the adverse effects of commercial fisheries are addressed through the ESA section 7 process. Gillnet, longline, trawl gear, and pot fisheries have all been documented as interacting with sea turtles. For all of these fisheries for which there is a Federal fishery management plan (FMP) or for which any Federal action is taken to manage that fishery, impacts have been evaluated under section 7. Several formal consultations have been conducted on the following fisheries that NOAA Fisheries has determined are likely to adversely affect threatened and endangered species: American lobster, calico scallop trawl fishery, monkfish, dogfish, southeastern shrimp trawl fishery, northeast multispecies, Atlantic pelagic swordfish/tuna/shark, and summer flounder/scup/black sea bass fisheries.

The southeastern shrimp trawl fishery affects more turtles than all other activities combined (NRC 1990). On December 2, 2002, NOAA Fisheries completed the Opinion for shrimp trawling in the southeastern United States under proposed revisions to the TED regulations (68 FR 8456, February 21, 2003). This Opinion determined that the shrimp trawl fishery under the revised TED regulations would not jeopardize the continued existence of any sea turtle species. This determination is based, in part, on the Opinion's analysis that shows the revised TED regulations are expected to reduce shrimp trawl-related mortality by 94% for loggerheads and 97% for leatherbacks compared to trawl-related mortality under previous TED regulations, and on the fact that nesting in the southeastern United States for all species of sea turtles (and Rancho Nuevo, Mexico in the case of Kemp's ridleys), with the exception of the northern nesting population of loggerhead turtles, has been increasing. However, NMFS (SEFSC 2001) population projection models indicate that a 30% decrease in benthic loggerhead mortality from an expanded TED rule will cause an increase in the northern nesting population. The shrimp trawling Opinion can be found at the following Web site:

http://www.nmfs.noaa.gov/prot_res/readingrm/ESAsec7/Biop_shrimp_trawling.PDF

On June 14, 2001, NOAA Fisheries issued a jeopardy opinion for the Highly Migratory Species (HMS) fisheries off the eastern United States. The HMS Opinion found that the continued prosecution of the pelagic longline fishery in the manner described in the HMS FMP was likely to jeopardize the continued existence of loggerhead and leatherback sea turtles. This determination was made by analyzing the effects of the fishery on sea turtles in conjunction with the environmental baseline and cumulative effects (for loggerheads this determination was based on the effects on the northern nesting population). The environmental baseline section of the HMS Opinion is incorporated herein by reference and can be found at the following NOAA Fisheries Web site:

http://www.nmfs.noaa.gov/prot_res/readingrm/ESAsec7/HMS060801final.pdf

NOAA Fisheries has implemented a reasonable and prudent alternative (RPA) in the HMS fishery which would allow the continuation of the pelagic longline fishery without jeopardizing the continued existence of loggerhead and leatherback sea turtles. The provisions of this RPA include the closure of the Grand Banks region off the northeastern United States and gear restrictions that are expected to reduce the bycatch of loggerheads by as much as 76% and of leatherbacks by as much as 65% compared to previously existing conditions. Further, NOAA Fisheries has implemented a major research project to develop measures aimed at further reducing longline bycatch. The implementation of this RPA reduces the negative effects that the HMS fishery has on the environmental baseline. The conclusions of the June 14, 2001, HMS Opinion and the subsequent implementation of the RPA are hereby incorporated into the environmental baseline section of this Opinion.

The environmental baseline for the June 14, 2001, HMS Opinion also considered the impacts from the North Carolina offshore spring monkfish gillnet fishery and the inshore fall southern flounder gillnet fishery, both of which were responsible for large numbers of sea turtle mortalities in 1999 and 2000, especially loggerhead sea turtles. However, during the 2001 season NOAA Fisheries implemented an observer program that observed 100% of the effort in the monkfish fishery, and then in 2002 a rule was enacted creating a seasonal monkfish gillnet closure along the Atlantic coast, based upon sea surface temperature data and turtle migration patterns. In 2001, NOAA Fisheries also issued an ESA section 10 permit to North Carolina with mitigative measures for the southern flounder fishery. Subsequently, the sea turtle mortalities in these fisheries were drastically reduced. Reinitiation of consultation for the summer flounder fishery has also begun. The reduction of turtle mortalities in these fisheries reduces the negative effects these fisheries have on the environmental baseline.

Potential adverse effects from Federal vessel operations in the action area and throughout the range of sea turtles include operations of the Navy (USN) and Coast Guard (USCG), the Environmental Protection Agency, the National Oceanic and Atmospheric Administration (NOAA), and the COE. NOAA Fisheries has conducted formal consultations with the USCG, the USN, and NOAA on their vessel operations. Through the section 7 process, where applicable, NOAA Fisheries has, and will continue to, establish conservation measures for all these agency vessel operations to avoid or minimize adverse effects to listed species. At the present time, however, they present the potential for some level of interaction.

In addition to vessel operations, other military activities including training exercises and ordnance detonation also affect sea turtles. Consultations on individual activities have been completed, but no formal consultation on overall USCG or USN activities in any region has been completed at this time.

Federally-funded and permitted projects to construct and maintain navigation channels have also been identified as a source of turtle mortality. Hopper dredges move relatively rapidly (compared to sea turtle swimming speeds) and can entrain and kill sea turtles, presumably as the drag arm of the moving dredge overtakes the slower moving turtle. Regional biological opinions (RBOs) for the COE have been completed for southeastern Atlantic waters (North Carolina through Florida), and Gulf of Mexico northern and western waters (Louisiana and Texas). The current Gulf-wide Opinion supersedes the latter RBO.

The COE and the Minerals Management Service of the Department of Interior (MMS) issue permits for oil and gas exploration, well development, production, and abandonment/rig removal activities that also may adversely affect turtles. Both these agencies have consulted with NOAA Fisheries on these activities which include the use of seismic arrays for oil and gas exploration in the Gulf of Mexico, the impacts of which have been addressed in Opinions for individual and multi-lease sales. Impacts are expected to result from vessel strikes, noise, marine debris, and the use of explosives to remove oil and gas structures.

Another action with Federal oversight (by the Federal Energy Regulatory Commission [FERC] or the Nuclear Regulatory Agency) which has impacts on sea turtles is the operation of electrical generating plants. Sea turtles entering coastal or inshore areas have been affected by entrainment in the cooling-water systems of electrical generating plants. Biological opinions have already been written for a number of electrical generating plants, and others are currently undergoing section 7 consultation.

Below is a table summarizing formal ESA section 7 consultations completed for Federal actions taking place in the southeastern United States that affect sea turtles:

Table 2. Summary of annual incidental take levels anticipated under the incidental take statements associated with NMFS' existing biological opinions in the U.S. Atlantic and Gulf of Mexico.

Federal Action	Annual Anticipated Incidental Take Level (lethal)[1]				
	Loggerhead	Leatherback	Green	Kemp's	Hawksbill
Coast Guard Vessel Operation	1(1)[2]	1(1)[2]	1(1)[2]	1(1)[2]	1(1)[2]
Navy-SE Ops Area[3]	91(91)	17(17)[2]	16(16)[2]	16(16)[2]	4(4)[2]
Navy-NE Ops Area	10(10)	0	1(1)[2]	1(1)[2]	0
Shipshock-Seawolf/Winston Churchill[4]	276(58)[2]	276(58)[2]	276(58)[2]	276(58)[2]	276(58)[2]
COE Dredging-NE Atlantic	27(27)	1(1)	6(6)[2]	5(5)[2]	0
COE Dredging-S. Atlantic	35(35)	0	7(7)	7(7)	2(2)
COE Dredging-N&W Gulf of Mexico	30(30)	0	8(8)	14(14)	2(2)
COE Dredging-E Gulf of Mexico	8 (8) [5]	5(5)[5]	5(5)[5]	5(5)[5]	5(5)[5]
COE Rig Removal, Gulf of Mexico	1(1)[2]	1(1)[2]	1(1)[2]	1(1)[2]	1(1)[2]
MMS Destin Dome Lease Sales	1(1)[2;6]	1(1)[2;6]	1(1)[2;6]	1(1)[2;6]	1(1)[2;6]

MMS 181 Lease Sales	1(1)[2;6]	1(1)[2;6]	1(1)[2;6]	1(1)[2;6]	1(1)[2;6]
MMS Rig Removal, Gulf of Mexico	10(10)[7]	5(5)[2;7]	5(5)[2;7]	5(5)[2;7]	5(5)[2;7]
NE Multispecies Sink Gillnet Fishery	10(10)	4(4)	4(4)	2(2)	0
ASMFC Lobster Plan	10 (10)	4(4)	0	0	0
Bluefish	6(3)	0	0	6(6)	
Herring	6(3)	1(1)	1(1)	1(1)	0
Mackerel, Squid, Butterfish	6(3)	1(1)	2(2)	2(2)	0
Monkfish Fishery[7]	6(3)	1(1)	1(1)	1(1)	0
Dogfish Fishery	6(3)	1(1)	1(1)	1(1)	0
Sargassum	30(30)[8]	1(1)[2]	1(1)[2]	1(1)[2]	1(1)[2]
Summer Flounder, Scup & Black Sea Bass	15(5)	3(3)[2]	3(3)[2]	3(3)[2]	3(3)[2]
Shrimp Fishery[9]	163,160 (3,948)	3,090 (80)	18,757 (514)	155,503 (4,208)	NA(640)[13]
Weakfish	20(20)	0	0	2(2)	0
HMS - Pelagic Longline Fishery[10]	468(7)	358(6)	46(2)	23(1)	46(2)
HMS - Shark gillnet Fishery[11]	20(20)	2(2)	2(2)	2(2)	2(2)
HMS - Bottom Longline Fishery[11]	12(12)	2(2)	2(2)	2(2)	2(2)
NRC – St. Lucie, FL[12]	1000[2] (10)[2]	1000[2] (1)	1000[2] (10)[2]	1000[2] (1)	1000[2] (1)
NRC – Brunswick, NC	50[2] (6)[2]	50[2]	50[2] (3)[2]	50[2] (2)[2]	50[2]
NRC – Crystal River, FL	55[2] (1)[2]	55[2] (1)[2]	55[2] (1)[2]	55[2] (1)[2]	55[2] (1)[2]
Total	**165,370 (4,346)**	**4,880 (197)**	**20,252 (656)**	**156,986 (4,348)**	**1,456 (835)**

[1]Anticipated Take level represents '**observed**' unless otherwise noted. Number in parenthesis represents lethal take and is a subset of the total anticipated take; numbers less than whole are rounded up.
[2] The anticipated take level may represent any combination of species and thus is tallied under each column.
[3] Includes Navy Operations along the Atlantic Coasts and Gulf of Mexico, Mine warfare center, Eglin AFB, Moody AFB
[4] Total **estimated** take includes acoustic harassment
[5]Up to 8 turtles total, of which, no more than 5 may be leatherbacks, greens, Kemp's or hawksbill, in combination.
[6]Total anticipated take is 3 turtles of any combination over a 30-year period
[7] Not to exceed 25 turtles, in total.
[8] Anticipated take for post-hatchlings for total period June 21, 1999 through January 2001
[9]Represents **estimated** take (interactions between turtles and trawls). Lethal take in parentheses.
[10] Represents **estimated** total take and **observed** lethal take in parentheses
[11] Represents **estimated** total and lethal take
[12] Annual incidental capture of up to 1,000 turtles, in any combination of the five species found in the action area. NMFS anticipates 1% of the total number of green and loggerhead turtles (combined) captured (i.e., if there are 900 total green and loggerhead turtles captured in one year, then 9 turtles in any combination of greens and loggerheads are expected to be injured or killed as a result. In cases where 1% of the total is not a whole number, then the total allowable incidental take due to injury or death will be rounded to the next higher whole number) will be injured or killed each year over the next 10 years as a result of this incidental capture. NMFS also anticipates two Kemp's ridley turtles will be killed each year and one hawksbill or leatherback turtle will be injured or killed every 2 years for the next 10 years.
[13] Actual mortalities of hawksbills, as a result of turtle/trawl interactions, is expected to be much lower than this number. This number represents the estimated total number of mortalities of hawksbill turtles from all sources in areas where shrimp fishing takes place.

Gulf Sturgeon and Gulf Sturgeon Critical Habitat

Incidental catch of Gulf sturgeon in both federally- and state-regulated fisheries has been documented. There have been incidental captures of Gulf sturgeon in the shrimp and gillnet fisheries in Apalachicola Bay (Swift et al. 1977, Wooley and Crateau 1985). Similar incidental catches have been reported in Mobile Bay, Tampa Bay, and Charlotte Harbor. Louisiana Department of Wildlife and Fisheries (LDWF) reported 177 Gulf sturgeon were incidentally captured by commercial fishermen in southeast Louisiana during 1992. Rogillio (September 20, 2002, pers. comm. to Eric Hawk, Gulf Sturgeon Workshop, University of Southern Mississippi, Hattiesburg, September 19-20, 2002) noted several recent instances of Gulf sturgeon takes by shrimpers operating off barrier island passes in Mississippi.

The operation of hydropower plants is a Federal action by FERC that has impacts on Gulf sturgeon. Sturgeon migrating up or down rivers and entering coastal and inshore areas can be affected by entrainment in the cooling-water systems; larvae may be adversely affected by heated water discharges. Dredging impacts associated with maintenance of hydropower and nuclear plants may affect both the Gulf sturgeon and its critical habitat.

The recent joint designation of Gulf sturgeon critical habitat by NOAA Fisheries and USFWS will benefit the species, primarily through the ESA section 7 consultation process. When critical habitat is designated, other Federal agencies are required to consult with NOAA Fisheries on actions they carry out, fund, or authorize, to ensure that their actions will not destroy or adversely modify critical habitat. In this way, a critical habitat designation will protect areas that are necessary for the conservation of the species. Designation of critical habitat may also enhance awareness within Federal agencies and the general public of the importance of Gulf sturgeon habitat and the need for special management considerations.

A designation of critical habitat also clarifies the section 7 consultation responsibilities for the Federal action agencies, particularly for projects where the action would not result in direct mortality, injury, or harm to individuals of the species. When critical habitat is designated, the action agency must consult - regardless of the seasonal presence or absence of the species - on actions that may affect critical habitat. Furthermore, the critical habitat designation describes the essential features of the habitat. Identifying the physical and biological features of each particular critical habitat area that are essential for species conservation assists agencies in identifying particular activities conducted outside the designated area that require section 7 consultation. For example, disposal of waste material in water adjacent to a critical habitat area may affect an essential feature (water quality) of the designated habitat and is therefore subject to the provisions of section 7.

Critical habitat designation also assists Federal agencies in planning future actions because it identifies, in advance, those habitats that will be given an additional review in section 7 consultations. This is particularly true in cases where two project areas exist and only one provides for the conservation of the species. With a designation of critical habitat, potential conflicts between Federal actions and listed species can be identified and possibly avoided early in the agency's process.

Federal agencies that consult on potential impacts to both Gulf sturgeon and its critical habitat include the Department of Defense (DOD), the COE, and the EPA. Dredging and dredged material disposal, and military activities including training exercises and ordnance detonation, have the potential to impact both the species and designated critical habitat. Numerous formal opinions have investigated project impacts to Gulf sturgeon; there has been a single formal opinion investigating impacts of dredge disposal on Gulf sturgeon critical habitat (NAS Pensacola). Numerous informal consultations with the DOD, COE, and EPA analyzing potential impacts to both Gulf sturgeon and its designated critical habitat have been conducted.

Federally-regulated stormwater and industrial discharges, and chemically treated discharges from sewage treatment systems, may impact Gulf sturgeon critical habitat. NOAA Fisheries and FWS continue to consult with EPA to minimize the effects of these activities on both listed species and designated critical habitat. In addition, other federally-permitted construction activities, such as beach restoration, have the potential to impact Gulf sturgeon critical habitat.

2. State or private actions

Sea Turtles

Commercial vessel traffic and recreational vessel pursuits can have an adverse effect on sea turtles through propeller and boat strike damage. Private vessels participate in high speed marine events concentrated in the southeastern United States and are a threat to sea turtles and marine mammals. The magnitude of these marine events is not currently known. NOAA Fisheries and the USCG (which permits these events) are in early consultation on these events, but a thorough analysis of impacts has not been completed.

Various fishing methods used in state fisheries, including trawling, pot fisheries, fly nets, and gillnets are known to cause interactions with sea turtles. Georgia and South Carolina prohibit gillnets for all but the shad fishery. Florida and Texas have banned all but very small nets in state waters. Louisiana, Mississippi, and Alabama have also placed restrictions on gillnet fisheries within state waters. Very little commercial gillnetting takes place in southeastern U.S. waters, with the exception of North Carolina. Most pot fisheries (turtles can get entangled in the lines in these fisheries) in the Southeast are prosecuted in areas frequented by sea turtles. Recreational angling, including bottom fishing for snapper, grouper, and other species in the Gulf of Mexico and southeastern waters, and fishing from private and public docks and piers, are known to occasionally take sea turtles by hooking and entanglement. NOAA Fisheries has consulted on potential sea turtle takes by fishermen on several federally-permitted public piers in Florida.

Gulf Sturgeon and Gulf Sturgeon Critical Habitat

A number of activities that may indirectly affect Gulf sturgeon and its critical habitat include discharges from wastewater systems, dredging, ocean dumping and disposal, and aquaculture. The impacts from these activities are difficult to measure. Where possible, however, conservation actions through the ESA section 7 process, ESA section 10 permitting, and state permitting programs, are being implemented to monitor or study impacts from these sources.

Increasing coastal development and ongoing beach erosion will result in increased demands by coastal communities, especially beach resort towns, for periodic privately-funded or federally-sponsored beach renourishment projects. These activities may affect Gulf sturgeon and its critical habitat by burying macroinvertebrates that occur in nearshore habitats that serve as foraging areas, in addition to the potential direct effect to the species by entrainment in dredge suction dragheads at the sand mining sites.

Increased groundwater withdrawal for irrigation in southwest Georgia may result in a 30% reduction of discharge to streams and thereby affect water quality and quantity. Reducing discharge decreases cool water habitats which are thought to offer sturgeon refugia from warm riverine water; recent droughts in the Apalachicola River basin have aggravated the loss of cool-water refugia; and spring-water intrusion into the Suwannee River during drought conditions changes ionic conductivity and water temperature unfavorably for embryonic development and larval success (Sulak and Clugston 1999).

3. Conservation and recovery actions shaping the environmental baseline

NOAA Fisheries has implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles in commercial fisheries. In particular, NOAA Fisheries has required the use of TEDs in southeastern U.S. shrimp trawls since 1989 and in summer flounder trawls in the mid-Atlantic area (south of Cape Charles, Virginia) since 1992. It has been estimated that TEDs are 97% efficient at excluding (releasing alive) turtles caught in such trawls. These regulations have been refined over the years to ensure that TED effectiveness is maximized through proper placement and installation, configuration (e.g., width of bar spacing), floatation, and more widespread use. Recent analyses by Epperly and Teas (2002) indicate that the minimum requirements for the escape opening dimensions were too small, and that as many as 47% of the loggerheads stranding annually along the Atlantic Seaboard and Gulf of Mexico were too large to fit through existing openings. NOAA Fisheries recently published a final rule to require larger escape openings in TEDs used in the southeastern shrimp trawl fishery (68 FR 8456; February 21, 2003). Based upon the analyses in Epperly and Teas (2002), leatherback and loggerhead sea turtles will greatly benefit from the new regulations, with expected reductions of 97% and 94% (over the reduction expected with the old TEDs), respectively, in mortality from shrimp trawling.

In 1993 (with a final rule implemented in 1995), NOAA Fisheries established a Leatherback Conservation Zone to restrict shrimp trawl activities from the coast of Cape Canaveral, Florida, to the North Carolina/Virginia border. This provided for short-term closures when high concentrations of normally pelagic leatherbacks are recorded in near coastal waters where the shrimp fleet operates. This measure was necessary because, due to their size, adult leatherbacks were larger than the escape openings of most NOAA Fisheries-approved TEDs. With the implementation of the new TED rule requiring larger opening sizes on all TEDs, the reactive emergency closures within the Leatherback Conservation Zone are no longer necessary.

NOAA Fisheries is also working to develop a TED which can be effectively used in a type of trawl known as a fly net, which is sometimes used in the mid-Atlantic and northeastern fisheries to target sciaenids and bluefish. Limited observer data indicate that takes can be quite high in this fishery. A prototype design has been developed, and testing has been underway since December 2002.

In addition, NOAA Fisheries has been active in public outreach efforts to educate fishermen regarding sea turtle handling and resuscitation techniques. NOAA Fisheries recently conducted a number of workshops with longline fishermen to discuss bycatch issues including protected species, and to educate them regarding handling and release guidelines. NOAA Fisheries intends to continue these outreach efforts and hopes to reach all fishermen participating in the pelagic longline fishery over the next one to two years. An extensive network of Sea Turtle Stranding and Salvage Network participants along the Atlantic and Gulf of Mexico not only collect data on dead sea turtles, but also rescue and rehabilitate any live stranded turtles.

Commercial harvesting of Gulf sturgeon has been banned by all coastal states where the species is likely present (i.e., Florida, Mississippi, and Alabama). State actions eliminating or limiting gillnetting also benefit the Gulf sturgeon.

Federal Essential Fish Habitat consultation requirements pursuant to the Magnuson-Stevens Fishery Management and Conservation Act also minimize and mitigate for losses of wetlands, and preserve valuable foraging and developmental habitat for Gulf sturgeon.

5.0 Effects of the Action

A. Hopper Dredging Effects on Sea Turtles

It has been previously documented in NOAA Fisheries' biological opinions and the present Opinion that maintenance hopper dredging in three of the four COE Districts in the action area occasionally results in sea turtle entrainment and death, even with seasonal dredging windows, turtle deflector dragheads in place, and concurrent relocation trawling. For example, in the western Gulf of Mexico from February 1995 through September 2002, a total of 29 lethal takes was documented (six Kemp's ridleys, 15 loggerheads, and eight greens) by Galveston District hopper maintenance dredging activities (Appendix I).

In the northern Gulf of Mexico from May 1995 to mid-July 2003, a total of 39 lethal sea turtles takes (including 27 loggerheads, eight Kemp's ridleys, and four unidentified) was reported by the New Orleans District as taken by hopper dredges during maintenance dredging. Thirty-six of the takes (22 loggerheads) occurred in the MR-GO dredging area; three takes (two Kemp's ridleys) occurred in the Calcasieu Channel. 2001 was a year of unusually high loggerhead sea turtle abundance in the MR-GO based on take records since 1995; ten of the 11 turtle takes that occurred between April 24 and June 10, 2001 were loggerheads. Since October 2002, hopper dredging in the MR-GO has resulted in ten lethal loggerhead entrainments.

In the Jacksonville District (Florida west coast) since 1995, six turtles have been documented as entrained: three lethal Kemp's ridley takes, and three loggerhead takes (one non-lethal) during Tampa Bay and Charlotte Harbor dredging.

No sea turtle takes have yet been documented by the Mobile District in its hopper dredging projects; however, until late-summer of 2002, the District did not require observers or screening on its hopper dredges.

It can be expected that future hopper dredging in the Gulf of Mexico action area will occasionally take sea turtles, principally loggerheads, Kemp's ridleys, and greens, and may rarely take a hawksbill turtle, based upon this data on hopper dredging takes and on the information below regarding sea turtle distribution.

Satellite telemetry work funded by COE and conducted by NOAA Fisheries' Galveston Laboratory, demonstrates the nearshore occurrence of Kemp's ridleys near northern Gulf channels. Kemp's ridleys remained within ten nmi of shore for greater than 95% of the observed time, with 90% of the observed locations within five nmi (M. Renaud, NOAA Fisheries' Galveston Laboratory, pers. comm.). Movements out of northern Gulf waters in response to cooling temperatures occurred during December, and Kemp's ridleys returned with warming waters in March.

Seasonal abundance of sea turtles utilizing nearshore waters of the northwest Gulf of Mexico varies with species and location. Green turtles within subtropical habitats of the Laguna Madre are the regions's only year-round, inshore occupant. Other species, especially the Kemp's ridley, are transient users of the coastal zone that venture toward tidal passes and into bays during May-August when food sources and other environmental factors are favorable. The May-August period has yielded over 80% of the sea turtles captures (n=516) recorded by Texas A&M researchers (Landry et al. 1997). Based on strandings, reported incidental captures, observer data (Gulf and South Atlantic Foundation, and NMFS) aerial surveys (SETS, Pascagoula Oil Platform Association data, Gulf Of Mexico red drum surveys of 1987, 1995, and 1999, CETAP, SEAS92 and SECAS95, MATS95, GulfCet I, GulfCet II, and GoMex surveys), and telemetry tracks, loggerheads are distributed ubiquitously in the Gulf Area, generally occurring in all areas, inshore and offshore, and at all times when shrimp trawl activity is likely to occur. Shrimping occurs essentially year-round. (NOAA Fisheries' unpublished data, December 2002: Environmental Assessment/Regulatory Impact Review of Technical Changes to the Turtle Excluder Device (TED) Regulations to Enhance Turtle Protection in the Southeastern United States).

Anticipated Increase in Beach Restoration Activities

The COE has indicated that beach restoration activities, and consequent offshore sand mining often using hopper dredges, are likely to increase this decade in Gulf of Mexico coastal states. Sand mining sites are to some extent selected by the COE based on their absence of, or safe distance from, hardbottoms which in addition to attracting sea turtles may damage the dragheads, reduce production, and may also not provide sand with characteristics suitable for beach restoration efforts. NOAA Fisheries believes that sea turtles and Gulf sturgeon will occasionally be found at some sand mining sites (or dredged material disposal sites) in the Gulf of Mexico (e.g., Pinellas County, Lido Key, Lee County, and Sarasota County Shore Protection Projects), probably attracted to nearby nesting beaches, hardbottoms, artificial reefs, or other structures which contain foraging habitat for sea turtles, or passes between barrier islands where Gulf sturgeon are known to congregate and forage in winter (e.g., Horn Island Pass, Mississippi; Perdido Pass, Alabama; Pensacola Pass, Boca Grande Pass, and Stump Pass, Florida). NOAA Fisheries believes that dredging of sand at designated sites, proposed sites, or currently undiscovered mining sites near hardbottoms, or disposal of dredged materials near navigation channels and passes, may adversely affect listed species by hopper dredge entrainment and damage (by degradation or destruction) to foraging habitat in or in proximity to disposal or mining sites.

Disorientation Effects of Hopper Dredge and Pumpout Barge Deck Lighting

NOAA Fisheries believes that female sea turtles approaching nesting beaches and neonates (i.e., hatchlings) emerging from nests and exiting their natal beaches, may be adversely affected by bright offshore lights from hopper dredges or hopper dredge pumpout barges operating in the nearshore (0-3 nmi) environment. Females approaching the beach to nest could be deterred from nesting by bright lights in the nearshore environment. 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 hopper dredge or anchored pumpout barge (instead of crawling or swimming seaward toward the open horizon), thus increasing their exposure time to predation. NOAA Fisheries recently received a report (M. Nicholas pers. comm. to E. Hawk, September 29, 2003) from a National Park Service biologist at Gulf Islands National Seashore) who relocated a clutch of 97 Perdido Key hatchlings on September 28, 2003. The biologist felt that the hatchlings were in danger of being attracted to a nearby operating, brightly lit hopper dredge which was dredging ½ to 1 mile offshore in Pensacola Entrance Channel. NOAA Fisheries considers it prudent that hopper dredges and hopper dredge pumpout barges operating within three nmi of sea turtle nesting beaches during sea turtle nesting and sea turtle hatchling emergence season (May 1-October 31, yearly), should shield essential deck lighting and reduce or extinguish non-essential deck lighting to the maximum extent possible consistent with vessel personnel safety and U.S. Coast Guard navigation requirements, to reduce potential disorientation effects, potential reduced or aborted nesting, and potential increased hatchling mortality from increased exposure to predators. This is consistent with U.S. Fish and Wildlife Service biological opinion requirements and Florida Wildlife Commission requirements for beach nourishment projects where nesting sea turtles may be present, and was jointly developed by these agencies, Florida Department of Environmental Protection, and the U.S. Army Corps of Engineers, Jacksonville District (Robbin Trindell, pers. comm. to Eric Hawk, September 30, 2003).

Sedimentation Effects
Efforts to reduce potential sedimentation damage to habitats adjacent to sand mining sites were incorporated into the 1995 SAD RBO, which recommended "water column sediment load deposition rates of no more than 200 mg/cm^2/day, averaged over a 7-day period, to protect coral reefs and hard bottom communities..." That measure will be carried forward in the Conservation Recommendations of the present Opinion. To reduce the possibility of listed species takes during sand mining activities, the terms and conditions of this Opinion will require that hopper dredges operating at offshore sand mining sites maintain a minimum distance of 400 feet from hardgrounds since these areas may attract sea turtles.

Notably, this Opinion includes only the hopper dredging of the aforementioned sand mining sites that do not occur within designated Gulf sturgeon critical habitat. This Opinion does not include any new sand mining site in designated critical habitat, nor the placement of sand in any littoral zone within designated critical habitat.

Sea Turtle Takes Associated with Sand Mining
Historically, sea turtle takes associated with sand mining activities for beach restoration, conducted using hopper dredges, have been few compared to channel dredging. In the South Atlantic, 11 loggerheads were taken from 1997-1999 at sand mining sites off Myrtle Beach, South Carolina (all of these takes occurred outside of the December 1-March 31 window). In North Carolina, two Kemp's ridleys and two loggerheads were taken in a single day at the Bogue Banks Restoration Project borrow site on December 21, 2001, apparently attracted to remains of an artificial, tire reef, and another Kemp's ridley was taken on April 11, 2002. In Florida's Brevard County, a loggerhead was taken at the Canaveral Shoals sand mining site on March 31, 2001, and another loggerhead was taken on February 19, 2002, at a nearby mining site. On March 19, 2003, a loggerhead sea turtle was taken during sand mining for the Bogue Banks Restoration Project (a relocation trawler moved five turtles out of the area between March 13-28). No other instances of hopper dredge takes at sand mining sites are known. There are no instances of takes yet recorded for sand mining activities in the Gulf of Mexico; these activities have been limited, sometimes have not been reported to NOAA Fisheries, and it is not known if observers have been present. However, NOAA Fisheries expects that future takes will occur in association with hopper dredge sand mining activities in the Gulf of Mexico.

Use of Bed-leveling Mechanical Dredging Devices
Bed-leveling is often associated with hopper dredging (and other types of dredging) operations. Bed-leveling "dredges" do not use suction and redistribute sediments, rather than removing them. Plows, I-beams, or other seabed-leveling mechanical dredging devices are often used to lower high spots left in

channel bottoms and dredged material deposition areas by hopper dredges or other type dredges. Some evidence indicates that they may be responsible for occasional sea turtle mortalities (Mark Dodd, GADNR, unpublished data; July 2003 BA for Brunswick Harbor Deepening, Savannah District COE). Sea turtles may be crushed as the leveling device–which weighs about 30 to 50 tons and is typically fixed with cables to a derrick mounted on a barge pushed or pulled by a tugboat at about one to two knots–passes over and crushes a turtle which failed to move out of the way and is not pushed out of the way by the sediment wedge "wave" which generated by and moving ahead of the device. Sea turtles at Brunswick Harbor, Georgia may have been crushed and killed by recent bed-leveling "clean-up dredging" which commenced after the hopper dredge finished its work in a particular area. Brunswick Harbor is also one of the sites where sea turtles captured by relocation trawlers sometimes show evidence of brumating (over-wintering) in the muddy channel bottom, which could explain why, if they were crushed by bed-level type dredges, they failed to react quickly enough to avoid the bed-leveler. Use of bed-levelers for cleanup operations, however, is probably preferable to use of hopper dredges since turtles which are foraging/resting/brumating on irregular bottoms are probably more likely to be entrained by suction dragheads because sea turtle deflector dragheads are less effective on uneven bottoms, hopper dredges move considerably faster than bed-leveler "dredges," and bed-levelers do not use suction.

B. Hopper Dredging Effects on Gulf Sturgeon

Dredge entrainment of Gulf sturgeon by hopper dredging has previously been assessed by NOAA Fisheries in section 7 consultations for channel maintenance. NOAA Fisheries had determined that the hopper dredge projects were not likely to adversely affect the species given either the projects' limited scope and/or the unlikely seasonal presence of Gulf sturgeon. While no Gulf sturgeon take by hopper dredges have been reported to date, allopatric sturgeon species on the Atlantic Seaboard have been taken occasionally by hopper dredge. Similarly, the existing RBO to the COE's South Atlantic Division for hopper dredging between North Carolina through Florida limits the incidental take to five shortnose sturgeon (*A. brevirostrum*). While NOAA Fisheries is unaware of any instances to date of Gulf sturgeon take by a hopper dredge, Atlantic sturgeon and shortnose sturgeon are occasionally taken by hopper dredges operating on the Atlantic seaboard (C. Slay, Coastwise Consulting, pers. comm. to E. Hawk; J. Crocker, October 15, 2003, pers. comm. to S. Bolden). Therefore, NOAA Fisheries considers it prudent to address potential Gulf sturgeon takes by hopper dredges operating in the Gulf of Mexico as we presume the species can be taken given the evidence from two morphologically and ecologically similar Atlantic sturgeon species.

While the probability of sea turtle take by hopper dredge is lessened by winter-time dredging (particularly when water temperatures are below 11°C), Gulf sturgeon are more likely to be present in estuarine and coastal waters, and passes between the barrier islands, during that period. Nevertheless, Gulf sturgeon may be more sensitive to vibrations transmitted along the bottom (by a noisy, approaching hopper dredge draghead) than turtles and other fishes due to their physostomus (pneumatic duct connects gas bladder and gut to allow gas to be taken in and emitted vs. psysoclistous fishes that lose the connection in adults) swim bladder; are not known to bury themselves and "hibernate" in the soft bottom mud of ship channels (but they are known to remain for long periods in low areas) as are some turtles (e.g., in Kings Bay and Brunswick Harbor, Georgia); and are mobile and are not likely to be entrained, even by a rapidly (approximately 3-5 knots) approaching hopper dredge deflector draghead. Although no take of a Gulf sturgeon by hopper dredge (or any other type of dredge) operating in the Gulf of Mexico has ever been reported to NOAA Fisheries, Atlantic sturgeon have been documented as taken by hopper dredges. Shortnose sturgeon have also been lethally taken by hydraulic pipeline dredging in the Delaware River since 1996. A shortnose sturgeon was taken by a mechanical clam shell bucket dredge in the Northeast (J. Crocker, June 10, 2003, pers. comm. to S. Bolden) and recently five shortnose were taken by a hopper dredge in the Kennebec River, Maine during emergency dredging operations there (J. Crocker, October 15, 2003, pers. comm. to S. Bolden). NOAA Fisheries believes that Gulf sturgeon can be lethally taken by hopper dredges, and it is most likely to occur in the northern or eastern Gulf of Mexico during dredging of barrier island passes or nearby sand sources during winter months.

Gulf Sturgeon Takes Associated with Sand Mining

NOAA Fisheries knows of no Gulf sturgeon takes associated with mining of sand from nearshore or offshore mining sites by hopper dredge or any other type of dredge. Gulf sturgeon presence would be unlikely at these sites, unless mining sites were near barrier island pass foraging sites or along migratory pathways (which are primarily inshore).

C. Dredging Effects on Gulf Sturgeon Critical Habitat

This Opinion identifies specific projects that will impact Gulf sturgeon critical habitat units #8 and #11 and four (of the seven) PCEs (food availability, water quality, sediment quality and migratory pathways) within both of those units (Table 3).

Table 3. Summary of COE projects within this Opinion that occur within designated Gulf sturgeon critical habitat or may impact Gulf sturgeon.

District/Project	Genetic stock*	Critical Habitat Unit	Riverine Pop Impacted
GALVESTON			
None			
NEW ORLEANS			
Lower Mississippi R.	Lake Pontchartrain Pearl River	None	Mississippi
Mississippi River - New Orleans Harbor	Lake Pontchartrain Pearl River	None	Mississippi
Mississippi River - Gulf Outlet	Lake Pontchartrain Pearl River	None	Mississippi
Mississippi River - Southwest Pass	Lake Pontchartrain Pearl River	None	Mississippi
MOBILE			
Gulfport Harbor	Pascagoula River	#8	Pascagoula/Pearl
Pascagoula Harbor	Pascagoula River	#8	Pascagoula/Pearl
Mobile Harbor	Pascagoula River	None	Mobile
Pensacola Harbor	Escambia/Yellow Rivers	#11	Yellow, Choctawhatchee and Apalachicola

JACKSONVILLE			
Pensacola Beach	Escambia/Yellow Rivers	#11	Yellow, Choctawhatchee and Apalachicola
NAS Pensacola Channel	Escambia/Yellow Rivers	#11	Yellow, Choctawhatchee and Apalachicola
Tampa Harbor	?	None	?
Charlotte Harbor	?	None	?

*Five regional or river-specific stocks (from west to east) have been identified: (1) Lake Pontchartrain and Pearl River, (2) Pascagoula River, (3) Escambia and Yellow Rivers, (4) Choctawhatchee River, and (5) Apalachicola, Ochlockonee, and Suwannee Rivers (Stabile et al. 1996). Because of small sample size, genetic stocks could not be determined for fish in the southeast (i.e., Tampa Area) as indicated by the "?."

Maintenance dredging is a repetitive activity in coastal Gulf of Mexico; some channels are dredged continuously to keep them navigable, others require dredging cycles of 2-10 years. Maintenance dredging removes sediments from navigation channel beds that have been transported there naturally (e.g., longshore transport). Materials removed during maintenance dredging are usually variable in quantity and consist of soft, uncompacted soil. For the purpose of this Opinion, NOAA Fisheries assumes that the sediments removed from the channel beds during maintenance dredging are similar to those that will remain in the channel beds after dredging (e.g., removal of sand and sand remaining) and therefore no alteration in habitat composition is occurring. Therefore, NOAA Fisheries assumes that channel beds provide similar habitat pre- and post-dredging.

NOAA Fisheries considered and analyzed the following factors to determine direct and indirect effects of dredging to current depth, width and length (no improvements regardless of prior authorization) within critical habitat on the four PCEs in units #8 and #11:

1. Food availability
2. Water quality
3. Sediment quality, and
4. Migratory pathways

1. Food Availability

Numerous reports have been published in the scientific literature describing the in situ effects of dredging and dredged material placement on birds, lobsters, fish, aquatic plants, benthic communities, turbidity, primary productivity, bioavailability of sediment trace metals, etc. (Lewis et al. 2001). Environmental impacts observed in these studies included reduction in number of benthic species (both species diversity and species abundance), increased turbidity, reduction of primary productivity and mobilization, and increased bioavailability of sediment trace metals.

Of particular concern is the potential impacts of dredging on Gulf sturgeon prey availability. Ontogenetic changes in Gulf sturgeon diet and foraging area have been documented. Young-of-year forage in freshwater on aquatic invertebrates and detritus (Mason and Clugston 1993, Sulak and Clugston 1999); juveniles forage throughout the river on aquatic insects (e.g., mayflies and caddisflies), worms (oligochaete), and bivalves (Huff 1975, Mason and Clugston 1993); adults forage sparingly in freshwater and depend almost entirely on estuarine and marine prey for their growth (Gu et al. 2001). Both adult and subadult Gulf sturgeon are known to lose up to 30% of their total body weight while in fresh water, and subsequently compensate the loss during winter feeding in marine areas (Carr 1983, Wooley and Crateau 1985, Clugston et al 1995, Morrow et al. 1998, Heise et al. 1999, Sulak and Clugston 1999, Ross et al. 2000). Therefore, once Gulf sturgeon leave the river having spent at least six months in the river fasting, it is presumed that they immediately begin feeding. Upon exiting the rivers, Gulf sturgeon initially concentrate around the mouths of their natal rivers in lakes and bays; they then disperse into nearshore areas (including Passes) and continue to forage. Therefore, the nearshore foraging and migratory areas are very important for the Gulf sturgeon as they offer not only the first foraging opportunity for the Gulf sturgeon exiting the rivers, but also migratory pathways to winter habitat and, more rarely, to other rivers.

Few data have been collected on the food habits of Gulf sturgeon; their threatened status limits sampling efforts and gastric lavaging has only recently become successful (anal lavaging is being investigated). Gulf sturgeon have been described as opportunistic and indiscriminate benthivores; their guts generally contain benthic marine invertebrates including amphiopods, lancelets, polychaetes, gastropods, shrimp, isopods, molluscs, and crustaceans (Huff 1975, Mason and Clugston 1993, Carr et al. 1996, Fox et al. 2000, Fox et al. 2002). During the early fall and winter, immediately following downstream migration, Gulf sturgeon are most often located in nearshore (depth less than 20 feet) sandy areas that support burrowing macroinvertebrates, presumably foraging (Craft et al. 2001, Ross et al. 2001a, Fox et al. 2002, Parauka et al. in press).

Short-term (one month) impacts on benthic macroinvertebrates following dredging were investigated by comparing community structure in a Florida bayou pre- and post-dredging: a significant reduction in both density (of species and individuals) and diversity was recorded (Lewis et al. 2001); of particular interest was the predominance of polychaetes (relative abundance of 68% pre- to 23% post-disposal) prior to dredging being replaced by harpacticoid copepods (from 6% to 69%) (Lewis et al. 2001). Comparison of mollusks from dredged and non-dredged areas in Boga Ciega Bay, Florida indicated a much smaller number and diversity of species in the dredged canals that in non-dredged areas (Sykes and Hall 1970).

2. Water Quality

Water quality impacts as a result of dredging are expected to be temporary, with suspended particles settling out within a short time frame. These sediment disturbance impacts will be minimal in nature and will not have a measurable effect on water quality (or on sea turtles or Gulf sturgeon directly). Additionally, past sampling of water column and elutriate chemistry in various locations within the project area demonstrated that dredging is not likely to significantly impact water quality. Potential changes in salinity and tidal amplitude are expected to be minimal. NOAA Fisheries does not expect measurable impacts to Gulf sturgeon critical habitat as a result of water quality impacts related to this project.

3. Sediment Quality

Potential impacts to sediment quality as a direct result of dredging channel beds were considered in this Opinion. The composition of dredged material removed from the channel beds is expected to be the same as that remaining. Because this Opinion is only authorizing dredging to maintain channels at depths existing at the time of this consultation, regardless of depth previously authorized, the sediments removed from the channel beds should be similar to those in the surrounding area given that shoaling is a result of transport from nearby areas (consisting of soft materials). Therefore, it is unlikely that the materials removed from the channels considered in this Opinion are different in composition from those that would remain in the channel beds following dredging. The COE shall contact NOAA Fisheries if they believe or have evidence indicating, for any of the projects considered within this Opinion, that dredged material is not compatible to that remaining in the channel beds in terms of grain size, color and composition. Therefore, NOAA Fisheries does not expect measurable impacts to Gulf sturgeon critical habitat as a result of sediment quality impacts related to these projects.

4. Migratory Pathways

Effects on migratory pathways as a PCE for units #8 and #11 were considered in this Opinion. These two units are known to support migratory pathways for Gulf sturgeon from at least three genetic subpopulations (Lake Pontchartain/Pearl River, Pascagoula River and Escambia/Yellow Rivers) and at least seven riverine subpopulations (Mississippi, Pascagoula, Pearl, Mobile, Choctawhatchee, Yellow, and Apalachicola Rivers) as groups of individuals from these subpopulations have been located by telemetry on numerous occasions within units #8 and #11 (Rogillio 1993, Ross et al. 2000, Ross et al. 2001b, Parauka et al. in press, F. Parauka USFWS pers. comm. 2002, Rogillio et al. in prep). Gulf sturgeon move through these two units for two main reasons: migration between winter and summer habitats (foraging along the way), and, more rarely, for inter-riverine movements. Because the hopper dredging associated with the project located in Gulf sturgeon critical habitat (Table 3) will be localized and not span the length/width of a unit, NOAA Fisheries concluded that the dredging events will not preclude passage through the migratory pathways by the Gulf sturgeon and therefore adequate area for migration will be available.

D. Effects of Relocation Trawling (Capture, Tag, and Release) in Association with Hopper Dredging

Relocation trawling has been successful at temporarily displacing Kemp's ridley, loggerhead, leatherback, and green sea turtles from channels and nearshore mining areas in the Atlantic and Gulf of Mexico (e.g., Thimble Shoals Channel, Virginia Beach, Virginia; Morehead City, Wilmington, and Bogue Banks, North Carolina; Charleston, South Carolina; Kings Bay, Georgia; Canaveral Entrance Channel, Tampa Bay, Charlotte Harbor, and St. Petersburg Harbor, Florida; MR-GO, Louisiana; Freeport Harbor, Aransas Pass, and Sabine-Neches Waterway, Texas) during periods when hopper dredging was imminent or ongoing. Some turtles captured during relocation trawling operations return to the dredge site and are subsequently recaptured. Sea turtle relocation studies by Standora et al. (1993) at Canaveral Channel relocated 34 turtles to six release sites of varying distances north and south of the channel. Ten turtles returned from southern release sites, and seven from northern sites, suggesting that there was no significant difference between directions. Return times observed suggested that there was a direct correlation between relocation distance and likelihood of return or length of return time to the channel when sea turtles were relocated to the south. No correlation was observed between the northern release sites and the time or likelihood of return. The study found that relocation of turtles to the site 70 km (43 miles) south of the channel would result in a return time of over 30 days.

REMSA, a private company contracted to conduct relocation trawling captured, tagged, and relocated 69 turtles in a 7-day period at Canaveral Channel in October 2002, with no recaptures; turtles were relocated a minimum of 3-4 miles away (Trish Bargo, REMSA, June 2, 2003 pers. comm. to Eric Hawk). Twenty-four hour per day relocation trawling conducted by REMSA at Aransas Pass Entrance Channel (Corpus Christi Ship Channel) from April 15, 2003, to July 7, 2003, relocated 71 turtles from ca 1.5-5 miles from the dredge site, with three recaptures (Trish Bargo, July 24, 2003 pers. comm. to Eric Hawk). One turtle released on June 14, 2003, around 1.5 miles from the dredge site, was recaptured four days later; another turtle released captured June 9, 2003, released about three miles from the dredge site was recaptured nine days later. Subsequent releases occurred five miles away. Of these 68 subsequent capture/releases, one turtle released on June 22, 2003 was recaptured 13 days later (REMSA Final Report, Sea Turtle Relocation Trawling, Aransas Pass, Texas, April-July 2003).

Prior to 1997, most relocation trawling in association with hopper dredging was performed by the Corps of Engineers under a NOAA Fisheries ESA section 10 incidental take/research permit. Since then, however, relocation trawling has primarily been conducted by private companies. In the last three years, Coastwise Consulting, Inc., has conducted over 132 days of relocation trawling at Morehead City, North Carolina; Charleston, South Carolina; and Kings Bay, Georgia (e-mail, C. Slay to E. Hawk, October 25, 2002). During the course of this work, at least 43 loggerheads, ten Kemp's ridleys, and one green turtle were successfully captured, tagged, and released. No dead or injured turtles were encountered and no captured turtles were recaptured during this work. Since around 1998, Coastwise Consulting has captured, tagged, and released approximately 80-90 turtles, with no evidence of injury or mortality (Pers. comm., C. Slay to E. Hawk, December 6, 2002). On the Atlantic coast, REMSA has also successfully tagged and relocated over 140 turtles in the last several years, most notably, 69 turtles (55 loggerheads and 14 greens) in a 7-day period at Canaveral Channel in October 2002, with no significant injuries. Other sea turtle relocation contractors (R. Metzger in 2001; C. Oravetz in 2002) have also successfully and non-injuriously trawl-captured and released sea turtles out of the path of oncoming hopper dredges. More recently in the Gulf of Mexico, REMSA captured, tagged, and relocated 71 turtles at Aransas Pass with no apparent long-term ill effects to the turtles. Three injured turtles captured were subsequently transported to University of Texas Marine Science Institute rehabilitation facilities for treatment (two had old, non-trawl related injuries or wounds; the third turtle may have sustained an injury to its flipper, apparently from the door chain of the trawl, during capture). Three of the 71 captures were recaptures–released around 1.5, three, and five miles, respectively, from the dredge site–and exhibited no evidence that their capture, tag, release, and subsequent recapture, was in any way detrimental.

The effects of this harassment of the turtles during capture and handling can result in raised levels of stressor hormones, and can cause some discomfort during tagging procedures. Based on past observations obtained during similar research-trawling for turtles, these effects are expected to dissipate within a day (Stabenau and Vietti 1991). Since turtle recaptures are rare, and recaptures that do occur typically happen several days to weeks after initial capture, cumulative adverse effects of recapture are not expected.

Rarely, even properly conducted relocation trawling can result in accidental sea turtle deaths. Henwood (pers. comm. to E. Hawk, December 6, 2002) noted that trawl-captured loggerhead sea turtles died on several occasions during handling on deck during winter trawling in Canaveral Channel in the early 1980s, after short (approximately 30-minute) tow times. However, Henwood also noted that a significant number of the loggerheads captured at Canaveral during winter months appeared to be physically stressed and in "bad shape" compared to loggerheads captured in the summer months from the same site, which appeared much healthier and robust. Stressed turtles or unhealthy turtles or turtles exposed to repeated forced submergences are more likely to be injured or killed during relocation trawling than healthy turtles.

In November 2002, during relocation trawling conducted in York Spit, Virginia, a Kemp's ridley sea turtle was likely struck by one of the heavy trawl doors or it may have been struck and killed by another vessel shortly before trawl net capture. The hopper dredge was not working in the area at the time (pers. comms. and e-mails, P. Bargo to E. Hawk, December 6 and 9, 2002).

NOAA Fisheries typically limits tow times for relocation trawling to 42 minutes or less measured from the time the trawl doors enter the water when setting the net to the time the trawl doors exit the water during haulback ("doors in - doors out"). The National Research Council report "Decline of the Sea Turtles: Causes and Prevention" (NRC 1990) suggested that limiting tow durations to 40 minutes in summer and 60 minutes in winter would yield sea turtle survival rates that approximate those required for the approval of new TED designs, i.e., 97%. The NRC report also concluded that mortality of turtles caught in shrimp trawls increases markedly for tow times greater than 60 minutes. Current NOAA Fisheries' TED regulations allow, under very specific circumstances, for shrimpers with no mechanical-advantage trawl retrieval devices on board, to be exempt from Federal TED requirements if they limit tow times to 55 minutes during April through October and 75 minutes from November through March. The presumption is that these tow time limits will result in turtle survivability comparable to having TEDs installed.

The Gulf and South Atlantic Fisheries Development Foundation's August 31, 1998, "Alternatives to TEDs: Final Report," presents data on 641 South Atlantic shallow tows (only one tow was in water over 15 fathoms [27.4 m]), all conducted under restricted tow times (55 minutes during April through October and 75 minutes from November through March), and 584 Gulf of Mexico nearshore tows conducted under the same tow time restrictions. Offshore effort in the Gulf of Mexico consisted of 581 non-time restricted tows which averaged 7.8 hours per tow. All totaled, 323 turtle observations were documented: 293 in the nearshore South Atlantic efforts, and 30 in the Gulf efforts (24 nearshore and six offshore). Of the 293 South Atlantic turtles (219 loggerhead, 68 Kemp' ridley, five green, and one leatherback), only 274 were used in the analyses (201 loggerhead, 67 Kemp's ridley, five green, and one leatherback) because 12 escaped from the nets after being seen and seven were caught in try nets. Of the 274 South Atlantic turtles captured using restricted tow times, only five loggerheads and one Kemp's ridley died because of the interaction. For the Gulf efforts, 26 turtles (eight loggerhead, 16 Kemp's ridley, two green) were captured, resulting in three mortalities (one loggerhead inshore, one loggerhead and one green offshore). Excluding all six offshore tows and both offshore mortalities (because of the prolonged, non-restricted tow times), we are left with 1,225 time-restricted tows (584 + 641) resulting in 298 trawl-captured turtles (274 + 24) resulting in seven mortalities, i.e., 2.3% of the interactions resulted in death.

In summary, NOAA Fisheries believes that properly conducted and supervised relocation trawling (i.e., observing trawl speed and tow-time limits, and taking adequate precautions to release captured animals) and tagging is unlikely to result in adverse effects to sea turtles. NOAA Fisheries estimates that, overall, sea turtle trawling and relocation efforts will result in considerably less than 0.5% mortality of captured turtles, primarily due to their being previously stressed or diseased or if struck by trawl doors or accidents on deck. On the other hand, hopper dredge entrainments invariably result in injury, and are almost always fatal. In the present Opinion, NOAA Fisheries requires relocation trawling and tagging as methods of reducing sea turtle entrainment in hopper dredges and to document the effects of relocation trawling, according to criteria defined in the ITS.

Effects and desirability of tagging relocated animals:
Tagging prior to release will help us learn more about the habits and identity of these trawl-captured animals after they are released; and if they are recaptured will enable improvements in relocation trawling design to further reduce the effect of the take. External and internal flipper tagging (e.g., with Inconel and PIT tags) are not considered dangerous procedures by the sea turtle research community; are routinely done by thousands of volunteers in the United States and abroad; and can be safely accomplished with minimal training. NOAA Fisheries knows of no instance where flipper tagging has resulted in mortality or serious injury to a trawl-captured sea turtle. Such an occurrence would be extremely unlikely because the technique of applying a flipper tag is minimally traumatic and relatively non-invasive; in addition, these tags are attached using sterile techniques. Important growth, life history, and migratory behavior data may be obtained from turtles captured and subsequently relocated. Therefore, these turtles should not be released without tagging (and scanning for pre-existing tags).

Collection of tissue samples: Tissue sampling is performed to determine the genetic origins of captured sea turtles, and learn more about their nesting beach/population origins. This is important information because some populations, e.g., the northern subpopulation of loggerheads nesting in the Southeast Region, may be declining. For all tissue sample collections, a sterile 4- to 6-mm punch sampler is used. Researchers who examined turtles caught two to three weeks after sample collection noted that the sample collection site was almost completely healed (Witzell, pers. comm.). NOAA Fisheries does not expect that the collection of a tissue sample from each captured turtle will cause any additional stress or discomfort to the turtle beyond that experienced during capture, collection of measurements, and tagging. Tissue sampling procedures are specified in the terms and conditions of this Opinion.

E. Effects of Dredged Material Disposal on Sea Turtles, Gulf Sturgeon, and Critical Habitat

NOAA Fisheries has reviewed the maintenance dredging projects that occur in the Gulf of Mexico on a recurring basis (see Proposed Action section for by-District project descriptions) and the disposal sites and methods which the COE uses to dispose of dredged material. Typically, dredged materials from channel maintenance dredging activities are disposed of down current of the navigation channels being maintained (by agitation dredging and sidecasting), or in designated disposal areas which are adjacent to and run approximately parallel to the navigation channels, or in nearby designated offshore disposal areas (to minimize transit time of the hopper dredge to and from the dredging site). Alternatively, they are used beneficially for barrier island restoration and creation of island, wetland, marsh, and shallow-water habitats, or to renourish eroded mainland beaches. With the exception of disposal of dredged materials within designated Gulf sturgeon critical habitat (which is not considered in this Opinion and must be consulted on individually by each COE District for projects under their respective permitting authority), NOAA Fisheries believes that disposal activities currently being conducted, and proposed to be continued, by the Galveston District, New Orleans District, Mobile District, and Jacksonville District are unlikely to adversely affect sea turtles or Gulf sturgeon. These species are highly mobile and should be able to easily avoid a descending sediment plume discharged at the surface by a hopper dredge opening its hopper doors, or pumping its sediment load over the side. This Opinion does not allow disposal actions within foraging habitat areas designated as Gulf sturgeon critical habitat. NOAA Fisheries also believes that foraging habitat for sea turtles is not likely a limiting factor in the Gulf of Mexico COE Districts and thus the temporary removal of relatively small areas (compared to remaining foraging habitat) of potential foraging habitat by burial with dredged material sediment will not measurably adversely affect sea turtles. Furthermore, large portions of areas routinely dredged by the New Orleans District in the MR-SWP and associated disposal sites are not suitable foraging habitat for sea turtles because of high freshwater flows. As well, typical nearshore areas of the Gulf of Mexico that are routinely renourished (e.g., west Florida beaches of Pinellas, Sarasota, Lee Counties), or might be renourished, or are being considered for renourishment (e.g., Orange Beach/Gulf Shores, Alabama) are not considered by NOAA Fisheries to be of particularly significant or essential foraging value to sea turtles. Turtles will typically forage further offshore where non-ephemeral limestone ledges supporting algal/sponge growth are located. These ledges are not routinely covered by shifting sands, as they are prone to in the high wave-energy nearshore environment. Foraging habitat for Gulf sturgeon, recognized with the designation of critical habitat, will not be adversely affected by this action. Furthermore, beach renourishment projects typically affect yearly only a minute portion of the many hundreds of miles of Gulf of Mexico nearshore beach environment available for foraging sea turtles.

COE District disposal activities (principally, Jacksonville District COE) which involve renourishing beaches where sea turtles nest are consulted on by the U.S. Fish and Wildlife Service because sea turtles on land fall under the purview of that agency. NOAA Fisheries believes that deposition of dredged materials on the beach or in the littoral nearshore environment for beach renourishment and creation of island, wetland, marsh, and shallow-water habitats in the Gulf of Mexico by any of the COE Districts during beach restoration or habitat restoration projects (excepting disposal in designated Gulf sturgeon critical habitat) described in the Proposed Action section of this Opinion, and similar actions, will not adversely affect sea turtles or Gulf sturgeon and may ultimately be of benefit to them if restoration efforts are successful. Nearshore habitats for foraging sea turtles and Gulf sturgeon are present in sufficient quantities such that removal of relatively small portions of potential foraging habitat will not cause measurable adverse effects on sea turtles or Gulf sturgeon.

Disposal Effects on Benthos

Sediment composition is a cardinal factor in controlling the settlement and viability of many marine invertebrates (Thorson 1956). In addition, benthic recovery is dependent on time of year. Placement of materials similar to ambient sediments (e.g., sand on sand or mud on mud) has been shown to produce less severe impacts in contrast to placement of dissimilar sediments, which generally results in more severe, long-term impact (Maurer et al. 1978, 1986). Deposition of relatively thin layers of dredged material (<10 cm; 4 in) can minimize impacts by allowing many populations of small, shallow-burrowing infauna with characteristically high reproductive rates and wide dispersal capabilities to recover quickly. Deposits greater than 20-30 cm (8-12 in) generally eliminate all but the largest and most vigorous burrowers (Maurer et al. 1978).

Observed rates of benthic community recovery after dredged material placement range from a few months to several years. The relatively species-poor benthic assemblages associated with low salinity estuarine sediments can recover in periods of time ranging from a few months to approximately one year (Leathem et al. 1973, McCauley et al. 1976, 1977, Van Dolah et al. 1979, 1984, Clarke and Miller-Way 1992), while the more diverse communities of high salinity estuarine sediments may require a year or longer (e.g., Jones 1986, Ray and Clarke 1999). Recovery rates for sandy inshore marine sites, should be similar to those reported for high salinity estuarine sites (Oliver et al. 1977, Richardson et al. 1977, Haskin et al. 1978, Van Dolah et al. 1984) if the overburden is comprised of similar sediments.

Most of what is known about the species specific recovery/recolonization of benthic communities following dredge material placement in the Gulf of Mexico is the result of work by Rakocinski et al. (1991, 1993, 1996); others (e.g., Dixon and Pilkey 1991, Nelson 1993) have focused on benthic recovery following beach restoration. Generally recovery/recolonization is dependent upon sediment-type, time, depth of overburden, depth, proximity to beach. One long-term (two year) study monitored recovery and concluded that while recolonization occurred, the macrobenthic community structure was different and wide fluctuations between stations was present two years post-event (Rakocinski et al. 1996).

NOAA Fisheries concludes that the effects of dredged material disposal on benthic communities is unlikely to adversely affect sea turtles or Gulf sturgeon.

Disposal Effects on Gulf Sturgeon Critical Habitat

No disposal within Gulf sturgeon critical habitat is authorized in this Opinion (see section entitled "Description of the Action Area and Proposed Action"). Therefore, NOAA Fisheries concludes that there are no disposal effects on Gulf sturgeon critical habitat.

F. Anticipated Incidental Take Levels Predicted for Each COE District:

While it is impossible to ascertain the exact number of future take of sea turtles and Gulf sturgeon, NOAA Fisheries bases the estimated anticipated take levels on the following data:

1. Previous sea turtle takes associated with hopper dredging during Gulf of Mexico maintenance dredging and sand mining operations by the COE's New Orleans, Galveston, and Jacksonville Districts (Mobile District has previously not had observers on hopper dredges so the historic level of incidental take, if any, is unknown);

2. The level of take anticipated in previous Opinions;

3. The distribution and abundance of sea turtles and Gulf sturgeon in the Gulf of Mexico;

4. COE adherence to dredging windows;

5. The magnitude of, and operational measures (including relocation trawling) employed by, individual dredging projects;

6. Documented sturgeon take by dredges on the Atlantic coast;

7. The number and description of the hopper dredging projects provided by each District; and

8. The proportion of known reproducing populations of Gulf sturgeon (total = 7) geographically located within each District.

Fresh Takes vs. Decomposed Takes

The incidental level of both sea turtle and Gulf sturgeon take is anticipated to consist of "fresh dead" animals. However, NOAA Fisheries realizes that dredging may produce an additional unquantifiable number of "previously dead" sea turtles or turtle parts. While decomposed animals taken in Federal operations are considered to be takes (the possession of a listed species is considered a take), NOAA Fisheries recognizes that decomposed sea turtles whose deaths were not necessarily related to the present activity may be entrained by the dredge. Theoretically, if dredging operations are conducted properly, no takes of sea turtles should occur since the turtle draghead defector should push the turtles to the side and the suction pumps should be turned off whenever the dredge draghead is away from the substrate. However, due to certain environmental and other conditions (e.g., rocky bottom, uneven substrate, sea swells, draghead operator error, clogged dragheads, etc.), the dredge dragheads may periodically lift off the bottom and draw in any other previously dead sea turtles or turtle parts it may encounter. Reviews of observer records reveal that entrainment of old turtle bones during hopper dredging operations occasionally occurs. Therefore, takes of decomposed listed species shall be evaluated on a case-by-case basis by NOAA Fisheries; these takes, depending upon the circumstances, may or may not be ascribed to the ongoing dredging operation and may or may not be counted towards the anticipated take level.

NOAA Fisheries relies heavily on the unbiased reports of the onboard endangered species observer and other sources of information (such as commercial fisheries operating in the area) when determining take of a listed species. Provided that NOAA Fisheries concurs with the COE's determination regarding the stage of decomposition, condition of the specimen, and ultimately the likely cause of mortality, the take may or may not be attributed to the incidental take level for a project. Similarly, sometimes parts of one dismembered turtle are taken in separate loads, sometimes several days apart; if the parts are a good "match" and appear to be from the same animal, NOAA Fisheries will likely determine that only a single turtle was taken. Also, turtles or sturgeon may strand near dredging operations, bearing marks or damage which could be construed as evidence of hopper dredge entrainment. NOAA Fisheries shall study these situations carefully in consultation with the affected COE Districts and Sea Turtle Stranding and Salvage Network (STSSN) personnel before reaching a determination on whether or not to count these as takes.

Take levels for the Galveston and New Orleans Districts are expected to remain identical to those established in the September 22, 1995, RBO, except that Gulf sturgeon takes will now be authorized for the New Orleans District. Since the RBO was issued, neither District has met or exceeded the established annual incidental take level (although the New Orleans District in July 2001 reinitiated consultation with

NOAA Fisheries when high turtle take levels in the MR-GO resulted in the District reaching 75% of its authorized take level of loggerhead sea turtles). NOAA Fisheries believes that the previously established anticipated take levels are still valid; however, one Gulf sturgeon will be added to the New Orleans District take limit where previously there was none, because NOAA Fisheries believes that there is a significant possibility that a Gulf sturgeon will be taken by a New Orleans District hopper dredge in the future. No Gulf sturgeon takes will be added to the Galveston District's take limit because Gulf sturgeon are not known to occur in the Galveston District.

Sea turtles and Gulf sturgeon may occur within the Mobile District's navigation channels and sand mining areas. Hopper dredge use by the Mobile District has occurred regularly in the past, but without observers to document potential sea turtle or Gulf sturgeon entrainment. Currently, a NOAA Fisheries' biological opinion does not exist to authorize potential takes during Mobile District hopper dredging activities. Although no take of listed turtles or sturgeon in the Mobile District have been reported to NOAA Fisheries, this is believed to be a reflection of the lack of observers present to monitor incoming dredged material for turtle and sturgeon parts. The present Opinion anticipates a limited amount of take for sea turtles and Gulf sturgeon by the Mobile District.

The Jacksonville District may incidentally take sea turtles and Gulf sturgeon in their hopper dredging operations west and north of Key West, Florida (takes in Key West channels are covered by the existing September 25, 1997, RBO to the COE's SAD); therefore, a take limit must be set for the Jacksonville District's Florida West Coast hopper dredging projects (Key West [excluding Key West navigation channels] to Aucilla River Basin [including the Aucilla River], Florida). The biennial incidental take level established for sea turtles and Gulf sturgeon in the October 1999 Charlotte Harbor Opinion will be subsumed into the Jacksonville District's Florida West Coast take level established in the present Opinion.

Anticipated Gulf-wide Take of Sea Turtles and Gulf Sturgeon by Hopper Dredges:

For the entire Gulf of Mexico from the U.S.-Mexico border to Key West, the annual documented COE incidental take per fiscal year, by injury or mortality, is expected to consist of twenty (20) Kemp's ridley turtles, fourteen (14) green turtles, four (4) hawksbill turtles, forty (40) loggerhead turtles, and four (4) Gulf sturgeon. This take level represents a total take per fiscal year for all channel dredging and sand mining by hopper dredges in the Gulf of Mexico by the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts collectively.

Galveston District

For the Galveston District, the annual documented incidental take, by injury or mortality, is expected to consist of seven (7) Kemp's ridleys, five (5) green turtles, one (1) hawksbill, and fifteen (15) loggerhead turtles per fiscal year for all channel dredging and sand mining by hopper dredge in the Galveston District. This level of take represents the same level of take authorized by the previous Opinion.

New Orleans District

For the New Orleans District, the documented annual incidental take, by injury or mortality, is expected to consist of seven (7) Kemp's ridleys, three (3) green turtles, one (1) hawksbill, and fifteen (15) loggerhead turtles, and one (1) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the New Orleans District. As in the previous Opinion, a greater number of green turtles is included in the incidental take level predicted for the Galveston District due to the greater abundance of green turtles in south Texas waters.

Mobile District (Florida Panhandle west of Aucilla River Basin to, but not including, the Mississippi River)
For the Mobile District, the documented annual incidental take, by injury or mortality, is expected to consist of three (3) Kemp's ridley, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and two (2) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the Mobile District. A greater number of Gulf sturgeon is included in the incidental take level predicted for the Mobile District than the New Orleans District due to the larger proportion of reproducing populations of of Gulf sturgeon in the former District.

Jacksonville District (Florida West Coast: Aucilla River Basin to, but not including, Key West)
For the Jacksonville District, the documented annual incidental take, by injury or mortality, is expected to consist of three (3) Kemp's ridleys, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and one (1) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the Jacksonville District west of Key West (hopper dredging of Key West navigation channels is covered under the existing regional hopper dredging RBO to the COE's SAD).

Anticipated Takes of Sea Turtles and Gulf Sturgeon through Relocation Trawling:

Though not included by the COE as an integral part of the proposed action, this Opinion will require the use of relocation trawling as a reasonable and prudent measure (RPM) to reduce the effect of take of turtles by hopper dredges. Even though relocation trawling involves directed take of turtles, it constitutes a legitimate RPM because it reduces the level of almost certain lethal and injurious take of sea turtles by hopper dredges, and allows the turtles captured non-injuriously by trawl to be relocated out of the path of the dredges. The Consultation Handbook (for Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act, U.S. Fish and Wildlife Service and National Marine Fisheries Service, March 1998) expressly authorizes such directed take as an RPM at page 4-54. Therefore, NOAA Fisheries will in this section evaluate the expected level of turtle take through required relocation trawling, so that these levels can be included in the evaluation of whether the proposed action will jeopardize the continued existence of the species.

Between October 1, 2002, and the present, approximately 80 sea turtles have been relocated in association with Gulf of Mexico hopper dredging projects, including projects at Aransas Pass, Brownsville Entrance Channel, and the MR-GO, by contract trawlers. Although 2002 was the first year the Galveston District conducted relocation trawling in association with some of its hopper dredging projects, henceforth the District will require mandatory 24-hr/day relocation trawling in association with all dredging projects within the District (Rob. Hauch, pers. comm. to E. Hawk, July 22, 2003).

NOAA Fisheries estimates that yearly relocation trawling in all of the navigation channels and sand mining areas of the Gulf of Mexico will take no more than 300 loggerhead, green, hawksbill, and Kemp's ridley sea turtles, and eight (8) Gulf sturgeon. This number is based on past recent history of relocation trawler takes in the Gulf of Mexico, information on Gulf sturgeon takes by shrimp trawlers at Gulf of Mexico barrier island passes (H. Rogillio, pers. comm. to Eric Hawk), the possibility that the events at Aransas Pass (where 70+ turtles were captured in 10 weeks during 2003) will repeat in other places in the Gulf of Mexico (perhaps simultaneously), increased presence of sea turtles in coastal waters as turtle populations recover and new TED regulations take effect leading to increased trawl capture rates, increased relocation trawling efforts in the Gulf of Mexico spurred in part by this summer's trawling success at Aransas Pass and MR-GO, the Galveston District's stated intent to conduct relocation trawling during on all their future District dredging projects (Rob Hauch, pers. comm. to Eric Hawk), probable increases in Gulf of Mexico summertime dredging when water temperatures are warmer and sea turtles are more abundant, and predicted relocation trawling captures by COE Districts in the Gulf of Mexico that have never before done so (i.e., Mobile District). As stated in the Reasonable and Prudent Measures, and Terms and Conditions of this ITS, relocation trawling is required under specific circumstances. This relocation trawling may result in sea turtle and Gulf sturgeon takes, but these takes are not expected to be injurious or lethal due to the short duration of the tow times (15 to 30 minutes per tow; not more than 42 minutes, as per Term and Condition No. 15) and required safe-handling procedures.

Estimated turtle take is derived as follows: In FY03, Shoreline Consulting captured 1-2 turtles at Aransas Pass, REMSA captured 71 turtles at Aransas Pass, relocation trawling at Brownsville Entrance Channel captured at least five more, and relocation trawling at the MR-GO captured seven in 2 ½ weeks, for a FY03 total of 85 turtles. However, if Galveston District dredged two large projects simultaneously in the summer, they could conceivably more than double the numbers taken this year. The three remaining COE Districts in the Gulf of Mexico would also be likely to be simultaneously conducting relocation trawling on some of their projects. Also, some major navigation projects have not been dredged in years and are due (e.g., Tampa Bay), as are minor projects known to take sea turtles (e.g., St. Petersburg Harbor). NOAA Fisheries arrived at the estimate of 300 potential sea turtle trawl captures yearly by Gulf of Mexico relocation trawlers by doubling the amount taken this year at Aransas Pass on the assumption that two large projects in the summer would take twice as many as one (73 x 2 = 146), then doubling it again to account for all the other uncertainties including increasing turtle populations, increased effectiveness of the larger TED escape openings, increased acceptance and use of relocation trawling, increased summer time trawling, increasing number of beach renourishment projects in the Gulf of Mexico.(146 x 2= 294), then rounding to 300 to allow an extra margin for error.

Sturgeon takes are estimates based on reports of Gulf sturgeon take by trawlers operating near Gulf of Mexico barrier island passes (H. Rogillio, pers. comm. to E. Hawk, 2002) and reports of gillnet interactions with Gulf sturgeon near passes where Gulf sturgeon are known to congregate in winter.

G. Summary of Effects of the Proposed Action on Sea Turtles, Gulf Sturgeon, and Gulf Sturgeon Critical Habitat

Stranding information indicates that sea turtle aggregations are found in the vicinity of Gulf of Mexico navigation channels and that sea turtles are present in nearshore Gulf coastal waters year-round. The previous NOAA Fisheries Opinion governing hopper dredging in the northern and western Gulf of Mexico (NMFS 1995) noted that shallow, warm, nearshore waters in the northern Gulf of Mexico provide prime Kemp's ridley habitat until cooling waters force turtles offshore or south along the Florida and southwest Texas coast. Generally, Kemp's ridleys were observed in water depths of less than 18 m and surface water temperatures greater than 12°C. Based on the year-round presence of sea turtles, seasonal presence of Gulf sturgeon in navigation channels and barrier island passes, sea turtles' potential presence at sand mining sites in proximity to hardgrounds, and the documented takes of sea turtles at sand mining sites in North Carolina, South Carolina, and Florida, it can be expected that future maintenance dredging and dredging for beach renourishment purposes with hopper dredges in the action area will occasionally capture and entrain sea turtles and Gulf sturgeon incidental to the proposed dredging activities. Most of these entrainments can be expected to result in death of the individuals overtaken by the draghead.

In addition to hopper dredge takes, NOAA Fisheries anticipates that sea turtles may be taken by bed-leveler type dredges. The Brunswick Harbor report received in July 2003 is the first report that NOAA Fisheries received indicating a possible link between bed-leveling mechanical dredging and sea turtle takes. Although there are no confirmed reports to date which definitively implicate bed-levelers with sea turtle takes, NOAA Fisheries believes, based on the Brunswick Harbor report, that a significant possibility exists that bed-leveling mechanical dredging may kill sea turtles during leveling/cleanup operations associated with hopper dredging projects not only at Brunswick Harbor, but also in Gulf of Mexico channels and dredged-material deposition areas where bed-levelers are used. Following the Brunswick Harbor report, NOAA Fisheries issued a biological opinion on September 11, 2003, to the Savannah District COE to allow the use of bed-leveling mechanical dredging devices during the Brunswick Harbor deepening project. That Opinion anticipated and established an incidental take of sea turtles pursuant to the proposed action. In the Gulf of Mexico, NOAA Fisheries will use STSSN observer reports and evidence from strandings in proximity of dredging projects where bed-levelers are being used to determine if sufficient evidence exists to indicate that a turtle was killed by a bed-leveler. If compelling STSSN observer reports and evidence indicate that a turtle was killed by a bed-leveling type dredge, that take will be deducted from the ITS' anticipated take level for that COE District where the take occurred.

NOAA Fisheries anticipates that for the entire Gulf of Mexico from the U.S.-Mexico border to Key West, not including Key West, endangered species observers aboard COE hopper dredging operations, and STSSN personnel indirectly monitoring bed-leveler type dredging, will document the take yearly, by injury or mortality, of a maximum of approximately 40 loggerhead turtles, 20 Kemp's ridley turtles, 14 green turtles, four hawksbill turtles, and four Gulf sturgeon, and of a maximum of 300 turtles and eight Gulf sturgeon taken non-injuriously by relocation trawling. These estimates are based on factors such as documented average and maximum yearly takes during previous years, variability in sea turtle abundance and distribution, annual maintenance dredging schedules, anticipated increases in beach nourishment projects, and anticipated takes established in previous Opinions. To be conservative and account for listed species which may be taken but not documented, NOAA Fisheries assumes that an equal number of sturgeon and turtles are killed by being crushed by the deflector dragheads but are not entrained and thus are not documented, or are entrained in fragments and are not detected by hopper dredge endangered species observers, or takes occur during periods when hopper dredge endangered species observers are not required or are not present. Thus, a maximum estimate of 80 loggerhead turtles, 40 Kemp's ridleys, 28 green turtles, eight hawksbill turtles, and eight Gulf sturgeon may be killed or injured annually in COE Gulf of Mexico hopper dredging operations. NOAA Fisheries estimates that 0-2 turtles and 0-1 Gulf sturgeon will be killed or injured annually pursuant to annual relocation trawling in the Gulf of Mexico.

With the exception of the northern nesting population of loggerheads, nesting for loggerheads, Kemp's ridley, and green sea turtles has been increasing or remaining stable in the southeast United States and (in the case of Kemp's ridleys) Rancho Nuevo, Mexico, given all of the ongoing impacts to these species which includes takes through maintenance dredging and sand mining using hopper dredges. Based on information presented in the Environmental Baseline section of this Opinion, the increase in TED opening sizes associated with the final rule, published in the *Federal Register* on February 21, 2003, (68 FR 8456) is expected to allow the northern nesting population of loggerheads to increase, though all sea turtle species in the Gulf of Mexico, and Gulf sturgeon, will benefit from the enlarged openings which will enhance escapement. Similarly, the population of Gulf sturgeon appears to be stable or increasing, and recent designation of critical habitat should further aid its recovery. Except for the Mobile District which previously has not had an Opinion authorizing incidental take (though NOAA Fisheries suspects takes none-the-less occurred), the proposed action does not constitute a significant increase in the authorized take, particularly injurious or lethal take, of sea turtles or Gulf sturgeon above levels associated with past and ongoing authorized maintenance dredging and sand mining activities involving the use of hopper dredging. Further, these take levels are very small compared to other activities, such as shrimping, other commercial fisheries, and vessel collisions, which are much greater sources of sea turtle and Gulf sturgeon take and mortality. Therefore, NOAA Fisheries believes that this level of anticipated take is not likely to alter the positive population trajectories of any of these species.

Finally, the critical habitat analysis that NOAA Fisheries conducted to investigate potential project impacts to PCEs within units #8 and #11 concluded that impacts from the project would not have a measurable effects on water quality, sediment quality, migratory pathways or prey availability. This conclusion was dependent upon two important parameters: 1) channels would only be maintained, not improved, and 2) sediments removed from the channel bed would not be different from those remaining; therefore available habitat would not be modified.

6.0 Cumulative Effects

Cumulative effects are the effects of future state, local, or private activities that are reasonably certain to occur within the action area or within the range of sea turtles. 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.

Within the action area, major future changes are not anticipated in the ongoing human activities described in the environmental baseline. The present, major human uses of the action area are expected to continue at the present levels of intensity in the near future. Listed species of turtles, however, migrate throughout the Atlantic Ocean and Gulf of Mexico and may be affected during their life cycles by non-Federal activities outside the action area.

Throughout the coastal Gulf of Mexico the loss of thousand of acres of wetlands is occurring due to natural subsidence and erosion, as well as reduced sediment input from the Mississippi River. Impacts caused by residential, commercial, and agricultural developments appear to be the primary causes of wetland loss in Texas.

Oil spills from tankers transporting foreign oil, as well as the illegal discharge of oil and tar from vessels discharging bilge water, will continue to affect water quality in the Gulf of Mexico. Cumulatively, these sources and natural oil seepage contribute most of the oil discharged into the Gulf of Mexico. Floating tar sampled during the 1970s, when bilge discharge was still legal, concluded that up to 60% of the pelagic tars sampled did not originate from northern Gulf of Mexico coast.

Marine debris will likely persist in the action area in spite of national and international treaty prohibitions. In Texas and Florida, approximately half of the stranded turtles examined have ingested marine debris (Plotkin and Amos 1990, Bolten and Bjorndal 1991). Although few individuals are affected, entanglement in marine debris may contribute more frequently to the death of sea turtles.

Coastal runoff and river discharges carry large volumes of petrochemical and other contaminants from agricultural activities, cities, and industries into the Gulf of Mexico. The coastal waters of the Gulf of Mexico have more sites with high contaminant concentrations than other areas of the coastal United States due to the large number of waste discharge point sources. The species of turtles analyzed in this Opinion may be exposed to and accumulate these contaminants during their life cycles. A few (n=12) Gulf sturgeon have been analyzed for pesticides and heavy metals (Bateman and Brim 1994). Each individual fish had concentrations of arsenic, mercury, DDT metabolites, toxaphene, polycyclic aromatic hydrocarbons and aliphatic hydrocarbons high enough to warrant concern (USFWS et al. 1995). Specific sources were not identified.

Beachfront development, lighting, and beach erosion control all are ongoing activities along the Atlantic and Gulf coasts. These activities potentially reduce or degrade sea turtle nesting habitats or interfere with hatchling movement to sea. Nocturnal human activities along nesting beaches may also discourage sea turtles from nesting sites. The extent to which these activities reduce sea turtle nesting and hatchling production is unknown. However, as conservation awareness spreads, more and more coastal cities and counties are adopting more stringent measures to protect hatchling sea turtles from the disorienting effects of beach lighting.

Because many activities that affect marine habitat involve some degree of Federal authorization (e.g., through MMS or COE), NOAA Fisheries expects that ESA section 7 will apply to most major, future actions that could affect designated Gulf sturgeon critical habitat.

State-regulated commercial and recreational fishing activities in Atlantic Ocean and Gulf of Mexico waters currently result in the incidental take of threatened and endangered species. It is expected that states will continue to license/permit large vessel and thrill-craft operations which do not fall under the purview of a Federal agency, and issue regulations that will affect fishery activities. Any increase in recreational vessel activity in inshore and offshore waters of the Gulf of Mexico and Atlantic Ocean will likely increase the number of turtles taken by injury or mortality in vessel collisions. Recreational hook-and-line fisheries have been known to lethally take sea turtles. Future cooperation between NOAA Fisheries and the states on these issues should help decrease take of sea turtles caused by recreational activities. NOAA Fisheries will continue to work with coastal states to develop and refine ESA section 6 agreements and section 10 permits to enhance programs to quantify and mitigate these takes.

7.0 Conclusion

The current status of sea turtle and Gulf sturgeon populations is not likely to be appreciably affected by hopper dredging operations in the action area, as has been described in detail in Sections 3.0 and 5.0 of this Opinion. In summary, NOAA Fisheries believes that the current status of sea turtle and Gulf sturgeon populations is stable or increasing and that hopper dredge-related take levels anticipated in the Effects of the Action (Section 5) and ITS of this Opinion will not change that conclusion. NOAA Fisheries acknowledges that documented takes represent partial estimates of total takes and believes that some takes may pass undetected by observers through inflow screening devices, due to the force of the water pressure, or because the animals are killed but not entrained; NOAA Fisheries estimates that unseen (thus, undocumented) takes represent roughly 50% of total documented takes and has evaluated the effects of the action including the expected undocumented takes.

It is also NOAA Fisheries' biological opinion that following the maintenance dredging of the channels (to existing depths only without improvements) the benthic community structure will return to, or return nearly to, pre-dredging status (i.e., species diversity, species richness, species abundance) with some inherent natural variability. Those benthic prey species will then be available for the conservation of Gulf sturgeon. NOAA Fisheries also concludes that the project will not impact water quality, sediment quality, or migratory pathways essential to the conservation of Gulf sturgeon. Therefore, NOAA Fisheries concludes that, when channels within designated critical habitat are dredged to only their current depth, without improvements (i.e., deepening or widening), the project will not destroy or adversely modify designated Gulf sturgeon critical habitat.

After reviewing the current status of sea turtles and Gulf sturgeon in the Gulf of Mexico; the environmental baseline for the action area; the effects of the proposed hopper dredging activities; and the cumulative effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion, it is NOAA Fisheries' biological opinion that the COE's hopper dredging activities, as proposed and described in the Proposed Action section of this Opinion, are not likely to jeopardize the continued existence of any listed species or destroy or adversely modify designated Gulf sturgeon critical habitat.

8.0 Incidental Take Statement

Section 9 of the ESA and Federal regulations issued pursuant to section 4(d) of the ESA prohibit the take of endangered and 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. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2) of the ESA, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Galveston, New Orleans, Mobile, and Jacksonville COE Districts so that they become binding conditions of any grant or permit issued to Gulf of Mexico hopper dredge operators for the exemption in section 7(o)(2) to apply. The COE has a continuing duty to regulate the activity covered by this incidental take statement. If the COE (1) fails to assume and implement the terms and conditions, or (2) fails to require the hopper dredge operators 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) will lapse. In order to monitor the impact of incidental take, the COE must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR 402.14(i)(3)].

Only incidental take resulting from the agency action, including incidental take caused by activities approved by the agency, that are identified in this statement and that comply with the specified reasonable and prudent measures, and terms and conditions, are exempt from the take prohibition of section 9(a) of the ESA.

Based on results of previous hopper dredging activities including dredging of Gulf of Mexico and southeastern U.S. channels, NOAA Fisheries foresees that future hopper dredging activities in U.S. Gulf of Mexico navigation channels and sand mining areas may result in the injury or mortality of loggerhead, Kemp's ridley, hawksbill, and green turtles, and Gulf sturgeon. A level of incidental take is anticipated; therefore, terms and conditions necessary to minimize and monitor takes are established.

Anticipated Gulf-wide Take by Hopper Dredging Activities:

For the entire Gulf of Mexico from the U.S.-Mexico border to Key West, the annual documented COE incidental take per fiscal year, by injury or mortality, is expected to consist of twenty (20) Kemp's ridley turtles, fourteen (14) green turtles, four (4) hawksbill turtles, forty (40) loggerhead turtles, and four (4) Gulf sturgeon. This take level represents a total take per fiscal year for all channel dredging and sand mining by hopper dredges in the Gulf of Mexico by the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts. Takes by bed-leveler type dredges will be more difficult to ascertain and determine responsibility for because bed-levelers do not entrain turtle parts, and no dredged materials come aboard for observers to monitor; furthermore, bed-leveler impacted turtles may not float ashore for several days, if at all. However, if compelling STSSN observer reports and evidence indicate that a turtle was killed by a bed-leveler associated with a hopper dredging project covered by this Opinion, that take will be deducted from the ITS' anticipated take level for that COE District where the take occurred.

In addition, the total anticipated annual non-injurious take by relocation trawling that is required under this ITS is expected to consist of 300 (three hundred) sea turtles, of any combination of the species, and of eight (8) Gulf sturgeon, across all the COE Districts and hopper dredging projects (the relocation trawling takes are not allocated by districts). NOAA Fisheries estimates that 0-2 turtles and 0-1 Gulf sturgeon will be killed or injured annually pursuant to annual relocation trawling in the Gulf of Mexico.

Galveston District
For the Galveston District, the annual documented incidental take by hopper dredges, by injury or mortality, is expected to consist of seven (7) Kemp's ridleys, five (5) green turtles, one (1) hawksbill, and fifteen (15) loggerhead turtles per fiscal year for all channel dredging and sand mining by hopper dredge in the Galveston District. This level of take represents the same level of take authorized by the previous Opinion. Although the annual level of hopper dredging in Freeport Channel has doubled since the previous Opinion, all takes recorded from Freeport Channel have been loggerheads and the District has never come close to reaching its anticipated take level for loggerheads, so no increase in take numbers of loggerheads or other species is expected.

New Orleans District
For the New Orleans District, the documented annual incidental take by hopper dredges, by injury or mortality, is expected to consist of seven (7) Kemp's ridleys, three (3) green turtles, one (1) hawksbill, and fifteen (15) loggerhead turtles, and one (1) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the New Orleans District. As in the previous Opinion, a greater number of green turtles is included in the incidental take level predicted for the Galveston District due to the greater abundance of green turtles in south Texas waters.

Mobile District (Florida Panhandle west of Aucilla River Basin to, but not including, the Mississippi River)
For the Mobile District, the documented annual incidental take by hopper dredges, by injury or mortality, is expected to consist of three (3) Kemp's ridley, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and two (2) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the Mobile District. A greater number of Gulf sturgeon is included in the incidental take level predicted for the Mobile District than the New Orleans District due to the greater abundance of Gulf sturgeon, and larger areas of designated Gulf sturgeon critical habitat, in the former.

Jacksonville District (Florida West Coast: Aucilla River Basin to, but not including, Key West)
For the Jacksonville District, the documented annual incidental take by hopper dredges, by injury or mortality, is expected to consist of three (3) Kemp's ridleys, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and one (1) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the Jacksonville District west of Key West (hopper dredging of Key West navigation channels is covered under the existing regional hopper dredging RBO to the COE's SAD).

Responsibility for Hopper Dredging Takes Where COE Jurisdiction is Blurred (Civil Works vs. Regulatory Projects):

As mentioned in Section 2.0, sometimes a hopper dredging activity is permitted by a COE District but the applicant/permittee is a different COE District. To ensure that the COE District ultimately responsible for authorizing a hopper dredge activity is held accountable for its permitting action which may result in a take, and to avoid confusion as to which COE District is to be charged with a take during a hopper dredging project authorized by a COE District but performed by another District or performed in another District, NOAA Fisheries has established the following guidelines for assigning take responsibility:

A protected species take shall normally be charged to the District which issues the regulatory permit for the hopper dredging. Civil works projects do not require regulatory permitting therefore civil works hopper dredging takes shall be charged to the COE District conducting or contracting the dredging project.

However, in Florida, the Mobile District will assume responsibility for (and be charged with) all takes of threatened or endangered species resulting from hopper dredging or relocation trawling activities contracted by the Mobile District even though regulatory permits for the activities may be issued by the Jacksonville District, based on a working agreement to this effect developed between the Mobile and Jacksonville Districts (Susan Rees, pers. comm. to Eric Hawk, October 30, 2003).

For example: The Jacksonville District authorizes (via regulatory permit action through a branch office of its Regulatory Division) the restoration of Pensacola Beach utilizing a hopper dredge. The Jacksonville District's Florida West Coast anticipated incidental take level ("quota") shall be charged with any takes ensuing from the hopper dredge activities even though Pensacola Beach geographically lies within the Mobile District's civil works boundaries, since the Jacksonville District has the authority to incorporate permit conditions to limit protected species take, and contracts the work.

For example: The Mobile District typically acts as construction agent for the U.S. Navy to hopper dredge the navigation channel at the Pensacola Naval Air Station ("Navy channel"), a non-civil works "regulatory" project subject to permitting by the Jacksonville District's Regulatory Division (which has regulatory permitting authority for projects in the Florida Panhandle). The Mobile District, acting for the Navy, applies for and obtains the required regulatory permit from Jacksonville District's Regulatory Division. However, the Mobile District, pursuant to the working agreement in place between the Mobile and Jacksonville Districts, shall be charged for any takes ensuing from that hopper dredging activity.

9.0 Reasonable and Prudent Measures

Regulations (50 CFR 402.02) implementing section 7 of the ESA define reasonable and prudent measures as actions the Director believes necessary or appropriate to minimize the impacts, i.e., amount or extent, of incidental take. The reasonable and prudent measures that NOAA Fisheries believes are necessary to minimize the impacts of hopper dredging in the Gulf of Mexico have been discussed with the COE and include use of temporal dredging windows, intake and overflow screening, use of sea turtle deflector dragheads, observer and reporting requirements, and sea turtle relocation trawling. The following reasonable and prudent measures and associated terms and conditions are established to implement these measures, and to document incidental takes. Only incidental takes that occur while these measures are in full implementation are authorized. These restrictions remain valid until reinitiation and conclusion of any subsequent section 7 consultation.

Seasonal Dredging Windows, Observer Requirements, Deflector Dragheads, and Relocation Trawling[5]

---

[5]The COE Wilmington District's sidecast dredges FRY, MERRITT, and SCHWEIZER, and split-hull hopper dredge CURRITUCK, are exempt from the above hopper dredging requirements (operating windows, deflectors, screening, observers, reporting requirements, etc.). Their small size and operating characteristics including small draghead sizes [2-ft by 2-ft, to 2-ft by 3-ft], small draghead openings [5-in by 5-in to 5 in by 8 in], small suction intake pipe diameters [10-14 in], and limited draghead suction [350-

Experience has shown that injuries sustained by sea turtles entrained in the hopper dredge dragheads are usually fatal. Current regional opinions for hopper dredging require seasonal dredging windows and observer monitoring requirements, deflector dragheads, and conditions and guidelines for relocation trawling, which NOAA Fisheries' believes are necessary to minimize effects of these removals on listed sea turtle species that occur in inshore and nearshore Gulf and South Atlantic waters.

Temperature- and date-based dredging windows:
Both the Mobile and Jacksonville Districts expressed comments opposing NOAA Fisheries' imposition of seasonal dredging windows in their respective Gulf of Mexico dredging areas. In their November 28, 2000, BA on their Florida west coast hopper dredging activities, the Jacksonville District indicated that sea turtles are present year-round in the Gulf, so windows would only be of limited effectiveness. In their October 30, 2002, comments to NOAA Fisheries, the Mobile District noted it did not want to be restricted to seasonal hopper dredging windows, indicating that these would potentially seriously and detrimentally impact its ability to complete its operations and maintain Federal navigation projects due to "no excess of large dredges of the type required to perform maintenance of most Federal projects" and other reasons related to dredging industry capacity, downsizing, "loss of production" associated with the deflector draghead, and safety concerns.

Sea turtles generally move inshore with warming waters and offshore with cooling waters. In East Coast channels, Dickerson et al. (1995) found reduced sea turtle abundance with water temperatures less than 16°C. They found that 1,008 trawls conducted at or below 16°C captured 22 turtles (4.4 per cent), while 1,791 trawls conducted above 16°C resulted in 473 (95.6 percent) captures. Dickerson et al. also found that sea turtles tend to avoid water temperatures less than 15°C; however, hopper dredging Kings Bay, Georgia between March 1-12, 1997 with surface water temperatures of 57-58°F (13.9-14.4°C) resulted in 11 turtle takes in nine days (NMFS 1997).

More recently, the Savannah District COE (COE 2003) reported that the average surface temperature at which recent hopper dredge turtle takes have occurred in Brunswick is 57.7°F (14.3°C) and that "there are scattered takes at lower temperatures than turtles would normally be expected to occur" but that "These lower temperatures may not have played a significant role in those takes." The lowest temperature at which multiple takes have occurred in Brunswick in 2003 is 57°F (13.9°C).

Recognizing the relationship between water temperature and sea turtle presence and based on work by the NOAA Fisheries' Galveston Laboratory (Renaud et al. 1994, 1995) funded by the COE, NOAA Fisheries wrote in its September 22, 1995 RBO to the Galveston and New Orleans Districts that sea turtles might be taken by hopper dredges "in all ship channels in the northern Gulf when temperatures exceed 12°C," and that "Lacking seasonal water temperature data, NMFS believes takes may occur from April through November northeast of Corpus Christi, Texas." Consequently, Term and Condition No. 3 of the 1995 RBO required that observers be aboard hopper dredges year-round from Corpus Christi southwest to the Mexican border, but "If no turtle take is observed in December, then observer coverage can be terminated during January and February or until water temperatures again reach 12°." It also required that "In channels

---

400 hp]) have been previously determined by NOAA Fisheries to not adversely affect listed species (March 9, 1999, ESA consultation with COE Wilmington District, incorporated herein by reference). The aforementioned vessels and commercial hopper and sidecast dredges of the same or lesser sizes and operating characteristics working in the Gulf of Mexico would be considered similarly exempt by NOAA Fisheries' SERO after consultation with SERO.

northeast of Corpus Christi (except for MR-SWP), observers shall be aboard whenever surface water temperatures are 12°C or greater, and/or between April 1 and November 30."

NOAA Fisheries published a final rule (67 FR 71895, December 3, 2002) effective January 2, 2003, to reduce the impact of large-mesh gillnet fisheries on the Atlantic Coast on sea turtles. This rule was directed primarily at the monkfish fishery, which uses large-mesh gillnet gear and operates in the area when sea turtles are present. The rule reduces impacts on endangered and threatened species of sea turtles by closing portions of the Mid-Atlantic Exclusive Economic Zone (EEZ) waters to fishing with gillnets with a mesh size larger than 8-inch (20.3-cm) stretched mesh. The timing of the restrictions was based upon an analysis of sea surface temperatures for the above areas. Sea turtles are known to migrate into and through these waters when the sea surface temperature is 11°C or greater (Epperly and Braun-McNeill 2002). The January 15 date for the re-opening of the areas north of Oregon Inlet, North Carolina to the large-mesh gillnet fisheries was also based upon the 11°C threshold and is consistent with the seasonal boundary established for the summer flounder fishery-sea turtle protection area (50 CFR 223.206(d)(2) (iii)(A)). In summary, NOAA Fisheries believes that the 11°C threshold established to protect East Coast sea turtles is reasonable and prudent to protect sea turtles in the Gulf of Mexico from hopper dredging operations.

Temperature- and date-based dredging windows appear to have been very effective in reducing sea turtle entrainments. Observer requirements and monitoring including assessment and relocation trawling have provided valuable real-time estimates of sea turtle abundance, takes, and distribution which have been helpful to COE project planning efforts. Evidence that the windows and observer requirements are effective and valuable is that neither the Galveston or New Orleans District's hopper dredging projects have exceeded their anticipated incidental takes since their combined RBO was issued in 1995; SAD has not exceeded its anticipated incidental take since its RBO was amended in 1997.

NMFS-approved observers monitor dredged material inflow and overflow screening baskets on many projects; however, screening is only partially effective and observed, documented takes provide only partial estimates of total sea turtle and Gulf sturgeon mortality. NOAA Fisheries believes that some listed species taken by hopper dredges go undetected because body parts are forced through the sampling screens by the water pressure and are buried in the dredged material, or animals are crushed or killed but not entrained by the suction and so the takes may go unnoticed. The only mortalities that are documented are those where body parts either float, are large enough to be caught in the screens, and can be identified as from sea turtle or sturgeon species. However, this Opinion estimates that with 4-inch inflow screening in place, the observers probably detect and record at least 50% of total mortality.

Relocation trawling has proved to be a useful conservation tool in most dredging projects where it has been implemented. The September 22, 1995, RBO included a Conservation Recommendation for relocation trawling which stated that "Relocation trawling in advance of an operating dredge in Texas and Louisiana channels should be considered if takes are documented early in a project that requires use of a hopper dredge during a period in which large number of sea turtles may occur." That RBO was amended by NOAA Fisheries (Amendment No. 1, June 13, 2002) to change the Conservation Recommendation to a Term and Condition of the RBO. Overall, it is NOAA Fisheries' opinion that the COE Districts choosing to implement relocation trawling have benefitted from their decisions. For example, in the Galveston District, Freeport Harbor Project (July 13-September 24, 2002), assessment and relocation trawling resulted in one loggerhead capture. In Sabine Pass (Sabine-Neches Waterway), assessment and relocation trawling in July-August 2002 resulted in five loggerhead and three Kemp's ridley captures. One turtle was killed by the dredge; this occurred while the relocation trawler was in port repairing its trawl net (P. Bargo, pers. comm. 2002). In the Jacksonville District, sea turtles have been relocated out of the path of hoppers dredges operating in Tampa Bay and Charlotte Harbor or their entrance channels. During St. Petersburg Harbor and

Entrance Channel dredging in the fall of 2000, a pre-dredging risk assessment trawl survey resulted in capture, tagging, and relocation of two adult loggerheads and one subadult green turtle. In February 2002 during the Jacksonville District's Canaveral Channel emergency hopper dredging project for the Navy, two trawlers working around the clock captured and relocated 69 loggerhead and green turtles in seven days, and no turtles were entrained by the hopper dredge. In the Wilmington District's Bogue Banks Project in North Carolina, two trawlers successfully relocated five turtles in 15 days between March 13 and 27, 2003; one turtle was taken by the dredge. Most recently, Aransas Pass relocation trawling associated with hopper dredging resulted in 71 turtles captured and released (with three recaptures) in three months of dredging and relocation trawling. Five turtles were killed by the dredge. No turtles were killed after relocation trawling was increased from 12 to 24 hours per day (Trish Bargo, October 27, 2003, pers. comm. to Eric Hawk).

This Opinion authorizes the per-fiscal-year non-lethal non-injurious take (minor skin abrasions resulting from trawl capture are considered non-injurious), external flipper-tagging, and taking of tissue samples of 300 sea turtles and eight Gulf sturgeon in association with all relocation trawling conducted by the COE throughout the Gulf of Mexico. This take shall not be broken down by District but rather is a Gulf-wide take limit. This take is limited to relocation trawling conducted during the 0-3 days immediately preceding the start of hopper dredging (as a means to determine/reduce the initial abundance of sea turtles in the area and determine if additional trawling efforts are needed), and during actual hopper dredging. Relocation trawling performed to reduce endangered species/hopper dredge interactions is subject to the requirements detailed in the terms and conditions of this Opinion.

NOAA Fisheries estimates that 0-2 turtles and 0-1 Gulf sturgeon will be killed or injured annually pursuant to annual relocation trawling in the Gulf of Mexico. Lethal or injurious takes which result from relocation trawling (including capturing, handling, weighing, measuring, tagging, holding, and releasing) are limited to one sea turtle and one Gulf sturgeon per District per fiscal year and will be subtracted from (counted against) the authorized, anticipated take levels discussed previously for hopper dredging. For example: a Kemp's ridley injury or lethal take during a COE District's relocation trawling effort shall be counted as a documented take against that District's fiscal year anticipated take level for that species. NOAA Fisheries shall be immediately notified of any mortalities or injuries sustained by protected species during relocation/assessment trawling.

Deflector Dragheads
V-shaped, sea turtle deflector dragheads prevent an unquantifiable yet significant number of sea turtles from being entrained and killed in hopper dredges each year. Without them, turtle takes during hopper dredging operations would unquestionably be higher. Draghead tests conducted in May-June 1993 by the COE's WES in clear water conditions on the sea floor off Fort Pierce, Florida, with 300 mock turtles placed in rows, showed convincingly that the newly-developed WES deflector draghead "performed exceedingly well at deflecting the mock turtles." Thirty-seven of 39 mock turtles encountered were deflected, two turtles were not deflected, and none were damaged. Also, "the deflector draghead provided better production rates than the unmodified California draghead, and the deflector draghead was easier to operate and maneuver than the unmodified California flat-front draghead." The V-shape reduced forces encountered by the draghead, and resulted in smoother operation (WES, Sea Turtle Project Progress Report, June 1993)." V-shaped deflecting dragheads are now a widely accepted conservation tool, the dredging industry is familiar with them and their operation, and they are used by all COE Districts conducting hopper dredge operations where turtles may be present, with the exception of the Mobile District.

In Gulf of Mexico coastal waters, evidence indicates that turtles are present year-round, further arguing for year-round deflector draghead use by all COE Districts of the Gulf of Mexico. Recent comprehensive NOAA Fisheries' Southeast Fishery Science Center (SEFSC) review and analyses (unpublished data, December 2002: Environmental Assessment/Regulatory Impact Review of Technical Changes to the Turtle Excluder Device (TED) Regulations to Enhance Turtle Protection in the Southeastern United States) of seasonal sea turtle distribution and strandings throughout the Gulf of Mexico (including coastal waters dredged by the Mobile District) noted that "Aerial surveys and observer data have indicated the presence of turtles in areas where strandings data are sparse" and "Turtles were in all areas at all times." (September 13, 2002, e-mail, Epperly to Hawk). NOAA Fisheries' SEFSC's sea turtle team leader Epperly also recommended against hopper dredges operating in those same areas "without monitoring, relocation, and specialized gear (i.e., deflectors) on the dragheads."

It wasn't until late-summer 2002 that the Mobile District started requiring observers and screening on its hopper dredges. REMSA recently completed ten days of 24-hr relocation trawling/dredged material monitoring for the Mobile District during ten days of emergency maintenance hopper dredging of the Mobile Bay ship channel (July 10-20, 2003). No sea turtle specimens or parts of specimens were observed during the ten days by either the relocation trawler observers or the shipboard dredge observers. Dredging is currently conducted in the Mobile District with onboard observers and 4-inch inflow screening but without deflector dragheads (Ladner, pers. comm. to Hawk, November 26, 2002). Mobile District, in written comments dated October 30, 2002, on a draft version of the present Opinion, noted that "The District recognizes the benefits of deflector dragheads to conservation of the species in areas where sea turtle takes occur. However, dragheads reduce dredging efficiency and result in dredges being onsite for a longer period of time. Consequently, the District finds no overriding need to utilize deflectors until it is proven, through use of screens and observers, that the Mobile District actually takes sea turtles during normal operations."

Habitat Protection Buffers

COE Jacksonville District biologists expressed concern (Yvonne Haberer, email to Eric Hawk, April 2003; Terri Jordan, pers. comm. August 11, 2003) over a NOAA Fisheries' draft version of the current Opinion proposed requirement of a 200-m buffer zone around hardgrounds in the vicinity of COE-proposed sand mining areas off Florida. In discussions over the Pinellas County Shore Protection Project, the COE noted that NOAA Fisheries has previously required only a 200-ft zone around hardgrounds adjacent to COE sand mining operations in the Gulf of Mexico. NOAA Fisheries' Protected Resources Division consulted with NOAA Fisheries Habitat Conservation Division, which stated that as a general rule, buffer zones should not be less than 400 feet to protect essential fish habitat. In its response to the COE, which included a request for additional information (Eric Hawk email to Yvonne Haberer, May 14, 2003) which was never received, NOAA Fisheries' Protected Resources Division concluded that a 200-ft buffer was inadequate and that a 200-meter buffer zone was appropriate to protect sea turtles which may be foraging on or around hardgrounds adjacent to mining sites from hopper dredge entrainment. NOAA Fisheries noted that hopper dredge vessels are large (typically 300-400 ft long); limited in their ability to maneuver; and given other variable factors such as wind, tide, weather, sea state, currents, operator fatigue, operator error, and instrument error, a 200-ft margin of safety around hardgrounds was inadequate to protect NOAA Fisheries trust resources and sea turtles which could be expected to frequent hardgrounds and their vicinity. Subsequently, however, conversations with hopper dredge industry officials and dredge operators have led NOAA Fisheries to conclude that based on advances in hopper dredge construction, including the use of highly maneuverable Z-drives (on some dredges), enhanced station-keeping ability, and industry-standard navigation practices and technologies including routine use of differential global positioning systems (DGPS), dredge operators will be able to routinely and safely maintain desired safe distances from hardgrounds that are marked on their charts (E. Hawk, August 14 and 18, 2003, pers. comms. with R. Richardson, Manson Dredging; Mark Sickles, Dredge Contractors of America; and W. Murcheson, NATCO Dredging). NOAA Fisheries has determined that 400 feet is an adequate, reasonable buffer zone that should be maintained around hardgrounds, to protect endangered living resources–i.e., sea turtles that may be foraging in their vicinity. Four hundred feet also provides the additional benefit of protecting hardgrounds from some of the probable adverse effects of sedimentation from the dredged material plume. For example, a generic test case numerical model simulation of a typical situation representative of hopper dredging of MMS shoals using the Trailing Suction Hopper Dredge Plume Model developed by Baird, Inc., for MMS, using inputted variables of a cross current of 20 cm/s, fine sand, two million cubic meter project, and a water depth of about 15 to 20 m, gave a sedimentation footprint of 200 m beyond the boundary of the dredge area (Rob Nairn, October 3, 2003, pers. comm. to Eric Hawk).

Summary

NOAA Fisheries has carefully reviewed and fully considered these and all other comments received from the affected COE Districts; however, in summary, after review of WES studies, SEFSC survey data, and based on past experience, NOAA Fisheries believes that seasonal dredging windows, deflector dragheads, observer and screening requirements, and relocation trawling have proved convincingly over the last decade to be an excellent combination of reasonable and prudent measures for minimizing the number and impact of sea turtle takes, enabling NOAA Fisheries to assess the quantity of turtles being taken, and allowing the affected COE Districts (Wilmington, Charleston, Savannah, Jacksonville, New Orleans, and Galveston) to meet their essential dredging requirements to keep Federal navigation channels open.

There are increased costs associated with observers and relocation trawling (current estimates are $3,500-$5,000/day for 24 hours of relocation trawling, $150-$200/day for a hopper dredge endangered species observer); delays sometimes occur, particularly when two turtles are taken in 24 hours, or when clay-like materials clog the inflow screening boxes; and dredging projects may take longer to complete. However, overall, NOAA Fisheries believes that loss of production associated with the deflector draghead is insignificant, while saving significant numbers of sea turtles from almost-certain death by dismemberment in suction dragheads; increased production costs, including costs of observers and relocation trawlers, pale in comparison to overall project costs; and NOAA Fisheries' experience over the past decade with the COE's SAD Districts and the Gulf of Mexico's Galveston and New Orleans Districts has shown that Federal hopper dredging projects get completed in a timely fashion. Also, allowable overdredging by the COE reduces to some degree the need for frequent maintenance dredging, and the conservation measures required by the biological opinions in place result in significantly reduced dredge interactions with sea turtles–interactions which usually prove fatal.

NOAA Fisheries considers that PIT tagging, external flipper tagging, and tissue sampling of turtles captured pursuant to relocation trawling, including genetic analysis of tissue samples taken from dredge- and trawl-captured turtles, will provide benefits to the species by providing data which will enable NOAA Fisheries to make determinations on what sea turtle stocks are being impacted, and how that may change over time as the population growth rates change among the different stocks (Sheryan Epperly, pers. comm. to Eric Hawk).

NOAA Fisheries estimates that 150-300 sea turtle tissue samples will be taken annually in the Gulf of Mexico during COE dredging and relocation trawling operations. Depending on the species, a few years of collection will provide sufficient sample size to assess stock composition (Peter Dutton, pers. comm. to Eric Hawk). Samples will continue to be collected and archived, until a follow-up analysis can be done two to three years after that if it is deemed necessary. NOAA Fisheries estimates that genetic analysis of tissue samples, including labor, costs about $100-150 per sample (Peter Dutton, pers. comm. to Eric Hawk); thus, the cost of analysis of 300 samples will be between $30,000 and $45,000. NOAA Fisheries believes that, minimally, the combined COE Gulf of Mexico Districts affected by this Opinion should provide $10,000 to help defray the cost of analysis of the first 300 samples taken. COE funds should be provided to NOAA

Fisheries' Southwest Fisheries Center's Dr. Peter Dutton, preferably in a lump-sum, one-time payment as a part of a Memorandum of Understanding (MOU) to be developed between Dr. Dutton and the COE's combined Gulf of Mexico Districts (similar to the current MOU nearing completion between the COE's South Atlantic Division and the Southwest Fisheries Science Center for hopper dredging/relocation trawling conducted by the South Atlantic Divisions four Atlantic Districts). After the initial financial contribution by the COE, NOAA Fisheries would continue to archive and store samples gathered by the COE but the COE's responsibility would be limited to taking the samples and shipping them to NOAA Fisheries' Southwest Fisheries Science Center. Incorporation of this funding requirement as a reasonable and prudent measure of this Opinion will result in the gathering of knowledge that is expected to reduce the effect of the takes from Gulf of Mexico dredging projects.

The dredging windows set forth in the terms and conditions of the 1995 Gulf of Mexico hopper dredging RBO, while very strongly encouraged by NOAA Fisheries for previously stated reasons, were ultimately discretionary activities by the COE and could be deviated from by the SAD or the Galveston or New Orleans Districts when they deemed essential or necessary after consultation with NOAA Fisheries, though this was infrequent. This flexibility is also stipulated in the Proposed Action section of the present Opinion which applies to all four COE Districts. Terms and conditions of the present Opinion remain largely the same, with the following significant exceptions:

1) The allowable window for hopper dredging has been extended to include the Mobile and Jacksonville Districts so that the December-March window is now Gulf-wide, from the Texas-Mexico border to Key West channels;

2) Previous temperature requirements of Term and Condition No. 3 of the 1995 RBO (i.e., "If no turtle take is observed during December, observer coverage can be terminated during January and February or until water temperatures again reach 12°C; In channels northeast of Corpus Christi, Texas [except for Southwest Pass as discussed below], observers shall be aboard whenever surface water temperatures are 12° or greater, and/or between April 1 and November 30.") have been modified downward to 11°C based on new sea turtle distribution information which indicates that sea turtles are more tolerant of cold than was previously thought. The discussion of temperature/sea turtle distribution supporting this change is incorporated herein by reference to the Monkfish Biological Opinion (dated April 14, 2003, prepared by NOAA Fisheries Northeast Region).

3) The September 22, 1995, RBO included a Conservation Recommendation for relocation trawling which stated that "Relocation trawling in advance of an operating dredge in Texas and Louisiana channels should be considered if takes are documented early in a project that requires use of a hopper dredge during a period in which large number of sea turtles may occur." That RBO was amended by NOAA Fisheries SER (Amendment No. 1, June 13, 2002), to change the Conservation Recommendation to a Term and Condition of the RBO. Term and Condition No. 10 of the amended RBO specified conditions under which relocation trawling "should be considered" and subject to what precautions it should be carried out, and authorized unlimited non-lethal, non-injurious take of sea turtles and Gulf sturgeon in association with relocation trawling deemed necessary the by COE. This amount of discretion has since been determined to be inappropriate for a non-discretionary term and condition of an ITS. Thus, the present Opinion's requirement for relocation trawling is more non-discretionary than as written in Amendment No. 1 in that it <u>requires</u> the use of relocation trawlers under specific conditions as a way to minimize turtle interactions, rather than only requiring that it be "considered" by the COE.

4) In the present Opinion, the COE Districts are authorized to request waivers from the relocation trawling requirement (which may be delivered and responded to by both agencies via electronic mail) for projects where the COE Districts do not feel relocation trawling is feasible, necessary or warranted.

5) The Districts are required to fund the cost of tissue sampling and genetic analyses of tissue samples from turtles taken during projects in their respective Districts.

The following terms and conditions implement the reasonable and prudent measures discussed above:

Terms and Conditions

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. Hopper dredging of Key West channels is covered by the existing August 25, 1995, RBO to the COE's SAD. The COE shall discuss with NOAA Fisheries why a particular project cannot be done within the December 1-March 31 "window."

2. *Non-hopper Type Dredging*: Pipeline or hydraulic dredges, because they are not known to take turtles, must be used whenever possible between April 1 and November 30 in Gulf of Mexico waters up to one mile into rivers. This should be considered particularly in channels such as those associated with Galveston Bay and Mississippi River - Gulf Outlet (MR-GO), where lethal takes of endangered Kemp's ridleys have been documented during summer months, and Aransas Pass, where large numbers of loggerheads may be found during summer months. In the MR-GO, incidental takes and sightings of threatened loggerhead sea turtles have historically been highest during April and October.

3. *Annual Reports*: The annual summary report, discussed below (#9), must give a complete explanation of why alternative dredges (dredges other than hopper dredges) were not used for maintenance dredging of channels between April and November.

4. *Observers*: The COE shall arrange for NOAA Fisheries-approved observers to be aboard the hopper dredges to monitor the hopper spoil, screening, and dragheads for sea turtles and Gulf sturgeon and their remains.

   a. Brazos Santiago Pass east to Key West, Florida: Observer coverage sufficient for 100% monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges year-round from Brazos Santiago Pass to (not including) Key West, Florida between April 1 and November 30, and whenever surface water temperatures are 11°C or greater.

   b. Observer coverage of hopper dredging of sand mining areas shall ensure 50% monitoring (i.e., one observer).

   c. Observers are not required at any time in Mississippi River - Southwest Pass (MR-SWP).

5. *Operational Procedures*: During periods in which hopper dredges are operating and NOAA Fisheries-approved observers are *not* required, (as delineated in #4 above), the appropriate COE District 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 COE 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 immediately by phone (727/570-5312) or fax (727/570-5517) if a sea turtle or Gulf sturgeon is taken by the dredge.

6. *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 COE, in consultation with observers and the draghead operator, determines that the draghead 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 COE 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.

c. Exemption - MR-SWP: Screening is not required at any time in MR-SWP.

7 *Dredging Pumps*: Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads 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 draghead frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the draghead is trimming off.

8. *Sea Turtle Deflecting Draghead*: A state-of-the-art rigid deflector draghead must be used on all hopper dredges in all Gulf of Mexico channels and sand mining sites at all times of the year except that the rigid deflector draghead is not required in MR-SWP at any time of the year.

9. *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges must be faxed to NOAA Fisheries' Southeast Regional Office (727-570-5517) by onboard endangered species observers within 24 hours of any sea turtle, Gulf sturgeon, or other listed species take observed.

A preliminary report summarizing the results of the hopper dredging and any documented sea turtle or Gulf sturgeon takes must be submitted to NOAA Fisheries within 30 working days of completion of any dredging project. Reports shall contain information on project location (specific channel/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 (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the COE deems relevant.

An annual report (based on fiscal year) must be submitted to NOAA Fisheries summarizing hopper dredging projects and documented incidental takes.

10. *Sea Turtle Strandings*: The COE Project Manager 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 draghead 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 COE'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 COE District where the take occurred.

11 *Reporting - Strandings*: Each COE District shall provide NOAA Fisheries' Southeast Regional Office with an annual report detailing incidents, with photographs when available, of stranded sea turtles and Gulf sturgeon that bear indications of draghead impingement or entrainment. This reporting requirement may be included in the end-of-year report required in Term and Condition No. 9, above.

12. *District Annual Relocation Trawling Report*: Each COE District shall provide NOAA Fisheries' Southeast Regional Office with end-of-project reports within 30 days of completion of relocation trawling projects, and an annual report summarizing relocation trawling efforts and results within their District. The annual report requirement may be included in the end-of-year report required in Term and Condition # 9, 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 by the COE at all projects where <u>any</u> of the following conditions are met; however, other ongoing projects not meeting these conditions are not required to conduct relocation trawling:

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 a District's sea turtle species quota for a particular species has previously been met.

14. *Relocation Trawling Waiver*: For individual projects the affected COE District may request by letter to 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.

15. *Relocation Trawling - Annual Take Limits*: This 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 COE 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:

a. *Trawl Time*: Trawl tow-time duration shall not exceed 42 minutes (doors in - doors out) and trawl speeds shall not exceed 3.5 knots.

b. *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 (Appendix IV).

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 appropriate COE 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 Appendix II or Appendix III of this Opinion. 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. This 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. *Cost Sharing of Genetic Analysis*: The COE's Gulf of Mexico Districts shall combine to provide a one-time payment of $10,000 to NOAA Fisheries to share the cost of NOAA-Fisheries analysis of 300 tissue samples taken during COE hopper dredging/trawling operations in the Gulf of Mexico. This cost is currently estimated by NOAA Fisheries to be about $100-150 per sample, or $30,000-$45,000. COE funds shall be provided to NOAA Fisheries' Southwest Fisheries Center's Dr. Peter Dutton as a part of a Memorandum of Understanding (MOU) to be developed between Dr. Dutton and the COE's combined Gulf of Mexico Districts and Divisions within six months of the issuance of this Opinion.

n. *PIT Tagging:* PIT tagging is not required or authorized for, and shall not be conducted by, ESOs 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.

o. *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 this 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.

p. *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, 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. 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.

16. *Hardground 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 hardground areas or bottom structures that serve as attractants to sea turtles for foraging or shelter. NOAA Fisheries considers (for the purposes of this Opinion only) a significant hardground 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 COE Districts shall ensure that sand mining sites within their Districts are adequately mapped to enable the dredge to stay at least 400 feet from these areas. If the COE 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.

17. *Training - Personnel on Hopper Dredges*: The respective COE Districts must ensure that 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 draghead assembly.

18. *Dredge Lighting*: From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout 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 OSHA requirements. All non-essential lighting on the dredge and pumpout 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 natal beaches.

10.0 Conservation Recommendations

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the COE in contributing to the conservation of sea turtles and Gulf sturgeon by further reducing or eliminating adverse impacts that result from hopper dredging.

Channel Conditions and Seasonal Abundance Studies: Channel-specific studies should be undertaken to identify seasonal relative abundance of sea turtles and Gulf sturgeon within Gulf of Mexico channels. The December 1 through March 31 dredging window and associated observer requirements listed above may be adjusted (after consultation and authorization by NOAA Fisheries) on a channel-specific basis, if (a) the COE can provide sufficient scientific evidence that sea turtles and Gulf sturgeon are not present or that levels of abundance are extremely low during other months of the year, or (b) the COE can identify seawater temperature regimes that ensure extremely low abundance of sea turtles or Gulf sturgeon in coastal waters, and can monitor water temperatures in a real-time manner. Surveys may indicate that some channels do not support significant turtle populations, and hopper dredging in these channels may be unrestricted on a year-round basis, as in the case of MR-SWP. To date, sea turtle deflector draghead efficiency has not reached the point where seasonal restrictions can be lifted.

2. *Draghead Modifications and Bed Leveling Studies*: The New Orleans, Galveston, Mobile, and Jacksonville Districts should supplement the efforts of SAD and WES to develop modifications to existing dredges to reduce or eliminate take of sea turtles, and develop methods to minimize sea turtle take during "cleanup" operations when the draghead maintains only intermittent contact with the bottom. Some method to level the "peaks and valleys" created by dredging would reduce the amount of time dragheads are off the bottom.

3. *Draghead Evaluation Studies and Protocol*: Additional research, development, and improved performance is needed before the V-shaped rigid deflector draghead can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities. Development of a more effective deflector draghead or other entrainment-deterring device (or combination of devices, including use of acoustic deterrents) could potentially reduce the need for sea turtle relocation or result in expansion of the winter dredging window. NOAA Fisheries should be consulted regarding the development of a protocol for draghead evaluation tests. NOAA Fisheries recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts coordinate with ERDC, SAD, the Association of Dredge Contractors of America, and dredge operators (Manson, Bean-Stuyvesant, Great Lakes, Natco, etc.) regarding additional reasonable measures they may take to further reduce the likelihood of sea turtle and Gulf sturgeon takes.

4. *Continuous Improvements in Monitoring and Detecting Takes*: The COE should seek continuous improvements in detecting takes and should determine, through research and development, a better method for monitoring and estimating sea turtle and Gulf sturgeon takes by hopper dredge. Observation of overflow and inflow screening is only partially effective and provides only partial estimates of total sea turtle and Gulf sturgeon mortality.

   Overflow Screening: The COE should encourage dredging companies to develop or modify existing overflow screening methods on their company's dredge vessels for maximum effectiveness of screening and monitoring. Horizontal overflow screening is preferable to vertical overflow screening because NOAA Fisheries considers that horizontal overflow screening is significantly more effective at detecting evidence of protected species entrainment than vertical overflow screening.

   Preferential Consideration for Horizontal Overflow Screening: The COE should give preferential consideration to hopper dredges with horizontal overflow screening when awarding hopper dredging contracts for areas where new materials, large amounts of debris, or clay may be encountered, or have historically been encountered. Excessive inflow screen clogging may in some instances necessitate removal of inflow screening, at which point effective overflow screening becomes more important.

5. *Section 10 Research Permits and Relocation Trawling*: NOAA Fisheries recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts, either singly or combined, apply to NOAA Fisheries for an ESA section 10 research permit to conduct endangered species research on species incidentally captured during relocation trawling. For example, satellite tagging of captured turtles could enable the COE Districts to gain important knowledge on sea turtle seasonal distribution and presence in navigation channels and sand mining sites and also, as mandated by section 7(a)(1) of the ESA, to utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species. SERO shall assist the COE Districts with the permit application process.

6. *Draghead Improvements - Water Ports*: NOAA Fisheries recommends that the COE's Gulf of Mexico Districts require or at least recommend to dredge operators that all dragheads on hopper dredges contracted by the COE for dredging projects be eventually outfitted with water ports located in the *top* of the dragheads to help prevent the dragheads from becoming plugged with sediments. When the dragheads become plugged with sediments, the dragheads are often raised off the bottom (by the dredge operator) with the suction pumps on in order to take in enough water to help clear clogs in the dragarm pipeline, which increases the likelihood that sea turtles in the

vicinity of the draghead will be taken by the dredge. Water ports located in the top of the dragheads would relieve the necessity of raising the draghead off the bottom to perform such an action, and reduce the chance of incidental take of sea turtles.

NOAA Fisheries supports and recommends the implementation of proposals by ERDC and SAD personnel for various draghead modifications to address scenarios where turtles may be entrained during hopper dredging (Dickerson and Clausner 2003). These include: a) an adjustable visor; b) water jets for flaps to prevent plugging and thus reduce the requirement to lift the draghead off the bottom; and c) a valve arrangement (which mimics the function of a "Hoffer" valve used on cutterhead type dredges to allow additional water to be brought in when the suction line is plugging) that will provide a very large amount of water into the suction pipe thereby significantly reducing flow through the visor when the draghead is lifted off the bottom, reducing the potential to take a turtle.

7. *Economic Incentives for No Turtle Takes*: The COE should consider devising and implementing some method of significant economic incentives to hopper dredge operators such as financial reimbursement based on their satisfactory completion of dredging operations, or *X* number of cubic yards of material moved, or hours of dredging performed, *without taking turtles*. This may encourage dredging companies to research and develop 'turtle friendly' dredging methods; more effective, deflector dragheads; pre-deflectors; top-located water ports on dragarms, etc.

8. *Sedimentation Limits to Protect Resources (Hardbottoms/Reefs)*: NOAA Fisheries recommends water column sediment load deposition rates of no more than 200 mg/cm^2/day, averaged over a 7-day period, to protect coral reefs and hard bottom communities from dredging-associated turbidity impacts to listed species foraging habitat.

9. *Boca Grande Pass - Conditions*: If the COE's Jacksonville District decides to renew dredging permits for the Boca Grande Pass, NOAA Fisheries recommends that the District conduct or sponsor a Gulf sturgeon study, including gillnetting and tagging utilizing ultrasonic and radio transmitters, and mtDNA sampling, to help determine the genetic origins, relative and seasonal abundance, distribution and utilization of estuarine and marine habitat by Gulf sturgeon within Charlotte Harbor estuary and Charlotte Harbor Entrance Channel, and shall report to NOAA Fisheries biannually on the progress and final results of said study.

10. *Relocation Trawling - Guidelines*: Within six months of the issuance of this Opinion, the COE's Gulf of Mexico Districts, in coordination with COE's SAD, shall develop relocation trawling guidelines to ensure safe handling and standardized data gathering techniques for sea turtles and Gulf sturgeon by COE contractors, and forward copies to NOAA Fisheries' Protected Resources Division.

    Sodium Vapor Lights on Offshore Equipment: On offshore equipment (i.e., hopper dredges, pumpout barges) shielded low pressure sodium vapor lights are highly recommended for lights that cannot be eliminated.

11.0 Reinitiation of Consultation

Requirements for Reinitiation of Consultation: Reinitiation of formal consultation is required if (a) the amount or extent of taking specified in the incidental take statement is exceeded, (b) new information reveals effects of the action that may affect listed species or critical habitat when designated in a manner or

12.0 Appendices

Appendix I.

Summary of Takes by Hopper Dredges in the COE Galveston District Since the 1995 RBO.

TABLE 1

MAINTENANCE DREDGING TURTLE TAKES BY FISCAL YEAR

Date Taken	Kemp's ridley	Loggerhead	Green	Hawksbill
Fiscal Year 1995				
Feb 19, 1995			1	
Feb 22, 1995			1	
Feb 26, 1995	1			
Aug 5, 1995	1			
Aug 31, 1995	1			
Sep 4, 1995	1			
Sep 16, 1995		1		
TOTAL FY 95	4	1	2	0
Fiscal Year 1996				
Oct 9, 1995		1		
Jun 28, 1996		1		
Jul 11, 1996		1		
Jul 13, 1996		1		
Jul 22, 1996		1		
TOTAL FY 96	0	5	0	0
Fiscal Year 1997				
Oct 13, 1996		1		
Mar 26, 1997	1			
Apr 29, 1997	1			
Jun 13, 1997		1		
TOTAL FY 97	2	2	0	0
Fiscal Year 1998				
TOTAL FY 98	0	0	0	0

Fiscal Year 1999				
Oct 29, 1998		1		
Feb 18, 1999			1	
Mar 2, 1999			1	
Jun 18, 1999		1		
Jun 19, 1999		1		
Jun 30, 1999		1		
TOTAL FY 99	0	4	2	0

Fiscal Year 2000				
Aug 10, 2000		1		
Aug 15, 2000		1		
TOTAL FY 00	0	2	0	0

Fiscal Year 2001				
TOTAL FY 01	0	0	0	0

Fiscal Year 2002				
Mar 18, 2002			1	
Mar 19, 2002			2	
Mar 20, 2002			1	
Aug 11, 2002		1		
TOTAL FY 02	0	1	4	0

TOTAL	6	15	8	0

TABLE 2

NEW-WORK DREDGING TURTLE TAKES BY FISCAL YEAR

Date Taken	Kemp's ridley	Loggerhead	Green	Hawksbill
Fiscal Year 1999				
Jan 4, 1999	1			

TABLE 2

NEW-WORK DREDGING TURTLE TAKES BY FISCAL YEAR

Date Taken	Kemp's ridley	Loggerhead	Green	Hawksbill
Sep 29, 1999			1	
TOTAL FY 99	1	0	1	0
Fiscal Year 2000				
TOTAL FY 00	0	0	0	0
TOTAL	1	0	1	0

TABLE 3

TURTLE TAKES BY PROJECT

Date Taken	Kemp's ridley	Loggerhead	Green	Hawksbill
Brazos Island Harbor				
Feb 19, 1995			1	
Feb 22, 1995			1	
Feb 26, 1995	1			
Apr 29, 1997	1			
Jun 13, 1997		1		
Feb 18, 1999			1	
Mar 2, 1999			1	
Mar 18, 2002			1	
Mar 19, 2002			1	
TOTAL	2	1	6	0
Corpus Christi Ship Channel				
Sep 16, 1995		1		
Jun 18, 1999		1		
Jun 19, 1999		1		
Jun 30, 1999		1		
TOTAL	0	4	0	0

TABLE 3

TURTLE TAKES BY PROJECT

Date Taken	Kemp's ridley	Loggerhead	Green	Hawksbill
Freeport Harbor				
Oct 9, 1995		1		
Jun 28, 1996		1		
Jul 11, 1996		1		
Jul 13, 1996		1		
Jul 22, 1996		1		
Oct 29, 1998		1		
Aug 10, 2000		1		
Aug 15, 2000		1		
TOTAL	0	8	0	0
Galveston Harbor and Channel /Houston-Galveston Navigation Channels				
Aug 15, 1995	1			
Aug 31, 1995	1			
Sep 4, 1995	1			
Jan 4, 1999	1			
Sep 29, 1999			1	
TOTAL	4	0	1	0
Matagorda Ship Channel				
Oct 13, 1996		1		
TOTAL	0	1	0	0
Sabine – Neches Waterway				
Mar 26, 1997	1			
Aug 11, 2002		1		
TOTAL	1	1	0	0
Port Mansfield Channel				

TABLE 3

TURTLE TAKES BY PROJECT

Date Taken	Kemp's ridley	Loggerhead	Green	Hawksbill
Mar 19, 2002			1	
Mar 20, 2002			1	
TOTAL	0	0	2	0

Appendix II:

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>>>

1. Put on a new pair of latex gloves.
2. Use a new disposable scalpel to cut out an approx. 1 cm (½ 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 "insert" near the plastron. It does not matter what stage of decomposition the carcass is in.
3. 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.
4. Put the sample into the plastic vial containing saturated NaCl with 20% DMSO *(SEE BELOW)
5. 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 "JMD20010715-01, <u>C. mydas</u>, 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.
6. Label the outside of the vial with the same information (stranding ID number, species, state and carapace length) using the permanent marker.
7. Place clear scotch tape over the writing on the vial to protect it from being smeared or erased.
8. Wrap parafilm around the cap of the vial by stretching it as you wrap.
9. Place vial within whirlpak and close.
10. Dispose of the scalpel.
11. 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.
12. 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
305-361-4207

THANK YOU FOR COLLECTING SAMPLES FOR SEA TURTLE GENETIC RESEARCH!!

Genetic Sample Kit Materials – DEAD turtles

- latex gloves
- single-use scalpel blades (Fisher Scientific 1-800-766-7000, cat. # 08-927-5A)
- plastic screw-cap vial containing saturated NaCl with 20% DMSO, wrapped in parafilm
- waterproof paper label, ¼" x 4"
- pencil to write on waterproof paper label
- permanent marker to label the plastic vials
- scotch tape to protect writing on the vials
- piece of parafilm to wrap the cap of the vial
- whirl-pak to return/store sample vial

Appendix III:

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 "JMD20010715-01, <u>C. mydas</u>, 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
305-361-4207

THANK YOU FOR COLLECTING SAMPLES FOR SEA TURTLE GENETIC RESEARCH!!

Genetic Sample Kit Materials – LIVE turtles

- latex gloves
  alcohol swabs
  Betadine/iodine swabs
  4-6 mm biopsy punch – sterile, disposable (Moore Medical Supply 1-800-678-8678, part #0052442)
  plastic screw-cap vial containing saturated NaCl with 20% DMSO, wrapped in parafilm
  wooden skewer
  waterproof paper label, ¼" x 4"
- pencil to write on waterproof paper label
  permanent marker to label the plastic vials
  scotch tape to protect writing on the vials
  piece if parafilm to wrap the cap of the vial
  whirl-pak to return/store sample vial

Appendix IV: 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.

13. 0 BIBLIOGRAPHY

1. Literature Cited - Turtle Species Accounts
2. Literature Cited - Gulf Sturgeon Species Account
3. General References and Other Literature Cited

1. Literature Cited - Turtle Species Accounts

Audubon, J.J. 1926. The Turtlers. Pp. 194-202 In: Delineations of American Scenery and Character, G.A Baker and Co., N.Y.

Balazs, G.H. 1982. Growth rates of immature green turtles in the Hawaiian Archipelago, p. 117 - 125. *In* K.A. Bjorndal (ed.), Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C.

Balazs, G.H. 1983. Recovery records of adult green turtles observed or originally tagged at French Frigate Shoals, northwestern Hawaiian Islands. NOAA Tech. Memo. NMFS-SWFC-36.

Balazs, G.H. 1999. Factors to consider in the tagging of sea turtles. In: Research and Management Techniques for the Conservation of Sea Turtles, by K.L. Eckert, K.A. Bjorndal, F.A. Abreu-Grobois, and M. Donnelly (editors). IUCN/SSC Marine Turtle Specialist Group Publication No. 4, 1999.

Bass, A.L., S.P. Epperly, J. Braun, D.W. Owens, and R.M. Patterson. 1998. Natal origin and sex ratios of foraging sea turtles in the Pamlico-Albemarle Estuarine Complex. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-415: 137-138.

Bjorndal, K.A., J.A. Wetherall, A.B. Bolten, and J.A. Mortimer. 1999. Twenty-six years of green turtle nesting at Tortuguero, Costa Rica: an encouraging trend. Conservation Biology 13: 126-134.

Brongersma, L. 1972. European Atlantic Turtles. Zool. Verhand. Leiden, 121: 318 pp.

Caldwell, D.K. and A. Carr. 1957. Status of the sea turtle fishery in Florida. Transactions of the 22nd North American Wildlife Conference, 457-463.

Carr, A.F., M.H. Carr, and A.B. Meylan. 1978. The ecology and migrations of sea turtles, 7. The west Caribbean green turtle colony. Bulletin of the American Museum of Natural History 162: 1-46.

Carr, A. 1984. So Excellent a Fishe. Charles Scribner's Sons, N.Y

Díez, C.E. 2000. Personal communication to Blair Witherington, FMRI.

Dodd, C.K. 1981. Nesting of the green turtle, *Chelonia mydas* (L.), in Florida: historic review and present trends. Brimleyana 7: 39-54.

Dodd, C.K. 1988. Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta* (Linnaeus 1758). U.S. Fish and Wildlife Service, Biological Report 88 (14).

Doughty, R.W. 1984. Sea turtles in Texas: a forgotten commerce. Southwestern Historical Quarterly 88: 43-70.

Dutton, P.H., B.W. Bowen, D.W. Owens, A. Barragán, and S.K. Davis. 1999. Global phylogeography of the leatherback turtles (*Dermochelys coriacea*). J. Zool. Lond 248:397-409.

Eckert, S.A. and K.L. Eckert, P. Ponganis, and G.L. Kooyman. 1989. Diving and foraging behavior of leatherback sea turtles (*Dermochelys coriacea*). Can. J. Zool. 67:2834-2840.

Eckert, K. L. 1995. Hawksbill sea turtle (*Eretmochelys imbricata*). National Marine Fisheries Service and U.S. Fish and Wildlife Service Status Reviews for Sea Turtles Listed under the Endangered Species Act of 1973. Silver Spring, Maryland: National Marine Fisheries Service, pp. 76-108.

Ehrhart, L.M. 1983. Marine turtles of the Indian River Lagoon System. Florida Sci. 46: 337-346.

Ehrhart, L.M. 1989. Status report of the loggerhead turtle. In Ogren, L., F. Berry, K. Bjorndal, H. Kumpf, R. Mast, G. Medina, H. Reichart, and R. Witham (eds.). Proceedings of the 2nd Western Atlantic Turtle Symposium. NOAA Technical Memorandum NMFS-SEFC-226: 122-139.

Ehrhart, L.M. and B.E. Witherington. 1992. Green turtle. In P. E. Moler (ed.). Rare and Endangered Biota of Florida, Volume III. Amphibians and Reptiles. University Presses of Florida: 90-94.

Epperly, S.P., J. Braun, and A.J. Chester. 1995b. Aerial surveys for sea turtles in North Carolina inshore waters. Fishery Bulletin 93: 254-261.

Ernst, L.H. and R.W. Barbour. 1972. Turtles of the United States. Univ. Kentucky Press, Lexington, Ky.

Florida Marine Research Institute, Florida Dept. of Environmental Protection. 2001. Florida statewide nesting beach survey data. Florida Department of Environmental Protection. Unpublished data.

FPL (Florida Power & Light Co.) St. Lucie Plant. 2000. Annual environmental operating report 1999. Juno Beach, Fla.

Frazer, N.B. and L.M. Ehrhart. 1985. Preliminary growth models for green, *Chelonia mydas*, and loggerhead, *Caretta caretta*, turtles in the wild. Copeia 1985: 73-79.

Frazer, N.B., C.J. Limpus, and J.L. Greene. 1994. Growth and age at maturity of Queensland loggerheads. U.S. Dep. of Commer. NOAA Tech. Mem. NMFS-SEFSC-351:42-45.

Garduño-Andrade, M., Guzmán, V., Miranda, E., Briseno-Duenas, R., and Abreu, A. 1999. Increases in hawksbill turtle *(Eretmochelys imbricata)* nestings in the Yucatán Peninsula, Mexico (1977-1996): data in support of successful conservation? Chelonian Conservation and Biology 3(2):286-295.

Groombridge, B. 1982. The IUCN Amphibia - Reptilia Red Data Book. Part 1. Testudines, Crocodylia, Rhynchocephalia. Int. Union Conserv. Nature and Nat. Res., 426 pp.

Guseman, J.L. and L.M. Ehrhart. 1992. Ecological geography of Western Atlantic loggerheads and green turtles: evidence from remote tag recoveries. In M. Salmon and J. Wyneken (compilers). Proceedings of the 11th Annual Workshop on Sea Turtle Biology and Conservation, NOAA Technical Memorandum NMFS. NMFS-SEFC-302: 50.

Henwood, T.A. and L.H. Ogren. 1987. Distribution and migrations of immature Kemp's ridley turtles (*Lepidochelys kempii*) and green turtles (*Chelonia mydas*) off Florida, Georgia, and South Carolina. Northeast Gulf Science, 9(2): 153-160.

Herbst, L.H. 1994. Fibropapillomatosis in marine turtles. Annual Review of Fish Diseases 4: 389-425.

Hildebrand, H. 1963. Hallazgo del area de anidación de la tortuga "lora" *Lepidochelys kempii* (Garman), en la costa occidental del Golfo de México (Rept., Chel.). Ciencia Mex., 22(a): 105-112

Hildebrand, H. 1982. A historical review of the status of sea turtle populations in the Western Gulf of Mexico. In K.A. Bjorndal (ed.). Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C. 447-453.

Hirth, H.F. 1997. Synopsis of the biological data on the green turtle *Chelonia mydas* (Linnaeus 1758). Biological Report 97(1), Fish and Wildlife Service, U.S. Dept of the Interior. 120 pp.

Hirth, H. 1980. Some aspects of the nesting behavior and reproductive biology of sea turtles. American Zoologist 20:507-523.

Jacobson, E.R. 1990. An update on green turtle fibropapilloma. Marine Turtle Newsletter 49: 7-8.

Jacobson, E.R., S.B. Simpson, Jr., and J.P. Sundberg. 1991. Fibropapillomas in green turtles. In G.H. Balazs, and S.G. Pooley (eds.). Research Plan for Marine Turtle Fibropapilloma, NOAA-TM-NMFS-SWFSC-156: 99-100.

Johnson, S.A., and L.M. Ehrhart. 1994. Nest-site fidelity of the Florida green turtle. In B.A. Schroeder and B.E. Witherington (compilers). Proceedings of the 13th Annual Symposium on Sea Turtle Biology and Conservation, NOAA Technical Memorandum NMFS-SEFSC-341: 83.

Keinath, J.A. 1993. Movements and behavior of wild and head-started sea turtles. Ph.D. Dissertation. College of William and Mary, Gloucester Point, Va., 206 pp.

Lagueux, C.J. 1998. Demography of marine turtles harvested by Miskito Indians of Atlantic Nicaragua. In R. Byles and Y. Fernández (compilers). Proceedings of the 16th Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412: 90.

Leon, Y.M. and C.E. Diez, 2000. Ecology and population biology of hawksbill turtles at a Caribbean feeding ground. Pp. 32-33 *in* Proceedings of the 18th International Sea Turtle Symposium, Abreu-Grobois, F.A., Briseno-Duenas, R. ,Marquez, R., and Sarti, L., Compilers. NOAA Technical Memorandum NMFS-SEFSC-436.

Lutcavage, M. and J.A. Musick. 1985. Aspects of the biology of sea turtles in Virginia. Copeia 1985(2): 449-456.

MacKay, A.L. and J.L. Rebholz. 1996. Sea turtle activity survey on St. Croix, U.S. Virgin Islands (1992-1994). In J.A. Keinath, D.E. Barnard, J.A. Musick, and B.A. Bell (Compilers). Proceedings of the 15th Annual Symposium on Sea Turtle Biology and Conservation. NOAA Tech. Memo. NMFS-SEFSC-387: 178-181.

Magnuson, J.J., K.A. Bjorndal, W.D. DuPaul, G.L. Graham, D.W. Owens, P.C.H. Pritchard, J.I. Richardson, G.E. Saul, and C.W. West. 1990. Decline of the sea turtles: causes and prevention National Academy Press, Washington, D.C. 274 pp.

Mayor, P., B. Phillips, and Z. Hillis-Starr. 1998. Results of stomach content analysis on the juvenile hawksbill turtles of Buck Island Reef National Monument, U.S.V.I. Pp. 230-232 *in* Proceedings of the 17th Annual Sea Turtle Symposium, S. Epperly and J. Braun, Compilers. NOAA Tech. Memo. NMFS-SEFSC-415.

Meylan, A.B. 1988. Spongivory in hawksbill turtles: a diet of glass. Science 239(393-395).

Meylan, A., B. Schroeder, and A. Mosier. 1995. Sea turtle nesting activity in the State of Florida 1979-1992. Florida Marine Research Publications 52: 1-51.

Meylan, A.B., and M. Donnelly. 1999. Status justification for listing the hawksbill turtle (*Eretmochelys imbricata* as critically endangered on the 1996 IUCN Red List of Threatened Animals. Chelonian Conservation and Biology 3(2): 200-204.

Meylan, A.B. 1999a. The status of the hawksbill turtle (*Eretmochelys imbricata*) in the Caribbean. Region. Chelonian Conservation and Biology 3(2): 177-184.

Meylan, A.B. 1999b. International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean region. Chelonian Conservation and Biology 3(2): 189-194.

Meylan, A.B., in prep. The hawksbill turtle (*Eretmochelys imbricata*). *In* Meylan, P. A,. and G. L. Heinrich, eds. The Biology and Conservation of Florida Turtles. Chelonian Research Monographs.

Morreale, S.J. and E.A. Standora. 1999. Vying for the same resources: potential conflict along migratory corridors. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-415: 69.

Murphy, T.M. and S.R. Hopkins. 1984. Aerial and ground surveys of marine turtle nesting beaches in the Southeast Region. Unpublished report prepared for the National Marine Fisheries Service.

Nietschmann, B. 1982. The cultural context of sea turtle subsistence hunting in the Caribbean and problems caused by commercial exploitation. In K.A. Bjorndal (ed.). Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C. 439-445.

NMFS Southeast Fisheries Science Center. 2001. Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the Western North Atlantic. U.S. Department of Commerce, National Marine Fisheries Service, Miami, Fla., SEFSC Contribution PRD-00/01-08; Parts I-III and Appendices I-V1.

NMFS and USFWS. 1991a. Recovery Plan for U.S. Population of Atlantic Green Turtle. National Marine Fisheries Service, Washington, D.C.

NMFS and USFWS. 1991b. Recovery Plan for U.S. Population of Loggerhead Turtle. National Marine Fisheries Service, Washington, D.C.

NMFS and USFWS. 1992. Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C.

NMFS and USFWS. 1993. Recovery Plan for Hawksbill Turtles in the U.S. Caribbean, Atlantic Ocean, and Gulf of Mexico. National Marine Fisheries Service, St. Petersburg, Fla.

NMFS and USFWS. 1995. Status reviews for sea turtles listed under the Endangered Species Act of 1973. National Marine Fisheries Service, Silver Spring, Md.

Ogren, L.H. 1989. Distribution of juvenile and sub-adult Kemp's ridley sea turtle: Preliminary results from 1984-1987 surveys, pp. 116-123 in: Caillouet, C.W. and A.M. Landry (eds), First Intl. Symp. on Kemp's Ridley Sea Turtle Biol, Conserv. and Management. Texas A&M Univ.Galveston, Tex., Oct. 1-4, 1985, TAMU-SG-89-105.

Parsons, J.J. 1972. The hawksbill turtle and the tortoise shell trade. In: Études de géographie tropicale offertes a Pierre Gourou. Paris: Mouton, pp. 45-60.

Pritchard, P.C.H. 1969. Sea turtles of the Guianas. Bull. Fla. State Mus. 13(2): 1-139.

Renaud, M.L. 1995. Movements and submergence patterns of Kemp's ridley turtles (*Lepidochelys kempii*). Journal of Herpetology 29: 370-374.

Richardson, J.I., Bell, R. and Richardson, T.H. 1999. Population ecology and demographic implications drawn from an 11-year study of nesting hawksbill turtles, *Eretmochelys imbricata*, at Jumby Bay, Long Island, Antigua, West Indies. Chelonian Conservation and Biology 3(2): 244-250.

Ross, J.P. 1979. Historical decline of loggerhead, ridley, and leatherback sea turtles, pp. 189-195. In: Bjorndal, K.A. (editor), Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C.

Schmid, J.R. and W.N. Witzell. 1997. Age and growth of wild Kemp's ridley turtles (*Lepidochelys kempii*): cumulative results of tagging studies in Florida. Chelonian Conserv. Biol. 2: 532 - 537.

Schroeder, B.A., and A.M. Foley. 1995. Population studies of marine turtles in Florida Bay. In J. I. Richardson and T.H. Richardson (compilers). Proceedings of the Twelfth Annual Workshop on Sea Turtle Biology and Conservation, NOAA Technical Memorandum NMFS-SEFSC-361: 117.

Schroeder, B.A., A.M. Foley, B.E. Witherington, and A.E. Mosier. 1998. Ecology of marine turtles in Florida Bay: Population structure, distribution, and occurrence of fibropapilloma. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-415: 265-267.

Schultz, J.P. 1975. Sea turtles nesting in Surinam. Zoologische Verhandelingen (Leiden), Number 143: 172 pp.

Shaver, D.J. 1991. Feeding ecology of wild and head-started Kemp's ridley sea turtles in south Texas waters. Journal of Herpetology. Vol. 23. 1991.

Shaver, D.J. 1994. Relative abundance, temporal patterns, and growth of sea turtles at the Mansfield Channel, Texas. Journal of Herpetology 28: 491-497.

Shoop, C.R. and R.D. Kenney. 1992. Seasonal distributions and abundance of loggerhead and leatherback sea turtles in waters of the northeastern United States. Herpetological Monographs. 6: 43-67.

Smith, G.M. and C.W. Coates. 1938. Fibro-epithelial growths of the skin in large marine turtles, *Chelonia mydas* (Linnaeus). Zoologica 24: 93-98.

Spotila, J.R., A.E. Dunham, A.J. Leslie, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 1996. Worldwide population decline of *Dermochelys coriacea*: are leatherback turtles going extinct? Chel. Conserv. Biol. 2(2): 209-222.

Spotila, J.R., R.D. Reina, A.C. Steyermark, P.T. Plotkin and F.V. Paladino. 2000. Pacific leatherback turtles face extinction. Nature 405: 529-530.

TEWG. 1998. An assessment of the Kemp's ridley (*Lepidochelys kempii)* and loggerhead (*Caretta caretta*) sea turtle populations in the western North Atlantic. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-409, 96 pp.

TEWG. 2000. Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-444, 115 pp.

USFWS and NMFS. 1992. Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*). National Marine Fisheries Service, St. Petersburg, Fla.

van Dam, R. and C. Diez, 1997. Predation by hawksbill turtles on sponges at Mona Island, Puerto Rico. Pp. 1421-1426, Proc. 8th International Coral Reef Symposium, v. 2.

van Dam, R. and C. Diez. 1998. Home range of immature hawksbill turtles (*Eretmochelys imbricata*) at two Caribbean islands. Journal of Experimental Marine Biology and Ecology, 220(1):15-24.

Wershoven, J.L. and R.W. Wershoven. 1992. Juvenile green turtles in their nearshore habitat of Broward County, Florida: a five-year review. In M. Salmon and J. Wyneken (compilers). Proceedings of the 11th Annual Workshop on Sea Turtle Biology and Conservation, NOAA Technical Memorandum NMFS. NMFS-SEFC-302: 121-123.

Witherington, B.E., and L.M. Ehrhart. 1989. Status and reproductive characteristics of green turtles (*Chelonia mydas*) nesting in Florida. In L. Ogren, F. Berry, K. Bjorndal, H. Kumpf, R. Mast, G. Medina, H. Reichart, and R. Witham (eds.). Proceedings of the 2nd Western Atlantic Turtle Symposium, NOAA Technical Memorandum NMFS-SEFC-226: 351-352.

Zug, G.R.. and J.F. Parham. 1996. Age and growth in leatherback turtles, *Dermochelys coriacea* (Testudines: Dermochelyidae): a skeletochronological analysis. Chel. Conserv. Biol. 2(2): 244-249.

Zwinenberg. A.J. 1977. Kemp's ridley, *Lepidochelys kempii* (Garman, 1880), undoubtedly the most endangered marine turtle today (with notes on the current status of *Lepidochelys olivacea*). Bulletin of the Maryland Herpetological Society, 13(3): 170-192.

2. Literature Cited - Gulf Sturgeon Species Account:

Barkuloo, J. 1988. Report on the conservation status of the Gulf of Mexico sturgeon, *Acipenser oxyrhynchus desotoi*. U.S. Fish and Wildlife Service, Panama City, Florida.

Bateman, D.H. and M.S. Brim. 1994. Environmental contaminants in Gulf sturgeon of northwest Florida, 1985-1991. U.S. Fish and Wildlife Service. Pub. No. PCFO-EC 94-09. Panama City, Florida. 23 pp. with appendices.

Carr, A. 1983. All the way down upon the Suwannee River. Audubon Magazine 85(2):78-101

Chapman, F.A., S.F. O'Keefe, and D.E. Campton. 1993. Establishment of parameters critical for the culture and commercialization of Gulf of Mexico sturgeon, *Acipenser oxyrhynchus desotoi*. Final Report, NOAA, St. Petersburg, Florida.

Dadswell, M.J. 1979. Biology and population characteristics of the shortnose sturgeon, *Acipenser brevirostrum* LeSeueur 1818 (Osteichthyes: Acipenseridae), in the St. John River estuary, New Brunswick, Canada. Canadian Journal of Zoology 57:2186-2210.

Fraser, T.H. 1984. New record of *Acipenser oxyrhynchus* in Charlotte Harbor, Florida. Florida Scientist 47(1):78-79.

1991. Endangered and threatened wildlife and plants; determination of threatened status for the Gulf sturgeon. Federal Register 56(189): 49653-49658.

1999. U.S. Fish and Wildlife Service. Draft biological opinion on the effects of the Mobile, Alabama, Harbor Navigation Project (Hurricane Recovery Plan) on the threatened Gulf sturgeon, *Acipenser oxyrinchus desotoi*. 28 pp. Feb. 26.

FWS & GSMFC. 1995. U.S. Fish and Wildlife Service and Gulf States Marine Fisheries Commission. Gulf sturgeon recovery plan. Atlanta, Georgia. 170 pp.

Gilbert, C. 1989. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Mid-Atlantic Bight)--Atlantic and shortnose sturgeons. U.S. Fish and Wildlife Service, Biological Report 82(11.12). U.S. Army Corps of Engineers TR EL-82-4. 28 pp.

Hollowell, J. 1980. Information report Gulf of Mexico sturgeon, *Acipenser oxyrhynchus desotoi* (Vladykov). U.S. Fish and Wildlife Service. Unpublished report.

Huff, J.A. 1975. Life history of the Gulf of Mexico sturgeon, *Acipenser oxyrhynchus desotoi*, in the Suwannee River, Florida. Marine Resources Pub. No. 16. 32 pp.

Mason, W.T., Jr., and J.P. Clugston. 1993. Foods of the Gulf sturgeon *Acipenser oxyrhynchus desotoi* in the Suwannee River, Florida. Transactions of the American Fisheries Society 122:378-385.

Odenkirk, J.S. 1989. Movements of Gulf of Mexico sturgeon in the Apalachicola River, Florida. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies. 43:230-238.

Reynolds, C.R. 1993. Gulf sturgeon sightings, historic and recent–a summary of public responses. U.S. Fish and Wildlife Service. Panama City, Fla. 40pp.

Sulak, K.J. and J.P. Clugston. 1999. Recent advances in life history of Gulf of Mexico sturgeon *Acipenser oxyrinchus desotoi* in the Suwannee River, Florida, U.S.A.: a synopsis. J. Appl. Ichth. 15: 116 - 128.

Swift, C., R.W. Yerger, and P.R. Parrish. 1977. Distribution and natural history of the fresh and brackish water fishes of the Ochlockonee River, Florida and Georgia. Bull. Tall Timbers Res. Sta. No. 20. October. Pp. 18-19. Tallahassee, Florida.

White, D.H., C.A. Mitchell, H.D. Kennedy, A.J. Krynitsky, and M.A. Ribick. 1983. Elevated DDE and toxaphene residues in fishes and birds refelct local contamination in the lower Rio Grande Valley, Texas. The Southwestern Naturalist 28(3):325-333.

Wooley, C.M., P.A. Moon, and E.J. Crateau. 1982. A larval Gulf of Mexico sturgeon (*Acipenser oxyrhynchus desotoi*) from the Apalachicola River, Florida. Northeast Gulf Science 5(2):57-58.

Wooley, C.M. and E.J. Crateau. 1985. Movement, microhabitat, exploitation, and management of Gulf of Mexico sturgeon, Apalachicola River, Florida. North American Journal of Fisheries Management 5:590-605.

Ziewitz, J.W. and G.A. Carmody. 1998. Anadromous fish habitat in the Alabama-Coosa-Tallapoosa and Apalachicola-Chattahoochee-Flint River basins. U.S. Fish and Wildlife Service. Panama City, Florida. December.

3. General References and Other Literature Cited

Aguilar, R., J. Mas, and X. Pastor. 1995. Impact of Spanish swordfish longline fisheries on the loggerhead sea turtle *Caretta caretta* population in the western Mediterranean. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-361:1-6.

Aguirre, A.A., Balazs, G., Zimmerman, B. and F.D. Galey. 1994. Organic contaminants and trace metals in the tissues of green turtles (*Chelonia mydas*) affected with fibropapillomas in the Hawaiian Islands. Marine Pollution Bulletin 28:109-114.

Anonymous. 1990. Sources of oil pollution in the oceans. Marine Conservation News 2(3):1-20, Autumn.

Applied Biology, Inc. 1993. Florida Power & Light Company, St. Lucie Unit 2 annual environmental operating report. AB-631. Prepared by Applied Biology, Inc. for Florida Power & Light Co. Juno Beach, Florida, pp. 71.

Babcock, H.L. 1937. The sea turtles of the Bermuda Islands, with a survey of the present state of the turtle fishing industry. Proc. Zool. Soc. Lond. 107: 595-601.

Bagley, D. and L. Ehrhart. 2000. Unpublished data.

Barlow, J. and P.J. Clapham. 1997. A new birth-interval approach to estimating demographic parameters of humpback whales. Ecology 78(2): 535-546.

Bass, A.L. 1999. Genetic analysis of juvenile loggerheads captured at the St. Lucie Power Plant.A report to National Marine Fisheries Service and Quantum Resources, Inc.

Bass, A.L., S-M. Chow, and B.W. Bowen. 1999. Final report for project titled: genetic identities of loggerhead turtles stranded in the Southeast United States. Unpublished report to NMFS, order number 40-AANF809090. Department of Fisheries and Aquatic Sciences, University of Florida, Gainesville, Fla., 11 pp.

Bass, A.L., S.P. Epperly, J. Braun, D.W. Owens, and R.M. Patterson. 1998. Natal origin and sex ratios of foraging sea turtles in the Pamlico-Albemarle Estuarine Complex. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-415:137-138.

Bass, A. L., C. J. Lagueux, and B. W. Bowen. 1998. Mixed stock composition of the Miskitu Cays green turtle fishery based on mtDNA markers. In S. P. Epperly, and J. Braun (Compilers). Proceedings of the Seventeenth Annual Sea Turtle Symposium. NOAA Tech. Memo. NMFS-SEFSC-415:7.

Belardo E., R. Matos, and F. Ortiz. 2000. Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and F. Ortiz. 1999. 1998 Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, San Juan, Puerto Rico.. Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and F.J. Ortiz.. 1998.. 1997 Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and F.J. Sanez. 1997. 1996 Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and F.J. Ortiz. 1996. 1995 Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and J.F. Sanez. 1995. 1994 Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and G. Roman. 1994. 1993 Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and G. Roman. 1993. 1992 Annual Report, Sea Turtle Conservation Project on Vieques Island, Final Draft. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

Bellmund, S., M.T. Masnik, and G. Laroche. 1982. Assessment of the impacts of the St. Lucie Nuclear Plant on threatened or endangered species. U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation. Docket No. 50-398, pp 68.

Best, P.B. 1979. Social organization in sperm whales, *Physeter macrocephalus*. In: H.E. Winn and B.L. Olla (Eds.) Behavior of marine animals, volume 3: cetaceans, p.227-289. Plenum Press, N.Y.

Bishop, C.A., Brown, G.P., Brooks, R.J., Lean, D.R.S., and J.H. Carey. 1994. Organochlorine contaminant concentrations in eggs and their relationship to body size and clutch characteristics of the female common snapping turtle (*Chelydra serpentina*) in Lake Ontario, Canada. Archives of Environmental Contamination and Toxicology 27:82-87.

Bishop, C.A., Brooks, R.J., Carey, J.H., Ng, P., Norstrom, R.J. and D.R.S. Lean. 1991. The case for a cause-effect between environmental contamination and development in eggs of the common snapping turtle (*Chelydra serpentina*) from Ontario, Canada. Journal of Toxicology and Environmental Health 33:521-547.

Bjorndal, K.A., A.B. Bolten, and H.R. Martins. In press. Somatic growth model of juvenile loggerhead sea turtles: duration of the pelagic stage.

Bjorndal, K.A., Bolten, A.B., and C.J. Lagueux. 1994. Ingestion of marine debris by juvenile sea turtles in coastal Florida habitats. Marine Pollution Bulletin, Vol. 28, No. 3, 154-158.

Bjorndal, K.A., A.B. Bolten, J. Gordon, and J.A. Camiñas. 1994a. *Caretta caretta* (loggerhead) growth and pelagic movement. Herp. Rev. 25:23-24.

Bjorndal, K.A., A.B. Meylan, and B.J. Turner. 1983. Sea turtles nesting at Melbourne Beach, Florida. I. Size, growth and reproductive biology. Biological Conservation 26:65-77.

Blaylock, Robert A., J.W. Hain, L.J. Hansen, D.L. Palka, and G.T. Waring. 1995. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments. NOAA Technical Memorandum NMFS-SEFSC-363. July. 211 pp.

Bolten, A.B., K.A. Bjorndal, H.R. Martins, T. F Dellinger, M.J. Biscoito, S.E. Encalada, and B.W. Bowen. 1998. Trans-Atlantic developmental migrations of loggerhead sea turtles demonstrated by mtDNA sequence analysis. Ecological Applications 8:1-7.

Bolten, A.B., K.A. Bjorndal, and H.R. Martins. 1994. Life history model for the loggerhead sea turtle (*Caretta caretta*) populations in the Atlantic: Potential impacts of a longline fishery. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SWFC-201:48-55.

Bolten, A.B., H.R. Martins, K.A. Bjorndal, and J. Gordon. 1993. Size distribution of pelagic-stage loggerhead sea turtles (*Caretta caretta*) in the waters around the Azores and Madeira. Arquipelago 11A: 49-54.

Bolten, A.B. and K.A. Bjorndal. 1991. Effects of marine debris on juvenile, pelagic sea turtles. Interim Project Report to the National Marine Fisheries Service Marine Entanglement Research Program. 41 pp.

Bowen, B.W., J.C. Avise, J.I. Richardson, A.B. Meylan, D. Margaritoulis, and S.R. Hopkins-Murphy. 1993. Population structure of loggerhead turtles (*Caretta caretta*) in the northwestern Atlantic Ocean and Mediterranean. Sea. Conserv. Biol. 7:834-844.

Bowen, B.W. 1995. Tracking marine turtles with genetic markers. BioSci. 45:528-53.

Brown, C.A., J.A. Cramer, and A. Bertolino. 2000. Estimates of bycatch by the U.S. Atlantic pelagic longline fleet during 1993-1998. Proceedings of the Sixth National Stock Assessment Workshop, March 28-30, 2000. NOAA Tech. Memo. NMFS-NWFSC.

Brown, C. 2000. Fishery Biologist, NMFS-Pelagic Longline Observer Program. Personal communication to Terri Jordan, NMFS, Silver Spring, MD.

Burchfield, P. 1996a. Personal Communication. Gladys Porter Zoo, Brownsville, Texas.

Burchfield, P. 1996b. Report on the Mexico/United States of America Kemp's ridley sea turtle population restoration project at the Rancho Nuevo, Barra Del Tordo, Barra Ostionales, Tepehuajes, La Pesca and Altamira Camps, Tamaulipas, Mexico. U.S. Department of Commerce, National Marine Fisheries Service.

Byles, R.A. 1988. Behavior and ecology of sea turtles from Chesapeake Bay, Virginia. A dissertation presented to the faculty of the School of Marine Science, The College of William and Mary in Virginia, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Caldwell, D.K. and D.S. Erdman. 1969. Pacific ridley sea turtle, *Lepidochelys olivacea*, in Puerto Rico. Bull. So. Calif. Acad. Sci. 68: 112.

Cannon, A.C. and J.P. Flanagan. 1996. Trauma and treatment of Kemp's ridley sea turtlews caught on hook-and-line by recreational fishermen. Draft abstract submitted for the 18th Annual Sea Turtle Symposium, Hilton Head, SC. February.

Carocci, F. and J. Majkowski. 1998. Aatlas of tuna and billfish catches. CD-ROM version 1.0. FAO, Rome, Italy.

Carr, A. 1987. New perspectives on the pelagic stage of sea turtle development. Conserv. Biol. 1:103-121.

Carr, A.F. 1954. The passing of the fleet. A. I .B. S. Bull. 4(5):17-19.

Carr, A.F. 1952. Handbook of Turtles. Ithaca, New York: Cornell University Press.

Carr, A.F., M.H. Carr and A.B. Meylan. 1978. The ecology and migrations of sea turtles. 7. The western Caribbean green turtle colony. Bull. Amer. Mus. Nat. Hist. 162(1):1-46.

Carr, A.F. and L. Ogren. 1960. The ecology and migrations of sea turtles. 4. The green turtle in the Caribbean Sea. Bull. Amer. Mus. Nat. Hist. 131(1):1-48.

CeTAP. 1982. A characterization of marine mammals and turtles in the mid- and north-Atlantic areas of the U.S. outer continental shelf, Final Report. U.S. Dept. of Interior, Bureau of Land Management, Contract No. AA551-CT8-48, Washington, D.C. 538 pp.

Chevalier, J. and Girondot, M. 1998. Nesting dynamics of marine turtles in French Guiana during the 1997 nesting season. Bull. Soc. Herp. Fr., 85-86: 5-19.

Clapham, P.J. and J.G. Mead. 1999. *Megaptera novaeangliae.* Mammalian Species. No. 604. 9 pp.

Clark, C.W. 1995. Application of U.S. Navy underwater hydrophone arrays for scientific research on whales. Rep. IWC 45: 210-212.

Clarke, M.R. 1980. Cephalapoda in the diet of sperm whales of the Southern Hemisphere and their bearing on sperm whale biology. Discovery Rep. 37:1-324.

Clarke, M.R. 1962. Stomach contents of a sperm whale caught off Madeira in 1959. Norsk Hvalfangst-tidende 51(5):173-191.

Coe, J.M., Rogers, D.B., Alexander, D.E., Laist, D.W. 1996. Marine Debris Sources, Impacts, and Solutions. National Marine Fisheries Service, ISBN 0-387-94759-0.

Cox, B.A. and Mauermann, R. G. Incidental Catch and Disposition of Sea Turtles by the Brownsville-Port Isabel Gulf Shrimp Fleet. 5 pp.

Cramer, J. and H. Adams. 2000. Large pelagic logbook newsletter: 1998. NOAA Tech. Memo. NMFS-SEFSC-433. 25 pp.

Crouse, D.T. 1999. The consequences of delayed maturity in a human-dominated world. American Fisheries Society Symposium. 23:195-202.

Crouse, D.T., L.B. Crowder, and H. Caswell. 1987. A stage-based population model for loggerhead sea turtles and implications for conservation. Ecol. 68:1412-1423.

Crowder, L.B., D.T. Crouse, S.S. Heppell, and T.H. Martin. 1994. Predicting the impact of turtle excluder devices on loggerhead sea turtle populations. Ecol. Applic. 4:437-445.

Dahlen, M.K., R. Bell, J.I. Richardson, and T.H. Richardson. 2000. Beyond D-0004: Thirty-four years of loggerhead (*Caretta caretta*) research on Little Cumberland Island, Georgia, 1964-1997. Proceedings of the Eighteenth International Sea Turtle Symposium. U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-SEFSC-436, pp. 60-62.

Dahlgren. 2000. Noise Blast Test Results Aboard USS Cole. Report from Dahlgren Division, Naval Surface Warfare Center to Commander-in Chief, U.S. Atlantic Fleet (N3). 18 July.

Davis, R. 2000. Personal Communication to Kathy Wang, NMFS St. Petersburg, Fla.

Davenport, J. and J. Wrench. 1990. Metal levels in a leatherback turtle. Marine Pollution

Bulletin 21:40-41

Dellinger, T. and H. Encarnacao. 2000. Accidental capture of sea turtles by the fishing fleet based at Madeira Island, Portugal. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SEFSC-443:218.

Department of Defense. 1999. The National Security Need for Vieques. July.

Department of the Navy. 1998. Shock Testing the SEAWOLF submarine. Final Environmental Impact Statement. Department of the Navy with cooperation from the National Marine Fisheries Service.

Dickerson, D.D. and D.A. Nelson. 1989. Recent results on hatchling orientation responses to light wavelengths and intensities. Pages 41-43 *in* Eckert, S.A., K.L. Eckert, and T.H. Richardson (compilers). Proceedings of the 9th Annual Workshop on Sea Turtle Conservation and Biology. NOAA Technical Memorandum NMFS-SEFSC-232.

Dickerson, D.D. and J.E. Clausner. 2003. Draft: Summary of Sea Turtle/Dredging Issues and Recommended Action Tasks Generated by the Improved Draghead Design Meeting, September 4, 2003, Atlanta, Georgia. U.S. Army Corps of Engineers, Engineering Research and Development Center, Vicksburg, Mississippi. 13pp.

Díez, C.E. 2000. Personal communication to Blair Witherington, FMRI.

Díez, C.E. and R.P. van Dam. 2000. Research Report for 1999 with summary of findings 1995 - 1999. Mona and Monito Island Hawksbill Turtle Research Project. Puerto Rico Department of Natural Resources, San Juan, PR (Díez)/Scripps Institute of Oceanography, La Jolla, CA (van Dam)

Doughty, R.W. Sea turtles in Texas: A forgotten commerce. Southwestern Historical Quarterly:43-70.

Eckert, K.L. 1993. Draft Status Review of Sea Turtles Listed Under the Endangered Species Act of 1973. Leatherback Sea Turtle *Dermochelys coriacea*. Prepared for NMFS, Silver Spring, MD.

Ecology and Environment. 1980. Environmental impact statement for the continued use of the Atlantic Fleet Weapons Training Facility, Inner Range (Vieques),Puerto Rico.

Ehrhart, L.M. 1983. Marine turtles of the Indian River lagoon system. Florida Sci. 46(3/4):337-346.

Ehrhart, L.M. 1979. A survey of marine turtle nesting at Kennedy Space Center, Cape Canaveral Air Force Station, North Brevard County, Florida, 1-122. Unpublished report to Division of Marine Resources, St. Petersburg, Florida, Fla. Dept. Nat. Res.

Epperly, S.P. and Braun-McNeill. 2002. The Use of AVHRR Imagery and the Management of Sea Turtle Interactions in the Mid Atlantic Bight. NMFS Southeast Fisheries Science Center. Unpublished.

Ernst, L.H. and R.W. Barbour. 1972. Turtles of the United States. Univ. Kentucky Press, Lexington Kentucky.

Epperly, S.A. 1996. Personal Communication. NMFS Beaufort Laboratory, North Carolina.

Epperly, S.P., J. Braun, and A. Veishlow. 1995. Sea turtles in North Carolina waters. Conserv. Biol. 9:384-394.

Epperly, S.P., J. Braun, A. J. Chester, F.A. Cross, J. . Merriner, and P.A. Tester. 1995. Winter distribution of sea turtles in the vicinity of Cape Hatteras and their interactions with the summer flounder trawl fishery. Bull. Mar. Sci. 56(2):519-540.

Epperly, S.A., Braun, J., Chester, A.J., Cross, F.A., Merriner, J.V., and P.A. Tester. 1994. Beach strandings as an indicator of at-sea mortality of sea turtles. Submitted to Fishery Bulletin. January 10, 1994.

Erdman, D.S., J. Harms, and M.M. Flores. 1973. Cetacean records from the northeastern Caribbean region. Cetology 17. 14 pp.

Expert Working Group (Byles, R, C. Caillouet, D. Crouse, L. Crowder, S. Epperly, W. Gabriel, B. Gallaway, M. Harris, T. Henwood, S. Heppell, R. Marquez-M, S. Murphy, W. Teas, N. Thompson, and B. Witherington) 1996. Kemp's ridley sea turtle (*Lepidochelys kempii*) status report. Submitted to NMFS June 28, 1996.

Expert Working Group (Byles, R, C. Caillouet, D. Crouse, L. Crowder, S. Epperly, W. Gabriel, B. Gallaway, M. Harris, T. Henwood, S. Heppell, R. Marquez-M, S. Murphy, W. Teas, N. Thompson, and B. Witherington) 1996. Status of the loggerhead turtle population (*Caretta caretta*) in the Western North Atlantic. Submitted to NMFS July 1, 1996.

Florida Marine Research Institute. Unpublished Data. Index Nesting Beach Survey Database. St. Petersburg, Fla.

Florida Power & Light Co. 1985. Sea turtle intake entrapment studies. Special Document 4/9/85.

Florida Power & Light Co. 2000. Physical and ecological factors influencing sea turtle entrainment at the St. Lucie Nuclear Plant: 1976-1998.

Florida Power & Light Co. 2000. M. Bressette. Unpublished data.

Foley, A. 2000. Florida Marine Research Institute, St. Petersburg, Fla. Personal communication.

Francisco, A.M., A.L. Bass, K.A. Bjorndal, A.B. Bolten, R. Reardon, M. Lamont, Y. Anderson, J. Foote, and B.W. Bowen. 2000. Stock structure and nesting site fidelity in Florida loggerhead turtles (*Caretta caretta*) resolved with mtDNA sequences. Unpublished Manuscript. Department of Fisheries and Aquatic Sciences, University of Florida, Gainesville, 23pp.

Frazer, N.B. 1992. Sea turtle conservation and halfway technology. Cons. Biol. 6:179-184.

Frazer, N.B., C.J. Limpus, and J.L. Greene. 1994. Gorwth and age at maturity of Queensland loggerheads. U.S. Dep. of Commer. NOAA Tech. Mem. NMFS-SEFSC-351: 42-45.

Frazer, N.B. and L.M. Ehrhart. 1985. Preliminary growth models for green, *Chelonia mydas*, and loggerhead, *Caretta caretta*, turtles in the wild. Copeia 1985:73-79.

Fuller, D.A. and Tappan, A.M. The Occurrence of Sea Turtles in Louisiana Coastal Waters. Coastal Fisheries Institute, Center for Wetland Resources, Louisiana State University. 1986 Sep. 46 pages.

Fulton, J. 1998. Personal Communication. U.S. Department of the Interior, Fish and Wildlife Service, Bon Secour National Wildlife Refuge, AL.

Gambell, R. 1985. Sei whale -- *Balaenoptera borealis*. In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Vol. 3: The sirenians and baleen whales. London: Academic Press. Pp. 155-170.

Geo-Marine, Inc. 1996. Land Use Management Plan for U.S. Naval Facilities Vieques, Puerto Rico

Gitschlag, G. 2001. NMFS Laboratory, Galveston, TX. Personal communication (July 24 e-mail) to Eric Hawk, NMFS, St. Petersburg, Fla.

Gitschlag, G. 1998. NMFS Laboratory, Galveston, TX. Personal communication to Kathy Wang, NMFS, St. Petersburg, Fla.

Gitschlag, G., and B.A. Herczeg. 1994. Sea Turtle Observations at Explosive Removals of Energy Structures. Marine Fisheries Review 56(2) pp 1-8.

Hansen, L.J., D.D. Mullin, T.A. Jefferson, and G.P. Scott. 1996. Visual surveys aboard ships and aircraft. Pages 55-132 in R.W.

Hain, J.H.W., M.J. Ratnaswamy, R.D. Kenney, and H.E. Winn. 1992. The fin whale in waters of the northeastern U.S. continental shelf. Rep. IWC 42: 653-669.

Harmer, K.B.E. 1923. Cervical vertebrae of a gigantic blue whale from Panama. Proceed. Zool. Soc. London 1923: 1085-1089.

Hastings, M. 2000. Analyses of sound levels by Mark 45 ship-to-shore guns. Unpublished report, 8 pp. Provided by Richard Copaken, Esq., to NMFS SERO.

Henwood, T.A., W. Stuntz, and N. Thompson. 1992. Evaluation of U.S. Turtle Protective Measures under existing TED regulations, including estimates of shrimp trawler related mortality in the Wider Caribbean. NOAA Tech Memo NMFS-SEFSC-303.

Henwood, T.A. and W. Stuntz. 1987. Analysis of sea turtle captures and mortalities during commercial shrimp trawling. Fishery Bulletin 85(4): 813-817.

Heppell, S.S., D.T. Crouse, L.B. Crowder, S.P. Epperly, and N.B. Frazer. In preparation. Population models for Atlantic loggerheads: past, present and future. In A. Bolten and B. Witherington, eds. Ecology and Conservation of Loggerhead Sea Turtles, Univ. Florida Press (presented at special loggerhead symposium in Orlando, Florida, March 2000).

Hildebrand, H. 1982. A historical review of the status of sea turtle populations in the western Gulf of Mexico, pp. 447-453 in Bjorndal, K., (ed.), Biology and Conservation of Sea Turtles. Proc. World Conf. of Sea Turtle Conserv. Smithsonian Inst. Press. Washington, D.C.

Hildebrand, H.H. Random Notes on Sea Turtles in the Western Gulf of Mexico. Western Gulf of Mexico Sea Turtle Workshop Proceedings, January 13-14, 1983. 1983 Oct:34-41. Note: A copy of the entire Workshop Proceedings is at SP000480.

Hilborn, R. 1998. The economic performance of marine stock enhancement projects. Bulletin of Marine Science, 62(2):661-674.

Hirth, H.F. 1971. Synopsis of biological data on the green turtle *Chelonia mydas* (Linnaeus) 1758. FAO Fisheries Synopsis. 85:1-77.

Hopkins-Murphy, S.R., and T.M. Murphy, Jr. 1988. Status of the loggerhead turtle in South Carolina, p. 35-37. In: B.A. Schroeder (comp.), Proceedings of the Eighth Annual Workshop on Sea Turtle Conservation and Biology. NOAA Tech. Memo. NMFS-SEFSC-214.

Iverson, S., D.M. Allen, and J.B. Higman. 1993. Shrimp capture and culture fisheries of the United States. Imprint of John Wiley & Sons, Inc. New York.

IWC. Committee for Whaling Statistics. 1959-1983. International whaling statistics, volumes 41-91 Comm. Whaling Stat., Oslo, Norway, var. paging.

Jefferson, T.A., S. Leatherwood, and M.A. Webber. 1993. FAO species identification guide. Marine Mammals of the World. Rome: Food and Agriculture Organization.

Johnson, D.R., C. Yeung, and C.A. Brown. 1999. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1992-1997. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-418, 70 pp.

Katona, S.K. and J.A. Beard. 1990. Population size, migrations, and feeding aggregations of the humpback whale in the western North Atlantic ocean. Rep. IWC Special Issue 12: 295-306.

Keinath, J.A. 1993. Movements and behavior of wild and head-started sea turtles. Ph.D. Diss. College of William and Mary, Gloucester Point, Va., 206 pp.

Klima, E.F. 1986. Summary report on biological impacts of offshore petroleum platform severance using explosives. NMFS Galveston Laboratory.

Klima, E.F., G.R. Gitschlag, and M.L. Renaud. 1988. Impacts of the explosive removal of offshore petroleum platforms on sea turtles and dolphins. Marine Fisheries Review, 50(3) pp 33-42.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta. 2001. Collisions between ships and whales. Mar. Mamm. Sci. 17: 35-7

Laist, D.W. 1997. Impacts of marine debris: entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. In: Coe, J.M. and D.B. Rogers, eds. Marine debris: sources, impacts, and solutions. New York: Springer-Verlag. Pp. 99-139.

Laurent, L, P. Casale, M.N. Bradai, B.J. Godley, G. Gerosa, A.C. Broderick, W. Schroth, B. Schierwater, A.M. Levy, D. Freggii, E.M. Abd El-Mawla, D.A. Hadoud,H.E. Gomati, M. Domingo, M. Hadjichristophorou, L. Kornaraky, F. Demirayak, and Ch. Gautier. 1998. Molecular resolution of marine turtle stock composition in fishery bycatch: a case study in the Mediterranean. Molecular Ecol. 7:1529-1542.

Law, R.J., Fileman, C.F., Hopkins, A.D., Baker, J.R., Harwood, J., Jackson, D.B., Kennedy, S., Martin, A.R. and R.J. Morris. 1991. Concentrations of trace metals in the livers of marine mammals (seals, porpoises and dolphins) from waters around the British Isles. Marine Pollution Bulletin 22:183-191.

Lazell, J.D. 1980. New England waters: critical habitat for marine turtles. Copeia 1980 (2):290-295.

LeBuff, C.R., Jr. 1990. The loggerhead turtle in the eastern Gulf of Mexico. Caretta Research, Inc., Sanibel, Fla, 216 pp.

LeBuff, C.R., Jr. 1974. Unusual nesting relocation in the loggerhead turtle, *Caretta caretta*. Herpetologica 30:29-31.

Leary, T. R. 1957. A schooling of leatherback turtles, *Dermochelys coriacea*, on the Texas coast. Copeia 1957(3):232.

Leatherwood, S. and R.R Reeves. 1983. The Sierra Club handbook of whales and dolphins. Sierra Club Books, San Francisco. 302 pp.

Limpus, C.J., V. Baker, and J.D. Miller. 1979. Movement induced mortality of loggerhead eggs. Herpetelogica 35(4): 335-338.

Lutcavage, M.E., P. Plotkin, B. Witherington, and P.L. Lutz. 1997. Human impacts on sea turtle survival. In: Lutz, P.L. and J.A. Musick, eds. The Biology of Sea Turtles. Boca Raton, Fla.: CRC Press. pp. 387-409.

Lutcavage, M.E., P.L. Lutz, G.D. Bossart, and D.M. Hudson. 1995. Physiologic and clinicopathologic effects of crude oil on loggerhead sea turtles. Arch. Environ. Contam. Toxicol. 28:417-422.

Lutz, P.L., 1987. Effects of ingestion of non-biodegradable debris in sea turtles. Final Report for the U.S. Department of Commerce; RFP No. FSN-5-0178.

Magnuson, J.J., K.A. Bjorndal, W.D. DuPaul, G.L. Graham, D.W. Owens, P.C.H. Pritchard, J.I. Richardson, G.E. Saul, and C.W. West. 1990. Decline of the sea turtles: causes and prevention. National Academy Press, Washington, D.C. 274 pp.

Mann, T.M. 1977. Impact of developed coastline on nesting and hatchling sea turtles in southeastern Florida. M.S. thesis. Florida Atlantic University, Boca Raton, Fla.

Márquez-M., R. 1990. FAO Species Catalogue, Vol. 11. Sea turtles of the world, an annotated and illustrated catalogue of sea turtle species known to date. FAO Fisheries Synopsis, 125, 81 pp.

Márquez, R., R. Byles, P. Burchfield, N. Thompson, M. Sanchez, J. Diaz, M.A. Carrasco, A.S. Leo, and C. Jimenez. 1995. The Recovery of the Kemp's ridley sea turtle population in the Mexican Beach of Rancho Nuevo, Tamaulipas. Draft submitted to the Marine Turtle Newsletter.

Matos, R., E. Belardo, and G. Roman. 1992. 1991 Annual Report, Vieques Island Sea Turtle Conservation Project With Management Recommendations. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

McGehee, M.A. 1990. Effects of moisture on eggs and hatchlings of loggerhead sea turtles (*Caretta caretta*). Herpetologica 46(3):251-258.

McKenzie, C., Godley, B.J., Furness, R.W., and D.E. Wells. 1999. Concentrations and patterns of organochlorine contaminants in marine turtles from Mediterranean and Atlantic waters. Marine Environmental Research 47:117-135.

Mead, J.G. 1977. Records of sei and Bryde's whales from the Atlantic coast of the United States, the Gulf of Mexico, and the Caribbean. Rep. Int. Whal. Commn., Special Issue 1: 113-116.

Mendonca, M.T. and L.M. Ehrhart. 1982. Activity, population size and structure of immature *Chelonia mydas* and *Caretta caretta* in Mosquito Lagoon, Florida. Copeia. (1):161-167.

Meylan, A. 1995. Facsimile dated April 5, 1995, to Sandy McPherson, National Sea Turtle Coordinator, U.S. Fish and Wildlife Service, Jacksonville, Fla. Florida Dept. of Environmental Protection, St. Petersburg, Fla.

Mexico. 1966. Instituto Nacional de Investigaciones Biologico-Pesqueras. Programa nacional de marcado de tortugas marinas. Mexico, INIBP:1-39.

Meyers-Schone, L. and B.T. Walton.1994. Turtles as monitors of chemical contaminants in the environment. Rev. Environ. Contam. Toxicol.; 1994, v. 135, p. 93-153

Meylan, A., B. Schroeder, and A. Mosier. 1995. Sea Turtle Nesting Activity in the State of Florida. Florida Marine Research Publications, No. 52.

Meylan, A.B. 1984. The Ecology and Conservation of the Caribbean Hawksbill (*Eretmochelys imbricata*). Final Report: WWF Project No. 1499.

Mignucci-Giannoni, A.A., B. Pinto-Rodriguez, M. Velasco-Escudero, R.A. Montoya-Ospina, N.M. Kimenez-Marrero, M.A. Rodriguez-Lopez, E.H. Williams, Jr., and D.K. Odell. 1999. Cetacean strandings in Puerto Rico and the Virgin Islands. J. Cetacean Res. Manage. 1: 191-198.

Mignucci-Giannoni, A.A. 1998. Zoogeography of cetaceans off Puerto Rico and the Virgin Islands. Carib. J. Sci. 34: 173-190.

Mignucci-Giannoni, A.A. 1996. Marine mammal strandings in Puerto Rico and the United States and British Virgin Islands. PhD thesis, University of Puerto Rico, Mayaguez Campus.

Mignucci-Giannoni, A.A. 1989. Zoogeography of marine mammals in Puerto Rico and the Virgin Islands. M.S. thesis, Univ. Rhode Island. 448 pp.

Miller, G.S. 1991. The bow shock environment from a 16-inch projectile flyby. NSWC Technical Report TR91-621, October.

Miller, K., G.C. Packard, and M.J. Packard. 1987. Hydric conditions during incubation influence locomotor performance of hatchling snapping turtles. Journal of Experimental Biology 127:401-412.

Milton, S. L., S. Leone-Kabler, A.A. Schulman, and P.L. Lutz. 1994. Effects of Hurricane Andrew on the sea turtle nesting beaches of South Florida. Bulletin of Marine Science 54-3: 974-981.

Moncada-G., A. Rodriguez, R. Marquez-M., and E. Carrillo. 2000. Marine Turtle Newsletter No. 90, pp. 13-15.

Morreale, S.J. 1993. Personal Communication. Cornell University, Ithaca, New York.

Morreale, S.J. and E.A. Standora. 1999. Vying for the same resources: potential conflict along migratory corridors. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-415: 69.

Morreale, S.J. and E.A. Standora. 1998. Early life stage ecology of sea turtles in northeastern U.S. waters. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-413, 49 pp.

Mrosovsky, N. and A. Carr. 1967. Preference for light of short wavelengths in hatchling green sea turtles (*Chelonia mydas*) tested on their natural nesting beaches. Behavior 28:217-231.

Mrosovsky, N. and S.J. Shettleworth. 1968. Wavelength preferences and brightness cues in water-finding behavior of sea turtles. Behavior 32:211-257.

Mullin, K.D. and W. Hoggard. 2000. Visual surveys of cetaceans and sea turtles from aircraft and ships, p.111- 322. In R.W. Davis, W.E. Evans, and B. Wursig, eds. Cetaceans, sea turtles and seabirds in northern Gulf of Mexico: distribution, abundance and habitat associations. Unpublished report. USGS/BRD/CR-1999-0006, OCS Study MMS 2002-002. Department of Marine Biology, Texas A&M University, Galveston, Texas.

Mullin, K.D., W. Hoggard, C.L. Roden, R.R. Lohoefener, C.M. Rogers, and B. Taggart. 1994. Cetaceans on the upper continental slope in the north-central GOM. Fishery Bulletin 92: 773-786.

Munsell, E. 2000. Department of the Navy. Deputy Assistant Secretary of the Navy for Installations and Environment. Personal Communication to Eric Hawk, NMFS. October 12.

NMFS & FWS. 1998. Recovery Plan for U.S. Pacific populations of the olive ridley sea turtle (*Lepidochelys olivacea*). NMFS, Silver Spring, MD.

NMFS & FWS. 1992. Recovery Plan for leatherback turtles in the U.S. Caribbean, Atlantic and Gulf of Mexico. NMFS, Washington, D.C.

NMFS & FWS. 1991. Recovery plan for the U.S. population of loggerhead turtle. National Marine Fisheries Service, Washington, D.C.

National Research Council. 1990. Decline of the sea turtles: Causes and prevention. National Academy Press, Washington, D.C., 259 p.

NMFS. 2001. Endangered Species Act Section 7 Reinitiation of consultation on the Atlantic Highly Migratory Species Fishery Management Plan and its Associated Fisheries. Biological Opinion. June 8.

NMFS SEFSC. 2001. Southeast Fisheries Science Center. Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the Western North Atlantic. U.S. Department of Commerce, National Marine Fisheries Service, Miami, Fla, SEFSC Contribution PRD-00/01-08; Parts I-III and Appendices I-V1.

NMFS. 2000. Endangered Species Act Section 7 consultation on the Atlantic Pelagic Fisheries for Swordfish, Tuna, Shark, and Billfish in the U.S. Exclusive Economic Zone. Biological Opinion. June 30.

NMFS. 2000b. Endangered Species Act Section 7 consultation on the proposed shock testing of the DDG-81 WINSTON CHURCHILL destroyer. Biological Opinion. October 10.

NMFS. 2000. E-mail from Wendy Teas to Terri Jordan regarding loggerhead turtle strandings in Puerto Rico since 1990.

NMFS. 1998. Turtle Expert Working Group, An Assessment of the Kemp's ridley (*Lepidochelys kempii*) and Loggerhead (*Caretta caretta*) Sea Turtle Populations in the Western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-409. 96 pp.

NMFS. 1998. Recovery plan for the blue whale (*Balaenoptera musculus*). Prepared by R.R. Reeves, P.J. Clapham, R.L. Brownell, and G.K. Silber for the National Marine Fisheries Service, Silver Spring, MD. 39 pp.

NMFS. 1998. Endangered Species Act Section 7 consultation on shrimp trawling in the southeastern U.S. under the sea turtle conservation regulations. Biological Opinion, March 24. 32 pp.

NMFS. 1997a. Endangered Species Act Section 7 consultation on Navy activities off the southeastern United States along the Atlantic Coast, May 15. 73 pp.

NMFS. 1997b. Endangered Species Act Section 7 consultation on the Atlantic Pelagic Fishery for Swordfish, Tuna, and Shark, in the Exclusive Economic Zone. Biological Opinion, May 29. 95 pp.

NMFS. 1997c. Endangered Species Act Section 7 consultation on the continued hopper dredging of channels and borrow areas in the southeastern United States. Biological Opinion, September 25. 15 pp.

NMFS. 1997e. Endangered Species Act Section 7 consultation on the continued operation of the circulating water system of the St. Lucie nuclear generating plant. Biological Opinion, February 7. 39 pp.

NMFS. 1996a. Endangered Species Act Section 7 consultation on the Fishery Management Plan (FMP) for Summer Flounder to include the management and fishing activities under the Draft FMPs for Scup and Black Sea Bass. Biological Opinion.

NMFS. 1996b. Endangered Species Act Section 7 consultation on the proposed shock testing of the U.S.S. SEAWOLF submarine off the Atlantic Coast of Florida during the summer of 1997. Biological Opinion, December 12. 50 pp.

NMFS. 1995. Endangered Species Act Section 7 consultation on United States Coast Guard vessel and aircraft activities along the Atlantic coast. Biological Opinion, September 15. 56 pp.

NMFS. 1995a. Endangered Species Act Section 7 consultation on channel maintenance dredging using a hopper dredge in the Galveston and New Orleans Districts of the Army Corps of Engineers. Biological Opinion, September 22. 23 pp.

NMFS. 1991. Recovery plan for the humpback whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 105 pp.

NMFS. 1991a. Endangered Species Act Section 7 consultation on Corps of Engineeers' dredging of channels in the southeastern United States from North Carolina through Cape Canaveral, Florida. Biological Opinion, November 25, 1991. 28 pp.

NRC. 1990. National Research Council (USA), Committee on Sea Turtle Conservation. Decline of the Sea Turtles: Causes and Prevention. National Academy Press, Washington DC.

NWS. 1999. National Weather Service. Hurricane Georges Preliminary Storm Report. From the Tropical Atlantic to the United States Virgin Islands and Puerto Rico.

Norrgard, J. 1995. Determination of stock composition and natal origin of a juvenile loggerhead turtle population (*Caretta caretta*) in Chesapeake Bay using mitochondrial DNA analysis. M.S. Thesis, College of William and Mary, Gloucester Point, Virginia. 47 pp.

Norris and Mohl. 1983. Can odontocetes debilitate prey with sound? American Naturalist. 122(1): 85-104.

Ogren, L.H. Biology and Ecology of Sea Turtles. 1988. Prepared for National Marine Fisheries, Panama City Laboratory. September 7.

Oravetz, C. 2001. Personal communication to Eric Hawk, NMFS, St. Petersburg, Fla.

Packard, G.C., M.J. Packard, K. Miller, and T.J. Boardman. 1988. Effects of temperature and moisture during incubation on carcass composition of hatchling snapping turtles (*Chelydra serpentina*). Journal of Comparative Physiology B 158:117-125.

Packard, G.C., M.J. Packard, T.J. Boardman, and MD. Ashen. 1981. Possible adaptive value of water exchange in flexible-shelled eggs of turtles. Science 213:471-473.

Paladino, F.V., M.P. O'Connor, and J.R. Spotila. 1990. Metabolism of leatherback turtles, gigantothermy and thermoregulation of dinosaurs. Nature 344:858-860.

Palsboll, P.J. J. Allen, M. Berube, P.J. Clapham, T.P Feddersen, et al. 197. Genetic tagging of humpback whales. Nature 388: 767-769.

Parsons, J.J. 1962. The green turtle and man. Gainesville, University of Florida Press.

Pater, L.L. 1981. Gun blast far field peak overpressure contours. NSWC TR79-442. Combat Systems Department, Naval Surface Weapons Center, Dahlgren, VA. March.

Peters, J.A. 1954. The amphibians and reptiles of the coast and coastal sierra of Michoacan, Mexico. Occ. Pap. Mus. Zool. 554:1-37.

Philbosian, R. 1976. Disorientation of hawksbill turtle hatchlings (*Eretmochelys imbricata*) by stadium lights. Copeia 1976:824.

Pilling, D. 2000. Captitol Hill Hearing Testimony by Admiral Donald Pilling, February 29.

Plotkin, P.T. 1995. Personal Communication. Drexel University, Philadelphia, Pennsylvania.

Plotkin, P.T., M.K. Wicksten, and A.F. Amos. 1993. Feeding ecology of the loggerhead sea turtle *Caretta caretta* in the Northwestern Gulf of Mexico. Marine Biology 115: 1-15

Plotkin, P. and A.F. Amos. 1990. Effects of anthropogenic debris on sea turtles in the northwestern Gulf of Mexico. *in* R.S. Shomura and M.L. Godfrey (eds.). Proceedings of the Second International Conference on Marine Debris. NOAA Tech. Memo NMFS- SWFSC-154: 736-743.

Plotkin, P. and A.F. Amos. 1988. Entanglement in and ingestion of marine debris by sea turtles by sea turtles stranded along the south Texas coast. The Eighth Annual Workshop on Sea Turtle Conservation and Biology, Fort Fisher, North Carolina.

Prescott, R.L. 1988. Leatherbacks in Cape Cod Bay, Massachusetts, 1977-1987. In: Schroeder, B.A. (compiler). Proceedings of the Eighth Annual Workshop on Sea Turtle Conservation and Biology. NOAA Tech. Memo. NMFS-SEFC-214:83-84.

Pritchard, P.C.H. 1969. Sea turtles of the Guianas. Bull. Fla. State Mus. 13(2):1-139.

Provancha, J. 1998. Annual report for sea turtle nesting in Mosquito Lagoon. Kennedy Space Center Florida.

Provancha, J. 1997. Annual report for sea turtle nesting in Mosquito Lagoon. Kennedy Space Center Florida.

Quantum Resources, Inc. 1994. Florida Power & Light Co., St. Lucie Unit 2 annual environmental operating report. Prepared by Quantum Resources, Inc. for Florida Power & Light Co. Juno Beach, Florida. Vol. 1, 49 pp.

Rankin-Baransky, K.C. 1997. Origin of loggerhead turtles (*Caretta caretta*) in the western North Atlantic as determined by mt DNA analysis. M.S. Thesis, Drexel University, Philadelphia, Penn.

Rebel, T.P. 1974. Sea turtles and the turtle industry of the West Indies, Florida and the Gulf of Mexico. Univ. Miami Press, Coral Gables, Florida.

Rice, D.W. Sperm Whale – *Physeter macrocephalus* Linnaeus, 1758. In: S. H. Ridgway and R. Harrison. Handbook of Marine Mammals. Vol. 4: River Dolphins and the Larger Toothed Whales. Academic Press, London. pp. 177 - 234.

Richardson, J.I. 1982. A population model for adult female loggerhead sea turtles (*Caretta caretta*) nesting in Georgia. Ph.D. Dissertation, University of Georgia, Athens, Georgia, 204 pp.

Richardson, J.I. and T.H. Richardson. 1982. An experimental population model for theloggerhead sea turtle (*Caretta caretta*), pp. 165-174. In K.A. Bjorndal, ed. Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C.

Roden, C.L. and K.D. Mullin. In press. Sightings of cetaceans in the northern Caribbean Sea and adjacent waters, Winter 1995. Carib. J. Sci.

Ross, J.P. and M.A. Barwani. 1982. Review of sea turtles in the Arabian area. In: Bjorndal, K.A. (editor), Biology and Conservation of Sea Turtles. pp. 373-383. Smithsonian Institution Press, Washington, D.C. 1995.

Ryder, C. 1995. Personal Communication. NMFS Northeast Fisheries Science Center.

Sakai, H., Ichihashi, H., Suganuma, H., and R. Tatsukawa. 1995. Heavy metal monitoring in sea turtles using eggs. Marine Pollution Bulletin 30:347-353.

Salmon, M., and J. Wyneken. 1990. Orientation by Swimming Sea Turtles: Role of Photic Intensity Differences While Near-shore. Proceedings of the Tenth Annual Workshop on Sea Turtle Biology and Conservation. NOAA Tech. Memo SEFSC-278. pp: 107-108

Sarti M., L., S.A. Eckert, N. Garcia T., A.R. Barragan. 1996. Decline of the world's largest nesting assemblage of leatherback turtles. Marine Turtle Newsletter 74: 2-5.

Schmidley, D.J. 1981. Marine mammals of the southeastern United States and the Gulf of Mexico. U.S. Fish and Wildlife Service. Office of Biological Services, Washington, DC, FWS/OBS-80/41, 165 pp.

Schmidt, H. 2000. Professor and Acting Head of Ocean Engineering, Massachusetts Institute of Technology. E-mail to Eric Hawk, NMFS, St. Petersburg, Fla.

Schroeder. B.A. 2000. Personal Communication to Anne Meylan, Florida Department of Environmental Protection, FMRI, St. Petersburg, Florida.

Schroeder. B.A. 1995. Personal Communication. Florida Department of Environmental Protection. Tequesta, Florida.

Schroeder, B.A. 1994. Florida index nesting beach surveys: are we on the right track? Pages 132-133 in Bjorndal, K.A., A.B. Bolten, D.A. Johnson, and P.J. Eliazar (compilers). Proceedings of the 14th Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-351.

Schroeder, B.A., A.M. Foley, B.E. Witherington, and A.E. Mosier. 1998. Ecology of marine turtles in Florida Bay: Population structure, distribution, and occurrence of fibropapilloma. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-415:265-267.

Schultz, J.P. 1975. Sea turtles nesting in Surinam. Zoologische Verhandelingen (Leiden), Number 143: 172 pp.

Sears, C.J. 1995. Preliminary genetic analysis of the population structure of Georgia loggerhead sea turtles. Presented at the Fifteenth Annual Symposium of Sea Turtle Biology and Conservation, February 1995, Hilton Head, SC.

Sears, C.J. 1994. Preliminary genetic analysis of the population structure of Georgia loggerhead sea turtles. U.S. Dep. Commer. NOAA Tech. Memo NMFS-SEFSC-351:135-139.

Sears, C.J., B.W. Bowen, R.W. Chapman, S.B. Galloway, S.R. Hopkins-Murphy, and C.M. Woodley. 1995. Demographic composition of the juvenile loggerhead sea turtle (*Caretta caretta*) feeding population off Charleston, South Carolina: evidence from mitochondrial DNA markers. Mar. Biol. 123:869-874.

Shaver, D.J. 2000. Personal communication regarding Head Start turtles nesting on Padre Island, Texas.

Shaver, D.J. 1994. Sea turtle abundance, seasonality and growth data at the Mansfield Channel, Texas. In B.A. Schroeder and B.E. Witherington (compilers), Proceedings of the thirteenth annual symposium on sea turtle biology and conservation, NOAA Tech. Memo NMFS-SEFC-341: 166-169.

Shaver, D.J. 1991. Feeding ecology of wild and head-started Kemp's ridley sea turtles in south Texas waters. Journal of Herpetology. Vol. 23. 1991.

Shoop, C.R. and R.D. Kenney. 1992. Seasonal distributions and abundance of loggerhead and leatherback sea turtles in waters of the northeastern United States. Herpetological Monographs. 6:43-67.

Simpendorfer, C.A. 2000. Predicting population recovery rates for endangered western Atlantic sawfishes using demographic analyses. Environmental Biology of Fishes 58:371-377.

Simpendorfer, C.A. 2001. Essential habitat of smalltooth sawfish (*Pristis pectinata*). Mote Marine Laboratory Technical Report 786, November 2001. 21pp.

Smith, T.D., J.Allen, P.J. Clapham, S. Katona, F. Larsen, J. Lien, D. Mattila, et al. 1997. An ocean-basin wide mark-recapture study of the North Atlantic humpback whale. Mar. Mammal Sci. 15(1):1-32.

South, C. and S. Tucker. 1991. Personal communication regarding sea turtle nesting in the state of Alabama. U.S. Fish and Wildlife Service, Daphne Field Office, Alabama.

Stanley. K.M., E.K. Stabenau, and A.M. Landry. 1988. Debris ingestion by sea turtles along the Texas Coast. Eighth Annual Workshop on Sea Turtle Conservation and Biology, Fort Fisher, North Carolina.

Standora, E.A., S.J. Morreale, A. Bolten, M.D. Eberle, J.M. Edbauer, T.S. Ryder; and K.L. Williams. 1993. Diving behavior, daily movements, and homing of loggerhead turtles (Caretta caretta) at Cape Canaveral, Florida. March and April 1993. Contr. Report to COE.

Starr-Hillis, Z. 2000. Personal communication to Anne Meylan, Florida Marine Research Institute, FMRI. St. Petersburg, Fla.

Stabenau, E.K. and K.R. Vietti. 1999. Physiological effects of short-term submergence of loggerhead sea turtles, *Caretta caretta*, in TED-equipped commercial fishing nets. Final Report to National Marine Fisheries Service, Pascagoula Laboratory, Pascagoula, Mississippi.

Storelli, M.M., E.Ceci and G.O. Marcotrigiano. 1998. Distribution of heavy metal residues in some tissues of *Caretta caretta* (Linnaeus) specimens beached along the Adriatic Sea (Italy). Bulletin of Enviromental Contamination and Toxicology 60:546-552.

Swingle, W.M., S.G. Barco, T.D. Pitchford, W.A. McLellan, and D.A. Pabst. 1993. Appearance of juvenile humpback whales feeding in the nearshore waters of Virginia. Mar. Mamm. Sci. 9: 309-315.

Teas, W. 2000. NMFS SEFSC, Personal Communication to Eric Hawk, NMFS St. Petersburg, Fla.

Teas, W.G. and A. Martinez. 1992. Annual report of the sea turtle stranding and salvage network Atlantic and Gulf coasts of the United States, January-December 1989.

Thompson, N.B., and H. Huang.1993. Leatherback turtles in southeast U.S. waters. NOAA Tech. Mem. NMFS-SEFSC-318. 11pp.

Townsend, C.H. 1935. The distribution of certain whales as shown by logbook records of American whale ships. Zoologica 19: 1-50.

Turtle Expert Working Group. 2000. Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-444, 115 pp.

Turtle Expert Working Group. 1998. (Byles, R., C. Caillouet, D. Crouse, L. Crowder, S. Epperly, W. Gabriel, B. Gallaway, M. Harris, T. Henwood, S. Heppell, R. Marquex-M, S. Murphy, W. Teas, N. Thompson, and B. Witherington). An Assessment of the Kemp's ridley sea turtle (*Lepidochelys kempii*) and loggerhead (*Caretta caretta*) sea turtle populations in the Western North Atlantic. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-409, 96 pp.

Underwood, G. 1951. Introduction to the study of Jamaican reptiles. Part 5. Nat. Hist. Notes Nat. Hist. Soc. Jamaica. 46:209-213.

U.S. Atomic Energy Commission. 1974. Final environmental statement related to construction of St. Lucie Plant Unit 2, Docket No. 50-389. USAEC, Directorate of Licensing. Washington, D.C.

Vargo, S., P. Lutz, D. Odell, E. Van Vleep and G. Bossart. 1986. Final report: Study of effects of oil on marine turtles. Tech. Rep. O.C.S. study MMS 86-0070. Vol. 2, 181pp.

Vicente, V.P. 1993. Spongivory in Caribbean hawksbill turtles, *Eretmochelys imbricata*: data from stranded specimens. Extended abstract for Proceedings: Thirteenth Annual Symposium on Marine Turtle Biology and Conservation. NOAA NMFS, Suite 1108, Banco de Ponce Building, Hato Rey, Puerto Rico 00918.

Wallmeyer, J. 2001. U.S. Navy Environmental Division, USN Southeast Region, Jacksonville, Florida. Personal communication to Eric Hawk, NMFS, St. Petersburg, Fla.

Wallmeyer, J. 2000. U.S. Navy Environmental Division, USN Southeast Region, Jacksonville, Florida. Personal communication to Eric Hawk, NMFS, St. Petersburg, Fla.

Waring, G.T., J.M. Quintal,and S.L. Swartz (Editors). 2000. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments. NOAA Technical Memorandum NMFS-NE-162. November. 303 pp.

Waring, G.T., D.L. Palka, P.J. Clapham, S. Swartz, M. Rossman, T.V.N. Cole, L.J. Hansen, K.D. Bisack, K.D. Mullin, R.S. Wells, and N.B. Barros. 1999. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments. NOAA Technical Memorandum NMFS-NE-153. October.

Revision No. 1 to November 19, 2003, Gulf of Mexico Regional Biological Opinion (GOM RBO) on Hopper Dredging of Navigation Channels and Borrow Areas in the U.S. Gulf of Mexico

The following replaces and supersedes the corresponding sections on pages 65-81 (Sections 9, 10, and 11) of the November 19, 2003, GOM RBO. New or revised text or paragraphs are identified by underline.

9.0 Reasonable and Prudent Measures

Regulations (50 CFR 402.02) implementing section 7 of the ESA define reasonable and prudent measures as actions the Director believes necessary or appropriate to minimize the impacts, i.e., amount or extent, of incidental take. The reasonable and prudent measures that NOAA Fisheries believes are necessary to minimize the impacts of hopper dredging in the Gulf of Mexico have been discussed with the COE and include use of temporal dredging windows, intake and overflow screening, use of sea turtle deflector dragheads, observer and reporting requirements, and sea turtle relocation trawling. The following reasonable and prudent measures and associated terms and conditions are established to implement these measures, and to document incidental takes. Only incidental takes that occur while these measures are in full implementation are authorized. These restrictions remain valid until reinitiation and conclusion of any subsequent section 7 consultation.

Seasonal Dredging Windows, Observer Requirements, Deflector Dragheads, and Relocation Trawling[1]

Experience has shown that injuries sustained by sea turtles entrained in the hopper dredge dragheads are usually fatal. Current regional opinions for hopper dredging require seasonal dredging windows and observer monitoring requirements, deflector dragheads, and conditions and guidelines for relocation trawling, which NOAA Fisheries' believes are necessary to minimize effects of these removals on listed sea turtle species that occur in inshore and nearshore Gulf and South Atlantic waters.

Temperature- and date-based dredging windows:
Both the Mobile and Jacksonville Districts expressed comments opposing NOAA Fisheries' imposition of seasonal dredging windows in their respective Gulf of Mexico dredging areas. In their November 28, 2000, BA on their Florida west coast hopper dredging activities, the Jacksonville District indicated that sea turtles are present year-round in the Gulf, so windows would only be of limited effectiveness. In their October 30, 2002, comments to NOAA Fisheries, the Mobile District noted it did not want to be restricted to seasonal hopper dredging windows, indicating that these would potentially seriously and detrimentally impact its ability to complete its operations and maintain Federal navigation projects due to "no excess of large dredges of the type required to perform maintenance of most Federal projects" and other reasons related to dredging industry capacity, downsizing, "loss of production" associated with the deflector draghead, and safety concerns.

---

[1] The COE Wilmington District's sidecast dredges FRY, MERRITT, and SCHWEIZER, and split-hull hopper dredge CURRITUCK, are exempt from the above hopper dredging requirements (operating windows, deflectors, screening, observers, reporting requirements, etc.). Their small size and operating characteristics including small draghead sizes [2-ft by 2-ft, to 2-ft by 3-ft], small draghead openings [5-in by 5-in to 5 in by 8 in], small suction intake pipe diameters [10-14 in], and limited draghead suction [350-400 hp]) have been previously determined by NOAA Fisheries to not adversely affect listed species (March 9, 1999, ESA consultation with COE Wilmington District, incorporated herein by reference). The aforementioned vessels and commercial hopper and sidecast dredges of the same or lesser sizes and operating characteristics working in the Gulf of Mexico would be considered similarly exempt by NOAA Fisheries' SERO after consultation with SERO.

Sea turtles generally move inshore with warming waters and offshore with cooling waters. In East Coast channels, Dickerson et al. (1995) found reduced sea turtle abundance with water temperatures less than 16ºC. They found that 1,008 trawls conducted at or below 16ºC captured 22 turtles (4.4 percent), while 1,791 trawls conducted above 16ºC resulted in 473 (95.6 percent) captures. Dickerson et al. also found that sea turtles tend to avoid water temperatures less than 15ºC; however, hopper dredging Kings Bay, Georgia between March 1-12, 1997 with surface water temperatures of 57-58ºF (13.9-14.4ºC) resulted in 11 turtle takes in nine days (NMFS 1997).

More recently, the Savannah District COE (COE 2003) reported that the average surface temperature at which recent hopper dredge turtle takes have occurred in Brunswick is 57.7ºF (14.3ºC) and that "there are scattered takes at lower temperatures than turtles would normally be expected to occur" but that "These lower temperatures may not have played a significant role in those takes." The lowest temperature at which multiple takes have occurred in Brunswick in 2003 is 57ºF (13.9ºC).

Recognizing the relationship between water temperature and sea turtle presence and based on work by the NOAA Fisheries' Galveston Laboratory (Renaud et al. 1994, 1995) funded by the COE, NOAA Fisheries wrote in its September 22, 1995 RBO to the Galveston and New Orleans Districts that sea turtles might be taken by hopper dredges "in all ship channels in the northern Gulf when temperatures exceed 12ºC," and that "Lacking seasonal water temperature data, NMFS believes takes may occur from April through November northeast of Corpus Christi, Texas." Consequently, Term and Condition No. 3 of the 1995 RBO required that observers be aboard hopper dredges year-round from Corpus Christi southwest to the Mexican border, but "If no turtle take is observed in December, then observer coverage can be terminated during January and February or until water temperatures again reach 12ºC." It also required that "In channels northeast of Corpus Christi (except for MR-SWP), observers shall be aboard whenever surface water temperatures are 12ºC or greater, and/or between April 1 and November 30."

NOAA Fisheries published a final rule (67 FR 71895, December 3, 2002) effective January 2, 2003, to reduce the impact of large-mesh gillnet fisheries on the Atlantic Coast on sea turtles. This rule was directed primarily at the monkfish fishery, which uses large-mesh gillnet gear and operates in the area when sea turtles are present. The rule reduces impacts on endangered and threatened species of sea turtles by closing portions of the Mid-Atlantic Exclusive Economic Zone (EEZ) waters to fishing with gillnets with a mesh size larger than 8-inch (20.3-cm) stretched mesh. The timing of the restrictions was based upon an analysis of sea surface temperatures for the above areas. Sea turtles are known to migrate into and through these waters when the sea surface temperature is 11ºC or greater (Epperly and Braun-McNeill 2002). The January 15 date for the re-opening of the areas north of Oregon Inlet, North Carolina to the large-mesh gillnet fisheries was also based upon the 11ºC threshold and is consistent with the seasonal boundary established for the summer flounder fishery-sea turtle protection area (50 CFR 223.206(d)(2) (iii)(A)). In summary, NOAA Fisheries believes that the 11ºC threshold established to protect East Coast sea turtles is reasonable and prudent to protect sea turtles in the Gulf of Mexico from hopper dredging operations.

Temperature- and date-based dredging windows appear to have been very effective in reducing sea turtle entrainments. Observer requirements and monitoring including assessment and relocation trawling have provided valuable real-time estimates of sea turtle abundance, takes, and distribution which have been helpful to COE project planning efforts. Evidence that the windows and observer requirements are effective and valuable is that neither the Galveston or New Orleans District's hopper dredging projects have exceeded their anticipated incidental takes since their combined RBO was issued in 1995; SAD has not exceeded its anticipated incidental take since its RBO was amended in 1997.

NMFS-approved observers monitor dredged material inflow and overflow screening baskets on many projects; however, screening is only partially effective and observed, documented takes provide only partial estimates of total sea turtle and Gulf sturgeon mortality. NOAA Fisheries believes that some listed species taken by hopper dredges go undetected because body parts are forced through the sampling screens by the water pressure and are buried in the dredged material, or animals are crushed or killed but not entrained by the suction and so the takes may go unnoticed. The only mortalities that are documented are those where body parts either float, are large enough to be caught in the screens, and can be identified as from sea turtle or sturgeon species. However, this Opinion estimates that with 4-inch inflow screening in place, the observers probably detect and record at least 50% of total mortality.

Relocation trawling has proved to be a useful conservation tool in most dredging projects where it has been implemented. The September 22, 1995, RBO included a Conservation Recommendation for relocation trawling which stated that relocation trawling in advance of an operating dredge in Texas and Louisiana channels should be considered if takes are documented early in a project that requires use of a hopper dredge during a period in which large number of sea turtles may occur." That RBO was amended by NOAA Fisheries (Amendment No. 1, June 13, 2002) to change the Conservation Recommendation to a Term and Condition of the RBO. Overall, it is NOAA Fisheries' opinion that the COE Districts choosing to implement relocation trawling have benefitted from their decisions. For example, in the Galveston District, Freeport Harbor Project (July 13-September 24, 2002), assessment and relocation trawling resulted in one loggerhead capture. In Sabine Pass (Sabine-Neches Waterway), assessment and relocation trawling in July-August 2002 resulted in five loggerhead and three Kemp's ridley captures. One turtle was killed by the dredge; this occurred while the relocation trawler was in port repairing its trawl net (P. Bargo, pers. comm. 2002). In the Jacksonville District, sea turtles have been relocated out of the path of hoppers dredges operating in Tampa Bay and Charlotte Harbor or their entrance channels. During St. Petersburg Harbor and Entrance Channel dredging in the fall of 2000, a pre-dredging risk assessment trawl survey resulted in capture, tagging, and relocation of two adult loggerheads and one subadult green turtle. In February 2002 during the Jacksonville District's Canaveral Channel emergency hopper dredging project for the Navy, two trawlers working around the clock captured and relocated 69 loggerhead and green turtles in seven days, and no turtles were entrained by the hopper dredge. In the Wilmington District's Bogue Banks Project in North Carolina, two trawlers successfully relocated five turtles in 15 days between March 13 and 27, 2003; one turtle was taken by the dredge. Most recently, Aransas Pass relocation trawling associated with hopper dredging resulted in 71 turtles captured and released (with three recaptures) in three months of dredging and relocation trawling. Five turtles were killed by the dredge. No turtles were killed after relocation trawling was increased from 12 to 24 hours per day (Trish Bargo, October 27, 2003, pers. comm. to Eric Hawk).

This Opinion authorizes the per-fiscal-year non-lethal non-injurious take (minor skin abrasions resulting from trawl capture are considered non-injurious), external flipper-tagging, and taking of tissue samples of 300 sea turtles and eight Gulf sturgeon in association with all relocation trawling conducted by the COE throughout the Gulf of Mexico. This take shall not be broken down by District but rather is a Gulf-wide take limit. This take is limited to relocation trawling conducted during the 0-3 days immediately preceding the start of hopper dredging (as a means to determine/reduce the initial abundance of sea turtles in the area and determine if additional trawling efforts are needed), and during actual hopper dredging. Relocation trawling performed to reduce endangered species/hopper dredge interactions is subject to the requirements detailed in the terms and conditions of this Opinion.

NOAA Fisheries estimates that 0-2 turtles and 0-1 Gulf sturgeon will be killed or injured annually pursuant to annual relocation trawling in the Gulf of Mexico. These Gulf-wide take levels **are in addition to** the harmful takes estimated to result from hopper dredging. In Section 7 of this opinion, NMFS conducted its jeopardy analyses based on the anticipated, documented lethal take across the GOM per fiscal year (i.e., by the combined districts) of 4 Gulf sturgeon and 40 loggerhead, 20 Kemp's ridley, 14 green, and 4 hawksbill sea turtles; 300 turtle and 8 Gulf sturgeon captures (non-injurious takes) by relocation trawling, and an additional 0-2 turtles and 0-1 Gulf sturgeon injured or killed during relocation trawling. NMFS has determined that it would not alter the jeopardy analyses if the total number of individuals of all the species authorized to be taken by the combined GOM districts (i.e., combined hopper dredge takes or combined relocation trawling takes) are taken all by one district in one fiscal year, or are taken across all 4 districts across the fiscal year. NMFS has determined that no individual species population will be unduly impacted if, for example, all 40 authorized, documented loggerhead takes were to occur in any one of the 4 GOM districts, rather than across all districts, the Mobile district were to take all 4 Gulf sturgeon, or all 20 green turtle takes occurred in the Galveston district. None of the species analyzed in the opinion for which takes have been authorized – turtles and Gulf sturgeon – have sub-populations that would be believed to be disproportionately adversely affected if all the takes came from one district versus another district.

Consequently, the district-specific take levels specified above shall constitute *initial* allocations, based on the COE's desire to have separate take allotments for each district. Districts that exceed their initial allocations may borrow takes from other districts, without adversely affecting listed species. However, if any district exceeds its initial allocation and continues operations using borrowed takes, that district should notify NMFS so NMFS can analyze why the district's anticipated take levels were exceeded. Also, the COE would need to tell NMFS which district the takes are being re-allocated from. NMFS does not believe that inter-district take sharing will result in significantly increased take levels by district, since each district will still want to conservatively manage its protected species allotment to ensure its ability to complete its own hopper dredging requirements. Nevertheless, NMFS will monitor for such a possibility. Take sharing restrictions are described in R&PM No. 19.

Deflector Dragheads

V-shaped, sea turtle deflector dragheads prevent an unquantifiable yet significant number of sea turtles from being entrained and killed in hopper dredges each year. Without them, turtle takes during hopper dredging operations would unquestionably be higher. Draghead tests conducted in May-June 1993 by the COE's WES in clear water conditions on the sea floor off Fort Pierce, Florida, with 300 mock turtles placed in rows, showed convincingly that the newly-developed WES deflector draghead "performed exceedingly well at deflecting the mock turtles." Thirty-seven of 39 mock turtles encountered were deflected, two turtles were not deflected, and none were damaged. Also, "the deflector draghead provided better production rates than the unmodified California draghead, and the deflector draghead was easier to operate and maneuver than the unmodified California flat-front draghead." The V-shape reduced forces encountered by the draghead, and resulted in smoother operation (WES, Sea Turtle Project Progress Report, June 1993)." V-shaped deflecting dragheads are now a widely accepted conservation tool, the dredging industry is familiar with them and their operation, and they are used by all COE Districts conducting hopper dredge operations where turtles may be present, with the exception of the Mobile District.

In Gulf of Mexico coastal waters, evidence indicates that turtles are present year-round, further arguing for year-round deflector draghead use by all COE Districts of the Gulf of Mexico. Recent comprehensive NOAA Fisheries' Southeast Fishery Science Center (SEFSC) review and analyses (unpublished data, December 2002: Environmental Assessment/Regulatory Impact Review of Technical Changes to the Turtle Excluder Device (TED) Regulations to Enhance Turtle Protection in the Southeastern United States) of seasonal sea turtle distribution and strandings throughout the Gulf of Mexico (including coastal waters dredged by the Mobile District) noted that "Aerial surveys and observer data have indicated the presence of turtles in areas where strandings data are sparse" and "Turtles were in all areas at all times." (September 13, 2002, e-mail, Epperly to Hawk). NOAA Fisheries' SEFSC's sea turtle team leader Epperly also recommended against hopper dredges operating in those same areas "without monitoring, relocation, and specialized gear (i.e., deflectors) on the dragheads."

It wasn't until late-summer 2002 that the Mobile District started requiring observers and screening on its hopper dredges. REMSA recently completed ten days of 24-hr relocation trawling/dredged material monitoring for the Mobile District during ten days of emergency maintenance hopper dredging of the Mobile Bay ship channel (July 10-20, 2003). No sea turtle specimens or parts of specimens were observed during the ten days by either the relocation trawler observers or the shipboard dredge observers. Dredging is currently conducted in the Mobile District with onboard observers and 4-inch inflow screening but without deflector dragheads (Ladner, pers. comm. to Hawk, November 26, 2002). Mobile District, in written comments dated October 30, 2002, on a draft version of the present Opinion, noted that "The District recognizes the benefits of deflector dragheads to conservation of the species in areas where sea turtle takes occur. However, dragheads reduce dredging efficiency and result in dredges being onsite for a longer period of time. Consequently, the District finds no overriding need to utilize deflectors until it is proven, through use of screens and observers, that the Mobile District actually takes sea turtles during normal operations."

Habitat Protection Buffers

COE Jacksonville District biologists expressed concern (Yvonne Haberer, email to Eric Hawk, April 2003; Terri Jordan, pers. comm. August 11, 2003) over a NOAA Fisheries' draft version of the current Opinion proposed requirement of a 200-m buffer zone around hardgrounds in the vicinity of COE-proposed sand mining areas off Florida. In discussions over the Pinellas County Shore Protection Project, the COE noted that NOAA Fisheries has previously required only a 200-ft zone around hardgrounds adjacent to COE sand mining operations in the Gulf of Mexico. NOAA Fisheries' Protected Resources Division consulted with NOAA Fisheries Habitat Conservation Division, which stated that as a general rule, buffer zones should not be less than 400 feet to protect essential fish habitat. In its response to the COE, which included a request for additional information (Eric Hawk email to Yvonne Haberer, May 14, 2003) which was never received, NOAA Fisheries' Protected Resources Division concluded that a 200-ft buffer was inadequate and that a 200-meter buffer zone was appropriate to protect sea turtles which may be foraging on or around hardgrounds adjacent to mining sites from hopper dredge entrainment. NOAA Fisheries noted that hopper dredge vessels are large (typically 300-400 ft long); limited in their ability to maneuver; and given other variable factors such as wind, tide, weather, sea state, currents, operator fatigue, operator error, and instrument error, a 200-ft margin of safety around hardgrounds was inadequate to protect NOAA Fisheries trust resources and sea turtles which could be expected to frequent hardgrounds and their vicinity. Subsequently, however, conversations with hopper dredge industry officials and dredge operators have led NOAA Fisheries to conclude that based on advances in hopper dredge construction, including the use of highly maneuverable Z-drives (on some dredges), enhanced station-keeping ability, and industry-standard navigation practices and technologies including routine use of differential global positioning systems (DGPS), dredge operators will be able to routinely and safely maintain desired safe distances from hardgrounds that are marked on their charts (E. Hawk, August 14 and 18, 2003, pers. comms. with R. Richardson, Manson Dredging; Mark Sickles, Dredge Contractors of America; and W. Murcheson, NATCO Dredging). NOAA Fisheries has determined that 400 feet is an adequate, reasonable buffer zone that should be maintained around hardgrounds, to protect endangered living resources, i.e., sea turtles that may be foraging in their vicinity. Four hundred feet also provides the additional benefit of protecting hardgrounds from some of the probable adverse effects of sedimentation from the dredged material plume. For example, a generic test case numerical model simulation of a typical situation representative of hopper dredging of MMS shoals using the Trailing Suction Hopper Dredge Plume Model developed by Baird, Inc., for MMS, using inputted variables of a cross current of 20 cm/s, fine sand, two million cubic meter project, and a water depth of about 15 to 20 m, gave a sedimentation footprint of 200 m beyond the boundary of the dredge area (Rob Nairn, October 3, 2003, pers. comm. to Eric Hawk).

Summary

NOAA Fisheries has carefully reviewed and fully considered these and all other comments received from the affected COE Districts; however, in summary, after review of WES studies, SEFSC survey data, and based on past experience, NOAA Fisheries believes that seasonal dredging windows, deflector dragheads, observer and screening requirements, and relocation trawling have proved convincingly over the last decade to be an excellent combination of reasonable and prudent measures for minimizing the number and impact of sea turtle takes, enabling NOAA Fisheries to assess the quantity of turtles being taken, and allowing the affected COE Districts (Wilmington, Charleston, Savannah, Jacksonville, New Orleans, and Galveston) to meet their essential dredging requirements to keep Federal navigation channels open.

There are increased costs associated with observers and relocation trawling (current estimates are $3,500-$5,000/day for 24 hours of relocation trawling, $150-$200/day for a hopper dredge endangered species observer); delays sometimes occur, particularly when two turtles are taken in 24 hours, or when clay-like materials clog the inflow screening boxes; and dredging projects may take longer to complete. However, overall, NOAA Fisheries believes that loss of production associated with the deflector draghead is insignificant, while saving significant numbers of sea turtles from almost-certain death by dismemberment in suction dragheads; increased production costs, including costs of observers and relocation trawlers, pale in comparison to overall project costs; and NOAA Fisheries' experience over the past decade with the COE's SAD Districts and the Gulf of Mexico's Galveston and New Orleans Districts has shown that Federal hopper dredging projects get completed in a timely fashion. Also, allowable overdredging by the COE reduces to some degree the need for frequent maintenance dredging, and the conservation measures required by the biological opinions in place result in significantly reduced dredge interactions, usually fatal, with sea turtles.

NOAA Fisheries considers that PIT tagging, external flipper tagging, and tissue sampling of turtles captured pursuant to relocation trawling, including genetic analysis of tissue samples taken from dredge- and trawl-captured turtles, will provide benefits to the species by providing data which will enable NOAA Fisheries to make determinations on what sea turtle stocks are being impacted, and how that may change over time as the population growth rates change among the different stocks (Sheryan Epperly, pers. comm. to Eric Hawk).

<u>NMFS and COE shall jointly develop and implement a Sampling and Analysis Plan for the collection and genetic analysis of sea turtle tissue samples that will provide information on the nesting or subpopulation identity of sea turtles being captured across the Gulf of Mexico, in order to validate the assumptions underlying the analysis of the effects of hopper dredging on sea turtles. NOAA Fisheries initially estimates that up to 340 sea turtle tissue samples may be taken annually in the Gulf of Mexico during COE dredging and relocation trawling operations, but the final total number of yearly samples, number of samples per species, distribution of samples across dredging locations in the Gulf of Mexico, and genetic and statistical analyses of samples will be determined in the Sampling and Analysis Plan.</u>

<u>There are several alternatives for funding the genetic sampling and analysis. COE funds may be provided to NOAA Fisheries' Southwest Fisheries Center's Dr. Peter Dutton, preferably in a lump-sum, one-time payment as a part of a Memorandum of Understanding (MOU) to be developed between Dr. Dutton and the COE's combined Gulf of Mexico Districts (similar to the current MOU nearing completion between the COE's South Atlantic Division and the Southwest Fisheries Science Center for hopper dredging/relocation trawling conducted by the South Atlantic Divisions four Atlantic Districts). Alternatively, the COE may conduct the analyses at their facilities. Another alternative is for the COE to contract out the sample analyses to independent laboratory(s) outside of NMFS and the COE. Inclusion of this sampling and</u>

<u>analysis requirement as a reasonable and prudent measure of this Opinion will result in the gathering of knowledge that will test the assumptions underlying the effects analyses of the Opinion, and may be helpful in reducing the effect of the takes from Gulf of Mexico dredging projects.</u>

The dredging windows set forth in the terms and conditions of the 1995 Gulf of Mexico hopper dredging RBO, while very strongly encouraged by NOAA Fisheries for previously stated reasons, were ultimately discretionary activities by the COE and could be deviated from by the SAD or the Galveston or New Orleans Districts when they deemed essential or necessary after consultation with NOAA Fisheries, though this was infrequent. This flexibility is also stipulated in the Proposed Action section of the present Opinion, which applies to all four COE Districts. Terms and conditions of the present Opinion remain largely the same, with the following significant exceptions:

1) The allowable window for hopper dredging has been extended to include the Mobile and Jacksonville Districts so that the December-March window is now Gulf-wide, from the Texas-Mexico border to Key West channels.

2) Previous temperature requirements of Term and Condition No. 3 of the 1995 RBO (i.e., "If no turtle take is observed during December, observer coverage can be terminated during January and February or until water temperatures again reach 12ºC; In channels northeast of Corpus Christi, Texas [except for Southwest Pass as discussed below], observers shall be aboard whenever surface water temperatures are 12ºC or greater, and/or between April 1 and November 30.") have been modified downward to 11ºC based on new sea turtle distribution information which indicates that sea turtles are more tolerant of cold than was previously thought. The discussion of temperature/sea turtle distribution supporting this change is incorporated herein by reference to the Monkfish Biological Opinion (dated April 14, 2003, prepared by NOAA Fisheries Northeast Region).

3) The September 22, 1995, RBO included a Conservation Recommendation for relocation trawling which stated that "Relocation trawling in advance of an operating dredge in Texas and Louisiana channels should be considered if takes are documented early in a project that requires use of a hopper dredge during a period in which large number of sea turtles may occur." That RBO was amended by NOAA Fisheries SER (Amendment No. 1, June 13, 2002), to change the Conservation Recommendation to a Term and Condition of the RBO. Term and Condition No. 10 of the amended RBO specified conditions under which relocation trawling "should be considered" and subject to what precautions it should be carried out, and authorized unlimited non-lethal, non-injurious take of sea turtles and Gulf sturgeon in association with relocation trawling deemed necessary the by COE. This amount of discretion has since been determined to be inappropriate for a non-discretionary term and condition of an ITS. Thus, the present Opinion's requirement for relocation trawling is more non-discretionary than as written in Amendment No. 1 in that it **requires** the use of relocation trawlers under specific conditions as a way to minimize turtle interactions, rather than only requiring that it be "considered" by the COE.

4) In the present Opinion, the COE Districts are authorized to request waivers from the relocation trawling requirement (which may be delivered and responded to by both agencies via electronic mail) for projects where the COE Districts do not feel relocation trawling is feasible, necessary or warranted.

5) The Districts are required to fund the cost of tissue sampling and genetic analyses of tissue samples from turtles taken during projects in their respective Districts.

The following terms and conditions implement the reasonable and prudent measures discussed above:

Terms and Conditions

1. *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. Hopper dredging of Key West channels is covered by the existing August 25, 1995, RBO to the COE's SAD. The COE shall discuss with NOAA Fisheries why a particular project cannot be done within the December 1-March 31window.

2. *Non-hopper Type Dredging*: Pipeline or hydraulic dredges, because they are not known to take turtles, must be used whenever possible between April 1 and November 30 in Gulf of Mexico waters up to one mile into rivers. This should be considered particularly in channels such as those associated with Galveston Bay and Mississippi River - Gulf Outlet (MR-GO), where lethal takes of endangered Kemp's ridleys have been documented during summer months, and Aransas Pass, where large numbers of loggerheads may be found during summer months. In the MR-GO, incidental takes and sightings of threatened loggerhead sea turtles have historically been highest during April and October.

3. *Annual Reports*: The annual summary report, discussed below (No.9), must give a complete explanation of why alternative dredges (dredges other than hopper dredges) were not used for maintenance dredging of channels between April and November.

4. *Observers*: The COE shall arrange for NOAA Fisheries-approved observers to be aboard the hopper dredges to monitor the hopper spoil, screening, and dragheads for sea turtles and Gulf sturgeon and their remains.

   a. Brazos Santiago Pass east to Key West, Florida: Observer coverage sufficient for 100% monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges year-round from Brazos Santiago Pass to (not including) Key West, Florida between April 1 and November 30, and whenever surface water temperatures are 11ºC or greater.

b. Observer coverage of hopper dredging of sand mining areas shall ensure 50% monitoring (i.e., one observer).

c. Observers are not required at any time in Mississippi River - Southwest Pass (MR-SWP).

5. *Operational Procedures*: During periods in which hopper dredges are operating and NOAA Fisheries-approved observers are *not* required, (as delineated in No. 4 above), the appropriate COE District 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 COE 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 immediately by phone (**727/824-5312**) or fax (**727/824-5309**) if a sea turtle or Gulf sturgeon is taken by the dredge.

6. *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 COE, in consultation with observers and the draghead operator, determines that the draghead 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 COE 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.

c. Exemption - MR-SWP: Screening is not required at any time in MR-SWP.

7. *Dredging Pumps*: Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads 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 draghead frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the draghead is trimming off.

8. *Sea Turtle Deflecting Draghead*: A state-of-the-art rigid deflector draghead must be used on all hopper dredges in all Gulf of Mexico channels and sand mining sites at all times of the year except that the rigid deflector draghead is not required in MR-SWP at any time of the year.

9. *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges must be faxed to NOAA Fisheries' Southeast Regional Office (727-570-5517) by onboard endangered species observers within 24 hours of any sea turtle, Gulf sturgeon, or other listed species take observed.

   A preliminary report summarizing the results of the hopper dredging and any documented sea turtle or Gulf sturgeon takes must be submitted to NOAA Fisheries within 30 working days of completion of any dredging project. Reports shall contain information on project location (specific channel/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 (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the COE deems relevant.

   An annual report (based on fiscal year) must be submitted to NOAA Fisheries summarizing hopper dredging projects and documented incidental takes.

10. *Sea Turtle Strandings*: The COE Project Manager 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 draghead 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 the deaths of these turtles, if hopper dredge or bed-leveler dredge-related, have already been accounted for in NMFS' jeopardy analysis, and because of different possible explanations for, and subjectivity in the interpretation of potential causes of strandings, these strandings will not be counted against the COE's take limit.

11. *Reporting - Strandings*: Each COE District shall provide NOAA Fisheries' Southeast Regional Office with an annual report detailing incidents, with photographs when available, of stranded sea turtles and Gulf sturgeon that bear indications of draghead impingement or entrainment. This reporting requirement may be included in the end-of-year report required in Term and Condition No. 9, above.

12. *District Annual Relocation Trawling Report*: Each COE District shall provide NOAA Fisheries' Southeast Regional Office with end-of-project reports within 30 days of completion of relocation trawling projects, and an annual report summarizing relocation trawling efforts and results within their District. The annual report requirement may be included in the end-of-year report required in Term and Condition No. 9, above.

13. *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 by the COE at all projects where any of the following conditions are met; however, other ongoing projects not meeting these conditions are not required to conduct relocation trawling:

    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 a District's sea turtle species initial take allocation for a particular species has previously been met.

14. *Relocation Trawling Waiver*: For individual projects the affected COE District may request by letter to 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.

15. *Relocation Trawling - Annual Take Limits*: This Opinion authorizes the annual (by fiscal year) non-injurious take of 300 sea turtles (of one species or combination of species) and 8 Gulf sturgeon, and lethal or injurious takes of up to 2 sea turtles and 1 Gulf sturgeon annually, by duly-permitted, NOAA Fisheries-approved observers in association with all relocation trawling conducted or contracted by the four Gulf of Mexico COE 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:

a. *Trawl Time*: Trawl tow-time duration shall not exceed 42 minutes (doors in - doors out) and trawl speeds shall not exceed 3.5 knots.

b. *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 (Appendix IV).

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 Limits*: <u>Any protected species injured or killed during or as a consequence of relocation trawling shall count toward the Gulf-wide limit for injurious or lethal takes during relocation trawling</u>. 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 to be developed, as described below. This 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. *Tissue Sampling and Genetic Analysis*: <u>The COE's Gulf of Mexico Districts shall collect and analyze a sufficient number of sea turtle tissue samples taken annually during COE hopper dredging/trawling operations in the Gulf of Mexico, to provide reliable information on the nesting or subpopulation identity of sea turtles being captured across the Gulf of Mexico. NMFS and the COE shall jointly design a Sampling and Analysis Plan, to be implemented by no later than the end of calendar year 2005, that prescribes, among other things, the total numbers of samples, numbers</u>

of samples per species, distribution of sample collections across dredging locations, and genetic and statistical analyses. The NMFS Southwest Fisheries Science Center (SWFSC) is the NMFS center for sea turtle genetic analysis, and NMFS' preferred approach to analyzing tissue samples is for the COE to enter into a memorandum of understanding with SWFSC to conduct the required analyses. The COE may arrange to have the genetic analyses conducted by any other qualified laboratory that may exist, so long as the results are consistent with the national standards for sea turtle genetic analysis in use at the SWFSC, and consistent with the Sampling and Analysis Plan to be developed under this Opinion.

n. *PIT Tagging:* PIT tagging is **not required or authorized for, and shall not be conducted** by ESOs 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.

o. *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 this 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.

p. *Handling Fibropapillomatose Turtles*: When handling sea turtles infected with fibropapilloma tumors, observers must 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.

16. *Hardground 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 hardground areas or bottom structures that serve as attractants to sea turtles for foraging or shelter. NOAA Fisheries considers (for the purposes of this Opinion only) a

significant hardground 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 COE Districts shall ensure that sand mining sites within their Districts are adequately mapped to enable the dredge to stay at least 400 feet from these areas. If the COE 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.

17. *Training - Personnel on Hopper Dredges*: The respective COE Districts must ensure that 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 draghead assembly.

18. *Dredge Lighting*: From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout 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 OSHA requirements. All non-essential lighting on the dredge and pumpout 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 natal beaches.

19. *Reallocation of Initial Take Allotments Among Districts:* As discussed above, the district-specific take allotments in Section 8.0 of this Opinion are initial allocations, based on past and projected future patterns of take in different areas of the Gulf of Mexico, but the jeopardy analyses are based upon the total Gulf-wide levels of take. Thus, the district-specific allotments may be used by the COE for planning purposes. Gulf of Mexico districts that exceed their initial allotments must request and receive re-allocation of takes from other districts within the GOM. The ceding district's initial take level is then correspondingly reduced. The district exceeding its initial allotment and borrowing take from another district must notify NMFS that it has exceeded its initial take allotment and which district it is borrowing from, so that NMFS may determine whether or not the exceedance represents new information in conflict with the assumptions underlying the effects analyses of the Opinion. A single district's exceedance of its initial allotment alone does not require reinitiation of consultation of the Opinion.

10.0 Conservation Recommendations

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the COE in contributing to the conservation of sea turtles and Gulf sturgeon by further reducing or eliminating adverse impacts that result from hopper dredging.

1. *Channel Conditions and Seasonal Abundance Studies*: Channel-specific studies should be undertaken to identify seasonal relative abundance of sea turtles and Gulf sturgeon within Gulf of Mexico channels. The December 1 through March 31 dredging window and associated observer requirements listed above may be adjusted (after consultation and authorization by NOAA Fisheries) on a channel-specific basis, if (a) the COE can provide sufficient scientific evidence that sea turtles and Gulf sturgeon are not present or that levels of abundance are extremely low during other months of the year, or (b) the COE can identify seawater temperature regimes that ensure extremely low abundance of sea turtles or Gulf sturgeon in coastal waters, and can monitor water temperatures in a real-time manner. Surveys may indicate that some channels do not support significant turtle populations, and hopper dredging in these channels may be unrestricted on a year-round basis, as in the case of MR-SWP. To date, sea turtle deflector draghead efficiency has not reached the point where seasonal restrictions can be lifted.

2. *Draghead Modifications and Bed Leveling Studies*: The New Orleans, Galveston, Mobile, and Jacksonville Districts should supplement the efforts of SAD and WES to develop modifications to existing dredges to reduce or eliminate take of sea turtles, and develop methods to minimize sea turtle take during "cleanup" operations when the draghead maintains only intermittent contact with the bottom. Some method to level the "peaks and valleys" created by dredging would reduce the amount of time dragheads are off the bottom.

3. *Draghead Evaluation Studies and Protocol*: Additional research, development, and improved performance is needed before the V-shaped rigid deflector draghead can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities. Development of a more effective deflector draghead or other entrainment-deterring device (or combination of devices, including use of acoustic deterrents) could potentially reduce the need for sea turtle relocation or result in expansion of the winter dredging window. NOAA Fisheries should be consulted regarding the development of a protocol for draghead evaluation tests. NOAA Fisheries recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts coordinate with ERDC, SAD, the Association of Dredge Contractors of America, and dredge operators (Manson, Bean-Stuyvesant, Great Lakes, Natco, etc.) regarding additional reasonable measures they may take to further reduce the likelihood of sea turtle and Gulf sturgeon takes.

4. *Continuous Improvements in Monitoring and Detecting Takes*: The COE should seek continuous improvements in detecting takes and should determine, through research and development, a better method for monitoring and estimating sea turtle and Gulf sturgeon

takes by hopper dredge. Observation of overflow and inflow screening is only partially effective and provides only partial estimates of total sea turtle and Gulf sturgeon mortality.

Overflow Screening: The COE should encourage dredging companies to develop or modify existing overflow screening methods on their company's dredge vessels for maximum effectiveness of screening and monitoring. Horizontal overflow screening is preferable to vertical overflow screening because NOAA Fisheries considers that horizontal overflow screening is significantly more effective at detecting evidence of protected species entrainment than vertical overflow screening.

Preferential Consideration for Horizontal Overflow Screening: The COE should give preferential consideration to hopper dredges with horizontal overflow screening when awarding hopper dredging contracts for areas where new materials, large amounts of debris, or clay may be encountered, or have historically been encountered. Excessive inflow screen clogging may in some instances necessitate removal of inflow screening, at which point effective overflow screening becomes more important.

5. *Section 10 Research Permits and Relocation Trawling*: NOAA Fisheries recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts, either singly or combined, apply to NOAA Fisheries for an ESA section 10 research permit to conduct endangered species research on species incidentally captured during relocation trawling. For example, satellite tagging of captured turtles could enable the COE Districts to gain important knowledge on sea turtle seasonal distribution and presence in navigation channels and sand mining sites and also, as mandated by section 7(a)(1) of the ESA, to utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species. SERO shall assist the COE Districts with the permit application process.

6. *Draghead Improvements - Water Ports*: NOAA Fisheries recommends that the COE's Gulf of Mexico Districts require or at least recommend to dredge operators that all dragheads on hopper dredges contracted by the COE for dredging projects be eventually outfitted with water ports located in the *top* of the dragheads to help prevent the dragheads from becoming plugged with sediments. When the dragheads become plugged with sediments, the dragheads are often raised off the bottom (by the dredge operator) with the suction pumps on in order to take in enough water to help clear clogs in the dragarm pipeline, which increases the likelihood that sea turtles in the vicinity of the draghead will be taken by the dredge. Water ports located in the top of the dragheads would relieve the necessity of raising the draghead off the bottom to perform such an action, and reduce the chance of incidental take of sea turtles.

NOAA Fisheries supports and recommends the implementation of proposals by ERDC and SAD personnel for various draghead modifications to address scenarios where turtles may be entrained during hopper dredging (Dickerson and Clausner 2003). These include: a) an adjustable visor; b) water jets for flaps to prevent plugging and thus reduce the requirement to lift the draghead off the bottom; and c) a valve arrangement (which mimics the function of a “Hoffer” valve used on cutterhead type dredges to allow additional water to be brought in when the suction line is plugging) that will provide a very large amount of water into the suction pipe thereby significantly reducing flow through the visor when the draghead is lifted off the bottom, reducing the potential to take a turtle.

7. *Economic Incentives for No Turtle Takes*: The COE should consider devising and implementing some method of significant economic incentives to hopper dredge operators such as financial reimbursement based on their satisfactory completion of dredging operations, or *X* number of cubic yards of material moved, or hours of dredging performed, *without taking turtles*. This may encourage dredging companies to research and develop “turtle friendly” dredging methods; more effective, deflector dragheads; pre-deflectors; top-located water ports on dragarms; etc.

8. *Sedimentation Limits to Protect Resources (Hardbottoms/Reefs)*: NOAA Fisheries recommends water column sediment load deposition rates of no more than 200 mg/cm^2/day, averaged over a 7-day period, to protect coral reefs and hard bottom communities from dredging-associated turbidity impacts to listed species foraging habitat.

9. *Boca Grande Pass - Conditions*: If the COE’s Jacksonville District decides to renew dredging permits for the Boca Grande Pass, NOAA Fisheries recommends that the District conduct or sponsor a Gulf sturgeon study, including gillnetting and tagging utilizing ultrasonic and radio transmitters, and mtDNA sampling, to help determine the genetic origins, relative and seasonal abundance, distribution and utilization of estuarine and marine habitat by Gulf sturgeon within Charlotte Harbor estuary and Charlotte Harbor Entrance Channel, and shall report to NOAA Fisheries biannually on the progress and final results of said study.

10. *Relocation Trawling - Guidelines*: Within six months of the issuance of this Opinion, the COE’s Gulf of Mexico Districts, in coordination with COE’s SAD, shall develop relocation trawling guidelines to ensure safe handling and standardized data gathering techniques for sea turtles and Gulf sturgeon by COE contractors, and forward copies to NOAA Fisheries’ Protected Resources Division.

11. *Sodium Vapor Lights on Offshore Equipment*: On offshore equipment (i.e., hopper dredges, pumpout barges) shielded low pressure sodium vapor lights are highly recommended for lights that cannot be eliminated.

11.0 Reinitiation of Consultation

Requirements for Reinitiation of Consultation: Reinitiation of formal consultation is required if (a) the total GOM-wide amount or extent of taking specified in the incidental take statement is exceeded, (b) new information reveals effects of the action that may affect listed species or critical habitat when designated in a manner or to an extent not previously considered, (c) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the Opinion, or (d) a new species is listed or critical habitat designated that may be affected by the identified action.

Advance Discussions of Potential Need for Reinitiation: NOAA Fisheries requests that COE districts initiate discussions with the Southeast Regional Office Protected Resources Division early to identify the potential need for reinitiation of consultation, well in advance of actually exceeding the amount or extent of taking specified in the incidental take statement. NOAA Fisheries requests notification when a) more than one turtle is taken by a dredge in any 24-hour period; b) four turtles are taken by a dredge during a single project; c) the dredge take reaches 75% of the total take level established for any one species; d) a Gulf sturgeon is taken by a dredge; e) a hawksbill turtle is taken by a dredge; f) a turtle or Gulf sturgeon is injuriously or lethally taken by a relocation trawler; or g) the relocation trawling incidental take limit for turtles or sturgeon is reached. The NOAA Fisheries Southeast Regional Office will work with the COE to quickly review such incidents, to discuss the need and advisability of further mitigating measures, and to plan for a reinitiation of consultation if it appears that one of the reinitiation triggers is likely to be met.

Dredging/Trawling Operations During Reinitiation of Consultation: Once the need for reinitiation is triggered, the COE is not necessarily required to suspend dredging or relocation trawling operations pending the conclusion of the reinitiated consultation, so long as the continuation of operations (by all districts) would not violate section 7(a)(2) or 7(d) of the ESA. In that case, the COE is advised to document its determination that these 6/24/2005provisions would not be violated by continuing activities covered by this Opinion during the reinitiation period and to seek NMFS' concurrence with its findings.

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
(727) 824-5312; FAX 824-5309
http://sero.nmfs.noaa.gov

JAN - 9 2007

F/SER3:EH

BG Joseph Schroedel, USA
Division Engineer
South Atlantic Division
U.S. Army Corps of Engineers
60 Forsyth Street S.W.
Atlanta, GA 30303-8801

Dear General Schroedel:

This responds to the U.S. Army Corps of Engineers' (COE), South Atlantic Division (SAD) e-mail request dated May 31, 2006, by Mr. Dennis Barnett of your Planning and Policy Division (PPD) to Mr. Eric Hawk of my Protected Resources Division (PRD). Mr. Barnett, acting as spokesperson for the three COE divisions containing the four COE Gulf of Mexico districts, submitted COE-requested changes to the current National Marine Fisheries Service (NMFS) Gulf of Mexico hopper dredging regional biological opinion (GRBO), issued November 19, 2003. Our response also addresses the Endangered Species Act (ESA) section 7(a)(2)/7(d) analysis submitted by e-mail on September 12, 2006, by Mr. Daniel Small of COE PPD in response to a take of a federally-listed smalltooth sawfish on August 12, 2006, by a COE-authorized relocation trawler during Tampa Harbor Entrance Channel maintenance dredging. A June 27, 2006, conference call and numerous subsequent e-mails, phone calls, and sharing of ideas between our respective staffs resulted in Revision 2 to the GRBO, enclosed herein.

NMFS previously amended the GRBO on June 24, 2005 (Revision 1). The COE requested additional changes to address remaining issues of concern, specifically: 1) GRBO-required funding for genetic testing of tissue samples collected from sea turtles taken on COE projects or COE-permitted projects; and 2) the methodology of how applicants on COE permits will be involved in consultation discussions regarding authorized levels of protected species take. Other COE requests included, specifically: 1) A request for a 25-percent annual overage of authorized take under the GRBO for any one calendar year, as long as the total anticipated take for the encompassing 5-year period was not exceeded; and 2) a request that the GRBO be revised to authorize relocation trawling takes of smalltooth sawfish. Currently, the GRBO authorizes takes of federally-listed sea turtles and Gulf sturgeon, but not smalltooth sawfish.

The COE and NMFS agreed during their conference call to hold the COE request for a 25-percent overage in abeyance pending significant additional analysis needed by both the COE and NMFS. Because these analyses will require significant additional effort and time, it was agreed to proceed with resolving those high-priority issues that can be addressed with a simple revision to the Incidental Take Statement (ITS). However, it will be reconsidered during NMFS' reinitiation of formal consultation on the GRBO to analyze the effects of the COE's request for an increase in its currently authorized non-lethal relocation trawling take limits for sea turtles and Gulf sturgeon. At that time, NMFS will also consider the COE's requested increase in its lethal relocation trawling take limit for sea turtles and its request for relocation trawling take authority for smalltooth sawfish. Increased take limits and take authority for species not included in the GRBO's ITS cannot be authorized without a thorough effects assessment and jeopardy analysis.

With respect to the COE's concern about genetic sampling, NMFS agrees that the GRBO requirement for COE funding of genetic sampling be modified because the COE has provided evidence that it cannot, within its current fiscal authority, fund this requirement. The COE, however, agrees to require the collection and shipment to NMFS for genetic analysis of tissue samples from all sea turtles and Gulf sturgeon taken by hopper dredges and relocation trawlers until NMFS, in consultation with COE scientists, determines they are no longer needed. The GRBO has been modified accordingly; this requirement has been included in the reasonable and prudent measures of the ITS.

With respect to applicant participation in the ESA consultation process and input into permitted-project protected species take levels, the COE will coordinate with NMFS prior to permit issuance. The COE will forward draft permit conditions to NMFS that are consonant with the RPMs and terms and conditions of the GRBO, including a proposed amount of authorized take of sea turtles and Gulf sturgeon per project allocated from the overall annual authorized take limit. Currently the COE's sea turtle and Gulf sturgeon take database and NMFS' take records are useful for estimation purposes, but are still too incomplete to support analyses to accurately predict particular dredging project protected species takes levels with any degree of certainty.

As requested by the COE and based on information provided by the COE with input from NMFS, Revision 2 segregates the previously established Gulf-wide protected species take limits into two allotments – one for COE civil works projects and one for COE-permitted projects. The COE retains the authority and flexibility to manage the allotment ratio, initially set at 80:20 (i.e., 80% for civil, 20% for permitted) for the combined Gulf districts, and adjust them yearly as necessary within the established ITS ceiling, according to its operational needs and its own internal hopper dredging protocol, in coordination with NMFS.

At the COE's request, NMFS' partitioning of the GRBO's Gulf-wide authorized take level into fixed allotments for each of the four COE districts has been superseded by the 80:20 ratio allotment take-limit scheme described above. Revision 2 includes NMFS' estimates of *anticipated* take by each district, unchanged from the original GRBO; however, NMFS has eliminated the district-level protected species allocations, where each district formerly held a guaranteed share of the Gulf-wide authorized level of per-fiscal-year take. The COE is developing an internal protocol to handle within-year management and sharing of takes between Gulf of Mexico COE districts. Other minor modifications to the GRBO and noteworthy changes included in Revision 2 are:

1) The COE is no longer required to consult with/notify NMFS whenever it deviates from the recommended hopper dredging windows (T&C 1).
2) Notification to NMFS and transmittal of information on protected species takes by hopper dredge can now occur by electronic mail to **takereport.nmfsser@noaa.gov** (T&C 9).
3) Any strandings or relocation trawler takes of protected species bearing evidence of potential dredge interaction, regardless of type of dredge implicated, shall not be counted against the GRBO's ITS (T&C 10), although the reporting requirement remains unchanged (T&C 11).
4) The minimum dimensions for a seawater holding tank for captured Gulf sturgeon have been eliminated and more flexible, protective standards have been instituted (T&C 15-f).
5) The GRBO is now the permitting authority to conduct PIT tagging; an ESA Section 10 permit is no longer required to conduct PIT tagging (T&C 15-h, T&C 15-i, T&C 16).
6) Submission requirements for PIT tag scan and external tag data, and genetic samples, have been standardized, to within 60 days after project completion (T&C 15-j, T&C 16).
7) The definition of hardgrounds is clarified to exclude navigation channels and jettys (T&C 17).

In addition, there are some minor changes to address inconsistent or unclear language use in the original GRBO: e.g., the terms "NMFS-approved observer," "observer," and "endangered species observer," have been standardized/changed to "NMFS-approved protected species observer." Other minor language changes clarify that weighing/measuring/sampling of protected species is only required when it can be done safely (T&C 15-d, T&C 20), and that NMFS-approved protected species observers are not required to take tissue samples of sea turtle viral fibropapillomas when these are encountered (T&C 15-l). Finally, NMFS encourages the COE to make fuller use of protected species taken during hopper dredging and relocation trawling by allowing and encouraging duly-permitted "piggy-back" research projects on protected species taken during these activities (T&C 15-d, Conservation Recommendation 5).

Revision 2 to the GRBO is enclosed. It replaces and supersedes Revision 1, and replaces and supersedes the corresponding sections of the 2003 GRBO. If you have any questions, please contact Eric Hawk at (727) 551-5773 or by e-mail at Eric.Hawk@noaa.gov.

We sincerely appreciate all the COE's past and ongoing protected species conservation efforts during hopper dredging activities in the Gulf and South Atlantic, and look forward to continued collaborative efforts to preserve our protected species. My compliments to your staff at SAD, in particular Mr. Daniel Small, and in the four Gulf of Mexico COE districts for working assiduously and effectively with NMFS staff, which enabled us to resolve your remaining concerns with the GRBO. We look forward to working closely with the COE to facilitate other activities, including reinitiation of consultation on the South Atlantic Regional Biological Opinion on hopper dredging, while conserving endangered and threatened species.

I would especially like to take this opportunity to applaud and congratulate the U.S. Army Corps of Engineers, and especially Dr. Dena Dickerson and her staff at the Environmental Data Research Center in Vicksburg, Mississippi, for the excellent job they have done developing and maintaining the COE's Sea Turtle Data Warehouse. The wealth of historic and current information contained in this database regarding hopper dredging project/protected species interactions, and the ease of use of the Sea Turtle Data Warehouse Website, has been exceedingly valuable to NMFS, and will continue to be very useful to both our agencies when making management and conservation decisions regarding protected species.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure

cc: COE SAD, Atlanta – Daniel Small, Dennis Barnett
COE MVD, Vicksburg
COE SWD, Dallas
COE, Mobile District – Susan Ivester Rees
COE, Galveston District – Carolyn Murphy
COE, Jacksonville District – Marie Burns, Terri Jordan
COE, New Orleans District – Linda Mathies
F/PR2 – Barbara Schroeder
F/SEC3 – Sheryan Epperly Chester

File: 1514-22.f.1.GOM, SAD
Ref: I/SER/2006/02953; I/SER/2006/01096

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

Revision 2 to the National Marine Fisheries Service (NMFS) November 19, 2003, Gulf of Mexico Regional Biological Opinion (GRBO) to the U.S. Army Corps of Engineers (COE) on Hopper Dredging of Navigation Channels and Borrow Areas in the U.S. Gulf of Mexico

The followings replaces parts of the original GRBO and supersedes Revision 1 to the GRBO. All replacements/revisions noted below are to be made to the November 19, 2003, biological opinion. Revision 1 should be discarded in its entirety.

REPLACE:
Anticipated Gulf-wide Take of Sea Turtles and Gulf Surgeon by Hopper Dredges (in Section 5, pp. 57-58 of GRBO), with the following:

Anticipated Gulf-wide Take of Sea Turtles and Gulf Sturgeon by Hopper Dredges and Bed-leveling associated with Hopper Dredging Projects:

For the entire Gulf of Mexico from the U.S.-Mexico border to Key West, the annual documented COE incidental take per fiscal year, by injury or mortality, is expected to consist of twenty (20) Kemp's ridley turtles, fourteen (14) green turtles, four (4) hawksbill turtles, forty (40) loggerhead turtles, and four (4) Gulf sturgeon. This take level represents a total take per fiscal year for all channel dredging and sand mining by hopper dredges in the Gulf of Mexico under the purview of the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts collectively. These totals include hopper dredging activities conducted by the COE (for maintenance of civil works and military navigation channels and for construction of federally-authorized hurricane-storm damage reduction projects) and performed by non-federal interests under COE permits (i.e., "regulatory" projects), including any bed-leveling associated with these hopper dredging activities. These totals are based on the following estimates of anticipated take levels in the Gulf of Mexico, by region, which are not allotments or limits per se. Subdivision of the COE's Gulf-wide anticipated incidental take is made later in this opinion, into two distinct and separate levels or allotments: one for COE-conducted ("civil works and national defense") projects, and the other for COE-permitted ("regulatory") projects.

Texas Coastal Area
For this area, the annual documented incidental take, by injury or mortality, is expected to consist of seven (7) Kemp's ridleys, five (5) green turtles, one (1) hawksbill, and fifteen (15) loggerhead turtles.

Louisiana Coastal Area
For this area, the documented annual incidental take, by injury or mortality, is expected to consist of seven (7) Kemp's ridleys, three (3) green turtles, one (1) hawksbill, and fifteen (15) loggerhead turtles, and one (1) Gulf sturgeon.

Florida Panhandle Coastal Area, west of Aucilla River Basin; Alabama Coastal Area; and Mississippi Coastal Area
For these areas, combined, the documented annual incidental take, by injury or mortality, is expected to consist of three (3) Kemp's ridley, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and two (2) Gulf sturgeon.

West Florida Coastal Area: Aucilla River Basin to, but not including, Key West
For this area, the documented annual incidental take, by injury or mortality, is expected to consist of three (3) Kemp's ridleys, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and one (1) Gulf sturgeon. Hopper dredging of Key West navigation channels is covered under the September 25, 1997, regional hopper dredging biological opinion (RBO) to the COE's South Atlantic Division (SAD), which includes by reference the reasonable and prudent measures (RPMs) of the August 25, 1995, hopper dredging RBO to the SAD.

REPLACE:
Anticipated Gulf-wide Take by Hopper Dredging Activities (in Section 8, pp. 63-65 of GRBO), with the following:

8.1 Anticipated Gulf-wide Take by Hopper Dredging and Bed-leveling and Relocation Trawling Activities Associated with Hopper Dredging Projects:

For the entire Gulf of Mexico from the U.S.-Mexico border to Key West, the annual documented COE incidental take per fiscal year, by injury or mortality, is expected to consist of forty (40) loggerhead turtles, twenty (20) Kemp's ridley turtles, fourteen (14) green turtles, four (4) hawksbill turtles, and four (4) Gulf sturgeon. This take level represents total take by injury or mortality per fiscal year anticipated for all navigation channel maintenance dredging and sand mining by hopper dredges and any associated bed-leveling activity in the Gulf of Mexico within the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts, by COE-conducted ("civil works and national defense") projects and COE-permitted ("regulatory") projects.

Based upon consultation with the COE, the annual documented lethal or injurious incidental take per fiscal year is allocated as follows:

8.1.1 For COE-*conducted* hopper dredging for federal civil works or national defense activities:

Thirty-two (32) loggerhead turtles, sixteen (16) Kemp's ridley turtles, eleven (11) green turtles, three (3) hawksbill turtles, and three (3) Gulf sturgeon.

8.1.2 For COE-*permitted* hopper dredging performed by others (i.e., non-COE entities):

Eight (8) loggerhead turtles, four (4) Kemp's ridley turtles, three (3) green turtles, one (1) hawksbill turtle, and one (1) Gulf sturgeon.

8.1.3 For relocation trawling:

Zero to two (2) turtles and zero to one (1) Gulf sturgeon. These numbers are in addition to anticipated lethal or injurious takes by hopper dredges noted in 8.1.1 and 8.1.2, above.

8.1.4 For relocation trawling, the following non-lethal take is anticipated/authorized per fiscal year.

Three hundred (300) sea turtles, of any combination of species (Kemp's ridley, green, loggerhead, leatherback, and hawksbill), and eight (8) Gulf sturgeon, across all the COE districts and hopper dredging projects. This take is limited to relocation trawling conducted during the 0-3 days immediately preceding the start of hopper dredging (as a means to determine/reduce the initial abundance of sea turtles in the area and determine if additional trawling efforts are needed), during actual hopper dredging, and during "down" times when the hopper dredging operations may be temporarily suspended due to lethal turtle/sturgeon takes, weather, hopper dredge mechanical problems, etc. Relocation trawling performed to reduce endangered species/hopper dredge interactions is subject to the requirements detailed in the terms and conditions of this opinion.

Regulatory Permits

Each COE district issuing a regulatory permit involving hopper dredging will be responsible for initiating contact with NMFS on behalf of permit applicants, and will forward draft permit conditions to NMFS that are consonant with the RPMs and terms and conditions of this Regional Biological Opinion, including a proposed amount of authorized take of sea turtles and Gulf sturgeon where applicable per project allocated from the overall annual authorized take limit. The COE will coordinate with NMFS prior to permit issuance. This may be done by electronic mail with an electronic response from NMFS. The draft permit conditions and proposed take level allocated may be of standardized content.

COE Gulf of Mexico Hopper Dredging Protocol

The COE will develop internal protocols for managing, documenting, reporting, and coordinating incidental takes for both COE-conducted and COE-permitted activities across Gulf of Mexico Districts to ensure compliance with the provisions of this Regional Biological Opinion. The protocol and any future revisions to it will be shared with the NMFS Southeast Regional Office, Protected Resources Division staff in a timely manner.

Adjustment of Take Allocations

The balance between the basic hopper dredging requirements (quantities, duration, timing, and locations) for COE-conducted dredging for civil works and national defense and for COE-permitted dredging may vary in the future. Based on annual changes in these requirements, the COE may, in coordination with NMFS, adjust the allocation of the authorized Gulf-wide incidental take numbers between COE-conducted hopper dredging and COE-permitted hopper dredging in advance of any given fiscal year, such that changes could be made to the allotments for the start of the subsequent fiscal year. Such adjustments would not affect the jeopardy analysis of this opinion or the terms and conditions of this ITS and can be made without reinitiation of consultation on this opinion.

New information requiring subsequent reinitation of consultation on this opinion, pursuant to the reinitiation triggers of 50 CFR 402.16, could result in an increase or decrease of the total allocated incidental take numbers for COE-conducted or COE-permitted hopper dredging within the current authorized ITS limit.

REPLACE:
Terms and Conditions (in Section 9, pp. 72-78 in the GRBO), Section 10 (Conservation Recommendations, pp. 78-80 in the GRBO), and Section 11 (Reinitiation of Consultation, pp. 80-81 in the GRBO), with the following:

Terms and Conditions

1. *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. Hopper dredging of Key West channels is covered by the existing September 25, 1997, RBO to the COE's SAD.

2. *Non-hopper Type Dredging*: Pipeline or hydraulic dredges, because they are not known to take turtles, must be used whenever possible between April 1 and November 30 in Gulf of Mexico waters up to one mile into rivers. This should be considered particularly in channels such as those associated with Galveston Bay and Mississippi River - Gulf Outlet (MR-GO), where lethal takes of endangered Kemp's ridleys have been documented during summer months, and Aransas Pass, where large numbers of loggerheads may be found during summer months. In the MR-GO, incidental takes and sightings of threatened loggerhead sea turtles have historically been highest during April and October.

3. *Annual Reports*: The annual summary report, discussed below (No. 9), must give a complete explanation of why alternative dredges (dredges other than hopper dredges) were not used for maintenance dredging of channels between April and November.

4. *Observers*: The COE shall arrange for NMFS-approved protected species observers to be aboard the hopper dredges to monitor the hopper bin, screening, and dragheads for sea turtles and Gulf sturgeon and their remains.

   a. Brazos Santiago Pass east to Key West, Florida: Observer coverage sufficient for 100% monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges year-round from Brazos Santiago Pass to (not including) Key West, Florida, between April 1 and November 30, and whenever surface water temperatures are 11°C or greater.

b. Observer coverage of hopper dredging of sand mining areas shall ensure 50% monitoring (i.e., one observer).

c. Observers are not required at any time in Mississippi River - Southwest Pass (MR-SWP).

5. *Operational Procedures*: During periods in which hopper dredges are operating and NMFS-approved protected species observers are *not* required (as delineated in No. 4 above), the appropriate COE District 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 COE if sea turtles or whales are seen in the vicinity.

c. Notify NMFS if sea turtles are observed in the dredging area, to coordinate further precautions to avoid impacts to turtles.

d. Notify NMFS immediately by phone (**727/824-5312**), fax (**727/824-5309**), or electronic mail (**takereport.nmfsser@noaa.gov**) if a sea turtle or Gulf sturgeon or any other threatened or endangered species is taken by the dredge.

6. *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.

a. Screen Size: The hopper's inflow screens should have 4-inch by 4-inch screening. If the COE, in consultation with observers and the draghead operator, determines that the draghead 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 COE shall notify NMFS 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: NMFS 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.

c. Exemption - MR-SWP: Screening is not required at any time in MR-SWP.

7. *Dredging Pumps*: Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads 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 draghead frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the draghead is trimming off.

8. *Sea Turtle Deflecting Draghead*: A state-of-the-art rigid deflector draghead must be used on all hopper dredges in all Gulf of Mexico channels and sand mining sites at all times of the year except that the rigid deflector draghead is not required in MR-SWP at any time of the year.

9. *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges must be faxed or e-mailed to NMFS' Southeast Regional Office **[fax: (727) 824-5309; e-mail: takereport.nmfsser@noaa.gov]** by onboard NMFS-approved protected species observers within 24 hours of any sea turtle, Gulf sturgeon, or other listed species take observed.

   A preliminary report summarizing the results of the hopper dredging and any documented sea turtle or Gulf sturgeon takes must be submitted to NMFS within 30 working days of completion of any dredging project. Reports shall contain information on project location (specific channel/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 (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the COE deems relevant.

   An annual report (based on fiscal year) must be submitted to NMFS summarizing hopper dredging projects and documented incidental takes.

10. *Sea Turtle and Gulf Sturgeon Strandings*: The COE or its 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, bed-leveler dredging, and relocation trawling operations and ask to be notified of any sea turtle strandings in the project area that, in the estimation of STSSN personnel, bear signs of potential draghead impingement or entrainment, or interaction with a bed-leveling type dredge. Similarly, the COE shall notify NMFS SERO PRD of any Gulf sturgeon strandings in the project area that, in the estimation of STSSN personnel, bear signs of potential draghead 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 completion to NMFS' Southeast Regional Office. Because the deaths of these turtles, if hopper dredge or bed-leveler dredge related, have already been accounted for in NMFS' jeopardy analysis, these strandings will not be counted against the COE's take limit.

11. *Reporting - Strandings*: Each COE District shall provide NMFS' Southeast Regional Office with an annual report detailing incidents, with photographs when available, of stranded sea turtles and Gulf sturgeon that bear indications of draghead impingement or entrainment or any dredge-type interaction. This reporting requirement may be included in the end-of-year report required in Term and Condition No. 9, above.

12. *District Annual Relocation Trawling Report*: Each COE District shall provide NMFS' Southeast Regional Office with end-of-project reports within 30 days of completion of relocation trawling projects, and an annual report summarizing relocation trawling efforts and results within their District. The annual report requirement may be included in the end-of-year report required in Term and Condition No. 9, above.

13. *Conditions Requiring Relocation Trawling*: Handling of sea turtles and Gulf sturgeon captured during relocation trawling in association with hopper dredging projects in Gulf of Mexico navigation channels and sand mining areas shall be conducted by NMFS-approved protected species observers. Relocation trawling shall be undertaken by the COE at all projects where <u>any</u> of the following conditions are met; however, other ongoing projects not meeting these conditions are not required to conduct relocation trawling:

   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 any of the incidental take limits, including per species limits, specified in Section 8.1, has previously been met.

14. *Relocation Trawling Waiver*: For individual projects the affected COE District may request by letter to NMFS a waiver of part or all of the relocation trawling requirements. NMFS will consider these requests and decide favorably if the evidence is compelling.

15. *Relocation Trawling - Annual Take Limits*: This opinion authorizes, without the need for an ESA section 10 permit: the annual (by fiscal year) non-injurious take of 300 sea turtles (of one species or combination of species including Kemp's ridley, loggerhead, green, leatherback, and hawksbill) and 8 Gulf sturgeon, and annual (by fiscal year) lethal or injurious takes of up to 2 sea turtles and 1 Gulf sturgeon, by trawlers conducting relocation trawling, and handling of those captured threatened or endangered species by NMFS-approved protected species observers, in association with all relocation trawling conducted or contracted by the four Gulf of Mexico COE Districts to temporarily reduce or assess the abundance of these listed species during, and in the 0-3 days immediately

preceding, a hopper dredging or bed-leveling project in order to reduce the possibility of lethal hopper dredge or bed-leveler interactions, subject to the following conditions:

a. *Trawl Time*: Trawl tow-time duration shall not exceed 42 minutes (doors in - doors out) and trawl speeds shall not exceed 3.5 knots.

b. *Handling During Trawling*: Sea turtles and Gulf 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 (Appendix IV).

c. *Captured Turtle and Gulf Sturgeon Holding Conditions*: Turtles and Gulf sturgeon may be held briefly for the collection of important scientific measurements, prior to their release. Captured sea turtles shall be kept moist, and shaded whenever possible, until they are released, according to the requirements of T&C 15-e, below. Captured Gulf sturgeon shall be held in a suitable well-aerated seawater enclosure until they are released, according to the conditions of T&C 15-f, below.

d. *Scientific Measurements*: When safely possible, all turtles shall be measured (standard carapace measurements including body depth), tagged, weighed, and a tissue sample taken prior to release. When safely possible, all Gulf sturgeon shall be measured (fork length and total length), tagged, weighed, and a tissue sample taken prior to release. Any external tags shall be noted and data recorded into the observers log. Only NMFS-approved protected species observers or observer candidates in training under the direct supervision of a NMFS-approved protected species observer shall conduct the tagging/measuring/weighing/tissue sampling operations.

   NMFS-approved protected species observers may conduct more invasive scientific procedures (e.g., blood letting, laparoscopies, anal and gastric lavages, mounting satellite or radio transmitters, etc.) and partake in or assist in "piggy back" research projects but only if the observer holds a valid federal sea turtle or Gulf sturgeon research permit (and any required state permits) authorizing the activities, either as the permit holder, or as designated agent of the permit holder, and has first notified NMFS' Southeast Regional Office, Protected Resources Division.

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 3 (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 5 (five) nmi away. If it can be done safely and without injury to the turtle, 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 well-aerated seawater holding tank, container, trough, or pool where a maximum of one fish 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 Limits*: Any protected species injured or killed during or as a consequence of relocation trawling shall count toward the Gulf-wide limit for injurious or lethal takes during relocation trawling (0-2 sea turtles and 0-1 Gulf sturgeon per fiscal year). 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. *Turtle Flipper External 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 NMFS-approved protected species observer aboard these relocation trawlers to flipper-tag with external-type 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. *PIT Tagging:* This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler to PIT-tag captured sea turtles and Gulf sturgeon. PIT tagging of sea turtles and Gulf sturgeon is not required to be done, if the NMFS-approved protected species observer does not have prior training or experience in said activity; however, if the observer has received prior training in PIT tagging procedures, then the observer shall PIT tag the animal prior to release (in addition to the standard external tagging):

   Sea turtle PIT tagging must then be performed in accordance with the protocol detailed at NMFS' Southeast Fisheries Science Center's Web page: http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. (See Appendix C on SEFSC's "Fisheries Observers" Web page);

   Gulf sturgeon PIT tagging must then be performed in accordance with the protocol detailed at the NMFS SERO PRD Web site address: http://sero.nmfs.noaa.gov/pr/protres.htm.

   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-kHz tag), then insert one in the other shoulder.

j. *Other Sampling Procedures*: All other tagging and external or internal sampling procedures (e.g., blood letting, laparoscopies, anal and gastric lavages, mounting satellite or radio transmitters, etc.) performed on live sea turtles or live Gulf sturgeon are not permitted under this opinion unless the observer holds a valid sea turtle sturgeon research permit authorizing the activity, either as the permit holder, designated agent of the permit holder.

k. *PIT-Tag Scanning and Data Submission Requirements*: All sea turtles and Gulf sturgeon captured by relocation trawling or dredges shall be thoroughly scanned for the presence of PIT tags prior to release using a multi-frequency scanner powerful enough to read multiple frequencies (including 125-, 128-, 134-, and 400-kHz tags) and read tags deeply embedded in muscle tissue (e.g., manufactured by Trovan, Biomark, or Avid). Turtles whose scans show they have been previously PIT tagged shall nevertheless be externally flipper tagged. Sea turtle 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 sea turtle data collected shall be submitted in electronic format within 60 days of project completion to Lisa.Belskis@noaa.gov and Sheryan.Epperly@noaa.gov. Sea turtle 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.

Gulf sturgeon data (PIT tag scan data and external tagging data) shall be submitted within 60 days of project completion to NOAA, National Marine Fisheries Service, Protected Resources Division, 263 13th Avenue South, St. Petersburg, Florida 33701, or by **fax: (727) 824-5309;** or by **e-mail: takereport.nmfsser@noaa.gov**, Attn: Dr. Stephania Bolden.

l. *Handling Fibropapillomatose Turtles*: NMFS-approved protected species observers are not required to handle or sample viral fibropapilloma tumors if they believe there is a health hazard to themselves and choose not to. When handling sea turtles infected with fibropapilloma tumors, observers must 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.

16. *Requirement and Authority to Conduct Tissue Sampling for Genetic Analyses*: This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler or hopper dredge to tissue-sample live- or dead-captured sea turtles, and live- or dead-captured Gulf sturgeon, without the need for an ESA section 10 permit.

All live or dead sea turtles and Gulf sturgeon captured by relocation trawling and hopper dredging (for both COE-conducted and COE-permitted activities) shall be tissue-sampled prior to release. Sampling shall continue uninterrupted until such time as NMFS determines and notifies the COE in writing that it has sufficient samples from specific areas across the Gulf of Mexico in order to obtain reliable genetic information on the nesting or sub-population identity of sea turtles and Gulf sturgeon being captured or lethally taken, to improve the effectiveness of future consultations.

Sea turtle tissue samples shall be taken in accordance with NMFS' Southeast Fisheries Science Center's (SEFSC) procedures for sea turtle genetic analyses (Appendix II of this opinion). The COE shall ensure that tissue samples taken during a dredging project are collected and stored properly and mailed within 60 days of the completion of their dredging project to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149.

Gulf sturgeon tissue samples (i.e., fin clips or barbel clips) shall be taken in accordance with NMFS SERO's Protected Resources Division's Gulf Sturgeon Tissue Sampling Protocol found at the NMFS SERO PRD Web site address: http://sero.nmfs.noaa.gov/pr/protres.htm. The COE shall ensure that tissue samples taken during a dredging project are collected and stored properly and mailed to SERO PRD (Attn: Dr. Stephania Bolden) within 60 days of the completion of their dredging project.

17. *Hardground 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 hardground areas or bottom structures that serve as attractants to sea turtles for foraging or shelter. NMFS considers (for the purposes of this opinion only) a significant hardground 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 COE Districts shall ensure that sand mining sites within their Districts are adequately mapped to enable the dredge to stay at least 400 feet from these areas. If the COE is uncertain as to what constitutes significance, it shall consult with NMFS SERO's Habitat Conservation Division (727-824-5317) and NMFS' Protected Resources Division (727-824-5312) for clarification and guidance. Walls of federally-maintained navigation channels, and jetties and other such man-made structures, are not considered hardgrounds for the purpose of this opinion.

18. *Training - Personnel on Hopper Dredges*: The respective COE Districts must ensure that 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 draghead assembly.

19. *Dredge Lighting*: From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within 3 nmi of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or OSHA requirements. All non-essential lighting on the dredge and pumpout 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 natal beaches.

10.0 Conservation Recommendations

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the COE in contributing to the conservation of sea turtles and Gulf sturgeon by further reducing or eliminating adverse impacts that result from hopper dredging.

1. *Channel Conditions and Seasonal Abundance Studies*: Channel-specific studies should be undertaken to identify seasonal relative abundance of sea turtles and Gulf sturgeon within Gulf of Mexico channels. The December 1 through March 31 dredging window and associated observer requirements listed above may be adjusted (after consultation and authorization by NMFS) on a channel-specific basis, if (a) the COE can provide sufficient scientific evidence that sea turtles and Gulf sturgeon are not present or that levels of abundance are extremely low during other months of the year, or (b) the COE can identify seawater temperature regimes that ensure extremely low abundance of sea turtles or Gulf sturgeon in coastal waters, and can monitor water temperatures in a real-time manner. Surveys may indicate that some channels do not support significant turtle populations, and hopper dredging in these channels may be unrestricted on a year-round basis, as in the case of MR-SWP. To date, sea turtle deflector draghead efficiency has not reached the point where seasonal restrictions can be lifted.

2. *Draghead Modifications and Bed Leveling Studies*: The New Orleans, Galveston, Mobile, and Jacksonville Districts should supplement the efforts of SAD and ERDC to develop modifications to existing dredges to reduce or eliminate take of sea turtles, and develop methods to minimize sea turtle take during "cleanup" operations when the draghead maintains only intermittent contact with the bottom. Some method to level the "peaks and valleys" created by dredging would reduce the amount of time dragheads are off the bottom. NMFS is ready to assist the COE in conducting studies to evaluate bed-leveling devices and their potential for interaction with sea turtles, and develop modifications if needed.

3. *Draghead Evaluation Studies and Protocol*: Additional research, development, and improved performance is needed before the V-shaped rigid deflector draghead can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities. Development of a more effective deflector draghead or other entrainment-deterring device (or combination of devices, including use of acoustic

deterrents) could potentially reduce the need for sea turtle relocation or result in expansion of the winter dredging window. NMFS should be consulted regarding the development of a protocol for draghead evaluation tests. NMFS recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts coordinate with ERDC, SAD, the Association of Dredge Contractors of America, and dredge operators (Manson, Bean-Stuyvesant, Great Lakes, Natco, etc.) regarding additional reasonable measures they may take to further reduce the likelihood of sea turtle and Gulf sturgeon takes.

4. *Continuous Improvements in Monitoring and Detecting Takes*: The COE should seek continuous improvements in detecting takes and should determine, through research and development, a better method for monitoring and estimating sea turtle and Gulf sturgeon takes by hopper dredge. Observation of overflow and inflow screening is only partially effective and provides only partial estimates of total sea turtle and Gulf sturgeon mortality.

   Overflow Screening: The COE should encourage dredging companies to develop or modify existing overflow screening methods on their company's dredge vessels for maximum effectiveness of screening and monitoring. Horizontal overflow screening is preferable to vertical overflow screening because NMFS considers that horizontal overflow screening is significantly more effective at detecting evidence of protected species entrainment than vertical overflow screening.

   Preferential Consideration for Horizontal Overflow Screening: The COE should give preferential consideration to hopper dredges with horizontal overflow screening when awarding hopper dredging contracts for areas where new materials, large amounts of debris, or clay may be encountered, or have historically been encountered. Excessive inflow screen clogging may in some instances necessitate removal of inflow screening, at which point effective overflow screening becomes more important.

5. *Section 10 Research Permits, Relocation Trawling, and Piggy-Back Research*: NMFS recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts, either singly or combined, apply to NMFS for an ESA section 10 research permit to conduct endangered species research on species incidentally captured during relocation trawling. For example, satellite tagging of captured turtles could enable the COE Districts to gain important knowledge on sea turtle seasonal distribution and presence in navigation channels and sand mining sites and also, as mandated by section 7(a)(1) of the ESA, to utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species. SERO shall assist the COE Districts with the permit application process. Similarly, NMFS encourages the COE to cooperate with NMFS' scientists, other federal agencies' scientists, and university scientists to make fuller use of turtles and Gulf sturgeon taken pursuant to the authority conferred by this opinion during hopper dredging and relocation trawling, by allowing and encouraging "piggy-back" research projects by duly-permitted individuals or their authorized designees. Piggy-back projects could include *non-lethal* research of many types,

including blood letting, laparoscopies, anal and gastric lavages, mounting satellite or radio transmitters, etc.

6. *Draghead Improvements - Water Ports*: NMFS recommends that the COE's Gulf of Mexico Districts require or at least recommend to dredge operators that all dragheads on hopper dredges contracted by the COE for dredging projects be eventually outfitted with water ports located in the *top* of the dragheads to help prevent the dragheads from becoming plugged with sediments. When the dragheads become plugged with sediments, the dragheads are often raised off the bottom (by the dredge operator) with the suction pumps on in order to take in enough water to help clear clogs in the dragarm pipeline, which increases the likelihood that sea turtles in the vicinity of the draghead will be taken by the dredge. Water ports located in the top of the dragheads would relieve the necessity of raising the draghead off the bottom to perform such an action, and reduce the chance of incidental take of sea turtles.

   NMFS supports and recommends the implementation of proposals by ERDC and SAD personnel for various draghead modifications to address scenarios where turtles may be entrained during hopper dredging (Dickerson and Clausner 2003). These include: a) an adjustable visor; b) water jets for flaps to prevent plugging and thus reduce the requirement to lift the draghead off the bottom; and c) a valve arrangement (which mimics the function of a "Hoffer" valve used on cutterhead type dredges to allow additional water to be brought in when the suction line is plugging) that will provide a very large amount of water into the suction pipe thereby significantly reducing flow through the visor when the draghead is lifted off the bottom, reducing the potential to take a turtle.

7. *Economic Incentives for No Turtle Takes*: The COE should consider devising and implementing some method of significant economic incentives to hopper dredge operators such as financial reimbursement based on their satisfactory completion of dredging operations, or *X* number of cubic yards of material moved, or hours of dredging performed, *without taking turtles*. This may encourage dredging companies to research and develop "turtle friendly" dredging methods; more effective, deflector dragheads; pre-deflectors; top-located water ports on dragarms; etc.

8. *Sedimentation Limits to Protect Resources (Hardbottoms/Reefs)*: NMFS recommends water column sediment load deposition rates of no more than 200 mg/cm^2/day, averaged over a 7-day period, to protect coral reefs and hard bottom communities from dredging-associated turbidity impacts to listed species foraging habitat.

9. *Boca Grande Pass - Conditions*: If the COE's Jacksonville District decides to renew dredging permits for the Boca Grande Pass, NMFS recommends that the District conduct or sponsor a Gulf sturgeon study, including gillnetting and tagging utilizing ultrasonic and radio transmitters, and mtDNA sampling, to help determine the genetic origins, relative and seasonal abundance, distribution and utilization of estuarine and marine habitat by Gulf sturgeon within Charlotte Harbor estuary and Charlotte Harbor Entrance

Channel, and shall report to NMFS biannually on the progress and final results of said study.

10. *Relocation Trawling - Guidelines*: Within six months of the issuance of this opinion, the COE's Gulf of Mexico Districts, in coordination with COE's SAD, should develop relocation trawling guidelines to ensure safe handling and standardized data gathering techniques for sea turtles and Gulf sturgeon by COE contractors, and forward copies to NMFS' Protected Resources Division.

11. *Sodium Vapor Lights on Offshore Equipment*: On offshore equipment (i.e., hopper dredges, pumpout barges) shielded low-pressure sodium vapor lights are highly recommended for lights that cannot be eliminated.

11.0 Reinitiation of Consultation

Requirements for Reinitiation of Consultation: Reinitiation of formal consultation is required if (a) the amount or extent of taking specified in the incidental take statement is exceeded (any of the specified limits), (b) new information reveals effects of the action that may affect listed species or critical habitat when designated in a manner or to an extent not previously considered, (c) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the opinion, or (d) a new species is listed or critical habitat designated that may be affected by the identified action.

Advance Discussions of Potential Need for Reinitiation: NMFS requests that COE districts initiate discussions with the Southeast Regional Office Protected Resources Division early to identify the potential need for reinitiation of consultation, well in advance of actually exceeding the amount or extent of taking specified in the incidental take statement. NMFS requests notification when a) more than one turtle is taken by a dredge in any 24-hour period; b) four turtles are taken by a dredge during a single project; c) the dredge take reaches 75% of the total take level established for any one species; d) a Gulf sturgeon is taken by a dredge; e) a hawksbill turtle is taken by a dredge; f) a turtle or Gulf sturgeon is injuriously or lethally taken by a relocation trawler; or g) the relocation trawling incidental take limit for turtles or sturgeon is reached. The NMFS Southeast Regional Office will work with the COE to quickly review such incidents, to discuss the need and advisability of further mitigating measures, and to plan for a reinitiation of consultation if it appears that one of the reinitiation triggers is likely to be met.

Dredging/Trawling Operations During Reinitiation of Consultation: Once the need for reinitiation is triggered, the COE is not necessarily required to suspend dredging or relocation trawling operations pending the conclusion of the reinitiated consultation, so long as the continuation of operations (by all districts and all permittees) would not violate section 7(a)(2) or 7(d) of the ESA. In that case, the COE is advised to document its determination that these provisions would not be violated by continuing activities covered by this opinion during the reinitiation period and to notify NMFS of its findings.

Appendix C

ESSENTIAL FISH HABITAT (EFH) ASSESSMENT

Draft Essential Fish Habitat Assessment for the
Sand Key Beach Renourishment
Pinellas County Beach Erosion Control Project
Pinellas County, Florida

Essential Fish Habitat (EFH) is defined in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson Stevens Act) of 1976, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), as "…those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." (16 U.S.C. 1802 (10)).

- *waters* include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate (50 CFR 600.10).
- *substrate* includes sediment, hard bottom, structures underlying the waters, and associated biological communities (50 CFR 600.10).
- *necessary* means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem (50 CFR 600.10).
- *spawning, breeding, feeding, or growth to maturity* covers a species throughout its life cycle.
- *healthy ecosystem* means an ecosystem where ecological productive capacity is maintained, diversity of the flora and fauna is preserved, and the ecosystem retains the ability to regulate itself. Such an ecosystem should be similar to comparable, undisturbed ecosystems with regard to standing crop, productivity, nutrient dynamics, trophic structure, species richness, stability, resilience, contamination levels, and the frequency of diseased organisms (50 CFR 600.10).
- *adverse effect* means any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810(a)).

Federal agencies are required to prepare an EFH assessment for any Federal action that may adversely affect EFH (50 CFR 600.920(e)(1)). The authority of NOAA to manage EFH is directly related to those species covered under Fishery Management Plans (FMPs) in the United States, including Alaska, Hawaii, the U.S. Virgin Islands and Puerto Rico (50 CFR 600). EFH assessments must include a description of the action, an analysis of the potential adverse effects of the action on EFH and the managed species, the Federal agency’s conclusion regarding the effects of the action on EFH, and proposed mitigation, if applicable (50 CFR 600.920(e)(3).

1.0 DESCRIPTION OF THE PROPOSED ACTION

1.1 NEED

Erosion caused by storms, wave action, and currents along barrier islands in Pinellas County has reduced the storm protection that these barrier island beaches provide. There is a need to restore the level of storm protection provided by the barrier islands through beach renourishment. The Pinellas County Beach Erosion Control Project has historically obtained beach-quality sand from inlet ebb shoals and the Egmont Channel Shoal to renourish Pinellas County beaches. Beach-quality fill has a color and grain size similar to the native beach sand. The continued use of the Egmont Channel Shoal borrow area to renourish northern portion of Sand Key has become cost-prohibitive due to transportation costs.

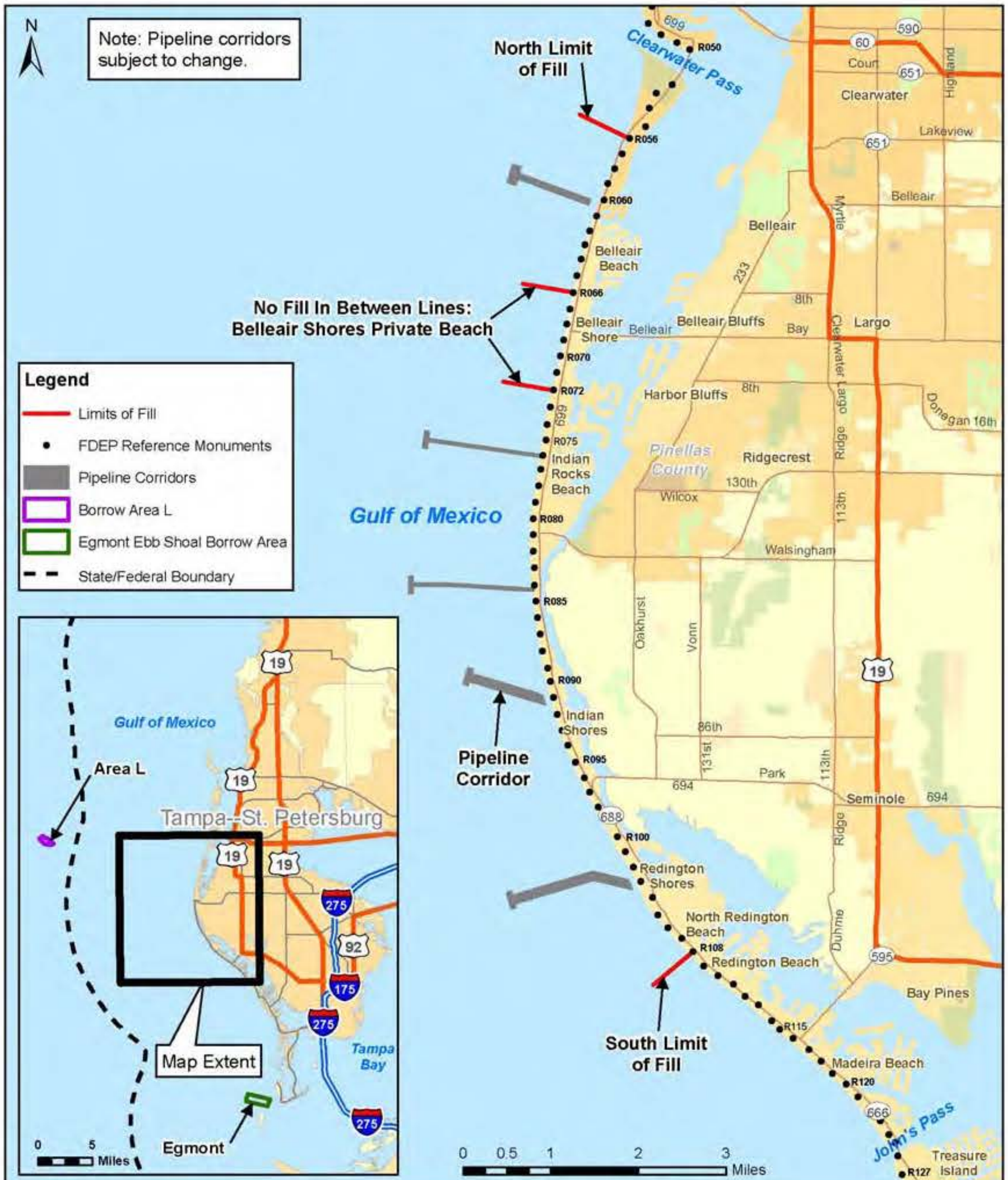
The purpose of the proposed project is to use Borrow Area L to renourish Sand Key beaches with beach-quality sand. Due to hydraulic losses experienced during the dredging process, up to 1.2 million cubic yards of sand would be dredged from the borrow area.

1.2 DESCRIPTION OF THE PROPOSED ACTION

The USACE proposes to dredge sand from Borrow Area L. The beach renourishment has been detailed in previous EAs (USACE 1997; 2002) that tiered off an EIS (USACE, 1984). This EA details the use of Borrow Area L, an alternative offshore borrow area. In summary, an 8.7-mile section of Sand Key beach along the shoreline of the Gulf of Mexico in Pinellas County, Florida (figures 1 and 2) will be renourished. This beach would be renourished with 800,000 cubic yards of sand between FDEP reference monuments R-56 and R-108 (a one-mile section at Belleair Shore between reference monuments R-66 and R-72 will not be renourished). The renourishment is expected to take from 10 to 14 months.

The proposed action of the Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE) is the issuance of a negotiated agreement pursuant to its authority under the Outer Continental Shelf Lands Act. The purpose of that action is to authorize the use of OCS sand (or other sediment) resources in beach nourishment and coastal restoration projects undertaken by Federal, state, or local government agencies, and/or in other federally authorized construction projects. In the case of this project, it is the use of sand from Borrow Area L. The No Action Alternative for the BOEMRE proposed action is to not issue a negotiated agreement.


Gulf of Mexico
Map Extent
Area L
North Limit of Fill
Sand Key
South Limit of Fill
Egmont Ebb Shoal Borrow Area
Gulf of Mexico
Brooksville
Hernando County
Pasco County
Hillsborough County
Tampa--St. Petersburg
Pinellas County
Tampa Bay
Manatee County
Sarasota--Bradenton
Sarasota County
Legend
Borrow Area L
Egmont Ebb Shoal Borrow Area
State/Federal Boundary
0 2.5 5 10 15 20 Miles
BORROW AREA L AND EGMONT EBB SHOAL BORROW AREA LOCATION
Sand Key Renourishment Project
Base Map: ESRI 9.3 Data CD
GEC
Figure: 1
Date: February 2010
Scale: 1:650,000
Source: USACE/GEC/ESRI
Map ID: 27307714-1892



LIMITS OF FILL AND PIPELINE CORRIDORS	Figure: 2
Sand Key Renourishment Project	Date: February 2010
	Scale: 1:96,000
	Source: USACE/GEC/ESRI
Base Map: ESRI 9.3 Data CD	Map ID: 27307714-1944

2.0 ANALYSIS OF THE POTENTIAL EFFECTS OF THE ACTION ON EFH AND THE MANAGED SPECIES

An EFH assessment (Dial Cordy and Associates Inc. 2003) was conducted for the nearshore area in conjunction with a previous environmental assessment (USACE 2002) on the previous renourishment. This previous EFH Assessment covered the nearshore area and is included by reference.

Borrow Area L has been designated as EFH for 31 species (Table 1). Managed species include coral and four species of crustaceans from the Shrimp, Stone Crab and Spiny Lobster Fishery Management Plans (FMPs) and 27 species of fishes from the Red drum, Reef Fish, Coastal Migratory FMP, and Highly Migratory FMP. The Gulf of Mexico Fisheries Management Council (GMFMC) (1998) has designated marine areas of non-vegetated bottoms, live bottoms, and water columns within the study area as EFH.

Table 1. Summary of EFH Designation for the Sand Key Beach Renourishment Project

Species	Scientific Name	Young of Year	Juveniles	Adults
Coral Species		X	X	X
Shrimp Fishery				
brown shrimp	*Farfantepenaeus aztecus*	X	X	X
pink shrimp	*F. duorarum*	X	X	X
Stone Crab Fishery				
Florida stone crab	*Menippe mercenaria*	X	X	X
Spiny Lobster Fishery				
spiny lobster	*Panulirus argus*	X	X	X
Red Drum Fishery				
red drum	*Sciaenops ocellatus*	X	X	X
Reef Fish Fishery				
gag grouper	*Mycteroperca microlepis*	X	X	X
gray snapper	*Lutjanus griseus*	X	X	X
gray triggerfish	*Balistes capriscus*	X	X	X
greater amberjack	*Seriola dumerili*	X	X	X
lane snapper	*L. synagris*	X	X	X
lesser amberjack	*S. fasciata*	X	X	X
red grouper	*Epinephelus morio*	X	X	X
red snapper	*L. campechanus*	X	X	X
scamp grouper	*M. phenax*	X	X	X
yellowtail snapper	*Ocyurus chrysurus*	X	X	X
Coastal Migratory Pelagic Fishery				
bluefish	*Pomatomus saltatrix*			X
dolphin	*Coryphaena hippurus*			X
cobia	*Rachycentron canadum*	X	X	X

Table 1. Summary of EFH Designation for the Sand Key Beach Renourishment Project

Species	Scientific Name	Young of Year	Juveniles	Adults
king mackerel	*Scomberomorus cavalla*	X	X	X
little tunny	*Euthynnus alletteratus*	X	X	X
Spanish mackerel	*S. maculatus*	X	X	X
Highly Migratory Pelagic Fishery		**Neonate**	**Juveniles**	**Adults**
blacknose shark	*Carcharinus acronotus*			X
blacktip shark	*C. limbatus*	X	X	X
bonnethead shark	*Sphyrna tiburo*		X	
bull shark	*C. leucas*	X	X	X
great hammerhead shark	*S. mokarran*			X
lemon shark	*Negaprion brevirostris*		X	X
sandbar shark	*C. plumbeus*	X	X	X
spinner shark	*C. brevipinna*	X		
nurse shark	*Ginglymostoma cirratum*		X	X
tiger shark	*Galeocerdo cuvieri*		X	

2.1 CORAL

EFH for coral consists of the total distribution of coral species and life stages throughout the Gulf of Mexico including the East and West Flower Garden Banks, Florida Middle Grounds, the southwest tip of the Florida reef tract, and predominant patchy hard bottom offshore of Florida from approximately Crystal River south to the Keys, and scattered along the pinnacles and banks from Texas to Mississippi at the shelf edge.

2.2 SHRIMP FISHERY

EFH for shrimp consists of Gulf of Mexico waters and substrates extending from the U.S.-Mexico border to Fort Walton Beach, Florida, from estuarine waters out to depths of 100 fathoms; waters and substrates extending from Grand Isle, Louisiana to Pensacola Bay, Florida between depths of 100 and 325 fathoms; waters and substrates extending from Pensacola Bay, Florida to the GMFMC-SAFMP boundary (the boundary between the areas covered by the GMFMC and the South Atlantic Fishery Management Council [SAFMC]) out to depths of 35 fathoms, with the exception of waters extending from Crystal River to Naples, Florida between depths of 10 and 25 fathoms and in Florida Bay between depths of 5 and 10 fathoms.

Brown shrimp

Brown shrimp EFH has been identified from the U.S.-Mexico border to the GMFMC-SAFMP boundary. Brown shrimp eggs are demersal, larvae are planktonic; both are found in waters shallower than 110 m. Postlarvae and juveniles are found in estuaries along the marsh edge, in and around submerged aquatic vegetation (SAV), tidal creeks and the inner marsh. Subadult brown shrimp are found in estuaries on mud bottoms and along the marsh edge. Adults are found in waters less than 110 m deep over silt and muddy sand.

Pink shrimp

Pink shrimp EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMP boundary. Pink shrimp eggs are demersal, larvae are planktonic; both are found in water shallower than 65 m. Postlarvae, juveniles, and subadults are found in estuaries over sand and shell substrate. Adult pink shrimp are found in waters less than 65 m deep, over sand and shell substrate.

2.3 STONE CRAB FISHERY

Stone crab

Stone crab EFH consists of Gulf of Mexico waters and substrates extending from the U.S.-Mexico border to Sanibel, Florida out to depths of 10 fathoms; waters and substrates extending from Sanibel, Florida to the GMFMC-SAFMP boundary from estuarine waters out to depths of 15 fathoms. Larvae are planktonic and are found in moderately high salinities offshore and in estuaries. Juvenile stone crabs are found in estuaries and offshore over shell and SAV; adult crabs are found over shell, SAV, and coral.

2.4 SPINY LOBSTER FISHERY

Spiny lobster

Spiny lobster EFH has been identified from the eastern Gulf of Mexico waters and substrates extending from Tarpon Springs to Naples, Florida between depths of 5 and 10 fathoms; waters and substrates extending from Cape Sable, Florida to the GMFMC-SAFMP boundary, out to depths of 15 fathoms. Larvae are found offshore in algae and SAV. Juveniles are found offshore in sponges and coral. Adult spiny lobsters are found over hardbottoms and crevices.

2.5 RED DRUM FISHERY

Red drum

Red drum EFH consists of all Gulf of Mexico estuaries; waters and substrates extending from Vermilion Bay, Louisiana to the eastern edge of Mobile Bay, Alabama out to depths of 25 fathoms; waters and substrates extending from Crystal River to Naples, Florida between depths of 5 and 10 fathoms; waters and substrates extending from Cape Sable, Florida to the GMFMC-SAFMC boundary between depths of 5 and 10 fathoms. Eggs and larvae are planktonic and are generally nearshore. Postlarvae and juveniles are in estuaries and nearshore waters associated with SAV, estuarine mud bottoms, at the water/marsh interface. Subadults are in estuaries associated with mud bottoms and oyster reefs. Adult red drum are in the Gulf of Mexico and over estuarine mud bottoms and oyster reefs.

2.6 REEF FISH FISHERY

EFH for reef fish consists of Gulf of Mexico waters and substrates extending from the U.S. Mexico border to the GMFMC-SAFMC boundary out to depths of 100 fathoms. Therefore, the project area is within the reef fish EFH area.

Gag grouper

Gag grouper EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMC boundary. Eggs are planktonic in Gulf waters. Juveniles are found in nearshore waters and associated with SAV and oyster beds in coastal lagoons and estuaries. Adult gag grouper are found in the Gulf in 10 to 100 m depths over hardbottoms, reefs, and coral.

Gray snapper

Gray snapper EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMC boundary. Eggs are planktonic in Gulf waters. Larvae and juveniles are typically in estuaries associated with SAV, mangroves, and mud bottoms. Adult gray snapper are found in estuarine or Gulf waters and are associated with SAV and mangroves over sand and mud.

Gray triggerfish

Gray triggerfish EFH has been identified from Florida and the Louisiana/Texas shelves. Eggs are found offshore over sand. Larvae are associated with floating plants such as *Sargassum*, and debris; postlarvae and juveniles are associated with floating plants such as *Sargassum*, debris, and mangroves. Adult gray triggerfish are generally found near reefs in waters more than 10 m deep.

Greater amberjack

Greater amberjack EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMC boundary. Juveniles are generally associated with floating plants such as *Sargassum*, and debris. Adult greater amberjack are generally pelagic over reefs and wrecks.

Lane snapper

Lane snapper EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMC boundary. Juveniles are generally found in estuarine or Gulf waters associated with SAV and mangroves over sand and mud. Adult lane snapper are generally found in Gulf waters between 4 and 132 m depths.

Lesser amberjack

Lesser amberjack EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMC boundary. Juveniles are found associated with floating plants such as *Sargassum* and debris. Adult lesser amberjacks are associated with oil rigs and irregular bottom features.

Red grouper

Red grouper EFH has been identified from the eastern Gulf of Mexico on the West Florida shelf. Eggs are planktonic and are found in depths of 25 to 50 m. Juveniles are found over hard bottoms and reefs or associated with SAV. Adult red grouper are associated with reefs, ledges, and outcrops.

Red snapper

Red snapper EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMC boundary. Larvae, postlarvae, and juveniles are generally associated with structure, over sand and mud, in waters between 17 and 183 m deep. Adult red snapper are associated with reefs, rock outcrops, and gravel in depths between 7 and 146 m.

Scamp grouper

Scamp grouper EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMC boundary. Juveniles are found over hard bottoms and reefs in 12 to 33 m water depths. Adult scamp grouper are found over hard bottoms in 12 to 189 m depths.

Yellowtail snapper

Yellowtail snapper EFH has been identified from Crystal River, Florida to the GMFMC-SAFMC boundary. Juveniles are found associated with SAV and mangroves over sand and mud in estuaries and the Gulf. Adult snapper are associated with reefs.

2.7 COASTAL MIGRATORY PELAGIC FISHERY

Bluefish

Bluefish EFH has been identified from Florida through Texas. Postlarvae and juveniles are found along beaches, and in estuaries and inlets. Adult bluefish are pelagic and are found in the Gulf and in estuaries.

Dolphin

Dolphin EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMC boundary. Dolphin larvae, postlarvae, juveniles, and adults are epipelagic and are generally found in Gulf and estuarine waters.

Cobia

Cobia EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMC boundary. Eggs are pelagic and found in the Gulf. Juveniles are found in estuaries and the shelf. Postlarval, juvenile, and adult cobia are found in coastal waters and the shelf.

King mackerel

King mackerel EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMC boundary. Juvenile and adult king mackerel are pelagic and are found in Gulf shelf waters.

Little tunny

Little tunny EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMC boundary. Postlarval, juvenile, and adult little tunny are pelagic and are found in coastal and shelf waters.

Spanish mackerel

Spanish mackerel EFH has been identified from the U.S./Mexico border to the GMFMC-SAFMC boundary. Eggs are pelagic and are found in Gulf waters. Larvae are found in estuarine and shelf waters. Postlarvae, juveniles, and adults are found in coastal and shelf waters.

2.8 HIGHLY MIGRATORY PELAGIC FISHERY

Highly migratory pelagic species are managed by the NMFS Highly Migratory Species Division, rather than the Gulf of Mexico Fishery Management Council. Highly migratory species (HMS) such as Atlantic tunas, swordfish, sharks, and billfish are found throughout the Atlantic Ocean and must be managed on domestic and international levels.

Blacknose shark

Adult blacknose shark EFH is in shallow coastal waters to the 25 m isobath from St. Augustine south to Cape Canaveral, FL; shallow waters to the 25 m isobath from the Florida Keys north to Cedar Key, FL; and Mississippi Sound from Mobile Bay, AL to the waters off Terrebonne Parish, LA in waters 25 to100 m deep.

Blacktip shark

EFH for early juvenile blacktip sharks is in waters less than 25 m deep from Ten Thousand Islands to Cedar Key, Florida. Late juvenile EFH is in waters less than 25 m deep from the Florida Keys to Cedar Key, Cape San Blas to the Mississippi Delta, and Galveston to Mexico. Adult blacktip shark EFH is found in waters less than 50 m deep from Florida Bay to Cape San Blas, Florida.

Bonnethead shark

Juvenile (39 to 82 cm TL) bonnethead shark EFH is in shallow coastal waters, inlets and estuaries from Cape Fear, NC southward to West Palm Beach, FL in waters less than 25 m deep; shallow coastal waters, inlets and estuaries from Miami around peninsular Florida as far north as Cedar Key in waters less than 25 m deep; and shallow coastal waters, inlets and estuaries from the Mississippi River westward to the Rio Grande River (Texas/Mexico border).

Bull shark

Neonate (<83 cm TL) bull shark EFH is in shallow coastal waters, inlets and estuaries in waters less than 25 m deep: from just north of Cape Canaveral, Florida at 29°N to just south of Cape Canaveral, Florida at 28°N; from just south of Charlotte Harbor, Florida at 26.5°N north to Cedar Key, Florida at 29°N; the mouth of Mobile Bay, Alabama from 87.75°W to 88.25°W; the mouth of Galveston Bay, Texas from 94.5°W to 95°W; and from South Padre Island, TX south of 28.5°N to Laguna Madre, Texas at 27°N. Juvenile (84 to 225 cm TL) EFH is 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 Apalachicola, FL at 85°W to the Mobile Bay, AL area at 88.5°W; and from just east of Galveston Bay, TX at 94.5°W to the U.S./Mexico border. Adult (>226 cm TL) bull shark EFH is in shallow coastal waters, inlets and estuaries in waters less than 25 m deep; and from just south of Charlotte Harbor, Florida at 26.5°N to Anclote Key, Florida at 28°N.

Great hammerhead shark

Adult (>210 cm TL) great hammerhead shark EFH is 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.

Lemon shark

Juvenile (69 to 235 cm TL) lemon shark EFH is in shallow coastal waters, inlets and estuaries offshore to the 25 m isobath, west of 79.75°W from Bull's Bay, SC to south of Cape Canaveral (West Palm Beach), FL at 28°N; shallow coastal waters, inlets and estuaries offshore to the 25 m isobath from Miami at 25.5°N, around peninsular Florida to Tampa Bay, FL (including the Keys) to 28°N; shallow coastal waters, inlets and estuaries offshore to the 25 m isobath off the south coast of Puerto Rico from 66°W to 67°W. Adult (>236 cm TL) lemon shark EFH is in shallow coastal waters, inlets and estuaries offshore to the 25 m isobath from Cumberland Island, GA at 31°N to St. Augustine, FL at 31°N; from West Palm Beach, FL at 27°N around peninsular Florida to 28.5° N near Anclote Key in shallow coastal waters, inlets and estuaries and offshore to the 25 m isobaths.

Sandbar shark

Neonate (<71 cm total length) sandbar shark EFH is in shallow coastal areas to the 25 m isobath from Montauk, NY at 72°W, south to Cape Canaveral, FL at 80.5°W (all year); nursery areas in shallow coastal waters from Great Bay, NJ to Cape Canaveral, FL, especially Delaware and Chesapeake Bays (seasonal-summer); also shallow coastal waters to up to a depth of 50 m on the west coast of Florida and the Florida Keys from Key Largo at 80.5°W north to south of Cape San Blas, FL at 85.25°W. Typical parameters include salinities greater than 22 ppt and temperatures greater than 21°C. Also on the west coast of Florida from the 50 m isobath to the 30 m isobath and approximately 20 miles offshore from the Virginia/Maryland border at 37.8°N south to Pamlico Sound, NC at 35.4°N. Juvenile (71 to 147 cm total length) EFH is in areas offshore southern New England and Long Island, NY, all waters, coastal and pelagic, north of 40°N and west of 70°W; also, south of 40°N at Barnegat Inlet, NJ, to Cape Canaveral, FL (27.5° N), shallow coastal areas to the 25 m isobath; also, in the winter, from 39°N to 36°N, in the Mid-Atlantic Bight, at the shelf break, benthic areas between the 90 and 200 m isobaths; also, on the west coast of Florida, from shallow coastal waters to the 50 m isobath, from Florida Bay and the Keys at Key Largo north to Cape San Blas, FL at 85.5°W. This includes Cape Poge Bay, MA around Chappaquiddick Island, MA, and off the south shore of Cape Cod, MA. Adult (>147 cm total length) sandbar shark EFH is in areas on the east coast of the U.S., shallow coastal areas from the coast to the 50 m isobath from Nantucket, MA, south to Miami, FL; also, shallow coastal areas from the coast to the 90 m isobath around peninsular Florida to the Florida panhandle at 85.5°W, near Cape San Blas, FL, including the Keys and saline portions of Florida Bay.

Spinner shark

Neonate (<71 cm TL) spinner shark EFH is along the coast of the southeastern United States and the west coast of Florida, shallow coastal waters out to the 25 m isobath, from Cape Hatteras, NC at 35.25° N around Florida including Florida Bay and the Florida Keys, and north to 29.25° N. Additionally, as displayed in Figure 6-25e: shallow coastal waters with muddy bottoms less than five meters deep, on the seaward side of coastal islands, and in shallow bays along seagrass beds from Apalachee Bay to St. Andrews Bay, FL.

Nurse shark

Juvenile (37 to 221 cm total length) nurse shark EFH is in 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. This includes areas in the northeast Gulf of Mexico (Apalachee Bay, Apalachicola Bay, and Crooked Island Sound, FL). Adult (>221 cm total length) EFH is in 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.

Tiger shark

Juvenile (91 to 296 cm TL) tiger shark EFH is in shallow coastal areas from Mississippi Sound (just west of Mississippi/Alabama border) to the 100 m isobath south to the Florida Keys; around the peninsula of Florida to the 100 m isobath to the Florida/Georgia border; north to Cape Lookout, NC from the 25 to100 m isobath; from Cape Lookout north to just south of the Chesapeake Bay, MD from inshore to the 100 m isobath; north of the mouth of Chesapeake Bay to offshore Montauk, Long Island, NY (to south of Rhode Island between the 25 and 100 m isobaths; and south and southwest coasts of Puerto Rico from inshore to the 2,000 m isobaths.

2.9 EFFECTS OF THE PROPOSED DREDGING ON FMP SPECIES

Marine areas of non-vegetated bottoms, live bottoms, and water columns within the study area have been designated as EFH. Dredging of sand from Borrow Area L would remove some of this EFH habitat. Existing hardbottom habitat will be avoided and 400 foot buffers will be maintained around the hardbottom habitat in Borrow Area L. Therefore, reef fish are less likely to be affected. Injury or entrainment due to dredging would most likely affect demersal or less mobile species, such as shellfish. Dredging may also affect feeding success of EFH species due to turbidity and loss of benthic organisms; however, this would be temporary and adjacent similar habitat is available for feeding.

Construction activities associated with the Borrow Area L Alternative dredging would affect non-vegetated bottoms, live bottoms, and water columns within the study area designated as EFH. The proposed dredging would likely have minimal adverse impacts on EFH, some of which would be temporary. Although the habitat will change from existing conditions, the modified habitat will have EFH value.

Many of the EFH species are associated with hardbottom areas. Scattered and continuous hardbottom is at least 400 feet away from Borrow Area L due to the 400 foot exclusionary buffer established around documented hardbottom features adjacent to the proposed borrow area to eliminate direct impacts and reduce indirect impacts to these features from dredging activities. Therefore, reef fish are less likely to be affected.

Impacts on EFH species could include entrainment of organisms during dredge operation; vessel strike; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; changes to soft bottom bathymetry in the borrow area during dredging; and temporary loss of prey items and foraging habitat. Injury or entrainment due to dredging would most likely affect demersal or less mobile species, such as shellfish

2.10 HABITAT AREAS OF PARTICULAR CONCERN (HAPCs)

Habitat Areas of Particular Concern (HAPCs) are subsets of EFH that are rare, particularly susceptible to human-induced degradation, especially important, or located in an environmentally stressed area. HAPCs generally 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.

No HAPCs are located within or near the project area.

2.11 ON-SITE ASSESSMENTS OF MARINE RESOURCES

On-site assessments of nearshore marine resources within the project area for a previous renourishment project were conducted in 2001 and 2002. Dominant nearshore aquatic community types were documented within and adjacent to nine borrow areas, pipeline corridors and nearshore areas. Surveys of ebb tidal shoal areas and the Pass-a-Grille channel were also performed. Marine habitats identified during the survey included hardbottom, shell hash, and open sand habitat. Fish observed during nearshore borrow area dive surveys are presented in Table 3. Coral and other species observed in nearshore hardbottom habitats during nearshore borrow area dive surveys are presented in Table 4.

Table 3. Fish Species Observed During USACE Nearshore Borrow Area Surveys

Species	Scientific Name
Juvenile grunt	*Haemulon* sp.
Juvenile highhat	*Equetus umbrosus*
Bluestriped grunt	*Haemulon sciurus*
Smallmouth grunt	*H. chrysargyreum*
Cottonwick	*H. melanurum*
Gray snapper	*Lutjanus griseus*
Hogfish	*Lachnolaimus maximus*
Sand diver	*Synodus intermedius*
Toadfish	*Opsanus beta*
Filefish	*Monocanthus* sp.
Slippery dick	*Halichoeres bivittatus*
Sand perch	*Diplectrum fromosum*
Sheepshead	*Archosargus probatocephalus*
Spadefish	*Chaetodopterus faber*
Porgy	*Calamus* sp.
Seaweed blenny	*Parablennius marmoreus*
Spottail pinfish	*Diplodus holbrooki*
Menhaden	*Brevoortia* sp.
Searobin	*Prionotus* sp.
Sharksucker	*Echeneis naucrates*
Black sea bass	*Centropristis striata*
Red grouper	*Epinephelus morio*
Checkered puffer	*Sphoeroides testudineus*
Belted sandfish	*Serranus subligarius*

Source: Dial Cordy, 2002 a,b,c; 2003.

Table 4. Benthic Taxa Observed During USACE Nearshore Borrow Area Surveys

Common Name	Scientific Name
Sponges	
brown bowl sponge	*Cribrochalina vasculum*
giant barrel sponge	*Xestospongia muta*
loggerhead sponge	*Spheciospongia vesparium*
ball sponge	*Ircinia* sp.
dark volcano sponge	*Calyx podatypa*
brown variable sponge	*Anthosigmella varians*
erect rope sponge	*Amphimedon compressa*
Scleractin Corals	
tube coral	*Cladocora arbuscula*

Table 4. Benthic Taxa Observed During USACE Nearshore Borrow Area Surveys

Common Name	Scientific Name
blushing star coral	*Stephanocoenia mitchelinii*
cactus coral	*Isophyllia sinuosa*
starlet coral	*Siderastrea sp.*
knobby star coral	*Solenastrea hyades*
mushroom coral	*Scolymia lacera*
hidden cup coral	*Phyllangia americana*
rose coral	*Manicina aereolata*
boulder star coral	*Montastrea annularis*
robust ivory tree coral	*Oculina robusta*
branching fire coral	*Millepora alcicornis*
Octocorals	
shelf-knob sea rod	*Eunicea succinea*
warty sea rod	*Eunicea calyculata*
giant slit-pore sea rod	*Plexaurella nutans*
delicate spiny sea rod	*Muricea laxa*
orange spiny sea rod	*Muricea elongata*
sea plume	*Pseudoterogorgia* sp.
yellow sea whip	*Pterogorgia citrina*
colorful sea whip	*Leptogorgia virgulata*
branching tube sponge	*Pseudoceratina crassa*
Echinoderms	
common comet star	*Linckia guildingii*
beaded sea star	*Astropecten articulatus*
rock-boring urchin	*Echinaster spinulosus*
striped sea star	*Luidia clathara*
sea star	*Luidia sp.*
banded sea star	*Luidia alternata*
orange-ridged sea star	*Echinometra lucunter*
variegated urchin	*Lytechinus variegates*
Mollusks	
penshell	*Pinna carnea*
lightning whelk	*Busycon contrarium*
tritons trumpet	*Charonia variegata*
Florida horse conch	*Pleuroploca gigantean*
Crustaceans	
Florida stone crab	*Menippe mercenaria*
Tunicates	
colonial tunicate	*Clavelina* sp.
overgrowing tunicates	Family Didemnidae
condominium tunicate	*Eudistoma* sp.

Source: Dial Cordy, 2002 a,b,c; 2003.

In addition, the U.S. Fish and Wildlife Service (USFWS) conducted dive surveys on the nearshore hardbottom in the project area (Table 5).

Table 5. Species Observed During USFWS Nearshore Livebottom Surveys

Species	Scientific name
Fishes	
Sand seatrout	*Cynoscion arenarius*
Spotted seatrout	*C. nebulosus*
Sea robin	Triglidae
White grunt	*Haemulon plumieri*
Slippery dick	*Halichoeres bivittatus*
Porcupine fish	*Diodon hystrix*
Hairy blenny	*Labrisomus nuchipinnis*
Invertebrates	
Sea whips	*Leptogorgia* sp.
Sea anemones	Zoanthidae
Bryozoans	Class Ectoprocta
Sea fan	*Lophogorgia* sp.
Yellow chimney sponge	*Cliona celata*
Tunicates	*Disemnum candidum botryllus* sp.
Sea urchin	*Lytechinus variegatus*
Stone crab	*Menippe mercenaria*
Tube worms	Class Polychaeta

Source: USFWS, 2006.

3.0 CONCLUSIONS REGARDING THE EFFECTS ON EFH

Borrow Area L primarily consists of sand patches and sand waves and encompasses approximately 286.5 acres; however, due to mitigation efforts not all the area will be used. Construction of the project is expected to take from 10 to 14 months. Borrow Area L is located in depths of approximately 45 feet (13.7 m) NAVD. The sediment within Borrow Area L is typically fine-grained sand with trace silt, trace shell hash, trace shell fragments and whole shell. Borrow Area L is within a ridge field; similar habitat is adjacent to the proposed borrow area.

Effects on EFH species would be short-term and localized; similar undisturbed habitat is adjacent to the borrow area.. Dredging may also affect feeding success of EFH species due to turbidity and loss of benthic organisms; however, this would be temporary and adjacent similar habitat is available for feeding.

Impacts to EFH would occur in the proposed borrow area but the limited spatial and temporal extent of dredging suggests these impacts will not adversely affect EFH on a broad scale.

No HAPCs are located within or near the project site.

4.0 MITIGATION FOR THE PROPOSED ACTION

One of the reasons Borrow Area L was selected was to minimize effects to hardbottom habitat in the borrow area. Dredging will not occur within a minimum of 400 feet from any significant hard-ground areas. The use of exclusionary buffers will eliminate any direct or indirect impacts to these features from dredging activities. Mitigation is not anticipated to be necessary with the dredging of Borrow Area L.

5.0 REFERENCES

Dial Cordy and Associates, Inc. 2002a. Marine Biological Survey, Pinellas County Shore Protection Project, Comprehensive Borrow Area Study. Prepared for U. S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL. 45 pp.

Dial Cordy and Associates, Inc. 2002b. Pinellas County Shore Protection Project, Comprehensive Borrow Area Study, Borrow Area Resource Identification and Impact Assessment. Prepared for the U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL. 30 pp.

Dial Cordy and Associates, Inc. 2002c. Nearshore Marine Biological Survey and Assessment, Pinellas County Shore Protection Project, Comprehensive Borrow Area Survey. Prepared for the U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL. 30 pp.

Dial Cordy and Associates. 2003. Essential Fish Habitat Assessment for the Alternative Sand Source Utilization, Pinellas County Shore Protection Project, Pinellas County, Florida. January 2003. Prepared for the U.S. Army Corps of Engineers.

GMFMC. 1998. Generic Amendment for Addressing Essential Fish Habitat Requirements of the Gulf of Mexico. http://www.Gulfcouncil.org/Beta/GMFMCWeb/EFH_Amendments.htm

USACE. 2002. Final Environmental Assessment Alternative Sand Source Utilization for the Pinellas County Beach Erosion Control Project. USACE, Jacksonville District, Jacksonville, FL.

USFWS. 1996. Final Fish and Wildlife Coordination Act Report on the Pinellas County Beach Renourishment Project, June 1996. USFWS South Florida Ecosystem Office, Vero Beach, Florida.

Appendix D

COASTAL ZONE MANAGEMENT CONSISTENCY EVALUATION

FLORIDA COASTAL ZONE MANAGEMENT PROGRAM
FEDERAL CONSISTENCY EVALUATION PROCEDURES

SAND KEY BEACH RENOURISHMENT
PINELLAS COUNTY BEACH EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA

1. Chapter 161, Beach and Shore Preservation. The intent of the coastal construction permit program established by this chapter is to regulate construction projects located seaward of the line of mean high water and which might have an effect on natural shoreline processes.

Response: The proposed plans and information will be submitted to the state in compliance with this chapter.

2. Chapters 163(part II), 186, and 187, County, Municipal, State and Regional Planning. These chapters establish the Local Comprehensive Plans, the Strategic Regional Policy Plans, and the State Comprehensive Plan (SCP). The SCP sets goals that articulate a strategic vision of the state's future. Its purpose is to define in a broad sense, goals, and policies that provide decision-makers directions for the future and provide long-range guidance for an orderly social, economic and physical growth.

Response: The proposed project has been coordinated with various Federal, state and local agencies during the planning process. The project meets the primary goal of the state Comprehensive Plan.

3. Chapter 252, Disaster Preparation, Response and Mitigation. This chapter creates a state emergency management agency, with the authority to provide for the common defense; to protect the public peace, health and safety; and to preserve the lives and property of the people of Florida.

Response: Since the project only concerns the dredging of offshore material, this chapter does not apply.

4. Chapter 253, State Lands. This chapter governs the management of submerged state lands and resources within state lands. This includes archeological and historical resources; water resources; fish and wildlife resources; beaches and dunes; submerged grass beds and other benthic communities; swamps, marshes and other wetlands; mineral resources; unique natural features; submerged lands; spoil islands; and artificial reefs.

Response: The proposed project does not occur within state boundaries; therefore this chapter does not apply.

5. Chapters 253, 259, 260, and 375, Land Acquisition. This chapter authorizes the state to acquire land to protect environmentally sensitive areas.

Response: Because the affected property is in public ownership, this chapter does not apply.

6. Chapter 258, State Parks and Aquatic Preserves. This chapter authorizes the state to manage state parks and preserves. Consistency with this statute would include consideration of projects that would directly or indirectly adversely impact park property, natural resources, park programs, management or operations.

Response: The proposed project does not occur within state boundaries; therefore this chapter does not apply.

7. Chapter 267, Historic Preservation. This chapter establishes the procedures for implementing the Florida Historic Resources Act responsibilities.

Response: The project was coordinated with the State Historic Preservation Officer (SHPO) and is consistent with this chapter.

8. Chapter 288, Economic Development and Tourism. This chapter directs the state to provide guidance and promotion of beneficial development through encouraging economic diversification and promoting tourism.

Response: The proposed project would be compatible with tourism for this area and therefore, is consistent with the goals of this chapter.

9. Chapters 334 and 339, Transportation. This chapter authorizes the planning and development of a safe balanced and efficient transportation system.

Response: No public transportation systems would be impacted by this project.

10. Chapter 370, Saltwater Living Resources. This chapter directs the state to preserve, manage and protect the marine, crustacean, shell and andromous fishery resources in state waters; to protect and enhance the marine and estuarine environment; to regulate fishermen and vessels of the state engaged in the taking of such resources within or without state waters; to issue licenses for the taking and processing products of fisheries; to secure and maintain statistical records of the catch of each such species; and, to conduct scientific, economic, and other studies and research.

Response: The project is not expected to significantly impact saltwater living resources. Marine crustacean, shellfish, and anadromous fishery resources would be temporarily impacted. Temporary and permanent impacts would occur within the marine environment. These impacts would be mitigated. Based on the overall impacts of the project, the project is consistent with the goals of this chapter.

11. Chapter 372, Living Land and Freshwater Resources. This chapter establishes the Game and Freshwater Fish Commission and directs it to manage freshwater aquatic life and wild animal life and their habitat to perpetuate a diversity of species with densities and distributions which

provide sustained ecological, recreational, scientific, educational, aesthetic, and economic benefits.

Response: The project would have no effect on freshwater aquatic life or wildlife.

12. Chapter 373, Water Resources. This chapter provides the authority to regulate the withdrawal, diversion, storage, and consumption of water.

Response: This project does not involve water resources as described by this chapter.

13. Chapter 376, Pollutant Spill Prevention and Control. This chapter regulates the transfer, storage, and transportation of pollutants and the cleanup of pollutant discharges.

Response: The contract specifications would prohibit the contractor from dumping oil, fuel, or hazardous wastes in the work area and would require that the contractor adopt safe and sanitary measures for the disposal of solid wastes. A spill prevention plan will be required. The proposed project is consistent with the intent of this chapter.

14. Chapter 377, Oil and Gas Exploration and Production. This chapter authorizes the regulation of all phases of exploration, drilling, and production of oil, gas, and other petroleum products.

Response: This project does not involve the exploration, drilling, or production of gas, oil or petroleum product; therefore, this chapter does not apply.

15. Chapter 380, Environmental Land and Water Management. This chapter establishes criteria and procedures to assure that local land development decisions consider the regional impact nature of proposed large-scale development. This chapter also deals with the Area of Critical State Concern program and the Coastal Infrastructure Policy.

Response: The proposed project would not have any regional impact on resources in the area. Therefore, the project is consistent with the goals of this chapter.

16. Chapters 381 (selected subsections on on-site sewage treatment and disposal systems) and 388 (Mosquito/Arthropod Control). Chapter 388 provides for a comprehensive approach for abatement or suppression of mosquitoes and other pest arthropods within the state.

Response: The proposed project would not further the propagation of mosquitoes or other pest arthropods. The proposed project would be consistent with the goals of this chapter.

17. Chapter 403, Environmental Control. This chapter authorizes the regulation of pollution of the air and waters of the state by the Florida Department of Environmental Regulation (now a part of the Florida Department of Environmental Protection).

Response: The proposed project does not occur within state boundaries; therefore this chapter does not apply.

18. Chapter 582, Soil and Water Conservation. This chapter establishes policy for the conservation of the state soil and water through the Department of Agriculture. Land use policies will be evaluated in terms of their tendency to cause or contribute to soil erosion or to conserve, develop, and utilize soil and water resources both onsite or in adjoining properties affected by the project. Particular attention will be given to projects on or near agricultural lands.

Response: The proposed project is not located near or on agricultural lands; therefore, this chapter does not apply.

Appendix E

PERTINENT CORRESPONDENCE

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

REPLY TO
ATTENTION OF

Planning Division
Environmental Branch

MAR 1 0 2010

Mr. David Hankla
U. S. Fish & Wildlife Service
North Florida Field Office
7915 Baymeadows Way, Suite 200
Jacksonville, FL 32256-7517

Dear Mr. Hankla:

The U.S. Army Corps of Engineers (Corps) is currently preparing an Environmental Assessment (EA) for the Pinellas County Beach Erosion Control Project. The proposed action includes placing approximately 1.8 million cubic yards of sand along 8.7 miles of shoreline between Reference Monuments 56 to 66 and 72 to 108, with a gap in the project from Reference Monuments 66 to 72. The proposed borrow area is located in federal waters approximately 11 miles west of Sand Key, and Minerals Management Service (MMS) is a cooperating agency on the EA (see Figure 1). Under the Outer Continental Shelf Lands Act, the federal action proposed by MMS is to authorize the use of the offshore borrow area.

Listed species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS) that may occur in the vicinity of the proposed work include: loggerhead turtle (*Caretta caretta*), green turtle (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), and Florida manatee (*Trichechus manatus latirostris*). The leatherback, hawksbill, and Kemp's ridley species nest on Florida beaches infrequently, and the effects of the proposed action to these three species are determined to be discountable. The Corps has determined that the proposed action may affect, but is not likely to adversely affect, the loggerhead turtle, green turtle, and the Florida manatee.

USFWS issued a Biological Opinion for the 2005 nourishment of Sand Key on February 28, 2005. The 2005 beach erosion control project extended from Reference Monuments 57 to 66, and from Reference Monuments 72 to 106. The Corps has reviewed the proposed action and determined that the effects to the species under the purview of the USFWS are similar to the effects identified in the Biological Assessment associated with the Biological Opinion issued in 2005. Based on this information, the Corps has determined that the findings of the previously issued Biological Opinion are valid for the currently proposed action, and the Corps agrees to abide by its terms and conditions.

Based on the information provided above and in the attached assessment, we request that you concur with this finding. If you have any questions, please contact Ms. Aubree Hershorin at (904) 232-2136 or by email at Aubree.G.Hershorin@usace.army.mil.

Sincerely,

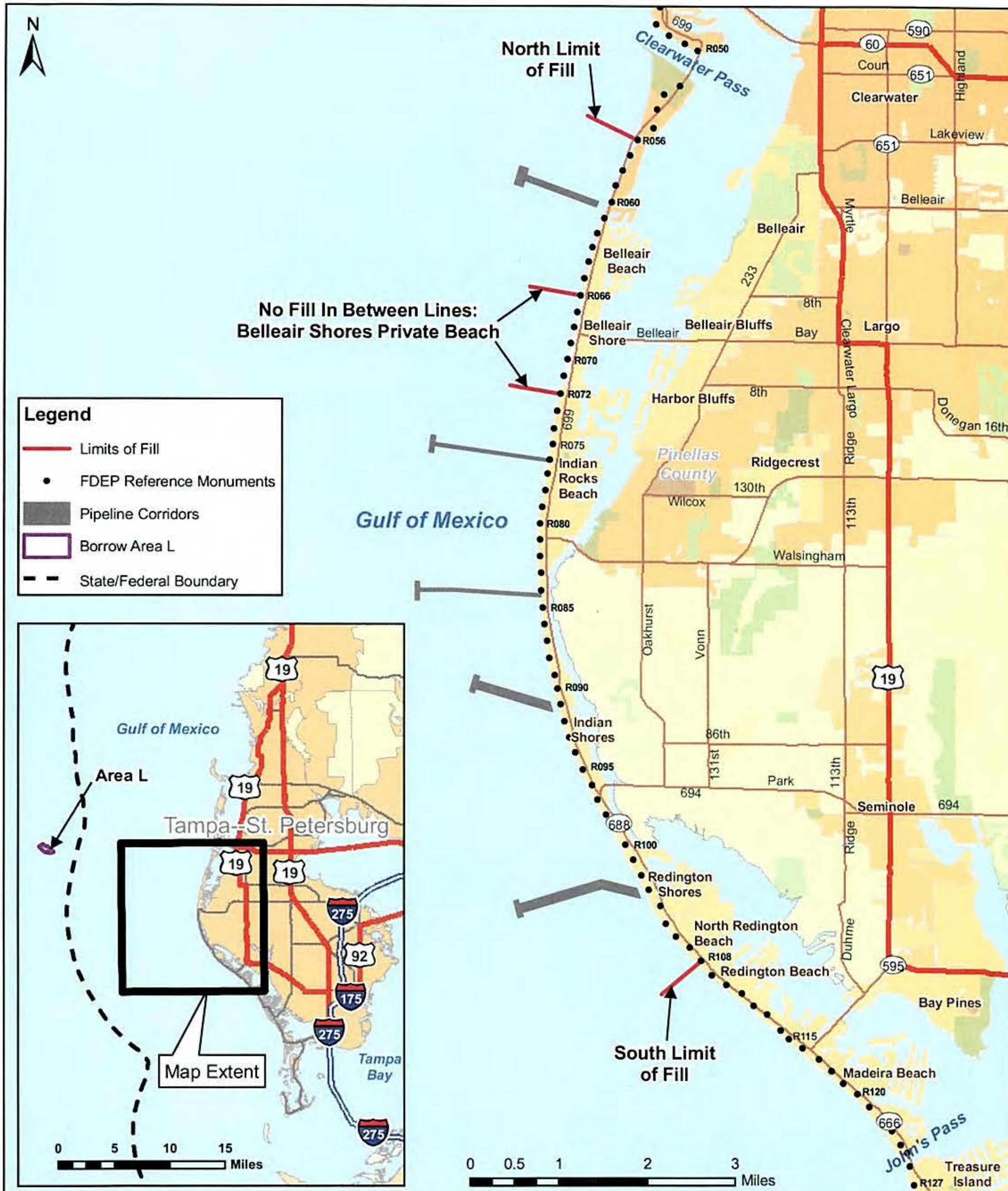
for Kenneth R Dugger

Eric P. Summa
Chief, Environmental Branch

Enclosure

Copies Furnished:

Colleen Finnegan, Minerals Management Service, Leasing Division, Marine Minerals and Alternative Energy Branch, 381 Elden Street, Mail Stop 4010, Herndon, Virginia 20170
Geoffrey Wikel, Minerals Management Service, Environmental Division, Branch of Environmental Assessment, 381 Elden Street, Mail Stop 4010, Herndon, Virginia 20170
Eddy Carter, G.E.C., Inc., 9357 Interline Avenue, Baton Rouge, Louisiana 70809
Nicole Elko, 6150 Rockefeller Road, Wadmalaw Island, South Carolina 29487



Project Location Map

Sand Key Renourishment Project

Base Map: ESRI 9.3 Data CD

GEC
Gulf Engineers & Consultants

Figure: 1	
Date: February 2010	
Scale: 1:96,000	
Source: USACE/GEC/ESRI	
Map ID: 27307714-1944	

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

REPLY TO
ATTENTION OF

MAR 1 0 2010

Planning Division
Environmental Branch

Mr. David Bernhardt
Protected Species
NOAA National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, FL 33701

Dear Mr. Bernhardt:

The U.S. Army Corps of Engineers (Corps) is currently preparing an Environmental Assessment (EA) for the Pinellas County Beach Erosion Control Project. The proposed borrow area is located approximately 11 miles off the coast of Sand Key, Pinellas County, Florida, in federal waters, and Minerals Management Service (MMS) is a cooperating agency on the EA. The Corps is assuming the responsibility of lead agency for the Section 7 consultation under the Endangered Species Act.

The proposed project is located between Clearwater Pass and Johns Pass (R56-66 and R72-108) in Pinellas County, Florida. The Corps proposes to place approximately 1.8 million cubic yards of sand along an 8.7-mile section of beach (see Figure 1). Listed species which may occur in the vicinity of the proposed work and are under the purview of the National Oceanic and Atmospheric Administration (NOAA) include: loggerhead turtle (*Caretta caretta*), green turtle (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), smalltooth sawfish (*Pristis pectinata*), and Gulf sturgeon (*Acipenser oxyrinchus desotoi*). Under the Outer Continental Shelf Lands Act, the federal action proposed by MMS is to authorize the use of the offshore borrow area.

The Corps has reviewed the proposed action and determined that it may affect, but is not likely to adversely affect, these species if a hopper dredge is used for the project. If a pipeline or hydraulic dredge were utilized, there would be no effect to these species. NOAA issued a Regional Biological Opinion (RBO) to the Corps for Dredging of Gulf of Mexico Navigational Channels and Sand Mining ("Borrow") Areas on November 19, 2003, with modifications on June 24, 2005 and January 9, 2007. Although it is unlikely that a hopper dredge will be utilized for the proposed action, we will comply with any applicable terms and conditions of the RBO.

Based on the information provided above, we request that you concur with this finding. If you have any questions, please contact Ms. Aubree Hershorin at (904) 232-2136 or by email at Aubree.G.Hershorin@usace.army.mil.

Sincerely,

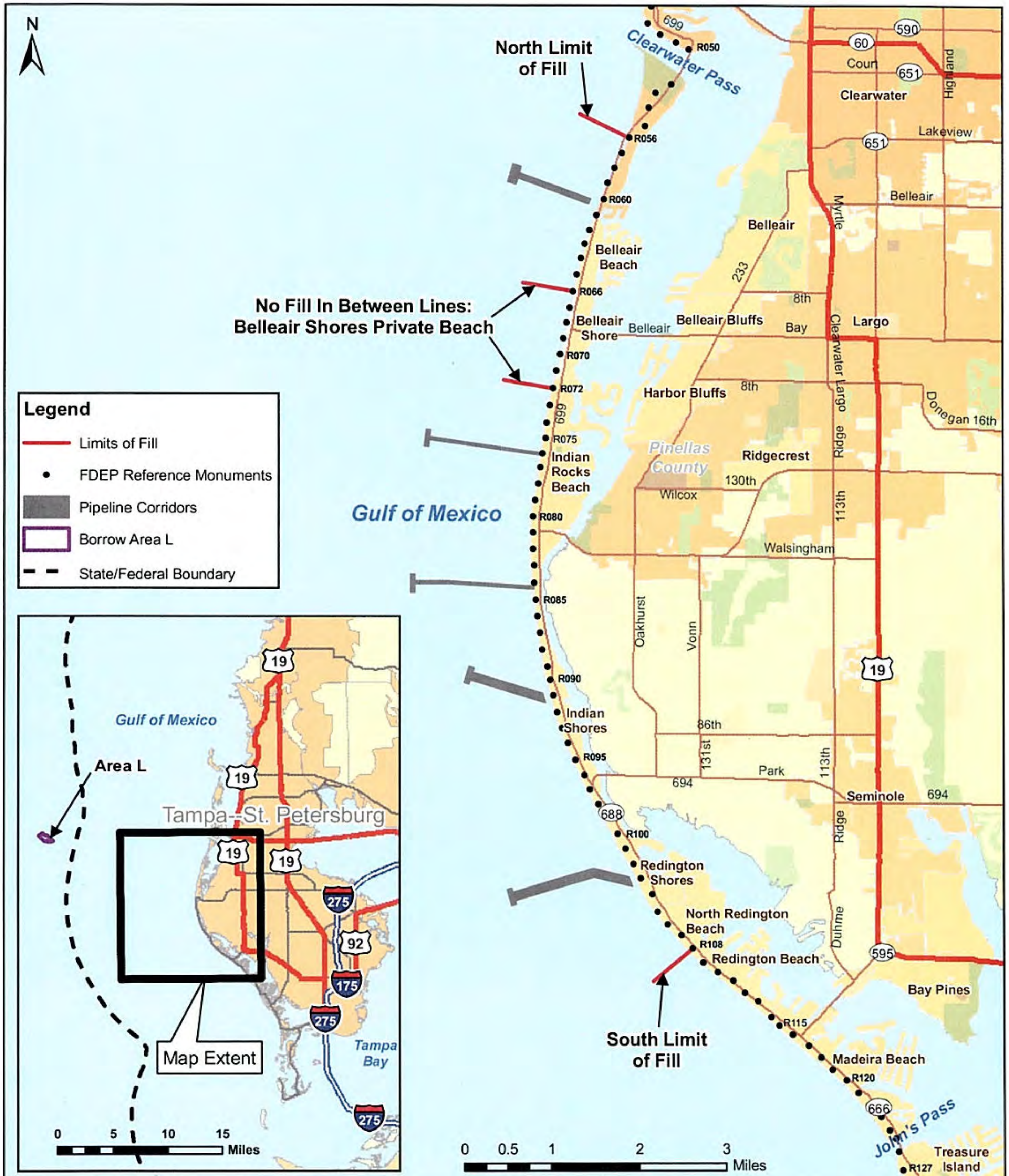
Kenneth R. Dugger

for Eric P. Summa
Chief, Environmental Branch

Enclosure

Copies Furnished:

Colleen Finnegan, Minerals Management Service, Leasing Division, Marine Minerals and Alternative Energy Branch, 381 Elden Street, Mail Stop 4010, Herndon, Virginia 20170
Geoffrey Wikel, Minerals Management Service, Environmental Division, Branch of Environmental Assessment, 381 Elden Street, Mail Stop 4010, Herndon, Virginia 20170
Eddy Carter, G.E.C., Inc., 9357 Interline Avenue, Baton Rouge, Louisiana 70809
Nicole Elko, 6150 Rockefeller Road, Wadmalaw Island, South Carolina 29487



Project Location Map

Sand Key Renourishment Project

Base Map: ESRI 9.3 Data CD

GEC Gulf Engineers & Consultants

Figure: 1	
Date: February 2010	
Scale: 1:96,000	
Source: USACE/GEC/ESRI	
Map ID: 27307714-1944	

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

REPLY TO
ATTENTION OF

Planning Division
Environmental Branch

APR 2 0 2010

Florida Department of Environmental Protection
Bureau of Beaches and Coastal Systems
c/o Lainie Edwards, Ph.D.
3900 Commonwealth Boulevard, Mail Station 300
Tallahassee, Florida 32399-3000

**Re: Pinellas County Sand Key Renourishment Project
Monitoring Requirements for Joint Coastal Permit**

Dear Lainie,

The U.S. Army Corps of Engineers (Corps) is in the process of applying for a Joint Coastal Permit to renourish nine miles of critically eroded shoreline on Sand Key in Pinellas County, Florida. The shoreline of Sand Key was originally nourished in four phases between 1988 and 1998. Mitigation was provided for impacts associated with this project as follows: 2.8 acres of impact at Indian Shores were mitigated prior to 1998; 5.0 acres of impact at Indian Rocks Beach, Redington Shores, and North Redington Beach were mitigated in 1998; and 0.3 acre at Clearwater Beach and Belleair Beach in 1998. The last nourishment of Sand Key occurred in 2005/2006, and no additional mitigation was required. The currently proposed project is maintaining the previously authorized fill template for which appropriate mitigation was provided.

Pursuant to guidance from the Florida Department of Environmental Protection Memorandum dated 6 June 2007 (attached), "maintaining an area that was authorized for construction after implementation of the formal mitigation rule will not be considered to adversely impact the value of functions provided to fish and wildlife and listed species by wetlands and other surface waters." However, we will conduct physical monitoring surveys of the project to ensure that it is constructed per the permit conditions. This approach is similar to the approach used to ensure secondary impacts did not occur during the 1998 project (see attached Notice of Intent). If the project is constructed per the permit conditions, the project impacts have already been mitigated and no additional biological monitoring is necessary.

Based on the information provided above, we request that you provide your concurrence within 15 days of receipt of this letter. If you have any questions, please contact Ms. Aubree Hershorin at (904) 232-2136 or by email at Aubree.G.Hershorin@usace.army.mil.

Sincerely,

Eric P. Summa
Chief, Environmental Branch

Enclosures

Copies Furnished:

Colleen Finnegan, Minerals Management Service, Leasing Division, Marine Minerals and Alternative Energy Branch, 381 Elden Street, Mail Stop 4010, Herndon, Virginia 20170
Geoffrey Wikel, Minerals Management Service, Environmental Division, Branch of Environmental Assessment, 381 Elden Street, Mail Stop 4010, Herndon, Virginia 20170
Eddy Carter, G.E.C., Inc., 9357 Interline Avenue, Baton Rouge, Louisiana 70809
Nicole Elko, 6150 Rockefeller Road, Wadmalaw Island, South Carolina 29487

Memorandum

Florida Department of Environmental Protection

TO:	DEP Regulatory Office Directors Janet G. Llewellyn, Director, Division of Water Resource Management
FROM:	Mimi Drew, Deputy Secretary Mimi Regulatory Programs and Energy
DATE:	June 6, 2007
SUBJECT:	**Guidance on Mitigation for Resource Impacts from Maintenance, Widening, or Deepening of Existing Manmade Channels, Canals, Berths, and Basins**

Existing manmade channels, canals, berths, and basins may support benthic communities dominated by corals, seagrasses, macroalgae or shellfish. When we process regulatory and proprietary applications for maintenance dredging, deepening, or widening of such areas, we have to decide if we can or should require mitigation to offset impacts to resources within the existing channel, canal, berth, or basin. The purpose of this memo is to provide guidance on this issue. The guidance below shall apply to applications reviewed under the Wetland Resource, Environmental Resource, or Joint Coastal Permitting Programs, and the sovereignty submerged lands program.

Many navigation channels, canals, berths, and basins were constructed long before the Wetland Resource Permit (WRP), Environmental Resource Permit (ERP) or Joint Coastal Permitting (JCP) programs were established or before the need to obtain a sovereignty submerged lands authorization. Some of that construction was regulated in the early days of the Wetland Resource Permit program prior to the adoption of a formal mitigation rule on January 3, 1989. Still others were authorized more recently and the initial impacts were offset with mitigation.

How resource impacts from dredging these existing areas should be handled will depend on the activity proposed and the regulatory history of the dredging, as provided in the scenarios below. *For the scenarios involving "maintenance," it is assumed that the activity has already been determined to qualify as maintenance, as opposed to the reconstruction of a channel, canal, berth, or basin that no longer functions for its intended use or, in an Aquatic Preserve, has regained its former natural characteristices due to lack of use or upkeep, under rules and guidance provided elsewhere.*

<u>Exempt Maintenance of a Manmade Channel, Canal, Basin or Berth</u>

Maintenance dredging of a legally existing area that qualifies for an exemption under s. 403.813(2)(f), F.S., can be conducted under the terms of the exemption, and no mitigation is required regardless of the presence of resources located within the channel, canal, berth, or basin.

Non-exempt Maintenance where Construction or Maintenance was Authorized by Previous WRP, ERP, or JCP issued after January 3, 1989.

If construction of the channel, canal, berth, or basin, or subsequent maintenance of the full extent of the channel, canal, berth, or basin, was authorized under a WRP processed under the provisions of the first formal mitigation rule (which became effective on January 3, 1989), or under an ERP or JCP, then the impacts of the proposed work should have been evaluated and any needed mitigation required under that previous permit. It is also possible, particularly in an Aquatic Preserve, that mitigation or similar activities were required as part of the sovereignty submerged lands "public interest" test. Assuming that any required mitigation was successfully completed, maintaining an area that was authorized for construction or maintenance after implementation of the formal mitigation rule will not be considered to adversely impact the value of functions provided to fish and wildlife and listed species by wetlands and other surface waters. Therefore, no mitigation will be necessary for subsequent permits to maintain the previously authorized and constructed configuration.

There may be circumstances where the only permit reviewed and issued under the provisions of the mitigation rule (effective January 3, 1989) was for maintenance dredging of *portions* of an existing channel, canal, berth, or basin. In those instances, only the areas reviewed and authorized for dredging under the permit will no longer require mitigation. Dredging of the portions of the channel, canal, berth, or basin not previously reviewed and authorized since implementation of the formal mitigation rule shall be reviewed as provided below.

Non-exempt Maintenance, No WRP, ERP, or JCP Issued, or WRP Issued Prior to the effective date of the Mitigation Rule on January 3, 1989.

For channels, canals, berths, and basins constructed prior to the need for a WRP, ERP or JCP, or for those constructed under a WRP prior to the adoption of the first formal mitigation rule on January 3, 1989, determining the need for mitigation becomes more complicated. Although there were no formal provisions related to mitigation in the wetland resource rules prior to January 3, 1989, mitigation was often included in such permits, most commonly after the passage of the Warren S. Henderson Wetlands Act in 1984. In addition, mitigation or other compensatory actions may have been required pursuant to a sovereignty submerged lands authorization or to federal laws applicable to the project at the time of construction. In order to determine if the maintenance dredging will adversely affect the value of functions provided to fish and wildlife and listed species by wetlands and other surface waters, staff should consider any compensatory actions or mitigation that may have been required under previous state or federal approvals to initially dredge the area. If mitigation requirements were imposed as a part of previous approvals, then no additional mitigation should be required to maintain the previously authorized and constructed configuration.

If no evidence is provided that impacts to resources were evaluated and the need for mitigation considered when the area was originally dredged, then the application for maintenance dredging should be evaluated for the proposed impacts to existing resources and mitigation required as appropriate. Note that it is the proposed impacts to the *currently existing* resources in the channel that should be evaluated, and not the resources that may have existed when the area was originally dredged.

Widening and Deepening of Existing Navigation Channels

If an applicant proposes to widen or deepen an existing channel, canal, berth, or basin, the impacts to the existing resources, including any secondary impacts, should be evaluated and mitigation required as appropriate. Keep in mind that the new sides and bottom of the channel, canal, berth, or basin may provide comparable substrate for colonization of similar communities, and only a consideration of time lag may be needed. In other cases, due to changes in depth, substrate, or water quality, the community expected to return may not adequately offset the functions lost, and additional mitigation may be required.

In any circumstance where mitigation is not required, or the mitigation will not include transplanting the organisms from the impact area to a mitigation site, I encourage you to work with the permittee or other interested parties who may be willing to voluntarily transplant any of the organisms that will be affected to other locations.

cc: Environmental Resource Permitting Program Administrators
Richard Cantrell, DWRM
Jim Stoutamire, OSLER
Janet Llewellyn, DWRM
Mike Barnett, BBCS
Marty Seeling, BBCS
Betsy Hewitt, OGC
Stephanie Bailenson, CAMA
Jeff Elledge, SJRWMD
Clark Hull, SWFWMD
Bob Brown, SFWMD
Jon Dinges, SRWMD
Guy Gowens, NWFWMD

RECEIVED
JUN 08 2007
BUREAU OF BEACHES
& COASTAL SYSTEMS

Exhibit A

DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE OF FLORIDA

In the Matter of an
Application for Joint Coastal Permit/Water Quality Certification,
Request for Variance and Authorization to Use Sovereign Submerged Lands by:

APPLICANT: U.S. Army Corps of Engineers c/o Richard E. Bonner P.O. Box 4970 Jacksonville, FL 32232-0019	PROJECT NAME: Sand Key Beach Nourishment File No: 522923209 County: Pinellas

---

CONSOLIDATED NOTICE OF INTENT TO ISSUE JOINT COASTAL PERMIT CONSENT OF USE TO USE SOVEREIGN SUBMERGED LANDS AND TO GRANT A VARIANCE

The Department of Environmental Protection gives consolidated notice of its intent to:

(a) issue a joint coastal permit under Chapter 161 and Part IV of Chapter 373, Florida Statutes (F.S.), and Title 62, Florida Administrative Code (F.A.C.) (draft copy of permit attached). Issuance of the joint coastal permit also constitutes certification of compliance with state water quality standards pursuant to Section 404 of the Clean Water Act, 33 U.S.C. 1344;

(b) grant a consent to use sovereign submerged lands for the proposed activity, under Article X, Section 11 of the Florida Constitution, Chapter 253, F.S., Title 18, F.A.C., and the policies of the Board of Trustees, as described, below subject to any fees or special consent of use conditions in the attached Recommended Proprietary Action document; and,

(c) issue a variance (File No. VE-52-715) from Rule 62-4.242(2) (a)2.b., Florida Administrative Code (F.A.C.).

Issuance of the joint coastal permit also constitutes a finding of consistency with Florida's Coastal Zone Management Program, as required by Section 307 of the Coastal Management Act.

I. DESCRIPTION OF THE PROPOSED ACTIVITY

The applicant, U.S. Army Corps of Engineers, applied on July 19, 1996 to the Department of Environmental Protection for a 10 year permit/water quality certification/ authorization to use sovereign submerged lands owned by the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees)/ and variance to nourish the beaches along the barrier island known as Sand Key by initially hydraulic dredging approximately 2,088,200 cubic yards of beach quality sand from the Egmont Channel shoal, directly discharging the material onto the beach, and maintaining the project dimensions by renourishing with approximately 645,500 cubic yards of material every 5 years. The 9.3 miles of shoreline to be nourished extend from DNR monuments R-56 to R-66 and R-71 to R-107. The stretch of beach known as Belleair Shores (between R-66 to R-71) will not be nourished.

The project is located along the beaches of the barrier island known as Sand Key in Pinellas County, Section 19, Township 29 South, Range 15 East, and Section 24, Township 30 South, Range 14 East, Pinellas County Aquatic Preserve, Outstanding Florida Waters, Class III waters. The borrow site is the Egmont Channel shoal located approximately 22 miles south of the project area and 3.5 miles west of Mullet Key from state plane coordinates X= 247,300 to X= 258,200 and Y=1,191,900 to Y=1,198,400, Class III waters.

The activity includes consideration of an application for a Consent of Use to place the dredged material on sovereignty submerged lands of the State of Florida in the Gulf of Mexico.

II. AUTHORITY FOR REVIEW

The Department has permitting authority under Part IV of Chapter 373 and Chapter 161, F.S., and Chapters 62B-41, 62B-49, 62-330, 62-341 and 62-343, F.A.C. The activity is not exempt from the requirement to obtain a joint coastal permit. Pursuant to Operating Agreements executed between the Department and the water management districts, as referenced in Chapter 62-113, F.A.C., the Department is responsible for reviewing this application.

The activity also requires a proprietary authorization, as it is located on sovereign submerged lands owned by the Board of Trustees of the Internal Improvement Trust Fund. The activity is not exempt from the need to obtain a proprietary authorization. Pursuant to Article X, Section 11 of the Florida Constitution, Sections 253.002 and 253.77, F.S., Sections 18-21.0040, 18-21.0051, and 62-343.075, F.A.C., the policies of the Board of Trustees, and the Operating Agreements executed between the Department and the water management districts, as referenced in Chapter 62-113, F.A.C., the Department has the responsibility to review and take final action on this request for proprietary authorization.

The applicant has requested a variance from Rule 62-4.242(2) (a)2.b., Florida Administrative Code (F.A.C.)., to allow turbidity levels not to exceed 29 nephelometric turbidity units (NTUs) at the project site within an Outstanding Florida Water (the Pinellas County Aquatic Preserve). The Department has the responsibility to review and take final action on this variance request per Chapters 403.201 and 403.938, Florida Statutes, and, Ch. 62-103.100, F.A.C.

III. BACKGROUND

Various segments of Sand Key have been nourished in the past as authorized by several permits issued by the Department including 521442399, 521634259, DBS86-146 PI, DBS910286, and 521175589.

The applicant, U.S. Army Corps of Engineers, applied on July 19, 1996 to nourish the beaches along the majority of the barrier island (with the exception of Belleair Shores and Madeira Beach) with almost identical fill construction templates as those authorized by the Department in the permits referenced above. The construction templates and design templates were determined based upon historical erosion rates and adjusted in some areas for the significant natural resources in the area (see the permit drawings for the actual templates for each R-monument).

Side-scan mosaic mapping surveys of the project area have been conducted and submitted by the applicant. Biological site assessments and side-scan verifications have been conducted by Department staff, including the most recent site assessment conducted between October 1-3, 1996. The project site is characterized as a high-energy sandy barrier island fronting the Gulf of Mexico. Landward of the mean high-water line (MHW) the island has been extensively developed with commercial and multi-family structures. There is little remaining of the native primary dune system.

Gulfward of the MHW the marine floor is characterized mostly as a barren sandy nearshore zone subject to high-energy waves and substantial sediment transport to ~200 ft. From ~200-400 ft. from shore there begins to appear low relief (less than 1 ft.) limestone hardbottom communities. Within this zone the hardbottom appeared in small patches, appeared to be mostly ephemeral in nature, and had limited coverage by attaching organisms. However, these patches did provide valuable habitat for a few species of gorgonians, crustaceans, and juvenile fish.

Very productive hardbottom with up to 5 ft. relief was found between ~400-800 ft. from shore (most of the hardbottom within this zone had relief less than 3 ft.; the highest relief observed was in the southern reaches of the project between R-102 to R-107). This zone consisted of large areas of hardbottom that appeared completely covered by many species of sponges, soft corals, tunicates, gorgonians, marine macro-algae, etc. The hardbottom provided a very important foundation for a thriving marine ecosystem as evidenced by the numerous species of macro-invertebrates and fishes also seen.

Drawings of the construction templates and the equilibrium toe-of-fill shown with an overlay of the exposed hardbottom were provided by the applicant in April 1996. These drawings were found to be in error. The original side-scan correctly identified the hardbottom at the project site; however, the depiction of the data appeared to be erroneously shifted too close to the shoreline during transposing with the project plans. A subsequent side-scan survey was conducted in September 1996. This latter side-scan was verified on-site by Department staff in October 1996 and found to be very accurate. An overlay of the project with the natural resources shown on the side-scan, and estimated impacts based on construction and equilibrium toe-of-fill was requested by Department staff following verification of the subsequent side-scan data in the field.

Pre-application meetings were conducted in January, February, and July of 1996 with the applicant to assist the applicant with the project design and to identify the information Department staff would need to process the application.

From the time the application was first submitted, the applicant stated that the proposed project was the same as that previously authorized by the permits issued by the Department for the nourishment of various segments of Sand Key. The applicant agreed to provide mitigation for the northern segments of Sand Key (R-56 to R-66), an area that had not previously been mitigated for. For the remaining segments of Sand Key, the applicant stated that the previous permits did not require mitigation, except for the area known as Indian Shores (R-86 to R-98) where approximately 6 acres of artificial reef were constructed using concrete rubble and culverts. Therefore, the applicant's position was that since no mitigation had previously been required, then no mitigation should be required now, if the construction templates remain the same.

Department staff compared the current proposal with the previously authorized activities It soon became clear that there was some information missing, not requested, or not provided at the time of the issuance of the original permits. For example, the original permits were issued based solely on the construction templates; the equilibrium toe-of-fill was not considered according to the Intent to Issues and the drawings attached to the permits. Additionally, there was no explanation of the mitigation for the adverse impacts to the hardbottom at Indian Shores in the Intent to Issue for Permit No. 521634259, but the final permit included conditions for mitigation. Since the permits had been issued without considering the equilibrium toe-of-fill, and due to the variation in the final position of the shifting sands while reaching equilibrium, it is not known what (if any) adverse impacts to the nearshore hardbottom areas existing at the site have occurred during past nourishment activities. The applicant's current drawings are more detailed than those available for the previously issued permits as the current proposal shows both the construction templates and the theoretical equilibrium toe-of-fill. When Department staff overlayed the equilibrium toe-of-fill with the latest side-scan data, it was found that some hardbottom would still be covered by the currently proposed project. Given the knowledge that theoretical equilibrium toe-of-fill calculations are not always accurate, and given the limited information available at the time of the issuance of the previous permits, the Department staff has concerns about the potential adverse impacts to the productive hardbottom areas at the project site.

To address the Department's concerns, a meeting with the applicant and Pinellas County, as the project's local sponsor, was held on December 19, 1996. During this meeting it was determined that the current proposal had basically the same construction templates as previously authorized activities for this area, with the exception of areas at R-72 and R-105. The applicant, Pinellas County, and the Department agreed to proceed with an enforceable letter of understanding (Agreement) to address potential adverse impacts to the productive hardbottom areas at the site. The agreement shall state that the county will mitigate for adverse impacts expected to occur on approximately 0.7 acres of hardbottom in the northern segment (R-56 to R-66) by constructing 2.0 acres of artificial reef gulfward of the project's equilibrium toe-of-fill, and mitigate for any hardbottom covered by the extension of the construction templates beyond the previously permitted designs. Regarding the potential impacts to hardbottom within the areas previously restored but not mitigated for, the county will monitor the hardbottom at select stations prior to, concurrent with, and following project completion, and mitigate for any adverse impacts to the hardbottom revealed by the monitoring. Pinellas County agreed to construct the mitigation and perform the monitoring and all future mitigation (if required based on the monitoring results). The Department agreed to proceed with an intent to issue and draft permit based on the above agreements with specific conditions in the permit referencing the agreement. The Department also agreed to proceed with issuing a final permit without first obtaining the final design memorandum, revised drawings and estimate of impact of the project with an overlay of the hardbottom as shown on the latest, corrected side-scan, monitoring plan, and mitigation plan. The applicant agreed to submit these documents prior to the issuance of the Notice To Proceed by the Department as required by Specific Condition No. 1 of the permit.

The borrow site for the initial and future periodic renourishments is the Egmont Channel Shoal. This borrow area consists of a shoal located approximately 22 miles south of the project area and, north of the entrance to Tampa Bay Harbor. Numerous core samples and sediment grain size analyses have been conducted on the Egmont Channel Shoal since the 1960's, including studies by the U.S. Geological Survey (Gelfenbaum, 1995). The site covers two and one half square miles (1,596 acres) and contains an estimated 19-23 million cubic yards of sand suitable for beach nourishment. To date, 2.9 million cubic yards of material have been removed from this shoal for four beach restoration projects. The composite mean grain size of the sediments within the proposed borrow site range from 0.17 mm to 0.42 mm. These size ranges are compatible with the sediment grain sizes historically found along the beaches at Sand Key ranging from 0.19 mm to 0.29 mm. The total percentage of fine sediments found within the core samples were less than 7%.

The Department received correspondence from the Egmont Key Alliance stating their concerns that dredging activities within the shoal may be contributing to increased erosion rates observed on Egmont Key. To address this the Department requested that the applicant provide egineering analysis of the expected change to wave energies and sediment transport along Egmont Key as a result of removing the material in the shoal. The analysis submitted by the applicant was determined to be acceptable by Department engineers. To further address this concern the permit will contain a specific condition which requires the permittee to monitor changes in the Egmont Key shoreline.

IV. BASIS OF ISSUANCE

A. General Basis for Issuance

The benefits of the project include the deposition of beach quality sand on an eroding barrier island that has several public accesses to the beach. This will improve and expand the amount of recreational beach that is currently available to the public in Southwest Florida, provide protection from storm events for the millions of dollars in structures along the shore, and it will replace valuable beach needed by the endangered marine turtles known to nest in the area. Specific conditions will be included in the permit to provide protection to endangered marine turtles and manatees.

Specific Conditions and monitoring will also be included in the permit to provide mitigation for any unavoidable adverse impacts to hardbottom at a minimum ratio of 2.0 acre created for every 1.0 acre adversely impacted. A higher than 1:1 ratio is required due to the fact that the activity is within an Outstanding Florida Water, the possible delay in providing mitigation for potential adverse impacts to existing hardbottom, and because the proposed mitigation is the construction of artificial reefs using materials unlike that naturally occurring at the site, which will result in the replacement of the very productive hardbottom with a structure and community having a different distribution of species, specimen size, function, productivity, and aesthetic appeal to snorkelers and divers. Therefore, even though the mitigation is expected to eventually be colonized by native species and be successful, the same degree of colonization, specimen sizes, and species diversity is not expected to be exactly identical as that of the naturally occurring limestone hardbottom communities and a higher ratio of created habitat is needed to provide the same level of function and productivity. Since the project contributes to the benefit of the public, and with mitigation, does not adversely impact the conservation of fish, wildlife, and their habitat, the project is clearly in the public interest.

Direct impacts to water quality resulting from the hydraulic pumping of the dredged material slurry onto the beaches should be temporary. Since the beach disposal site is within Outstanding Florida Waters within the Pinellas County Aquatic Preserve, turbidity levels at the edge of a 150 meter mixing zone must be equal to (or less than) background levels, in accordance with Rule 62-4.242(2), F.A.C. The beach disposal could cause elevated turbidity at the edge of a 150 meter mixing zone originating from the point of discharge of fill material onto the beach. Accordingly, the applicant has requested a variance from Rule 62-4.242(2) (a)2b, F.A.C., to allow the temporary elevation of up to 29 nephelometric turbidity units (NTUs) above natural background at the edge of a 150 meter mixing zone.

There is no practicable means known to further minimize the potential for elevated turbidity using the borrow material selected and considering hydrodynamic processes in the nearshore area at the beach nourishment site. The beach nourishment work will be accomplished in a manner which minimizes the potential for elevated turbidity, including the use of construction dikes and a minimum set-back for the discharge pipe from open water at the beach. Turbidity will be monitored during the beach disposal work to ensure compliance at these limits.

Water quality is not expected to be degraded. The material to be dredged is beach compatible sand that meets Department guidelines and is compatible with the grain sizes of the historically present sediments along Sand Key. The variance will be granted and Specific conditions will be included in the permit to ensure that turbidity will not be elevated above 29 nephelometric units outside the standard 150 meter mixing zone. Long term water quality degradation is not expected to result from this project.

The permit will not be valid until and unless the Department issues a final order authorizing a variance from the above-referenced rules. The variance is temporary and shall only be valid during beach nourishment work accomplished under the requirements of and during the term of the permit and shall be subject to all monitoring conditions required by the permit.

The permit will authorize the continuation of previously approved activities that have occurred in this area for years as part of the continued maintenance of the beaches along Sand Key. No adverse secondary or cumulative impacts are expected by proceeding with the project, provided the conditions and monitoring of the permit are closely adhered to, and the proper dredging and filling techniques are followed.

B. Specific Regulatory Basis for Issuance

Through the above and based on the general/limiting and specific conditions to the permit, the applicant has provided affirmative reasonable assurance that the construction and operation of the activity, considering the direct, secondary and cumulative impacts, will comply with the provisions of Chapter 161 and Part IV of Chapter 373, F.S., and the rules adopted thereunder, including the Conditions for Issuance or Additional Conditions for Issuance, pursuant to Part IV of Chapter 373, F.S., Chapter 62-330 and Sections 40D-4.301 and 40D-4.302, F.A.C. The construction and operation of the activity will not result in violations of water quality standards set forth in Chapters 62-3, 62-4, 62-302, 62-520, 62-522 and 62-550, F.A.C., or provided in the requested variance from the provision of Rule 62-4.242(2) (a)2.b, F.A.C. The applicant has also demonstrated that the construction of the activity, including a consideration of the direct, secondary, and cumulative impacts, is clearly in the public interest, pursuant to paragraph 373.414(1)(a), F.S.

C. Specific Proprietary Basis for Issuance

Through the above and based on the general/limiting and specific conditions to the consent of use, the applicant has met all applicable requirements for proprietary authorizations to use sovereign submerged lands, pursuant to Article X, Section 11 of the Florida Constitution, Chapters 253, F.S., associated rule 18-21 F.A.C., and the policies of the Board of Trustees. The applicant has provided reasonable assurance that the activity:

(1) will clearly be "in the public interest",

(2) will maintain essentially natural conditions;

(3) will not cause adverse impacts to fish and wildlife resources or public recreation or navigation; and

(4) will not interfere with the riparian rights of adjacent property owners.

In addition, the project is consistent with the goals and objectives of the "Conceptual State Lands Management Plan" adopted by the Board of Trustees on March 17, 1981.

V. PUBLICATION OF NOTICE

The Department has determined that the proposed activity, because of its size, potential effect on the environment or the public, controversial nature, or location, is likely to have a heightened public concern or likelihood of request for administrative proceedings. Therefore, pursuant to Section 62B-49.005 (8), F.A.C., you (the applicant) are required to publish at your own expense the enclosed notice of this Consolidated Notice of Intent to Issue. The notice shall be published one time only within 30 days, in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. The applicant shall provide proof of publication to:

Department of Environmental Protection
Bureau of Beaches and Coastal Systems
3900 Commonwealth Blvd., Mail Station 300
Tallahassee, Florida 32399-3000

The proof of publication shall be provided to the above address within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time shall be grounds for denial of the permit and easement to use sovereign submerged lands.

VI. RIGHTS OF AFFECTED PARTIES

The Department will issue the permit (draft permit attached), the consent to use sovereign submerged lands and grant the variance from the provision of Rules 62-4.242(2) (a)2.b., F.A.C., unless a timely petition for an administrative hearing is filed pursuant to sections 120.569 and 120.57 of the Florida Statutes, or all parties reach a written agreement on mediation as an alternative remedy under section 120.573 before the deadline for filing a petition. Choosing mediation will not adversely affect the right to a hearing if mediation does not result in a settlement. The procedures for petitioning for a hearing are set forth below, followed by the procedures for pursuing mediation.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative hearing in accordance with sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any other person must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent of intent, whichever occurs first. A petitioner must mail a copy of the petition to the applicant at the address indicated above, at the time of filing. The failure of any person to file a petition (or a request for mediation, as discussed below) within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 of the Florida Statutes, or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the discretion of the presiding officer upon the filing of a motion in compliance with rule 28-5.207 of the Florida Administrative Code.

A petition must contain the following information:

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number, and the county in which the project is proposed;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interest are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by the petitioner, if any;

(e) A statement of the facts that the petitioner contends warrant reversal or modification of the Department's action or proposed action;

f) A statement identifying the rules or statutes that the petitioner contends require reversal or modification of the Department's action or proposed action; and

(g) A statement of the relief sought by the petitioner, stating precisely the action that the petitioner wants the Department to take with respect to the action or proposed action addressed in this notice of intent.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice of intent. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirement set forth above.

Any person may elect to pursue mediation by reaching a mediation agreement with all parties to the proceeding (which include the applicant, the Department, and any person who has filed a timely and sufficient petition for a hearing) and by showing how the substantial interests of each mediating party are affected by the Department's action or proposed action. The agreement must be filed in (received by) the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, by the same deadline as set forth above for the filing of a petition.

The agreement to mediate must include the following:

(a) The names, addresses, and telephone numbers of any persons who may attend the mediation;

(b) The name, address, and telephone number of the mediator selected by the parties, or a provision for selecting a mediator within a specified time;

(c) The agreed allocation of the costs and fees associated with the mediation;

(d) The agreement of the parties on the confidentiality of discussions and documents introduced during mediation;

(e) The date, time and place of the first mediation session, or a deadline for holding the first session, if no mediator has yet been chosen;

(f) The name of each party's representative who shall have authority to settle or recommend settlement;

(g) Either an explanation of how the substantial interests of each mediating party will be affected by the action or proposed action addressed in this notice of intent or a statement clearly identifying the petition for hearing that each party has already filed, and incorporating it by reference; and

(h) The signatures of all parties or their authorized representatives.

As provided in section 120.573 of the Florida Statutes, the timely agreement of all parties to mediate will toll the time limitation imposed by sections 120.569 and 120.57 for requesting and holding an administrative hearing. Unless otherwise agreed by the parties, the mediation must be concluded within sixty days of the execution of the agreement. If mediation results in settlement of the administrative dispute, the Department must enter a final order incorporating the agreement of the parties. Persons whose substantial interests will be affected by such a modified final decision of the Department have a right to petition for a hearing only in accordance with the requirements for such petitions set forth above, and must therefore file their petitions within fourteen days of receipt of this notice of intent. If mediation terminates without settlement of the dispute, the Department shall notify all parties in writing that the administrative hearing processes under sections 120.569 and 120.57 remain available for disposition of the dispute, and the notice will specify the deadlines that then will apply for challenging the agency action and electing remedies under those two statutes.

A party to this proceeding has the right to request review of this order's consistency with section 161.041, F.S., by the Governor and Cabinet, sitting as the Land and Water Adjudicatory Commission, in accordance with Chapter 42-2, Florida Administrative Code, and specifically Rule 42-2.0131, Florida Administrative Code. To initiate such a review, your request must be filed within twenty (20) days of the date of this order with the Secretary of the Commission at Florida Land and Water Adjudicatory Commission, The Capitol, Room 2105, Tallahassee, Florida 32399-0001. A copy of the request must also be served on both the Department of Environmental Protection, Agency Clerk, 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399, and on any person named in this order, within 20 days from the date of this order if the request for review is to be effective.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

Alfred B. Devereaux Jr., Chief
Bureau of Beaches and Coastal Systems
3900 Commonwealth Blvd., Mail Station 300
Tallahassee, Florida 32399-3000

Written by: Rick Bray and Robert M Brantly.

Copies furnished to:

Matthew Miller, COE
Rick McMillian, COE
Michael Bentzien, U.S. Fish and Wildlife Service
George Percy, Fl. Dept. of State
Sandra Colbert, Egmont Key Alliance, Inc.
John Meyer, Tampa Bay Regional Planning Council
James Terry, Pinellas County Board of County Commissioners
Thomas Miller, City of Clearwater
Jan Platt, Agency on Tampa Bay Management
Linda Shelley, Fl. Dept. of Community Affairs
Andreas Mager, U.S. Dept. of Commerce
Pete Hubbell, SWFWMD
DEP-DRP, Cultural and Historical Resources
DEP, Southwest District Office - SLERP
DEP, Office of General Counsel
DEP, BBCS Deputy Clerk
Permit Information Center

FILING AND ACKNOWLEDGMENT

FILED, on this date with the designated Department Clerk, pursuant to 120.52(11), Florida Statutes, receipt of which is hereby acknowledged.

10 January 1997

Deputy Clerk Date

From: Ryan Hendren [mailto:Ryan.Hendren@noaa.gov]
Sent: Thursday, April 22, 2010 3:07 PM
To: Hershorin, Aubree SAJ
Subject: Re: Pinellas County Beach Erosion Control Project

Aubree:

Upon review of your project, NMFS-PRD concurs that the Pinellas County Beach Erosion Control Project would be covered by NMFS' November 19, 2003, Regional Biological Opinion (GMRBO) and following revisions to the GMRBO, should the USACE use hopper dredging for the new borrow sites.
The GMRBO analyzes and accounts for the effects of "federally permitted or federally sponsored hopper dredging of all U.S. Gulf of Mexico sand mining areas (borrow sites) and virgin (previously unused) sand mining areas for beach nourishment, restoration, and protection projects", on listed species.
Thus, any effects to sea turtles or Gulf sturgeon from the proposed project have been analyzed in the GMRBO, are included in that opinion's incidental take statement, and are subject to the terms and conditions of that opinion.
I have attached copies of the GMRBO and the two revisions to this document for your future use. If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action, consultation will need to be reestablished.

Please contact me if you have any additional questions. -rH

Florida Department of
Environmental Protection
Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

May 5, 2010

Eric P. Summa
Chief, Environmental Branch
USACE – SAJ
PO Box 4970
Jacksonville, FL 32232-0019

RE: Letter dated 4/20/10 - Future Pinellas County Sand Key Nourishment Project, Monitoring Requirements for JCP

Dear Mr. Summa:

Thank you for your letter inquiring if Biological Monitoring will be required and reaffirming the Corps understanding of the amount of previously provided mitigation. We acknowledge your statement that the currently proposed project will maintain the previously authorized fill template at R-56 to R-66 and R-86 to R-98, for which mitigation has previously been provided to offset direct burial and ETOF impacts to **8.1 acres** of hardbottom to date. The June 6, 2007 memorandum you attached and reference within the second paragraph of the letter **is clearly not applicable** because it only provides guidance for assessing mitigation in existing manmade channels, canals, berths and basins - which are not the subject of this proposed application.

As we have previously communicated to Aubree during teleconferences and again via the attached email, more mitigation will be required for the pending project if additional hardbottom is impacted in new work areas (those outside R-56 to R-66 and R-86 to R-98), or if additional project- related hardbottom impacts occur anywhere within the project limits, beyond the amount previously mitigated for. The latter can only be determined through biological monitoring. Sand placed on the beach does not equilibrate in precisely the same way among nourishment events, and multiple nourishment events can have cumulative effects on surrounding hardbottom, which can result in additional hardbottom impacts. To be clear, DEP will require biological monitoring after the next event(s), which we also previously communicated to the Corps during the teleconference - explaining our reasoning in detail. A current summertime baseline hardbottom survey of entire project area will be required to complete any application you may submit.

I look forward to receiving your new application and working with Corps staff through the RAI process as outlined in the ICA document.

Sincerely,

Merrie Beth Neely, Ph.D.
Environmental Specialist III
Bureau of Beaches and Coastal Resources

CC:
Lainie Edwards – BBCS-JCP
Vlad Kosmynin- BBCS-JCP
Marty Seeling – BBCS-JCP
Colleen Finnegan and Geoffrey Wikel, MMS
Eddy Carter and Nicole Elko, GEC, Inc.
BBCS File

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

REPLY TO
ATTENTION OF

Planning Division
Environmental Branch

JUL 14 2010

Mr. Dave Hankla
U.S. Fish and Wildlife Service
North Florida Field Office
7915 Baymeadows Way, Suite 200
Jacksonville, Florida 32256-7517

Dear Mr. Hankla:

The U.S. Army Corps of Engineers (Corps) is proposing to renourish Sand Key in Pinellas County, Florida, as part of the Pinellas County Beach Erosion Control Project. The project would place approximately 1.8 million cubic yards of beach compatible sand along 8.7 miles of beach. The borrow site is located approximately 12 miles offshore of Sand Key in federal waters.

Pursuant to Section 7(a) of the Endangered Species Act, please find enclosed the Biological Assessment (BA) prepared by Gulf Engineers & Consultants, Inc. under contract to the Corps. The BA addresses the concerns of the threatened and endangered species under the purview of the U.S. Fish and Wildlife Service (USFWS). Listed species which may occur in the vicinity of the proposed work and are under the jurisdiction of the USFWS include: loggerhead turtle (*Caretta caretta*), Kemp's ridley turtle (*Lepidochelys kempii*), green turtle (*Chelonia mydas*), Hawksbill turtle (*Eretmochelys imbricate*), leatherback turtle (*Dermochelys coriacea*), and Florida manatee (*Trichechus manatus latirostris*).

Based on the enclosed BA, the Corps has determined that the proposed project will have the following effects on the species presented in the table below.

Common Name	Scientific Name	Determined Effect
Loggerhead turtle	*Caretta caretta*	*May adversely affect*
Kemp's ridley turtle	*Lepidochelys kempii*	*May adversely affect*
Green turtle	*Chelonia mydas*	*May adversely affect*
Hawksbill turtle	*Eretmochelys imbricate*	*May affect, but is not likely to adversely affect*
Leatherback turtle	*Dermochelys coriacea*	*May affect, but is not likely to adversely affect*
Florida manatee	*Trichechus manatus latirostris*	*May affect, but is not likely to adversely affect*

The Corps requests your written concurrence with our determination for the Hawksbill turtle, leatherback turtle, and Florida manatee. For the loggerhead turtle, Kemp's ridley turtle, and green turtle we request the initiation of formal consultation.

If you have any questions or need further information, please contact Ms. Aubree Hershorin by phone at 904-232-2136 or by email at Aubree.G.Hershorin@usace.army.mil.

Sincerely,

Eric P. Summa
Chief, Environmental Branch

Enclosure

ENDANGERED SPECIES
BIOLOGICAL ASSESSMENT

SAND KEY BEACH RENOURISHMENT
PINELLAS COUNTY BEACH EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA

1.0 INTRODUCTION

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended requires that, "*Each Federal agency shall, in consultation with and with the assistance of the secretary, insure that any action authorized, funded, or carried out by such agency… Is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species. . .*

This Biological Assessment (BA) provides the information required pursuant to the ESA and implementing regulation (50 CFR 402.14) to comply with the ESA. Additional jurisprudence includes the National Environmental Policy Act (NEPA) of 1969, 42 U.S.C. section 4321, *et seq.*; the Fish and Wildlife Conservation Act of 1958 (PL 85-624; 16 U.S.C. 661 *et seq.*); the Marine Mammal Protection Act of 1972; and the Bald Eagle Protection Act of 1940.

This BA was prepared by the U.S. Army Corps of Engineers (USACE) as the lead agency for this project. The USACE is acting on behalf of the Minerals Management Service, which is a cooperating agency under NEPA.

1.1 PURPOSE AND NEED FOR ACTION

Erosion along barrier islands in Pinellas County, Florida, caused by storms, wave action, and currents has lowered beach profiles, thereby reducing the protection that barrier island beaches provide from future storms. There is a need to restore the level of protection provided by the barrier island beaches through their renourishment. Similar concerns in the past have resulted in fill material being placed along the shorelines. The Pinellas County Beach Erosion Control Project has historically obtained beach quality fill from inlet borrow areas and the Egmont Channel Shoal, the currently authorized borrow area for nourishment of Pinellas County Beaches. Due to the shallow nearshore waters, the use of the Egmont Channel Shoal requires barges to travel along depth contours for a roundtrip distance of about 45 miles to reach the northern portion of the renourishment project. The high cost of fuel has greatly increased the cost of renourishment using the Egmont Channel Shoal. Borrow areas closer to Sand Key would significantly reduce the hauling distance, thus offering more cost-effective construction options.

Sand Key is a coastal barrier island between Clearwater Pass and Johns Pass (Figures 1 and 2). Except for the north and south ends of the island, Sand Key has been classified as critically eroded (FDEP, 2009). The island is highly developed and this erosion threatens the infrastructure of the islands communities and recreational use. Beach renourishment of Sand Key has taken place since the late 1960s. The purpose of this proposed action is to utilize a sand source closer to Sand Key for maintenance renourishment activity.

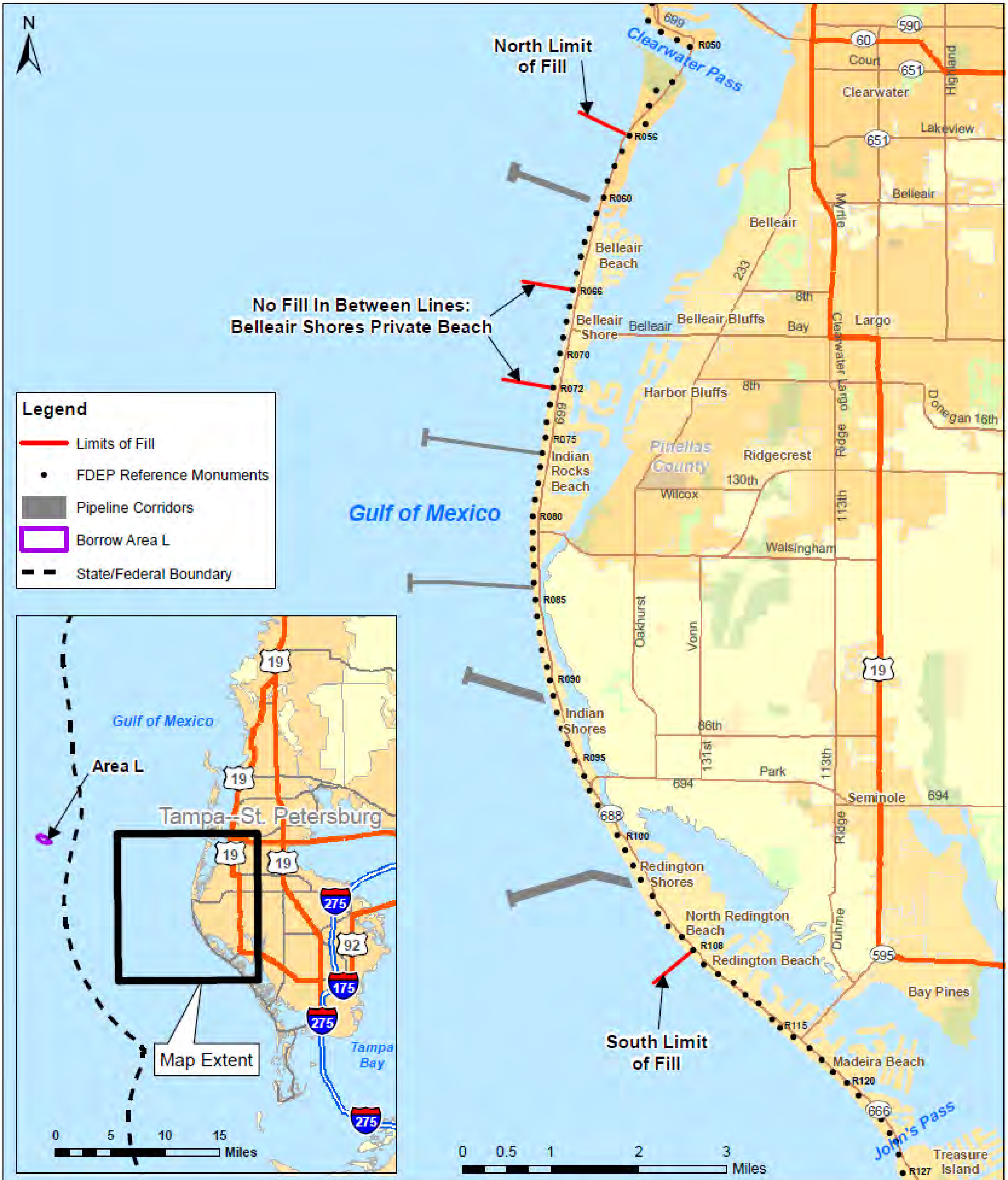
BORROW AREAS A THROUGH L AND EBB SHOAL BORROW AREAS

Sand Key Renourishment Project

Base Map: ESRI 9.3 Data CD

GEC Gulf Engineers & Consultants

Figure: 3	
Date: February 2010	
Scale: 1:350,000	
Source: USACE/GEC/ESRI	
Map ID: 27307714-1981	



LIMITS OF FILL AND PIPELINE CORRIDORS

Sand Key Renourishment Project

Base Map: ESRI 9.3 Data CD

GEC
Gulf Engineers & Consultants

Figure: 2	
Date: February 2010	
Scale: 1:96,000	
Source: USACE/GEC/ESRI	
Map ID: 27307714-1944	

The purpose of this Biological Assessment (BA) is to address the effect of the Sand Key Beach Renourishment Project on ESA-listed species, listed as endangered or threatened under the Federal and state Endangered Species Act (ESA).

1.2 PROJECT BACKGROUND

Previous nourishments on Sand Key include: North Redington Beach and Redington Shores in 1988, Indian Rocks Beach in 1990, Indian Shores in 1992, the initial nourishment of the Sand Key portion of Clearwater and Belleair Beach and the first nourishment of previous locations in1998; and the entire Sand Key project in 2005 and 2006. Fill was generally obtained from Egmont Channel Shoal. However, the round trip boat trip to the Northern portion of Sand Key is approximately 45 miles because the water is shallow and the ships have to follow the contours. Due to the high cost of the last renourishment ($45 million), the USACE wanted to obtain fill from a closer site.

Coordination and consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) was previously conducted on the Pinellas County Beach Renourishment Project. A final Coordination Act Report was completed by the USFWS in June of 1996:

- *Final Fish and Wildlife Coordination Act Report on the Pinellas County Beach Renourishment Project, June 1996. USFWS South Florida Ecosystem Office, Vero Beach, Florida.*

The following Biological Opinions were prepared for previous shore protection and dredging projects on the South-Central Gulf Coast of Florida and are relevant to the proposed activities.

- *NMFS Biological Opinion dated October 1, 1996, Dredging of Egmont Shoal to Nourish Pinellas County, Florida, Beaches. NMFS, Southeast Regional Office.*

- *USFWS Biological Opinion dated November 30, 1991, Indian Shores Beach Renourishment NMFS, Southeast Regional Office.*

- *NMFS Biological Opinion dated October 26, 1999, Maintenance Dredging of Charlotte Harbor Entrance Channel. NMFS, Southeast Regional Office.*

- *NMFS. 2003 (as amended in 2005 and 2007). Biological Opinion to the U.S. Army Corps of Engineers on Dredging of Gulf of Mexico Navigation Channels and Sand Mining ("Borrow") Areas Using Hopper Dredges by USACE Galveston, New Orleans, Mobile, and Jacksonville Districts (Consultation Number F/SER/2000/01287). NOAA National Marine Fisheries Service, Southeast Regional Office. November 19, 2003.*

This BA addresses the proposed action in compliance with Section 7(c) of the ESA of 1973, as amended. Section 7 of the ESA ensures that, through consultation (or conferencing for proposed species) with the USFWS, Federal actions do not jeopardize the continued existence of any threatened, endangered, or proposed species, or result in the destruction or adverse modification of critical habitat.

1.3 SPECIES AND CRITICAL HABITAT TO BE ADDRESSED

1.3.1 Listed Species

The USACE has determined that the following listed species under the purview of the USFWS may be present in the area and may be affected by dredging the proposed borrow area and renourishing the beach at Sand Key:

Table 1. Listed Species from Pinellas County That Could Be Affected By the Proposed Project			
Species	**Scientific Name**	**Federal Status**	**State Status**
SEA TURTLES			
Loggerhead sea turtle	*Caretta caretta*	T	LT
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	LE
Green sea turtle	*Chelonia mydas*	T	LE
Hawksbill sea turtle	*Eretmochelys imbricate*	T	LE
Leatherback sea turtle	*Dermochelys coriacea*	T	LE
MARINE MAMMALS			
Florida manatee	*Trichechus manatus latirostris*	E	LE
E, LE=Endangered; T, LT=Threatened; LS=Species of Special Concern			

1.3.2 Critical habitat

No critical habitat for the above-mentioned species is located within the project area.

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 Renourishment Area

The USACE proposes to renourish an 8.7-mile section of beach along the shoreline of the Gulf of Mexico in Pinellas County, Florida, on Sand Key from Clearwater Pass to John’s Pass, including the Sand Key portion of Clearwater Beach, Belleair Beach, Indian Rocks Beach, Indian Shores, Redington Shores, and North Redington Beach (a one mile section at Belleair Shore between R-66 and R-72 will not be renourished). The beach would be renourished between Florida Department of Environmental Protection (FDEP) reference monuments R-56 and R-66 and R-72 and R-108.

The proposed project would place approximately 1.8 million cubic yards of beach-compatible sand from an offshore borrow area (Figure 1). The fill material will be similar in both coloration and grain size distribution to the native beach. The fill material will be free of construction debris, rocks, or other foreign matter and will not contain, on average, greater than 10 percent fines (i.e., silt and clay passing the #200 sieve) and will not contain, on average, greater than 5 percent coarse gravel or cobbles, inclusive of shell material (retained by the #4 sieve). The sand will be mechanically dredged by a clamshell dredge, loaded in a scow, or sand barge, that will be pushed to the beach project area with tugboats. Once offshore of the beach, the scows will be hooked up to an unloader that will pump the sand through a submerged pipeline to the beach.

2.2 Offshore Sand Source

Borrow Area L is located approximately 12.8 miles west of Clearwater Pass in Federal Waters (Figure 1). Borrow Area L was selected based upon these criteria: beach sand compatibility, adequate available volume, reduced amount of hardbottom habitats, absence of cultural resources, and proximity to the renourishment areas. A sand resource survey was conducted in 1994 by the USACE to identify borrow areas closer to the renourishment site. Nine study areas (designated A through I) were identified that contained material that may be compatible to the beach sand. Only three of these areas (C, D, and H) were found to contain sufficient quantities of suitable material and additional geophysical and vibracore data were collected to determine suitability. Areas D and H were found to have potentially compatible sand; however, the quantity (889,400 cubic yards) was insufficient for the Sand Key renourishment project. Three additional areas (J through L) were examined and Area L was found to contain a sufficient quantity of suitable material.

3.0 DESCRIPTION OF THE PROJECT AREA

The action area includes the beach from mean low low water (MLLW) to the crest of the primary dune or landward structure and is located between FDEP monuments R56 and R108, except for a gap between R-66 and R-72. The action area also includes nearshore waters off Sand Key and Borrow Area L in Federal waters. The action area contains suitable nesting habitat for sea turtles and activity in this area could impact nesting females, their nests and eggs, and any hatchlings, either in the nest or emerging from the nest and moving to the Gulf of Mexico. The nearshore and offshore portion of the action area also contains hardbottom areas.

3.1 HABITATS

3.1.1 Offshore Sand Bottom Communities

Softbottom habitats include areas with little or no rock, limestone, or hard coral structure, and comprise mostly sand, shelly sand, mud, and silt substrates. Where sand is the primary substrate and vegetation is lacking, the most diverse portion of the biota is the benthic infauna. The most consistent animals within these communities are polychaetes, oligochaetes, mollusks, sipunculans, peracarid crustaceans, flatworms, and nemerteans. Other frequent occupants of these habitats include demersal fishes (e.g., flounders), bivalves, decapod crustaceans, and certain shrimps.

3.1.2 Hardbottom Communities

Lyons and Collard (1974) described these communities as areas of moderate wave energy with quartz sand and shell fragment sediments extending offshore. Large temperate mollusks and echinoderms tend be the dominant animals. In areas over 10 meters deep, exposed rock substrate allows for the establishment of scleractinians, mollusks, crustaceans, tunicates, and other species commonly found in south Florida waters (Smith, 1974; Lyons and Collard, 1974). Quartz sands with biologically influenced carbonates present also dominate the sediments within this area.

3.1.2.1 Marine Algae

The marine algae present within the areas offshore of Pinellas County are highly diverse. Phillips, *et al*. (1960) identified 95 taxa of algae within areas of similar depth in this area. Dominant algal species observed during this and other studies include *Caulerpa* sp., *Halimeda* sp., *Udotea flabellum*, *Sargassum* sp., and *Rhipocephalus phoenix* (Phillips, *et al*., 1960; EPA, 1981; CZR, 1991).

3.1.2.2 Invertebrates

Many of the benthic invertebrates associated with hardbottom habitats along the eastern Gulf of Mexico are similar to species found in the more tropical waters of the Caribbean and south Florida reef tract. Lyons and Collard (1974) characterized the shallow shelf habitat offshore of Pinellas County as an area with sediments dominated by quartz sand and biogenically derived carbonates with exposed rock substrate. The exposed rock provides habitat for attached organisms, such as corals, and associated free-living invertebrates. Previous studies have identified species common to habitats offshore of Pinellas County (EPA, 1981; CZR, 1991; Child, 1992; Posey, *et. al*, 1996). The species listed in these previous studies compares closely to species observed during recent surveys (Dial Cordy and Associates, 2001, 2002a, 2002b) (Table 3). Over 40 invertebrate species were observed from the diver and video surveys. There are many more cryptic and less obvious species present within these complex habitats.

3.1.2.3 On-site Assessments

On-site assessments of marine resources within the project area for a previous renourishment project were conducted in 2001 and 2002. Dominant aquatic community types were documented within and adjacent to nine borrow areas, pipeline corridors and nearshore areas. Surveys of ebb tidal shoal areas and the Pass-a-Grille channel were also performed. Marine habitats identified during the survey included hardbottom, shell hash, and open sand habitat. A list of coral and other species observed in hardbottom habitats within the study area during recent surveys is included in Table 2.

Table 2 Benthic Taxa Observed During USACE Borrow Area Surveys

Common Name	Scientific Name
Sponges	
brown bowl sponge	*Cribrochalina vasculum*
giant barrel sponge	*Xestospongia muta*
loggerhead sponge	*Speciospongia vesparium*

ball sponge	*Ircinia sp.*
dark volcano sponge	*Calyx podatypa*
brown variable sponge	*Anthosigmella varians*
erect rope sponge	*Amphimedon compressa*
Scleractin Corals	
tube coral	*Cladocora arbuscula*
blushing star coral	*Stephanocoenia mitchelinii*
cactus coral	*Isophyllia sinuosa*
starlet coral	*Siderastrea sp.*
knobby star coral	*Solenastrea hyades*
mushroom coral	*Scolymia lacera*
hidden cup coral	*Phyllangia americana*
rose coral	*Manicina aereolata*
boulder star coral	*Montastrea annularis*
robust ivory tree coral	*Oculina robusta*
branching fire coral	*Millepora alcicornis*
Octocorals	
shelf-knob sea rod	*Eunicea succinea*
warty sea rod	*Eunicea calyculata*
giant slit-pore sea rod	*Plexaurella nutans*
delicate spiny sea rod	*Muricea laxa*
orange spiny sea rod	*Muricea elongata*
sea plume	*Pseudoterogorgia sp.*
yellow sea whip	*Pterogorgia citrina*
colorful sea whip	*Leptogorgia virgulata*
branching tube sponge	*Pseudoceratina crassa*
Echinoderms	
common comet star	*Linckia guildingii*
beaded sea star	*Astropecten articulatus*
rock-boring urchin	*Echinaster spinulosus*
striped sea star	*Luidia clathara*
sea star	*Luidia sp.*
banded sea star	*Luidia alternata*
orange-ridged sea star	*Echinometra lucunter*
variegated urchin	*Lytechinus variegates*
Mollusks	
penshell	*Pinna carnea*
lightning whelk	*Busycon contrarium*
tritons trumpet	*Charonia variegata*
Florida horse conch	*Pleuroploca gigantean*

Crustaceans	
Florida stone crab	*Menippe mercenaria*
Tunicates	
colonial tunicate	*Clavelina sp.*
overgrowing tunicates	Family Didemnidae
condominium tunicate	*Eudistoma sp.*
Source: USACE 2002	

In addition, the USFWS conducted dive surveys on the nearshore hardbottom in the project area (Table 3).

Table 3 Species Observed During USFWS Nearshore Livebottom Surveys	
Species	**Scientific name**
Fishes	
Sand seatrout	*Cynoscion arenarius*
Spotted seatrout	*C. nebulosus*
Sea robin	Triglidae
White grunt	*Haemulon plumieri*
Slippery dick	*Halichoeres bivittatus*
Porcupine fish	*Diodon hystrix*
Hairy blenny	*Labrisomus nuchipinnis*
Invertebrates	
Sea whips	*Leptogorgia* sp.
Sea anemones	Zoanthidae
Bryozoans	Class Ectoprocta
Sea fan	*Lophogorgia* sp.
Yellow chimney sponge	*Cliona celata*
Tunicates	*Disemnum candidum botryllus* sp.
Sea urchin	*Lytechinus variegatus*
Stone crab	*Menippe mercenaria*
Tube worms	Class Polychaeta
Source: USFWS 2006	

3.1.3 Pelagic Communities

The pelagic community consists of all species that can occur in the water column. Species can include phytoplankton, zooplankton, floating algae; eggs, larval, and juvenile invertebrates and eggs, larval, juvenile, and adult fishes. Sea turtles and marine mammals are also pelagic species.

4.0 THREATENED AND ENDANGERED SPECIES

This section includes life history, including nesting and feeding behaviors, and critical habitat for the species that could be found in the action area (from Table 1).

4.1 SEA TURTLES

Sea turtle numbers have declined due to habitat loss; killing for meat and egg harvesting; pollution and debris ingestion; gill-net, long-line, and trawling fisheries; beach armoring and nourishment; beach erosion; artificial lighting; and coastal development.

Loggerhead turtle

Loggerhead turtles occur throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans and are widely distributed within their range. They can be found hundreds of miles offshore or inshore in bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers (USFWS, 2010). Loggerheads primarily feed on mollusks, crustaceans, fish, and other marine animals. Feeding areas often include coral reefs, rocky areas, and ship wrecks. Adult loggerheads may make considerable migrations between foraging areas and nesting beaches. Loggerheads reach sexual maturity at about 35 years of age.

Loggerheads nest from Texas to Virginia within the continental U.S. and a large number of loggerheads nest in the southeastern U.S. The total number of nests per year over the last decade in the U.S. is estimated to be between 47,000 and 90,000 (NMFS and USFWS, 2008). Loggerheads nest between late April and early September. Females exhibit strong nest site fidelity and return to their natal beach to nest. Loggerheads typically nest above the high-tide mark on open beaches or along narrow bays with suitable sand. They may prefer steeply sloped beaches with gradually sloped offshore approaches. Three to five nests, or more may be laid during a single nesting season; eggs incubate after about two months. Hatchlings are pelagic move to downwelling areas where seagrass and debris accumulates and frequently associate with *Sargassum* rafts where as juveniles they remain for years. Larger, juvenile loggerheads become benthic feeders in coastal areas. During nesting season, adults remain in nearshore and estuarine waters near nesting beaches.

No critical habitat has been designated for the loggerhead.

Green sea turtle

Green turtles are found in tropical and sub-tropical waters around the world. In the U.S. Atlantic waters, green turtles are found from Texas to Massachusetts, the U.S. Virgin Islands, and Puerto Rico. Green turtles are generally found over shallow flats and seagrass and algae areas inside bays and inlets. Resting areas include rocky bottoms, oyster, worm, and coral reefs. Post-hatchling pelagic-stage turtles may be omnivorous. Adult turtles are herbivores and consume algae and seagrasses.

In Florida, most green turtle nesting occurs on the east coast south of Cape Canaveral (NMFS and UFWS, 1991). However, 29 nests were documented on the southwest coast of Florida in 1994, in five southwest counties, including Pinellas (Meylan, *et al*., 1995). Green turtles frequently nest on open high-energy beaches with a sloping platform and minimal disturbance; nests are dug above the high-water line. Nesting occurs in Florida from June to late September.

After leaving the nest, hatchlings swim to convergence zones and may seek refuge and food in *Sargassum* rafts; where they remain for a period of time. Older turtles leave the pelagic habitat to feed benthically.

Critical habitat consists of waters surrounding Culebra Island, Puerto Rico.

Kemp's ridley turtle

Kemp's ridley turtles are found in shallow nearshore and inshore waters of the northern Gulf of Mexico, particularly in Louisiana. During the winter, northern Gulf turtles may travel to deeper water. Turtles found in the northwestern Atlantic Ocean feed in coastal waters up to New England during the summer and migrate southward during the winter (NMFS and UFWS, 1992). Kemp's ridleys are often found in salt marsh waterbodies. Neonatal Kemp's ridleys feed on Sargassum and infauna or other epipelagic species. Post-pelagic turtles are benthic feeders over sand and mud bottoms and primarily consume crabs, particularly portunid crabs, and other crustaceans. Hatchlings may become entrained in Gulf of Mexico eddies, are dispersed by oceanic surface currents, then enter coastal shallow water habitats when they reach about 20 cm in length.

Kemp's ridleys prefer to nest on beaches backed by extensive swamps or large open waterbodies with seasonal narrow connections to the ocean. Nesting occurs from April to July, principally on the beaches of the western Gulf of Mexico. During the nesting season, females may either stay in nearshore waters or may move up to 10 km along the beach before returning to the nesting beach.

No critical habitat has been designated.

Hawksbill turtle

Hawksbill turtles occur in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans. In the continental U.S., hawksbills have been found along the Gulf of Mexico and along the eastern seaboard as far north as Massachusetts; however, but are rare north of Florida. Hawksbill turtles are frequently found along rocky areas, coral reefs, shallow coastal areas, lagoons or oceanic islands, and narrow creeks and passes. Post-hatchlings are pelagic and occupy convergence zones, floating among *Sargassum* and debris and may eat fish eggs, *Sargassum*, and debris (NOAA and USFWS, 1993). Hawksbill sea turtles feed primarily on sponges once they transition to a benthic existence; only specific sponge species are consumed.

Within the continental U.S., hawksbills nest only along the southeastern coast of Florida and the Florida Keys. Hawksbills nest on low- and high-energy beaches. Hawksbills nest on many types of substrates and may place nests under vegetation. Nesting is generally at low densities, ranging from a few dozen to a few hundred individuals, on scattered undisturbed deep-sand small beaches, except for long expanses of beach on the Gulf and Caribbean coasts of the Yucatán Peninsula, Mexico. In most locations, hawksbills nest between April and November; a few hawksbills nest in the Florida Keys and on the east coast of Florida. Hawksbills frequently return to the same beach to nest.

Critical habitat has been designated at Isla Mona, Culebra Island, Cayo Norte, and Island Culebrita, Puerto Rico.

Leatherback turtle

Leatherback turtles are highly migratory and pelagic. Leatherbacks can be found in deeper water than most other species of sea turtles and have been found in cold waters, such as Alaska, due to the ability to regulate their core body temperature somewhat. Leatherbacks primarily feed on jellyfish, but also consume sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. In the Gulf of Mexico, leatherbacks are frequently associated with cabbage head jellyfish *Stomolophus* and *Aurelia* jellyfish. The distribution and food habits of post-hatchling and juvenile leatherbacks are unknown, although they may be pelagic and associate with *Sargassum* weed.

Nesting occurs in the U.S. from March to July; the Pacific coast of Mexico has the largest known concentration of nesting leatherbacks. From 38 to 125 leatherbacks nested in Florida from 1981 to 1990. Nesting does not appear to occur on the west coast of Florida, although one nest was observed off the northwest coast of Florida in 1974. Females prefer to nest on well-sloped high-energy sand beaches backed with vegetation near deep water and generally rough seas. Nesting surveys may underestimate leatherhead nesting because they generally begin in May and leatherbacks can nest as early as late February. Although many females return to the same beaches to nest, some females have been found to nest on beaches up to 100 km apart in a single season.

Critical habitat is in the U.S. Virgin Islands.

Site-specific Information on Sea Turtles

Nesting sea turtles in the Pinellas County area are primarily loggerheads, although a few green turtles nests have been found on an infrequent basis. All the sea turtle nests reported from Pinellas County from 2004 to 2008 were those of loggerhead sea turtles (Table 4 - Fish and Wildlife Research Institute of the Florida Fish and Wildlife Conservation Commission, 2010). Similarly, sea turtles nesting in the Tampa Bay area from 1982-1997 were loggerhead turtles with two exceptions, a single Kemp's ridley on Madeira Beach in Pinellas County in May 1989 and a single green sea turtle at Fort de Soto in Pinellas County in 1994 (Meylan *et al*., 1994). Only 11 hawksbill sea turtle nests were reported in Florida from 1979 to 1992 and the Kemp's ridley nest in Pinellas County mentioned previously was the only nest of that species reported from Florida during that time period (Meylan *et al*., 1995).

Strandings in Tampa Bay inshore waters from 1980 through 1997 were examined by Meylan *et al*. (1998). Most of the stranded turtles were loggerheads, followed by Kemp's ridleys, green turtles, and hawksbills. Strandings of loggerheads were more numerous from March through June, with a smaller peak in October and November. Green turtles were primarily stranded outside the summer months and peaked in February and March. Kemp's ridleys were stranded in all months except August, with no apparent seasonal pattern.

Table 4: Sea Turtle Nests reported on Pinellas County Beaches from 2004-2008			
	Loggerhead	**Green**	**Leatherback**
2004	154	0	0
2005	156	0	0
2006	165	0	0
2007	78	0	0
2008	196	0	0
Source: Fish and Wildlife Research Institute, 2010.			

4.2 FLORIDA MANATEE

The Florida manatee (*Trichechus manatus latirostris*) is a subspecies of the West Indian manatee (*Trichechus manatus*) and can be found throughout the southeastern United States, including the project area. Manatees may travel great distances during warm months and have been spotted in Massachusetts and Texas (USFWS, 2007). Manatees are a sub-tropical species and are cold intolerant, in Florida, they prefer warm-water sites during the winter, leaving only to feed during warming trends. Manatees congregate near warm water sites, such as natural springs, power plants, and deep canals, when temperatures drop. Florida manatees are found in freshwater, brackish, and marine environments, including coastal tidal rivers and streams, mangrove swamps, salt marshes, freshwater springs, and vegetated bottoms. Manatees are herbivores and feed on aquatic vegetation. Preferred feeding areas in coastal and riverine habitats appear to be shallow grass beds near deep channels. Primary threats include watercraft-related strikes, entanglement in fishing lines and crab pot lines, exposure to cold and red tide (USFWS 2007).

Site-Specific Information on Marine Mammals

Several Federal and state manatee protection areas are located in Tampa Bay, including around several power plants. Manatees inhabit both fresh and salt water and have been observed in canals, rivers, estuaries, bays, and on rare occasion have been observed as far as 6 km off the Florida Gulf coast (USFWS, 1996). Aerial surveys indicate that as many as 190 manatees may use Tampa Bay (Ackerman, 1995). Surveys show that over 900 manatees inhabit the west coast of Florida. The highest concentrations of manatees along Florida's Gulf coast exist in Citrus, Levy, Lee, and Collier Counties. Data suggest that of the manatees living in the Tampa Bay area, most occur within the bay where water temperatures are more stable year round. Only 15 manatees were surveyed in the eastern portion of Tampa Bay during aerial surveys in 1992 (Ackerman, 1995).

The project area is in nearshore and offshore areas and any manatees present in the area would likely be migrating between feeding areas.

5.0 DISCUSSION OF POTENTIAL IMPACTS TO LISTED SPECIES

Project-Specific Information on Sea Turtles

All five species are listed as either threatened or endangered under the ESA. Several biological opinions provided by the USFWS for previous beach placement actions on the Gulf coast of Florida discuss in detail the background information for sea turtles including, status and distribution, behavior, life history, population dynamics, etc. and are included by reference below:

- *US Fish and Wildlife Service. Biological Opinion, September 7, 2001. Mexico Beach Canal Sand Bypass, Gulf of Mexico, Bay County, Florida. Public Notice 200100140 (IP-DHB).*

- *US Fish and Wildlife Service. Biological Opinion, February 20, 2003. Beach placement of dredge material from the Panama City Harbor Channel Maintenance Dredging.*

- *US Fish and Wildlife Service. Biological Opinion, April 30, 2004. Walton County City of Destin Beach Restoration Gulf of Mexico, Walton and Okaloosa Counties, Florida. Public Notice SAJ 2003-8314-IP-TLZ.*

Critical habitat has not been designated in the continental U.S.; therefore, the proposed project would not adversely modify critical habitat.

Potential impacts to the nesting activities of sea turtles due to beach renourishment may include changes in beach slope, formation of escarpments, sediment compaction, changes in the incubation environment, and changes in beach lighting. To the maximum extent practicable, construction activities on the beach will be scheduled to avoid the sea turtle nesting season (May 1 through September 30). If the nesting season cannot be avoided, project modifications (i.e. modified pipeline routes, staging areas, etc.) may be made during the nesting season to help avoid or minimize potential impacts.

If nourishment beach activities extend into portions of the nesting season, monitoring for sea turtle nesting activity will be considered throughout the construction area including the disposal area and beachfront pipeline routes in accordance with guidelines provided by the USFWS. The location and operation of heavy equipment within the project area will be limited to daylight hours to the maximum extent practicable to minimize impacts to nesting sea turtles. Monitoring for nest activity prior to the construction activities may be necessary to allow nests laid within a potential construction zone to be relocated outside of the construction zone prior to project commencement to avoid potential losses. However, relocation measures should be considered as a last alternative.

The proposed project could potentially adversely affect sea turtles in the following ways (USACE, 2007):

- Both stockpiled pipe on the beach and the pipeline route running parallel to the shoreline may impede nesting sea turtles from accessing more suitable nesting sites,

- The operation of heavy equipment on the beach may impact nesting females and incubating nests,
- Associated lighting impacts from the nighttime operations and the increased beach profile elevation may deter nesting females from coming ashore and disorient emerging hatchlings,
- Burial of existing nests may occur if missed by monitoring efforts,
- Escarpment formations may impede nesting females as well as cause potential losses of sand during the beach equilibration process,
- Nesting success may be reduced as a result of relocation efforts,
- Sediment density (compaction), shear resistance (hardness), sediment moisture content, beach slope, sediment color, sediment grain size, sediment grain shape, and sediment grain mineral content may be altered, potentially effecting the nesting and incubating environment,
- Hard sediment may prevent a female from digging a nest or result in a poorly constructed nest cavity,
- Changes in sediment properties and color could alter the temperature of the beach and incubating nests; thus influencing sex ratios, and
- Hard structures (groins, breakwaters, etc.) may prevent access to suitable nesting sites, directly and indirectly interfere with the nesting process, impede and/or trap nesting females and hatchlings resulting in increased energy expenditure, concentrate predators, and alter longshore sediment transport and down-drift erosion.

The USACE plans to alleviate impacts to nesting sea turtles in the project area by implementing steps that are now common practice including, but not limited to:

- design modifications,
- contingency plans,
- risk assessments,
- sediment quality monitoring,
- compaction tests,
- tilling,
- leveling escarpments in the fill, and
- monitoring for nests, etc. (USACE, 2007).

Despite the implementation of the measures outlined above, the chance of adversely affecting nesting sea turtles still exists. Therefore, it has been determined that the proposed actions may adversely affect loggerhead and green turtles.

Project-Specific Information on the Florida Manatee

Direct effects on the Florida manatee from the dredging operation and the placement of material on the beach should be minor. Vessels, including crew boats, tugs, barges, etc., will be used in dredging operations; therefore, the potential for collision may exist. To ensure that dredging does not adversely affect manatees, the USACE has adopted the *Special Manatee Protection Conditions* as part of its standard operating procedures on all water-related projects. These conditions are available on the USACE, Jacksonville District website at http://www.saj.usace.army.mil/Divisions/Planning/Branches/Environmental/Protection_Manatee.htm.

Since the *Special Manatee Protection Conditions* will be incorporated into the USACE specifications and will be adhered to by the project Contractor, the proposed actions may affect but are not likely to adversely affect the Florida manatee. There is no designated critical habitat present in the project area.

6.0 EFFECTS ASSESSMENT

Based on the information provided in this assessment, the USACE determines that the proposed project will have the following affect on the listed species:

Table 5. Summary of Potential Effects on Listed Species That May be Found in the Project Area

Species	Scientific Name	Federal Status	
SEA TURTLES			
Loggerhead sea turtle	*Caretta caretta*	T	May adversely affect
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	May adversely affect
Green sea turtle	*Chelonia mydas*	T	May adversely affect
Hawksbill sea turtle	*Eretmochelys imbricate*	T	May affect, but is not likely to adversely affect
Leatherback sea turtle	*Dermochelys coriacea*	T	May affect, but is not likely to adversely affect
FLORIDA MANATEE			
Florida manatee	*Trichechus manatus latirostris*	E	May affect, but is not likely to adversely affect
E=Endangered; T=Threatened			

7.0 REFERENCES

Florida Department of Environmental Protection. Critically Eroded Beaches in Florida http://www.dep.state.fl.us/beaches/publications/pdf/CritEroRpt09.pdf . Bureau of Beaches and Coastal Systems Division Of Water Resource Management, Department Of Environmental Protection, State of Florida.

Meylan, A., B. Schroeder, and A. Mosier. 1995. Sea turtle nesting activity in the State of Florida 1979-1992. Florida Mar. Research Publ. 52: I-51.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1991. Recovery Plan for U.S. Population of Atlantic Green Turtle *(Chelonia mydas)*. National Marine Fisheries Service, Washington, D.C.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1992. Recovery Plan for U.S. Population for the Kemp's Ridley Sea Turtle *(Lepidochelys kempii)*. National Marine Fisheries Service, St. Petersburg, FL.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1992. Recovery Plan for Leatherback Turtles (*Dermochelys* cori*acea)* in the U.S. Caribbean, Atlantic and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1993. Recovery Plan for Hawksbill Turtles in the U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico, *(Eretmochelys imbricata),* National Marine Fisheries Service, St. Petersburg, Florida.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2008. Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (*Caretta caretta*), Second Revision. National Marine Fisheries Service, Silver Spring, MD.

USACE. 1990. Environmental effects of dredging: Technical note. Alternative Dredging Equipment and Operational Methods to Minimize Sea Turtle Mortalities. Technical note EEDP-09-6. U.S. Army Waterways Experiment Station, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199.

USACE. 2006. Summary of First Regional Workshop on Dredging, Beach Nourishment, and Birds on the South Atlantic Coast. ERDC/EL TR-06-10. USACE Engineer Research and Development Center.

USACE. 2007. Draft Regional Biological Assessment Sand Placement along the Coast of Florida. U.S. Army Corps of Engineers, Jacksonville District.

U.S. Fish and Wildlife Service and Gulf States Marine Fisheries Commission. 1995. Gulf Sturgeon Recovery Plan. Atlanta, Georgia. 170 pp.

U.S. Fish and Wildlife Service. 2007. West Indian Manatee (*Trichechus manatus*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Ecological Services Office, Jacksonville, Florida, Caribbean Field Office, Boquerón, Puerto Rico. 79 pp.

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

REPLY TO
ATTENTION OF

Planning Division
Environmental Branch

JUL 14 2010

To Whom It May Concern:

Pursuant to the National Environmental Policy Act and U.S. Army Corps of Engineers Regulation (33 CFR 230.11), this letter constitutes the Notice of Availability of the draft Environmental Assessment (EA) for the Supplemental Sand Source for the Pinellas County Beach Erosion Control project. This project is located on Sand Key, Pinellas County, Florida. Enclosed is the draft Finding of No Significant Impact (FONSI).

The draft EA is available on the U.S. Army Corps of Engineers, Jacksonville District website at http://www.saj.usace.army.mil/Divisions/Planning/Branches/Environmental/DocsNotices_OnLine_PinellasCo.htm for your review and comment. For comments to be considered, they must be received within 30 days from the date of this letter unless additional review time is authorized by federal law. Letters should be addressed to the letterhead address, to the attention of the Planning Division, Environmental Branch, Coastal Section. If you have any questions or comments, please contact Ms. Aubree Hershorin by telephone at 904-232-2136, or by email at Aubree.G.Hershorin@usace.army.mil.

Sincerely,

Eric P. Summa
Chief, Environmental Branch

Enclosure

FLORIDA DEPARTMENT OF STATE
Dawn K. Roberts
Interim Secretary of State
DIVISION OF HISTORICAL RESOURCES

Mr. Eric P. Summa
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

July 20, 2010

Re: DHR Project File No.: 2010-02874 / 1A-32 Permit No.: 0910.019
Received by DHR: June 18, 2010
Sand Key Submerged Cultural Resources Survey, Offshore Sand Key, Pinellas County, Florida

Dear Mr. Summa:

Our office received and reviewed the above referenced survey report in accordance with Section 106 of the *National Historic Preservation Act of 1966* (Public Law 89-665), as amended in 1992, and *36 C.F.R., Part 800: Protection of Historic Properties*, and Chapter 267, *Florida Statutes*, for assessment of possible adverse impact to cultural resources (any prehistoric or historic district, site, building, structure, or object) listed, or eligible for listing, in the National Register of Historic Places (NRHP).

In July and September 2009, Tidewater Atlantic Research, Inc. (TAR) conducted an archaeological and historical remote sensing survey of the Area L sand borrow site near Sand Key. The survey was conducted on behalf of Coastal Planning and Engineering, Inc. and the U.S. Army Corps of Engineers (Corps). TAR identified two magnetic anomalies within the surveyed area.

TAR determined that one anomaly (L-1) appears to represent modern debris. However, the other anomaly (L-2) exhibits characteristics suggestive of potentially significant cultural material. TAR recommends that anomaly L-2 and a 200-meter radius buffer surrounding the anomaly be avoided by dredging activities.

Based on the information provided by the Corps, anomaly L-2 and its 200-meter buffer area have been removed from the area proposed for dredging. The Corps has determined that the proposed undertaking will have no adverse effect on historic properties. Our office concurs with this determination.

However, in order for the report to be complete in accordance with Chapter 1A-46, *Florida Administrative Code,* the following information must be forwarded:

- **Survey Log Sheet:** A completed Florida Master Site File survey log sheet and associated USGS quadrangle map plotting the surveyed area are required with each survey submitted to our office.

- **Laws and Regulations:** Page 1 of the report should be amended to cite Chapter 267, *Florida Statutes*, rather than Section 276.12, *Florida Statues.*

For any questions concerning our comments, please contact Rudy Westerman, Historic Preservationist, by electronic mail at rjwesterman@dos.state.fl.us, or by phone at 850.245.6333. We appreciate your continued interest in protecting Florida's historic properties.

Sincerely,

Laura A. Kammerer

Laura A. Kammerer
Deputy State Historic Preservation Officer
For Review and Compliance

Pc: Gordon Watts, Tidewater Atlantic Research, Inc.

SEMINOLE TRIBE OF FLORIDA
TRIBAL HISTORIC PRESERVATION OFFICE

TRIBAL HISTORIC
PRESERVATION OFFICE

SEMINOLE TRIBE OF FLORIDA
AH-TAH-THI-KI MUSEUM

34725 WEST BOUNDARY ROAD
CLEWISTON, FL 33440

PHONE: (863) 983-6549
FAX: (863) 902-1117

TRIBAL OFFICERS

CHAIRMAN
MITCHELL CYPRESS

VICE CHAIRMAN
RICHARD BOWERS JR.

SECRETARY
PRISCILLA D. SAYEN

TREASURER
MICHAEL D. TIGER

Dan Hughes
USACE – Jacksonville District
P.O. Box 4970
Jacksonville, FL 32232-0019

THPO#: 006303

August 5, 2010

Subject: Assessment of Effects for the Proposed Sand Key Beach Re-nourishment Project, Offshore Sand Key, Pinellas County, Florida

Dear Mr. Hughes,

The Seminole Tribe of Florida's Tribal Historic Preservation Office (STOF-THPO) has received the Corps of Engineers correspondence concerning the aforementioned project. The STOF-THPO has no objection to your findings at this time. However, the STOF-THPO would like to be informed if cultural resources that are potentially ancestral or historically relevant to the Seminole Tribe of Florida are inadvertently discovered during the construction process. We thank you for the opportunity to review the information that has been sent to date regarding this project. Please reference *THPO-006303* for any related issues.

We look forward to working with you in the future.

Sincerely,

Direct routine inquiries to:

Willard Steele
Tribal Historic Preservation Officer
Seminole Tribe of Florida

Anne Mullins
Compliance Review Supervisor
annemullins@semtribe.com

ety:AM

Tampa Bay Regional Planning Council

Chair
Commissioner Jack Mariano

Vice-Chair
Jill Collins

Secretary/Treasurer
Commissioner Larry Bustle

Executive Director
Manny Pumariega

August 24, 2010

Ms. Aubree G. Hershorin
U.S. Army Corps of Engineers
Jacksonville District
P. O. Box 4970
Jacksonville, FL 32232-0019

Subject: ***IC&R #084-10, Environmental Assessment for the Supplemental Sand Source for the Pinellas County Beach Erosion Control Project, Pinellas County***

Dear Ms. Hershorin:

The Tampa Bay Regional Planning Council recently received correspondence from your agency regarding the above-mentioned project submitted for processing under the Intergovernmental Coordination and Review program.

While our agency **does** find the proposal to be regionally significant, initial in-house review does not indicate the necessity for specific action by our Council. All member local governments of the Tampa Bay Regional Planning Council's (TBRPC) Clearinghouse Review Committee and/or TBRPC's full policy board will be notified of your application. You will be contacted if any local concerns are identified.

In accordance with the State's delegated IC&R review requirements, this project is considered to have met the local requirements of the IC&R process and no further review will be required by our Agency. This letter constitutes compliance with IC&R only and does not preclude the applicant from complying with ***other*** applicable requirements or regulations.

If you have any questions, please do not hesitate to contact me (ext. 29).

Sincerely,

John M. Meyer
IC&R Coordinator

JMM/bj

4000 Gateway Centre Boulevard, Suite 100 · Pinellas Park, FL 33782
Phone: 727-570-5151 · Fax: 727-570-5118 · www.tbrpc.org

FLORIDA DEPARTMENT OF STATE
Dawn K. Roberts
Interim Secretary of State
DIVISION OF HISTORICAL RESOURCES

Mr. Eric Summa
Environmental Branch- Coastal Section
Jacksonville Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

August 25, 2010

Re: DHR Project File No.: 2010-3879 / Received: July 19, 2010
Pinellas County Beach Erosion Control Project
Pinellas County

Dear Mr. Summa:

Our office received and reviewed the project in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended and 36 CFR Part 800. The State Historic Preservation Officer is to advise and assist federal agencies when identifying historic properties (archaeological, architectural, and historical resources) listed, or eligible for listing, in the National Register of Historic Places, assessing the project's effects, and considering alternatives to avoid or minimize adverse effects.

Because of the nature of the project, this office concurs that no historic properties eligible for listing in the National Register will be affected.

If you have any questions concerning our comments, please contact Michael Hart, Historic Sites Specialist, by phone at 850.245.6333, or by electronic mail at mrhart@dos.state.fl.us. Your continued interest in protecting Florida's historic properties is appreciated.

Sincerely,

Laura A. Kammerer

Laura A. Kammerer
Deputy State Historic Preservation Officer
For Review and Compliance

500 S. Bronough Street • Tallahassee, FL 32399-0250 • http://www.flheritage.com

❒ Director's Office	❒ Archaeological Research	✓ Historic Preservation
850.245.6300 • FAX: 245.6436	850.245.6444 • FAX: 245.6452	850.245.6333 • FAX: 245.6437

Florida Department of Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Charlie Crist
Governor

Jeff Kottkamp
Lt. Governor

Mimi A. Drew
Secretary

October 20, 2010

Mr. Eric P. Summa
Chief, Environmental Branch
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Summa:

The Florida Department of Environmental Protection has coordinated a review of the Department of the Army, Jacksonville District Corps of Engineers - Draft Supplemental Environmental Assessment (SEA), Supplemental Sand Source for Sand Key Beach Renourishment - Offshore Pinellas County, Florida under the following authorities: Presidential Executive Order 12372; § 403.061(40), *Florida Statutes*; the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended; and the National Environmental Policy Act, 42 U.S.C. §§ 4321-4347, as amended

Based on the information contained in the draft SEA and proposed measures to eliminate or avoid impacts to fish and wildlife resources, the state has determined that the proposed use of the federal waters/lands borrow area is consistent with the Florida Coastal Management Program. Regarding the state waters/lands portion of the proposed Sand Key project, the Florida Department of Environmental Protection, Bureau of Beaches and Coastal Systems is currently processing the Joint Coastal Permit application for the Sand Key project. The final agency action on this required permit will serve as the State of Florida's Coastal Zone Management Act consistency decision for the state lands/water portion of the proposed project in accordance with Section 373.428, *Florida Statutes*.

Thank you for the opportunity to review the proposed use of sand resources in federal waters. Should you require additional information or assistance, please contact me at (850) 245-2163.

Sincerely,

Deborah L. Tucker
Environmental Administrator

cc: Lauren Milligan, FDEP
Aubree Hershorin, ACOE

FLORIDA DEPARTMENT OF STATE
Dawn K. Roberts
Interim Secretary of State
DIVISION OF HISTORICAL RESOURCES

October 20, 2010

RECEIVED

OCT 21 2010

DEP Office of
Intergov't Programs

Ms. Debby Tucker
Florida Department of Environmental Protection
3900 Commonwealth Blvd., Mail Station #47
Tallahassee, Florida 32399-3000

Re: SHPO/DHR Project File No.: 2010-4842
Received: October 5, 2010
SAI No.: FL201010015497C
U.S. Army Corps of Engineers (USACE) - Jacksonville District
Draft Supplemental Environmental Assessment – Sand Key Beach Restoration Sand Source in Federal Waters – Finding of No Significant Impact
Offshore Pinellas County

Dear Ms. Tucker:

Our office reviewed the referenced application in accordance with Section 106 of the National Historic Preservation Act of 1966; the National Environmental Policy Act; as well as with Chapters 267, *Florida Statutes*, and Florida's Coastal Zone Consistency Program. The purpose of our review is to identify possible impact to historic resources listed, or eligible for listing, in the National Register of Historic Places, or otherwise of historical, architectural or archaeological value. The State Historic Preservation Officer is to advise and assist state and federal agencies and applicants to identify historic resources, assess effects on them, and considerations of alternatives to avoid or minimize adverse effects.

A review of our records indicates that the sand source area was subjected to professional investigations by the USACE earlier this year. Based on the conditions agreed to by the USACE to protect magnetic anomaly L-2 identified in the study with no less than a 200-meter buffer area and removing it from the sand source area proposed for dredging, we concur with the finding of no adverse effect on historic properties and the finding of no significant impact. It is the opinion of this office that the project is consistent with Florida's Coastal Zone Consistency program

If you have any questions concerning our comments, please contact me at 850-245-6333 or lkammerer@dos.state.fl.us. Thank you for your interest in protecting Florida's historic properties.

Sincerely,

Laura A. Kammerer

Laura A. Kammerer
Deputy State Historic Preservation Officer
For Review and Compliance

FLORIDA DEPARTMENT OF STATE
Dawn K. Roberts
Interim Secretary of State
DIVISION OF HISTORICAL RESOURCES

Mr. Eric P. Summa
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

November 8, 2010

Re: DHR Project File No.: 2010-02874-B / 1A-32 Permit No.: 0910.019
Revised Report Received by DHR: November 8, 2010
Sand Key Submerged Cultural Resources Survey, Offshore Sand Key, Pinellas County, Florida

Dear Mr. Summa:

Our office received and reviewed the above referenced survey report in accordance with Section 106 of the *National Historic Preservation Act of 1966* (Public Law 89-665), as amended in 1992, and *36 C.F.R., Part 800: Protection of Historic Properties*, and Chapter 267, *Florida Statutes*, for assessment of possible adverse impact to cultural resources (any prehistoric or historic district, site, building, structure, or object) listed, or eligible for listing, in the National Register of Historic Places (NRHP).

In July and September 2009, Tidewater Atlantic Research, Inc. (TAR) conducted an archaeological and historical remote sensing survey of the Area L sand borrow site near Sand Key. The survey was conducted on behalf of Coastal Planning and Engineering, Inc. and the U.S. Army Corps of Engineers (Corps). TAR identified two magnetic anomalies within the surveyed area.

TAR determined that one anomaly (L-1) appears to represent modern debris. However, the other anomaly (L-2) exhibits characteristics suggestive of potentially significant cultural material. TAR recommends that anomaly L-2 and a 200-meter radius buffer surrounding the anomaly be avoided by dredging activities.

The Corps has removed anomaly L-2 and its 200-meter buffer area from the area proposed for dredging. The Corps has determined that the proposed undertaking will have no adverse effect on historic properties.

Based on the information provided, our office concurs with these determinations and finds the submitted report to be complete and sufficient in accordance with Chapter 1A-46, *Florida Administrative Code*.

For any questions concerning our comments, please contact Rudy Westerman, Historic Preservationist, by electronic mail at rjwesterman@dos.state.fl.us, or by phone at 850.245.6333. We appreciate your continued interest in protecting Florida's historic properties.

Sincerely,

Laura A. Kammerer

Laura A. Kammerer
Deputy State Historic Preservation Officer
For Review and Compliance

Pc: Gordon Watts, Tidewater Atlantic Research, Inc.
Louis Tesar, Interoffice Mail Station 8B

FLORIDA DEPARTMENT OF STATE
Glenda E. Hood
Secretary of State
DIVISION OF HISTORICAL RESOURCES

Mr. James C. Duck
Jacksonville District US Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

August 4, 2003

Re: DHR Project No. 2003-2216B / Final Report Received: August 1, 2003
DHR Reference 2002-5430
Final Report: *Remote Sensing Survey of Pass-a-Grille Channel Borrow Area and Archaeological Diver Identification and Evaluation of Three Targets near Pass-a-Grill Channel and Five Targets at Egmont Channel Borrow Area, Pinellas County, Florida*

Our office reviewed the draft version of the above referenced report on April 1, 2003 (DHR No. 2002-2216). At that time, we found the submitted report complete and sufficient in accordance with Chapter 1A-46, *Florida Administrative Code*. None of the anomalies are recommended for additional investigation. It is the opinion of Tidewater Atlantic Research, Inc. that the proposed project will have no effect on historic properties eligible for listing in the *National Register of Historic Places*, or otherwise of historical or archaeological value. Based on the information provided, this office concurs with this determination and finds the submitted report complete and sufficient in accordance with Chapter 1A-46, *Florida Administrative Code*.

If you have any questions concerning our comments, please contact Alissa Slade, Historic Sites Specialist, at amslade@mail.dos.state.fl.us or (850) 245-6333. Your interest in protecting Florida's historic properties is appreciated.

Sincerely,

Frederick P. Gaske, Deputy SHPO

for Janet Snyder Matthews, Ph.D., Director and
State Historic Preservation Officer

Hershorin, Aubree SAJ

From: Mark Sramek [Mark.Sramek@noaa.gov]
Sent: Friday, November 12, 2010 1:32 PM
To: Hershorin, Aubree SAJ
Subject: Re: FW: RAI # 3 DEP Permit # 0238664-001-JC Sand Key Beach Nourishment

NOAA's National Marine Fisheries Service, Southeast Region, Habitat Conservation Division, has reviewed the subject Department of the Army permit application listed below. We anticipate that any adverse effects that might occur on marine and anadromous fishery resources would be minimal and, therefore, do not object to issuance of the permit.

Hershorin, Aubree SAJ wrote:

<<image001.gif>> Hi Mark,

I noticed that #28 addresses EFH under your purview (likely why you were copied on the RAI response). In case you have not yet received the Notice of Availability of the Draft EA, I've attached it for your reference. The Draft EA is available at our website at http://www.saj.usace.army.mil/Divisions/Planning/Branches/Environmental/DOCS/OnLine/Pinellas/BeachErosion/Sand Key Draft EA.pdf for your review and comment. We are providing 400-foot buffer around all significant hardbottom communities at the borrow area site that were identified by sidescan sonar data.

If you have any questions or need additional information, please don't hesitate to contact me.

Thank you,

Aubree Hershorin
Biologist, U.S. Army Corps of Engineers
Planning Division
701 San Marco Blvd.
Jacksonville, FL 32207
Phone: (904) 232-2136

-----Original Message-----
From: Deal, Tori [mailto:Tori.Deal@dep.state.fl.us]
Sent: Friday, July 30, 2010 4:42 PM
To: Summa, Eric P SAJ
Cc: Edwards, Lainie; Seeling, Martin; Barnett, Michael; Nicole Elko; McAdams, James J SAJ; Jacqueline.J.Keiser@saj02.usace.army.mil; Lagrone, James W SAJ; Vorstadt, Bill; Mark Sramek; Hershorin, Aubree SAJ; Brantly, Robert; Malakar, Subarna; Koch, Jennifer L.; Florko, Catherine; Woodruff, Paden; Dow, Roxane; Reed, Alex (Jillian); Kosmynin, Vladimir; JCP Compliance; ASquires@pinellascounty.org; Runnels, Randy
Subject: RAI # 3 DEP Permit # 0238664-001-JC Sand Key Beach Nourishment

Hello All,

Please see the link below for RAI # 3 DEP Permit # 0238664-001-JC Sand Key Beach Nourishment:

http://bcs.dep.state.fl.us/env-prmt/pinellas/pending/0238664_Sand_Key_Beach_Nourishment/001-JC/Completeness%20Review/RAI_%233/

Thank you,

Tori Deal

Bureau of Beaches and Coastal Systems

Joint Coastal Permitting Assistant

Telephone:850-414-7731

Email contact Tori.Deal@dep.state.fl.us

The Department of Environmental Protection values your feedback as a customer. DEP Secretary Michael W. Sole is committed to continuously assessing and improving the level and quality of services provided to you. Please take a few minutes to comment on the quality of service you received. Simply click on this link to the DEP Customer Survey <http://survey.dep.state.fl.us/?refemail=Tori.Deal@dep.state.fl.us> . Thank you in advance for completing the survey.

United States Department of the Interior

U. S. FISH AND WILDLIFE SERVICE

7915 BAYMEADOWS WAY, SUITE 200
JACKSONVILLE, FLORIDA 32256-7517

IN REPLY REFER TO:
FWS Log No. 41910-2010-F-0301

December 3, 2010

Colonel Alfred A. Pantano, Jr. District Engineer
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232

Dear Colonel Pantano:

This document is the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed sand placement on Sand Key located in Pinellas County, Florida, and its effects on the loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), Kemp's ridley sea turtle (*Lepidochelys kempii*), West Indian (Florida) manatee (*Trichechus manatus latirostris*), and piping plover (*Charadrius melodus*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your request for formal consultation was received on 19 July 2010.

This biological opinion is based on information provided in the 10 March 2010 and 14 July 2010 correspondences from your office. A complete administrative record of this consultation is on file at the Service's St. Petersburg Ecological Services Satellite Office.

The Corps determined that the proposed action may affect, but was not likely to adversely affect the Florida manatee and the piping plover. The Corps also determined that the proposed action may adversely affect the loggerhead, green, and Kemp's ridley sea turtles. The Service concurs with these determinations.

<u>Florida manatee</u>

The Service concurs with this determination providing the *Standard Manatee Conditions for In-Water Work* (2009) are implemented during the construction of this project. In addition, we recommend the placement of mooring fenders on barges and other large vessels such that, when moored together or at the docking facilities, the fenders provide a minimum stand-off distance, at and below the water line, of 4 feet under maximum compression. Furthermore, no destruction or adverse modification of designated critical habitat will result from this action. Because no incidental take of manatees is anticipated, no such authorization under the Marine Mammal Protection Act (MMPA) is required.

Piping plover

Non-breeding piping plovers are known to occur along Pinellas County's beaches. Natural organic material deposited on the beach (wrack) provides important foraging and roosting habitat for piping plovers and other shorebirds. It also serves to protect important shorebird habitat by helping stabilize beaches through reduction in erosive processes such as eolian sand transport. Protection of wrack can help to offset the direct and indirect impacts associated with beach nourishment and ensuing human disturbance.

The Service has determined that the proposed project may affect, but is not likely to adversely affect the piping plover provided the inclusion of the following conditions:

1. Piping plover optimal habitat shall be avoided to the maximum extent practicable. Site selection for equipment staging, travel corridors, construction vehicles including all - terrain vehicles and pipeline alignment shall stay just above or just below the primary "wrack" line and swash zone. The water and land-based loading and unloading of equipment, materials, supplies, and personnel shall be limited to the footprint of the staging and storage area, with the exception of the transportation of job-related personnel.

2. The Service and the Florida Fish and Wildlife Conservation Commission (FWC) will meet with the local sponsor to discuss areas within one mile of the north end of Johns Pass and the south end of Clearwater Pass at Sand Key Park where natural accumulation of wrack can remain on the beach year-round. This meeting shall occur prior to the proposed activity.

3. Vehicles including all-Terrain Vehicles (ATVs) traversing the beach, used by beach life-guards, beach maintenance employees, turtle watch volunteers and law enforcement will avoid the soft sand areas in the wrack protection zone and follow the FWC's Beach Driving Best Management Practices: (http://www.myfwc.com/CONSERVATION/ConservationYouLiving_w_Wildlife_BeachDriving.htm). Emergency vehicles shall have full access to the beach including the wrack protection zone.

4. Educational signs will be installed highlighting the importance of beach habitats to wildlife and explaining the importance of the wrack within one mile of the north end of Johns Pass and the south end of Clearwater Pass at Sand Key Park the shoreline. The FWC will provide examples of the information to include on these signs.

Based on the preceding, the Service has determined that the proposed project may affect, but is not likely to adversely affect the piping plover provided that the Corps project plans included the above measures to preserve piping plover foraging and roosting habitat within the project area.

Consultation History

On 15 March 2010, the Service received correspondence from the Corps requesting to abide by the terms and conditions of a biological opinion issued in 2005 for nourishment of Sand Key. The Service denied this request.

On 14 July 2010, the Serviced received a Biological Assessment for the Pinellas County Beach Erosion Control Project.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The applicant proposes to place approximately 1.8 million cubic yards of sand along 8.7 miles of shoreline of the Gulf of Mexico in Pinellas County, Florida, on Sand Key from Clearwater Pass to John's Pass including the Sand Key portion of Clearwater Beach, Belleair Beach, Indian Rocks Beach, Indian Shores, Redington Shores, and North Redington Beach. The sand placement is between the Florida Department of Environmental Protection's (FDEP) reference monuments R-56 to R-66 and R-72 to R-108. A one mile section at Belleair Shore between R-66 and R-72 will not be part of this action. The proposed Borrow Area L is located in Federal Waters approximately 12.8 miles west of Clearwater Pass.

The proposed project would place beach-compatible sand from the offshore borrow area with fill material similar in both coloration and grain size distribution to the existing beach. The fill material will be free of construction debris, rocks, or other foreign matter and will not contain, on average, greater than 10 percent fines (i.e. silt and clay passing the #200 sieve) and will not contain, on average, greater than 5 percent coarse gravel or cobbles, inclusive of shell material (retained by the #4 sieve). The sand will be mechanically extracted by a clamshell dredge, loaded in a scow, or sand barge and transported by tugboats towards the project area beach. The sand will then be pumped through a submerged pipeline to the beach.

Action area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. The Service has determined that the action area for this project is between FDEP Reference Monuments R-56 to R-66 and R-72 to R-108.

Conservation Measures

Sea Turtles

1. FWC and the local sponsor have an agreement to conduct sea turtle monitoring for a minimum of two additional nesting seasons after nourishment event if placed sand remains.

STATUS OF THE SPECIES/CRITICAL HABITAT

The Service has responsibility for implementing recovery of sea turtles when they come ashore to nest. This biological opinion addresses nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) has jurisdiction over sea turtles in the marine environment.

Loggerhead Sea Turtle

The loggerhead sea turtle was federally listed as a threatened species on July 28, 1978 (43 FR 32800). The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans.

The loggerhead sea turtle grows to an average weight of about 200 pounds and is characterized by a large head with blunt jaws. Adults and subadults have a reddish-brown carapace. Scales on the top of the head and top of the flippers are also reddish-brown with yellow on the borders. Hatchlings are a dull brown color (NMFS 2002a). The loggerhead feeds on mollusks, crustaceans, fish, and other marine animals.

The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. It may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas.

Within the Northwest Atlantic, the majority of nesting activity occurs from April through September, with a peak in June and July (Williams-Walls *et al.* 1983, Dodd 1988, Weishampel *et al.* 2006). Nesting occurs within the Northwest Atlantic along the coasts of North America, Central America, northern South America, the Antilles, Bahamas, and Bermuda, but is concentrated in the southeastern U.S. and on the Yucatán Peninsula in Mexico on open beaches or along narrow bays having suitable sand (Sternberg 1981, Ehrhart 1989, Ehrhart *et al.* 2003, NMFS and Service 2008).

No critical habitat has been designated for the loggerhead sea turtle.

Green Sea Turtle

The green sea turtle was federally listed as 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. The green sea turtle has a worldwide distribution in tropical and subtropical waters.

The green sea turtle grows to a maximum size of about 4 feet and a weight of 440 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. The carapace is smooth and colored gray, green, brown and black. Hatchlings are black on top and white on the bottom (NMFS 2002b). Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrasses and marine algae.

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 (NMFS and Service 1991a). Nesting also has been documented along the Gulf coast of Florida from Escambia County through Franklin County in northwest Florida and from Pinellas County through Collier County in southwest Florida (FWC Statewide Nesting Beach Survey 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 nesting reports).

Green sea turtles are generally found in fairly shallow waters (except when migrating) inside reefs, bays, and inlets. The green turtle is attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting.

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was federally listed as endangered on December 2, 1970 (35 FR 18320). The Kemp's ridley, along with the flatback sea turtle (*Natator depressus*), has the most geographically restricted distribution of any sea turtle species. 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.

Adult Kemp's ridleys, considered the smallest marine turtle in the world, weigh an average of 100 pounds with a carapace measuring between 24-28 inches in length. The almost circular carapace has a grayish green color while the plastron is pale yellowish to cream in color. The carapace is often as wide as it is long. Their diet consists mainly of swimming crabs, but may also include fish, jellyfish, and an array of mollusks.

The majority of nesting for the entire species occurs on the primary nesting beach at Rancho Nuevo, Mexico (Marquez-Millan. 1994). Outside of nesting, adult Kemp's ridleys are believed to spend most of their time in the Gulf of Mexico, while juveniles and subadults also regularly occur along the eastern seaboard of the U.S. (Service and NMFS 1992). There have been rare instances when immature ridleys have been documented making transatlantic movements (Service and NMFS 1992). It was originally speculated that Kemp's ridleys that make it out of the Gulf of Mexico might be lost to the breeding population (Hendrickson 1980), but data indicate that many of these turtles are capable of moving back into the Gulf of Mexico (Henwood and Ogren 1987). In fact, there are documented cases of Kemp's ridleys captured in the Atlantic that migrated back to the nesting beach at Rancho Nuevo (Schmid and Witzell 1997, Schmid 1998, Witzell 1998).

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 7.9 inches in length, at which size they enter coastal shallow water habitats (Ogren 1989).

No critical habitat has been designated for the Kemp's ridley sea turtle.

Life history

Loggerhead Sea Turtle

Loggerheads are long-lived, slow-growing animals that use multiple habitats across entire ocean basins throughout their life history. This complex life history encompasses terrestrial, nearshore, and open ocean habitats. The three basic ecosystems in which loggerheads live are the:

1. Terrestrial zone (supralittoral) - the nesting beach where both oviposition (egg laying) and embryonic development and hatching occur.

2. Neritic zone - the inshore marine environment (from the surface to the sea floor) where water depths do not exceed 656 feet . The neritic zone generally includes the continental shelf, but in areas where the continental shelf is very narrow or nonexistent, the neritic zone conventionally extends to areas where water depths are less than 656 feet.

3. Oceanic zone - the vast open ocean environment (from the surface to the sea floor) where water depths are greater than 656 feet.

Maximum intrinsic growth rates of sea turtles are limited by the extremely long duration of the juvenile stage and fecundity. Loggerheads require high survival rates in the juvenile and adult stages, common constraints critical to maintaining long-lived, slow-growing species, to achieve positive or stable long-term population growth (Congdon et al. 1993; Heppell 1998; Crouse 1999; Heppell et al. 1999, 2003; Musick 1999).

The generalized life history of Atlantic loggerheads is shown in Figure 1 (from Bolten 2003).

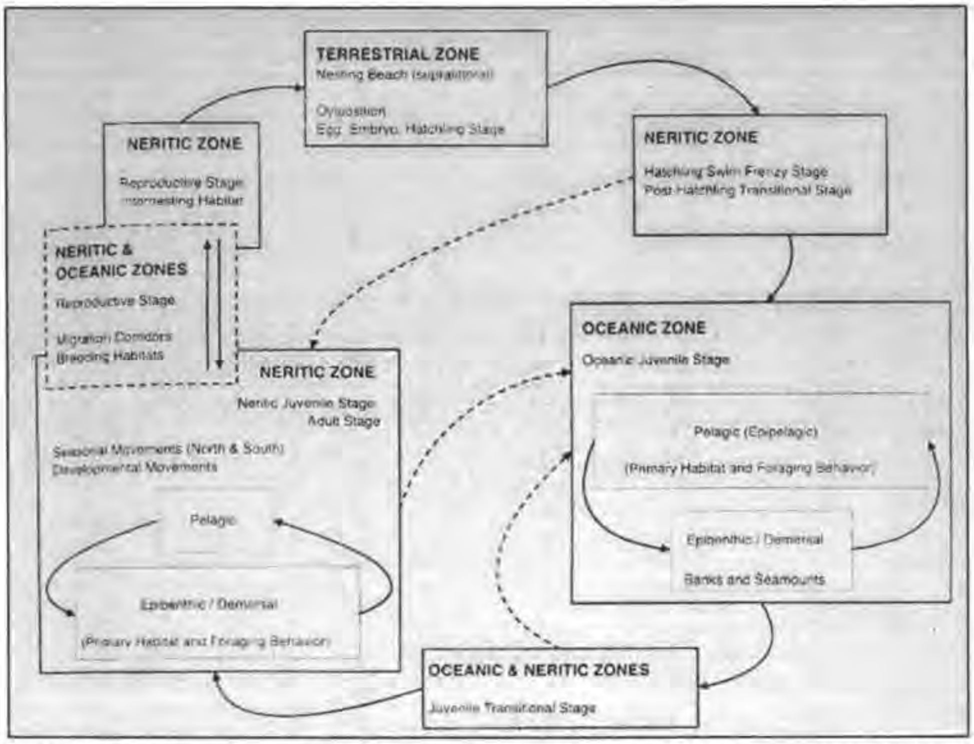


Figure 1. Life history stages of a loggerhead turtle. The boxes represent life stages and the corresponding ecosystems, solid lines represent movements between life stages and ecosystems, and dotted lines are speculative (Bolten 2003).

Numbers of nests and nesting females are often highly variable from year to year due to a number of factors including environmental stochasticity, periodicity in ocean conditions, anthropogenic effects, and density-dependent and density-independent factors affecting survival, somatic growth, and reproduction (Meylan 1982, Hays 2000, Chaloupka 2001, Solow et al. 2002). Despite these sources of variation, and because female turtles exhibit strong nest site fidelity, a nesting beach survey can provide a valuable assessment of changes in the adult female population, provided that the study is sufficiently long and effort and methods are standardized (Meylan 1982, Gerrodette and Brandon 2000, Reina et al. 2002). Table 1 summarizes key life history characteristics for loggerheads nesting in the U.S.

Table 1. Typical values of life history parameters for loggerheads nesting in the U.S. (NMFS and Service 2008).

Life History Trait	Data
Clutch size (mean)	100-126 eggs[1]
Incubation duration (varies depending on time of year and latitude)	Range = 42-75 days[2,3]
Pivotal temperature (incubation temperature that produces an equal number of males and females)	29.0°C[5]
Nest productivity (emerged hatchlings/total eggs) x 100 (varies depending on site specific factors)	45-70percent[2,6]
Clutch frequency (number of nests/female/season)	3-4 nests[7]
Internesting interval (number of days between successive nests within a season)	12-15 days[8]
Juvenile (<87 cm CCL) sex ratio	65-70percent female[4]
Remigration interval (number of years between successive nesting migrations)	2.5-3.7 years[9]
Nesting season	late April-early September
Hatching season	late June-early November
Age at sexual maturity	32-35 years[10]
Life span	>57 years[11]

1 Dodd 1988.
2 Dodd and Mackinnon (1999, 2000, 2001, 2002, 2003, 2004).
3 B. Witherington, FWC, pers. comm. 2006 (information based on nests monitored throughout Florida beaches in 2005, n=865).
4 National Marine Fisheries Service (2001); A. Foley, FWC, pers. comm. 2005.
5 Mrosovsky (1988).
6 B. Witherington, FWC, pers. comm. 2006 (information based on nests monitored throughout Florida beaches in 2005, n=1,680).
7 Murphy and Hopkins (1984); Frazer and Richardson (1985); Ehrhart, unpublished data; Hawkes *et al.* 2005; Scott 2006; Tony Tucker, Mote Marine Laboratory, personal communication, 2008.
8 Caldwell (1962), Dodd (1988).
9 Richardson et al. (1978); Bjorndal et al. (1983); Ehrhart, unpublished data.
10 M. Snover, NMFS, pers. comm. 2005.
11 Dahlen et al. (2000).

Loggerheads nest on ocean beaches and occasionally on estuarine shorelines with suitable sand. Nests are typically laid between the high tide line and the dune front (Routa 1968, Witherington 1986, Hailman and Elowson 1992). Wood and Bjorndal (2000) evaluated four environmental factors (slope, temperature, moisture, and salinity) and found that slope had the greatest influence on loggerhead nest-site selection on a beach in Florida. Loggerheads appear to prefer relatively narrow, steeply sloped, coarse-grained beaches, although nearshore contours may also play a role in nesting beach site selection (Provancha and Ehrhart 1987).

The warmer the sand surrounding the egg chamber, the faster the embryos develop (Mrosovsky and Yntema 1980). Sand temperatures prevailing during the middle third of the incubation period also determine the sex of hatchling sea turtles (Mrosovsky and Yntema 1980). Incubation temperatures near the upper end of the tolerable range produce only female hatchlings while incubation temperatures near the lower end of the tolerable range produce only male hatchlings.

Loggerhead hatchlings pip and escape from their eggs over a 1- to 3-day interval and move upward and out of the nest over a 2- to 4-day interval (Christens 1990). The time from pipping to emergence ranges from 4 to 7 days with an average of 4.1 days (Godfrey and Mrosovsky 1997). Hatchlings emerge from their nests en masse almost exclusively at night, and presumably using decreasing sand temperature as a cue (Hendrickson 1958, Mrosovsky 1968, Witherington et al. 1990). Moran *et al.* (1999) concluded that a lowering of sand temperatures below a critical threshold, which most typically occurs after nightfall, is the most probable trigger for hatchling emergence from a nest. After an initial emergence, there may be secondary emergences on subsequent nights (Carr and Ogren 1960, Witherington 1986, Ernest and Martin 1993, Houghton and Hays 2001).

Hatchlings use a progression of orientation cues to guide their movement from the nest to the marine environments where they spend their early years (Lohmann and Lohmann 2003). Hatchlings first use light cues to find the ocean. On naturally lighted beaches without artificial lighting, ambient light from the open sky creates a relatively bright horizon compared to the dark silhouette of the dune and vegetation landward of the nest. This contrast guides the hatchlings to the ocean (Daniel and Smith 1947, Limpus 1971, Salmon et al. 1992, Witherington 1997, Witherington and Martin 1996, Stewart and Wyneken 2004).

Loggerheads in the Northwest Atlantic display complex population structure based on life history stages. Based on mtDNA, oceanic juveniles show no structure, neritic juveniles show moderate structure, and nesting colonies show strong structure (Bowen *et al.* 2005). In contrast, a survey using microsatellite (nuclear) markers showed no significant population structure among nesting populations (Bowen *et al.* 2005), indicating that while females exhibit strong philopatry, males may provide an avenue of gene flow between nesting colonies in this region.

<u>Green Sea Turtle</u>

Green turtles deposit from one to nine clutches within a nesting season, but the overall average is about 3.3 nests. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997). 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 two, three, four or more years intervene between breeding seasons (NMFS and Service 1991a). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Kemp's Ridley Sea Turtle

Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a small number of Kemp's ridleys nest consistently along the Texas coast (TEWG 1998). In addition, rare nesting events have been reported in Alabama, Florida, Georgia, South Carolina, and North Carolina. Historical information indicates that tens of thousands of ridleys nested near Rancho Nuevo, Mexico, during the late 1940s (Hildebrand 1963). The Kemp's ridley population experienced a devastating decline between the late 1940s and the mid-1980s. The total number of nests per nesting season at Rancho Nuevo remained below 1,000 throughout the 1980s, but gradually began to increase in the 1990s. In 2007, 11,268 nests were documented along the 18.6 miles of coastline patrolled at Rancho Nuevo, and the total number of nests documented for all the monitored beaches in Mexico was 15,032 (Service 2007c). During the 2007 nesting season, an arribada with an estimated 5,000 turtles was recorded at Rancho Nuevo from May 20 to May 23. In addition, 128 nests were recorded during 2007 in the U.S., primarily in Texas.

Population dynamics

Loggerhead Sea Turtle

The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. However, the majority of loggerhead nesting is at the western rims of the Atlantic and Indian Oceans. The most recent reviews show that only two loggerhead nesting beaches have greater than 10,000 females nesting per year (Baldwin et al. 2003, Ehrhart et al. 2003, Kamezaki et al. 2003, Limpus and Limpus 2003, Margaritoulis et al. 2003): South Florida (U.S.) and Masirah (Oman). Those beaches with 1,000 to 9,999 females nesting each year are Georgia through North Carolina (U.S.), Quintana Roo and Yucatán (Mexico), Cape Verde Islands (Cape Verde, eastern Atlantic off Africa), and Western Australia (Australia). Smaller nesting aggregations with 100 to 999 nesting females annually occur in the Northern Gulf of Mexico (U.S.), Dry Tortugas (U.S.), Cay Sal Bank (Bahamas), Sergipe and Northern Bahia (Brazil), Southern Bahia to Rio de Janerio (Brazil), Tongaland (South Africa), Mozambique, Arabian Sea Coast (Oman), Halaniyat Islands (Oman), Cyprus, Peloponnesus (Greece), Island of Zakynthos (Greece), Turkey, Queensland (Australia), and Japan.

The loggerhead is commonly found throughout the North Atlantic including the Gulf of Mexico, the northern Caribbean, the Bahamas archipelago, and eastward to West Africa, the western Mediterranean, and the west coast of Europe.

The major nesting concentrations in the U.S. are found in South Florida. However, loggerheads nest from Texas to Virginia. Total estimated nesting in the U.S. has fluctuated between 49,000 and 90,000 nests per year from 1999-2008 (FWC, unpublished data; GDNR, unpublished data; SCDNR, unpublished data; NCWRC, unpublished data). About 80 percent of loggerhead nesting in the southeast U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties). Adult loggerheads are known to make considerable migrations between foraging areas and nesting beaches (Schroeder et al. 2003, Foley et al. 2008). During non-nesting years, adult females from U.S. beaches are distributed in waters off the eastern U.S. and throughout the Gulf of Mexico, Bahamas, Greater Antilles, and Yucatán.

From a global perspective, the U.S. nesting aggregation is of paramount importance to the survival of the species as is the population that nests on islands in the Arabian Sea off Oman (Ross 1982, Ehrhart 1989). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interaction on foraging grounds and migration routes (E. Possardt, Service, personal communication 2005). The loggerhead nesting aggregations in Oman and the U.S. account for the majority of nesting worldwide.

Green Sea Turtle

About 150 to 3,000 females are estimated to nest on beaches in the continental U.S. annually (FWC 2005). 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 (NMFS and Service 1998a). 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).

Kemp's Ridley Sea Turtle

Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a small number of Kemp's ridleys nest consistently along the Texas coast (TEWG 1998). In addition, rare nesting events have been reported in Alabama, Florida, Georgia, South Carolina, and North Carolina. Historical information indicates that tens of thousands of ridleys nested near Rancho Nuevo, Mexico, during the late 1940s (Hildebrand 1963). The Kemp's ridley population experienced a devastating decline between the late 1940s and the mid-1980s. The total number of nests per nesting season at Rancho Nuevo remained below 1,000 throughout the 1980s, but gradually began to increase in the 1990s. In 2007, 11,268 nests were documented along the 18.6 miles of coastline patrolled at Rancho Nuevo, and the total number of nests documented for all the monitored beaches in Mexico was 15,032 (Service 2007c). During the 2007 nesting season, an arribada with an estimated 5,000 turtles was recorded at Rancho Nuevo from May 20 to May 23. In addition, 128 nests were recorded during 2007 in the U.S., primarily in Texas.

Status and Distribution

Loggerhead Sea turtle

Five recovery units (subpopulations) have been identified in the Northwest Atlantic based on genetic differences and a combination of geographic distribution of nesting densities and geographic separation (NMFS and Service 2008):

1. Northern Recovery Unit (NRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through southern Virginia (the northern extent of the nesting range).

2. Peninsula Florida Recovery Unit (PFRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through Pinellas County on the west coast of Florida, excluding the islands west of Key West, Florida.

3. Dry Tortugas Recovery Unit (DTRU) - defined as loggerheads originating from nesting beaches throughout the islands located west of Key West, Florida.

4. Northern Gulf of Mexico Recovery Unit (NGMRU) - defined as loggerheads originating from nesting beaches from Franklin County on the northwest Gulf coast of Florida through Texas.

5. Greater Caribbean Recovery Unit (GCRU) - composed of loggerheads originating from all other nesting assemblages within the Greater Caribbean (Mexico through French Guiana, The Bahamas, Lesser Antilles, and Greater Antilles).

Figure 2. Map of the distribution of the loggerhead recovery units.

Mitochondrial DNA analyses show that there is limited exchange of females among these recovery units (Ehrhart 1989; Foote et al. 2000; Hawkes et al. 2005; J. Richardson, personal communication cited in NMFS 2001). Based on the number of haplotypes, the highest level of loggerhead mtDNA genetic diversity in the Northwest Atlantic has been observed in females of the Greater Caribbean Recovery Unit that nest at Quintana Roo, Mexico (Encalada et al. 1999; Nielsen et al. in press).

Nuclear DNA analyses show that there are no substantial subdivisions across the loggerhead nesting colonies in the southeastern United States. Male-mediated gene flow appears to be keeping the subpopulations genetically similar on a nuclear DNA level (Francisco-Pearce 2001).

Historically, the literature has suggested that the northern U.S. nesting beaches (NRU and NGMRU) produce a relatively high percentage of males and the more southern nesting beaches (PFRU, DTRU, and GCRU) a relatively high percentage of females (e.g., Hanson et al. 1998; NMFS 2001; Mrosovsky and Provancha 1989). The NRU and NGMRU were believed to play an important role in providing males to mate with females from the more female-dominated subpopulations to the south. However, in 2002 and 2003, researchers studied loggerhead sex ratios for two of the U.S. nesting subpopulations, the northern and southern subpopulations (NGU and PFRU, respectively) (Blair 2005; Wyneken et al. 2005). The study produced interesting results. In 2002, the northern beaches produced more females and the southern beaches produced more males than previously believed. However, the opposite was true in 2003 with the northern beaches producing more males and the southern beaches producing more females in keeping with prior literature. Wyneken et al. (2005) speculated that the 2002 result may have been anomalous; however, the study did point out the potential for males to be produced on the southern beaches. Although this study revealed that more males may be produced on southern recovery unit beaches than previously believed, the Service maintains that the NRU and NGMRU play an important role in the production of males to mate with females from the more southern recovery units.

The NRU is the second largest loggerhead nesting aggregation in the Northwest Atlantic. Annual nest totals from northern beaches averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (Georgia Department of Natural Resources, unpublished data; North Carolina Wildlife Resources Commission, unpublished data, South Carolina Department of Natural Resources, unpublished data), representing approximately 1,272 nesting females per year (4.1 nests per female, Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3percent annually. Nest totals from aerial surveys conducted by the South Carolina Department of Natural Resources showed a 1.9percent annual decline in nesting in South Carolina since 1980. Overall, there is strong statistical data to suggest the NRU has experienced a long-term decline.

The PFRU is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census of the PFRU undertaken from 1989 to 2007 reveals a mean of 64,513 loggerhead nests per year representing approximately 15,735 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (Commission, unpublished data). This near-complete census provides the best statewide estimate of total abundance, but because of variable survey effort, these numbers cannot be used to assess trends. Loggerhead nesting trends are best assessed using standardized nest counts made at Index Nesting Beach Survey (INBS) sites surveyed with constant effort over time. An analysis of these data has shown a decline in nesting from 1989-2008 (Witherington et al. 2009). The analysis that reveals this decline uses nest-count data from 345 representative Atlantic-coast index zones (total length = 301 km) and 23 representative zones on Florida's southern Gulf coast (total length = 23 km). The spatial and temporal coverage (annually, 109 days and 368 zones) accounted for an average of 70 percent of statewide loggerhead nesting activity between 1989 and 2008. Negative binomial regression models that fit restricted cubic spline curves to aggregated nest-counts were used in trend evaluations. Results of the analysis indicated that there had been a decrease of 26 percent over the 20-year period and a 41 percent decline since 1998. The mean annual rate of decline for the 20-year period was 1.6 percent.

The NGMRU is the third largest nesting assemblage among the four U.S. recovery units. Nesting surveys conducted on approximately 300 km of beach within the NGMRU (Alabama and Florida only) were undertaken between 1995 and 2007 (statewide surveys in Alabama began in 2002). The mean nest count during this 13-year period was 906 nests per year, which equates to about 221 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC, unpublished data). Evaluation of long-term nesting trends for the NGMRU is difficult because of changed and expanded beach coverage. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. There are 12 years (1997-2008) of Florida INBS data for the NGMRU (Commission, unpublished data). A log-linear regression showed a significant declining trend of 4.7 percent annually.

The DTRU, located west of the Florida Keys, is the smallest of the identified recovery units. A near-complete nest census of the DTRU undertaken from 1995 to 2004, excluding 2002, (9 years surveyed) reveals a mean of 246 nests per year, which equates to about 60 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (Commission, unpublished data). Surveys after 2004 did not include principal nesting beaches within the recovery unit (i.e., Dry Tortugas National Park). The nesting trend data for the DTRU are from beaches that are not part of the INBS program but are part of the Statewide Nesting Beach Survey (SNBS) program. There are 9 years of data for this recovery unit. A simple linear regression accounting for temporal autocorrelation revealed no trend in nesting numbers. Because of the annual variability in nest totals, a longer time series is needed to detect a trend.

The GCRU is composed of all other nesting assemblages of loggerheads within the Greater Caribbean. Statistically valid analyses of long-term nesting trends for the entire GCRU are not available because there are few long-term standardized nesting surveys representative of the region. Additionally, changing survey effort at monitored beaches and scattered and low-level nesting by loggerheads at many locations currently precludes comprehensive analyses. The most complete data are from Quintana Roo and Yucatán, Mexico, where an increasing trend was reported over a 15-year period from 1987-2001 (Zurita et al. 2003). However, since 2001, nesting has declined and the previously reported increasing trend appears not to have been sustained (Julio Zurita, personal communcation, 2006). Other smaller nesting populations have experienced declines over the past few decades (e.g., Amorocho 2003).

Recovery Criteria

DEMOGRAPHIC RECOVERY CRITERIA:

1. Number of Nests and Number of Nesting Females
   a. Northern Recovery Unit
      (1) There is statistical confidence (95percent) that the annual rate of increase over a generation time of 50 years is 2percent or greater resulting in a total annual number of nests of 14,000 or greater for this recovery unit (approximate distribution of nests is NC=14percent [2,000], SC=66percent [9,200], and GA=20percent [2,800]).
      (2) This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

b. Peninsular Florida Recovery Unit

(1) There is statistical confidence (95percent) that the annual rate of increase over a generation time of 50 years is statistically detectable (1percent) resulting in a total annual number of nests of 106,100 or greater for this recovery unit.

(2) This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

c. Dry Tortugas Recovery Unit

(1) There is statistical confidence (95percent) that the annual rate of increase over a generation time of 50 years is 3percent or greater resulting in a total annual number of nests of 1,100 or greater for this recovery unit.

(2) This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

d. Northern Gulf of Mexico Recovery Unit

(1) There is statistical confidence (95percent) that the annual rate of increase over a generation time of 50 years is 3percent or greater resulting in a total annual number of nests of 4,000 or greater for this recovery unit (approximate distribution of nests (2002-2007) is FL= 92percent [3,700] and AL=8percent [300]).

(2) This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

e. Greater Caribbean Recovery Unit

(1) The total annual number of nests at a minimum of three nesting assemblages, averaging greater than 100 nests annually (e.g., Yucatán, Mexico; Cay Sal Bank, The Bahamas) has increased over a generation time of 50 years.

(2) This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

2. <u>Trends in Abundance on Foraging Grounds</u>

A network of in-water sites, oceanic and neritic, distributed across the foraging range is established and monitoring is implemented to measure abundance. There is statistical confidence (95percent) that a composite estimate of relative abundance from these sites is increasing for at least one generation.

3. <u>Trends in Neritic Strandings Relative to In-water Abundance</u>

Stranding trends are not increasing at a rate greater than the trends in in-water relative abundance for similar age classes for at least one generation.

LISTING FACTOR RECOVERY CRITERIA:

1. **Present or Threatened Destruction, Modification, or Curtailment of a Species Habitat or Range**
   - a. **Terrestrial**
     - (1) Beach armoring, shoreline stabilization structures, and all other barriers to nesting are categorized and inventoried for areas under U.S. jurisdiction. A peer-reviewed strategy is developed and implemented to ensure that the percentage of nesting beach free of barriers to nesting is stable or increasing relative to baseline levels.
     - (2) Beach sand placement projects conducted in areas under U.S. jurisdiction are in compliance with state and FWS criteria and are conducted in a manner that accommodates loggerhead needs and does not degrade or eliminate nesting habitat.
     - (3) At least 982 miles of loggerhead nesting beaches and adjacent uplands (current amount as identified in Appendix 4) under U.S. jurisdiction are maintained within conservation lands in public (Federal, state, or local) or private (NGO and private conservation lands) ownership that are managed in a manner compatible with sea turtle nesting.
     - (4) A peer-reviewed model is developed that describes the effects of sea level rise on loggerhead nesting beaches, and steps have been taken to mitigate such effects.
     - (5) Nesting beaches outside U.S. jurisdiction are managed for compatibility with loggerhead nesting.
   - b. **Marine (estuarine, neritic, and oceanic)**

     A peer-reviewed, comprehensive strategy is developed and implemented to identify, prioritize, and protect marine habitats (e.g., feeding, migratory, inter-nesting) important to loggerheads.

2. **Overutilization for Commercial, Recreational, Scientific, or Educational Purposes**
   - a. Legal harvest (both commercial and subsistence) in the Caribbean, Atlantic, and Mediterranean is identified and quantified. A strategy is developed and implemented to eliminate legal harvest through international agreements.
   - b. A scientifically based nest management plan outlining strategies for protecting nests (under U.S. jurisdiction) from natural and manmade impacts is developed and implemented.

3. **Disease or Predation**
   - a. Ecologically sound predator control programs are implemented to ensure that the annual rate of mammalian predation on nests (under U.S. jurisdiction) is 10percent or below within each recovery unit based on standardized surveys.
   - b. A peer-reviewed strategy is developed to recognize, respond to, and investigate mass/unusual mortality or disease events.

4. **Inadequacy of Existing Regulatory Mechanisms**

a. Light management plans, which meet minimum standards identified in the Florida Model Lighting Ordinance (Florida Administrative Code Rule 62B-55), are developed, fully implemented, and effectively enforced on nesting beaches under U.S. jurisdiction. Annual percentage of total nests with hatchlings disoriented or misoriented by artificial lighting does not exceed 10percent based on standardized surveys.
b. Specific and comprehensive Federal legislation is developed, promulgated, implemented, and enforced to ensure long-term (including post-delisting) protection of loggerheads and their terrestrial and marine habitats, including protection from fishery interactions.
c. State and local legislation is developed and/or maintained, promulgated, implemented, and enforced to ensure long-term (including post-delisting) protection of loggerheads and their terrestrial and marine habitats, including protection from fishery interactions.
d. Foreign nations with significant loggerhead foraging or migratory habitat have implemented national legislation and have acceded to international and multi-lateral agreements to ensure long-term protection of loggerheads and their habitats. Nations that have important foraging or migratory habitat include Canada, Mexico, Cuba, The Bahamas, Turks and Caicos Islands, Nicaragua, Panama, Colombia, Spain, Portugal, Morocco, and Cape Verde Islands.
e. Nations that conduct activities affecting loggerheads in foraging or migratory habitats in the North Atlantic Basin and the western Mediterranean have implemented national legislation and have acceded to international and multi-lateral agreements to ensure long-term protection of loggerheads and their habitats throughout the high seas and in foreign EEZs.

5. <u>Other Natural or Manmade Factors Affecting Its Continued Existence</u>

a. A peer-reviewed strategy is developed and fully implemented to minimize fishery interactions and mortality for each domestic commercial fishing gear type that has loggerhead bycatch.
b. A peer-reviewed strategy is developed and fully implemented in cooperation with relevant nations to minimize fishery interactions and mortality of loggerheads in foreign EEZs and on the high seas.
c. A peer-reviewed strategy is developed and fully implemented to quantify, monitor, and minimize effects of trophic changes on loggerheads (e.g., diet, growth rate, fecundity) from fishery harvests and habitat alterations.
d. A peer-reviewed strategy is developed and fully implemented to quantify, monitor, and minimize the effects of marine debris ingestion and entanglement in U.S. territorial waters, the U.S. EEZ, foreign EEZs, and the high seas.
e. A peer-reviewed strategy is developed and fully implemented to minimize vessel strike mortality in U.S. territorial waters and the U.S. EEZ.

Green Turtle

Nesting data collected as part of the Florida SNBS program (2000-2006) show that a mean of approximately 5,600 nests are laid each year in Florida. Nesting occurs in 26 counties with a peak along the east coast, from Volusia through Broward Counties. The green turtle nesting population of Florida (Florida green turtle) is increasing based on 19 years (1989-2007) of INBS data from throughout the state. The increase in nesting in Florida is likely a result of several factors, including: (1) a Florida statute enacted in the early 1970s that prohibited the killing of green turtles in Florida; (2) the species listing under the ESA in 1973, affording complete protection to eggs, juveniles, and adults in all U.S. waters; (3) the passage of Florida's constitutional net ban amendment in 1994 and its subsequent enactment, making it illegal to use any gillnets or other entangling nets in state waters; (4) the likelihood that the majority of Florida adult green turtles reside within Florida waters where they are fully protected; (5) the protections afforded Florida green turtles while they inhabit the waters of other nations that have enacted strong sea turtle conservation measures (e.g., Bermuda); and (6) the listing of the species on Appendix I of Convention on International Trade of Endangered Species (CITES), which stopped international trade and reduced incentives for illegal trade from the U.S.

Recovery Criteria

The U.S. Atlantic population of green sea turtles can be considered for delisting when, over a period of 25 years the following conditions are met:

1. The level of nesting in Florida has increased to an average of 5,000 nests per year for at least six years. Nesting data shall be based on standardized surveys.

2. At least 25 percent (65 miles) of all available nesting beaches (260 miles) are in public ownership and encompass at least 50 percent of the nesting activity.

3. A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The current "Recovery Plan for the U.S. Population of Atlantic Green Turtle (Chelonia mydas)" was completed in 1991, the Recovery Plan for U.S. Pacific Populations of the Green Turtle (Chelonia mydas)" was completed in 1998, and the "Recovery Plan for U.S. Pacific Populations of the East Pacific Green Turtle (Chelonia mydas)" was completed in 1998. The recovery criteria contained in the plans, while not strictly adhering to all elements of the Recovery Planning Guidelines (Service and NMFS), are a viable measure of the species status.

Kemp's Ridley Sea Turtle

Today, under strict protection, the population appears to be in the early stages of recovery. The recent nesting increase can be attributed to full protection of nesting females and their nests in Mexico resulting from a binational effort between Mexico and the U.S. to prevent the extinction of the Kemp's ridley, and the requirement to use Turtle Excluder Devices (TEDs) in shrimp trawls both in the U.S. and Mexico.

The Mexico government also prohibits harvesting and is working to increase the population through more intensive law enforcement, by fencing nest areas to diminish natural predation, and by relocating most nests into corrals to prevent poaching and predation. While relocation of nests into corrals is currently a necessary management measure, this relocation and concentration of eggs into a "safe" area is of concern since it makes the eggs more susceptible to reduced viability.

Recovery Criteria

The goal of the recovery plan is for the species to be reduced from endangered to threatened status. The Recovery Team members feel that the criteria for a complete removal of this species from the endangered species list need not be considered now, but rather left for future revisions of the plan. Complete removal from the federal list would certainly necessitate that some other instrument of protection, similar to the Marine Mammal Protection Act, be in place and be international in scope. Kemp's ridley can be considered for reclassification to threatened status when the following four criteria are met:

1. Protection of the known nesting habitat and the water adjacent to the nesting beach (concentrating on the Rancho Nuevo area) and continuation of the bi-national project;

2. Elimination mortality of incidental catch from commercial shrimping in the U.S. and Mexico through the use of TEDs and full compliance with the regulations requiring TED use;

3. Attainment of a population of at least 10,000 females nesting in a season; and

4. All priority one recovery tasks in the recovery plan are successfully implemented.

The current Recovery Plan for the Kemp's ridley sea turtle was implemented in 1992 (Service and NMFS 1992). Significant new information on the biology and population status of Kemp's ridley has become available since 1992. Consequently, a full revision of the recovery plan has been undertaken by the Service and NMFS and is nearing completion. The revised plan will provide updated species biology and population status information, objective and measurable recovery criteria, and updated and prioritized recovery actions. The Service and NMFS completed a five-year status review of the Kemp's ridley sea turtle in August 2007 (NMFS and Service 2007a). Recommendations provided in the five-year review focused on the protection of the species both in the water (enforcement of TED use) and on land (nesting habitat).

Common threats to sea turtles in Florida

Anthropogenic (human) factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion, armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs, and an increased presence of native species (*e.g.*, raccoons, armadillos, and opossums), which raid and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the western North Atlantic coast, other areas along these coasts have limited or no protection.

Anthropogenic threats in the marine environment include oil and gas exploration and transportation; marine pollution; underwater explosions; hopper dredging, offshore artificial lighting; power plant entrainment and/or impingement; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; poaching and fishery interactions. On April 20, 2010, an explosion and fire on the Mobile Offshore Drilling Unit Deepwater Horizon MC252 occurred approximately 50 miles southeast of the Mississippi Delta. A broken well head at the sea floor resulted in a sustained release of oil, estimated at 35,000 and 60,000 barrels per day. On July 15, the valves on the cap were closed, which effectively shut in the well and all sub-sea containment systems. Damage assessment from the sustained release of oil is currently ongoing and the Service does not have a basis at the present time to predict the complete scope of effects to the species range-wide.

Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor, particularly for green turtles. This disease 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.

Climate change is evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level, according to the Intergovernmental Panel on Climate Change Report (IPCC 2007a). The IPCC Report (2007) describes changes in natural ecosystems with potential wide-spread effects on many organisms, including marine mammals and migratory birds. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the Department of the Interior

(DOI) requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2007).

Temperatures are predicted to rise from 2°C to 5°C for North America by the end of this century (IPCC 2007a, b). Other processes to be affected by this projected warming include rainfall (amount, seasonal timing and distribution), storms (frequency and intensity), and sea level rise.

Climatic changes in Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management. Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006). As the level of information increases concerning the effects of global climate change on sea turtles, the Service will have a better basis to address the nature and magnitude of this potential threat and will more effectively evaluate these effects to the range-wide status of sea turtles.

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, 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 United States; therefore, the proposed action would not result in an adverse modification.

ENVIRONMENTAL BASELINE

Status of the species within the action area

Loggerhead Sea Turtle

The loggerhead sea turtle nesting and hatching season for Southern Gulf of Mexico beaches extends from April 1 through November 30. Incubation ranges from about 45 to 95 days.

The Sand Key project area has a significant number of loggerhead nests. The project lies within the Middle Pinellas County Beaches and North Pinellas County Beaches area. Between 14 and 78 loggerhead sea turtle nests were deposited annually on Middle Pinellas County Beaches and North Pinellas County Beaches from 2005 through 2009.

Green Sea Turtle

The green sea turtle nesting and hatching season for Southern Gulf of Mexico beaches extends from May 15 through October 31. Incubation ranges from about 45 to 75 days.

The Sand Key project lies within the Middle Pinellas County Beaches and North Pinellas County Beaches area. No green sea turtle nests were laid from 2005 through 2009 on Middle Pinellas County Beaches and North Pinellas County Beaches. One green sea turtle nest was laid in 2000 in this area.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle nesting and hatching season for Southern Gulf of Mexico beaches extends from April through August. Incubation ranges from about 45 to 58 days.

The Sand Key project lies within the Middle Pinellas County Beaches and North Pinellas County Beaches area. No Kemp's ridley sea turtle nests were laid from 2005 through 2009 on Middle Pinellas County Beaches and North Pinellas County Beaches. Two Kemp's ridley sea turtle nests were laid in 2002 in this area.

Factors affecting the species environment within the action area

Coastal Development

Loss of nesting habitat related to coastal development has had the greatest impact on nesting sea turtles in Florida. Beachfront development not only causes the loss of suitable nesting habitat, but can result in the disruption of powerful coastal processes accelerating erosion and interrupting the natural shoreline migration (National Research Council 1990a). This may in turn cause the need to protect upland structures and infrastructure by armoring, groin placement, beach emergency berm construction and repair, and beach nourishment which cause changes in, additional loss or impact to the remaining sea turtle habitat.

Hurricanes

Hurricanes were probably responsible for maintaining coastal beach habitat upon which sea turtles depend through repeated cycles of destruction, alteration, and recovery of beach and dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain and can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes and other storms can result in the direct or indirect loss of sea turtle nests, either by erosion or washing away of the nests by wave action or inundation or "drowning" of the eggs or hatchlings developing within the nest or indirectly by loss of nesting habitat. Depending on their frequency, storms can affect sea turtles on either a short-term basis (nests lost for one season and/or temporary loss of nesting habitat) or long term, if frequent (habitat unable to recover). How hurricanes affect sea turtle nesting also depends on its characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining nesting habitat, frequent or successive severe weather events could threaten the ability of certain sea turtle populations to survive and recover. Sea turtles evolved under natural coastal environmental events such as hurricanes. The extensive amount of pre-development coastal beach and dune habitat allowed sea turtles to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to sea turtle survival and recovery. On developed beaches, typically little space remains for sandy beaches to become re-established after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their pre-storm locations can result in a major loss of nesting habitat.

Erosion

The designation of a Critically Eroded Beach is a planning requirement of the State's Beach Erosion Control Funding Assistance Program. A segment of beach shall first be designated as critically eroded in order to be eligible for State funding. A critically eroded area is a segment of the shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critically eroded areas may also include peripheral segments or gaps between identified critically eroded areas which, although they may be stable or be slightly eroded now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects (FDEP 2005). It is important to note, that for an erosion problem area to be critical, there shall exist a threat to or loss of one of four specific interests – upland development, recreation, wildlife habitat, or important cultural resources. The total of critically eroded beaches statewide in Florida for 2007 is 388 miles of 497 miles of shoreline. Seventy-eight percent of the State's shoreline is considered to be critically eroded.

Beachfront Lighting

Artificial beachfront lighting may cause disorientation (loss of bearings) and misorientation (incorrect orientation) of sea turtle hatchlings. Visual signs are the primary sea-finding mechanism for hatchlings (Mrosovsky and Carr 1967; Mrosovsky and Shettleworth 1968; Dickerson and Nelson 1989; Witherington and Bjorndal 1991). Artificial beachfront lighting is a documented cause of hatchling disorientation and misorientation on nesting beaches (Mann 1977; FWC 2006). The emergence from the nest and crawl to the sea is one of the most critical periods of a sea turtle's life. Hatchlings that do not make it to the sea quickly become food for ghost crabs, birds, and other predators or become dehydrated and may never reach the sea. Some types of beachfront lighting attract hatchlings away from the sea while some lights cause adult turtles to avoid stretches of brightly illuminated beach. Research has documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992). During the 2007 sea turtle nesting season in Florida, over 64,000 turtle hatchlings were documented as being disoriented **(Table 2)** (FWC/FWRI 2007, http://www.myfwc.com/seaturtle/Lighting/Light_Disorient.htm). Exterior and interior lighting associated with condominiums had the greatest impact causing approximately 42 percent of documented hatchling disorientation/misorientation. Other causes included urban sky glow and street lights (http://www.myfwc.com/seaturtle/Lighting/Light_Disorient.htm)

Table 2. Documented Disorientations along the Florida coast.

Year	Total Number of Hatchling Disorientation Events	Total Number of Hatchlings Involved in Disorientation Events	Total Number of Adult Disorientation Events
2001	743	28,674	19
2002	896	43,226	37
2003	1,446	79,357	18
2004	888	46,487	24
2005	976	41,521	50
2006	1,521	71,798	40
2007	1,410	64,433	25
2008	1192	49,623	62
2009	1274	44,828	41

Predation

Depredation of sea turtle eggs and hatchlings by natural and introduced species occurs on almost all nesting beaches. Depredation by a variety of predators can considerably decrease sea turtle nest hatching success. The most common predators in the southeastern United States are ghost crabs (*Ocypode quadrata*), raccoons (*Procyon lotor*), feral hogs (*Sus scrofa*), foxes (*Urocyon cinereoargenteus* and *Vulpes vulpes*), coyotes (*Canis latrans*), armadillos (*Dasypus novemcinctus*), cats (*Felis catus)*, and fire ants (*Solenopsis* spp.) (Dodd 1988, Stancyk 1995). Raccoons are particularly destructive on the Atlantic coast and may take up to 96 percent of all nests deposited on a beach (Davis and Whiting 1977, Hopkins and Murphy 1980, Stancyk et al. 1980, Talbert et al. 1980, Schroeder 1981, Labisky et al. 1986). As nesting habitat dwindles, it is essential that nest production be naturally maximized so the turtles may continue to exist in the wild.

In response to increasing depredation of sea turtle nests by coyote, fox, hog, and raccoon, multi-agency cooperative efforts have been initiated and are ongoing throughout Florida, particularly on public lands.

Climate Change

Based on the present level of available information concerning the effects of global climate change on the status of sea turtles, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting sea turtles or its designated critical habitat. Nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

EFFECTS OF THE ACTION

This section is an analysis of the beneficial, direct, and indirect effects of the proposed actions on nesting sea turtles, nests, eggs, and hatchling sea turtles within the Action Area. The analysis includes effects interrelated and interdependent of the project activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed activity. An interdependent activity is an activity that has no independent utility apart from the action.

Factors to be considered

The proposed projects will occur within habitat that is used by sea turtles for nesting and may be constructed during a portion of the sea turtle nesting season. Long-term and permanent impacts could include a change in the nest incubation environment from the restoration/nourishment material. Short-term and temporary impacts to sea turtle nesting activities could result from project work occurring on the nesting beach during the active nesting or hatching period, changes in the physical characteristics of the beach from the placement of the beach restoration/nourishment material and change in the nest incubation environment from the material.

Proximity of action: Sand placement activities would occur within and adjacent to nesting habitat for sea turtles and dune habitats that ensure the stability and integrity of the nesting beach. Specifically, the project would potentially impact loggerhead and green nesting females, their nests, and hatchling sea turtles.

Distribution: Sand placement activities that may impact nesting and hatchling sea turtles and sea turtle nests would occur along Gulf of Mexico and Atlantic Ocean coasts.

Timing: The timing of the sand placement activities could directly and indirectly impact nesting females, their nests, and hatchling sea turtles when conducted between March 1 and November 30.

Nature of the effect: The effects of the sand placement activities may change the nesting behavior of adult female sea turtles or diminish the nesting or nest success, change the behavior of hatchling sea turtles resulting in nests or hatching events being missed during the daily survey of the Action Area. Sand placement can also change the incubation conditions within the nest. Any decrease in productivity and/or survival rates would contribute to the vulnerability of the sea turtles nesting in Florida.

Duration: The sand placement activity may be a one-time activity or a multiple-year activity and each sand placement project may take between 3 and 7 months to complete. Thus, the direct effects would be expected to be short-term in duration. Indirect effects from the activity may continue to impact nesting and hatchling sea turtles and sea turtle nests in subsequent nesting seasons.

Disturbance frequency: Sea turtle populations in Florida may experience decreased nesting success, hatching success and hatchling emerging success that could result from the sand placement activities being conducted at night during one nesting season or during the earlier or latter parts of two nesting seasons.

Disturbance intensity and severity: Depending on the need (including post-disaster work) and the timing of the sand placement activities during sea turtle nesting season, effects to the sea turtle populations of Florida, and potentially the U.S. populations, could be important.

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 if the placed sand is highly 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 benefit sea turtles more than an eroding beach it replaces.

Adverse Effects

Through many years of research, it has been documented that beach nourishment can have adverse effects on nesting female sea turtles and hatchlings. Results of monitoring sea turtle nesting and beach nourishment activities provide additional information on how sea turtles respond to nourished beaches, minimization measures, and other factors that influence nesting, hatching, and emerging success. Science-based information on sea turtle nesting biology and review of empirical data on beach nourishment monitoring is used to manage beach nourishment activities to eliminate or reduce impacts to nesting and hatchling sea turtles and sea turtle nests so that beach nourishment can be accomplished (**Table 3**). Measures can be incorporated pre-, during, and post-construction to reduce impacts to sea turtles. Because of the long history of sea turtle monitoring in Florida, it is not necessary to require studies on each project beach to document those effects each time.

Table 3. Effects of beach nourishment on sea turtles and minimization measures.

FACTOR	DURING CONSTRUCTION	POST CONSTRUCTION	SEA TURTLE BEHAVIOR	MINIMIZATION		
				PRE	DURING	POST
Barriers - physical and visual	Low nesting success	Abort nesting	Shift nests seaward, abort nesting Barrier to hatching		Equipment stored off the beach at night, project timing outside nesting season in high density nesting areas (Broward to Brevard)	Remove equipment from the beach after project is completed.
Nest relocation	Lower hatching and emergency success		Shift nests seaward	Design	Implement	Reconfigure Natural reworking
Construction lighting	Nest site selection and Disorientation.		Shift nests seaward Misorientation landward rather than seaward	Design	Implement	Reconfigure Natural reworking
Profile		Escarpments Nest site selection Hatchling orientation	Shift nests seaward Misorientation landward rather than seaward	Design	Implement	Reconfigure Natural reworking
Elevation		Nest site selection, Unnatural profile, Disorientation.	Shift nests seaward	Design	Implement	Natural reworking
Barriers - physical and visual		Escarpments	Abort nesting	Design	Implement	Reconfigure Natural reworking
Substrate		Compaction Cementation Color	Abort nesting Barrier to hatching	Material quality	QA/QC Plan Limit	Tilling Removal of unsuitable

			Change in incubation length/sex ratio		equipment driving over beach fill	material
Lights		Landward development	Confusion of nesting females, Dis- and mis-orientation of hatchlings	Install Wildlife Lighting	Stop gap, lights off during times of nest hatching	Install Wildlife Lighting

Direct Effects

Direct effects are those direct or immediate effects of a project on the species or its habitat. 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).

1. *Nest relocation*

Besides the potential for missing nests during surveys and a nest relocation program, there is a potential for eggs to be damaged by nest movement or relocation, 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 nests in their original location, Moody (1998) found that hatching success was lower in relocated nests at 9 of 12 beaches evaluated. In addition, emergence success was lower in relocated nests at 10 of 12 beaches surveyed in 1993 and 1994. Many of the direct effects of beach nourishment may persist over time. These direct 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, repair/replacement of groins and jetties and future sand migration.

2. *Equipment*

Heavy machinery on beach:
The use of heavy machinery on beaches during a construction project may also have adverse effects on sea turtles. Equipment left on the nesting beach overnight 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.

Driving on the beach for the project:
The operation of motor vehicles or equipment on the beach to complete the project work at night affects sea turtle nesting by: interrupting or colliding with a female turtle on the beach; headlights disorienting or misorienting emergent hatchlings; vehicles running over hatchlings attempting to reach the ocean; and vehicle tracks traversing the beach interfering with hatchlings crawling to the ocean. Apparently, hatchlings become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier et al. 1981). Driving directly above or over incubating egg clutches or on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success and directly killing pre-emergent hatchlings (Mann 1977; Nelson and Dickerson 1987; Nelson 1988).

Depending on when the dune project is completed dune vegetation may have become established in the vicinity of dune restoration sites. The physical changes and loss of plant cover caused by vehicles on vegetated areas or dunes can lead to various degrees of instability and cause dune migration. As vehicles move over the sand, sand is displaced downward, lowering the substrate. Since the vehicles also inhibit plant growth, and open the area to wind erosion, the beach and dunes may become unstable. Vehicular traffic on the beach or through dune breaches or low dunes may cause acceleration of overwash and erosion (Godfrey et al. 1978). Driving along the beachfront should be between the low and high tide water lines. To minimize the impacts to the beach and recovering dunes, transport and access to the dune restoration sites should be from the road. However, if the work needs to be conducted from the beach, the areas for the truck transport and bulldozer/bobcat equipment to work in should be designated and marked.

3. *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; 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; 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.

The newly created wider and flatter beach berm exposes sea turtles and their nests to lights that were less visible, or not visible, from nesting areas before the beach nourishment leading to a higher mortality of hatchlings. Review of over 10 years of empirical information from beach nourishment projects indicates that the number of sea turtles impacted by lights increases on the post-construction berm. A review of a selected nourished beaches in Florida (South Brevard, North Brevard, Captiva Island, Ocean Ridge, Boca Raton, Town of Palm Beach, Longboat Key, and Bonita Beach) indicated disorientation reporting increased by approximately 300 percent ($\pm$ 282 std. dev.) the first nesting season after project construction and up to 542 percent (+ 872 std. dev.) the second year compared to pre-nourishment reports (Trindell et al. 2005).

Specific examples of increased lighting disorientations after a beach nourishment project include Brevard and Palm Beach counties, Florida. A nourishment project in Brevard County, completed in 2002, showed an increase of 130 percent in disorientations in the nourished area. Disorientations on beaches in the County that were not nourished remained constant (R. Trindell, FWC, personal communication 2007). This same result was also documented in 2003 when another beach in Brevard County was nourished and the disorientations increased by 480 percent (R. Trindell, FWC, personal communication 2007). Installing appropriate beachfront lighting is the most effective method to decrease the number of disorientations on any developed beach including nourished beaches.

A shoreline protection project was constructed at Ocean Ridge in Palm Beach County, Florida between August 1997 and April 1998. Lighting disorientation events increased after nourishment. In spite of continued aggressive efforts to identify and correct lighting violations in 1998 and 1999, 86 percent of the disorientation reports were in the nourished area in 1998 and 66percent of the reports were in the nourished area in 1999 (Howard and Davis 1999).

While the effects of artificial lighting have not been specifically studied on each beach that is nourished in Florida, based on the experience of increased artificial lighting disorientations on other Florida beaches, impacts are expected to potentially occur on all nourished beaches statewide.

Changing to sea turtle compatible lighting can be easily accomplished at the local level through voluntary compliance or by adopting appropriate regulations. Of the 27 coastal counties in Florida where sea turtles are known to nest, 19 have passed beachfront lighting ordinances in addition to 58 municipalities (FWC 2007b, http://myfwc.com/seaturtle/Lighting/Light_Ordinance.htm). Local governments have realized that adopting a lighting ordinance is the most effective method to address artificial lighting along the beachfront.

Indirect Effects

Indirect effects are those effects that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Effects from the proposed project may continue to affect sea turtle nesting on the project beach and adjacent beaches in future years.

1. *Increased susceptibility to catastrophic events*

Nest relocation within a nesting season 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).

2. *Increased beachfront development*

Pilkey and Dixon (1996) state that 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 that 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 much larger ones that accommodated more beach users replaced older buildings. Overall, shoreline management creates 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 1990a), and can also result in greater adverse effects due to artificial lighting, as discussed above.

3. *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 hatchling emergence (Nelson and Dickerson 1987; Nelson 1988).

Beach nourishment projects create an elevated, wider and unnatural flat slope berm (beach). Sea turtles nest closer to the water the first few years after nourishment because of the altered profile (and perhaps unnatural sediment grain size distribution) (Ernest and Martin 1999, Trindell 2005) (**Figure 3**).

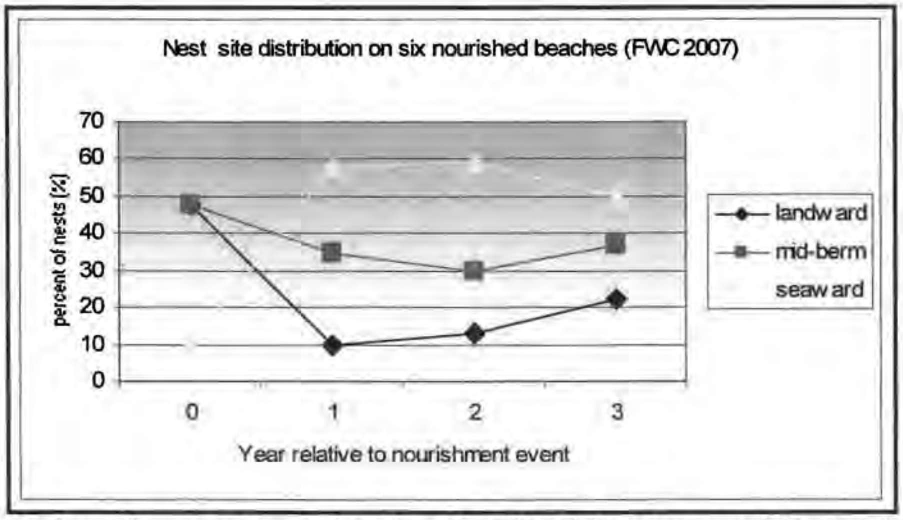


Figure 3. Review of sea turtle nesting site selection following nourishment (Trindell 2005).

Beach compaction and unnatural beach profiles resulting 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 cause increased physiological stress to the animals (Nelson and Dickerson 1988b). Nelson and Dickerson (1988c) concluded that, 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 (minimum depth of 36 inches) 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. However, a pilot study by Nelson and Dickerson (1988c) showed that a tilled nourished beach will remain uncompacted for up to one year.

Multi-year beach compaction monitoring and, if necessary, tilling would ensure that 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 shall 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.

4. *Escarpment formation*

On nourished beaches, steep escarpments may develop along their water line interface as they adjust from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984; Nelson et al. 1987). These escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998). Researchers have shown that female sea 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 any escarpments prior to the nesting season.

5. *Construction of Groins and jetties*

Groins and jetties are shore-perpendicular structures that are designed to trap sand that would otherwise be transported by longshore currents. Jetties are defined as structures placed to keep sand from flowing into channels (Kaufman and Pilkey 1979; Komar 1983). In preventing normal sand transport, these structures accrete updrift beaches while causing accelerated beach erosion downdrift of the structures (Komar 1983; Pilkey et al. 1984; National Research Council 1987), a process that results in degradation of sea turtle nesting habitat. As sand fills the area updrift from the groin or jetty, some littoral drift and sand deposition on adjacent downdrift beaches may occur due to spillover. However, these groins and jetties often force the stream of sand into deeper offshore water where it is lost from the system (Kaufman and Pilkey 1979). The greatest changes in beach profile near groins and jetties are observed close to the structures, but effects eventually may extend many kilometers along the coast (Komar 1983).

Jetties are placed at ocean inlets to keep transported sand from closing the inlet channel. Together, jetties and inlets are known to have profound effects on adjacent beaches (Kaufman and Pilkey 1979). Witherington et al. (2005) found a significant negative relationship between loggerhead nesting density and distance from the nearest of 17 ocean inlets on the Atlantic coast of Florida. The effect of inlets in lowering nesting density was observed both updrift and downdrift of the inlets, leading researchers to propose that beach instability from both erosion and accretion may discourage loggerhead nesting.

Construction or repair of groins and jetties during the nesting season may result in the destruction of nests, disturbance of females attempting to nest, and disorientation of emerging hatchlings from project lighting. Following construction, the presence of groins and jetties may interfere with nesting turtle access to the beach, result in a change in beach profile and width (downdrift erosion, loss of sandy berms, and escarpment formation), trap hatchlings, and concentrate predatory fishes, resulting in higher probabilities of hatchling predation.

Escarpments may develop on beaches between groins as the beaches equilibrate to their final profiles. These escarpments are known to prevent females from nesting on the upper beach and can cause them to choose unsuitable nesting areas, such as seaward of an escarpment. These nest sites commonly receive prolonged tidal inundation and erosion, which results in nest failure (Nelson and Blihovde 1998). As groin structures fail and break apart, they spread debris on the beach, which may further impede nesting females from accessing suitable nesting sites and trap both hatchlings and nesting turtles.

Species' response to a proposed action

The following summary illustrates sea turtle responses to and recovery from a nourishment project comprehensively studied by Ernest and Martin (1999). A significantly larger proportion of turtles emerging on nourished beaches abandoned their nesting attempts than turtles emerging on natural or pre-nourished beaches. This reduction in nesting success is 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 untilled, hard-packed sands increases significantly relative to natural conditions. However, tilling (minimum depth of 36 inches) is 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 natural levels (Ernest and Martin 1999).

During the first post-construction year, nests on nourished beaches are deposited significantly seaward of the toe of the dune and significantly landward of the tide line than nests on natural beaches. More nests are washed out on the wide, flat beaches of the nourished treatments than on the narrower steeply sloped natural beaches. This phenomenon may persist through the second post-construction year monitoring and resulting 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 equilibrate to a more natural contour.

The principal effect of beach nourishment on sea turtle reproduction is a reduction in nesting success during the first year following project construction. Although most studies have attributed this phenomenon to an increase in beach compaction and escarpment formation, Ernest and Martin (1999) indicated that 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 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 BO. 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 Service is not aware of any cumulative effects in the project area.

CONCLUSION

After reviewing the current status of the loggerhead, green, and Kemp's ridley turtles, the environmental baseline for the action area, the effects of the proposed beach nourishment, and the cumulative effects, the Service's biological opinion is that the beach nourishment project, as proposed, is not likely to jeopardize the continued existence of the loggerhead, green, or Kemp's ridley sea turtles, and is not likely to destroy or adversely modify designated critical habitat. No critical habitat has been designated for the loggerhead, green, or Kemp's ridley sea turtles in the continental United States; therefore, none will be affected.

For loggerheads, the PFRU averages 64,513 nests per year. The entire recovery unit occurs within Florida and consists of approximately 1,166 miles of shoreline. Of the available nesting habitat within the PFRU, sand placement activities for this action will occur on 8.7 miles of beach. For green and Kemp's ridley sea turtles, the proposed project will affect only 8.7 miles of the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern U.S.

Research has shown that the principal effect of sand placement 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 that 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 Act and Federal regulation pursuant to section 4(d) of the Act 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 Act provided that 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 ANTICIPATED

The Service anticipates the proposed action will impact 8.7 miles of nesting sea turtle beach habitat, which will result in take of nesting loggerhead, green, and Kemp's ridley sea turtles. Anticipated take consists of: (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) 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 the 8.7 miles of beach that has been identified for sand placement. 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 will likely 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 that 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 considers the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerhead, green, and Kemp's ridley sea turtles.

1. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence and beach mouse burrow construction shall be used for sand placement.

2. All derelict concrete, metal, coastal armoring geotextile material or other debris shall be removed from the beach prior to any sand placement.

3. A post-construction survey(s) of all artificial lighting visible from the project beach shall be completed by the local sponsor or applicant. This information shall be provided to the Service and the FWC.

4. A meeting between representatives of the contractor, the Service, the FWC, and the permitted sea turtle surveyor, and other species surveyors as appropriate, shall be held prior to the commencement of work on this project.

5. During the sea turtle nesting season, daytime surveys for nesting sea turtles shall be conducted. If nests are constructed in the area of beach nourishment, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation. Nest relocation shall not occur upon completion of the project.

6. Beach compaction shall be monitored and tilling (non-vegetated areas to a minimum depth of 36 inches) shall be conducted if needed immediately after completion of the

sand placement project and prior to the next three nesting seasons to reduce the likelihood of impacting sea turtle nesting and hatching activities. (NOTE: Out-year beach compaction monitoring and tilling are not required if placed material no longer remains on the dry beach.)

7. Escarpment formation shall be monitored and leveling shall be conducted if needed immediately after completion of the sand placement project and prior to the next three nesting seasons to reduce the likelihood of impacting nesting and hatchling sea turtles.

8. Construction equipment and materials shall be stored in a manner that will minimize impacts to nesting and hatchling sea turtles to the maximum extent practicable.

9. Lighting associated with the project construction shall be minimized to reduce the possibility of disrupting and disorienting nesting and/or hatchling sea turtles.

10. During the sea turtle nesting season, the contractor shall not extend the beach fill more than 500 feet along the shoreline between dusk and the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site at night to monitor and report any sea turtles that may emerge within the project area.

11. A report describing the actions taken to implement the terms and conditions of this incidental take statement shall be submitted to the Service by July 31 of the year following completion of the proposed work for each year when the activity has occurred.

12. The Service and the FWC shall be notified if a sea turtle adult, hatchling, or egg, or beach mouse is harmed or destroyed as a direct or indirect result of the project.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, 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. 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. Such material shall be predominately of carbonate, quartz or similar material with a particle size distribution ranging between 0.062mm and 4.76mm (classified as sand by either the Unified Soils or the Wentworth classification), 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 historic beach sediment at the disposal site, and shall not contain:

1a. Greater than 5 percent, by weight, silt, clay or colloids passing the #230 sieve;

1b. Greater than 5 percent, by weight, fine gravel retained on the #4 sieve (- 2.25φ);

1c. Coarse gravel, cobbles or material retained on the 3/4 inch sieve in a percentage or size greater than found on the native beach;

1d. Construction debris, toxic material or other foreign matter; and

1e. Material that will result in cementation of the beach.

2. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach prior to any sand placement to the maximum extent practicable. If debris removal activities take place during the sea turtle nesting season (April 15 through September 30), the work shall be conducted during daylight hours only and shall not commence until completion of the sea turtle survey each day.

3. A survey shall be conducted of all lighting visible from the beach placement area by the local sponsor or applicant, using standard techniques for such a survey, between May 1 and May 15, and between July 15 and August 1, in the year following construction. A summary report of the surveys shall be submitted to the Service by December 1 of each year in which surveys are conducted. After the annual report is completed, a meeting shall be set up with the applicant or local sponsor, county or municipality, FWC and the Service to discuss the survey report, as well as any documented sea turtle disorientations in or adjacent to the project area.

4. A meeting between representatives of the contractor, Service, FWC, the permitted sea turtle surveyor, and other species surveyors as appropriate, shall be held prior to the commencement of work on projects. At least 10-business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle and beach mouse protection measures as well as additional guidelines when construction occurs during the sea turtle nesting season, such as storing equipment, minimizing driving, feral cat observation and reporting within the work area as well as follow up meetings during construction.

5. For sand placement projects that occur during the period from May 1 through October 31, daily early morning (before 9 a.m.) surveys shall be conducted, and eggs shall be relocated per the requirements below.

   Nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by April 15 whichever is later. Nesting surveys shall continue through the end of the project or through September 15 whichever is earlier. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirement listed in 5a through 5c below.

5a. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to F.A.C 68E-1. Please contact FWC's Marine Turtle Management Program in Tequesta at (561) 575-5408 for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (in all time zones). The contractor shall not extend the beach fill more than 500 feet along the shoreline between dusk and the following day until a daily nesting survey has been completed and the beach cleared for fill advancement. This measure will ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

5b. Only those nests that may be affected by sand placement activities will be relocated. Nest relocation shall not occur upon completion of the project. Nests requiring relocation shall 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. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, or subject to artificial lighting. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests.

5c. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the nourished berm prior to tilling shall be marked and left in place unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and/or a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity will occur within this area nor will any activities occur which could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

6. Sand compaction shall be monitored in the area of sand placement immediately after completion of the project and prior to April 15 for 3 subsequent years. Sand compaction shall be monitored in accordance with a protocol agreed to by the Service, FWC, and the applicant or local sponsor. At a minimum, the protocol provided under 6a and 6b below shall be followed. If tilling is required, the area shall be tilled to a depth of 36 inches. All tilling activity shall be completed prior to those dates listed above.

   Each pass of the tilling equipment shall be overlapped to allow thorough and even tilling. If the project is completed during the nesting season, tilling will not be performed in areas where nests have been left in place or relocated. (NOTE: The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post-construction compaction levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.) A report on the results of the compaction monitoring shall be submitted to the Service's field office prior to any tilling actions being taken.

6a. 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).

6b. 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 will include all 18 values for each transect line, and the final 6 averaged compaction values.

6c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the following dates listed above.

6d. 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 Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

6e. Tilling shall occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

7. Visual surveys for escarpments along the project area shall be made immediately after completion of the sand placement project and during March 15 to April 15 for 3 subsequent years if sand from the project area still remains on the beach.

   Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of at least 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by April 15. Any escarpment removal shall be reported by location. If the project is completed during the sea turtle nesting and hatching season, escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The Service shall be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the Service or FWC 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 shall be submitted to the Service's Field Office. (NOTE: Out-year escarpment monitoring and remediation are not required if placed material no longer remains on the dry beach).

8. Staging areas for construction equipment shall be located off the beach, if off-beach staging areas are available, during the sea turtle nesting season. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. Temporary storage of pipes shall be off the beach to the maximum extent possible. If the pipes shall be on the beach, they shall be placed in a manner that will minimize the impact to nesting habitat and shall not compromise the integrity of the dune systems.

9. Direct lighting of the beach and nearshore waters shall 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.

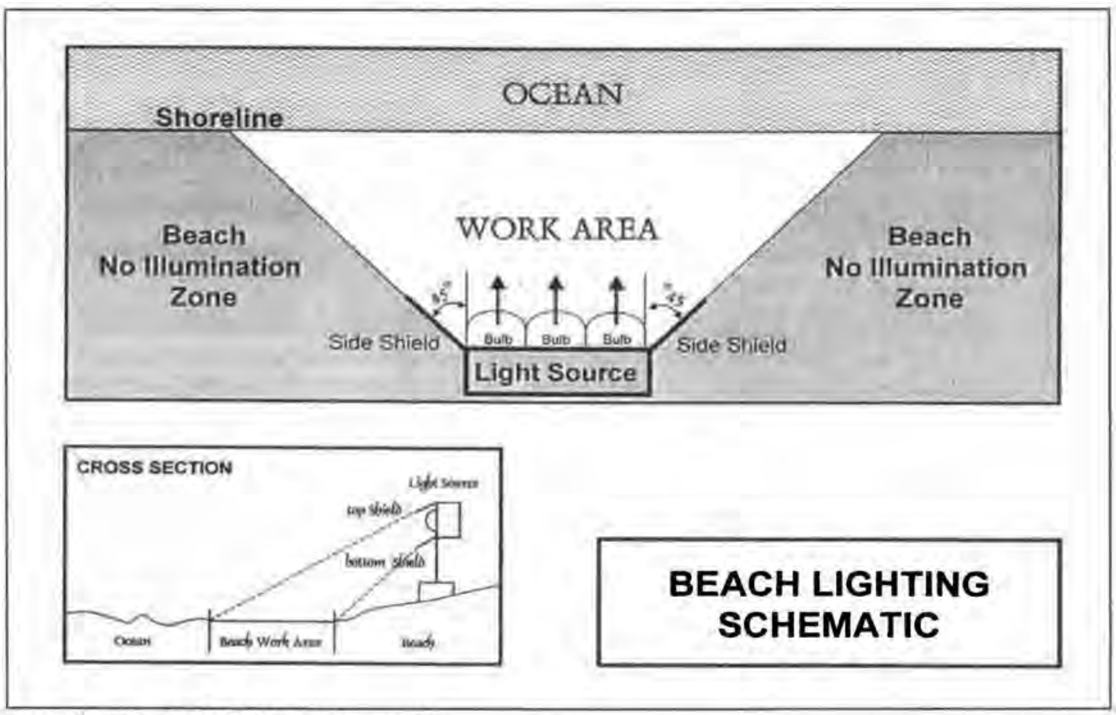


Figure 4. Beach lighting schematic.

10. During the sea turtle nesting season, the contractor shall not extend the beach fill more than 500 feet along the shoreline between dusk and the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, an agreed upon distance will be decided on during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the contractor will be allowed to proceed with the placement of fill during daylight hours until dusk at which time the 500-foot length limitation shall apply.

11. A report describing the projects conducted during the year and actions taken to implement the reasonable and prudent measures and terms and conditions of this incidental take statement shall be submitted to the Service by March 1 of the following year of completing the proposed work for each year when the activity has occurred. This report will include the following information:

Table 4. Information to include in the report following the project completion.

All projects	Project location (include Florida DEP R-Monuments)
	Project description
	Dates of actual construction activities
	Names and qualifications of personnel involved in sea turtle nesting surveys and relocation activities (separate the nests surveys for nourished and non-nourished areas)
	Descriptions and locations of self-release beach sites
	Nest survey and relocation results

12. In the event a sea turtle nest is excavated during construction activities, the permitted person responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

    Upon locating a dead or injured sea turtle adult, hatchling, egg, or beach mouse that may have been harmed or destroyed as a direct or indirect result of the project, the Corps, permittee, and/or local sponsor shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922) and the Service Office immediately.

    Care shall be taken in handling injured sea turtles, eggs or beach mice to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

The Service concludes that 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 that 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 4,015 linear feet 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 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.

1. Appropriate native salt-resistant dune vegetation should be established on the restored dunes. The FDEP, Bureau of Beaches and Wetland Resources, 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.

3. Educational signs should be placed where appropriate at beach access points explaining the importance of the area to sea turtles and/or the life history of sea turtle species that nest in the area.

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.

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; (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.

If you have any questions regarding this biological opinion, please contact Todd Mecklenborg at (727) 820-3705.

Sincerely,

Linda S. Walker

David L. Hankla
for Field Supervisor

LITERATURE CITED

Ackerman, R.A. 1980. Physiological and ecological aspects of gas exchange by sea turtle eggs. American Zoologist 20:575-583.

Baldwin, R., G.R. Hughes, and R.I.T. Prince. 2003. Loggerhead turtles in the Indian Ocean. Pages 218-232 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Bjorndal, K.A., A.B. Meylan, and B.J. Turner. 1983. Sea turtles nesting at Melbourne Beach, Florida, I. Size, growth and reproductive biology. Biological Conservation 26:65-77.

Bolten, A.B. 2003. Active swimmers - passive drifters: the oceanic juvenile stage of loggerheads in the Atlantic system. Pages 63-78 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Caldwell, D.K. 1962. Comments on the nesting behavior of Atlantic loggerhead sea turtles, based primarily on tagging returns. Quarterly Journal of the Florida Academy of Sciences 25(4):287-302.

Carr, A. and L. Ogren. 1960. The ecology and migrations of sea turtles, 4. The green turtle in the Caribbean Sea. Bulletin of the American Museum of Natural History 121(1):1-48.

Chaloupka, M. 2001. Historical trends, seasonality and spatial synchrony in green sea turtle egg production. Biological Conservation 101:263-279.

Christens, E. 1990. Nest emergence lag in loggerhead sea turtles. Journal of Herpetology 24(4):400-402.

Coastal Engineering Research Center. 1984. Shore protection manual, volumes I and II. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Congdon, J.D., A.E. Dunham, and R.C. van Loben Sels. 1993. Delayed sexual maturity and demographics of Blanding's turtles (*Emydoidea blandingii*): implications for conservation and management of long-lived organisms. Conservation Biology 7(4):826-833.

Dahlen, M.K., R. Bell, J.I. Richardson, and T.H. Richardson. 2000. Beyond D-0004: Thirty-four years of loggerhead (*Caretta caretta*) research on Little Cumberland Island, Georgia, 1964-1997. Pages 60-62 *in* Abreu-Grobois, F.A., R. Briseno-Duenas, R.

Marquez, and L. Sarti (compilers). Proceedings of the Eighteenth International Sea Turtle Symposium. NOAA Technical Memorandum NMFS-SEFSC-436.

Daniel, R.S. and K.U. Smith. 1947. The sea-approach behavior of the neonate loggerhead turtle (*Caretta caretta*). Journal of Comparative and Physiological Psychology 40(6):413-420.

Davis, G.E. and M.C. Whiting. 1977. Loggerhead sea turtle nesting in Everglades National Park, Florida, U.S.A. Herpetologica 33:18-28.

Dickerson, D.D. and D.A. Nelson. 1989. Recent results on hatchling orientation responses to light wavelengths and intensities. Pages 41-43 *in* Eckert, S.A., K.L. Eckert, and T.H. Richardson (compilers). Proceedings of the 9th Annual Workshop on Sea Turtle Conservation and Biology. NOAA Technical Memorandum NMFS-SEFC-232.

Dodd, C.K., Jr. 1988. Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta* (Linnaeus 1758). Service, Biological Report 88(14).

Dodd, M.G. and A.H. Mackinnon. 1999. Loggerhead turtle (*Caretta caretta*) nesting in Georgia, 1999: implications for management. Georgia Department of Natural Resources unpublished report. 41 pp.

Dodd, M.G. and A.H. Mackinnon. 2000. Loggerhead turtle (*Caretta caretta*) nesting in Georgia, 2000: implications for management. Georgia Department of Natural Resources unpublished report. 47 pp.

Dodd, M.G. and A.H. Mackinnon. 2001. Loggerhead turtle (*Caretta caretta*) nesting in Georgia, 2001. Georgia Department of Natural Resources unpublished report submitted to the U.S. Fish and Wildlife Service for grant E-5-1 "Coastal Endangered Species Management." 46 pp.

Dodd, M.G. and A.H. Mackinnon. 2002. Loggerhead turtle (*Caretta caretta*) nesting in Georgia, 2002. Georgia Department of Natural Resources unpublished report submitted to the U.S. Fish and Wildlife Service for grant E-5-2 "Coastal Endangered Species Management." 46 pp.

Dodd, M.G. and A.H. Mackinnon. 2003. Loggerhead turtle (*Caretta caretta*) nesting in Georgia, 2003. Georgia Department of Natural Resources unpublished report submitted to the U.S. Fish and Wildlife Service for grant E-5-3 "Coastal Endangered Species Management." 46 pp.

Dodd, M.G. and A.H. Mackinnon. 2004. Loggerhead turtle (*Caretta caretta*) nesting in Georgia, 2004. Georgia Department of Natural Resources unpublished report submitted to the U.S. Fish and Wildlife Service for grant E-5-4 "Coastal Endangered Species Management." 44 pp.

Ehrhart, L.M. 1989. Status report of the loggerhead turtle. Pages 122-139 *in* Ogren, L., F. Berry, K. Bjorndal, H. Kumpf, R. Mast, G. Medina, H. Reichart, and R. Witham (editors). Proceedings of the 2nd Western Atlantic Turtle Symposium. NOAA Technical Memorandum NMFS-SEFC-226.

Ehrhart, L.M., D.A. Bagley, and W.E. Redfoot. 2003. Loggerhead turtles in the Atlantic Ocean: geographic distribution, abundance, and population status. Pages 157-174 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Ernest, R.G. and R.E. Martin. 1993. Sea turtle protection program performed in support of velocity cap repairs, Florida Power & Light Company St. Lucie Plant. Applied Biology, Inc., Jensen Beach, Florida. 51 pp.

Ernest, R.G. and R.E. Martin. 1999. Martin County beach nourishment project: sea turtle monitoring and studies. 1997 annual report and final assessment. Unpublished report prepared for the Florida Department of Environmental Protection.

Florida Department of Environmental Protection. 2005. Critically eroded beaches in Florida. Bureau of Beaches and Coastal Systems. 76 pp.

Florida Fish and Wildlife Conservation Commission. 2007a. Reported nesting activity of the Kemps Ridley (*Lepidochelys kempii*), in Florida, 1979-2007. Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission. Data Summary Date: 1 July 2008. http://research.myfwc.com/images/articles/2377/sea_turtle_nesting_on_florida_bchs_93-07.pdf

Florida Fish and Wildlife Conservation Commission. WC. 2007b. Sea turtle protection ordinance adopted by counties and municipalities (as of 01/02/2008). http://myfwc.com/seaturtle/Lighting/Light_Ordinance.htm

Foley, A. 2005. Personal communication to Loggerhead Recovery Team. Florida Fish and Wildlife Research Institute.

Frazer, N.B. and J.I. Richardson. 1985. Annual variation in clutch size and frequency for loggerhead turtles, *Caretta-caretta*, nesting at Little Cumberland Island, Georgia, USA. Herpetologica 41(3):246-251.

Gerrodette, T. and J. Brandon. 2000. Designing a monitoring program to detect trends. Pages 36-39 *in* Bjorndal, K.A. and A.B. Bolten (editors). Proceedings of a Workshop on Assessing Abundance and Trends for In-water Sea Turtle Populations. NOAA Technical Memorandum NMFS-SEFSC-445.

Glenn, L. 1998. The consequences of human manipulation of the coastal environment on hatchling loggerhead sea turtles (*Caretta caretta*, L.). Pages 58-59 *in* Byles, R., and Y. Fernandez (compilers). Proceedings of the Sixteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412.

Godfrey, P.J., S.P. Leatherman, and P.A. Buckley. 1978. Impact of off-road vehicles on coastal ecosystems. Pages 581-599 *in* Coastal Zone '78 Symposium on Technical, Environmental Socioeconomic and Regulatory Aspects of Coastal Zone Management. Vol. II, San Francisco, California.

Godfrey, M.H. and N. Mrosovsky. 1997. Estimating the time between hatching of sea turtles and their emergence from the nest. Chelonian Conservation and Biology 2(4):581-585.

Hailman, J.P. and A.M. Elowson. 1992. Ethogram of the nesting female loggerhead (*Caretta caretta*). Herpetologica 48:1-30.

Hays, G.C. 2000. The implications of variable remigration intervals for the assessment of population size in marine turtles. Journal of Theoretical Biology 206:221-227.

Hendrickson, J.R. 1958. The green sea turtle *Chelonia mydas* (Linn.) in Malaya and Sarawak. Proceedings of the Zoological Society of London 130:455-535.

Hendrickson, J.R. 1980. The ecological strategies of sea turtles. American Zoologist 20:597-608.

Henwood, T.A. and L.H. Ogren. 1987. Distribution and migration of immature Kemp's ridley turtles (*Lepidochelys kempi*) and green turtles (*Chelonia mydas*) off Florida, Georgia, and South Carolina. Northeast Gulf Science 9(2):153-159.

Heppell, S.S. 1998. Application of life-history theory and population model analysis to turtle conservation. Copeia 1998(2):367-375.

Heppell, S.S., L.B. Crowder, and T.R. Menzel. 1999. Life table analysis of long-lived marine species with implications for conservation and management. Pages 137-148 *in* Musick, J.A. (editor). Life in the Slow Lane: Ecology and Conservation of Long-lived Marine Animals. American Fisheries Society Symposium 23, Bethesda, Maryland.

Hildebrand, H.H. 1963. Hallazgo del área de anidación de la tortuga marina "lora" *Lepidochelys kempi* (Garman), en la coasta occidental del Golfo de México. Sobretiro de Ciencia, México 22:105-112.

Hirth, H.F. 1997. Synopsis of the biological data on the green turtle *Chelonia mydas* (Linnaeus 1758). Service, Biological Report 97(1).

Hosier, P.E., M. Kochhar, and V. Thayer. 1981. Off-road vehicle and pedestrian track effects on the sea –approach of hatchling loggerhead turtles. Environmental Conservation 8:158-161.

Hopkins, S.R. and T.M. Murphy. 1980. Reproductive ecology of *Caretta caretta* in South Carolina. South Carolina Wildlife Marine Resources Department Completion Report. 97 pp.

Howard, B. and P. Davis. 1999. Sea turtle nesting activity at Ocean Ridge in Palm Beach County, Florida 1999. Palm Beach County Dept. of Environmental Resources Management, West Palm Beach, Florida. 10 pp.

Hughes, A.L. and E.A. Caine. 1994. The effects of beach features on hatchling loggerhead sea turtles. in: Proceedings of the 14th Annual Symposium on Sea turtle biology and conservation, March 1-5, 1994, Hilton Head, South Carolina. NOAA, Tech. Memo. NMFS-SEFSC-351.

Intergovernmental Panel on Climate Change. 2007a. Climate Change 2007: The Physical Science Basis - Summary for Policymakers. Contribution of Working Group I Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change

Intergovernmental Panel on Climate Change. 2007b. Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability. Working Group II Contribution to the Intergovernmental Panel on Climate Change. Fourth Assessment Report.

Kamezaki, N., Y. Matsuzawa, O. Abe, H. Asakawa, T. Fujii, K. Goto, S. Hagino, M. Hayami, M. Ishii, T. Iwamoto, T. Kamata, H. Kato, J. Kodama, Y. Kondo, I. Miyawaki, K. Mizobuchi, Y. Nakamura, Y. Nakashima, H. Naruse, K. Omuta, M. Samejima, H. Suganuma, H. Takeshita, T. Tanaka, T. Toji, M. Uematsu, A. Yamamoto, T. Yamato, and I. Wakabayashi. 2003. Loggerhead turtles nesting in Japan. Pages 210-217 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Labisky, R.F., M.A. Mercadante, and W.L. Finger. 1986. Factors affecting reproductive success of sea turtles on Cape Canaveral Air Force Station, Florida, 1985. Final report to the United States Air Force. United States Fish and Wildlife Service Cooperative Fish and Wildlife Research Unit, Agreement Number 14-16-0009-1544, Research Work Order Number 25. 18 pp.

Limpus, C.J. 1971. Sea turtle ocean finding behaviour. Search 2(10):385-387.

Limpus, C.J., V. Baker, and J.D. Miller. 1979. Movement induced mortality of loggerhead eggs. Herpetologica 35(4):335-338.

Limpus, C., J.D. Miller, and C.J. Parmenter. 1993. The northern Great Barrier Reef green turtle *Chelonia mydas* breeding population. Pages 47-50 *in* Smith, A.K. (compiler), K.H. Zevering and C.E. Zevering (editors). Raine Island and Environs Great Barrier Reef: Quest to Preserve a Fragile Outpost of Nature. Raine Island Corporation and Great Barrier Reef Marine Park Authority, Townsville, Queensland, Australia.

Limpus, C.J. and D.J. Limpus. 2003. Loggerhead turtles in the equatorial and southern Pacific Ocean: a species in decline. Pages 199-209 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Lohmann, K.J. and C.M.F. Lohmann. 2003. Orientation mechanisms of hatchling loggerheads. Pages 44-62 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Mann, T.M. 1977. Impact of developed coastline on nesting and hatchling sea turtles in southeastern Florida. Unpublished M.S. thesis. Florida Atlantic University, Boca Raton, Florida.

Margaritoulis, D., R. Argano, I. Baran, F. Bentivegna, M.N. Bradai, J.A. Camiñas, P. Casale, G. De Metrio, A. Demetropoulos, G. Gerosa, B.J. Godley, D.A. Haddoud, J. Houghton, L. Laurent, and B. Lazar. 2003. Loggerhead turtles in the Mediterranean Sea: present knowledge and conservation perspectives. Pages 175-198 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

McGehee, M.A. 1990. Effects of moisture on eggs and hatchlings of loggerhead sea turtles (*Caretta caretta*). Herpetologica 46(3):251-258.

Meylan, A. 1982. Estimation of population size in sea turtles. Pages 135-138 *in* Bjorndal, K.A. (editor). Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C.

Miller, K., G.C. Packard, and M.J. Packard. 1987. Hydric conditions during incubation influence locomotor performance of hatchling snapping turtles. Journal of Experimental Biology 127:401-412.

Moody, K. 1998. The effects of nest relocation on hatching success and emergence success of the loggerhead turtle (*Caretta caretta*) in Florida. Pages 107-108 *in* Byles, R. and Y. Fernandez (compilers). Proceedings of the Sixteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412.

Moran, K.L., K.A. Bjorndal, and A.B. Bolten. 1999. Effects of the thermal environment on the temporal pattern of emergence of hatchling loggerhead turtles *Caretta caretta*. Marine Ecology Progress Series 189:251-261.

Mrosovsky, N. and A. Carr. 1967. Preference for light of short wavelengths in hatchling green sea turtles (*Chelonia mydas*), tested on their natural nesting beaches. Behavior 28:217-231.

Mrosovsky, N. and S.J. Shettleworth. 1968. Wavelength preferences and brightness cues in water finding behavior of sea turtles. Behavior 32:211-257.

Mrosovsky, N. and C.L. Yntema. 1980. Temperature dependence of sexual differentiation in sea turtles: implications for conservation practices. Biological Conservation 18:271-280.

Murphy, T.M. and S.R. Hopkins. 1984. Aerial and ground surveys of marine turtle nesting beaches in the southeast region. Unpublished report prepared for the National Marine Fisheries Service.

National Marine Fisheries Service and U. S. Fish and Wildlife Service. 1991a. Recovery plan for U.S. population of Atlantic green turtle (*Chelonia mydas*). National Marine Fisheries Service, Washington, D.C.

National Marine Fisheries Service and U. S. Fish and Wildlife Service. 1991b. Recovery plan for U.S. population of loggerhead turtle (*Caretta caretta*). National Marine Fisheries Service, Washington, D.C.

National Marine Fisheries Service and U. S. Fish and Wildlife Service 1998a. Recovery plan for U.S. Pacific populations of the green turtle (*Chelonia mydas*). National Marine Fisheries Service, Silver Spring, MD. 84 pp.

National Marine Fisheries Service. May 17, 2002a. Office of Protected Resources: Loggerhead Sea Turtles (*Caretta caretta*).

National Marine Fisheries Service. May 17, 2002b. Office of Protected Resources: Green Sea Turtles (*Chelonia mydas*).

National Marine Fisheries Service and U. S. Fish and Wildlife Service. 2007a. Loggerhead sea turtle (*Caretta caretta*) 5-year review: Summary and evaluation. August. 65 pp.

National Marine Fisheries Service and U. S. Fish and Wildlife Service. 2007b. Green sea turtle (*Chelonia mydas*) 5-year review: Summary and evaluation. August. 102 pp.

National Research Council. 1990a. Managing coastal erosion. National Academy Press; Washington, D.C.

Nelson, D.A. 1987. The use of tilling to soften nourished beach sand consistency for nesting sea turtles. Unpublished report of the U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Nelson, D.A. and D.D. Dickerson. 1987. Correlation of loggerhead turtle nest digging times with beach sand consistency. Abstract of the 7th Annual Workshop on Sea Turtle Conservation and Biology.

Nelson, D.A. 1988. Life history and environmental requirements of loggerhead turtles. U.S. Fish and Wildlife Service Biological Report 88(23). U.S. Army Corps of Engineers TR EL-86-2 (Rev.).

Nelson, D.A. and B. Blihovde. 1998. Nesting sea turtle response to beach scarps. Page 113 *in* Byles, R., and Y. Fernandez (compilers). Proceedings of the Sixteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412.

Nelson, D.A. and D.D. Dickerson. 1988a. Effects of beach nourishment on sea turtles. *In* Tait, L.S. (editor). Proceedings of the Beach Preservation Technology Conference '88. Florida Shore & Beach Preservation Association, Inc., Tallahassee, Florida.

Nelson, D.A. and D.D. Dickerson. 1988b. Hardness of nourished and natural sea turtle nesting beaches on the east coast of Florida. Unpublished report of the U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Nelson, D.A. and D.D. Dickerson. 1988c. Response of nesting sea turtles to tilling of compacted beaches, Jupiter Island, Florida. Unpublished report of the U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Nelson, D.A., K. Mauck, and J. Fletemeyer. 1987. Physical effects of beach nourishment on sea turtle nesting, Delray Beach, Florida. Technical Report EL-87-15. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Packard, M.J. and G.C. Packard. 1986. Effect of water balance on growth and calcium mobilization of embryonic painted turtles (*Chrysemys picta*). Physiological Zoology 59(4):398-405.

Packard, G.C., M.J. Packard, and T.J. Boardman. 1984. Influence of hydration of the environment on the pattern of nitrogen excretion by embryonic snapping turtles (*Chelydra serpentina*). Journal of Experimental Biology 108:195-204.

Packard,G.C., M.J. Packard, T.J. Boardman, and M.D. Ashen. 1981. Possible adaptive value of water exchange in flexible-shelled eggs of turtles. Science 213:471-473.

Packard, G.C., M.J. Packard, and W.H.N. Gutzke. 1985. Influence of hydration of the environment on eggs and embryos of the terrestrial turtle *Terrapene ornata*. Physiological Zoology 58(5):564-575.

Parmenter, C.J. 1980. Incubation of the eggs of the green sea turtle, *Chelonia mydas*, in Torres Strait, Australia: the effect of movement on hatchability. Australian Wildlife Research 7:487-491.

Pilkey, O.H. and K.L. Dixon. 1996. The Corps and the shore. Island Press; Washington, D.C. Plant, N.G. and G.B. Griggs. 1992. Interactions between nearshore processes and beach morphology near a seawall. Journal of Coastal Research 8(1):183-200.

Possardt, E. 2005. Personal communication to Sandy MacPherson, Service.

Provancha, J.A. and L.M. Ehrhart. 1987. Sea turtle nesting trends at Kennedy Space Center and Cape Canaveral Air Force Station, Florida, and relationships with factors influencing nest site selection. Pages 33-44 *in* Witzell, W.N. (editor). Ecology of East Florida Sea Turtles: Proceedings of the Cape Canaveral, Florida Sea Turtle Workshop. NOAA Technical Report NMFS-53.

Raymond, P.W. 1984. The effects of beach restoration on marine turtles nesting in south Brevard County, Florida. Unpublished M.S. thesis. University of Central Florida, Orlando, Florida.

Richardson, T.H., J.I. Richardson, C. Ruckdeschel, and M.W. Dix. 1978. Remigration patterns of loggerhead sea turtles (*Caretta caretta*) nesting on Little Cumberland Island and Cumberland Island, Georgia. Pages 39-44 *in* Henderson, G.E. (editor). Proceedings of the Florida and Interregional Conference on Sea Turtles. Florida Marine Research Publications Number 33.

Ross, J.P. 1979. Sea turtles in the Sultanate of Oman. World Wildlife Fund Project 1320. May 1979 report. 53 pp.

Ross, J.P. 1982. Historical decline of loggerhead, ridley, and leatherback sea turtles. Pages 189-195 *in* Bjorndal, K.A. (editor). Biology and Conservation of Sea Turtles. Smithsonian Institution Press; Washington, D.C.

Ross, J.P. and M.A. Barwani. 1995. Review of sea turtles in the Arabian area. Pages 373-383 *in* Bjorndal, K.A. (editor). Biology and Conservation of Sea Turtles, Revised Edition. Smithsonian Institution Press, Washington, D.C. 615 pp.

Salmon, M., J. Wyneken, E. Fritz, and M. Lucas. 1992. Seafinding by hatchling sea turtles: role of brightness, silhouette and beach slope as orientation cues. Behaviour 122 (1-2):56-77.

Schroeder, B.A. 1981. Predation and nest success in two species of marine turtles (*Caretta caretta* and *Chelonia mydas*) at Merritt Island, Florida. Florida Scientist 44(1):35.

Schroeder, B.A. 1994. Florida index nesting beach surveys: are we on the right track? Pages 132-133 *in* Bjorndal, K.A., A.B. Bolten, D.A. Johnson, and P.J. Eliazar (compilers). Proceedings of the 14th Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-351.

Schmid, J.R. and W.N. Witzell. 1997. Age and growth of wild Kemp's ridley turtles (Lepidochelys kempi): cumulative results of tagging studies in Florida. Chelonian Conservation and Biology 2(4):532-537.

Schmid, J.R. 1998. Marine turtle populations on the west central coast of Florida: results of tagging studies at the Cedar Keys, Florida, 1986-1995. Fishery Bulletin 96:589-602.

Snover, M. 2005. Personal communication to the Loggerhead Sea Turtle Recovery Team. National Marine Fisheries Service.

Solow, A.R., K.A. Bjorndal, and A.B. Bolten. 2002. Annual variation in nesting numbers of marine turtles: the effect of sea surface temperature on re-migration intervals. Ecology Letters 5:742-746.

Spotila, J.R., E.A. Standora, S.J. Morreale, G.J. Ruiz, and C. Puccia. 1983. Methodology for the study of temperature related phenomena affecting sea turtle eggs. Service Endangered Species Report 11.

Stancyk, S.E. 1995. Non-human predators of sea turtles and their control. Pages 139-152 *in* Bjorndal, K.A. (editor). Biology and Conservation of Sea Turtles, Revised Edition. Smithsonian Institution Press. Washington, D.C.

Stancyk, S.E., O.R. Talbert, and J.M. Dean. 1980. Nesting activity of the loggerhead turtle *Caretta caretta* in South Carolina, II: protection of nests from raccoon predation by transplantation. Biological Conservation 18:289-298.

Talbert, O.R., Jr., S.E. Stancyk, J.M. Dean, and J.M. Will. 1980. Nesting activity of the loggerhead turtle (*Caretta caretta*) in South Carolina I: a rookery in transition. Copeia 1980(4):709-718.

Trindell, R. 2005. Sea turtles and beach nourishment. Florida Fish and Wildlife Conservation Commission, Imperiled Species Management Section. Invited Instructor, CLE Conference.

Trindell, R. 2007. Personal communication from Robbin Trindell, PhD., Florida Fish and Wildlife Conservation Commission summary of lighting impacts on Brevard County beaches after beach nourishment. Imperiled Species Management Section, Tallahassee, FL. to Lorna Patrick, U. S. Fish and Wildlife Service, Panama City, Florida.

Trindell, R., Conti, M., Gallagher, D. and B. Witherington. 2005. Turtles and lights on Florida's nesting beaches. Poster paper presented at the 25th Annual Symposium on Sea Turtle Biology and Conservation.

U.S. Fish and Wildlife Service. 2007a. Draft communications plan on the U.S. Fish and Wildlife Service's Role in Climate Change.

U.S. Fish and Wildlife Service. 2006. Strategic Habitat Conservation. Final Report of the National Ecological Assessment Team to the U.S. Fish and Wildlife Service and U.S. Geologic Survey.

Witherington, B.E. 1986. Human and natural causes of marine turtle clutch and hatchling mortality and their relationship to hatching production on an important Florida nesting beach. Unpublished M.S. thesis. University of Central Florida, Orlando, Florida.

Witherington, B.E. 1992. Behavioral responses of nesting sea turtles to artificial lighting. Herpetologica 48:31-39.

Witherington, B.E. 1997. The problem of photopollution for sea turtles and other nocturnal animals. Pages 303-328 *in* Clemmons, J.R. and R. Buchholz (editors). Behavioral Approaches to Conservation in the Wild. Cambridge University Press, Cambridge, United Kingdom.

Witherington, B.E. 2006. Personal communication to Loggerhead Recovery Team on nest monitoring in Florida during 2005. Florida Fish and Wildlife Research Institute.

Witherington, B.E. and L.M. Ehrhart. 1989. Status and reproductive characteristics of green turtles (*Chelonia mydas*) nesting in Florida. Pages 351-352 *in* Ogren, L., F. Berry, K. Bjorndal, H. Kumpf, R. Mast, G. Medina, H. Reichart, and R. Witham (editors). Proceedings of the Second Western Atlantic Turtle Symposium. NOAA Technical Memorandum NMFS-SEFC-226.

Witherington, B.E. and K.A. Bjorndal. 1991. Influences of artificial lighting on the seaward orientation of hatchling loggerhead turtles (*Caretta caretta*). Biological Conservation 55:139-149.

Witherington, B.E. and R.E. Martin. 1996. Understanding, assessing, and resolving light pollution problems on sea turtle nesting beaches. Florida Marine Research Institute Technical Report TR-2. 73 pp.

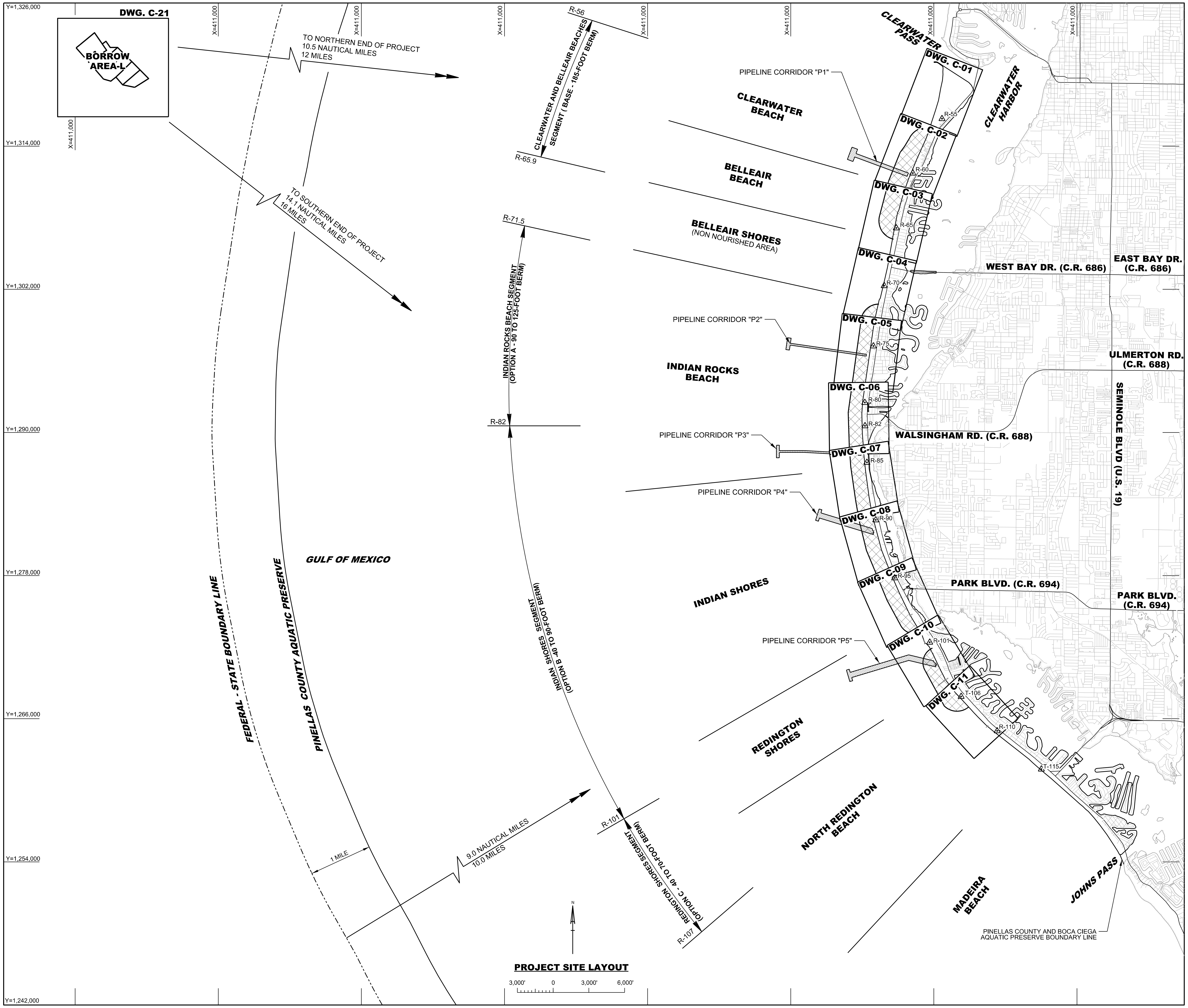
Wood, D.W. and K.A. Bjorndal. 2000. Relation of temperature, moisture, salinity, and slope to nest site selection in loggerhead sea turtles. Copeia 2000(1):119-128.

Wyneken, J., L. DeCarlo, L. Glenn, M. Salmon, D. Davidson, S. Weege., and L. Fisher. 1998. On the consequences of timing, location and fish for hatchlings leaving open beach hatcheries. Pages 155-156 *in* Byles, R. and Y. Fernandez (compilers). Proceedings of the Sixteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412.

Zurita, J.C., R. Herrera, A. Arenas, M.E. Torres, C. Calderón, L. Gómez, J.C. Alvarado, and R. Villavicencio. 2003. Nesting loggerhead and green sea turtles in Quintana Roo, Mexico. Pages 125-127 *in* Seminoff, J.A. (compiler). Proceedings of the Twenty-second Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-50

Attachment 2

Final Project Drawings



SAFTEY ON THIS JOB DEPENDS ON YOU

US Army Corps of Engineers
Jacksonville District

No.	SYM	ZONE	DESCRIPTION

DESIGNED BY: J.W.L.	DATE: 19 MAY 2011
DWN BY: J.W.L. & D.B.V.	CKD BY: J.W.L.
SUBMITTED BY: J.W.L.	SOLICITATION NO.: SOLICIT #
PLOT SCALE: AS SHOWN	CONTRACT NO.: CNT #
PLOT DATE: N/A	FILE NUMBER: N/A
FILE NAME: 116684-PISK11-G103PLN.dgn	

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
JACKSONVILLE DISTRICT
JACKSONVILLE, FLORIDA

BCOE
INITIAL REVIEW

BEACH EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA
SAND KEY
BEACH RENOURISHMENT 2011
GENERAL
PROJECT SITE LAYOUT

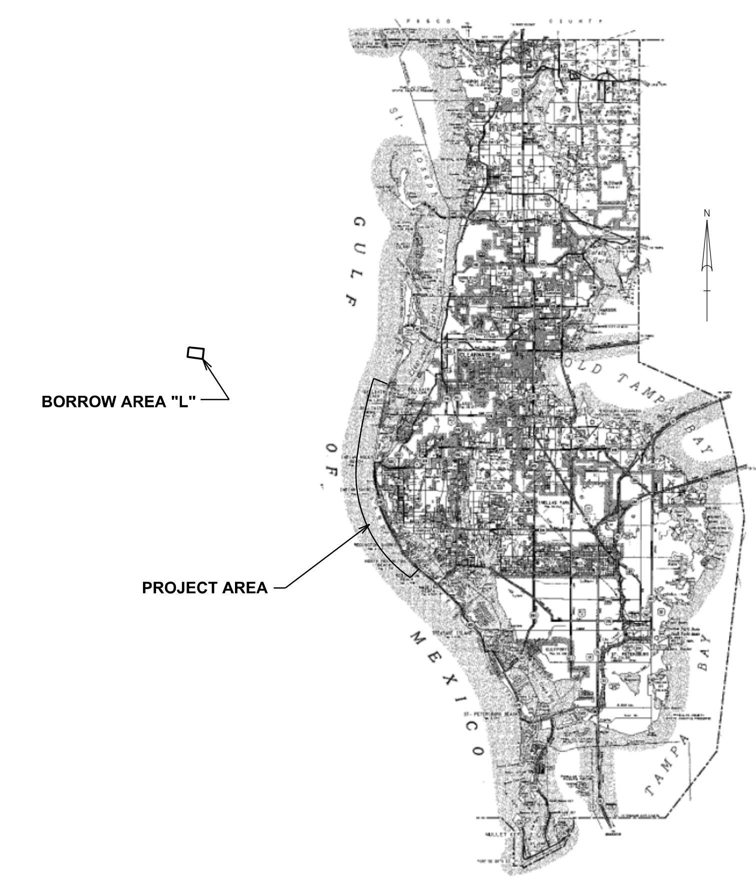
DRAWING NO.
G-03

NOTES:
1. SEE DWG. G-02 FOR PROJECT LOCATION, VICINITY, INDEX TO DRAWINGS, GENERAL NOTES, LEGEND, AND ABBREVIATIONS.
2. BEACH FILL WIDITHS ARE EXAGGERATED FOR CLARITY.

Attachment 2

US Army Corps of Engineers
Jacksonville District

BORROW AREA PLAN
SCALE: 'A'



BORROW AREA LOCATION MAP
N.T.S.

NOTES:

1. GENERAL NOTES AND LEGEND PROVIDED ON DWG. G-02 DO NOT APPLY TO THIS DWG.
2. REFER TO PLATE G-02 FOR PROJECT LOCATION, VICINITY, INDEX TO DRAWINGS, AND ABBREVIATIONS.
3. SEE DWG. NO. G-03 FOR BASE BEACH FILL LAYOUT AND OPTIONS.
4. SEE DWGS, NO. C-01 THRU C-11 FOR BEACH FILL PLANS AND DWGS. NO. C-12 THRU C-20 FOR BEACH FILL CROSS-SECTIONS.
5. THE PLANE COORDINATES SHOW ON THIS PLATE ARE BASED ON THE FLORIDA STATE PLANE WEST COORDINATE SYSTEM (0902) AND REFERENCED TO THE NORTH AMERICAN DATUM OF 1983(NAD83).
6. CONTOUR ELEVATIONS ARE BASED ON BORROW AREA HYDROGRAPHIC SURVEY. HYDROGRAPHIC SURVEY NOTES ARE PROVIDED IN SEPARATE HEADER ON THIS DWG.
7. L-1 MAGNETIC ANOMALY WAS IDENTIFIED AS "FISH/CRAB TRAPS, PIPES, CABLE OR SMALL BOAT ANCHORS" IN THE "*SAND KEY SUBMERGED CULTRUAL RESOURCES SURVY, OFFSHORE SAND KEY, PINELLAS COUNTY, FLORIDA, 2010*" REPORT DATED 30 MARCH 2010 & PREPARED BY COASTAL PLANNING & ENGINEERING, INC. (CPE). A COPY OF THE REPORT IS APPENDED TO THE SPECIFICATIONS.

BORROW AREA LEGEND:

- CUT AREA LIMITS WITHIN BORROW AREA L
- PROBABLE HARDBOTTOM RESOURCE
- 400-FOOT HARDBOTTOM BUFFER AREA
- 200-m CULTURAL RESOURCE BUFFER
- 2009 VIBRACORES
- L-## - 2009 MAGNETIC ANOMALIES
- 11 - CUT AREA COORDINATE POINT
- -50 - 2009 EXISTING HYDROGRAPHIC CONTOURS

HYDROGRAPHIC SURVEY NOTES:

1. HYDROGRAPHIC SURVEY OF THE BORROW AREA WAS COLLECTED BY OTHERS FROM SEPTEMBER 16-17, 2009. THIS HYDROGRAPHIC SURVEY WAS CONDUCTED FOR PINELLAS COUNTY FOR USE AS A GEOTECHNICAL DESIGN SURVEY. FOR MORE DETAILS REFER TO THE CPE FIELD BOOK #038.
2. THE HYDROGRAPHIC SURVEY DATA WAS COLLECTED USING AN ODOM HYDROTRAC, SINGLE FREQUENCY, SURVEY GRADE SOUNDER. THE SOUNDER WAS CALIBRATED PRIOR TO THE START OF THE SURVEY FOLLOWING MANUFACTURERS RECOMMENDED PROCEDURES.
3. THE COORDINATES ARE IN FEET BASED ON THE VERTICAL AND HORIZONTAL DATA THAT WAS COLLECTED AND PRESENTED RELATIVE TO THE NORTH AMERICA VERTICAL DATUM OF 1988 (NAVD 88) AND THE FLORIDA STATE PLANE COORDINATE SYSTEM BASED ON THE TRANSVERSE MERCATOR PROJECTION, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
4. HORIZONTAL POSITIONING AND VERTICAL TIDE CORRECTIONS BASED ON FDEP SECOND ORDER MONUMENTS 15-90-DA-17A, ELEVATION 4.84' NAVD88 AND 15-90-DA-19, ELEVATION 4.54' NAVD88.

BORROW AREA COORDINATES

POINT	FLORIDA WEST ZONE COORDINATES (NAD83)		POINT	FLORIDA WEST ZONE COORDINATES (NAD83)	
	X	Y		X	Y
1.	315,082.90	1,322,244.80	11.	318,980.98	1,319,145.05
2.	316,625.27	1,323,513.23	12.	318,411.45	1,319,794.27
3.	317,268.39	1,322,571.31	13.	317,989.26	1,319,446.60
4.	317,578.86	1,322,787.78	14.	317,375.60	1,319,625.41
5.	317,938.42	1,322,276.63	15.	315,788.88	1,321,438.22
6.	318,558.24	1,322,278.35	16.	316,671.11	1,321,941.26
7.	319,744.61	1,321,090.03	17.	316,933.54	1,321,603.85
8.	320,440.18	1,320,389.78	18.	317,637.10	1,322,031.30
9.	321,158.99	1,319,665.68	19.	317,944.70	1,321,735.89
10.	319,700.13	1,318,994.60	20.	319,018.73	1,320,366.48

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALE
'A' 400' 0 400' 800'

No.	SYM	ZONE	DESCRIPTION

DESIGNED BY: B.W.N. | DATE: 19 MAY 2011
DWN BY: J.W.L. & D.B.V. | CKD BY: J.W.L. | SOLICITATION NO.: SOLICIT #
SUBMITTED BY: J.W.L. | CONTRACT NO.: CNT #
PLOT SCALE: AS SHOWN | PLOT DATE: N/A | FILE NUMBER: N/A
FILE NAME: 116684-PISK11-CB121PLN

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
JACKSONVILLE DISTRICT
JACKSONVILLE, FLORIDA

BCOE
INITIAL REVIEW

BEACH EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA
SAND KEY
BEACH RENOURISHMENT 2011
CIVIL
BORROW AREA "L" PLAN AND CROSS-SECTIONS

DRAWING NO.
C-21

Attachment 3

Migratory Bird Protection Policy

Migratory Bird Protection

Throughout the Jacksonville District there are numerous unique species of migratory birds. These birds are protected by state and federal laws. A large majority of these birds species are shorebirds and colonial nesting birds. During construction and/or dredging along the waterways, habitat for these birds are affected or created. The Jacksonville District in conjunction with the State of Florida Freshwater Game and Fish Commission, the Audubon Society and the U.S. Fish and Wildlife Service has developed a District wide policy concerning its activities and migratory bird nesting.

District Policy

CESAJ-PD-ES
MIGRATORY BIRD PROTECTION POLICY JACKSONVILLE DISTRICT

1. I have reviewed the report for the proposed policy for the protection of migratory birds during construction and maintenance activities within the Jacksonville District.

2. The draft migratory bird policy has been coordinated with all interested parties by letter dated 10 January 1992 and 25 February 1992. After taking into consideration all comments, the policy was revised and the final policy was coordinated with the U.S. Fish and Wildlife Service (USFWS) and the Florida Game and Freshwater Fish Commission (FG&FWFC) by letter dated 8 March 1993. These two agencies not only have expertise in the field but also have regulatory responsibilities under the Migratory Bird Treaty Act and the Florida Threatened and Endangered Species Act. The FG&FWFC responded by letter dated 12 November 1993 commending the District for its efforts in producing a thorough and proactive plan and was looking forward to working with us to solve any unforeseen problems. The USFWS responded by letter dated 19 March 1993 stating that it appreciated the Corps' efforts to protect nesting birds and believed that this policy should reduce conflicts.

3. I hereby authorize the attached Migratory Bird Protection Policy to be implemented for the State of Florida within the Jacksonville District. This policy will not only be implemented for construction and maintenance projects but also as conditions for permits issued by Regulatory Division where applicable. This policy will also meet the District's responsibilities under the Migratory Bird Treaty Act of 1918 and the Florida Threatened and Endangered Species Act of 1977.

TERRENCE C. SALT
Colonel, Corps of Engineers
Commanding

MIGRATORY BIRD PROTECTION POLICY

1.0 AUTHORITY: The Migratory Bird Treaty Act of 1918, as amended (16 USC 703) protects most migratory bird species as listed by the US Fish and Wildlife Service. The Florida Endangered and Threatened Species Act of 1977, Title XXVIII, Chapter 372.072, provides for the protection of species listed by the State.

2.0 PURPOSE: The purpose of this plan is to provide protection to nesting migratory bird species that commonly use the dredged material disposal sites within Jacksonville District while facilitating disposal of dredged material to meet the Federal standard for navigation channel and harbor maintenance as authorized by Congress.

3.0 PLAN IMPLEMENTATION. The Plan will consist of four phases: Planning, Implementation, Monitoring, and Mitigation (if necessary).

3.1 Planning. The U.S. Army Corps of Engineers (Corps) will develop a dredging and construction schedule which avoids disposal of dredged material into sites used by nesting birds or avoids construction of disposal areas during nesting to avoid potential conflicts between completion of the construction and nesting activities. Should scheduling to avoid the nesting season not be possible or unforseen construction delays occur, then, a site protection plan (SPP) will be developed detailing how the impacts on the birds will be avoided, minimized, or otherwise mitigated. An advisory committee titled the Migratory Bird Protection Interagency Committee (MBPIC), headed by the Corps and composed of interested parties, will be convened twice a year to review dredging and disposal area construction schedules. (At a minimum the committee will be composed of a representative of the local sponsor, the Corps, U.S. Fish and Wildlife Service and the Florida Game and Freshwater Fish Commission.) If it appears that avoidance of the nesting season is not possible, the SPP will be implemented based on recommendations of the advisory committee. If adverse impacts occur to nesting sites as a result of the project, the MBPIC may recommend appropriate mitigation, based on nesting impacts identified and the requirements of the selected species.

3.2 Implementation. The SPP will be included in the Plans and Specifications for the project as a contingency plan should the nesting season not be avoided (Appendix I). The SPP will be implemented when construction occurs between 1 April and 1 September. Monitoring will be a major component of the SPP.

3.3.1 Monitoring. In order to assure that migratory bird nesting is being protected and suitable nesting sites have been maintained, an SPP will be implemented should construction extend into migratory bird nesting season. The SPP will be implemented between April 1st and ending September 1st while dredging or construction is underway. After the April 1st date, monitoring for bird nesting behavior will be conducted daily during the construction period. Should nesting behavior be observed, the location, number and type of species would be noted (Appendix I). Nesting success would also be noted during the monitoring period. If incidental take occurs, it will be reported to the

Corps, the USFWS, and the Florida Game and Freshwater Fish Commission (FGFWFC).

3.3.2 Mitigation. Should dredge material disposal operations impact important nesting sites, appropriate mitigation actions will be taken.

3.4 Site Protection Plan Review. Nesting success of the birds will also be recorded. Should data indicate that nesting success has been negative due to predation, then, the MBPIC will review the monitoring results to determine if future migratory bird protection is necessary at the site. If it is determined that nesting cannot be successful at the site, then the disposal area will be exempted by the USFWS and FGFWFC from further SPP coverage until new information indicates a review by the MBPIC.

4.0 ALTERNATIVES: The following alternatives are considered useful in preventing impacts to the nesting birds in order of preference. The No Action alternative, disposal without management consideration for the migratory birds, was not considered. Aside from the protection afforded by Federal and State laws, ignoring this resource would violate the Corps' stewardship responsibilities.

4.1 Avoidance. The dredging and disposal will be scheduled to avoid the migratory bird nesting season. This alternative would totally eliminate adversely impacting migratory bird nesting and in some cases would create nesting for selected species such as terns and plovers. This avoidance , in some circumstances, could limit the Corps ability to maintain and/or construct navigation channels, and could result in increased costs to the ports and harbors affected.

4.2 Creating Undesirable Habitat. Flooding the disposal area; placing flagging or line over the construction area to discourage bird flight into it; placement of brush, straw, or plastic as ground cover; seeding and/or sodding exposed areas; or disturbing the surface by furrowing the area. Should scheduling not be possible to avoid impacting the birds due to either the length of time required to dredge or from weather or equipment delays, this passive alternative method could make suitable nesting habitat unusable for nesting by physical alteration of the habitat. There could be additional costs from the contracting of labor and for the acquisition of the equipment or products to be used in making the bird nesting habitat undesirable.

4.3 Dissuasion (Noise generation, activity). Should scheduling not be possible to avoid impacting the birds due to either the length of time required to dredge or from weather or equipment delays, this active alternative would make otherwise suitable nesting habitat undesirable for nesting by audible and physical activity. There could be additional costs from the contracting of labor and for the acquisition of the equipment, personnel or products to be used. Noise and concussion equipment provides generally short-term dissuasion. Human generated deterrents have proven effective in previous Corps disposal areas. In order to use this alternative, authorization from the US Fish and Wildlife Service and the State of Florida would be necessary to meet the statutory requirements.

4.4 Alternative Nesting Sites. Creation of alternate nesting sites outside the construction area is a possible option. Should scheduling not be possible to avoid impacting the birds due to either the length of time required to dredge or from weather or equipment delays, the creation of alternate nesting habitat would allow the birds to find nesting in areas not used for construction. This would require additional costs from the contracting of existing equipment and labor to clear and rake a suitable area prior to nesting season. This alternative would be effective only when implemented in conjunction with the aforementioned alternatives for preventing impacts in disposal areas.

4.5 Incidental Take. This alternative would include the incidental taking of birds or their eggs during nesting. In order to use this alternative, authorization from the US Fish and Wildlife Service and the State of Florida would be necessary to meet the statutory requirements. Therefore, this alternative would not be used or authorization sought unless an emergency situation exists which would require completing construction work or performing the necessary dredging.

5.0 COORDINATION. Meetings have been conducted in the Jacksonville and Tampa Harbor areas with members of the Port Authorities, the US Fish and Wildlife Service, the Florida Game and Freshwater Fish Commission, the Audubon Society, the Sierra Club (Jacksonville only), and the Florida Inland Navigation District (Jacksonville only). Copies of the draft plans were submitted to these agencies and reviewed (Appendix II). The responses have been considered and incorporated into the final plan.

6.0 CONCLUSIONS: Based on all available information, coordination with interested parties and State and Federal agencies having expertise and jurisdiction in the area of migratory birds, and private organizations, we offer the following conclusions: Dredging and construction of disposal areas will be accomplished outside the migratory bird nesting season, if possible. Should work be conducted during nesting season, daily monitoring of the construction site will be conducted to determine if nesting within the site is imminent. Should nesting potentials exist, steps will be taken to make the sites undesirable for nesting until construction, dredging and/or disposal operations are complete. If nesting occurs the contractor, the Contracting Officer, the U.S. Fish and Wildlife Service and the Florida Game and Freshwater Fish Commission will be notified. The Migratory Bird Protection Committee will be informed of the situation so that appropriate coordination and remedial action can be implemented. 7.0 REFERENCES.

- Bull, John and Farrand, John, Jr. 1977. The American Society Field Guide to North American Birds, Eastern Region.

- Endangered Species Act of 1982, as amended.

- Migratory Bird Treaty Act of 1918 (16 USC 703).

- Paul, Richard T. 1991. Personal Communications.

- Paul, Richard T. and Woolfenden, Glen E. 1985. Proceedings, Tampa Bay Area Scientific Information Symposium. Current Status and Trends in Bird Populations of Tampa Bay, pages 426-447.

- Smith, Dr. Hanley K.. 1991. Personal Communications.

- US Fish and Wildlife Service, December 1984. Biological Report 85(15), Tampa Bay Environmental Atlas.

- US Fish and Wildlife Service, June 1986. Biological Report 86(6), Mitigation Options for Fish and Wildlife Resources Affected By Port and Other Water Dependent Developments in Tampa, Florida.

- US Army Corps of Engineers, DOTS Request Memorandum. Management of Disposal Islands in Tampa Bay to Minimize Impacts To Nesting Shorebirds, DOTS Request 92-010. 22 November 1991.

- US Army Corps of Engineers, December 1987. Technical Report DS-78-18, Development and Management of Avian Habitat on Dredged Material Islands.

- US Army Corps of Engineers, December 1987. Technical Report DS-78-19, An Introduction to Habitat Development on Dredged Material. 8.0 LIST OF PREPARERS NAME DISCIPLINE EXPERIENCE ROLE IN PREPARING PLAN

- William J. Fonferek Biologist 14 years environmental impacts assessment Project Manager, Principal Preparer, Biological Impact Assessment

- Hanley K. Smith, Ph.D. Chief, Environmental Resources Branch 23 years biology and wetland research Principal Reviewer Pace Wilbur Biologist 2 years environmental regulation, 2 years environmental consulting Consultant, Waterways Experiment Station