DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
9900 SOUTHWEST 107TH AVENUE, SUITE 203
MIAMI, FLORIDA 33176

REPLY TO
ATTENTION OF

February 23, 2011

Miami Section
SAJ-1998-01677 (IP-MLC)

City of Key West
Attn: Jim Scholl
525 Angela Street
Key West, Florida 33040

Dear Applicant:

The U.S. Army Corps of Engineers (Corps) has completed the review and evaluation of your Department of the Army permit application, number SAJ-1998-01677 (IP-MLC). Our regulations require that you have an opportunity to review the terms and conditions prior to final signature by the Department of the Army. Enclosed is an unsigned Department of the Army permit instrument (permit).

Please read carefully the Special Conditions beginning on page 3 of the permit. These were developed to apply specifically to your project. Water Quality Certification is also required prior to issuance of a permit. The Corps has received a copy of the State of Florida certification for your project. In accordance with General Condition 5 of the permit, any special conditions of the Water Quality Certification have been attached to the Department of the Army permit.

Instructions for Objecting to Permit Terms and Conditions: This letter contains an initial proffered permit for your proposed project. If you object to certain terms and conditions contained within the permit, you may request that the permit be modified. Enclosed you will find a Notification of Administrative Appeal Options and Process fact sheet and Request for Appeal (RFA) form. If you choose to object to certain terms and conditions of the permit, you must follow the directions provided in Section 1, Part A and submit the completed RFA form to the letterhead address.

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria under 33 CFR Part 331.5, and that it has been received by the District office within 60 days of the date of the RFA. Should you decide to submit an RFA form, it must be received at the letterhead address by April 24, 2011.

Instructions for Accepting Terms and Conditions and Finalizing Your Permit: It is not necessary to submit an RFA form to the District office, if you do not object to the decision in this letter. In this case, the permit must be signed by the applicant in the space provided on the signature page of the permit. In the case of corporations, acceptance must be by an officer of that corporation authorized to sign on behalf of the corporation. The party responsible for assuring the work is done in accordance with the permit terms and conditions must sign the permit. Please type or print the name and title of the person signing below the signature and the date signed.

SIGN AND RETURN THE PERMIT, IN ITS ENTIRETY, TO THE LETTERHEAD ADDRESS.

The permit will be signed by the District Engineer and returned to you. It is important to note that the permit is not valid until the District Engineer signs it.

The Corps Jacksonville District Regulatory Division is committed to improving service to our customers. We strive to perform our duty in a friendly and timely manner while working to preserve our environment. We invite you to take a few minutes to visit the following link and complete our automated Customer Service Survey: http://regulatory.usacesurvey.com/. Your input is appreciated - favorable or otherwise.

If you have any questions concerning this application, you may contact Megan Clouser in writing at the letterhead address, by electronic mail at Megan.L.Clouser@usace.army.mil, or by telephone at 305-526-7182.

Sincerely,

Donald W. Kinard
Chief, Regulatory Division

Enclosures

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: City of Key West, Smathers Beach	File Number: **SAJ-1998-01677**	Date: February 23, 2011

Attached is:		See Section below
X	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- *ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.*

- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- *ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.*

- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- *ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.*

- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
Project Manager as noted in letter	for process: Stuart Santos 904-232-2018

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

	Date:	Telephone number:
_____ Signature of appellant or agent.		

DEPARTMENT OF THE ARMY PERMIT

Permittee: City of Key West
Attn: Jim Scholl
525 Angela Street
Key West, Florida 33040

Permit No: SAJ-1998-01677(IP-MLC)

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

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

You are authorized to perform work in accordance with the terms and conditions specified below. By virtue of the issuance of this permit, the previous Notice of Noncompliance, cease and desist directive, and associated enforcement matters related to the work are hereby rescinded and released without penalty or further action required.

Project Description: The applicant proposes to place fill for the renourishment of a recreational beach in Key West, Monroe County, Florida in accordance with the Monroe County Shore Protection Project. The proposed project includes the restoration and stabilization of approximately 3,000 feet of beach shoreline along Smathers Beach. A maximum of 12,891 cubic yards of sand will be used to provide a berm height of +6.0 feet NGVD with a design profile. These total construction fill volumes includes the design, advanced renourishment, and overfill volume. As designed, there should be no impacts to seagrass as a result of beach renourishment. The project is needed to provide storm protection and control erosion threatening a recreational beach within waters of the United States, in accordance with the approved plans (10 pages), pages 1-2, and 7-10, date stamped by the Corps on October 17, 2007, and pages 3-6 date stamped by the Corps on February 23, 2011. The work described above is to be completed in accordance with the 10 pages of drawings and 5 attachments affixed at the end of this permit instrument.

Project Location: The proposed project site known as Smathers Beach, is located adjacent to South Roosevelt Boulevard on the southern coast of Key West, in Section 05, Township 68 South, Range 25 East, Key West, Monroe County, Florida (Real estate numbers 00064660-000100, 00064660-000200, and 00064660-000000).

Directions to site: To reach the proposed project site from Miami, travel south on the Turnpike (HEFT) until it merges with US-1, make a left onto South Roosevelt Boulevard and follow the curve. The project site is located at on the right.

Latitude & Longitude: Latitude 24° 33m 06s
Longitude -81° 46m 15s

Permit Conditions

General Conditions:

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

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

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

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

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

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

Special Conditions:

1) **Reporting Address:** All reports, documentation and correspondence required by the conditions of this permit shall be submitted to the following address: U.S. Army Corps of Engineers, Regulatory Division, Enforcement Section, 9900 SW 107th Avenue, Suite 203, Miami, FL 33176. The Permittee shall reference this permit number, SAJ-1998-01677 (IP-MLC), on all submittals.

2) **Commencement Notification:** Within 10 days from the date of initiating the authorized work, the Permittee shall provide to the Corps a written notification of the date of commencement of work authorized by this permit.

3) **Assurance of Navigation and Maintenance:** The Permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structures or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the Permittee will be required, upon due notice from the U.S. Army Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

4) **Turbidity Barriers:** Prior to the initiation of any of the work authorized by this permit the Permittee shall install floating turbidity barriers with weighted skirts that extend to within 1 foot of the bottom around all work areas that are in or adjacent to, surface waters. The turbidity barriers shall remain in place and be maintained until the authorized work has been completed and all erodible materials have been stabilized.

5) **Manatee Conditions:** Permittee shall comply with the "Standard Manatee Conditions for In-Water Work 2009" attached to this permit and available online at the following Web page:

http://myfwc.com/docs/WildlifeHabitats/Manatee_StdCondIn_waterWork.pdf

6) **Regulatory Agency Changes**: Should any other regulatory agency require changes to the work authorized or obligated by this permit, the Permittee is advised that a modification to this permit instrument is required prior to the initiation of those changes. It is the Permittee's responsibility to request modification of this permit from the Miami Regulatory Office.

7) **Sea Turtle and Smalltooth Sawfish Construction Conditions:** The Permittee shall comply with National Marine Fisheries Service's "Sea Turtle and Smalltooth Sawfish Construction Conditions" dated March 23, 2006, attached to this permit.

8) **Environmental Resource Permit:** The permittee shall comply with the conditions specified in the Florida Department of Environmental Protection, Consolidated Joint Coastal Permit and Sovereign Submerged Land Authorization #0129031-001-JC was approved and issued on 26 May 1999 (copy attached).

9) Fill material used for this project shall be limited to suitable, clean fill material, which excludes items such as trash, debris, car bodies, asphalt, construction materials, concrete block with exposed reinforcement bars, and soils contaminated with any toxic substance, in toxic amounts (see Section 307 of the Clean Water Act). The type of fill material used shall be consistent with the sand disposition outlined in the FWS BO dated May 13, 2010.

10) As-Builts: Within sixty (60) days of completion of the authorized work or at the expiration of the construction window of this permit, whichever occurs first, the Permittee shall submit to the Corps as-built drawings of the authorized work and the attached As-Built Certification Form. The drawings shall be signed and sealed by a registered professional engineer and include the following: (Submittals on 8½" x 11" format)

(1) A plan view drawing of the location of the authorized work footprint with an overlay of the work as constructed in the same scale as the attached permit drawings. Include all "earth disturbance," including wetland impacts, water management structures, and any on-site mitigation areas as applicable.

(2) List any deviations between the work authorized by this permit and the work as constructed. In the event the completed work deviates, in any manner, from the authorized work, describe on the As-Built Certification Form the deviations between the work authorized by this permit and the work as constructed. Clearly indicate on the as-built drawings any deviations that have been listed. Please note that the depiction and/or description of any deviations on the drawings and/or As-Built Certification Form do not constitute approval of any deviations by the U.S. Army Corps of Engineers.

(3) The Department of the Army Permit number.

(4) Include pre- and post-construction aerial photographs of the project site, if available.

11) Endangered Species: This Corps permit does not authorize you to take a threatened or endangered species, in particular the Loggerhead sea turtle (*Caretta caretta*), Green sea turtle (*Chelonia mydas*), Leatherback sea turtle (*Dermochelys coriacea*), Kemp's ridley sea turtle (*Lepidochelys kempii*), Hawksbill sea turtle (*Eretmochelys imbricata*), or Smalltooth sawfish (*Pristis pectinata*). In order to legally take a listed species, the Permittee must have separate authorization under the Endangered Species Act (ESA) (e.g., an ESA Section 10 permit, or a BO under ESA Section 7, with "incidental take" provisions with which the Permittee must comply). The enclosed

U.S. Fish and Wildlife Service (FWS) Biological Opinion (BO), dated May 13, 2010, contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the BO. Authorization under this Corps permit is conditional upon your compliance with all of the mandatory terms and conditions associated with incidental take of the attached BO, which are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of the BO, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Corps permit. The FWS is the appropriate authority to determine compliance with the terms and conditions of its BO, and with the ESA.

12) Pre-, During, and Post-Construction Monitoring Report: Prior to initiating construction, at least once per month during construction, and within sixty (60) days from completion of the authorized work, the Permittee shall submit a pre-, during, and post-construction monitoring report outlining the impacts to submerged aquatic resources, if any, during the construction phase of the project. A copy of all reports will be submitted to the National Marine Fisheries Service's West Palm Beach office to the attention of Ms. Jocelyn Karazsia, at 400 North Congress Avenue, Suite 120, West Palm Beach, FL 33401. The format of this report is included in this permit as Attachment B.

13) If the Corps determines that the proposed mitigation is inappropriate, within sixty (60) days of notification by the Corps, the Permittee shall submit to the Corps an alternate compensatory mitigation proposal sufficient to create the functional lift required from the work authorized under this permit. The alternate compensatory mitigation proposal may be required to include additional mitigation to compensate for the temporal loss of resource functions associated with the project. The Corps reserves the right to fully evaluate, amend, and approve or reject the alternate compensatory mitigation proposal. Within one hundred twenty (120) days of Corps approval, the Permittee will complete the alternate compensatory mitigation proposal.

14) This Corps permit does not authorize you to damage, diminish, degrade, impair, destroy or otherwise harm any Florida Keys National Marine Sanctuary (FKNMS) trust resource. In order to legally conduct your work, you are provided a copy of the FKNMS letter of authorization dated October 19, 2010. You must understand and agree to comply with the provisions of this document. The FKNMS letter contains mandatory terms and conditions. Your authorization under this Corps permit is conditional upon your compliance with all of the mandatory terms and conditions associated with the FKNMS requirements, whose terms and conditions would constitute noncompliance with your Corps permit. The FKNMS is the appropriate authority to determine compliance with the terms and conditions of its requirements and with the Marine Protection, Research, and Sanctuaries Act of 1972 (16 U.S.C. 1432).

Further Information:

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

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

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

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

2. Limits of this authorization.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

_____ _____
(PERMITTEE) (DATE)

_____
(PERMITTEE NAME-PRINTED)

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

_____ _____
(DISTRICT ENGINEER) (DATE)
Alfred A. Pantano, Jr.
Colonel, U.S. Army
District Commander

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

_____ _____
(TRANSFEREE-SIGNATURE) (DATE)

_____
(NAME-PRINTED)

_____
(ADDRESS)

_____
(CITY, STATE, AND ZIP CODE)

Attachments to Department of the Army Permit Number SAJ-1998-01677 (IP-MLC)

1. PERMIT DRAWINGS: 10 pages, pages 1-2, and 7-10, date stamped by the Corps on October 17, 2007, and pages 3-6 date stamped by the Corps on February 23, 2011.

2. WATER QUALITY CERTIFICATION: Specific Conditions of the water quality permit/certification number specified in Florida Department of Environmental Protection, Consolidated Joint Coastal Permit and Sovereign Submerged Land Authorization #0129031-001-JC was approved and issued on 26 May 1999 (attached). The permit has subsequently been extended and since then. The final expiration date is now June 6, 2011, in accordance with General Condition number 5 on page 3 of this DA permit.

3. Attachment A: USFWS Biological Opinion dated May 13, 2010, FWS 41420-2008-FA-0185

4. Attachment B: "*Smathers Beach Monitoring*" plan

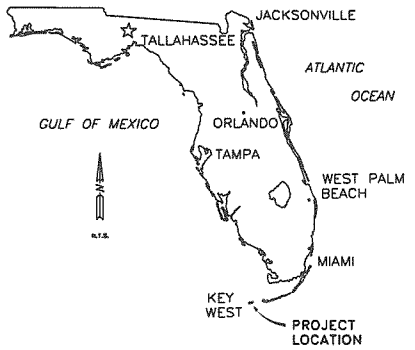
5. Sea Turtle and Smalltooth Sawfish Construction Conditions dated March 23, 2006

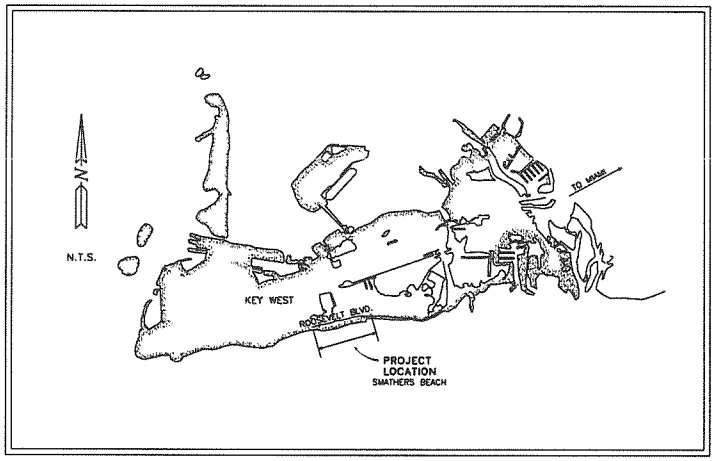
6. Standard Manatee Conditions for In-Water Work July 2009

CITY OF KEY WEST ENGINEERING DEPARTMENT
STATE OF FLORIDA

PLANS OF PROPOSED

SMATHERS BEACH RENOURISHMENT PROJECT





SHEET INDEX

SHEET NO.	SHEET DESCRIPTION
T1	COVER SHEET
C1-C4	PROJECT PLAN VIEW
C5-C8	BEACH FILL CROSS SECTIONS

US ARMY CORPS OF ENGINEERS

OCT 17 2007

1 of 10

MIAMI REGULATORY OFFICE

COE #: 1997-1677

PROJECT MANAGER: Clousac

I CERTIFY THAT THESE PLANS ARE IN COMPLIANCE WITH THE APPLICABLE SECTIONS OF 62B-41,F.A.C.

GERALD ZADIKOFF, PE. DATE

BASE DATA/DESIGN (1999) PER:

COASTAL PLANNING & ENGINEERING, INC.

BOCA RATON (561) 391-8102 SARASOTA JACKSONVILLE FLORIDA

SEAL OF THE CITY OF KEY WEST, FLORIDA

G. M. SELBY Inc.

6999 N. WATERWAY DR.
MIAMI, FL 33155
TEL. : (305) 262-0715
FAX : (305) 262-0724

G.M. SELBY NO: KWC240300
DRAWN BY: F.C. DATE: 08-24-07
CHECKED BY:
ENGINEER: GERALD ZADIKOFF
LICENSE NO.: CIVIL PE# 44206 FL
SEAL

5/23/07

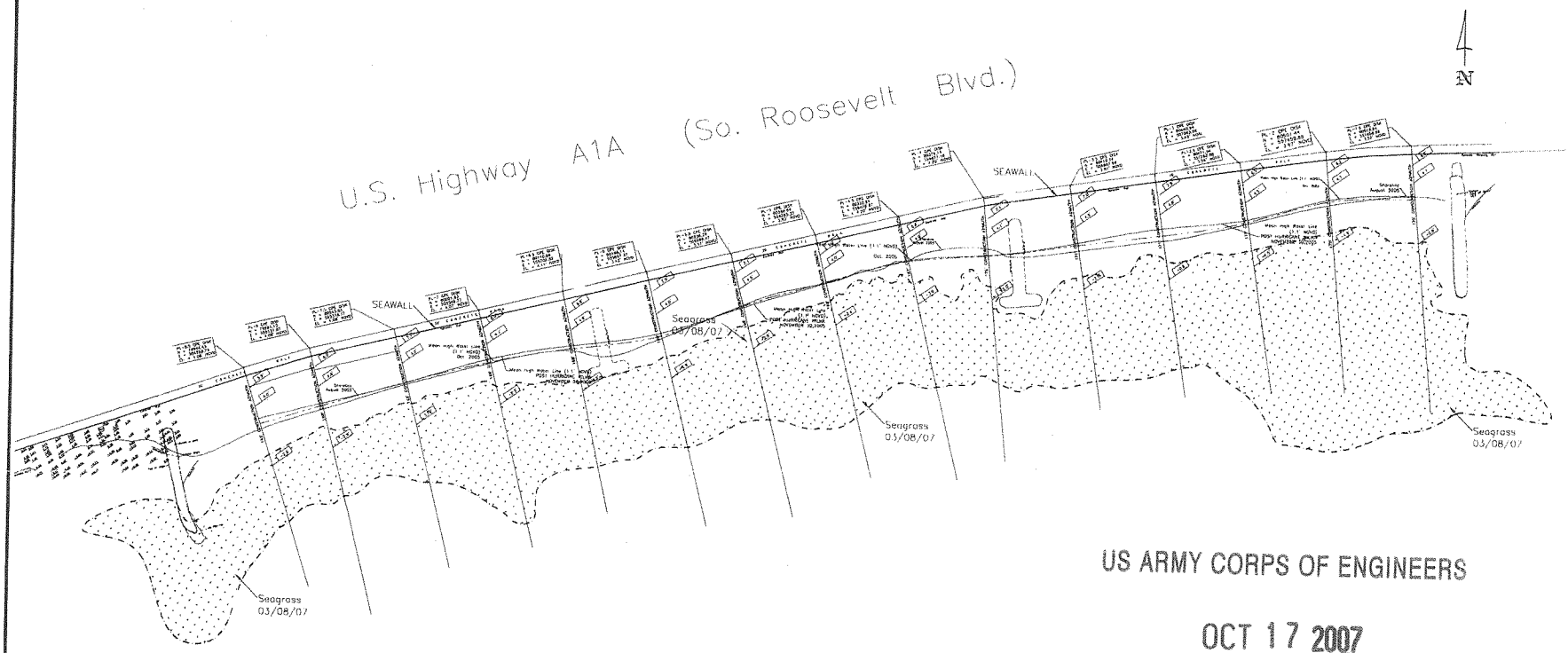
REVISIONS

NO.	DATE	DESCRIPTION

SMATHERS BEACH

SHEET TITLE: COVER SHEET

SHEET NO: T-1



US ARMY CORPS OF ENGINEERS

OCT 17 2007

2 of 10

MIAMI REGULATORY OFFICE
COE #: 1998-1677
PROJECT MANAGER: eloise

NOTES:

1. THE SEAGRASS EDGE WAS OBSERVED IN THE FIELD BY A MAINE BIOLOGIST AND MAPPED USING A MAGELLAN GPS.
2. PLANE COORDINATES ARE BASED ON NORTH AMERICAN DATUM NAD 83 RELATIVE TO THE TRANSVERSE MERCATOR PROJECTION FOR FLORIDA, EAST ZONE (0901).
3. DATE OF FIELD SURVEY: 3/08/07.
4. SHORELINE FROM BEACH SURVEY OF MARCH, 2007.
5. ZONES AS SHOWN MEASURED FROM THE SEAWALL.

SEAGRASS IMPACT		CUMULATIVE TOTAL
100 FT. ZONE	0.0 ACRES	0.00 ACRES
200 FT. ZONE	2.13 ACRES	2.13 ACRES
300 FT. ZONE	6.79 ACRES	8.92 ACRES
400 FT. ZONE	5.93 ACRES	14.85 ACRES
500 FT. ZONE	2.35 ACRES	17.20 ACRES
600 FT. ZONE	1.62 ACRES	18.82 ACRES
+600 FT. ZONE	0.41 ACRES	19.23 TOTAL ACRES

SEAL OF THE CITY OF KEY WEST, FLORIDA

C. M. SELBY Inc.

6999 N. WATERWAY DR.
MIAMI, FL 33155
TEL (305) 262-0715
FAX (305) 262-0724

C.M. SELBY NO. KWC240.300
DRAWN BY F.C. DATE 03.15.07
CHECKED BY
ENGINEER: GERALD ZADIKOFF
LICENSE NO. CIVIL PE# 44206 FL
SEAL

8/23/07

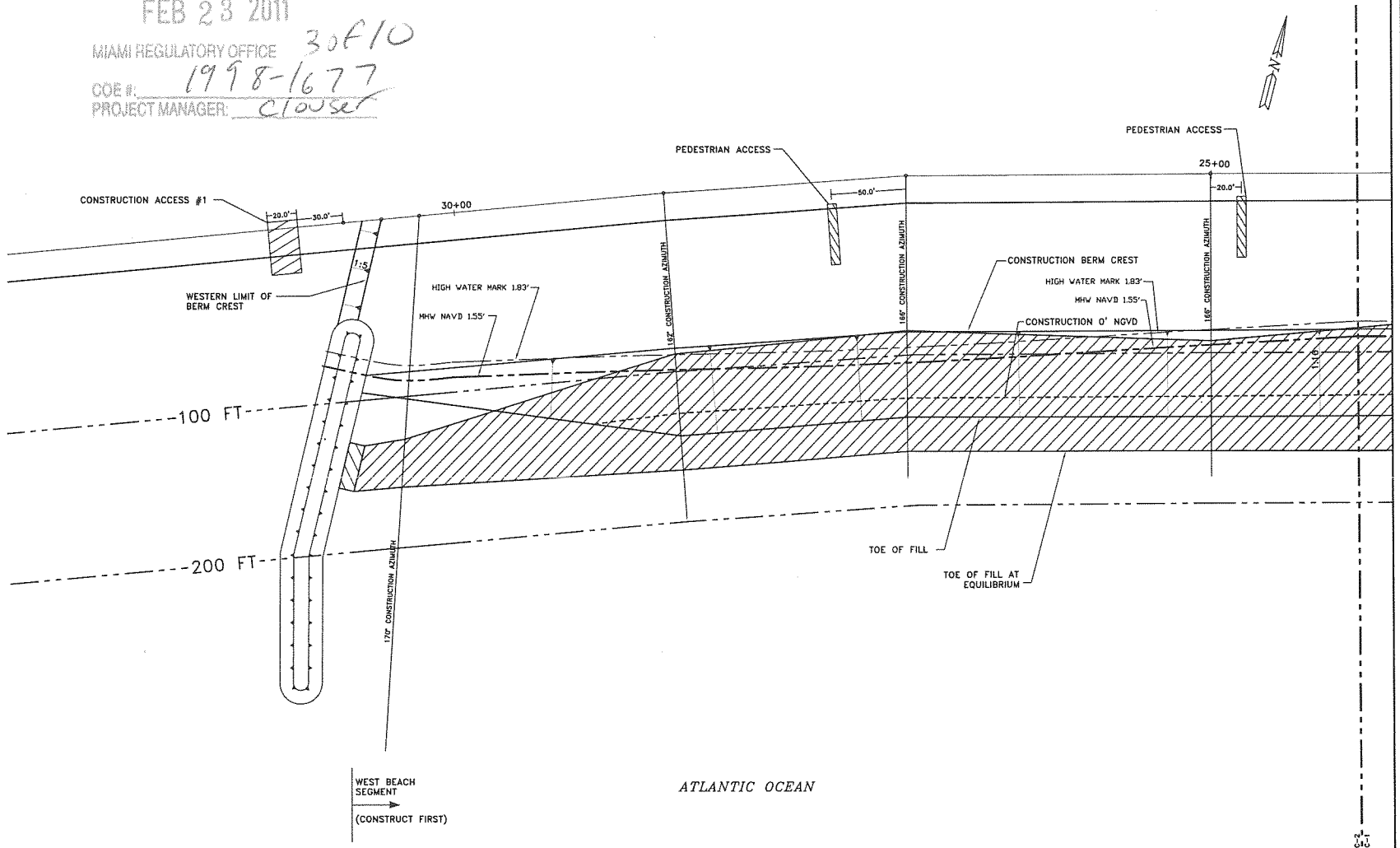
REVISIONS

NO	DATE	DESCRIPTION

SMATHERS BEACH SURVEY & SEAGRASS MARCH, 2007

SHEET TITLE:
SEAGRASS AREA SITE PLAN

SHEET NO
C-3



LEGEND:

- MHW
- HIGH WATER MARK USACE JURISDICTIONAL LINE
- WORK AREA

SMATHERS BEACH PLAN VIEW
SCALE: 1 = 30

NOTES:
1. CONSTRUCTION ACCESS TO THE WEST SEGMENT SHALL BE LIMITED TO CONSTRUCTION ACCESS #1 & #2.
2. CONTRACTOR SHALL NOT PLANT VEGETATION ACROSS PEDESTRIAN ACCESSES, WHICH ARE 6 FEET WIDE AND EXTEND FROM THE SIDEWALK TO THE WATER.
3. CONTRACTOR SHALL INSTALL WOODEN WALKWAY AT EACH PEDESTRIAN ACCESS, AS INDICATED IN PLANS.

G. M. SELBY Inc.
6999 N. WATERWAY
DR. MIAMI, FL 33155
TEL : (305) 262-0715
FAX : (305) 262-0724

G.M. SELBY NO:	KWC290410
DRAWN BY: F.C.	DATE: 07-15-10
CHECKED BY:	
ENGINEER: GERALD ZADIKOFF	
LICENSE NO.: CIVIL PE# 44206 FL	
SEAL:	

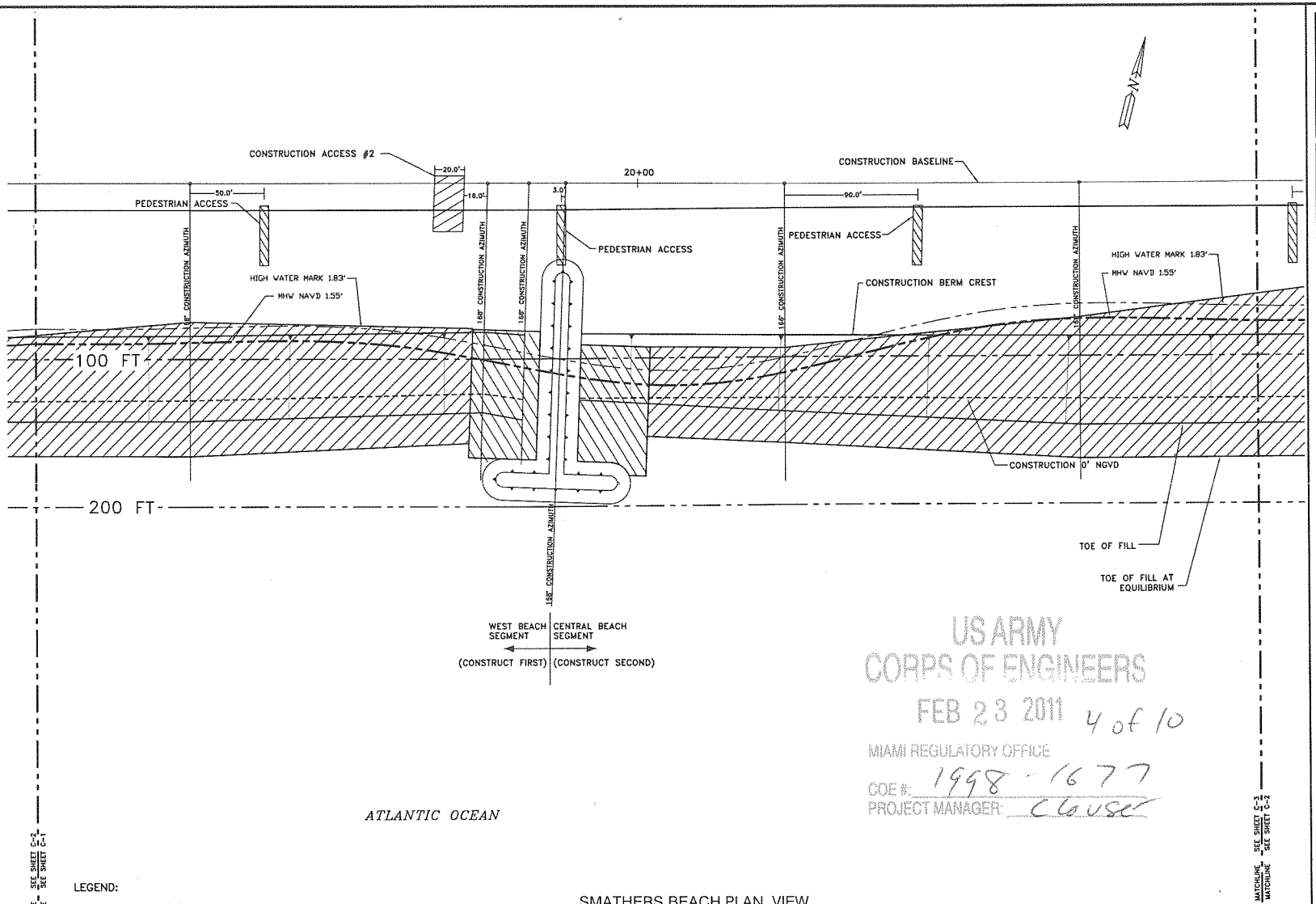
REVISIONS

NO.	DATE	DESCRIPTION

USACE JURISDICTIONAL HIGH WATER LINE

SHEET TITLE: PLAN VIEW

SHEET NO: HW-1



SMATHERS BEACH PLAN VIEW
SCALE: 1 = 30

4 of 10

G. M. SELBY Inc.
6999 N. WATERWAY
DR. MIAMI, FL 33155
TEL : (305) 262-0715
FAX : (305) 262-0724

G.M. SELBY NO:	KWC290410
DRAWN BY: F.C.	DATE: 07-15-10
CHECKED BY:	
ENGINEER:	GERALD ZADIKOFF
LICENSE NO.:	CIVIL PE# 44206 FL
SEAL	

REVISIONS

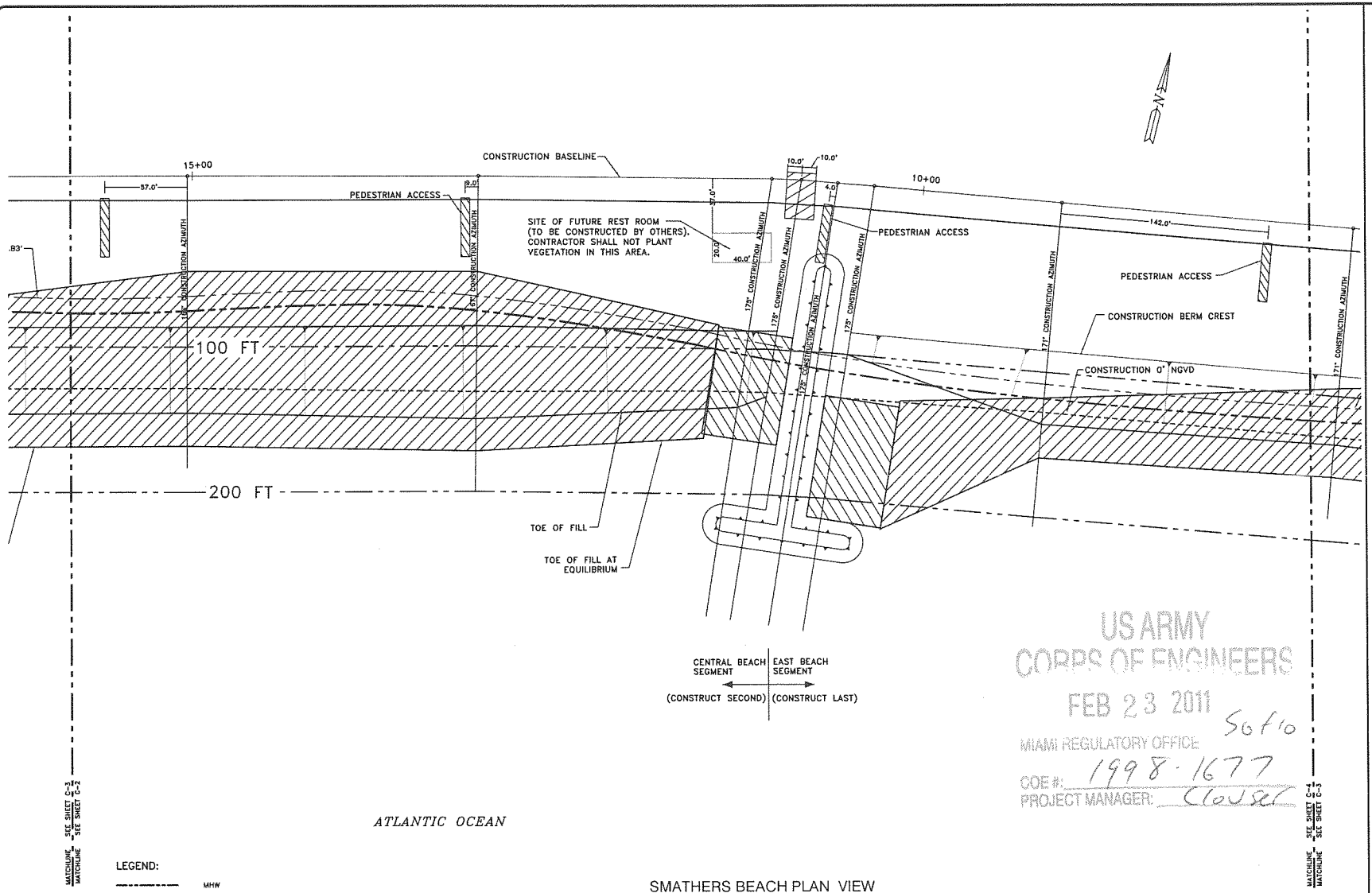
NO.	DATE	DESCRIPTION

USACE JURISDICTIONAL HIGH WATER LINE

SHEET TITLE: PLAN VIEW

SHEET NO: HW-2

\\GMS-SERVER\GMS Files\2010\CITY OF KEY WEST\SMATHERS BEACH Permitting for USACE\12-23-2010 REV 24 X 36 SEAGRASS OVERLAY



LEGEND:

- MHW
- HIGH WATER MARK USACE JURISDICTIONAL LINE
- WORK AREA

SMATHERS BEACH PLAN VIEW
SCALE: 1 = 30

G. M. SELBY Inc.
6999 N. WATERWAY DR. MIAMI, FL 33155
TEL : (305) 262-0715
FAX : (305) 262-0724

G.M. SELBY NO:	KWC290410
DRAWN BY: F.C.	DATE: 07-15-10
CHECKED BY:	
ENGINEER:	GERALD ZADIKOFF
LICENSE NO.:	CIVIL PE# 44206 FL
SEAL	

REVISIONS

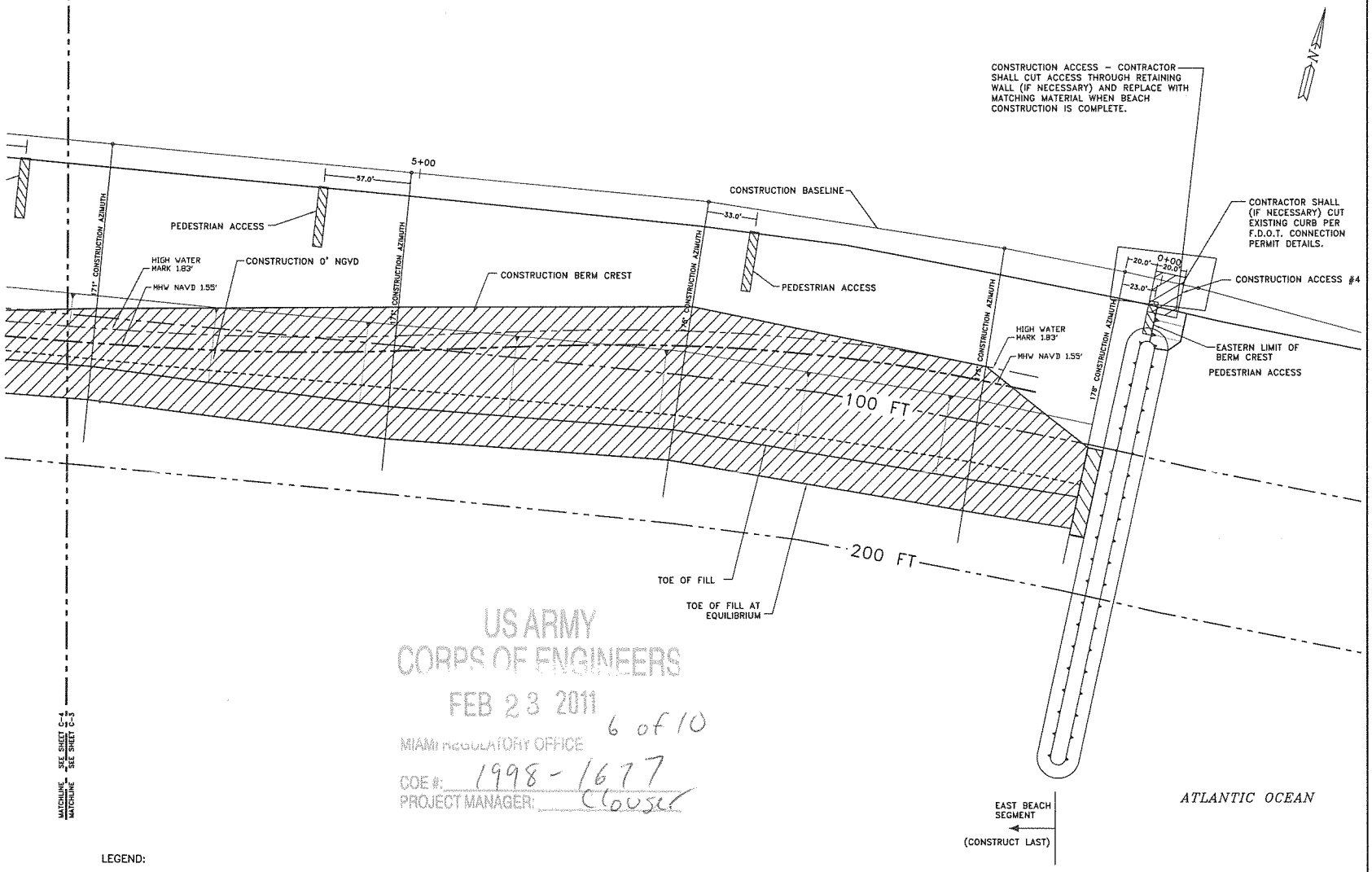
NO.	DATE	DESCRIPTION

USACE JURISDICTIONAL HIGH WATER LINE

SHEET TITLE: PLAN VIEW

SHEET NO: HW-3

\\GMS-SERVER\GMS Files\2010\CITY OF KEY WEST\SMATHERS BEACH Permitting for USACE\12-23-2010 REV 24 X 36 SEAGRASS OVERLAY



LEGEND:

- MHW
- HIGH WATER MARK USACE JURISDICTIONAL LINE
- WORK AREA

SMATHERS BEACH PLAN VIEW
SCALE: 1 = 30

G. M. SELBY Inc.
6999 N. WATERWAY
DR. MIAMI, FL 33155
TEL. : (305) 262-0715
FAX : (305) 262-0724

G.M. SELBY NO:	KWC290410
DRAWN BY: F.C.	DATE: 07-15-10
CHECKED BY:	
ENGINEER:	GERALD ZADIKOFF
LICENSE NO.:	CIVIL PE# 44206 FL
SEAL:	

REVISIONS

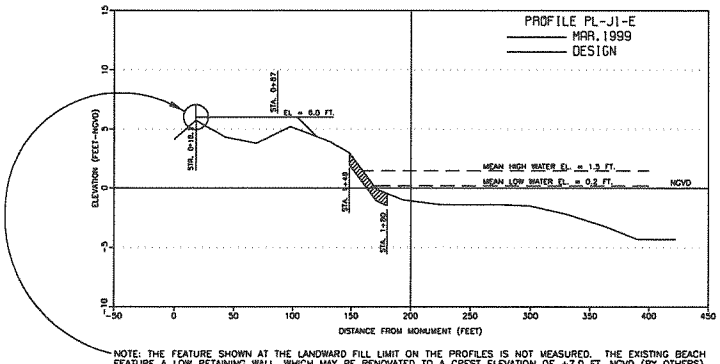
NO.	DATE	DESCRIPTION

USACE JURISDICTIONAL HIGH WATER LINE

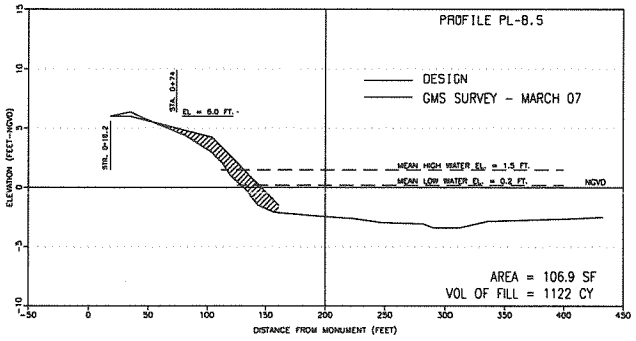
SHEET TITLE: PLAN VIEW

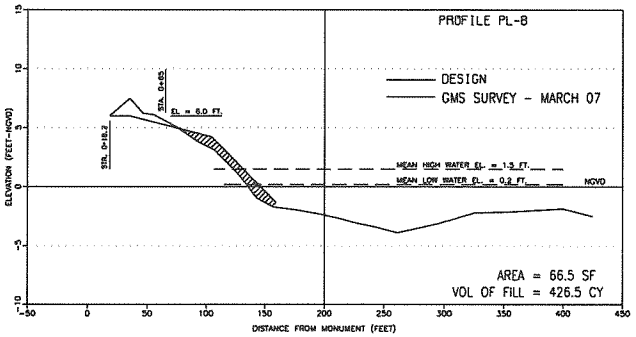
SHEET NO: HW-4

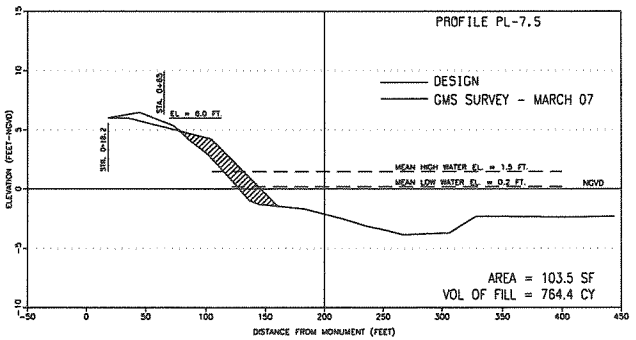
\\GMS-SERVER\GMS Files\2010\CITY OF KEY WEST\SMATHERS BEACH Permitting for USACE\12-23-2010 REV 24 X 36 SEAGRASS OVERLAY

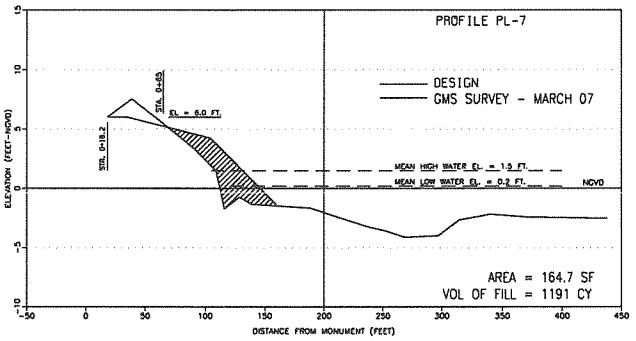


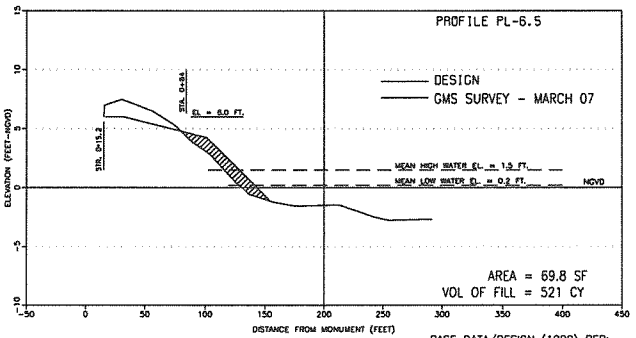
NOTE: THE FEATURE SHOWN AT THE LANDWARD FILL LIMIT ON THE PROFILES IS NOT MEASURED. THE EXISTING BEACH FEATURE A LOW RETAINING WALL, WHICH MAY BE RENOVATED TO A CREST ELEVATION OF +7.0 FT. NGVD (BY OTHERS) PRIOR TO THE BEACH FILL. (TYP.) IF THE ELEVATION OF THE RETAINING WALL IS LOWER THAN THE ELEVATION OF THE DESIGN BEACH, THEN THE CONTRACTOR SHALL CONSTRUCT A 1V:5H LANDWARD SLOPE FROM THE DESIGN BERM CREST TO THE PEAK OF THE RETAINING WALL.











DENOTES AREA TO BE EXCAVATED BY OTHERS AND FILLED UNDER THIS CONTRACT

BASE DATA/DESIGN (1999) PER:

COASTAL PLANNING & ENGINEERING, INC.
BOCA RATON (561) 391-8102 SARASOTA JACKSONVILLE FLORIDA

US ARMY CORPS OF ENGINEERS

OCT 17 2007

MIAMI REGULATORY OFFICE

7 of 10

1998-1677

CE #:

OJECT MANAGER: Elowitz

SEAL OF THE CITY OF KEY WEST, FLORIDA

G. M. SELBY Inc.

5999 N. WATERWAY DR.
MIAMI, FL 33155
TEL. : (305) 262-0715
FAX : (305) 262-0724

G.M. SELBY NO:	KWC240300
DRAWN BY: F.C.	DATE: 08-24-07
CHECKED BY:	
ENGINEER:	GERALD ZADIKOFF
LICENSE NO.:	CIVIL PE# 44206 FL

SIGNATURE

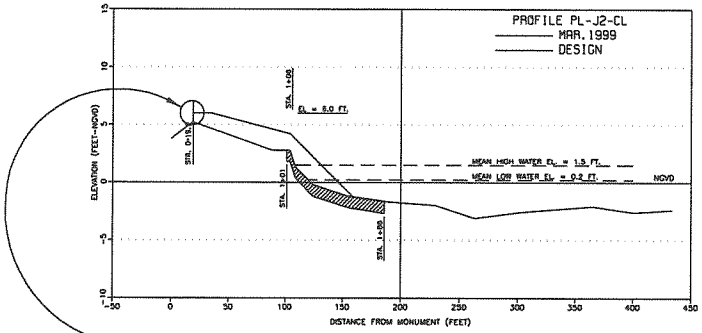
REVISIONS

NO.	DATE	DESCRIPTION

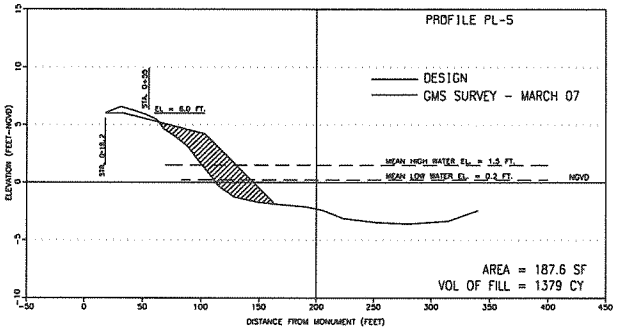
SMATHERS BEACH

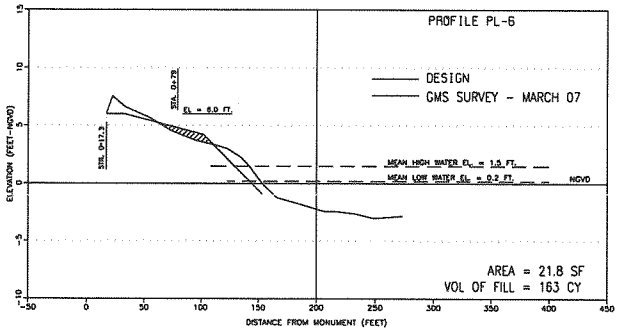
SHEET TITLE:
BEACH FILL CROSS SECTIONS

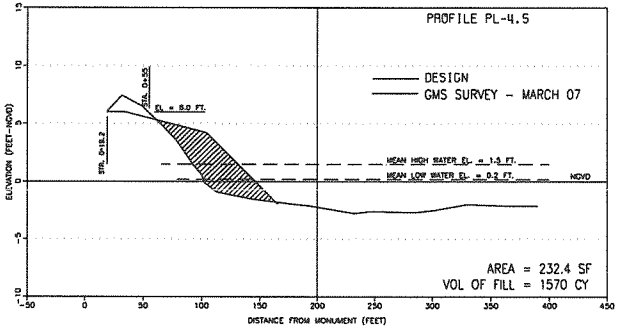
SHEET NO:
C-5

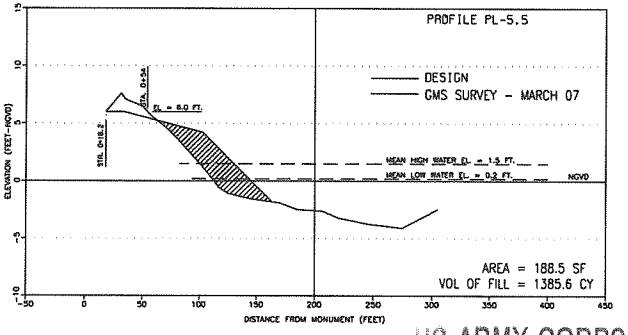


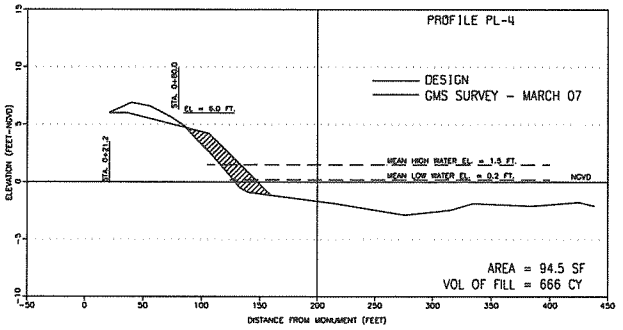
NOTE: THE FEATURE SHOWN AT THE LANDWARD FILL LIMIT ON THE PROFILES IS NOT MEASURED. THE EXISTING BEACH FEATURE A LOW RETAINING WALL, WHICH MAY BE RENOVATED TO A CREST ELEVATION OF +7.0 FT. NGVD (BY OTHERS) PRIOR TO THE BEACH FILL. (TYP.) IF THE ELEVATION OF THE RETAINING WALL IS LOWER THAN THE ELEVATION OF THE DESIGN BEACH, THEN THE CONTRACTOR SHALL CONSTRUCT A 1V:5H LANDWARD SLOPE FROM THE DESIGN BERM CREST TO THE PEAK OF THE RETAINING WALL.











US ARMY CORPS OF ENGINEERS

DENOTES AREA TO BE EXCAVATED BY OTHERS AND FILLED UNDER THIS CONTRACT

BASE DATA/DESIGN (1999) PER:

COASTAL PLANNING & ENGINEERING, INC.
BOCA RATON (561) 391-8102 SARASOTA JACKSONVILLE FLORIDA

OCT 17 2007
8 of 10
MIAMI REGULATORY OFFICE
COE #: 1998-1677
PROJECT MANAGER: C Lovell

SEAL OF THE CITY OF KEY WEST, FLORIDA

G. M. SELBY Inc.
6999 N. WATERWAY DR.
MIAMI, FL 33155
TEL. : (305) 262-0715
FAX : (305) 262-0724

G.M. SELBY NO:	KWC240300
DRAWN BY: F.C.	DATE: 08-24-07
CHECKED BY:	
ENGINEER: GERALD ZADIKOFF	
LICENSE NO.: CIVIL PE# 44206 FL	
SEAL:	

8/24/07

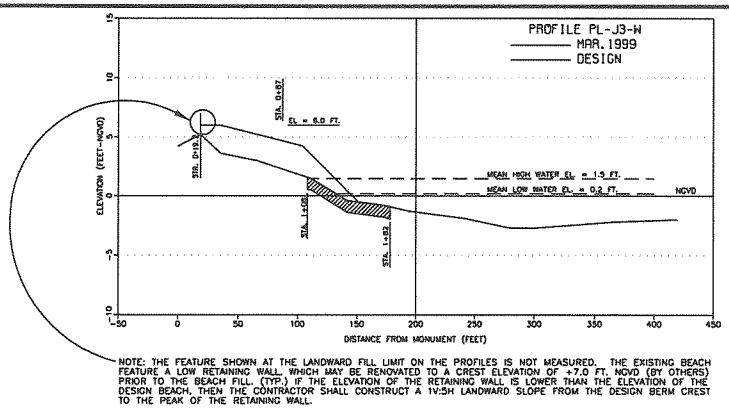
REVISIONS

NO.	DATE	DESCRIPTION

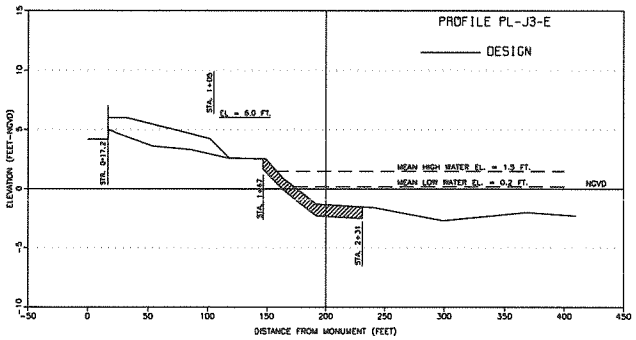
SMATHERS BEACH

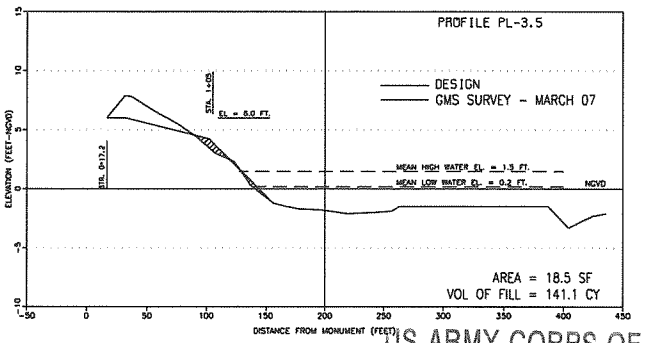
SHEET TITLE:
BEACH FILL CROSS SECTIONS

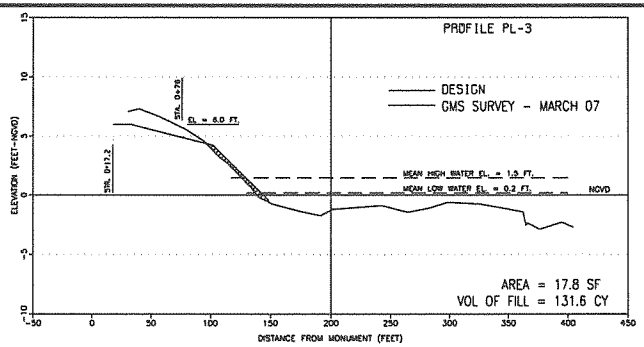
SHEET NO:
C-6

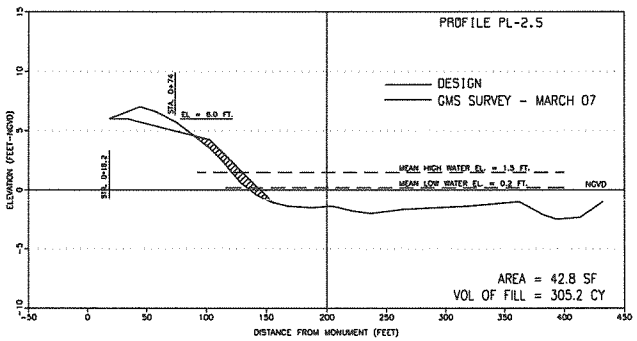


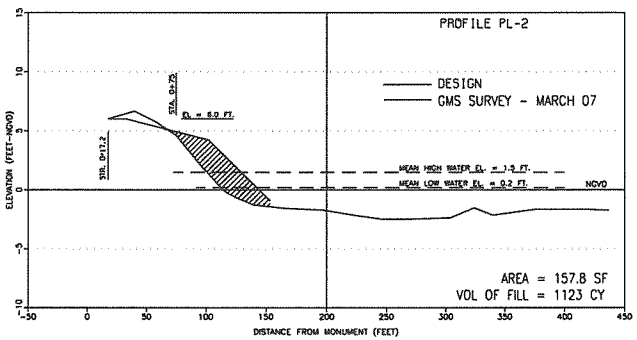
NOTE: THE FEATURE SHOWN AT THE LANDWARD FILL LIMIT ON THE PROFILES IS NOT MEASURED. THE EXISTING BEACH FEATURE A LOW RETAINING WALL, WHICH MAY BE RENOVATED TO A CREST ELEVATION OF +7.0 FT. NGVD (BY OTHERS) PRIOR TO THE BEACH FILL. (TYP.) IF THE ELEVATION OF THE RETAINING WALL IS LOWER THAN THE ELEVATION OF THE DESIGN BEACH, THEN THE CONTRACTOR SHALL CONSTRUCT A 1V:5H LANDWARD SLOPE FROM THE DESIGN BERM CREST TO THE PEAK OF THE RETAINING WALL.











DENOTES AREA TO BE EXCAVATED BY OTHERS AND FILLED UNDER THIS CONTRACT

BASE DATA/DESIGN (1999) PER:

COASTAL PLANNING & ENGINEERING, INC.
BOCA RATON (561) 391-8102 SARASOTA JACKSONVILLE FLORIDA

US ARMY CORPS OF ENGINEERS

OCT 17 2007

9 of 10

MIAMI REGULATORY OFFICE
CE #: 1998-1677
ROJECT MANAGER: Clouser

SEAL OF THE CITY OF KEY WEST, FLORIDA

G. M. SELBY Inc.

6999 N. WATERWAY DR.
MIAMI, FL 33155
TEL. : (305) 262-0715
FAX : (305) 262-0724

G.M. SELBY NO:	KWC240300
DRAWN BY: F.C.	DATE: 08-24-07
CHECKED BY:	
ENGINEER: GERALD ZADIKOFF	
LICENSE NO.: CIVIL PE# 44206 FL	

SEAL

8/24/07

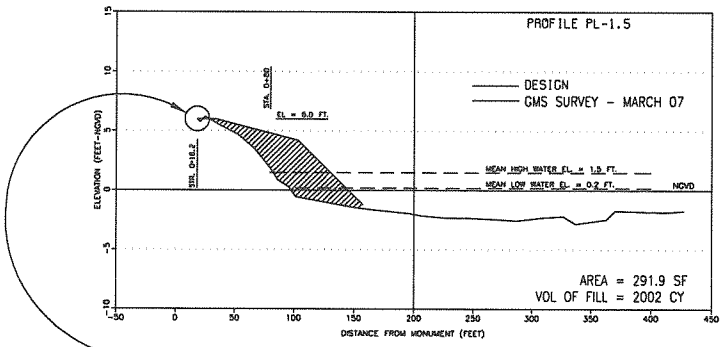
REVISIONS

NO.	DATE	DESCRIPTION

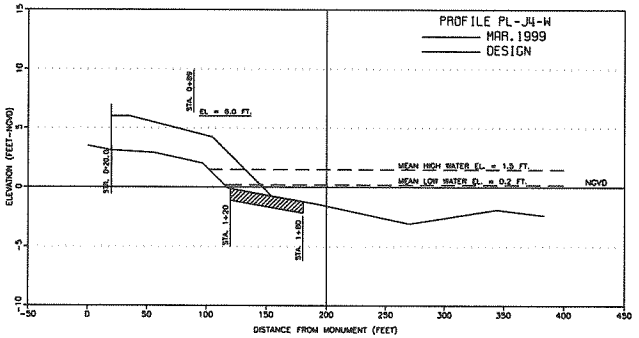
SMATHERS BEACH

SHEET TITLE:
BEACH FILL CROSS SECTIONS

SHEET NO:
C-7



NOTE: THE FEATURE SHOWN AT THE LANDWARD FILL LIMIT ON THE PROFILES IS NOT MEASURED. THE EXISTING BEACH FEATURE A LOW RETAINING WALL, WHICH MAY BE RENOVATED TO A CREST ELEVATION OF +7.0 FT. NGVD (BY OTHERS) PRIOR TO THE BEACH FILL. (TYP.) IF THE ELEVATION OF THE RETAINING WALL IS LOWER THAN THE ELEVATION OF THE DESIGN BEACH, THEN THE CONTRACTOR SHALL CONSTRUCT A 1V:5H LANDWARD SLOPE FROM THE DESIGN BERM CREST TO THE PEAK OF THE RETAINING WALL.



DENOTES AREA TO BE EXCAVATED BY OTHERS AND FILLED UNDER THIS CONTRACT

US ARMY CORPS OF ENGINEERS

OCT 17 2007

10 of 10

MIAMI REGULATORY OFFICE

COE #: 1998-1677

PROJECT MANAGER: Elousef

TOTAL VOLUME OF SAND TO BE PLACED ON SMATHERS:
Tot. VOL=12891 CY

BASE DATA/DESIGN (1999) PER:

COASTAL PLANNING & ENGINEERING, INC.
BOCA RATON (561) 391-9102 SARASOTA JACKSONVILLE FLORIDA

SEAL OF THE CITY OF KEY WEST, FLORIDA

G. M. SELBY Inc.

6999 N. WATERWAY DR.
MIAMI, FL 33155
TEL. : (305) 262-0715
FAX : (305) 262-0724

G.M. SELBY NO:	KWC240300
DRAWN BY: F.C.	DATE: 08-24-07
CHECKED BY:	
ENGINEER: GERALD ZADIKOFF	
LICENSE NO.: CIVIL PE# 44206 FL	

SEAL

9/24/07

REVISIONS

NO.	DATE	DESCRIPTION

SMATHERS BEACH

SHEET TITLE:

BEACH FILL CROSS SECTIONS

SHEET NO:

C-8

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

May 13, 2010

Alfred A. Pantano, Jr.
District Commander
U.S. Army Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Service Federal Activity Code:	41420-2008-FA-0185
Corps Application No:	SAJ-1998-1677 (IP-MLC)
Date Received:	November 14, 2007
Formal Consultation Initiation Date:	December 9, 2009
Project:	Sand Placement
Applicant:	City of Key West
County:	Monroe

Dear Colonel Pantano:

This document transmits the Fish and Wildlife Service's (Service) biological opinion based on our review of a proposal to place sand along approximately 0.57 mile of shoreline in Monroe County, Florida. The U.S. Army Corps of Engineers (Corps) determined on September 22, 2009, the proposed project "may affect" the threatened loggerhead sea turtle (*Caretta caretta*), the endangered leatherback sea turtle (*Dermochelys coriacea*), the endangered green sea turtle (*Chelonia mydas*), the endangered hawksbill sea turtle (*Eretmochelys imbricata*), and the endangered Kemp's ridley sea turtle (*Lepidochelys kempii*), and we concur with your determination. This document is provided in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*).

In the November 8, 2007, Public Notice, the Corps also determined the proposed action will have "no effect," on the endangered West Indian manatee (*Trichechus manatus*). In order to protect this species, the Corps will ensure specific construction safety precautions are implemented as outlined in the *Standard Manatee Conditions for In-Water Work* (Florida Fish and Wildlife Conservation Commission [FWC] 2009a). No impacts to critical habitat are anticipated. Based upon implementation of the above stated conditions, the Service concurs with the Corps' determination in regard to the West Indian manatee.

This Biological Opinion is based on information provided in the Corps' Public Notice dated November 8, 2007, and correspondence with the Corps, National Marine Fisheries Service (NOAA Fisheries), FWC, and the City of Key West (Applicant). A complete administrative record of this consultation is on file at the South Florida Ecological Services Office, Vero Beach, Florida.

Hardbottom Reef Habitat and Seagrasses

The proposed project is expected to impact approximately 2.61 acres of seagrasses. The Applicant did not submit a mitigation plan for the current proposed project because the Applicant mitigated for similar seagrass impacts during the original nourishment project completed in 1999. Mitigation consisted of scraping down the 6.5 acre Blimp Pad Site (BPS), transplanting seagrasses from Smathers Beach, and restoring BPS to its natural state as a salt pond, seagrass and mangrove habitat. Seagrass transplantation was completed in March 2000, and the final monitoring report completed in 2004. In addition, the Applicant was given mitigation credit for improvements made to the White Street Pier which resulted in the recolonization of approximately 0.3 acre of seagrass habitat. Both the Florida Department of Environmental Protection (DEP) and NOAA Fisheries have accepted the past mitigation for the currently proposed project.

We recommend the Corps consult with NOAA Fisheries concerning potential impacts to nearshore hardbottom reef habitat and seagrasses adjacent to the sand placement fill template and the shoreline downdrift and updrift areas.

CONSULTATION HISTORY

On November 14, 2007, the Service received a copy of the Corps' Public Notice dated November 8, 2007, and a letter from the Corps dated October 22, 2008, requesting informal consultation concerning nesting sea turtles and the West Indian manatee.

Between December 4, 2007, and November 4, 2009, the Service sent numerous emails to the Corps requesting additional information.

On September 22, 2009, the Corps sent the Service an email stating that they had determined that the proposed project "may affect" nesting sea turtles.

On December 9, 2009, the Service received the last of the requested information from the Corps and initiated formal consultation.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Applicant proposes to place beach compatible sand along Smathers Beach, Monroe County, Florida (Figure 1). The project area consists of a 0.57 mile long fill template where approximately 12,891 cubic yards (cy) of beach compatible sand will be placed. The proposed design berm template will provide a height of +6.0 feet National Geodetic Vertical Datum and a 1 vertical:5 horizontal slope. The intent of the project is to renourish and improve the shoreline for recreational use, and reduce shoreline erosion.

Beach compatible sand will be obtained from the ER Jahna Ortona Sand Mine, Moore Haven, Florida, and must be approved by DEP and meet all requirements as outlined in the Florida Administrative Code subsection 62B-41.007. Sand excavated from the sand mine will be trucked to the sand placement fill template using conventional triaxle dump trucks and deposited at the staging area at the east end of the project area (Figure 1). Front end loaders will load the sand into all-terrain dump trucks, delivered to the fill template, and graded to the permitted design fill profile using a bulldozer. No upland habitat impacts associated with the beach access corridor is anticipated.

Sand placement is scheduled to commence as soon as all regulatory authorizations are in place. The Applicant anticipates the project will take approximately 4 to 6 weeks to complete. If construction extends into the sea turtle nesting season (March 1 to November 30), no work will commence until daily nesting surveys have been completed. Construction activities will take place only during daylight hours.

The action area is defined as all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action. The Service identifies the action area to include the sand placement fill template (0.57 mile), the staging area, and the all-terrain dump truck shoreline corridor. Due to the relatively small quantity of sand placed in the fill template, and past postconstruction results, downdrift and updrift effects are considered negligible. The project is located along the Atlantic Ocean, at Smathers Beach, Monroe County, Florida at latitude 24.5517 and longitude -81.7708.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

Loggerhead Sea Turtle

The loggerhead sea turtle, listed as a threatened species on July 28, 1978 (43 Federal Register [FR] 32800), inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Loggerhead sea turtles nest within the continental United States (U.S.) from Louisiana to Virginia. Major nesting concentrations in the U.S. are found on the coastal islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf coasts of Florida (Hopkins and Richardson 1984).

No critical habitat has been designated for the loggerhead sea turtle.

Green Sea Turtle

The green sea turtle was federally listed 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 turtle has a worldwide distribution in tropical and subtropical waters. Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Suriname. Within the U.S., green turtles nest in

small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NOAA Fisheries and Service 1991a). Nesting has also been documented along the Gulf coast of Florida on Santa Rosa Island (Okaloosa and Escambia Counties) and from Pinellas County through Collier County. Green turtles have been known to nest in Georgia, but only on rare occasions, and sporadically in North Carolina and South Carolina. Unconfirmed nesting of green turtles in Alabama has also been reported.

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys (63 FR 46693).

Leatherback Sea Turtle

The leatherback sea turtle, listed as an endangered species on June 2, 1970 (35 FR 8491), nests on shores of the Atlantic, Pacific and Indian Oceans. Nonbreeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Nesting grounds are distributed worldwide, with the Pacific Coast of Mexico supporting the world's largest known concentration of nesting leatherbacks in the Pacific. The largest nesting colony in the wider Caribbean region is found in French Guiana, but nesting occurs frequently, although in lesser numbers, from Costa Rica to Columbia and in Guyana, Suriname, and Trinidad (National Research Council 1990; NOAA Fisheries and Service 1992).

The leatherback regularly nests in the U.S. in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia (NOAA Fisheries and Service 1992). Leatherback turtles have been known to nest in Georgia, South Carolina, and North Carolina, but only on rare occasions. Leatherback nesting has also been reported on the northwest coast of Florida (LeBuff 1990); a false crawl (nonnesting emergence) has been observed on Sanibel Island (LeBuff 1990).

Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands (44 FR 17710).

Hawksbill Sea Turtle

The hawksbill sea turtle was listed as an endangered species on June 2, 1970 (35 FR 8491). The hawksbill is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean. Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Miami-Dade Counties) and the Florida Keys (Monroe County) (Meylan 1992; Meylan et al. 1995). However, hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors. Therefore, surveys in Florida likely underestimate actual hawksbill nesting numbers (Meylan et al. 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NOAA Fisheries and Service 1993).

Critical habitat for the hawksbill sea turtle has been designated for selected beaches or waters of Mona, Monito, Culebrita, and Culebra Islands, Puerto Rico (63 FR 46693).

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was listed as endangered on December 2, 1970 (35 FR 18320). The range of the Kemp's ridley includes the Gulf of Mexico coasts of Mexico and the U.S., and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland. Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a very small number of Kemp's ridleys nest consistently along the Texas coast (Turtle Expert Working Group 1998). In addition, rare nesting events have been reported in Florida, Alabama, South Carolina, and North Carolina. 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 NOAA Fisheries 1992).

No critical habitat has been designated for the Kemp's ridley sea turtle.

Life history

Loggerhead Sea Turtle

Loggerheads are known to nest from one to seven times within a nesting season (Talbert et al. 1980; Lenarz et al. 1981; Richardson and Richardson 1982); the mean is approximately 4.1 (Murphy and Hopkins 1984). The interval between nesting events within a season varies around a mean of about 14 days (Dodd 1988). Mean clutch size varies from about 100 to 126 eggs along the southeastern U.S. coast (NOAA Fisheries and Service 1991b). Incubation ranges from about 45 to 95 days. Nesting migration intervals of 2 to 3 years are most common in loggerheads, but the number can vary from 1 to 7 years (Dodd 1988). Age at sexual maturity is believed to be about 20 to 30 years (Turtle Expert Working Group 1998).

Green Sea Turtle

Green turtles deposit from one to nine clutches within a nesting season, but the overall average is 3.3. The mean interval between nesting events within a season is 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). Incubation ranges from about 45 to 75 days. Only occasionally do females produce clutches in successive years. Usually 2 or more years intervene between breeding seasons (NOAA Fisheries and Service 1991a). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Leatherback Sea Turtle

Leatherbacks nest five to seven times within a nesting season, with an observed maximum of 11 (NOAA Fisheries and Service 1992). The interval between nesting events within a season is about 10 days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few

dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Incubation ranges from about 55 to 75 days. Nesting migration intervals of 2 to 3 years were observed in leatherbacks nesting on Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in 6 to 10 years (Zug and Parham 1996).

Hawksbill Sea Turtle

Hawksbills nest on average four and one half times per season at intervals of approximately 14 days (Corliss et al. 1989). In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (NOAA Fisheries and Service 1993). Incubation lasts for about 60 days. On the basis of limited information, nesting migration intervals of 2 to 3 years appear to predominate. Hawksbills are recruited into the reef environment at about 14 inches in length and are believed to begin breeding about 30 years later. The time required to reach 14 inches in length however, is unknown, and growth rates vary geographically. As a result, actual age at sexual maturity is not known.

Kemp's Ridley Sea Turtle

Nesting occurs from April into July during which time the turtles appear off the Tamaulipas and Veracruz coasts of Mexico. Precipitated by strong winds, the females swarm to mass nesting emergences, known as *arribadas* or *arribazones*, to nest during daylight hours. Clutch size averages 100 eggs (Service and NOAA Fisheries 1992). The incubation period ranges from 45 to 70 days. Hatchlings, after leaving the nesting beach, are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 8 inches in length, at which size they enter coastal shallow water habitats (Ogren 1989). Some females breed annually and nest an average of one to four times in a season at intervals of 10 to 28 days. Age at sexual maturity is believed to be between 7 to 15 years (Turtle Expert Working Group 1998).

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 regions of the Atlantic and Indian Oceans. The most recent reviews show that only two loggerhead nesting beaches (South Florida [U.S.] and Masirah [Oman]) 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). 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 47,000 and 90,000 nests per year over the last decade (FWC, unpublished data; Georgia and South Carolina Department of Natural Resources, unpublished data; North Carolina Wildlife Resources Commission, 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 nonnesting 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. The loggerhead nesting aggregations in Oman and the U.S. account for the majority of nesting worldwide.

Green Sea Turtle

About 150 to 2,750 females are estimated to nest on beaches in the continental U.S. annually. In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year (NOAA Fisheries and Service 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 group in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season (Limpus et al. 1993). In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

A dramatic drop in nesting numbers has been recorded on major nesting beaches in the Pacific. Spotila et al. (2000) have highlighted the dramatic decline and possible extirpation of leatherbacks in the Pacific.

The East Pacific and Malaysia leatherback populations have collapsed. Spotila et al. (1996) estimated that only 34,500 females nested annually worldwide in 1995, which is a dramatic decline from the 115,000 estimated in 1980 (Pritchard 1982). In the eastern Pacific, the major nesting beaches occur in Costa Rica and Mexico. At Playa Grande, Costa Rica, considered the most important nesting beach in the eastern Pacific, numbers have dropped from 1,367 leatherbacks in 1988-1989 to an average of 188 females nesting between 2000-2001 and 2003-2004. In Pacific Mexico, 1982 aerial surveys of adult female leatherbacks indicated this area had become the most important leatherback nesting beach in the world. Tens of thousands of nests were laid on the beaches in the 1980s, but during the 2003-2004 seasons a total of 120 nests were recorded. In the western Pacific, the major nesting beaches lie in Papua New Guinea, Papua, Indonesia, and the Solomon Islands. These are some of the last remaining significant nesting assemblages in the Pacific. Compiled nesting data estimated approximately 5,000 to 9,200 nests annually with 75 percent of the nests being laid in Papua, Indonesia.

However, the most recent population size estimate for the North Atlantic alone is a range of 34,000 to 94,000 adult leatherbacks (Turtle Expert Working Group 2007). In Florida, an annual increase in number of leatherback nests at the core set of index beaches ranged from 27 to 498 between 1989 and 2008. Under the Core Index Nesting Beach Survey (INBS) program, 198.8 miles of nesting beach have been divided into zones, know as core index zones, averaging 0.5 mile in length. Annually, between 1989 and 2008, these core index zones were monitored daily during the 109-day sea turtle index nesting season (May 15 to August 31). On all index beaches, researchers recorded nests and nesting attempts by species, nest location, and date.

Nesting in the Southern Caribbean occurs in the Guianas (Guyana, Suriname, and French Guiana), Trinidad, Dominica, and Venezuela. The largest nesting populations at present occur in the western Atlantic in French Guiana with nesting varying between a low of 5,029 nests in 1967 to a high of 63,294 nests in 2005, which represents a 92 percent increase since 1967 (Turtle Expert Working Group 2007). Trinidad supports an estimated 6,000 nesting leatherbacks annually, which represents more than 80 percent of the nesting in the insular Caribbean Sea. Leatherback nesting along the Caribbean Central American coast takes place between Honduras and Colombia. In Atlantic Costa Rica, at Tortuguero, the number of nests laid annually between 1995 and 2006 was estimated to range from 199 to 1,623. Modeling of the Atlantic Costa Rica data indicated that the nesting population has decreased by 67.8 percent over this time period.

In Puerto Rico, the main nesting areas are at Fajardo on the main island of Puerto Rico and on the island of Culebra. Between 1978 and 2005, nesting increased in Puerto Rico with a minimum of 9 nests recorded in 1978 and a minimum of 469 to 882 nests recorded each year between 2000 and 2005. Recorded leatherback nesting on the Sandy Point National Wildlife Refuge on the island of St. Croix, U.S. Virgin Islands between 1990 and 2005, ranged from a low of 143 in 1990 to a high of 1,008 in 2001. In the British Virgin Islands, annual nest numbers have increased in Tortola from 0 to 6 nests per year in the late 1980s to 35 to 65 nests per year in the 2000s.

The most important nesting beach for leatherbacks in the eastern Atlantic lies in Gabon, Africa. It was estimated there were 30,000 nests along 60 miles of Mayumba Beach in southern Gabon

during the 1999-2000 nesting season. Some nesting has been reported in Mauritania, Senegal, the Bijagos Archipelago of Guinea-Bissau, Turtle Islands and Sherbro Island of Sierra Leone, Liberia, Togo, Benin, Nigeria, Cameroon, Sao Tome and Principe, continental Equatorial Guinea, Islands of Corisco in the Gulf of Guinea and the Democratic Republic of the Congo, and Angola. In addition, a large nesting population is found on the island of Bioko (Equatorial Guinea).

Hawksbill Sea Turtle

About 15,000 females are estimated to nest each year throughout the world with the Caribbean accounting for 20 to 30 percent of the world's hawksbill population. Only five regional populations remain with more than 1,000 females nesting annually (Seychelles, Mexico, Indonesia, and two in Australia) (Meylan and Donnelly 1999). Mexico is now the most important region for hawksbills in the Caribbean with about 3,000 nests per year (Meylan 1999). Other significant but smaller populations in the Caribbean still occur in Martinique, Jamaica, Guatemala, Nicaragua, Grenada, Dominican Republic, Turks and Caicos Islands, Cuba, Puerto Rico, and U.S. Virgin Islands. In the U.S. Caribbean, about 150 to 500 nests per year are laid on Mona Island, Puerto Rico and 70 to 130 nests per year are laid on Buck Island Reef National Monument, U.S. Virgin Islands. In the U.S. Pacific, hawksbills nest only on main island beaches in Hawaii, primarily along the east coast of the island of Hawaii. Hawksbill nesting has also been documented in American Samoa and Guam (NOAA Fisheries and Service 1998b).

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 (Turtle Expert Working Group 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 Kemp's 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 2007). 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 (NOAA Fisheries 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, Bahamas, Lesser Antilles, and Greater Antilles).

Mitochondrial DNA (mtDNA) analyses show that there is limited exchange of females among these recovery units (Ehrhart 1989; Foote et al., 2000; NOAA Fisheries 2001; Hawkes et al. 2005. 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 GCRU 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 U.S. 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 (Mrosovsky and Provancha 1989; Hanson et al. 1998; NOAA Fisheries 2001). 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). 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, 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 to 2008, a period of near-complete surveys of NRU nesting beaches (NOAA Fisheries and Service 2008), 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 1.3 percent annually. Nest totals from aerial surveys conducted by the South Carolina Department of Natural Resources showed a 1.9 percent 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 revealed 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). 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 INBS sites surveyed with constant effort over time. In 1979, the Statewide Nesting Beach Survey (SNBS) program was initiated to document the total distribution, seasonality and abundance of sea turtle nesting in Florida. In 1989, the INBS program was initiated in Florida to measure seasonal productivity, allowing comparisons between beaches and between years. Of the 190 SNBS surveyed areas, 33 participate in the INBS program (representing 30 percent of the SNBS beach length).

An analysis of these data has shown a decline in nesting from 1989 to 2008 (Witherington et al. 2009). The analysis that reveals this decline uses nest count data from 345 representative Atlantic coast index zones (total length = 187 miles) and 23 representative zones on Florida's southern Gulf Coast (total length = 14.3 miles). 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 186 miles 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 approximately 221 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984). 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. 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) revealed a mean of 246 nests per year, which equates to approximately 60 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984). Surveys after 2004 did not include principal nesting beaches within the recovery unit. The nesting trend data for the DTRU are from beaches that are not part of the INBS program, but are part of the SNBS program. There are nine 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 andYucatán, Mexico, where an increasing trend was reported over a 15-year period from 1987 to 2001 (Zurita et al. 2003). However, since 2001, nesting has declined and the previously reported increasing trend appears not to have been sustained (NOAA Fisheries and Service 2008). Other smaller nesting populations have experienced declines over the past few decades (Amorocho 2003).

Threats include incidental take from channel dredging and commercial trawling, longline, and gill net fisheries; loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and nonnative predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and disease. There is particular concern about the extensive incidental take of juvenile loggerheads in the eastern Atlantic by longline fishing vessels from several countries.

Green Sea Turtle

Total population estimates for the green turtle are unavailable, and trends based on nesting data are difficult to assess because of large annual fluctuations in numbers of nesting females. For instance, in Florida, where the majority of green turtle nesting in the southeastern U.S. occurs, estimates range from 150 to 2,750 females nesting annually. Populations in Suriname and Tortuguero, Costa Rica, may be stable, but there is insufficient data for other areas to confirm a trend.

A major factor contributing to the green turtle's decline worldwide is commercial harvest for eggs and food. Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor and has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die. Other threats include loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and nonnative predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and incidental take from channel dredging and commercial fishing operations.

Leatherback Sea Turtle

Declines in leatherback nesting have occurred over the last 2 decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (historically estimated to be 65 percent of the worldwide population), is now less than 1 percent of its estimated size in 1980. Spotila et al. (1996) estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200 and an upper limit of about 42,900. This is less than one third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. Presently, the largest population is in the western Atlantic. Using an age-based demographic model, Spotila et al. (1996) determined leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and even the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded leatherbacks are on the road to extinction and further population declines can be expected unless we take action to reduce adult mortality and increase survival of eggs and hatchlings.

The crash of the Pacific leatherback population is believed primarily to be the result of exploitation by humans for the eggs and meat, as well as incidental take in numerous commercial fisheries of the Pacific. Other factors threatening leatherbacks globally include loss or degradation of nesting habitat from coastal development; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and nonnative predators; degradation of foraging habitat; marine pollution and debris; and watercraft strikes.

Hawksbill Sea Turtle

The hawksbill sea turtle has experienced global population declines of 80 percent or more during the past century and continued declines are projected (Meylan and Donnelly 1999). Most populations are declining, depleted, or remnants of larger aggregations. Hawksbills were previously abundant, as evidenced by high-density nesting at a few remaining sites and by trade statistics. The decline of this species is primarily due to human exploitation for tortoiseshell. While the legal hawksbill shell trade ended when Japan agreed to stop importing shell in 1993, a significant illegal trade continues. It is believed individual hawksbill populations around the world will continue to disappear under the current regime of exploitation for eggs, meat, and tortoiseshell, loss of nesting and foraging habitat, incidental capture in fishing gear, ingestion of and entanglement in marine debris, oil pollution, and boat collisions. Hawksbills are closely associated with coral reefs, one of the most endangered marine ecosystems.

Kemp's Ridley Sea Turtle

The decline of this species was primarily due to human activities, including the direct harvest of adults and eggs and incidental capture in commercial fishing operations. Today, under strict protection, the population appears to be in the early stages of recovery. 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 in shrimp trawls in both nations.

The Mexican government also prohibits harvesting, and is working to increase the population through more intensive law enforcement, by fencing nest areas to reduce natural predation, and by relocating all 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 due to movement-induced mortality, disease vectors, catastrophic events like hurricanes, and marine predators once the predators learn where to concentrate their efforts.

Analysis of the species/critical habitat likely to be affected

The proposed action has the potential to adversely affect nesting sea turtles, their nests, and hatchlings within the action 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 sea turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities, and behavior modification of nesting females due to escarpment formation within the action area during the nesting season that could result in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs. In addition, the quality of the placed sand could affect the ability of female sea 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 for any sea turtle in the continental U.S.; therefore, the proposed action would not result in an adverse modification to critical habitat.

ENVIRONMENTAL BASELINE

Climate Change

According to the Intergovernmental Panel on Climate Change Report (IPCC 2007), warming of the earth's climate is unequivocal, as is now evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level. The IPCC Report (2007) describes changes in natural ecosystems with potential widespread effects on many organisms, including marine mammals, reptiles, 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 requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2008).

Climate change at the global level drives alterations in weather at the regional level, although weather is also strongly affected by season and local effects (*e.g.*, elevation, topography, latitude, proximity to the ocean). Average temperature is predicted to rise from 36°F to 41°F for North America by the end of this century (IPCC 2007). Other processes to be affected by this projected warming include rainfall (amount, seasonal timing, and distribution), storms (frequency and intensity), and sea level rise. However, the exact magnitude, direction, and distribution of these changes at the regional level are not well understood or easy to predict. Seasonal change and local geography make prediction of the effects of climate change at any location variable. Climatic changes in south Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management (Pearlstine 2008).

Air Temperature

Current models predict changes in mean global temperature in the range of 4°F to 8°F by 2100. How this manifests at the regional and local scale is uncertain. A change of just a couple degrees can have profound effects, particularly at temperature extremes. For example, in Florida, winter frost, a 2-degree transition from 33°F to 31°F, greatly affects vegetation. While predicted changes in average annual temperature appear small, local and seasonal temperature variation may be greater. It is also important to consider that an increase in the temperature of the global atmosphere may manifest as an increase or a decrease in local means and extremes. We do not currently know either the direction or anticipated size of temperature change in Florida, but the following possibilities at the local level should be considered:

1. Changes (likely small) in mean annual temperature.
2. Greater extremes of temperature in summer (average highs) and winter (average lows).
3. More prolonged and seasonally extended frosts.
4. Shifts in the distribution of temperature regimes (*e.g.*, isotherms and growing zones).
5. Changes in the seasonal onset of temperature changes (*e.g.*, earlier spring).
6. Changes in the duration of temperature regimes (*e.g.*, longer and warmer summers).
7. Changes in both air and water (lake, river, ocean) temperature.

Most organisms have preferred ranges of temperature and lethal temperature limits they cannot survive. Many organisms require temperature signals or suitable temperature regimes to successfully complete life cycle activities such as nesting and winter dormancy. Some organisms are sensitive to temperature for incubation, sex determination (*e.g.*, sea turtles, alligators), or seed germination. The oxygen content of water (affecting fish) and the water content of vegetation (affecting fire combustion) are temperature-dependent. Some noxious or undesirable organisms may proliferate under different temperature regimes (*e.g.*, blue green algae in lakes and exotic species). Changes in temperature will likely affect fish and wildlife resources in many ways depending on the direction, amount, timing, and duration of the changes.

Rainfall

Ecosystems in Florida are sensitive to variation in rainfall. Well-drained soils, rapid runoff, and high plant transpiration quickly redistribute water available to organisms. Despite a high average rainfall, much of Florida experiences seasonal drought that profoundly affects fish and wildlife

resources. Florida's rain depends on both global and regional climate factors (*e.g.*, jet stream, El Niño, frontal progression, storms and hurricanes) and local weather (*e.g.*, thunderstorms, sea breezes, lake effects and local circulation) that are likely affected by climate change. The following possibilities at the local level should be considered:

1. Changes in average annual rainfall (*e.g.*, higher or lower).
2. Changed seasonal distribution of rainfall (*e.g.*, when rain falls).
3. Changed regional distribution of rainfall (*e.g.*, where rain falls).
4. Changed intensity (*e.g.*, more severe storm rain, or dispersed "misty" rain).

Rainfall changes are affected by temperature. The affects of changes in rainfall will likely be mediated through responses by vegetation and the changed availability of surface water (*e.g.*, lakes, ponds, rivers, swamps, and wet prairies) on which many organisms depend. In the longer term, changes in deposition or recharge to surficial and deep aquifers may affect spring flow. Florida has an unusually large area of wetland habitats supporting wildlife. If climate change reduces rainfall, then desertification of much of Florida is possible and it may come to resemble "desert islands" such as much of the Bahamas that occur at the same latitude. Rainfall changes may have the most profound effects on Florida's fish and wildlife resources.

Storms

Another predicted effect of climate change is to increase the frequency and intensity of severe storms, particularly tropical cyclones (hurricanes). Higher sea temperatures and high atmosphere conditions generate energy and conditions suitable for storms. There is some controversy about whether this effect is already discernible against the background of natural variation and cycles of hurricane occurrence.

Hurricanes are generally considered detrimental to human interests and may directly cause wildlife mortality. However, their effect in natural systems is generally transient; plants and animals tend to rapidly recover. Hurricanes do have significant secondary effects, reshaping coastal habitat structure (barrier islands, beaches, salt/freshwater intrusion to marshes, and estuaries), replenishing water bodies and aquifers and renewing plant succession, which are not completely negative for wildlife. Hurricane effects will interact with rainfall and sea level changes, possibly exacerbating coastal flooding. Hurricanes also redistribute organisms, particularly plants, by spreading seeds and other propagules. The following possibilities at the local level should be considered:

1. Changes in storm intensity and frequency.
2. Changes in the possibility of more concentrated storm tracks leading to more frequent storm landfall.
3. Interaction of surge and sea level for more severe coastal and adjacent inland effects.
4. Distribution of invasive species.

Sea Level Rise

All current predictions suggest sea level will rise due to melting of continental and glacial ice and thermal expansion of the oceans. Florida, with its extensive coastline and low topography is

highly vulnerable to sea level rise. The magnitude of the predicted rise is currently unknown and estimates vary from a few inches to yards. Modeled predictions using median consensus sea level rise estimates indicate that significant portions of Florida's coastline will be inundated and a major redistribution of coastal habitats is likely. However, to put this in context, Florida's coast currently experiences sea level fluctuations of 2 to 6 feet twice daily as tides and is exposed to storm surges of 10 to 16 feet in occasional hurricanes. Sea level changes will be superimposed on these normal, larger fluctuations. While these changes will likely be disastrous to human structures and activities, the effect on wildlife and its habitat may be less damaging. In essence, coastal habitats will migrate inland and Florida's flat coastal topography, a result of previous sea level changes, will mitigate the effect. Current coastal forests, dunes and beaches will migrate inland and be displaced by marsh, while current marsh will become sea grass, barrier islands will become sandbars and new barrier islands arise. The primary effect for wildlife will be redistribution, and possibly increase in some habitats at the expense of others.

More profound changes in the coastal and marine environment may be driven by the temperature and rainfall effects that may promote the distribution of mangroves and coral reefs into the expanded coastal zone. The main hazard to wildlife from sea level rise will arise from efforts to protect human structures from these changes by dikes, seawalls, dredging, beach nourishment and similar engineering responses. Changes in temperature regimes in the ocean may cause shifts in distribution of marine species, and profound but entirely unpredictable effects may be generated if climate changes causes large scale change in ocean circulation such as the Florida Current. The following possibilities at the local level should be considered:

1. Transient but damaging effects on vulnerable coastal species (*e.g.*, beach nesting shorebirds, and sea turtles).
2. Redistribution of coastal habitats with disruptions of productivity.
3. Sedimentation effects during the transition.
4. Interactive synergy with other climate effects (*e.g.*, temperature, and storm frequency) to generate unanticipated second order effects.
5. Disruption of coastal migration patterns, particularly "passive" migrations of larvae driven by local water movement effects.
6. Secondary effects of protection of human structures.
7. Migration zones and corridors available to allow changes in distribution.

To summarize, effects of climate change on wildlife in Florida are likely to be widespread and profound, and occur over a variety of dimensions and variables. As these effects cannot be prevented or delayed under current circumstances, a practical response will be to identify key areas and key species and habitats that are vulnerable to irreversible change and develop policy and planning to mitigate effects on these vulnerable entities.

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. However, as it relates to nesting sea turtles, if predictions about global warming are realized, increased storms and rising sea levels could damage or destroy nests and nesting habitat, and temperature changes could skew sex ratios. In

regard to piping plovers, increased storms and rising sea levels could damage, destroy, or otherwise alter foraging and roosting habitat. Consequently, 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).

Status of the species/critical habitat within the action area

Sea Turtles

In 2009, Monroe County beaches supported approximately 0.5 percent of the overall sea turtle nesting along the east coast of Florida (FWC 2009b). In total, 305 loggerhead and green sea turtle nests were recorded in 2009, along the 28.3 miles of County beaches included in the FWC's Florida SNBS (Table 1). The distribution of nests among species in 2009 included 199 loggerhead sea turtles and 106 green sea turtles (Table 1). From 2005 to 2009, there was an average of 100 loggerhead, 40 green, and zero leatherback sea turtle nests laid within the County annually (Table 1).

In Monroe County, 10.8 sea turtle nests were laid per mile in 2009 (Table 1). The nesting density along 1 mile of shoreline including Smathers Beach was 1 nest per mile in 2009 (Table 2).

Loggerhead Sea Turtle

Of the counties along the east coast of Florida, Monroe County supported the eleventh highest nesting of loggerhead sea turtles with 199 nests or 7 nests per mile in 2009 (FWC 2009b; Table 1). In 2009, loggerhead sea turtles laid 1 nest or 1 nest per mile along 1 mile of shoreline including Smathers Beach (Table 2). In 2009, loggerhead sea turtles made 198 false crawls in Monroe County (FWC 2009b; Table 1). Along 1 mile of shoreline including Smathers Beach, loggerhead turtles made 3 false crawls in 2009 (Table 2).

Green Sea Turtle

In 2009, Monroe County had a green sea turtle nesting density of 3.7 nests per mile (FWC 2009b; Table 1). In 2009, no occurrences of green sea turtle nesting or false crawls were documented along the 1 mile of shoreline encompassing Smathers Beach (Table 2). In Monroe County, 80 false crawls were documented in 2009 (FWC 2009b; Table 1).

Leatherback Sea Turtle

Between 2005 and 2009, no leatherback sea turtle nests or false crawls were documented along Monroe County (FWC 2009b; Tables 1 and 2).

Hawksbill Sea Turtle

No occurrences of hawksbill nesting have been documented in Monroe County. The majority of nesting surveys conducted in Florida occur during the morning hours and are based on

interpretation of the tracks left by the turtles as they ascend and descend the beach; the turtles themselves are rarely observed. Because hawksbill turtle tracks are difficult to discern from loggerhead tracks, it is likely that nesting by hawksbill turtles is underreported (Meylan et al. 1995).

Kemp's Ridley Sea Turtle

No nesting has been reported in Monroe County for Kemp's ridley turtles. The majority of nesting surveys conducted in Florida occur during the morning hours and are based on interpretation of the tracks left by the turtles as they ascend and descend the beach; the turtles themselves are rarely observed. Because Kemp's ridley turtle tracks are difficult to discern from loggerhead tracks, it is likely that nesting by Kemp's ridley turtles is underreported (Meylan et al. 1995).

Factors affecting the species habitat within the action area

First constructed in the early 1960s, Smathers Beach has been renourished several times from upland sand sources to replenish sand lost to storms and other erosion events. Between 1988 and 2009, Smathers Beach has been renourished nine times as follows:

1. 5,555 tons in 1988.
2. 1,390 tons in 1996.
3. 4,235 tons as a result of Hurricane Georges.
4. 8,630 tons as a result of Hurricane Irene.
5. 23,600 cy in 2000.
6. 4,643 cy in 2001 and groins rebuilt.
7. 1,200 tons in 2003.
8. 3,550 tons in 2006 as a result of the 2005 hurricane season.
9. 3,350 tons in 2009 as a result of the 2008 hurricane season.

Beach Maintenance And Pollution

Regular beach maintenance in the form of tractor tilling may disrupt or impact deposited nests and nesting sea turtles. Plastics, styrofoam, and fishing line are pollutants that may negatively impact nesting success and nearshore foraging. In the project area, beach maintenance (raking) is performed daily.

Lighting

A primary anthropogenic threat to sea turtles along nesting shorelines includes hatchling disorientation as a result of artificial lighting along the beach. Typically, sea turtle hatchlings will emerge from the nest and orient themselves towards the brighter, open horizon of the ocean (Salmon et al. 1992). If artificial lights are visible from the beach, sea turtle hatchlings tend to travel toward the artificial lights instead of the ocean. Disorientation events often result in hatchling mortality as a result of dehydration, predation, and in some cases, motor vehicle strikes.

The proposed project area is subject to the City of Key West Sea Turtle Protection Ordinance, which includes measures to reduce impacts of coastal lighting on nesting sea turtles and hatchlings.

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 U.S. 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)*, dogs (*Canis lupus familiaris*), and fire ants (*Solenopsis* spp.) (Dodd 1988; Stancyk 1995; Indian River County 2008). 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).

Shoreline Equilibration

As restored beaches equilibrate to a more natural profile, steep vertical escarpments often form along the seaward edge of the constructed beach berm and this presents a physical barrier to nesting turtles. Additionally, as beach profiles equilibrate, losses of nests laid in the seaward portions of the renourished beach due to erosion may be high. Steinitz et al. (1998) following long-term studies at Jupiter Island indicated that at 2 years postrenourishment, nesting success was considerably higher than prerenourishment levels and similar to densities found on nearby noneroded beaches. However, the nesting success declined as the renourished beach eroded and narrowed until the next renourishment event.

EFFECTS OF THE ACTION

The analysis of the direct and indirect effects of the proposed action on sea turtles and the interrelated and interdependent activities of those effects was based on beneficial and detrimental factors.

Factors to be considered

The proposed action has the potential to adversely affect nesting sea turtles and their nests, and hatchlings within the proposed action area during the construction activities associated with sand placement along Smathers Beach, Monroe County, Florida. 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 or damage to sea turtle nests, developing embryos, and hatchlings 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, behavior modification of nesting sea turtles that could result in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs, reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site, disorientation of female and hatchling sea turtles on beaches in and adjacent to the construction area as a result of coastal lighting that becomes visible on the wider beach, and the loss of nesting habitat.

Analyses for effects of the action

Beneficial effects

The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (*e.g.,* grain size, shape, color) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may be more stable than the eroding one it replaces, thereby benefiting sea turtles.

Direct effects

Sand Placement

Placement of approximately 12,891 cy of sand along 0.57 mile of beach in and of itself may not provide suitable nesting habitat for sea turtles. Although placement of beach compatible material may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not incorporated during project construction. Sand placement 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 impact the long-term survival of the species. For example, 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. Potential adverse effects during the project construction phase include disturbance of existing nests, which may have been missed, disturbance of females attempting to nest, and disorientation of emerging hatchlings. In addition, heavy equipment will be required to distribute the sand to the design fill template. This equipment will have to traverse the action area, which could result in harm to nesting sea turtles, their nests, and emerging hatchlings.

Nest relocation

Besides the risk of missing nests during a nest relocation program, there is a potential for eggs to be damaged by their movement, particularly if eggs are not relocated within 12 hours of deposition (Limpus et al. 1979). Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus et al. 1979; Ackerman 1980; Parmenter 1980; Spotila et al. 1983; McGehee 1990). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings.

Nest moisture content is known to influence the incubation environment of the embryos and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard et al. 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard et al. 1985), hatchling size (Packard et al. 1981; McGehee 1990), energy reserves in the yolk at hatching (Packard et al. 1988), and locomotory ability of hatchlings (Miller et al. 1987). In a 1994 Florida study comparing loggerhead hatching

and emergence success of relocated nests with *in situ* nests, Moody (1998) found hatching success was lower in relocated nests at 9 of 12 beaches evaluated and emergence success was lower in relocated nests at 10 of 12 beaches surveyed in 1993 and 1994.

Missed nests

Although a nesting survey and nest marking program would reduce the potential for sea turtle nests to be impacted by construction activities, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, or tides) or misidentified as false crawls during daily patrols. 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).

Equipment

The placement of construction materials, as well as the use of heavy machinery or equipment on the beach during a construction project, may have adverse effects on sea turtles. They can create barriers to nesting sea turtles emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure. The equipment can also create impediments to hatchling sea turtles as they crawl to the ocean.

Indirect effects

Many of the direct effects of sand placement may persist over time and become indirect impacts. These indirect effects include increased susceptibility of relocated nests to catastrophic events during the construction period, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, and the formation of escarpments.

Increased susceptibility to catastrophic events

Relocation of sea turtle nests may concentrate eggs in an area making them more susceptible to catastrophic events. Hatchlings released from concentrated areas may also be subject to greater predation rates from both land and marine predators, because the predators learn where to concentrate their efforts (Glenn 1998; Wyneken et al. 1998).

Increased beachfront development

Pilkey and Dixon (1996) state 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 sand placement project can encourage more development in coastal areas. Following completion of a sand placement project in Miami during 1982, investment in new and updated facilities substantially increased tourism in the area (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as older buildings were replaced by much larger ones that accommodated more beach users. Overall, shoreline management 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 1990), and can also result in greater adverse effects due to artificial lighting, as discussed above.

Changes in the physical environment

Sand placement activities may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings (Nelson and Dickerson 1987; Nelson 1988).

Beach compaction and unnatural beach profiles that may result from sand placement activities could negatively impact sea turtles regardless of project timing. Very fine sand 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 (*e.g.*, increase in false crawls) have been documented on severely compacted nourished beaches (Fletemeyer 1980; Raymond 1984; Nelson and Dickerson 1987; Nelson et al. 1987), and increased false crawls may result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests and also cause increased physiological stress to the animals (Nelson and Dickerson 1988b). Nelson and Dickerson (1988c) concluded 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 tilling compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a nourished beach with a root rake may reduce the sand compaction to levels comparable to unnourished beaches. However, a pilot study by Nelson and Dickerson (1988b) showed that a tilled nourished beach will remain uncompacted for up to 1 year. Therefore, the Service requires multiyear beach compaction monitoring and, if necessary, tilling to ensure project impacts on sea turtles are minimized.

A change in sediment color on a beach could change the natural incubation temperatures of nests in an area, which, in turn, could alter natural sex ratios. To provide the most suitable sediment for nesting sea turtles, the color of the nourished sediments must resemble the natural beach sand in the area. Tilling, natural reworking of sediments, and bleaching from exposure to the sun would help to lighten dark nourishment sediments; however, the timeframe for sediment mixing and bleaching to occur could be critical to a successful sea turtle nesting season.

Escarpment formation

On nourished beaches, steep escarpments may develop along their waterline 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 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 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.

Species' response to a proposed action

Ernest and Martin (1999) conducted a comprehensive study to assess the effects of sand placement on loggerhead nesting and reproductive success. The following findings illustrate sea turtle responses to and recovery from a nourishment project. A significantly larger proportion of turtles emerging on nourished beaches abandoned their nesting attempts than turtles emerging on control or prenourished beaches. This reduction in nesting success was most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics associated with the nourishment project (*e.g.*, beach profile, sediment grain size, beach compaction, and frequency and extent of escarpments). During the first postconstruction year, the time required for turtles to excavate an egg chamber on the untilled, hard packed sands of one treatment area increased significantly relative to control and background conditions. However, in another treatment area, tilling was effective in reducing sediment compaction to levels that did not significantly prolong digging times. As natural processes reduced compaction levels on nourished beaches during the second postconstruction year, digging times returned to background levels.

During the first postconstruction year, nests on the nourished beaches were deposited significantly farther from both the dune toe and the tide line than nests on control beaches. Furthermore, nests were distributed throughout all available habitat and were not clustered near the dune toe as they were in the control area. As the width of nourished beaches decreased during the second year, among treatment differences in nest placement diminished. More nests were washed out on the wide, flat beaches of the nourished treatments than on the narrower steeply sloped beaches of the control beach. This phenomenon persisted through the second postconstruction year monitoring and resulted from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping, occurred as the beach equilibrated to a more natural contour.

As with other sand placement projects, Ernest and Martin (1999) found the principal effect of nourishment on sea turtle reproduction was a reduction in nesting success during the first year following project construction. Although most studies have attributed this phenomenon to an increase in beach compaction and escarpment formation, Ernest and Martin (1999) indicate changes in beach profile may be more important. Regardless, as a nourished beach is reworked by natural processes in subsequent years and adjusts from an unnatural construction profile to a more natural beach profile, beach compaction and the frequency of escarpment formation decline, and nesting and nesting success return to levels found on natural beaches.

Similar short-term effects to listed sea turtle species and their habitat are anticipated to occur as a result of sand placement activities related to the proposed project. Generally, these adverse effects are limited to the first year after construction. Nonetheless, an increase in sandy beach may not necessarily equate to an increase in suitable sea turtle nesting habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

No additional activities other than the sand placement action outlined in this biological opinion are anticipated in the foreseeable future.

CONCLUSION

It is the Service's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles. This conclusion is based on the following:

1. The proposed sand placement event will directly impact 0.57 mile of shoreline. This represents 0.04 and 0.05 percent of the approximately 1,400 and 1,166 miles of available sea turtle nesting habitat in the southeastern United States, and in the PFRU, respectively.

2. 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 the initial nourishment and subsequent renourishment events.

3. Research has 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.

4. Take of sea turtles will be minimized by implementation of the Reasonable and Prudent Measures, and Terms and Conditions outlined below. These measures have been shown to help minimize adverse impacts to sea turtles.

5. The Service's review of the current status of sea turtles, the environmental baseline for the action area, the effects of the proposed sand placement, and the cumulative effects.

6. No critical habitat has been designated for the loggerhead, green, leatherback, Kemp's Ridley, and hawksbill sea turtles in the continental U.S.; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, 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 nondiscretionary, and must be implemented by the Corps so they become binding conditions of any 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 adhere to the Terms and Conditions of the incidental take statement through enforceable terms that are added to the permit, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must ensure that the permittee reports 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

Sea Turtles

The Service anticipates approximately 0.57 mile of sea turtle nesting habitat could be taken as a result of the proposed action; however, incidental take of sea turtles will be difficult to detect for the following reasons:

1. Turtles nest primarily at night and all nests are not located because:
   a. Natural factors, such as rainfall, wind, and tides may obscure crawls; and
   b. Human-induced 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. Escarpments may form and obstruct an unknown number of females from accessing a suitable nesting site.
6. The number of nests lost due to erosion of the nourished beach template is unknown.

However, the level of take of these species can be anticipated by the disturbance and nourishment of suitable turtle nesting beach habitat because of the following:

1. Turtles nest within the project area.
2. Project construction may occur during a portion of the nesting season.
3. Sand placement will modify the incubation substrate, beach slope, and sand compaction.

Take is expected to be in the form of:

1. Destruction of all sea turtle 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 sea turtle 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 sea turtles attempting to nest within the project area or on adjacent beaches as a result of construction activities.
5. Behavior modification of nesting sea turtles 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.
6. Destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.
7. Misdirection of nesting sea turtles or hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of lights from beachfront development that reach the elevated berm postconstruction.

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 0.57 mile of beach 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 ensure that the permittee immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

EFFECT OF THE TAKE

Sea Turtles

In this accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the loggerhead, green, leatherback, hawksbill, or Kemp's ridley sea turtles. Critical habitat has not been designated in the project area; therefore, the project will not result in destruction or adverse modification of critical habitat for any of the sea turtle species.

Incidental take of nesting and hatchling sea turtles is anticipated to occur during project construction and during the life of the project. Take will occur on nesting habitat along 0.57 mile of beach within the action area.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles in the proposed action area.

1. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence must be used on the project site.

2. If sand placement activities are conducted during the nesting season (March 1 through November 30), surveys for nesting sea turtles must be conducted. If nests are constructed in the project area, the eggs must be relocated.

3. Immediately after completion of the project and prior to the next three nesting seasons, beach compaction must be monitored and tilling must be conducted as required by March 1 to reduce the likelihood of impacting sea turtle nesting and hatching activities. The March 1 deadline is required to reduce impacts to leatherbacks that nest in greater frequency along the South Atlantic coast of Florida than elsewhere in the continental U.S.

4. Immediately after completion of the project and prior to the next three nesting seasons starting March 1, monitoring must be conducted to determine if escarpments are present and escarpments must be leveled as required to reduce the likelihood of impacting sea turtle nesting and hatching activities.

5. The Applicant must ensure that contractors performing the sand placement work fully understand the sea turtle protection measures detailed in this incidental take statement.

6. During the nesting season (March 1 through November 30) construction equipment and supplies must be stored in a manner that will minimize impacts to sea turtles to the maximum extent possible.

7. Lighting surveys along the project area will be conducted.

8. The sea turtle permit holder must be notified immediately upon excavation of a sea turtle nest.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must ensure that the permittee complies with the following terms and conditions, which implement the reasonable and prudent measures, described above, and outline required reporting and monitoring requirements. These terms and conditions are nondiscretionary.

Protection of sea turtles

1. In accordance with the 2001 rule change under subsection 62B-41.007, Florida Administrative Code, all fill material placed on the beach must be analogous to that which

naturally occurs within the project location or vicinity in quartz to carbonate ratio, color, median grain size, and median sorting. Specifically, such material shall be predominately of carbonate, quartz, or similar material with a particle size distribution ranging between 0.062 mm and 4.76 mm (classified as sand by either the Unified Soil Classification System or the Wentworth classification). The material shall be similar in color, grain size distribution (sand grain frequency, mean and median grain size, and sorting coefficient) to the material in the existing coastal system at the nourishment 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.
1c. Coarse gravel, cobbles, or other material retained on the 0.75-inch sieve in a percentage size greater than found on the native beach.
1d. Construction debris, toxic material or other foreign matter; and not result in contamination or cementation of the beach.

These standards must not be exceeded in any 10,000 square foot section, extending through the depth of the nourished beach. If the natural beach exceeds any of the limiting parameters listed, then the fill material must not exceed the naturally occurring level for that parameter.

2. Daily early morning surveys for sea turtles will be required if any portion of the sand placement construction occurs during the nesting season (March 1 through November 30). Nesting surveys must be initiated 65 days prior to construction activities, or by March 1, whichever is later. Nesting surveys must continue through the end of the project or through September 30, whichever is earlier. If nests are constructed in areas where they may be affected by sand placement activities, eggs must be relocated per the following requirements:

2a. Nesting surveys and egg relocations will only be conducted by personnel with prior experience and training in nesting survey and egg relocation procedures. Surveyors must have a valid FWC Permit. Nesting surveys must be conducted daily between sunrise and 9 a.m. The contractor must not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys must be performed in such a manner so as to ensure that sand placement activities do not occur in any location prior to completion of the necessary sea turtle protection measures.

2b. Only those nests that may be affected by sand placement activities will be relocated. Nests requiring relocation must be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with sand placement activities must cease when these activities no longer threaten nests.

2c. Nests deposited within areas where construction activities have ceased or will not occur for 65 days must be marked and left in *in situ* unless other factors threaten the success of the nest. The sea turtle permit holder must install an on-beach marker at the nest site and a secondary marker at a point landward as possible to assure the future location of the

nest will be possible should the on-beach marker be lost. A series of stakes and highly visible survey ribbon or string must be installed to establish a 10-foot radius around the nest. No activity will occur within this area nor will any activity occur which could result in impacts to the nest. Nest sites must be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the sand placement activity.

3. Immediately after completion of sand placement and prior to March 1 for 3 consecutive years, sand compaction must be monitored in the area of sand placement. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of postconstruction compaction levels. In addition, out-year compaction monitoring and remediation are not required if the Applicant can demonstrate that placed sand no longer remains above the mean high water line. If required, the area must be tilled to a depth of 36 inches, and all tilling activity must be completed prior to March 1. Each pass of the tilling equipment must be overlapped to allow more thorough and even tilling. Compaction monitoring should at a minimum include:

   3a. Compaction sampling stations must be located at 500-foot intervals along the project area. One station must be at the dune toe (when material is placed in this area), and one station must be midway between the dune toe and the high water line (normal wrack line).

   At each station, the cone penetrometer will 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 will be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth will 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 six averaged compaction values.

   3b. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area must be tilled prior to March 1. If values exceeding 500 psi are distributed throughout the project area, but in no case do those values exist at two adjacent stations at the same depth, then consultation with the 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.

4. Visual surveys for escarpments along the project area must be made immediately after completion of the project and prior to March 1 for 3 consecutive years. All escarpments shall be leveled, or the beach profile shall be reconfigured, to minimize escarpment formation. In addition, weekly surveys of the project area shall be conducted during the three consecutive nesting seasons following completion of sand placement as follows:

4a. The number of escarpments and their location relative to DEP reference monuments shall be recorded during each weekly survey and reported relative to the length of the beach survey (e.g., 50 percent escarpments). Notations on the height of these escarpments shall be included (0 to 2 feet, 2 to 4, and 4 feet or higher) as well as the maximum height of all escarpment; and

4b. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet must be leveled to the natural beach contour by March 1. An escarpment removal shall be reported relative to DEP reference monument locations. The Service and FWC must 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 and persist for more than one week during the peak nesting and hatching season (May 1 to October 31) to determine the appropriate action to be taken. If it is determined escarpment leveling is required during the nesting season, the Service and FWC will provide written authorization that describes methods to be used to reduce the likelihood of impacting existing nests.

5. The Applicant must arrange a meeting between representatives of the contractor, the Service, the FWC, and the sea turtle permit holder responsible for egg relocation at least 30 days prior to the commencement of work on this project. At least 10 days advance notice must be provided prior to conducting this meeting. This will provide an opportunity for explanation or clarification of the sea turtle protection measures.

6. During the nesting season (March 1 through November 30), staging areas for construction equipment must be located off the beach to the maximum extent possible. Nighttime storage of construction equipment not in use must be off the beach to minimize disturbance to sea turtle nesting and hatching activities.

7. A preconstruction lighting survey shall be conducted followed by a lighting survey 30 days postconstruction to ensure no lights or light sources are visible from the project area. Additional lighting surveys shall be conducted annually prior to March 1 in perpetuity.

8. In the event a sea turtle nest is excavated during construction activities, the sea turtle permit holder responsible for egg relocation for the project must be notified so the eggs can be moved to a designated relocation site.

Reporting

9. A report describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the FWC, Imperiled Species Management Section, Tallahassee office and the Service's South Florida Ecological Services Office, Vero Beach, Florida within 60 days postconstruction. This report will include the dates of actual construction activities, names and qualifications of personnel involved in nest surveys and relocation activities, descriptions and locations of self-release beach sites, nest survey and relocation results, hatching success of nests, preconstruction lighting survey results, postconstruction escarpment and sand compaction survey results, tilling activity, and both the presconstruction and 30-day postconstruction lighting survey results.

Additionally, a monitoring report will be submitted for three consecutive nesting seasons postconstruction by December 31 that will include sand compaction survey or tilling activities, and escarpment survey results. Also, a report summarizing all lights visible, using standard survey techniques for such surveys, shall be submitted by March 1 documenting compliance with the Monroe County beach lighting ordinance and enforcement action.

All reports will be submitted electronically to the Corps, FWC, and the Service on standard electronic media (*e.g.*, compact disc).

10. Upon locating a dead, injured, or sick endangered or threatened sea turtle specimen, initial notification must be made to the Service's Office of Law Enforcement (10426 NW 31st Terrace, Miami, Florida 33172; 305-526-2610). Additional notification must be made to FWC at 1-888-404-3922 and the Service's South Florida Ecological Services Office (1339 20th Street, Vero Beach, Florida 32960-3559; 772-562-3909). Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure evidence intrinsic to the specimen is not unnecessarily disturbed.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Surveys for nesting success of sea turtles should be continued for a minimum of 3 years following sand placement to determine whether sea turtle nesting and hatchling success has been adversely impacted.

2. To increase public awareness about sea turtles, informational signs should be placed at beach access points where appropriate. The signs should explain the importance of the beach to sea turtles and the life history of sea turtle species that nest in the area.

3. Appropriate native salt-resistant dune vegetation should be established on restored dunes. The DEP Office of Beaches and Coastal Systems can provide technical assistance on the specifications for design and implementation.

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.

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.

Should you have additional questions or require clarification, please contact Jeff Howe at 772-562-3909, extension 283.

Sincerely yours,

Paul Souza
Field Supervisor
South Florida Ecological Services Office

cc: electronic only
Corps, Miami, Florida (Megan Clouser)
DEP, Tallahassee, Florida (Stephanie Gudeman)
EPA, West Palm Beach, Florida (Richard Harvey)
FWC, Tallahassee, Florida (Robbin Trindell)
NOAA Fisheries, West Palm Beach, Florida (Jocelyn Karazsia)
Service, Atlanta, Georgia (Franklin Arnold)
Service, St. Petersburg, Florida (Anne Marie Lauritsen)
USGS, Gainesville, Florida (Susan Walls)

LITERATURE CITED

Ackerman, R.A. 1980. Physiological and ecological aspects of gas exchange by sea turtle eggs. American Zoologist 20:575-583.

Amorocho, D. 2003. Monitoring nesting loggerhead turtles (*Caretta caretta*) in the central Caribbean coast of Colombia. Marine Turtle Newsletter 101:8-13.

Baldwin, R., G.R. Hughes, and R.I.T. Prince. 2003. Loggerhead turtles in the Indian Ocean. Pages 218-232 *in* A.B. Bolten and B.E. Witherington, editors. Loggerhead Sea Turtles. Smithsonian Books; Washington, D.C.

Blair, K. 2005. Determination of sex ratios and their relationship to nest temperature of loggerhead sea turtle (*Caretta caretta*, L.) hatchlings produced along the southeastern Atlantic coast of the United States. M.S. thesis. Florida Atlantic University; Boca Raton, Florida.

Coastal Engineering Research Center. 1984. Shore protection manual, volumes I and II. U.S. Army Corps of Engineers Waterways Experiment Station; Vicksburg, Mississippi.

Corliss, L.A., J.I. Richardson, C. Ryder, and R. Bell. 1989. The hawksbills of Jumby Bay, Antigua, West Indies. Pages 33-35 *in* S.A. Eckert, K.L. Eckert, and T.H. Richardson, compilers. Proceedings of the Ninth Annual Workshop on Sea Turtle Conservation and Biology. NOAA Technical Memorandum NMFS-SEFC-232.

Davis, G.E. and M.C. Whiting. 1977. Loggerhead sea turtle nesting in Everglades National Park, Florida, U.S.A. Herpetologica 33:18-28.

Dean, C. 1999. Against the tide: the battle for America's beaches. Columbia University Press; New York, New York.

Dodd, C.K., Jr. 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).

Ehrhart, L.M. 1989. Status report of the loggerhead turtle. Pages 122-139 *in* L. Ogren, 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.

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* A.B. Bolten and B.E. Witherington, editors. Loggerhead Sea Turtles. Smithsonian Books; Washington, D.C.

Encalada, S.E., J.C. Zurita, and B.W. Bowen. 1999. Genetic consequences of coastal development: the sea turtle rookeries at X'cacel, Mexico. Marine Turtle Newsletter 83:8-10.

Ernest, R.G. and R.E. Martin. 1999. Martin County beach nourishment project: sea turtle monitoring and studies. 1997 annual report and final assessment. Report prepared for the Florida Department of Environmental Protection; Tallahassee, Florida.

Fletemeyer, J. 1980. Sea turtle monitoring project. Report prepared for the Broward County Environmental Quality Control Board; Ft. Lauderdale, Florida.

Florida Fish and Wildlife Conservation Commission. 2009a. Standard Manatee Conditions for In-water Work. Tallahassee, Florida [Internet]. [cited July 24, 2009]. Available from: http://myfwc.com/docs/WildlifeHabitats/Manatee_StdCondIn_ waterWork.pdf

Florida Fish and Wildlife Conservation Commission. 2009b. Florida Statewide Nesting Beach Survey Data-2008 Season [Internet]. [cited July 24, 2009]. Available from: http://www.floridamarine.org/features/view_article.asp?id=11812.

Foley, A., B. Schroeder, and S. MacPherson. 2008. Post-nesting migrations and resident areas of Florida loggerheads. Pages 75-76 *in* H. Kalb, A. Rohde, K. Gayheart, and K. Shanker, compilers. Proceedings of the Twenty-fifth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-582.

Foote, J., J. Sprinkel, T. Mueller, and J. McCarthy. 2000. An overview of twelve years of tagging data from *Caretta caretta* and *Chelonia mydas* nesting habitat along the central Gulf coast of Florida, USA. Pages 280-283 *in* H.J. Kalb and T. Wibbels, compilers. Proceedings of the Nineteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-443.

Francisco-Pearce, A.M. 2001. Contrasting population structure of *Caretta caretta* using mitochondrial and nuclear DNA primers. Masters thesis, University of Florida; Gainesville, Florida.

Glenn, L. 1998. The consequences of human manipulation of the coastal environment on hatchling loggerhead sea turtles (*Caretta caretta*, L.). Pages 58-59 *in* R. Byles and Y. Fernandez, compilers. Proceedings of the Sixteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412.

Hanson, J., T. Wibbels, and R.E. Martin. 1998. Predicted female bias in sex ratios of hatchling loggerhead sea turtles from a Florida nesting beach. Canadian Journal of Zoology 76(10):1850-1861.

Hawkes, L.A., A.C. Broderick, M.H. Godfrey, and B.J. Godley. 2005. Status of nesting loggerhead turtles *Caretta caretta* at Bald Head Island (North Carolina, USA) after 24 years of intensive monitoring and conservation. Oryx 39(1):65-72.

Hildebrand, H. 1963. Hallazgo del area de anidacion de la tortuga'lora' *Lepidochelys kempii* (Garman), en la costa occidental del Golfo de Mexico (Rept., Chel.). Ciencia Mexicana 22(4):105-112.

Hirth, H.F. 1997. Synopsis of the biological data on the green turtle *Chelonia mydas* (Linnaeus 1758). U.S. Fish and Wildlife Service, Biological Report 97(1).

Hopkins, S.R. and T.M. Murphy. 1980. Reproductive ecology of *Caretta caretta* in South Carolina. South Carolina Wildlife Marine Resources Department Completion Report.

Hopkins, S.R. and J.I. Richardson, editors. 1984. Recovery plan for marine turtles. National Marine Fisheries Service; St. Petersburg, Florida.

Indian River County. 2008. A plan for the protection of sea turtles on the eroding beaches of Indian River County, Florida. Annual report–2007 to the U.S. Fish and Wildlife Service in support of Indian River County's incidental take permit (TE057875-0) causally related to emergency shoreline protection activities.

Intergovernmental Panel on Climate Change Fourth Assessment Report. 2007. Climate Change 2007: Synthesis Report. Summary for Policy Makers. Valencia, Spain.

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* A.B. Bolten 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.

LeBuff, C.R., Jr. 1990. The loggerhead turtle in the eastern Gulf of Mexico. Caretta Research, Inc.; Sanibel Island, Florida.

Lenarz, M.S., N.B. Frazer, M.S. Ralston, and R.B. Mast. 1981. Seven nests recorded for loggerhead turtle (*Caretta caretta*) in one season. Herpetological Review 12(1):9.

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* A.K. Smith, 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* A.B. Bolten and and B.E. Witherington, editors. Loggerhead Sea Turtles. Smithsonian Books; Washington, D.C.

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* A.B. Bolten and B.E. Witherington, editors. Loggerhead Sea Turtles. Smithsonian Books; Washington, D.C.

McDonald, D.L. and P.H. Dutton. 1996. Use of PIT tags and photoidentification to revise remigration estimates of leatherback turtles (*Dermochelys coriacea*) nesting in St. Croix, U.S. Virgin Islands, 1979-1995. Chelonian Conservation and Biology 2(2):148-152.

McGehee, M.A. 1990. Effects of moisture on eggs and hatchlings of loggerhead sea turtles (*Caretta caretta*). Herpetologica 46(3):251-258.

Meylan, A.B. 1992. Hawksbill turtle *Eretmochelys imbricata*. Pages 95-99 *in* P.E. Moler, editor. Rare and endangered biota of Florida, volume III. University Press of Florida; Gainesville, Florida.

Meylan, A.B. 1999. Status of the hawksbill turtle (*Eretmochelys imbricata*) in the Caribbean region. Chelonian Conservation and Biology 3(2):177-184.

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):200-224.

Meylan, A., B. Schroeder, and A. Mosier. 1995. Sea turtle nesting activity in the State of Florida 1979-1992. Florida Marine Research Publications Number 52; St. Petersburg, Florida.

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* R. Byles and Y. Fernandez, compilers. Proceedings of the Sixteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412.

Mrosovsky, N. and J. Provancha. 1989. Sex ratio of hatchling loggerhead sea turtles: data and estimates from a five year study. Canadian Journal of Zoology 70:530-538.

Murphy, T.M. and S.R. Hopkins. 1984. Aerial and ground surveys of marine turtle nesting beaches in the southeast region. Report prepared to the National Marine Fisheries Service [Internet]. [cited July 16, 2009]. Available from: http://www.dnr.sc.gov/seaturtle/Literature/Murphy%201984survey%20marine%20turtle%20nest%20bch.pdf.

National Marine Fisheries Service. 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. NOAA Technical Memorandum NMFS-SEFSC-455.

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. 1992. Recovery plan for leatherback turtles (*Dermochelys coriacea*) 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 turtle (*Eretmochelys imbricata*) in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service; St. Petersburg, Florida.

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, Maryland.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998b. Recovery plan for U.S. Pacific populations of the hawksbill turtle (*Eretmochelys imbricata*). National Marine Fisheries Service; Silver Spring, Maryland.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2008. Recovery plan for northwest Atlantic population of the loggerhead sea turtle (*Caretta caretta*), Second Edition. National Marine Fisheries Service; Silver Spring, Maryland.

National Research Council. 1990. Decline of the sea turtles: causes and prevention. National Academy Press; Washington, D.C.

National Research Council. 1995. Beach nourishment and protection. National Academy Press; Washington, D.C.

Nelson, D.A. 1987. The use of tilling to soften nourished beach sand consistency for nesting sea turtles. Report of the U.S. Army Corps of Engineers Waterways Experiment Station; Vicksburg, Mississippi.

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* R. Byles, 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. 1987. Correlation of loggerhead turtle nest digging times with beach sand consistency. Abstract of the Seventh Annual Workshop on Sea Turtle Conservation and Biology; Wekiwa Springs State Park, Florida.

Nelson, D.A. and D.D. Dickerson. 1988a. Hardness of nourished and natural sea turtle nesting beaches on the east coast of Florida. Report of the U.S. Army Corps of Engineers Waterways Experiment Station; Vicksburg, Mississippi.

Nelson, D.A. and D.D. Dickerson. 1988b. Response of nesting sea turtles to tilling of compacted beaches, Jupiter Island, Florida. Report of the U.S. Army Corps of Engineers Waterways Experiment Station; Vicksburg, Mississippi.

Nelson, D.A. and D.D. Dickerson. 1988c. Hardness of nourished and natural sea turtle nesting beaches on the east coast of Florida. 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.

Nielsen, J.T., F.A. Abreu-Grobois, A. Arenas, and M.S. Gaines. In press. Increased genetic variation uncovered in loggerhead turtles from Quintana Roo, Mexico and St. George Island, Florida. *In* Proceedings of the Twenty-ninth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum.

Ogren, L.H. 1989. Distribution of juvenile and subadult Kemp's ridley turtles: preliminary results from the 1984-1987 surveys. Pages 116-123 *in* C.W. Caillouet, Jr., and A.M. Landry, Jr., editors. Proceedings of the First International Symposium on Kemp's Ridley Sea Turtle Biology, Conservation and Management. Texas A&M University Sea Grant College Program TAMU-SG-89-105.

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, 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 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, 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.

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.

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.

Pearlstine, L.G. 2008. Ecological consequences of climate change for the Florida Everglades: An initial summary. Technical memorandum. South Florida Natural Resources Center; Everglades National Park, Homestead, Florida.

Pilkey, O.H. and K.L. Dixon. 1996. The Corps and the shore. Island Press; Washington, D.C.

Pritchard, P.C.H. 1982. Nesting of the leatherback turtle, *Dermochelys coriacea* in Pacific Mexico, with a new estimate of the world population status. Copeia 1982(4):741-747.

Pritchard, P.C.H. 1992. Leatherback turtle *Dermochelys coriacea*. Pages 214-218 *in* P.E. Moler, editor. Rare and Endangered Biota of Florida, Volume III. University Press of Florida; Gainesville, Florida.

Raymond, P.W. 1984. The effects of beach restoration on marine turtles nesting in south Brevard County, Florida. M.S. thesis. University of Central Florida; Orlando, Florida.

Richardson, J.I. and T.H. Richardson. 1982. An experimental population model for the loggerhead sea turtle (*Caretta caretta)*. Pages 165-176 *in* K.A. Bjorndal, editor. Biology and Conservation of Sea Turtles. Smithsonian Institution Press; Washington, D.C.

Ross, J.P. 1979. Sea turtles in the Sultanate of Oman. World Wildlife Fund Project 1320, Washington, D.C.

Ross, J.P. 1982. Historical decline of loggerhead, ridley, and leatherback sea turtles. Pages 189-195 *in* K.A. Bjorndal, 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* K.A. Bjorndal, editor. Biology and Conservation of Sea Turtles, Revised Edition. Smithsonian Institution Press; Washington, D.C.

Salmon, M., J. Wyneken, E.U. Fritz, and M. Lucas. 1992. Ocean finding by hatchling sea turtles interplay of silhouette, slope, brightness as guideposts in orientation. Page 101 *in* M. Salmon and J. Wyneken, compilers. Proceedings of the Eleventh Annual Workshop in Sea Turtle Biology and Conservation. NOAA Technical Memorandum. NMFS-SEFSC-302.

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* K.A. Bjorndal, A.B. Bolten, D.A. Johnson, and P.J. Eliazar, compilers. Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-351.

Schroeder, B.A., A.M. Foley, and D.A. Bagley. 2003. Nesting patterns, reproductive migrations, and adult foraging areas of loggerhead turtles. Pages 114-124 *in* A.B. Bolten and B.E. Witherington, editors. Loggerhead Sea Turtles. Smithsonian Books; Washington, D.C.

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. U.S. Fish and Wildlife Service Endangered Species Report 11.

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? Chelonian Conservation and Biology 2(2):290-222.

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.

Stancyk, S.E. 1995. Non-human predators of sea turtles and their control. Pages 139-152 *in* K.A. Bjorndal, editor. Biology and Conservation of Sea Turtles. 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.

Steinitz, M.J., M. Salmon, and J. Wyneken. 1998. Beach renourishment and loggerhead turtle reproduction: A seven year study at Jupiter Island, Florida. Journal of Coastal Research. 14(3):1000-1013.

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.

Turtle Expert Working Group. 1998. 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.

Turtle Expert Working Group. 2007. An assessment of the leatherback turtle population in the Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-555.

U.S. Fish and Wildlife Service. 2006. Strategic Habitat Conservation [Internet]. Final Report of the National Ecological Assessment Team to the U.S. Fish and Wildlife Service and U.S. Geologic Survey. Arlington, Virginia [cited February 6, 2009]. Available from: http://www.fws.gov/science/doc/SHC_FinalRpt.pdf.

U.S. Fish and Wildlife Service. 2007. Final report on the Mexico/United States of America population restoration project for the Kemp's ridley sea turtle, *Lepidochelys kempii,* on the coasts of Tamaulipas and Veracruz, Mexico. U.S. Fish and Wildlife Service; Arlington, Virginia.

U.S. Fish and Wildlife Service. 2008. Rising to the urgent challenges of a changing climate. Draft Strategic Plan [Internet]. Arlington, Virginia [cited February 6, 2009]. Available from: http://www.fws.gov/home/climatechange/pdf/climate_change_draft_ strategic_plan.pdf

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1992. Recovery plan for the Kemp's ridley sea turtle (*Lepidochelys kempii*). National Marine Fisheries Service; St. Petersburg, Florida.

Witherington, B.E. and L.M. Ehrhart. 1989. Status and reproductive characteristics of green turtles (*Chelonia mydas*) nesting in Florida. Pages 351-352 *in* L. Ogren, 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., P. Kubilis, B. Brost, and A. Meylan. 2009. Decreasing annual nest counts in a globally important loggerhead sea turtle population. Ecological Applications 19:30-54.

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* R. Byles and Y. Fernandez, compilers. Proceedings of the Sixteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412.

Wyneken, J., L.B. Crowder, and S. Epperly. 2005. Final report: evaluating multiple stressors in loggerhead sea turtles: developing a two-sex spatially explicit model. Final Report to the U.S. Environmental Protection Agency National Center for Environmental Research, Washington, DC. EPA Grant Number: R829094.

Zug, G.R. and J.F. Parham. 1996. Age and growth in leatherback turtles, *Dermochelys coriacea* (Testidines: Dermochelyidae): a skeletochronological analysis. Chelonian Conservation and Biology 2(2):244-249.

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* J.A. Seminoff, compiler. Proceedings of the Twenty-second Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-503.

Table 1. Summary of sea turtle nesting data along Monroe County, Florida (28.3 miles survey length) from 2005 to 2009 (FWC 2009b).

Year	Loggerhead Nests	Loggerhead False Crawls	Green Nests	Green False Crawls	Leatherback Nests	Leatherback False Crawls
2005	77	161	21	32	0	0
2006	66	101	18	19	0	0
2007	85	122	37	11	0	0
2008	73	195	16	18	0	0
2009	199	198	106	80	0	0
Mean	**100**	**155**	**40**	**32**	**0**	**0**

Table 2. Summary of sea turtle nesting data from 2005 to 2009[1], for a 3.5-mile section of shoreline encompassing the Smathers Beach sand placement action area in Monroe County, Florida.

Year	Loggerhead Nests	Loggerhead False Crawls
2005	2	0
2006	5	3
2007	11	5
2008	1	0
2009	1	3
Mean	**4**	**2**

[1] From 2005 to 2007, beach length surveyed was approximately 3.5 miles. For 2008 and 2009, beach length surveyed was approximately 1.0 miles.

Figure 1. Location of the proposed sand placement project on 0.57 mile of shoreline along Smathers Beach, Monroe County, Florida.

Attachment B

SMATHERS BEACH - MONITORING

Seagrass and Hard Bottom Communities- Monitoring

1. General

Seagrass and hard bottom communities exist offshore of Monroe County, within the indirect impact zone of the project area, offshore of the beach fill area, and further offshore in deeper water. The permitee and its representatives shall avoid contact with any and all sea grass and hard bottom communities outside the fill template. It is the sole responsibility of the permitee to locate and avoid all hard bottom formations and hard bottom biological communities other than those located within the construction templates if any.

Schedule for Biological Monitoring. Monitoring events should include, at a minimum: One monitoring event prior to nourishment, (7 – 30 days before construction activities); One biological monitoring event during the construction activities; Thereafter, monitoring events once every four months for the first year post-nourishment, and one final monitoring event at two-years post-project.

2. Reporting Requirements

Water Quality and Biological Habitat Reporting. The biological habitat monitoring will be performed by a qualified Marine/Coral Reef biologist familiar with the sea grasses and coral located in the FKNMS. The pre-nourishment biological report is to include all seagrass and other hard-grounds located the areas which are directly in the beach fill template as well as the secondary impact areas. An establishment of the boundaries close to the project will be performed. This report is to be submitted to the FKNMS before commencement of the construction activities.

During the construction (beach fill activities) an evaluation of the turbidity effects on the nearshore habitat will be made by the qualified biologist. The main objective is to establish that the beach fill activities are not spreading

out beyond the secondary impact zone. (see section on turbidity monitoring). The field report must be submitted to the FKNMS within 5 days of completing the field work.

The series of post beach nourishment monitoring events will be performed by a qualified biologist to establish that the seagrass beds and hard-grounds have not been affected by the nourishment project. Transects will be set up along the established profile line and measurements will be recorded with a 1 m square quadrat placed every 10 m within the impact zones to 10 m beyond the impact zones. All data shall be recorded and documented using sound scientific methods. A report should be submitted to the FKNMS after each monitoring event describing the biologist's findings. See Section

3. Turbidity Control and Water Quality Monitoring

The sea grasses and other marine life in the near shore region of Smathers Beach are susceptible to damage caused by turbidity. The permitee shall make every effort to avoid increasing the turbidity level as a result of the beach fill construction activities. The permitee is to follow all requirements concerning water quality as provided by permits for the project.

Turbidity Screens. The permitee shall place turbidity screens extending, without break, across the entire beach segment on which construction activities are underway. On opposite ends (East and West) beyond the limits of the segment, the screen shall attach to groins or the dry beach in such a manner that the spread of the turbidity is limited to the greatest extent possible. The turbidity screen shall extend across the entire water column and be placed in a manner which is as rigid as possible. The screens will be in place and maintained throughout construction on the beach segment, and shall be promptly removed upon the approval of the segment by the engineer. The placement of the screens shall be conducted consistent with the manufacturer's recommendations.

Turbidity Monitoring Required

Type: Turbidity NTUs

Turbidity shall be monitored at least twice daily while construction is ongoing. The engineer shall take samples using a certified lab provided bottles. Samples shall be taken at least 4 hours apart.

Turbidity shall also be sampled after construction is completed at each site and before turbidity curtains are removed.

Construction Site – During Construction

Background: 300 m. up-current from each site where construction is ongoing, at mid-depth, outside of any turbidity generated by this project.

Compliance: 10 m. beyond turbidity curtains surrounding each construction site, at mid-depth, within the densest portion of any turbidity plume, if present. **Not to exceed 0 NTU above background during construction activities in the FKNMS**. (During construction testing will be performed with Field instrumentation approved by the FDEP).

Construction Site – After Construction

Background: 150 m up-current from each construction site, at mid-depth, outside of any influence of this project.

Compliance: Within turbidity curtains surrounding each site, at mid-depth. **Monitoring for 1 week post construction of each zone on a daily basis. Not to exceed 0 NTU above background.**

4. Reports and Information

All monitoring data (including biological habitat monitoring) shall be submitted by the engineer to the permitee within one week of analysis with documents containing the following information:

a. Permit number;

b. Dates of sampling and analysis;

c. A statement describing the methods used in collection, handling, storage and analysis of the samples;

d. A map indicating the sampling locations;(with latitude and longitude).

e. A statement signed by the individual responsible for implementation of the sampling program concerning the authenticity, precision, limits of detection and accuracy of the data; (Name of person who conducted the survey and other representatives present).

f. Documentation that the laboratory performing the sampling and analyses has an approved quality control and assurance plan on file with the DEP.

Monitoring reports shall also include the following information for each sample that is taken:

a. time of day samples taken;

b. depth of water body;

c. depth of sample;

d. antecedent weather conditions;

e. tidal stage and direction of flow; and tidal rage of site.

f. approximate wind direction and velocity.

g. elevation of seagrass (deepest, shallowest) in reference to the tidal datum or relative to elevation of nearby similar habitats;

h. Results of preliminary visual reconnaissance, Area (acres or square meters) of proposed impact (total area, including any gaps among existing seagrass cover), Estimate of percent cover and species present/absent;

i. Site map that delineates area surveyed and seagrass patches or beds, evaluate density estimate;

j. Other information to be discussed in the report: fishery resource observations, sediment type, and information requested in Unified Mitigation Assessment Method Part I and Part II worksheets (geographic relationship to uplands or other water bodies, significant nearby features, anticipated wildlife utilization, uniqueness.

The compliance locations given above shall be considered the limits of the temporary mixing zone for turbidity allowed during construction (0 NTUs above background must be met at the edge of the 150 m mixing zone). If monitoring reveals turbidity levels at the compliance site in excess of the turbidity level at the corresponding background site, construction activities shall cease immediately and not resume until corrective measures have been taken and turbidity has returned to acceptable levels. Any such occurrence shall also be immediately reported to the DEP District branch office in Marathon and the USACE Miami office.

STANDARD MANATEE CONDITIONS FOR IN-WATER WORK

2009

The permittee shall comply with the following conditions intended to protect manatees from direct project effects:

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

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

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

d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

e. Any collision with or injury to a manatee shall be reported immediately to the FWC Hotline at 1-888-404-FWCC. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-731-3336) for north Florida or Vero Beach (1-772-562-3909) for south Florida.

f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Awareness signs that have already been approved for this use by the Florida Fish and Wildlife Conservation Commission (FWC) must be used (see MyFWC.com). One sign which reads *Caution: Boaters* must be posted. A second sign measuring at least 81/2" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities.

CAUTION: MANATEE HABITAT

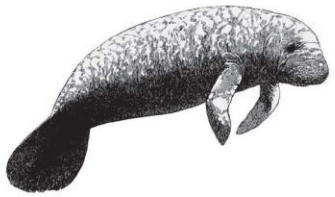
All project vessels

IDLE SPEED / NO WAKE

When a manatee is within 50 feet of work
all in-water activities must

SHUT DOWN

Report any collision with or injury to a manatee:



Wildlife Alert:

1-888-404-FWCC(3922)

cell *FWC or #FWC

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

The permittee shall comply with the following protected species construction conditions:

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

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

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

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

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

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

g. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Revised: March 23, 2006
O:\forms\Sea Turtle and Smalltooth Sawfish Construction Conditions.doc