CESAJ-RD-SP (1145b)
SAJ-2006-05344 (IP-EGR)

DRAFT MEMORANDUM FOR RECORD

SUBJECT: Department of the Army Environmental Assessment and Statement of Findings for the Above-numbered Permit Application

1. Applicant: Palm Beach County Board of County Commissioners
Department of Environmental Resources Management
c/o Richard Walesky, Director
2300 North Jog Road, 4th Floor
West Palm Beach, FL 33411-2743

2. Location, Existing Site Conditions, Original Project Description, Modified Project Description, Changes to Project:

a. Location: The project site is located in the Atlantic Ocean generally between DEP monuments R-61 and R-66 (approximately 1.1 linear miles), Singer Island (Sections 15, 22, 23 and 26, Township 42 S, Range 43 E) in Palm Beach County, Florida. The mitigation site is located on submerged land approximately 300 feet offshore of Singer Island, 3,000 feet south of the project area.

b. Existing Site Conditions: The project area is bordered by John D. MacArthur Beach State Park to the north, Ocean Reef Park to the south and condominiums and SR A1A to the west. Much of the native dune system within the project area has been lost to upland development. A natural dune and stable beach is present adjacent to John D. MacArthur Beach State Park where vegetation includes seagrape (*Coccoloba uvifera*), sea oats (U*niola paniculata*), inkberry (*Scaevola plumieri L.*), bitter Panicum grass (*Panicum amarum*), bay cedar (*Suriana maritima*), and seashore elder (*Iva imbricata*). South of MacArthur State Park, Palm Beach County has restored the dune in front of the condominiums and re-vegetated with sea oats, rail road vine (*Ipomea pes-caprae*) and seagrape. Dunes do not exist in front of several seawalls which front structures constructed on top or in front of the dune. The project area has experienced periodic beach and dune erosion and is designated as “critically eroded” by the Florida Department of Environmental Protection. The average shoreline retreat from R-61 to R-66 between 2003 and 2008 was 41 feet due in large part to tropical storm events in 2004 and 2005.

The submerged bottom consists of a matrix of nearshore hard bottom, sediment over hard bottom and sand bottom. The hard bottom in this area is generally low profile and is largely ephemeral, although a small area within the project area is persistently exposed. The dynamics are largely storm driven and related to high-energy events such as tropical storms and hurricanes. Surveys conducted in June 2008 included twelve transects with eight transects perpendicular to the FDEP Range monuments R-61 through R-68, two reference transects located north of the project area, and two reference transects located south of the project area. *Padina* spp. and turf algae are the dominant macroalgae in the area, while scleractinian corals and other fauna accounted for low percent cover throughout the hard bottom habitat. The fish assemblage (including cryptic fishes) found in association with the hard bottom habitat was comprised of 27 families and 60 taxa and was dominated by grunts (Haemulidae) and most of the individuals observed were early life stages.

c. Original Project Description: The initial project application submitted in July 2006 was to construct an emergent, segmented breakwater consisting of 13 rubble-mound segments and a terminal breakwater structure 200 feet offshore of Singer Island. Individual breakwater segments would measure approximately 100-feet by 350-feet, extending to +1 feet above Mean High Water (MHW). The V-shaped terminal structure would measure approximately 114-feet by 260-feet, extending to -5 feet below MHW. Individual breakwater segments would be designed to trap the sand nearshore and allow for the outward accretion of beach sand from the natural shore to the breakwater segments. The V-shaped structure would be designed to capture and return littorally transported sand back to the beach. Nearshore hardbottom would be impacted both directly by placement of the rubble-mound structures and by movement of sand shoreward of the structures. No compensatory mitigation would be proposed. The U.S. Army Corps of Engineers (Corps) preliminarily determined the project required an Environmental Impact Statement (EIS) and requested the County provide qualification packages. In August 2007, the Corps approved the selection of a third party contractor to prepare the EIS. The Corps issued a public notice and requested initiation of consultation with NMFS and USFWS for federally listed species in September 2007.

Based on comments received from the Corps and other commenting agencies, the proposed project was modified to eliminate two of

the southernmost breakwater segments and the V-shaped terminal structure. These structures were eliminated to avoid impacts to high-profile, persistently exposed natural hardbottom. In October 2007 at the request of the County, the Corps agreed to first evaluate the project with an Environmental Assessment (EA) instead of proceeding with the EIS based on the removal of the two southernmost breakwater segments and the V-shaped terminal structure. Additionally, the location of the eleven breakwater segments was modified based on existing hardbottom elevations in order to avoid hardbottom habitat with the highest elevations, relief, and ledges. The location of the four northernmost breakwater segments were shifted slightly offshore to reduce the potential for tombolo formation at the updrift end of the project. Based on these changes, the modified project proposal was to construct eleven emergent rubble mound breakwaters on submerged land approximately 200 feet offshore, between DEP monuments R-61 and R-66. A typical breakwater segment would measure 103 feet in width (east-west) and 362 feet in length (north-south) at the base. The crest of the structure would be 240 feet in length and would extend to +3 feet NGVD, with MHW at 1.98 NGVD. The breakwaters would be separated by approximately 300 feet crest to crest and approximately 180 feet toe to toe. The breakwaters would be located in depths of -10 to -16 feet NGVD.

The Corps (CESAJ-RD-SP) participated in a meeting in March 2009 with Palm Beach County, U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), the State, and representatives from U.S Congressman Ron Klein's and Florida State Senator Atwater's office to discuss project issues. During this meeting NMFS indicated the project may result in a jeopardy analysis for sea turtles. CESAJ-RD-SP indicated the project would first be evaluated with an Environmental Assessment (EA) and the project may have significant impacts which would result in a permit denial or a requirement to go through the Environmental Impact Statement (EIS) process. Also at this time there was no mitigation proposed for project impacts. Following the meeting, the Corps issued a Biological Assessment (BA) on 24 March 2009. The BA resulted in additional information needs for the Endangered Species Act (ESA) consultations which were provided in September 2009 by the County. In response to the receipt of a compensatory mitigation proposal on 31 March 2009, the modified emergent breakwater project was circulated by public notice on 11 May 2009. In response to the two public notices for the emergent breakwaters, the Singer Island Civic Association, Inc., Seagrape

Condominium Association, The Dunes Towers Association, Inc., and the group “Breakwaters Now!” sent letters supporting the originally-proposed emergent breakwater project in order to protect property and ensure public safety. Letters and e-mails were also received from individuals (Mickey Dry, Robert Yastrzemski, Brian Schneiderman, John Born, James Moren, Greg Lyon, Daniel Lofaso, Charles Dashur, Adam Breo, and Robert Matriscino) and organizations (Florida Wildlife Federation (FWF) and Surfrider Foundation) opposed to the emergent breakwater project due to the unacceptable risks and dangerous precedent the project would pose, and requested that an EIS be prepared and a public hearing be held. The Caribbean Conservation Corporation also opposed the project and requested that an EIS be prepared. During the review of the emergent breakwater application, U.S. Senator Mel Martinez and U.S. Senator Bill Nelson requested that the Corps provide a response to their constituents’ requests concerning the length of the permitting process, and U.S. Representative E. Clay Shaw, Jr., requested that the Corps provide a response to his constituents’ request for an expedited review of the permit application.

On 29 October 2009, the Corps requested a complete alternatives analysis, cumulative impacts analysis, a response to several relevant public comments, revised drawings, and monitoring plans. The County submitted their RAI response on 19 January 2010. The Corps Regulatory Division (CESAJ-RD-SP) requested that the Engineering Division (CESAJ-EN-WC) review the County’s modeling and alternatives analysis on 1 February 2010. The engineering review request from CESAJ-RD-SP was based on concerns related to downdrift erosion that may be caused by the emergent breakwaters as well as impacts on sea turtle nesting and hatchling survival.

CESAJ-EN-WC provided an engineering analysis on 3 February 2010. The engineering analysis concluded that the proposed emergent structures would have a strong impact on existing littoral processes, which could result in detrimental effects to the adjacent shorelines. Specifically, the field of structures would trap large volumes of southward moving sediment that would in turn create a sediment deficit downdrift. Additionally, the CESAJ-EN-WC review concluded that tombolo formation was very likely to occur, which would block longshore transport. The review included a discussion of the 32ND Street Breakwaters in Miami Beach. Tombolo formation at this site caused extensive downdrift erosion. The review included alternative designs that would reduce the disruption to littoral processes while

maintaining an adequate protective beach. These alternative designs include decreasing the number or length of the breakwater segments, increasing their distance offshore, and decreasing their crest elevation.

The engineering review discussed the Sunny Isles Submerged Breakwater, constructed in 2001, as an example of an alternative design that would reduce downdrift impacts and impacts to sea turtles. The structure was designed to promote the accretion of a salient (slight accretion of the shoreline) while still allowing sediment to move in the alongshore direction. The structures were designed to preclude complete tombolo formation. According to CESAJ-EN-WC, the formerly highly-erosive beach has been stabilized, and no downdrift impacts have been noted as a result of the project.

The engineering review also discussed the Prefabricated Erosion Prevention (PEP) reefs constructed in Indian River and Palm Beach Counties in the late 1980's and early 1990's since the failure of these structures were used to justify the construction of emergent breakwaters over a submerged design. PEP reefs were submerged, narrow crested concrete structures, triangular in cross section. Since the PEP reefs were essentially an impermeable concrete wall, water was forced to flow alongshore, then outward around the ends of the structure, causing localized scouring and some shoreline erosion. CESAJ-EN-WC concluded that the performance of the PEP reef is not indicative of the general performance of submerged breakwaters. The PEP reefs were ineffective at reducing incoming wave energy largely because of the narrow crest width. Alongshore jetting of large volumes of water was primarily due to the impervious nature of the structures and the long, unsegmented plan-view layout. In comparison, no jetting or alongshore flow issues have been noted at the Sunny Isles Breakwater site, and no significant scouring or structural settlement have occurred. The successful use of submerged or low-crest breakwaters has been documented at project sites throughout the world, under a wide variety of environmental conditions. CESAJ-EN-WC concluded that this option should not be dismissed at Singer Island based solely on the performance of the experimental PEP reef, a structure that bears little similarity to the more commonly constructed and time tested broad-crested rubble mound designs.

With respect to hardbottom impacts, CESAJ-EN-WC indicated that breakwater segments could be relocated seaward to avoid

hardbottom areas and the segment crests could be lowered to reduce salient formation that would cover hardbottom habitat. Impacts to sea turtles could also be minimized by designing the structures with submerged crest elevations and moving them further offshore. The crest elevation of the Sunny Isles Breakwaters was -3 feet Mean Low Water (MLW) at the time of construction. In the nine years following construction, the structure has settled less than a foot, so current crest elevations vary from -3 to -4 feet MLW. Extensive monitoring of that structure and of the sea turtle population has been conducted by Miami-Dade County since the breakwater was completed. No instances of any injuries or deaths have been reported in this nine year period, in spite of heavy nesting activity in the area. The structures mimic the characteristics and performance of the natural reef system, and sea turtles are able to swim over and around the submerged breakwater segments without injury.

In summary, the engineering review completed by CESAJ-EN-WC concluded that the concerns raised by CESAJ-RD-SP appeared to be justified. It was determined that it was highly likely that the proposed emergent breakwaters would adversely alter existing littoral processes to the point of seriously damaging the adjacent beaches. Additionally, the emergent structures would pose a greater threat to sea turtles than comparable submerged structures.

The Corps (CESAJ-RD-SP and CESAJ-EN-WC) participated in a meeting on February 16, 2010, with Palm Beach County, the County's consultants (Humiston and Moore Engineers), FWS, NMFS, the Florida Department of Environmental Protection (FDEP), the Florida Fish and Wildlife Conservation Commission (FWC), and County Commissioner Karen Marcus to discuss the Corps engineering analysis, the alternatives analysis submitted by the County, and the status of the FWS and NMFS biological opinions. The Corps engineering analysis concluded that the proposed emergent breakwaters would likely alter existing littoral processes to the point of seriously damaging the adjacent beaches and would pose a greater threat to sea turtles than comparable submerged structures. The Corps requested that the County provide a detailed alternatives analysis to include the submerged breakwater alternative as well as the construction of a sand transfer plant at the Jupiter Inlet. The County agreed to provide a revised alternatives analysis. Because the County's consulting engineers disagreed with the Corps findings, the Corps

(CESAJ-EN-WC) agreed to consult with the Corps Engineer Research and Development Center (ERDC) to (1) review the submitted modeling analysis, (2) determine the "state of the art" with respect to modeling submerged breakwaters, and (3) review the potential downdrift effects of the proposed project. The Corps agreed to this consultation since ERDC had experience with the modeling used by the county's engineers (CMS and NLINE models).

By memorandum issued 19 March 2010, ERDC provided a review of the proposed project. The ERDC analysis concluded that the proposed emergent breakwaters would present an unacceptable risk in terms of blockage of littoral drift to downdrift beaches and the associated erosional pressure the proposed project will exert on downdrift beaches. Additionally, the Corps understood that NMFS was drafting a jeopardy analysis Biological Opinion for threatened/ endangered sea turtles. The Corps transmitted the ERDC analysis to Palm Beach County by letter dated 22 March 2010, and requested that the County withdraw the current application before 31 March 2010 in order to consider all practicable project alternatives that would meet the project purpose and have less impact on downdrift beaches and threatened/ endangered sea turtles. By letter dated 31 March 2010, the County requested that the Corps review of the permit application be suspended in order to allow for a review of potential design alternatives. By letter dated 31 March 2010, the Corps notified the County that the permit application was withdrawn.

On 7 April 2010, the NMFS submitted their draft biological opinion (BO) to the Corps. The draft BO concluded the proposed emergent breakwaters are likely to jeopardize the continued existence of the threatened loggerhead sea turtle. No "reasonable and prudent alternatives" were identified, and no incidental take statement was provided in the draft. The Corps forwarded the draft BO to the County for use in their revised project design.

d. Modified Project Description: A revised application for submerged breakwaters was submitted to the Corps on 2 June 2010. The proposed project is to place approximately 181,468 tons of limestone within a 10-acre area in order to construct eleven submerged rubble mound breakwaters on submerged land approximately 270 feet offshore, between DEP monuments R-61 and R-66. A typical breakwater segment measures 103 feet in width (east-west) and 362 feet in length (north-south) at the base. The crest of the segments averages 260 feet in length and would

extend to -2 feet Mean Low Water, or -4.38 feet North Atlantic Vertical Datum (NAVD) with a ± 1 foot construction tolerance. The breakwaters are separated by an average of approximately 265 feet crest to crest and approximately 157 feet toe to toe. The breakwaters would be located in depths of -11 to -18 feet NAVD. In order to offset permanent impacts to 0.72 acres of exposed ephemeral hardbottom and periodic impacts to another 0.51 acres resulting from salients fluctuating in the lee of the structures, the applicant proposes to construct an artificial reef by placing 1.75 acres of limestone rock within a 31.76-acre mitigation area located 3,000 feet south of the project site.

Construction would take place from a barge with a long armed excavator and rock grappler. Breakwaters would be built from washed limestone. Construction would only take place during daylight hours with no equipment left in the project area over night. Most construction would take place over the summer months to take advantage of calm seas and would occur over a span of two years. Construction could take place during the winter season depending on weather conditions.

e. Changes to Project: In the permit application for the submerged breakwaters, the applicant initially proposed that the structures would be “self-mitigating” since they would function as fully submerged hardbottom habitat similar to an artificial reef. Upon further review and consultation with the resources agencies, it was determined that the high relief breakwater structures were not appropriate to offset the impacts to low relief hardbottom. This determination was made due to the potential for the structures to be modified and the different ecological functions performed by low relief and high relief hardbottom habitat. In response to this determination, the applicant submitted an appropriate mitigation plan.

3. Project Purpose:

a. Basic: The project purpose is shoreline stabilization and storm protection.

b. Overall: The overall project purpose is to provide shoreline stabilization and storm protection along an eroded portion of Singer Island.

4. Scope of Analysis: The scope of analysis includes the navigable waters within the project area and updrift/downdrift of

the project area, and endangered species and essential fish habitat concerns.

5. Statutory Authority: Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) and Section 404 of the Clean Water Act (33 U.S.C. 1344).

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

a. State Permit/Certification: The Florida Department of Environmental Protection (FDEP) permit number _____ was issued on_____. Issuance of the permit was contingent upon the inclusion of several special conditions for the project. These conditions would be attached to and become a part of the Corps' permit.

b. Coastal Zone Management (CZM) consistency/permit: Issuance of a DEP permit certifies that the project is consistent with the CZM plan.

c. Other Authorizations: No information has been received regarding any other authorizations that may be required.

7. Date of Public Notice and Summary of Comments

a. Important dates: A pre-application meeting was held with the Corps (CESAJ-EN-WC and CESAJ-RD-SP) and the County's consulting engineers (Humiston and Moore) on 13 April 2010. Humiston and Moore provided an assessment of the Sunny Isles Breakwater project design and indicated that it would not be as effective at Singer Island. The Corps re-iterated that it was not suggesting that submerged breakwaters were the only potential alternative and that it would not be appropriate to take the Sunny Isles design and place it at Singer Island without site specific adjustments. The Corps indicated it would evaluate all alternatives submitted by the County in the upcoming permit application, but would not re-evaluate the emergent breakwater project withdrawn by the County. Beginning on 16 April 2010, the Corps, Palm Beach County, FDEP, NMFS, and FWS participated in bi-weekly teleconference calls to coordinate the project review and address issues and concerns. In the bi-weekly teleconference on 16 April 2010, the Corps reiterated that the critical aspect of any structural alternative would be sufficient sand bypassing and minimization of potential sea turtle impacts. It was also agreed

that for the submerged breakwater alternative, a maximum crest elevation of -2 feet MLW would be a good starting point in order to reduce sea turtle impacts caused by the breakwaters. An additional pre-application meeting was held with the Corps (CESAJ-EN-WC and CESAJ-RD-SP), FDEP, and the County's consulting engineers (Humiston and Moore) on 13 May 2010. Humiston and Moore provided a summary of their submerged breakwater modeling analysis. The analysis indicated that submerged structures would trip storm waves and limit offshore sand losses while limiting disruption to longshore sediment transport. The Corps agreed that the modeling approach was appropriate and requested that structure impoundment volumes be provided in the sediment budget.

The application for the alternative design for eleven submerged breakwaters was received by the Corps on 2 June 2010. The Corps considered the application complete on 2 June 2010. The Corps issued a Public Notice for the submerged breakwater design on 7 June 2010, and sent the notice to all interested parties including appropriate State and Federal agencies. The Corps determined the project may affect five species of threatened/endangered nesting sea turtles (*Chelonia mydas, Eretmochelys imbricata, Lepidochelys kempii, Dermochelys coriacea, and Caretta caretta*) and may affect, but is not likely to adversely affect the endangered West Indian manatee (*Trichechus manatus*), and requested initiation of formal consultation with the FWS by e-mail dated 3 June 2010. The Corps determined the project would have no effect on *Acropora* spp., may affect, but is not likely to adversely affect the endangered smalltooth sawfish (*Pristis pectinata*), and may affect five species of threatened/endangered swimming sea turtles and requested initiation of formal consultation with NMFS Protective Resources Division (PRD) by e-mail dated 3 June 2010. The Corps issued a RAI for the revised project on 23 June 2010. The applicant's incomplete RAI response was received on 13 July 2010. Additional responses were received from the applicant during the project review.

b. All comments received on this application (i.e. the submerged breakwater application) have been reviewed and are summarized below:

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

(2) U.S. Fish and Wildlife Service (FWS): By e-mails dated 21 June 2010 and 7 July 2010, the FWS requested additional information regarding the sea turtle monitoring plan, physical monitoring plan, mitigation plan, and the project design. The FWS issued a Biological Opinion dated 3 September 2010 for the project impacts on threatened and endangered species under the purview of FWS. The FWS consultation is discussed in section 10 (e) of this document.

(3) National Marine Fisheries Service (NMFS) – Habitat Conservation Division (HCD): By letter dated 21 June 2010, NMFS HCD provided four Essential Fish Habitat (EFH) Conservation Recommendations. The EFH consultation is discussed in section 10 (f) of this document.

(4) National Marine Fisheries Service (NMFS) – Protected Resources Division (PRD): By e-mails dated 21 June 2010 and 7 July 2010, the NMFS requested additional information regarding the sea turtle monitoring plan, physical monitoring plan, mitigation plan, and the project design. The NMFS issued a Biological Opinion dated 16 September 2010 for the project impacts on threatened and endangered species under the purview of NMFS. The NMFS consultation is discussed in section 10 (e) of this document.

(5) State Historic Preservation Officer (SHPO): By letter dated 5 December 2007, SHPO stated that review of the Florida Master Site File indicates that no significant cultural resources are recorded within the project area. However the SHPO requested that the permit include a special condition requiring the Permittee to make all contractors aware of the requirement to notify the proper entities regarding unexpected finds or discoveries during project construction.

(6) U.S. Coast Guard (USCG): Did not respond to the public notice.

(7) State and local agencies: Florida Fish and Wildlife Conservation Commission (FWC): Did not respond to the public notice.

(8) Organizations: Surfrider Foundation (Surfrider), Florida Wildlife Federation (FWF), Sea Turtle Conservancy (STC), and Defenders of Wildlife: By letter dated 22 June 2010, Surfrider, FWF, STC, and Defenders of Wildlife opposed the project

and the determination that no EIS would be prepared for the project. Specifically, the concerns are the project (1) would destroy or degrade public trust resources via loss of sand to downdrift beaches/ downdrift erosion, burial of nearshore hardbottom, degradation of natural beaches, increased rip currents, swimming hazards, and navigational hazards, (2) benefit a very small group of people and adversely affect the public health, safety, welfare, or the property of others due to diminished recreational opportunities and erosion downdrift of the breakwaters, and (3) would negatively impact marine species (sea turtles, manatees, smalltooth sawfish, invertebrates, nearshore microorganisms) and hardbottom habitat. The letter also suggests that the effects of climate change and sea level rise on project performance should be assessed, the alternatives analysis lacks in-depth consideration of other alternatives, and that the completed engineering analysis/ modeling is inaccurate and uncertainty remains with respect to the predicted shoreline response. These organizations expressed similar concerns with the originally-proposed emergent breakwater application.

(9) Individuals: Ms. Ann Gray provided a letter dated May 31, 2010 (prior to the receipt of a revised application) opposing the project due to aesthetic concerns, navigational and swimming hazards, and sea turtle impacts. Ms. Gray suggested use of a sand transfer plant.

(10) Internal Coordination: The emergent breakwater permit application review was coordinated with CESAJ-EN-WC. In response to the application received on 2 June 2010, CESAJ-EN-WC requested the following information by e-mail dated 23 June 2010: (1) an assessment of the feasibility, benefits, and impacts of pre-filling the structures and a range of impoundment volumes expect to result from the project, (2) inclusion of project area mean high water line surveys Inclusion of project area Mean High Water Line surveys in the Physical Monitoring Plan and more frequent monitoring surveys during year one, post-construction, (3) additional information in the alternatives analysis regarding incremental crest width analysis completed and the justification for the selected crest width, ands (4) an estimate of the structural settlement expected and how this will impact project performance.

(11) United States Congress: Staff from Congressman Ron Klein’s office participated in several teleconference calls regarding the status of the permit review.

(12) Public Hearing Requests: No public hearing requests were received for the submerged breakwater application.

c. Applicant's response to comments: The Corps forwarded all comment letters and e-mails to the applicant upon receipt. The applicant partially responded to the Corps RAI by letter dated 13 July 2010. The RAI response did not include impoundment volumes or a sediment budget. The information received was forwarded to the USFWS, NMFS HCD, and NMFS PRD upon receipt. The applicant's responses to Surfrider Foundation, Florida Wildlife Federation, Sea Turtle Conservancy, the Defenders of Wildlife and Ms. Ann Gray are as follows: The applicant recognizes the potential for rip current formation in the "Technical Evaluation of Design Alternatives" report. The greatest potential for rip currents would occur during storm events with increased wave heights or elevated tides when swimming is already inherently dangerous. To caution residents of the potential for rip currents, signage will be developed and distributed to all condominiums within the project area for posting at their beach access points. With respect to the potential for project-related navigational hazards, the Coast Guard has indicated the structures would not require any maritime markers since the project is positioned landward of the most seaward natural emergent rock features located adjacent to the south end of the project area. To increase boater safety around the project, warning buoys with reflective surfaces will be anchored at the terminal ends of the project and a Notice to Mariners will be issued.

Climate change concerns were addressed in the RAI response. The international Panel for Climate Change (IPCC) estimates that the global average sea level will rise between 0.6 feet and 2 feet in the next century. The projection for sea level rise is within the construction tolerance for the crest elevation, therefore the effect from sea level rise will be negligible considering the variability that is expected from normal weather patterns. If at some point in the future it is determined the performance of the structures is reduced by sea level rise, an additional layer of rock could be added to the crest of the structures to compensate.

The use of the Melbourne wave gauge data was discussed in the applicant's RAI response. The applicant indicated that ideally a long term wave record for Singer Island nearshore is preferred to wave hindcast or measurements far from the project site. However in the absence of long-term nearshore data for Singer Island,

representative wave environment for Singer Island was provided through short term deployment for wave measurements in the nearshore of the project area and comparisons to available wave records in the region. The wave gauge at Melbourne provided valuable long-term wave measurements in wave environment similar to Singer Island. The shadowing of the Cape to the Melbourne gauge location only shelters waves from NNW to N directions which are not a significant wave energy window for Singer Island. Directional wave measurements for a 6-week period during the months of June and July 2005 were collected at the nearshore of the project site and compared to the Melbourne wave gauge data for the same period. The two gauges were deployed in similar water depth of 7 meters to 9 meters and collected comparable data. The data shows the level of agreement of wave heights, period, and direction especially for the most significant event which is important from the standpoint of sediment transport. Lower wave energy events compared well in period and direction, and showed similarity in smaller wave height although did not quantitatively compare as well at these lower energies. These lower energy waves are however less important from the standpoint of sand transport. The wave record of 2003 was used as a representative wave time series for long-term simulations. Based on sensitivity analysis of the calculated longshore and cross shore transport using the 20-year offshore WIS data, the ratios of net transport to gross transport of 2003 was similar to the 20-year average for the offshore WIS data. In addition, various model runs of the 61-year NLINE model calibration runs were done using different yearly wave time series from the Melbourne gauge and offshore WIS data. The wave data of the Melbourne gauge for 2003 provided the best calibration fit which was then verified with the verification model runs. The Melbourne data is therefore considered to be the best available data that is representative of the project area wave climate.

d. Additional Coordination: The permit application was coordinated with CESAJ-EN-WC on 3 June 2010. CESAJ-EN-WC also participated in bi-weekly teleconference calls during the application review process. CESAJ-EN-WC information requests related to the sediment budget, shoreline surveys, alternatives analysis, and structural settlement were included in the Corps RAI. The County provided an incomplete response to the 23 June 2010 RAI questions provided by CESAJ-EN-WC. Specifically, the response did not include a project sediment budget. Additional coordination with CESAJ-EN-WC was initiated on 30 June 2010 to resolve shoreline survey requirements. On 12 July 2010, CESAJ-

EN-WC indicated that in addition to the Differential Global Positioning System mean high water line surveys required in the "Sea Turtle Monitoring Plan for the Singer Island Erosion Control Project", the Permittee should also conduct surveys during the September 30 to March 1 interval. In addition to the wading depth profile surveys required in the "Physical Monitoring Plan", the Permittee should also conduct quarterly wading depth profile surveys in the project area and the downdrift area (R-66 to R-70) during year one following completion of project construction.

Based on a memorandum from FDEP dated 17 September 2010 identifying concerns with project performance and safety hazards, CESAJ-RD-SP requested that CESAJ-EN-WC provide an independent analysis based on the information provided by the applicant, specifically the revised July 2010 "Technical Evaluation of Design Alternatives" report that was submitted after the initial permit application in June 2010. In a meeting held on 23 September 2010 with the FDEP, County, and CESAJ-EN-WC the 17 September 2010 FDEP memorandum was discussed. The FDEP reiterated concerns with the modeling results and expected level of erosion control provided by the project. Rip current concerns were also addressed, including mitigation measures to reduce swimming safety hazards (signage, buoys, lifeguards). CESAJ-EN-WC again requested the sediment budget. On 30 September 2010, the County provided a response to FDEP memorandum dated 17 September 2010. The response provided additional information concerning rip current generation and expected project performance based on the completed modeling. This response was coordinated with CESAJ-EN-WC on 30 September 2010. Based on the review of the "Technical Evaluation of Design Alternatives" report, FDEP memo, County response, and additional wave data received from Humiston and Moore via e-mail dated 4 October 2010, CESAJ-EN-WC provided the following final draft comments on 14 October 2010:

1. In general, the new submerged breakwater alternative appropriately addresses and resolves the Corps of Engineers' major engineering issues of concern related to the initially proposed emergent breakwater project, particularly the issues of impacts to downdrift beaches. Specifically, the new design alternative involving submerged detached breakwaters should substantially decrease the potential for partial or complete blockage of littoral drift to downdrift beaches. Furthermore, the development of shoreline salients landward of the proposed series of submerged breakwaters is expected to be considerably

more subdued compared to those expected to develop behind the previously proposed series of emergent breakwaters, reducing the extent of coverage of nearshore hardbottom.

2. The analysis still does not specifically quantify the potential downdrift impact location of the proposed project nor does it quantify the magnitude of volumetric impact of the project. The technical analysis of the proposed project should clearly identify the expected project impact area as well as the volumetric magnitude of the impact either in terms of an annual or total impact after equilibration of the shore to the implemented project.

3. The issue of an apparent disconnect between the regional NLINE model and the detailed local NLINE model was not addressed in the technical evaluation of the proposed system of submerged detached breakwaters. This issue centered about the specification of a sediment source from an offshore bar system in the detailed local model that was not included in the calibrated and verified regional NLINE model.

4. Regarding the use of the CMS-2D numerical model in this analysis, evaluation of submerged detached breakwaters at Singer Island with a 2D model is not outside the norm for present-day practice. The project set up includes evaluation of submerged and emergent detached breakwaters, as well as a "no-structure" future condition. Calculation of waves in the vicinity of these alternatives is likely reasonable for all cases. For all detached breakwater calculations, we believe that the wave patterns (diffraction patterns, magnitudes, etc.) are reasonable.

5. There remains some concern regarding the generation of rip currents and overall public safety throughout the project area. Specifically, recently-provided analyses indicate that potentially hazardous rip currents could be generated approximately 2% of the time, based on a relatively small set of input wave height and direction parameters. A more detailed examination of incident wave conditions versus resulting current velocities is recommended. Effects of wave period on rip current generation should be examined as well. Some model output (fig 36H) suggests that an alongshore gradient may be created south of the southernmost structure, with the potential to erode this area. Some discussion of the erosion potential along this reach of shoreline should be provided in the sediment budget.

6. In conclusion, the proposed series of submerged detached breakwaters for erosion control along Singer Island in Palm Beach County, Florida, appears to present a decreased level of risk (compared to the original emergent design) in terms of potential downdrift impacts. The design and analysis documentation should however be updated to fully document the existing sediment budget throughout the region, and the impact of the proposed project on this sediment budget. This documentation should include quantifying the volume of sediment accumulation landward of the submerged breakwaters and the volume of expected erosion elsewhere and identify the areas of shoreline where the impacts are expected to be realized. The present documentation indicates shoreline accretion in the project area (compared to the without project condition) but no associated impact area. A more detailed discussion of rip current generation throughout the project and adjacent areas should be provided, including anticipated impacts on sediment movement and on public safety.

The Humiston and Moore memo dated 13 October 2010, which responded to 8 October 2010 DEP comments, was not considered in the draft comments provided by CESAJ-EN-WC. Based on review of this document, along with the “Sediment Budget Analysis” provided by Humiston and Moore on 26 October 2010 and follow up information provided by Humiston and Moore via e-mail dated 28 October 2010, and teleconference on 29 October 2010, CESAJ-EN-WC provided the following final engineering comments on_____:

8. Alternatives:

a. Avoidance (No action, uplands, availability of other sites): The no action alternative would not meet the project purpose of stabilizing the erosion-prone shoreline and providing storm protection in the project area. ERDC analysis in the memo dated 19 March 2010 indicated that the shoreline within the project area has historically been and is expected to remain relatively stable. However, ERDC also acknowledges that within the proposed project area the shoreline has undergone recent erosional pressure and infrastructure is vulnerable to storm-induced damages. If no action is taken to stabilize the shoreline, it is highly probable that the project area would be subject to more intense shoreline erosion events leaving valuable private property more vulnerable to potentially catastrophic damage during storm events. In the Biological Opinion for the project, the FWS recognizes the potential benefits of the

breakwaters to minimize the effects of erosion on sea turtle nesting habitat and extend the interval of any future sand placement events. The continued loss of valuable beach habitat utilized by nesting sea turtles would also likely result from the no action alternative. The no-action alternative would likely result in the construction of additional seawalls along the shoreline in the project area. According to information provided by the applicant, twelve of seventeen properties in the project area either have existing seawalls, permits to construct seawalls, or pending applications to construct seawalls. This corresponds to 16% of the shoreline in the project area with existing seawalls, and 55% in some stage of permitting. Seawalls reflect wave energy resulting in accelerated erosion rates during storm events. The no-action alternative combined with the likely increase in seawall construction would likely pose unacceptable risks to public safety along the project area shoreline during coastal storm events.

There are no upland alternatives that would meet the project purpose. Dune restoration, located above the highest annual tide line, is not a practicable alternative that would meet the project purpose. The location of several condominiums on top of the dune system severely limits the effectiveness of this alternative to stabilize the shoreline and protect property from storm events. Dune restoration has been completed annually since 2002 in the project area with limited effectiveness, and one emergency restoration was completed in 2007. In response to the retreating shoreline and infrastructure left vulnerable after erosion events, Palm Beach County has placed approximately 279,665 cubic yards of sand for dune restoration in the project area; however the shoreline has continued to recede. There is not enough dune system width between the existing properties and the mean high water line along this stretch of shoreline to make dune restoration alone a feasible method of achieving the project purpose. Bulkhead construction in uplands is also not a practicable alternative to achieve the project purpose and would not adequately address erosional pressure within the project area. Bulkhead construction alone would not provide a sufficient level of shoreline stabilization and storm protection that would meet the project purpose. It is likely that the beach would continue to be eroded and eventually very little, or no beach would be left in front of the bulkheads, resulting in an increased risk of structures failing during storm events.

The applicant evaluated the no action alternative with (1) modeling of potential dune and beach erosion for high frequency storms ranging from 5-year storm events to 25-year storm events, and (2) modeling long-term shoreline change for the case of a continuous seawall along the project shoreline based on the volumetric loss that will occur seaward of the project line of seawall placement. Due to modeling limitations, the analysis did not consider the direct interaction of waves with the exposed vertical surface of the seawalls. This interaction results in wave reflection and turbulence in front of the seawall which typically accelerates erosion in front of the seawall. Therefore the results of the analysis are considered to be conservative and actual beach loss would likely be more rapid than the results provided. Results of the high frequency storm analysis with seawall influence indicated that the shoreline could lose 110,000 cubic yards of sand during a 5-year storm event, reducing the width of dry beach by approximately 58 percent (88 feet to 37 feet). For a 25-year storm event, the volumetric sand loss increases to 210,000 cubic yards and width of dry beach decreases 95 percent (88 feet to 4 feet). The long-term shoreline change analysis simulated 10 years of shoreline change with a continuous seawall along the current vegetation line in the project area. Wave data from the Melbourne gauge for 2003 was used to represent a typical wave year and data for 2004 represented wave conditions for a highly active year. The results of the 10-year analysis indicate the area of beach within the project area would decrease from 17.8 acres to 1.5 acres, a 91 percent reduction, with no beach remaining along the northern two-thirds of the shoreline in the project area.

There are no other sites available that would achieve the project purpose. The only offsite alternative identified would be to utilize a sand transfer plant offsite in order to stabilize the shoreline by redirecting sand from another location to a location updrift of the project site. This alternative is not practicable considering the northern project site boundary location is 2.8 miles north of the existing sand transfer plant at the Lake Worth Inlet, which directs sand from north of the inlet to south of the inlet. The Jupiter Inlet is located approximately 9.2 miles to the north of the project site and a sand transfer plant located at that site would not provide the level of sand accretion and storm protection necessary to meet the overall project purpose at the project site. In accordance with the Jupiter Inlet Management Plan approved by FDEP, the Jupiter Inlet District currently pumps approximately 87,000 cubic yards of material per

year from the sand trap onto the beaches south of the inlet. The alternative to construct a sand transfer plant at Jupiter Inlet would not be expected to transfer a substantially higher volume of material than current methods. Any effort to construct a sand transfer plant at Jupiter Inlet would be proposed and coordinated by the Jupiter Inlet District. In addition, the current land use adjacent to the inlet is residential and gaining approval from land owners for plant access is unlikely. Therefore, this alternative would not meet the project purpose.

b. Minimization (modified project designs, etc.): The applicant has minimized project impacts to the maximum extent practicable. The applicant considered several alternatives that had the potential to minimize the impacts of the project. Several alternatives, including beach nourishment, groin construction, and emergent breakwaters were assessed to determine if the project purpose could be met with less impact to the aquatic environment by utilizing these alternatives.

1. Beach nourishment would not be a less environmentally-damaging practicable alternative to the proposed breakwaters. The CP&E Feasibility Study completed in 1993 estimated a 65-foot design berm width, which is the berm width necessary to prevent damage to the dune in a 10-year return period storm, to be 796,300 cubic yards using a +9 foot NGVD berm elevation. The 2002 CSI study indicated a beach renourishment creating a 60 foot beach width between R-61 and R-66 would require 450,000 cubic yards of sand and would impact approximately 2 acres of nearshore hardbottom. Singer Island has a prevalence of nearshore hardbottom reef that would be adversely impacted by the level of beach nourishment that would be required to address the erosion currently occurring. Beach nourishment projects in areas with high levels of erosion often require frequent renourishment, which translates into reoccurring impacts to the aquatic environment and high long-term maintenance costs. The impacts to hardbottom reef resulting from beach nourishment and renourishment activities would likely be substantial over time. The reoccurring impacts to the aquatic environment combined with the long-term costs of nourishment (estimated at 10 million dollars) eliminate this alternative.

2. Another alternative considered by the applicant was the construction of 16 groins separated by approximately 330 feet. The structures would consist of king piles with adjustable concrete panels that are designed to step down with the profile

of the beach to minimize impacts to sea turtles. Groins interrupt the natural littoral sand transport causing sand to accumulate on the updrift side of the structure. Once the updrift side of the structure fills to capacity, littoral sand transport is forced to bypass around the terminal end of the structure, in deeper water seaward of the normal transport zone. These may induce rip currents that exacerbate the loss of sand offshore, increasing erosion on the downdrift side of the structure. These structures would also not provide a sufficient level of storm protection and therefore would not meet the project purpose.

3. T-head groins consisting of a shore parallel element (T-head) that is effectively an emergent breakwater and a shore perpendicular element with a low profile that allows sand transport to bypass the structure between the T-head and the shoreline) can reduce downdrift impacts, but are most appropriate near inlets where the shore perpendicular section helps to maintain the beach profile in location where strong tidal currents might otherwise be channeled between the T-head and shoreline, causing current acceleration and scour. On a straight open shoreline such a Singer Island, the shore perpendicular element is not necessary, and if eliminated the structure is the same as a nearshore segmented breakwater.

4. The construction of emergent breakwaters was eliminated as an alternative in the review of the original permit application due to unacceptable risk in terms of blockage of littoral drift to downdrift beaches, the associated erosional pressure the proposed project would exert on downdrift beaches, and the unacceptable impacts to threatened and endangered sea turtles. The NMFS draft BO concluded that the originally-proposed emergent breakwaters would likely jeopardize the continued existence of the threatened loggerhead sea turtle. The Corps' preliminary analysis of this alternative is that it is not permittable and contrary to public interest. This alternative was the applicant's preferred alternative submitted in the original permit application.

5. Combinations of the above alternatives were considered in the review of the project. Small scale beach renourishment combined with dune restoration would not be expected to provide a sustainable solution to the erosion problems within the project area. This alternative would require frequent renourishment, which translates into reoccurring impacts to the aquatic

environment and high long-term maintenance costs. The impacts to hardbottom reef resulting from beach nourishment and renourishment activities would likely be substantial over time. Additionally, combinations of structural alternatives such as breakwaters and groins would not provide a less environmentally damaging alternative to the proposed submerged breakwaters. There were no combinations of practicable alternatives that would meet the project purpose with less environmental impacts than the preferred alternative considering costs, existing technology, and logistics.

A submerged breakwater design was selected as the applicant's preferred alternative following the Corps' rejection of the emergent breakwaters because of the sufficient level of shoreline stabilization and storm protection the structures would provide with reduced impacts to sea turtles, the aquatic environment, and downdrift beaches. The submerged design improves longshore sand movement and decreases the potential for substantial downdrift impacts when compared with the emergent breakwater alternative. The proposed submerged breakwater was designed with a wide crest to improve performance with respect to both wave attenuation and to minimize the potential for adverse hydrodynamic effects such as scouring and rip currents. The wide crest of the submerged structures provide greater wave attenuation than a narrow crest because it draws energy from the wave for the entire time it takes the wave to transverse across the width of the crest. From a hydrodynamic perspective, the structure is porous and the increased hydrostatic pressure in the interstitial spaces beneath the wave will cause water to flow away from the high pressure area beneath the wave during the time the wave is traversing the structure. Some of that flow will be in the seaward direction which is expected to reduce adverse hydrodynamic effects.

Shoreline and nearshore morphological responses to submerged structures are dynamic and the responses may be highly variable depending on wave and tide conditions. The evaluation of this alternative involved modeling the submerged breakwater in Sunny Isles that was designed by the Corps. The apparent success of the Sunny Isles project appears to be based on (1) the limited wave attenuation with the structures primarily acting as a shore-parallel sill that reduces offshore sand transport that might otherwise occur during episodes of relatively steep high energy waves, and (2) improved sand budget as a result of the nourishment completed along adjacent beaches.

The technical analysis of this project completed by the applicant demonstrated that under typical conditions, the estimated wave attenuation is approximately ten percent. The analysis shows the sediment loss from the project area would be reduced from approximately 36,000 cubic yards per year to approximately 8,000 cubic yards per year, and shoreline recession will be reduced from historic rates of approximately 8 feet per year to less than 2 feet per year. The County considers this to be a more manageable erosion rate than the current situation that has required the ongoing practice of placing 50,000 cubic yards of sand per year in restored dunes in the project area. The County expects to continue dune nourishment above the highest annual tide line in the project area as necessary to supplement the erosion control and storm protection benefits provided by the proposed breakwaters.

To minimize the impacts of their preferred alternative, the applicant modified the project to avoid impacts to high-profile, persistently exposed natural hardbottom. Additionally, the location of the eleven breakwater segments was modified based on existing hardbottom elevations in order to avoid hardbottom habitat with the highest elevations, relief, and ledges. Various configurations of the submerged breakwaters were evaluated in the July 2010 “Technical Evaluation of Design Alternatives”. The applicant considered moving the breakwaters farther offshore and reducing the breakwater width to reduce impacts to hard bottom. However, modification of the location was not feasible due to physical restraints related to substrate suitability, deeper water offshore and the nearshore sandbar. The crest width was selected to provide an acceptable level of wave energy attenuation based on wave periods of 8 to 12 seconds, which correspond to high frequency storm conditions on Singer Island. Narrower crest widths have been demonstrated to be ineffective and more likely to cause undesirable hydrodynamic effects. Additionally, reducing the number of breakwaters in the project area was not expected to achieve the project purpose for the entire length of shoreline that has been designated as critically eroded and subject to storm-induced erosion events. The project has been designed to function as a system to provide shoreline stabilization and storm protection along the entire reach between FDEP monuments R-61 and R-66. Based on modeling results, previous project results, and the best available engineering and scientific information, the project includes the minimum size and number of submergent breakwaters that would achieve the project purpose at the site.

c. Compensatory Mitigation: In order to offset impacts to 0.11 acre of ephemeral hardbottom habitat due to the beach response (covering by sand due to salient formation), 0.72 acres of ephemeral hardbottom habitat permanently covered by the breakwater footprint, and 0.40 acre of persistently exposed hardbottom periodically covered by the beach response, the applicant proposes to construct an artificial reef by placing 1.75 acres of limestone rock within a 31.76-acre mitigation area located 3,000 feet south of the project site. Limestone boulders would be placed into 95 single or double layer clusters in water depths of -7.66 feet NGVD to -16.66 feet NGVD. The clusters would have an approximate dimension of 20 feet by 40 feet and the spacing between each cluster would be 35 feet laterally and 30 feet longitudinally. Biological and physical monitoring of the mitigation would be conducted in accordance with the Corps permit conditions to ensure the site achieves ecological success. The artificial reef site was determined to be appropriate for hardbottom mitigation as it is located adjacent to the impact site and adjacent to other successful hardbottom mitigation areas.

The impacts were assessed using an analysis of 2009 aerial photography which showed that there are 18.24 acres of exposed hardbottom between FDEP monuments R-60.5 and R-66. All hardbottom in the project area is ephemeral in nature; however the hardbottom was classified as ephemeral or persistent for the purposes of the UMAM assessment. Persistent hardbottom is defined as hardbottom that was exposed for any three consecutive years during the 15 year period of hardbottom analysis. All other hardbottom exposed during the 2009 survey is classified as ephemeral with shorter durations and/or lower frequencies of exposure.

Based on the Uniform Mitigation Assessment Method (UMAM), the breakwaters and resulting salients would result in a total functional loss of 1.05 units. The UMAM impact delta score for the 0.72 acres of ephemeral hardbottom habitat covered by the breakwater structures is 0.83. The UMAM impact delta score for the 0.11 acre of ephemeral hardbottom habitat covered by the beach response is 0.83. The UMAM impact delta score for the 0.40 acre of persistently exposed hardbottom periodically covered by the beach response is 0.90. The total functional gain of the proposed mitigation area is 1.05 units based on a mitigation delta of 0.80, a time lag of 5 years (1.07), and a risk factor of

1.25. The proposed mitigation, if successful, would fully offset all proposed impacts to hardbottom habitat.

d. Conclusions of Alternatives Analysis: The review shows that all the alternatives have been considered and it has been adequately demonstrated based on modeling results and supporting documentation submitted by the applicant that the proposed submerged breakwater alternative is the least environmentally damaging and only practicable alternative considering cost, existing technology and logistics.

9. Section 404(b)(1) Guidelines Evaluation:

a. Factual determinations:

(1) Physical substrate: The underlying Pleistocene Anastasia Formation anchors Florida's east coast beaches. This material appears as a submerged reef roughly parallel to and along the shoreline of Singer Island. In addition to this geological formation, sabellarid worm reefs are located offshore. Sands covering the Anastasia Formation in the project area are composed of quartz and shell fragment. The breakwaters would cover approximately 0.72 acres of hard bottom and 9.28 acres of sand bottom. Additionally, the salients in the lee of the structure would cover an additional 0.51 acres of hardbottom. These hard bottom impacts would be offset by the compensatory mitigation proposed near the project area. Construction of the breakwater structures would result in the conversion of 9.28 acres of sand bottom into high relief hardbottom habitat. No mitigation credit was generated from this conversion. The artificial reef mitigation site would be located in areas with a 1 to 3 foot thick layer of sand bottom (composed of quartz and shell fragment) located on top of the Anastasia Formation.

(2) Water circulation, fluctuation, and salinity: The project is located within the tidal waters of the Atlantic Ocean. The project would alter water circulation in the immediate vicinity of the structures. The breakwaters are designed to attenuate wave energy which reduces the primary cause of erosion. Additionally, the breakwaters would modify wave patterns through diffraction. The combination of these factors on wave energy modifies the local littoral transport rates and is expected to result in the accumulation of sand and minimization of erosion along the shoreline behind the breakwater. The shoreline is expected to form a salient which achieves a state of equilibrium,

and once equilibrium is achieved, sand transport past the structure resumes thereby minimizing the potential of adverse downdrift effects. The applicant would be required to comply with a physical monitoring plan to assess the shoreline response and correct erosion caused by the structures. The alteration of water circulation is not expected to adversely impact water quality or aquatic functions and values in the project area. The alteration of water circulation would likely result in the formation of rip currents between the breakwater segments during certain wave conditions. Rip currents are discussed further in section 10 (a)(13) and (17). No impact on salinity would result from the project.

(3) Suspended particulate/turbidity: Construction of the breakwaters would result in temporary turbidity; however the State permit would be conditioned to ensure there are no violations of State water quality standards. The project would be constructed from south to north to minimize downdrift turbidity during construction activities. The Corps permit would be not be issued until the applicant receives water quality certification from the State. The Corps permit would be conditioned to include the specific conditions required under the State permit.

(4) Contaminant availability: The project is not expected to introduce contaminants into the aquatic environment. Water quality certification is required prior to the issuance of the Corps permit. The Corps would include permit conditions requiring the use of clean fill material pursuant to the requirements of the Clean Water Act.

(5) Aquatic ecosystem effects: The project will impact essential fish habitat, federally-managed recreational and commercial fisheries, beach and sand bottom communities, nearshore hardbottom communities, and endangered/ threatened marine turtles. The breakwaters would cover approximately 0.72 acres of hard bottom and 9.28 acres of sand bottom. Additionally, the salients in the lee of the structure would cover an additional 0.51 acres of hardbottom. Hardbottom impacts will result in the loss of primary productivity (algae) and substrate for recruitment by sessile benthic organisms, and loss of habitat utilized by fish and other marine organisms. Hard bottom impacts would be offset by the compensatory mitigation proposed near the project area. The mitigation site would provide 1.75 acres of hardbottom habitat that would benefit

marine communities impacted by breakwater construction. Sandy bottom communities will become buried, smothering infauna that is a food source for fish and other marine life. Construction of the breakwater structures would result in the conversion of 9.28 acres of sand bottom into high relief hardbottom habitat. Construction of the breakwaters would also result in temporary turbidity that would affect these communities.

It is expected that the breakwater structures would adversely impact marine turtles attempting to migrate to and from the nesting beach and increase predation on hatchlings as they move between and over the breakwater structures. Fish assemblages are expected to shift as a result of the project due to high relief structures attracting larger predatory fish. The breakwater structures would provide high relief hardbottom habitat beneficial to many marine organisms. Salients forming in the lee of the structures are expected to result in a more stable beach profile that would likely increase the suitable marine turtle nesting area and the utilization of the beach by wildlife.

(6) Proposed disposal site: The breakwaters would be placed in an area consisting of a matrix of nearshore hard bottom, sediment over hard bottom and sand bottom. The hard bottom in this area is generally low profile and is largely ephemeral, although a small area within the project area has a higher relief and is persistently exposed. The artificial reef mitigation would be located in an area with sediment over hard bottom.

(7) Cumulative effects: Past, present, and reasonably foreseeable future impacts from structural beach shoreline protection and stabilization projects along the Palm Beach County coastline have been considered in the review of this project in order to assess the potential cumulative effects of the proposed breakwaters. The Corps is aware of two other existing breakwater structure constructed in Palm Beach County, occurring between the Jupiter Inlet and the Boca Inlet, a distance of approximately 42 miles. The Palm Beach County Prefabricated Erosion Prevention (PEP) Reef is a large continuous submerged breakwater constructed of concrete modules and the Breakers breakwaters are a series of emergent rock breakwaters. Outside of Palm Beach County, the Vero Beach PEP Reef is submerged, segmented, and consists of concrete modules. The 32nd Street Breakwaters in Miami Beach caused downdrift erosion. The Sunny Isles Submerged Breakwaters have stabilized the project area shoreline.

The PEP in Palm Beach County did not function as intended and accelerated erosion over much of the project area and was later removed. The PEP reef in Vero Beach settled significantly and a study performed to determine its functionality was inconclusive. The 32nd St. Breakwaters in Miami have performed as intended in that it successfully accreted sand behind the proposed structures; however the project caused erosion south of the project. In addition to breakwater construction, there are numerous existing groin fields, seawalls, and other past shoreline stabilization projects in Palm Beach County. The ongoing impacts of these projects include sea turtle nesting behavior modifications and the alteration of sand transport along the Palm Beach County shoreline.

The Corps is aware of three planned breakwater projects in Palm Beach County that could be constructed in the future with the intent of protecting and stabilizing project area shorelines. The Corps is currently reviewing an EIS for the Central Palm Beach County Comprehensive Erosion Control Project. This project includes an unspecified number of either emergent or submerged breakwater structures extending from the Town of Palm Beach south approximately 31,000 linear feet (1.3 miles) through Lantana and into the Town of Manalapan. The Jupiter Beach Erosion Control Project would include an unspecified number of emergent or submerged breakwater structures constructed along a ½ mile stretch of beach located south of the Jupiter Inlet and extending to the Jupiter Beach Resort. Impacts from these projects are difficult to predict, and are contingent on site specific avoidance and minimization measures and the engineering design of the breakwaters. Mitigation would be required for all impacts to hardbottom communities associated with these planned projects. Marine turtle nesting and swimming impacts, similar to those assessed in the review of this project, may result from these projects. Future projects would also be reviewed by FWS and NMFS pursuant to the Endangered Species Act and project specific reasonable and prudent measures would likely be required.

Additionally these future breakwater projects would affect longshore and cross-shore sediment transport impacting both up drift and downdrift areas. If these projects are designed as emergent breakwaters, it is likely the Corps would have some of the same concerns that arose during evaluation of the applicant’s original proposal for emergent breakwaters at Singer Island and

potentially these future projects may be deemed contrary to public interest.

The incremental cumulative effect of the proposed breakwaters on sea turtles would be negative with respect to restricting the species' movement through the project area, loss of foraging habitat, and increased hatchling predation; however there would be benefits to the species in reducing beach erosion and creating a stable nesting beach profile. The FWS believes that incidental take will be limited to 1.1 miles of nesting beach habitat as a result of this project. Incidental take is in the form of disturbance to nesting females due to construction activities or the presence of the breakwaters, behavior modification of nesting females and hatchlings due to escarpment formation, the destruction of nests from escarpment leveling, behavior modification of nesting sea turtles or hatchlings due to the presence of the breakwaters which may act as barriers to movement, or cause disorientation, and predation of hatchlings due to the presence of breakwater segments. The FWS identifies reasonable and prudent measures, which are discussed in Section 9(e), to minimize the amount of take. These measures will be incorporated into the permit to minimize the potential for take. Cumulative effects, including the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area were considered in the FWS Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in the FWS cumulative effects analysis because they require separate consultation pursuant to section 7 of the Act. The FWS has considered potential cumulative effects of this project on sea turtles based on the above considerations and determined there would be no cumulative effects of the action on endangered species under FWS' purview.

Adverse cumulative impacts to hardbottom resources would be minimized and offset with appropriate mitigation in a location adjacent to the project site. Cumulative water quality impacts will be discountable given State permitting requirements with respect to water quality certification. Cumulative wildlife and fisheries impacts would also be discountable. No other measurable cumulative impacts are expected for any other resource.

Secondary effects include construction turbidity that could impact the aquatic environment. These impacts would be temporary and are expected to be minimal. As a condition of permit, the

applicant will be required to utilize best management practices to ensure impacts to water quality are minimized. The structures could cause the creation of tombolos or cause erosion of the shoreline downdrift of the breakwaters. Monitoring will be conducted to assess any secondary impacts downdrift of the project, and adaptive management will be utilized to correct tombolo formation or erosion caused by the project which may include beach nourishment by the County downdrift. Additionally, in the event a structure fails, all debris and structural material would be removed from the nearshore waters and deposited in a Corps-approved upland location. Further, the structures could be removed or modified if they cause adverse impacts to the beach or dune system.

b. Restrictions on discharges:

(1) Alternatives (See paragraph 8):

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

(b) The activity does need to be located in a special aquatic site to fulfill its basic purpose.

(c) It has been demonstrated in paragraph 8 above that there are no practicable, less environmentally-damaging alternatives which would satisfy the project purpose.

(2) Other program requirements:

(a) The proposed activity will not violate applicable State water quality standards or Section 307 prohibitions or effluent standards.

(b) The proposed activity will not jeopardize the continued existence of federally listed threatened or endangered species or affect their designated critical habitat.

(c) The proposed activity will not violate the requirements of a federally designated marine sanctuary.

(3) The activity will not cause or contribute to significant degradation of waters of the United States, including adverse effects on human health; life stages of aquatic organisms;

ecosystem diversity, productivity and stability; and recreational, aesthetic, and economic values.

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

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

10. Public Interest Review:

a. Public interest factors: The Corps reviewed all of the public interest factors. The Corps considers the public interest factors identified below as relevant to this proposal. The Corps considered both cumulative and secondary impacts on these public interest factors.

(1) Conservation: The breakwaters would modify the aquatic environment in the project area. Compensatory mitigation would be required for all adverse impacts to the aquatic habitat. Therefore, any potential adverse effects on conservation would be minor.

(2) Economics: The breakwaters would have an overall positive impact on the local economy. Construction activities would generate jobs and revenue for contractors. The project would protect valuable private coastal property and improve the local economic base which is affected by employment, tax revenues, community services, and property values. The project would stabilize an eroding beach and sand accretion would increase the area of beach used for recreation, which is a significant economic sector in the project area. The structures are not expected to reduce other recreational uses (surfing, swimming) in an economically significant manner.

(3) Aesthetics: The project will alter the visual character of the submerged bottom in the project area. The perception of this alteration will vary from person to person. Some would prefer to have a natural view of the submerged bottom without interference from man-made structures. Others may find the structures interesting and appreciate the utilization of the structures by aquatic fauna.

(4) General environmental concerns: The project will impact beach and sand bottom communities, nearshore hardbottom communities, and endangered/ threatened marine turtles as discussed in paragraph 9. These impacts would be reduced through the applicant's adherence to the terms and conditions of the FWS and NMFS Biological Opinions and the compensatory mitigation proposed by the applicant for hardbottom impacts. Water quality is not expected to be substantially affected by the project.

(5) Wetlands: No impacts to wetlands are proposed.

(6) Historic and cultural resources: The Corps made a determination of "no potential to cause effect" to cultural resources due to the nature of the activity and the location of the project in a dynamic nearshore environment that is extensively developed and used for recreation. The Corps ensured compliance with the National Historic Preservation Act through coordination with the Florida Department of State, Division of Historical Resources (DHR). DHR determined that review of the Florida Master Site File indicates that no significant cultural resources are recorded within the project area. However, the DHR requested that the permit, if issued, include a special condition requiring the Permittee to make all contractors aware of the requirement to notify the proper entities regarding unexpected finds or discoveries during project construction.

(7) Fish and wildlife values: The proposed project is expected to impact 0.11 acre of ephemeral hardbottom habitat due to the beach response (covering by sand due to salient formation), and an additional 0.72 acres of ephemeral hardbottom habitat will be permanently covered by the breakwater footprint. In addition, 0.40 acre of persistently exposed hardbottom will be periodically covered by the beach response, converting this acreage into more ephemeral hardbottom habitat. Hardbottom impacts will result in the loss of primary productivity (algae) and substrate for recruitment by sessile benthic organisms, and loss of habitat for fish utilization. Sandy bottom communities will also become buried, smothering infauna that may be food source for fish and other marine life. The benthic and fish species common to these ephemeral hardbottom areas are adapted to, and tolerant of, the natural wide range of physical conditions common to these dynamic nearshore areas. The impacts resulting from the conversion of sandy bottom to limestone breakwater structures are minor and would not require compensatory mitigation. The structures are also expected to

affect sea turtle nesting and hatchling success along approximately 1.1 miles of shoreline in the project area. It is expected that the breakwater structures would adversely impact marine turtles attempting to migrate to and from the nesting beach and increase predation on hatchlings as they move between the breakwater structures. Take of sea turtles, as discussed in Section 10(e) of this document, would be minimized by the implementation of the Reasonable and Prudent Measures, and Term and Conditions outlined in the FWS and NMFS Biological Opinions. Compensatory mitigation adjacent to the project site would offset the fish and wildlife impacts resulting from the loss of hardbottom habitat. Additionally, the breakwater structures will create habitat that mimics natural hardbottom by providing surface area for colonization of benthic organisms.

(8) Flood hazards: The project would reduce flood hazards to the properties located along the project shoreline. Shorelines downdrift of the project area could experience erosion, however the applicant will be required to monitor the performance of the project and correct erosion caused by the structures.

(9) Floodplain values: The beach between the shoreline and the dune ridge is in FEMA Zone V8, areas of 100-year coastal flood with velocity. The dune ridge (elevation 10 feet NGVD 29) is in FEMA Zone C, areas of minimal flooding. The project would reduce flood hazards to the properties located along the project shoreline. Shorelines downdrift of the project area could experience erosion, however the applicant will be required to monitor the performance of the project and correct erosion caused by the structures.

(10) Land use: The primary responsibility for land use decisions is held by State, local, and Tribal governments. The project would help maintain current land use, by protecting properties from erosion and storm impacts.

(11) Navigation: The project will be constructed near the shoreline (approximately 270 feet offshore) in average water depths between -11 feet and -18 feet NAVD. The crests of the eleven structures averages 260 feet in length and would extend to -2 feet Mean Low Water, or -4.38 feet NAVD and would not be visible to boaters. The project location is within and adjacent to existing hardbottom areas that are already potentially hazardous to navigation and avoided by vessels. The USCG and FWC did not provide any comments on the Public Notice. According to

information provided by the applicant, the USCG has indicated that the structures would not require any maritime markers since the project is positioned landward of the most seaward natural emergent rock features located adjacent to the south end of the project. To increase navigational safety, the terminal ends of the project will be marked with warning buoys with reflective surfaces. Buoys will also be placed in the gaps between each breakwater segment. The location of the project will be coordinated with NOAA and USCG to ensure the structures are updated on navigational charts, and that a Notice to Mariners is issued. Therefore, the project is not expected to adversely impact navigation.

(12) Shore erosion and accretion: The project is designed to reduce shore erosion and provide sand accretion in the lee of the structures. The breakwaters would provide a wider beach profile that would improve recreational values and protect upland property. Shorelines downdrift of the project area could experience erosion, however the applicant will be required to monitor the performance of the project and correct erosion caused by the structures including conducting beach nourishment down drift if necessary. In addition, the County's large scale beach nourishment efforts to the north of the project site and the on-going dune restoration in the project area establish feeder beach conditions to the downdrift beaches.

(13) Recreation: The project would stabilize an eroding beach and sand accretion would increase the area of beach used for recreation. The structures would likely be utilized for diving, snorkeling, and fishing. The structures are not expected to adversely impact surfing in a substantial manner. The project area is not highly utilized by surfers according to observations made by Palm Beach County staff. Surfer utilization of the nearshore is reported to be more common at Ocean Reef Park located immediately south of the project area. There are no public parks or public beach access walkways in the project area.

The potential for additional rip current development between the gaps of the structures was assessed by the applicant. Rip currents generated by the placement of breakwaters could adversely affect swimmers who utilize the project area. Based on modeling provided by the applicant rip currents between the gaps of the breakwater structures would form. Rip currents would be generated primarily when wave heights are greater than 1 meter coming within 7 degrees from the shore normal angle. Under these

conditions (wave heights greater than 1 meter) it is unlikely there will be many swimmers in the water, particularly weak swimmers, when conditions are inherently dangerous. Some oblique waves are also expected to generate rip currents when long period waves refract toward nearshore. Analysis of the model results for wave conditions under the “no action” alternative indicate that waves higher than 1 meter coming within 7 degrees from shore normal are likely to cause natural rip currents. The model results indicate that the maximum current velocity of natural rip currents might be lower in magnitude than within the proposed breakwaters, but of larger spatial extent. With the breakwaters in place, the offshore directed rip current locations would be limited to the gap locations whereas under the “no action” condition, the naturally occurring rip currents could occur at varying locations. To minimize the potential for swimming hazards, rip current warning signage will be developed and distributed to all condominiums within the project area for posting at their beach access points. Additionally, safety buoys with handles will be placed between the gaps of the breakwaters to allow swimmers a secure position to signal for help.

(14) Water supply: The project would not affect water supply.

(15) Water quality: The project is not expected to adversely impact water quality. Minor temporary turbidity is expected during construction; however permits would be conditioned to ensure water quality standards are not violated.

(16) Energy needs: The project would not affect energy needs.

(17) Safety: Boaters that are unfamiliar with the area could run into the structures. The project location is within and adjacent to existing hardbottom areas that are potentially hazardous to navigation, therefore boat operators would likely avoid the area and the structures. The location of the project will be coordinated with NOAA and USCG to ensure the structures are updated on navigational charts. To increase navigational safety, the terminal ends of the project will be marked with warning buoys with reflective surfaces. Buoys will also be placed in the gaps between each breakwater segment. As discussed in 10(a)(13) above, the structures could also result in rip currents in the project area. However, these currents commonly occur in the Atlantic Ocean, and are a well-known danger in

coastal areas. To minimize the potential for swimming hazards, signage is proposed at beach access points and safety buoys will be placed between the gaps of the breakwaters. The structures would provide improved public safety during storm events through the protection of property and the minimization of storm surge flood damage. The project is subject to Federal, State, and local safety laws and regulations.

(18) Food and fiber production: The project would not affect food and fiber production.

(19) Mineral needs: The project would not affect mineral needs.

(20) Considerations of property ownership: The project would not adversely affect property ownership considerations. The breakwaters would help protect valuable coastal property from erosion and storm impacts. Properties downdrift of the breakwaters could experience erosion, however the applicant will be required to monitor the performance of the project and correct erosion caused by the structures in accordance with the physical monitoring plan and the Corps permit special conditions.

b. Describe the relative extent of the public and private need for the proposed structure or work: The project is needed to serve the public's interest by providing shoreline stabilization to reduce damages to private development and public beaches and protect upland structures from shore erosion and storm surges, storm tidal flooding, and wave effects.

c. Describe the practicability of using reasonable alternative locations and methods to accomplish the objective of the purposed work where there are unresolved conflicts as to resource use: No practicable alternative exists which meets the project purpose and does not involve the discharge of fill into waters of the United States. No practicable alternative exists that would have less impact on the surrounding environment and meet the project purpose. The no action alternative would allow for the continued erosion of the project beach and would not provide the benefits needed for storm damage protection.

d. Describe the extent and permanence of the beneficial and/or detrimental effects which the proposed work is likely to have on the public and private uses to which the area is suited: The loss of nearshore hardbottom habitat is a detrimental effect

which would be permanent; however, compensatory mitigation will be required to offset those impacts. Permanent detrimental impacts to marine turtle nesting and hatchling survival in the project area would result from the structures, however the resulting sand accretion in the lee of the structures would protect and widen nesting beach and increase the area of beach used for recreation. The structures and resulting sand accretion would permanently protect shorefront development and beach/dune resources in the project area.

e. Threatened or endangered species: The Corps determined the project may affect five species of threatened/endangered nesting sea turtles (*Chelonia mydas, Eretmochelys imbricata, Lepidochelys kempii, Dermochelys coriacea, and Caretta caretta*) and may affect, but is not likely to adversely affect (MANLAA) the endangered West Indian manatee (*Trichechus manatus*), and requested initiation of formal consultation with the FWS by e-mail dated 3 June 2010. By e-mails dated 21 June 2010 and 7 July 2010, the FWS requested additional information regarding the sea turtle monitoring plan, physical monitoring plan, mitigation plan, and the project design. The additional information was submitted by the applicant and forwarded to the FWS on 23 July 2010 and 26 August 2010. The FWS concurred with the Corps determination for nesting sea turtles and issued a Biological Opinion (BO) dated 3 September 2010. The BO also provided concurrence with the Corps determination of MANLAA for the West Indian manatee.

The FWS anticipates approximately 1.1 miles of nesting beach habitat could be taken as a result of the proposed action; however incidental take of sea turtles will be difficult to detect since (1) an unknown number of females may avoid the beach and be forced to nest in a less than optimal area, (2) escarpments may form and obstruct an unknown number of females from accessing a suitable nesting site, (3) the number of nests lost due to erosion of the shoreline adjacent to the segmented breakwater is unknown, (4) breakwater segments may obstruct or disorient an unknown number of adult and hatchling sea turtles during ingress and egress at nesting sites, and (5) an unknown number of hatchlings may be predated as a result of obstruction or increase predators associated with the breakwater segments. Take is expected in the form of harassment of sea turtles attempting to nest along the shoreline adjacent to the project area as a result of construction activities and the presence of the breakwaters, behavior modification due to escarpment

formation, destruction of nests due to escarpment leveling, behavior modification of nesting sea turtles or hatchlings due to the presence of the breakwaters, and predation of hatchlings due to the presence of the breakwaters.

In the BO, the FWS concluded that the project is not likely to jeopardize the continued existence of loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles. This conclusion was based on the following: (1) long-term adverse effects to adult and hatchling sea turtles are anticipated as a result of the segmented breakwater. The principle long-term effects are on nesting and hatchling success within a minimum of 1.1 miles of shoreline for the duration of the structures existence. Although a variety of factors influence how the structures will perform, measures can be implemented to minimize adverse impacts to sea turtles. (2) Take of sea turtles will be minimized by the implementation of the Reasonable and Prudent Measures and Terms and Conditions outlined in the BO. Leveling escarpments and removing breakwater debris distributed along the beach prior to nesting season have been shown to help minimize adverse impacts to sea turtles. (3) The FWS review of the current status of sea turtles, the environmental baseline for the action area, the effects of the proposed breakwater, and the cumulative effects. (4) No critical habitat has been designated for the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles in the continental U.S.; therefore none will be affected. The Reasonable and Prudent Measures and Terms and Conditions contained in the BO will be incorporated into the DA permit. To minimize the potential for construction related impacts, construction shall only take place during daylight hours, no construction equipment shall be left in the project area overnight, the permit would be conditioned to require compliance with the "Standard Manatee Conditions for In-Water Work – 2009", and wharf/boat fenders would be utilized to reduce the risk of a vessel crushing a manatee.

The Corps would not include several discretionary conservation recommendations (CR) included in the BO as permit conditions since these recommendations cannot be enforced and/or controlled by the Corps. These include encouraging a moratorium on all seawall construction, and considering upland retreat of future and present construction. The Corps would also not require sea turtle educational signs since there are no public beach access areas in the project area to place the signs. With respect to the CR related to construction activities taking place outside

the sea turtle nesting and hatching season, the Permittee would be authorized to construct the breakwaters during the sea turtle nesting and hatching period since ocean conditions are more favorable for construction during this time. Allowing construction during this time would result in a substantial reduction in construction timeframes and costs. However, the Permittee would be required to maximize the amount of construction that takes place from November 1 through April 30th in order to reduce the likelihood of interfering with sea turtle nesting and hatching. Construction would cease immediately if a turtle is taken during construction activities and the Permittee would immediately contact the Corps, FWS, and NMFS. The CR related to extending physical and biological monitoring beyond 5 years was addressed in the permit conditions. Physical monitoring would be required for the life of the project. Sea turtle monitoring components would be reviewed at the end of the component monitoring period to determine if addition monitoring will be required. The project would have no effect on any other threatened or endangered species under the purview of the FWS.

The Corps determined the project would have no effect on *Acropora* spp., may affect, but is not likely to adversely affect the endangered smalltooth sawfish (*Pristis pectinata*), and may affect five species of threatened/endangered swimming sea turtles and requested initiation of formal consultation with NMFS Protective Resources Division (PRD) by e-mail dated 3 June 2010. By e-mails dated 21 June 2010 and 7 July 2010, the NMFS requested additional information regarding the sea turtle monitoring plan, physical monitoring plan, mitigation plan, and the project design. The additional information was submitted by the applicant and forwarded to the NMFS on 23 July 2010. The NMFS concurred with the Corps determination for four species of swimming sea turtles (*Chelonia mydas, Eretmochelys imbricata, Dermochelys coriacea, and Caretta caretta)* and issued a Biological Opinion (BO) dated 16 September 2010. In the BO, NMFS indicated the project effect determination for Kemp's ridley sea turtles should be MANLAA, since this species rarely occurs in the nearshore waters of Palm Beach County. The Corps concurred with this assessment and used the NMFS BO for concurrence with this MANLAA determination. The BO also provided concurrence with the Corps determination of MANLAA for the smalltooth sawfish.

NMFS anticipates the proposed action would impact a maximum of approximately 1.23 acres of nearshore hardbottom habitat, displacing an estimated 7 juvenile green sea turtles with a

strong site affinity for the impacted area. This displacement is expected to result in 6 non-lethal takes and 1 lethal take of juvenile green sea turtles. The presence of the breakwaters is expected to result in an additional 26 percent increase in the loss of hatchlings annually to predation. NMFS determined the anticipated level of take is not likely to jeopardize the continued existence of green, leatherback, loggerhead, and hawksbill turtles nor the proposed Northwest Atlantic loggerhead distinct population segment. The Reasonable and Prudent Measures and Terms and Conditions contained in the BO will be incorporated into the DA permit. To minimize the potential for construction related impacts, the permit would be conditioned to require compliance with the National Marine Fisheries Service's "Sea Turtle and Smalltooth Sawfish Construction Conditions" dated March 23, 2006. The Permittee would also be required to comply with the "Sea Turtle Monitoring Plan for the Singer Island Erosion Control Project". In addition, the sea turtle hatchling predation monitoring would be extended to include a year two post construction monitoring event in accordance with the one CR provided in the BO. The year one and year two monitoring results would be compared to determine if additional monitoring will be required by the Corps, FWS, and NMFS. The results of the other sea turtle monitoring components would be reviewed at the end of the component monitoring period to determine if addition monitoring will be required. The project would have no effect on any other threatened or endangered species under the purview of NMFS.

f. Essential Fisheries Habitat (EFH): The public notice included an initial determination that the project would have an adverse impact on EFH or Federally managed fisheries. By letter dated 21 June 2010, NMFS HCD provided four EFH Conservation Recommendations which include: (1) the permit shall be conditioned to prohibit barges and other work vessels or equipment from spudding or anchoring over hardbottom resources. This condition should also prescribe a minimum clearance over hardbottom to avoid contact and degradation of the resource. In addition, this condition should require compliance with the installation plan that would be developed by the contractor. (2) The permit shall be conditioned to require a performance monitoring plan that contains clear performance criteria and a schedule for the applicant, Jacksonville District, NMFS, and other interested agencies to review project performance and determine if adaptive management measures are needed. Specifically, the plan shall include provisions for monitoring

hardbottom in the project area to determine if the actual amount of hardbottom impacted exceeds the amount of hardbottom currently proposed for impact. These measures may include breakwater removal, in case that the breakwaters do not function as designed or additional compensatory mitigation if additional hardbottom is impacted. (3) The applicant shall develop a compensatory mitigation plan to offset the direct and indirect losses of hardbottom from the project. The functional assessment used to show that sufficient mitigation is planned shall include a discussion of how sand trapped by the breakwaters would impact the frequency that hardbottom habitat is emergent from the sand. Narratives and corresponding maps are needed to describe how the impacts were calculated. (4) A biological monitoring plan for the artificial reef site should be developed and coordinated with NMFS. The plan shall include a fish assemblage component that includes sampling early life stages of reef fish that utilize the hardbottom habitat. The plan shall include quantifying how sand trapped by the breakwaters impacts persistent and non-persistent hardbottom in the project area.

The Corps coordinated changes to the mitigation plan and UMAM assessments with NMFS. By e-mail dated 18 August 2010, the Corps submitted a revised UMAM assessment to NMFS HCD. NMFS HCD concurred with the UMAM assessment during a meeting on 26 August 2010. By e-mail dated 3 September 2010 the Corps provided NMFS HCD with the following mitigation reef parameters that would be made a condition of a Corps permit, if issued: (1) none of the mitigation reef or reef building materials (e.g., loose limestone rock) shall be located shallower than the -7.66-foot NAVD (-5.4 feet MLW) contour or deeper than the -16.66-foot NAVD contour (-14.4 feet MLW); (2) at depths shallower than -10.3 feet NAVD (-8 feet MLW), all mitigation reef must be composed of a single (un-stacked) layer of rock or reef modules, not to exceed 4 feet in relief (prior to subsidence); (3) at depths deeper than -10.3 feet NAVD (-8 feet MLW), no mitigation reef (stacked or un-stacked) shall have a vertical relief that exceeds 6 feet (prior to subsidence); (4) at least 1.4 feet of clearance shall exist between the highest point of any reef component and the mean low water elevation; and (5) for reef constructed seaward of the -10.3-foot NAVD (-8 feet MLW) contour, the vertical relief shall not exceed 60% of the water column depth during MLW. By e-mail dated 17 September 2010, NMFS HCD concurred with the proposed mitigation reef parameters with the understanding that the applicant would be required to exhaust the shallower water

areas within the overall mitigation reef area before building artificial reef in the deeper water areas.

The Corps issued a 10-day letter to NMFS on _____ which outlined how the EFH Conservation Recommendations would be implemented. Specifically, the Corps indicated that (1) the permit would be conditioned to prohibit spudding or anchoring over exposed hardbottom habitat. Permit conditions would require that construction vessels only operate in depths sufficient to preclude damage to hardbottom habitat and all operations would be conducted in a manner so as to eliminate the possibility of equipment dragging on the bottom and damaging natural resources. The construction plan includes a material transport vessel corridor boundary and construction of the project from south to north to minimize downdrift turbidity during construction activities. The limestone used to construct the project would be washed prior to placement in the Atlantic Ocean. The Corps would require as-built drawings that would show both the location of all previously-surveyed hardbottom at the site, and all impacts to existing hardbottom that resulted from the construction operations, including any unauthorized impacts. For any unauthorized impacts, the Corps may require compensatory mitigation. (2) The permit would be conditioned to require physical and biological monitoring plans that contain clear performance and reporting criteria that would allow the Corps, NMFS, and FWS to review project performance and determine if adaptive management measures are needed. The permit would be conditioned to include provisions for monitoring hardbottom in the project area to determine if the actual amount of hardbottom impacted exceeds the amount of hardbottom currently proposed for impact. The permit would also be conditioned to require the Permittee to acknowledge ownership of all breakwater material deployed in the project area, accept responsibility for maintenance of the breakwater structures, and affirm it possesses the ability to assume liability for all damages that may arise with respect to the breakwaters. In the event the breakwater system or a component of the breakwater system fails, the permit would be conditioned to require that all debris be removed from the Atlantic Ocean and deposited in an approved upland site. If the breakwater system causes significant adverse impacts that were not anticipated or addressed in the National Environmental Policy Act documentation for the project, the Permittee would meet with the Corps and the Florida Department of Environmental Protection Agency to discuss an appropriate course of action which may include removal or modification of the breakwaters to

prevent further significant adverse impacts. Significant impacts would be determined by the Corps following review of the post construction physical and biological monitoring reports. The Corps may require the Permittee to implement additional mitigation measures necessary to mitigate significant adverse impacts that were not anticipated. (3) The applicant developed a compensatory mitigation plan approved by the Corps and NMFS HCD to offset the direct and indirect losses of hardbottom from the project. The hardbottom impact calculations and the functional assessment used to determine the mitigation requirement were approved by NMFS HCD. The mitigation reef would be conditioned to encompass a total area of 31.76 acres to consist of 1.75 acres of limestone boulder clusters separated by areas of sandy bottom. No artificial reef material would be placed within 50 feet of exposed natural hardbottom. The reef would be constructed in an area of sandy bottom with a thickness of 1 to 3 feet located atop rock, as verified by sediment depth surveys. None of the mitigation reef or reef building materials would be located shallower than the -7.66-foot NAVD (-5.4 feet MLW) contour or deeper than the -16.66-foot NAVD contour (-14.4 feet MLW). At depths shallower than -10.3 feet NAVD (-8 feet MLW), all mitigation reef must be composed of a single (un-stacked) layer of rock or reef modules, not to exceed 4 feet in relief (prior to subsidence). At depths deeper than -10.3 feet NAVD (-8 feet MLW), no mitigation reef (stacked or un-stacked) would have a vertical relief that exceeds 6 feet (prior to subsidence). At least 1.4 feet of clearance would exist between the highest point of any reef component and the mean low water elevation. For reef constructed seaward of the -10.3-foot NAVD (-8 feet MLW) contour, the vertical relief would not exceed 60% of the water column depth during MLW. The compensatory mitigation reef would be placed offshore of Singer Island, at a previously-designated mitigation site located approximately 3,000 feet south of the project area. The permit would be conditioned to require that the Permittee fully utilize all appropriate shallow water areas less than -10.3 feet NAVD within the mitigation site prior to building artificial reef in areas deeper than -10.3 feet NAVD. (4) A biological monitoring plan for the artificial reef site was developed and coordinated with NMFS and would be made a condition of the Corps permit. The plan includes a fish assemblage component that includes sampling early life stages of reef fish that utilize the hardbottom habitat. The permit would be conditioned to include provisions for monitoring hardbottom in the project area to determine if the actual amount of hardbottom

impacted exceeds the amount of hardbottom currently proposed for impact.

By letter dated _____, NMFS HCD concurred that with inclusion of the above permit conditions and the mitigation and monitoring requirements, the goals of the Magnuson-Stevens Fishery Conservation and Management Act and its regulations for implementing the EFH requirements of the Act will be met for the project. Therefore, the Corps is satisfied that the consultation procedures outlined in 50 CFR Section 600.920 of the regulation to implement the EFH provisions of the Magnuson-Stevens Act have been met.

g. Corps Wetland Policy: The proposed project would not result in the loss of any wetlands.

h. Cumulative and Secondary Impacts: See discussion in paragraph 9.

i. Corps analysis of comments and responses: Full consideration was given to all comments received during the public notice. Based on the breakwater modeling results, information provided by the applicant, and the best available information, the Corps responses are as follows:

The project would not adversely affect the conservation of fish and wildlife and marine productivity via burial of hardbottom and degradation of natural beaches. The compensatory mitigation required for the project fully offsets the proposed impacts to the aquatic environment. The structures themselves would also provide valuable high relief hardbottom habitat. The project would not result in “significant adverse impacts” via sea turtle impacts, and is not expected to substantially increase erosion rates downdrift of the project (including Ocean Reef Park). The sea turtle impacts were reviewed by the Corps, FWS, and NMFS, and any permit would be conditioned to ensure “significant adverse impacts” are avoided.

There would be additional recreational opportunities as a result of the structures and the anticipated wider beach profile. Any nautical hazard created by the structures would be minimal. The project is located within existing hardbottom areas that are already potentially hazardous to navigation, buoys will be placed at the terminal ends of the project and in the breakwater segment gaps, and the location of the project would be updated on

navigational charts. The project would likely cause additional rip currents, however these currents commonly occur in the Atlantic Ocean, and are a well-known danger in coastal areas. Rip currents are expected to occur between the gaps of the breakwaters primarily in conditions with 1 meter or higher waves generated in a shore normal direction. According to project modeling, the greatest potential for rip currents would occur during storm events with increased wave heights or elevated tides when swimming is already inherently dangerous. Informational signs will be placed at all beach access points in the project area to warn swimmers of the potential danger of rip currents in the project area. Additionally, safety buoys with handles will be placed between the gaps of the breakwaters to allow swimmers a secure position to signal for help.

The project would protect valuable private and public property and would benefit overall public safety and welfare through storm protection benefits. The project is expected to provide a long-term solution to the problem of coastal erosion in the project area by achieving sand accumulation and equilibrium, which reduces vulnerability to the effects of coastal storms. The project is also expected to reduce wave run up during coastal storm events, thereby minimizing the potential for storm impacts to valuable beach and dune habitat as well as infrastructure. Downdrift erosion rates will be monitored, and the applicant will be required to assess the performance of the project, modify the project if necessary, and correct erosion caused by the structures. The project review process resulted in a determination that the project would not result in violation of the National Environmental Policy Act (NEPA) or the Endangered Species Act. The potential effects of global warming and sea level rise were considered in the analysis of marine turtle impacts and the long-term viability of the project. Sea level rise would not increase or decrease the level of marine turtle impacts related to the construction of breakwaters. In the long-term, breakwaters are a viable method of achieving shoreline stabilization and storm protection in the project area considering the potential impacts of sea level rise. The breakwater design can be modified over time to adjust for any change in the sea level.

The Corps determined that an EIS is not required for this project based on the findings in this environmental assessment. If the project causes significant adverse impacts that were not anticipated or addressed in the NEPA documentation for the

project, the breakwater system shall be removed or modified to prevent further significant adverse impacts and the NEPA analysis for the project updated. Significant impacts will be determined by the Corps following review of the post construction physical and biological monitoring reports. The Corps may require the Permittee to implement additional mitigation measures necessary to mitigate adverse impacts that were not anticipated.

11. Public Hearing Evaluation: Under the previous permit application for the emergent breakwaters the Corps received several requests for a public hearing. However, no requests for a public hearing were received by the Corps for this permit application. The Corps determined that a public hearing would not be held unless additional information was necessary to make a decision on the application. Based on the information submitted and the comments provided, substantive additional information would not be received and a public hearing would not benefit the decision-making process on this permit application. Several stakeholder meetings were held and a public notice was issued for the project which resulted in sufficient public involvement and commenting to allow the Corps to reach a permit decision.

12. Determinations:

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

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

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

d. Section 176(c) of the Clean Air Act General Conformity Rule Review: The proposed permit action has been analyzed for conformity applicability pursuant to regulations implementing Section 176(c) of the Clean Air Act. It has been determined that the activities proposed under this permit will not exceed *de*

minimis levels of direct emissions of a criteria pollutant or its precursors and are exempted by 40 CFR Part 93.153. Any later indirect emissions are generally not within the Corps' continuing program responsibility and generally cannot be practicably controlled by the Corps. For these reasons a conformity determination is not required for this permit action.

PREPARED BY:	REVIEWED BY:
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REVIEWED BY:	APPROVED BY:
Stephen Sullivan Chief, South Permits Branch	Alfred A. Pantano, Jr. Colonel, Corps of Engineers Commanding

CF:
CESAJ-RD-PE