United States Department of the Interior

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

April 28, 2006

Colonel Robert M. Carpenter
District Engineer
U.S. Army Corps of Engineers
701 San Marcos Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Consultation Code: 41420-2006-F-0018
Corps Application No.: SAJ-2005-7908 (IP-PC)
Dated: December 7, 2005
Project: Reach 8 Beach Nourishment Project
Applicant: Town of Palm Beach
County: Palm Beach

Dear Colonel Carpenter:

This document transmits the Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed Reach 8 Beach Nourishment and Dune Restoration Project. The project is located in Sections 23 and 26, Township 44 South, Range 43 East, Palm Beach County, Florida, and has effects on the threatened loggerhead sea turtle (*Caretta caretta*), the endangered green sea turtle (*Chelonia mydas*), the endangered leatherback sea turtle (*Dermochelys coriacea*), the endangered hawksbill sea turtle (*Eretmochelys imbricata*), the endangered Kemp's ridley sea turtle (*Lepidochelys kempii*) and the endangered West Indian manatee (*Trichechus manatus*). This biological opinion is written in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*) and the Fish and Wildlife Coordination Act of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*).

This biological opinion is based on information provided by the U.S. Army Corps of Engineers (Corps); National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS); Town of Palm Beach (Applicant); the Applicant's agents, Coastal Planning & Engineering, Incorporated (CPE), Greenberg Traurig (GT); the Florida Department of Environmental Protection (DEP); the Florida Fish and Wildlife Conservation Commission (FWC); telephone conversations and email correspondence, field investigations, and other sources. A complete administrative record of this consultation is on file at the South Florida Ecological Services Office, Vero Beach, Florida.

FISH AND WILDLIFE RESOURCES

The Service has received correspondence from the Environmental Protection Agency (EPA) dated January 4, 2006, and February 3, 2006, and from NMFS dated January 11, 2006, and February 3, 2006, concerning impacts to nearshore hardbottom and associated marine resources that are likely to result from the beach renourishment component of the proposed project. This is not related to the dune restoration project the applicant seeks to finalize by May 15, 2006, which is also considered in the following biological opinion. We understand that you have also received these documents. The Service shares the concerns stated by EPA and NMFS that the extent and severity of impacts to nearshore hardbottom requires further evaluation, particularly related to avoidance, minimization, and mitigation measures that will be undertaken by the Applicant. At this time, and without additional information regarding projected effects to nearshore aquatic resources, the Service does not support issuance of a permit that will include beach renourishment impacts below-mean-high-water, as currently proposed. The Service looks forward to working with the Corps and the Applicant to resolve outstanding fish and wildlife resource issues associated with the beach renourishment component of this project.

Consultation History

On October 31, 2000, the Service amended the October 24, 1996, biological opinion (Service Log Number 4-1-00-F-497) for the Coast of Florida Study, Region III to authorize a beach nourishment project within the Reach 7 of the Town of Palm Beach, Florida (Corps Permit Number SAJ-2000-380 [IP-PLC]. This project was known as the Phipps Ocean Park project.

On January 28, 2005, the Corps issued a permit authorizing the Phipps Ocean Park beach restoration activities.

On November 28, 2005, the Applicant requested a permit modification from the Corps for the Phipps Ocean Park project to include approximately 6,580 feet (ft) of dune and beach berm restoration from approximately 250 ft north of R-129 through the southern Town of Palm Beach Boundary, located approximately 130 ft south of R-134.

On November 29, 2005, the Applicant requested Corps authorization to remove material from previously-authorized Borrow Areas III and IV for placement into the 3,600-ft area between R-120 and R-124 (the Phipps Ocean Park project footprint). The Corps did not request consultation with the Service for this action and authorized the Applicant's request on December 21, 2005.

On December 5, 2005, the Corps initiated consultation with the Service for a 6,970-ft beach nourishment project within the Town of Palm Beach known as Reach 8. The Corps determined the proposed project "may affect" federally listed sea turtles, and "may affect, but would not likely adversely affect" the West Indian manatee. In Palm Beach County, manatees are common year-round residents with no distinct patterns of abundance. During the proposed project construction, manatees would most likely to be affected by support boats moving through channels from the dock areas to the dredge vessels. However, the Applicant agreed to abide by

the *Standard Manatee Construction Conditions*, and the conditions will be included in the Corps Permit. These actions should reduce the likelihood of adverse effects to an insignificant or discountable level, and therefore, the Service concurs with this determination for the manatee.

On April 7, 2006, the Corps amended the Reach 8 request for formal consultation to extend the project completion timeframe from April 30 to May 30, 2006, to include the stockpiling and excavation of material at the Phipps Ocean Park project area, and to include 6,580 ft of dune construction.

On April 13, 2006, based upon a correspondence from a private citizen, the Service learned of work being conducted in Reach 8. The Service informed the Corps that incidental take had not been authorized for work in Reach 8 (south of R-132) under the December 21, 2005 modification to permit number 2000380 IP-PLC.

On April 17, 2006, the Corps requested confirmation from the Applicant that work was not occurring south of R-132 prior to issuance of the Service's biological opinion.

On April 18, 2006, the Service requested clarification from the Corps whether the proposed project included beach renourishment and dune construction at the Reach 8 project site.

On April 18, 2006, the Corps notified the Service that the consultation request was for the Reach 8 beach and dune construction, the stockpiling and excavation of material from the previously-permitted Reach 7 project.

On April 18, 2006, Applicant's agent, GT, confirmed that the Applicant would not work south of R-132 until the Corps had received the biological opinion from the Service for the proposed project, and that the Applicant requested an extension to work until May 15, 2006.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The purpose of the project, known as Reach 8, is to restore the project area shorelines from erosion that occurred during the hurricanes of 2004 and 2005. The proposed project will be completed by May 15, 2006. The project is located along Reach 8 shorelines of the Town of Palm Beach in Palm Beach County, Florida (Figure 1).

The Applicant proposes to impact the Atlantic coast shoreline with approximately 505,700 cubic yards (cy) of beach quality material from approximately R-125 to 130 ft south of R-134. Within this area, approximately 1,650 ft of project area will be excluded between R-127 and R-129. In addition, approximately 75,000 cy of beach quality material would be placed above the mean high water line from approximately 250 ft north of R-129 to 130 ft south of R-134 for dune restoration.

Fill material for the project comes from previously permitted (DEP Permit No. 0165332-001-JC; Corps permit No.SAJ-2000-380 [IP-PLC], June 22, 2000) borrow sites III and IV (Figure 2) for the Phipps Ocean Park Beach Restoration Project. The material was stockpiled between R-120 and R-124, and will be distributed by dump-trucks, bulldozers, and other land-based equipment. Native vegetation will be added to reinforce the dunes and restore the aesthetic value of the beach. Beach tilling will be conducted to ensure that the compaction of the material is low enough to allow sea turtle nesting and the planting of vegetation. Total project impacts including excavation and placement of material is approximately 2.17 mi.

The project will include a berm height of +9 ft NGVD, with a design profile consisting of a 1V:50H foreshore slope and a nearshore slope averaging 1V:10H. The beach fill design profile includes an average berm width of approximately 143 ft. The proposed fill template is intended to provide an average fill volume density of 72 cy per ft of beach.

The action area is defined as all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action. The Service has determined that the action area for this project includes approximately 2.17 mi of Palm Beach County shoreline as described above and includes adjacent, non-project sections of the beach.

STATUS OF THE SPECIES AND CRITICAL HABITAT RANGEWIDE

Species/Critical Habitat Description

Loggerhead Sea Turtle

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

The loggerhead is considered one of the largest species among sea turtles. As adults, the average length of the carapace is 3 ft and the average weight is 275 pounds (lbs) (FWC 2004), but the loggerhead's name is derived from the physical appearance of its large head. Adults and sub-adults have a large, reddish-brown carapace. Scales on the top and sides of the head and on top of the flippers are also reddish-brown, but have yellow borders. The neck, shoulders, and limb bases are dull brown on top and medium yellow on the sides and bottom. The plastron is also medium yellow. Adult average size is 36.2 inches (in) straight carapace length.

The loggerhead is the most abundant sea turtle occurring in U.S. waters. This species is found in the open ocean offshore areas of Palm Beach County due to the warm temperatures of south Florida's waters and the availability of foraging grounds provided by nearshore hardbottom habitat. These turtles nest regularly on the County's shoreline and are the predominant sea turtle

species in the area. Loggerhead females nest between late April and early September, reaching peak nesting during the months of June and July.

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

Green Sea Turtle

The green sea turtle was federally listed as a protected species on July 28, 1978 (Service 1978). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. Adults commonly reach a carapace length of 39.4 in and 330.7 lbs in mass. Colorization of the adult carapace range from solid black to gray, yellow, green, and brown in various patterns; the plastron is a much lighter yellow to white. Hatchlings are distinctively black on the dorsal carapace and white on the ventral plastron.

The green turtle has a worldwide distribution in tropical and subtropical waters. Major green sea turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NMFS and Service 1991a). Nesting also has been documented along the Gulf coast of Florida on Santa Rosa Island (Okaloosa and Escambia Counties) and from Pinellas County through Collier County (Florida FWC statewide nesting database). Green turtles have been known to nest in Georgia, but only on rare occasions (Georgia Department of Natural Resources [DNR] statewide nesting database). The green sea turtle also nests sporadically in North Carolina and South Carolina (North Carolina Wildlife Resources Commission statewide nesting database; South Carolina DNR statewide nesting database). Unconfirmed nesting of green turtles in Alabama has also been reported (Bon Secour National Wildlife Refuge 2004).

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

Leatherback Sea Turtle

The leatherback sea turtle, listed as an endangered species on June 2, 1970 (Service 1970), nests on shores of the Atlantic, Pacific and Indian Oceans. The carapace is distinguished by a rubber-like texture, about 1.6 in thick, and made primarily of tough, oil-saturated connective tissue. No sharp angle is formed between the carapace and the plastron, resulting in the animal being somewhat barrel-shaped. The average curved carapace length for adult turtles is 61 in and the weight ranges from 440.9 to 1,543.2 lbs. Non-breeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Nesting grounds are distributed worldwide, with the Pacific Coast of Mexico supporting the world's largest known concentration of nesting leatherbacks. The largest nesting colony in the wider Caribbean region is found in French Guiana, but nesting occurs frequently, although in lesser numbers, from Costa Rica to Columbia

and in Guyana, Surinam, and Trinidad (NMFS and Service 1992a; National Research Council 1990).

The leatherback regularly nests in the U.S. in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia (NMFS and Service 1992a). Leatherback turtles have been known to nest in Georgia, South Carolina, and North Carolina, but only on rare occasions (Murphy 1996; Winn 1996; Boettcher 1998). Leatherback nesting also has been reported on the northwest coast of Florida (LeBuff 1990); a false crawl (non-nesting emergence) has been observed on Sanibel Island (LeBuff 1990).

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

Hawksbill Sea Turtle

The hawksbill sea turtle was listed as an endangered species on June 2, 1970 (Service 1970) and is one of the smallest sea turtles of the Gulf of Mexico. Weighing only 95 to 165 lbs as an adult and ranging in size from 24.6 to 37 in straight carapace length, hawksbills have a hawk-like beak, posteriorly overlapping carapace scutes, and two pairs of claws on their flippers (NMFS and Service 1993; Bass 1994). The hawksbill is found in tropical and subtropical waters of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean. Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Dade Counties) and to the Florida Keys in Monroe County, Florida (Meylan 1992; Meylan et al. 1995). Surveys in Florida likely underestimate actual hawksbill nesting numbers because hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors (Meylan et al. 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NMFS and Service 1993).

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

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was listed as endangered on December 2, 1970, and internationally, the Kemp's ridely is considered the most endangered sea turtle (Service and NMFS 1992; Turtle Ecosystem Working Group [TEWG] 2000). The smallest living sea turtle, the Kemp's ridley has a straight carapace length around 25.6 in, with the adult's shell almost as wide as they are long. The dorsal carapace is round to heart-shaped and distinctly light gray. Adults of this species are usually confined to the Gulf of Mexico, although adult-sized individuals sometimes are found on the east coast of the U.S. (NMFS and Service 1992b).

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

Life History

Loggerhead Sea Turtle

Loggerheads are known to nest from one to seven times within a nesting season (Talbert et al. 1980; Richardson and Richardson 1982; Lenarz et al. 1981); the mean is approximately four times (Murphy and Hopkins 1984). Females typically select nesting sites on continental coastlines adjacent to warm-temperate currents. In south Florida, the demographically independent loggerhead nesting population occurs from 29° N on the east coast to Sarasota County on the west coast (Dodd 1988; TEWG 2000). The interval between nesting events within a season varies about a mean of 14 days (Dodd 1988). Mating takes place in late March to early June, and eggs are laid throughout the summer, with a mean clutch size of 100 to 126 eggs in the southeastern U.S. (NMFS and Service 1991b). Nesting migration intervals of 2 to 3 years are most common in loggerheads, but the number can vary from 1 to 7 years (Dodd 1988). Age at sexual maturity is believed to be about 20 to 30 years (TEWG 1998).

Green Sea Turtle

Green turtles take an estimated 20 to 50 years to reach sexual maturity, (the longest to maturity for any sea turtle species), and mating occurs in the waters off of the nesting beaches (Frazer and Ehrhart 1985; Hirth 1997). Green turtles deposit from one to nine clutches within a nesting season, but the overall average is about three. The interval between nesting events within a season varies around a mean of 13 days (Hirth 1997), and the mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years; usually 2 or more years intervene between breeding seasons (Balazs 1983; NMFS and Service 1991a).

Leatherback Sea Turtle

Leatherbacks nest an average of five to seven times within a nesting season, with an observed maximum of 11 times (NMFS and Service 1992b). The interval between nesting events within a season is 9 to 10 days. Clutch size averages 80 to 85 yoked eggs, with the addition of usually a few dozen smaller, yolkless eggs laid toward the end of the clutch (Pritchard 1992). Nesting migration intervals of 2 to 3 years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in 6 to 10 years (Zug and Parham 1996).

Hawksbill Sea Turtle

Hawksbills nest on average about four and a half times per season at intervals of approximately 14 days (Corliss et al. 1989). In Florida and the U.S. Caribbean clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (NMFS and Service 1993). On the basis of limited information, nesting migration intervals of 2 to 3 years predominate. The

incubation period averages 60 days. Age at sexual maturity is believed to be about 30 to 40 years (Rhodin and Pritchard 1999).

Kemp's Ridley Sea Turtle

Female Kemp's Ridleys return to their nesting beaches about every 2 years. The mean clutch size for these turtles is approximately 100 eggs per nest, with an average of 2.5 nests per female within a season. Nesting occurs from April into July and is essentially limited to the beaches of the western Gulf of Mexico, near Rancho Nuevo in southern Tamaulipas, Mexico (TEWG 1998). The western coast of Florida (specifically the Cedar Keys area), the eastern coast of Alabama, and the mouth of the Mississippi River are identified as important developmental regions for the Kemp's ridley (NMFS and Service 1992b). Studies have shown that the post-hatchling pelagic stage varies from 1 to 4 or more years, and the benthic immature stage lasts 7 to 9 years (Renaud 1995). The TEWG (1998) estimated age to maturity is between 7 and 15 years.

Population Dynamics

Loggerhead Sea Turtle

Total estimated nesting of loggerhead sea turtles in the southeast U.S. is approximately 68,000 to 90,000 nests per year according to the FWC statewide nesting database, Georgia Department of Natural Resources, South Carolina Department of Natural Resources, and the North Carolina DNR statewide nesting databases in 2002. In 1998, there were over 80,000 nests in Florida alone. From a global perspective, the southeastern U.S. nesting aggregation is of paramount importance to the survival of the species and is second in size only to the aggregation which nests on islands in the Arabian Sea off Oman (Ross 1982; Ehrhart 1989; NMFS and Service 1991b). The status of the Oman colony has not been evaluated recently, which is cause for concern (Meylan et al. 1995). The loggerhead nesting aggregations in Oman, the southeastern U.S., and Australia account for about 88 percent of nesting worldwide (NMFS and Service 1991b). About 80 percent of loggerhead nesting in the southeastern U.S. occurs in the six Florida counties of Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward (NMFS and Service 1991b).

Green Sea Turtle

About 150 to 2,750 female green sea turtles are estimated to nest on beaches in the continental U.S. annually (FWC 2003b). In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year. Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting aggregation in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season. In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

Recent estimates of global nesting populations indicate 26,000 to 43,000 female leatherback sea turtles nest annually (Spotila et al. 1996). The largest nesting populations at present occur in the western Atlantic in French Guiana (4,500 to 7,500 females nesting per year) and Colombia (estimated several thousand nests annually), and in the western Pacific in West Papua (formerly Irian Jaya) and Indonesia (about 600 to 650 females nesting per year). In the U.S., small nesting populations occur on the Florida east coast (approximately 100 females per year; FWC 2003b), Sandy Point, U.S. Virgin Islands (50 to 190 females per year; Alexander et al. 2002), and Puerto Rico (30 to 90 females per year).

Hawksbill Sea Turtle

About 15,000 females are estimated to nest each year throughout the world with the Caribbean accounting for 20 to 30 percent of the world's hawksbill population (Meylan 1989). Panama, which used to support the most important nesting population in the Caribbean, is only a remnant population. With 3,000 to 4,500 nests per year, Mexico is now the most important region for hawksbills in the Caribbean (NMFS and Service 1998). Other significant-but-smaller populations in the Caribbean still occur in Martinique, Jamaica, Guatemala, Nicaragua, Grenada, Dominican Republic, Turks and Caicos Islands, Cuba, Puerto Rico, and U.S. Virgin Islands. In the U.S. Caribbean, about 100 to 350 nests per year are laid on Mona Island, Puerto Rico, and 60 to 120 nests per year on Buck Island Reef National Monument, U.S. Virgin Islands (NMFS and Service 1993). In the U.S. Pacific, hawksbills nest only on main island beaches in Hawaii, primarily along the east coast of the island of Hawaii (NMFS and Service 1998). Hawksbill nesting has also been documented in American Samoa and Guam.

Kemp's Ridley Sea Turtle

At one time, more than 40,000 female Kemp's ridleys nested in a single, mass nesting (termed "arribada" or "arrived" in English) in Tamaulipas, Mexico. Since 1947, a drastic reduction in the number of nesting females caused the near extinction of this species (Ross et al. 1989). The nesting population produced a low of 702 nests in 1985; however, since the mid-1980's, the number of nests laid in a season has been increasing primarily due to nest protection efforts and implementation of regulations requiring the use of turtle excluder devices (TEDs) in commercial fishing trawls (Marquez 1989). The implementation of TEDs within the United States began in 1987, and since 1990, NMFS requires TEDs for all trawlers throughout the entire year. During the 1999 and 2000 nesting seasons, more than 3,600 nests were deposited on Mexico beaches (NMFS and Service 1992b).

Status and Distribution

Loggerhead Sea Turtle

Genetic research involving analysis of mitochondrial DNA has identified five different loggerhead subpopulations/nesting aggregations in the western North Atlantic: 1) the Northern

Subpopulation occurring from North Carolina to around Cape Canaveral, Florida (about 29° N.); 2) South Florida Subpopulation occurring from about 29° North on Florida's east coast to Sarasota on Florida's west coast; 3) Dry Tortugas, Florida Subpopulation; 4) Northwest Florida Subpopulation occurring at Eglin Air Force Base and the beaches near Panama City; and 5) Yucatán Subpopulation occurring on the eastern Yucatán Peninsula, Mexico (Bowen 1994; Bowen et al. 1993; Encalada et al. 1998; Pearce 2001). These data indicate that gene flow between these five regions is very low. If nesting females are extirpated from one of these regions, regional dispersal will not be sufficient to replenish the depleted nesting subpopulation. The Northern Subpopulation has declined substantially since the early 1970s, but most of that decline occurred prior to 1979. No significant trend has been detected in recent years (TEWG 1998, 2000). Adult loggerheads of the South Florida Subpopulation have shown significant increases over the last 25 years, indicating that the population is recovering, although a trend could not be detected from the State of Florida's Index Nesting Beach Survey program from 1989 to 1998. To date, nesting surveys in the Dry Tortugas, Northwest Florida, and Yucatán Subpopulations have been too irregular to allow for a meaningful trend analysis (TEWG 1998, 2000).

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

Green Sea Turtle

Total population estimates for the green sea turtle are unavailable, and trends based on nesting data are difficult to assess because of large annual fluctuations in numbers of nesting females. For instance, in Florida, where the majority of green turtle nesting in the southeastern U.S. occurs, estimates range from 150 to 2,750 females nesting annually (FWC 2003b). Populations in Surinam and Tortuguero, Costa Rica may be stable, but there is insufficient data for other areas to confirm a trend.

The green sea turtle has a worldwide distribution in tropical and subtropical waters. Pelagic hatchlings are believed to reside in oceanic waters for a period of 3 to 7 years (Balazs 1983). Upon reaching a juvenile carapace length of 8 to 10 in, greens migrate to shallow nearshore areas where they develop to sexual maturity (NMFS and Service 1991a; Ernst et al. 1994). Optimal developmental habitats possess two essential resources: 1) an abundance of submerged vegetation (seagrasses and/or algae); and 2) within close proximity to nearshore reefs or rocky areas that are used for resting (Ernst et al. 1994; Bjorndal 1997). A major factor contributing to the green turtle's decline worldwide is commercial harvest for eggs and food. Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor and has seriously impacted green sea turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with

swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die. Other threats include: loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and incidental take from channel dredging and commercial fishing operations (NMFS and Service 1991a).

Leatherback Sea Turtle

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

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

Hawksbill Sea Turtle

The hawksbill sea turtle has experienced global population declines of 80 percent or more during the past century (Meylan and Donnelly 1999). Most populations are declining, depleted, or remnants of larger aggregations. Only five regional populations remain that have more than 1,000 females nesting annually (Seychelles, Mexico, Indonesia, and two in Australia). Hawksbills were previously abundant, as evidenced by high-density nesting at a few remaining sites and by trade statistics. The decline of this species is primarily due to human exploitation for tortoise shell. While the legal hawksbill shell trade ended when Japan agreed to stop importing shell in 1993, a significant illegal trade continues. It is believed individual hawksbill populations around the world will continue to disappear under the current regime of exploitation for eggs, meat, and tortoise shell, loss of nesting and foraging habitat, incidental capture in

fishing gear, ingestion of and entanglement in marine debris, oil pollution, and boat collisions. Hawksbills are closely associated with coral reefs, one of the most endangered of all marine ecosystem types.

Kemp's Ridley Sea Turtle

Since 1947, a drastic reduction in the number of nesting females caused the near extinction of this species (Ross et al. 1989). The decline of this species is primarily due to human activities, including the direct harvest of adults and eggs and incidental capture in commercial fishing operations. It is estimated that before the implementation of TEDs, the commercial shrimp fleet killed 500 to 5,000 Kemp's ridleys each year. Besides shrimp trawls, Kemp's ridleys have been taken in pound nets, trawls, gill nets, hook and line, crab traps, and longline gear (Marquez 1989).

Analysis of the Species/Critical Habitat Likely to be Affected

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project area. The effects of the proposed action on sea turtles will be considered further in the remaining sections of this biological opinion. Potential effects include destruction of nests deposited within the boundaries of the proposed project, harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities, disorientation of hatchling turtles, as a result of project lighting, on beaches adjacent to the construction area as they emerge from the nest and crawl to the water, and behavior modification of nesting females due to escarpment formation within the project area during a nesting season resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs. The quality of the placed sand could affect the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest. Critical habitat has not been designated in the continental U.S.; therefore, the proposed action would not result in adverse modification.

ENVIRONMENTAL BASELINE

Status of the Species/Critical Habitat within the Action Area

The distribution of sea turtle nesting activity on the east coast of Florida makes up a high percentage of the overall distribution of nesting activity within the state. According to the 2004 nesting season data, 90 percent of the total nesting activity on Florida's coastline occurs on the Atlantic coast. Palm Beach County accounted for approximately 23 percent of the overall nesting activity in the state of Florida during the 2004 season. Among the coastal counties of the east coast (Nassau, Duval, St. John's, Flagler, Volusia, Brevard, Indian River, St. Lucie, Martin, Broward, Miami-Dade, and Monroe), Palm Beach County constituted approximately 26 percent of the overall nesting on the Florida's eastern coastline in 2004 (FWC 2004).

The green, leatherback, and loggerhead sea turtles constitute the highest nesting densities that occur on the southeast Florida coast from Brevard to Palm Beach counties. The hawksbill and the Kemp's ridley sea turtles nest infrequently along the County's shoreline. Overall, 11,893 nests were recorded in 2004 over 42.4 mi of shoreline in Palm Beach County. Total nests recorded for the previous 16 nesting seasons are provided in Table 1 (FWC 2004).

According to data collected during the 2004 nesting season, the results indicate a decrease in overall sea turtle nesting (all species combined) along 42.4 mi of Palm Beach County shoreline when compared to the three previous survey years (FWC 2004).

Loggerhead Sea Turtle

The loggerhead sea turtle nesting and hatching season for the south Florida Atlantic beaches extends from March 15 through November 30. On average, the nesting and hatching season specific to the action area occurs May 9 to July 29. This average nesting season duration is based on data obtained from the FWC (2004) delineating the first nest date recorded and the last nest date recorded per nesting season (1993 through 2004). Incubation ranges for loggerhead sea turtle nests vary from 45 to 95 days.

The Applicant has a comprehensive sea turtle monitoring program in place for all Atlantic Ocean shoreline and nesting beaches within their jurisdiction. Within, and adjacent to, the proposed project area, approximately 2.4 mi of shoreline are surveyed annually during nesting season for nest deposition and location. Between 1996 and 2004, the number of loggerhead nests deposited on the Reach 8 project area beach within the Town of Palm Beach ranged from a high of 324 nests in 1996 to a low of 151 in 2004 (Table 2). Table 2 provides loggerhead sea turtle nesting data adjacent to and within the action area.

Green Sea Turtle

Green sea turtle nesting and hatching season for south Florida Atlantic beaches extends from May 1 through November 30. On average, the nesting and hatching season specific to the action area occurs from June 14 to July 24. Within a nesting season, earliest documented green sea turtle nest in the project area was recorded on April 30, 2000; the latest documented nests were deposited on August 29, 2002. The average nesting season duration is based upon the data obtained from the FWC (2004) sea turtle nesting database delineating the first nest date and the last nest date recorded per nesting season (1993 through 2004). Incubation ranges for green sea turtle nests varies from 45 to 95 days.

Within, and adjacent to, the proposed project area, approximately 2.4 mi are annually surveyed during nesting season for nest deposition and location. Between the years 1993 and 2004 the number of green nests deposited on the project area beach and adjacent areas within the Town of Palm Beach ranged from a high of 26 nests in 1996 to a low of two nests in 1997. Table 3 provides green sea turtle nesting data adjacent to and within the action area.

Leatherback Sea Turtle

The leatherback sea turtle nesting and hatching season for the south Florida Atlantic beaches extends from February 15 through November 15. On average, the nesting and hatching season specific to the action area occurs April 12 to May 18. The earliest documented nest was recorded on March 19, 2001, and the latest documented nest deposit was recorded on June 20, 2003. The average nesting season duration is based upon the data obtained from the FWC (2004) delineating the first nest date and the last nest date recorded per nesting season (1993 through 2004). Incubation for leatherback sea turtle nests ranges from 55 to 75 days.

Within, and adjacent to, the proposed project area, approximately 2.4 mi of shoreline are surveyed annually during nesting season for nest deposition and location. Between 1993 and 2004, the number of leatherback nests deposited adjacent to and on Reach 8 project area beaches within the Town of Palm Beach ranged from a low of three nests in 1998 and 2004 to a high of 15 nests in 1999. Table 4 provides the leatherback sea turtle nesting data within the action area.
Hawksbill Sea Turtle

The hawksbill sea turtle nesting and hatching season for southern Florida Atlantic beaches extends from February 15 through November 15. Incubation lasts about 60 days. A total of five documented nesting events have occurred within Palm Beach County over the last 19 years. In 1985, the first documented nesting event was a hawksbill nest on Lantana beaches located south of the action area. Two nests were documented in 1992 on Boca Raton beaches. One nest was recorded in the Highland Beach area on March 30, 2000, and on April 15, 2004, one nest was deposited on Jupiter Beach. No hawksbill sea turtle nesting has been documented within the action area.

Kemp's Ridley Sea Turtle

No nesting events have been documented in the last 15 years in or near the action area. Four non-nesting emergences occurred between May 1, 1989 and September 10, 1989 in Phipps Ocean Park, Palm Beach County. This area is located just north of the action area.

Factors affecting the species environment within the action area

In Palm Beach County there are eight critically eroded areas (31 mi), two non-critically eroded areas (0.9 mi), and one critically eroded inlet shoreline area (0.8 mi) (DEP 2005). Due to the impact of the 2004 and 2005 hurricane seasons on much of the Florida's Atlantic coastline, critically eroded areas that once existed in Palm Beach County increased in size by 0.3 mi. The proposed project shoreline, between monuments R-125 and R-128, is deemed a critically eroded beach by the DEP. The erosion is currently threatening private development and local parks (DEP 2005).

In addition to shoreline protection response projects and subsequent actions to combat erosion, nesting sea turtles face several potential land-based obstacles along the shoreline that may inhibit nesting success. Buildings and seawalls along the proposed project's shoreline may pose an

obstacle to nesting occurrences. Regular beach maintenance in the form of tractor tilling may disrupt or impact deposited nests and nesting females. Plastics, styrofoam, and fishing line are pollutants that may negatively impact nesting success and nearshore foraging.

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

EFFECTS OF THE ACTION

Factors to be Considered

Impacts associated with this project are expected to occur along 2.17 mi of suitable sea turtle nesting habitat during the sea turtle nesting season (March 1 to May 15).

Analyses for Effects of the Action

Beneficial Effects - The placement of sand on a beach with reduced dry fore-dune habitat may increase sea turtle nesting habitat because the placed sand will be highly compatible *(i.e.*, grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may be more stable than the eroding one it replaces, thereby benefiting sea turtles. Planting of native dune vegetation will further stabilize against wind erosion.

Direct Effects - Placement of sand on a beach, in and of itself, may not provide suitable nesting habitat for sea turtles. Although beach nourishment may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not incorporated during project construction. Nourishment during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of eggs and hatchlings and, along with other mortality sources, may significantly impact the long-term survival of the species. For instance, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. While a nest monitoring and egg relocation program would reduce these impacts, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, or tides), or misidentified as false crawls, during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. Even under the best of conditions, about 7 percent of the nests can be misidentified as false crawls by experienced sea turtle nest surveyors (Schroeder 1994).

Nest relocation

Besides the potential for missing nests during a nest relocation program, there is a potential for eggs to be damaged by their movement, particularly if eggs are not relocated within 12 hours of deposition (Limpus et al. 1979). Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus et al. 1979; Ackerman 1980; Parmenter 1980; Spotila et al. 1983; McGehee 1990). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. Water availability is known to influence the incubation environment of the embryos and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard et al. 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard et al. 1985), hatchling size (Packard et al. 1981; McGehee 1990), energy reserves in the yolk at hatching (Packard et al. 1988), and locomotory ability of hatchlings (Miller et al. 1987).

In a 1994, a DEP study of hatching and emergence success of *in situ* and relocated nests at seven sites in Florida found that hatching success was lower for relocated nests in five of seven cases with an average decrease for all seven sites of 5.01 percent (range = 7.19 percent increase to 16.31 percent decrease). Emergence success was lower for relocated nests in all 7 cases by an average of 11.67 percent (range = 3.6 to 23.36 percent; Meylan 1995).

Equipment

The placement of pipelines and the use of heavy machinery on the beach during a construction project may also have adverse effects on sea turtles. Pipelines and equipment can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure.

Artificial lighting

Visual cues are the primary sea-finding mechanism for hatchling sea turtles (Mrosovsky and Carr 1967; Mrosovsky and Shettleworth 1968; Dickerson and Nelson 1989; Witherington and Bjorndal 1991). When artificial lighting is present on or near the beach, it can misdirect hatchlings once they emerge from their nests and prevent them from reaching the ocean (Philbosian 1976; Mann 1977; and FWC sea turtle disorientation database). In addition, a significant reduction in sea turtle nesting activity has been documented on beaches illuminated with artificial lights (Witherington 1992). Therefore, construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, misdirect females trying to return to the surf after a nesting event, and misdirect emergent hatchlings from adjacent non-project beaches. Any source of bright lighting can profoundly affect the orientation of hatchlings, both during the crawl from the beach to the ocean and once they begin swimming offshore. Hatchlings attracted to light sources on dredging barges may not only suffer from interference in migration, but may also experience higher probabilities of predation by fishes that are also attracted to the dredge lights. This impact could be reduced by using the minimum

amount of light necessary, which may require shielding or low pressure sodium lighting during project construction.

Indirect Effects - Many of the direct effects of beach nourishment may persist over time and become indirect impacts. These indirect effects include increased susceptibility of relocated nests to catastrophic events, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, the formation of escarpments, and future sand migration.

Increased susceptibility to catastrophic events

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

Increased beachfront development

Pilkey and Dixon (1996) state that beach replenishment frequently leads to more development, and development in greater density, within shorefront communities. These communities are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also notes that the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as older buildings were replaced by much larger ones that accommodated more beach users. Overall, shoreline management may create an upward spiral of initial protective measures resulting in more expensive development which leads to the need for more and larger protective measures. Increased shoreline development may adversely affect sea turtle nesting success. Greater development may support larger populations of mammalian predators, such as raccoons, than undeveloped areas (National Research Council 1990). Increased development can also result in greater adverse effects from artificial lighting as discussed above.

Changes in the physical environment

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

Beach compaction and unnatural beach profiles that may result from beach nourishment activities could negatively impact sea turtles regardless of the timing of projects. Very fine sand and/or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson

et al. 1987; Nelson and Dickerson 1988a). Significant reductions in nesting success (*i.e.*, false crawls occurred more frequently) have been documented on severely-compacted nourished beaches (Fletemeyer 1980; Raymond 1984; Nelson and Dickerson 1987; Nelson et al. 1987). Increased false crawls may result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests and also cause increased physiological stress to the animals (Nelson and Dickerson 1988b). Nelson and Dickerson (1988c) concluded, in general, beaches nourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

These impacts can be minimized by using suitable sand and by tilling compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a nourished beach with a root rake may reduce the sand compaction to levels comparable to unnourished beaches. A pilot study by Nelson and Dickerson (1988c) showed that a tilled nourished beach will remain uncompacted for up to 1 year. Therefore, the Service requires multi-year beach compaction monitoring and, if necessary, tilling to ensure that project impacts on sea turtles are minimized.

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

Escarpment formation

On nourished beaches, steep escarpments may develop along their water line interface as they adjust from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984; Nelson et al. 1987). These escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998). Researchers have shown that female turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (*e.g.*, in front of the escarpments, which often results in failure of nests due to prolonged tidal inundation). This impact can be minimized by leveling any escarpments prior to the nesting season.

Species' Response to the Proposed Action

Ernest and Martin (1999) conducted a comprehensive study to assess the effects of beach nourishment on loggerhead sea turtle nesting and reproductive success. The following findings illustrate sea turtle responses to and recovery from a nourishment project. A significantly larger proportion of turtles emerging on nourished beaches abandoned their nesting attempts than turtles emerging on control or prenourished beaches. This reduction in nesting success was most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics associated with the nourishment project (*e.g.*, beach

profile, sediment grain size, beach compaction, frequency and extent of escarpments). During the first post-construction year, the time required for turtles to excavate an egg chamber on the untilled, hard-packed sands of one treatment area increased significantly relative to control and background conditions. However, in another treatment area, tilling was effective in reducing sediment compaction to levels that did not significantly prolong digging times. As natural processes reduced compaction levels on nourished beaches during the second post-construction year, digging times returned to background levels.

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

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

CUMULATIVE EFFECTS

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

CONCLUSION

After reviewing the current status of these species, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the beach nourishment and dune restoration project, as proposed, is not likely to jeopardize the continued existence of the federally threatened loggerhead sea turtle, endangered green sea turtle, endangered leatherback sea turtle, endangered hawksbill sea turtle, or endangered Kemp’s ridley sea turtle. No critical habitat has been designated in the project area

for the loggerhead, the green, leatherback, hawksbill, or Kemp's ridley sea turtle; therefore, none will be affected.

Of the approximately 1,400 mi of available sea turtle nesting habitat in the southeastern U.S., the proposed project will affect 2.17 mi of beach proposed for the nourishment and dune restoration. Research has shown that the principal effect of beach renourishment on sea turtle reproduction is a reduction in nesting success, and this reduction is most often limited to the first year following project construction. Research has also shown that the impacts of a nourishment project on sea turtle nesting habitat are typically short-term because a nourished beach will be reworked by natural processes in subsequent years, and sand compaction and the frequency of escarpment formation will decline. Although a variety of factors, including some that cannot be controlled, can influence how a nourishment project will progress and perform from an engineering perspective, measures are implemented to minimize impacts to sea turtles.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of, the agency action is not considered to be prohibited under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the Corps so that they become binding conditions of any grant or permit issued to the Applicant, as appropriate, for the exemption in section 7(o)(2) to apply. Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the Applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, Corps must report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

The Service anticipates 2.17 mi of nesting beach habitat could be taken as a result of this proposed action. The take is expected to be in the form of: (1) destruction of all nests that may

be constructed and eggs that may be deposited from March 1 through May 15 for the 2006 dune construction) and from September 1 through September 30 and missed by a nest survey and egg relocation program within the boundaries (footprint) of the proposed project; (2) destruction of all nests deposited from October 1 through February 28 (or 29 as applicable) when a nest survey and egg relocation program is not required to be in place within the boundaries (footprint) of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) misdirection of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

Incidental take is anticipated for only the 2.17 mi of beach that has been identified for sand placement and dune restoration. The Service anticipates incidental take of sea turtles will be difficult to detect for the following reasons: (1) the turtles nest primarily at night and all nests are not found because [a] natural factors, such as rainfall, wind, and tides may obscure crawls and [b] human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program; (2) the total number of hatchlings per undiscovered nest is unknown; (3) the reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown; (4) an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area; (5) lights may misdirect an unknown number of hatchlings and cause death; and (6) escarpments may form and cause an unknown number of females from accessing a suitable nesting site.

However, the level of take of these species can be anticipated by the project because: (1) turtles nest within the project site; (2) the project will likely occur during a portion of the nesting season; (3) the project will modify the incubation substrate, beach slope, and sand compaction; and (4) artificial lighting will deter and/or misdirect nesting females and hatchlings.

EFFECT OF THE TAKE

In this biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species. Critical habitat has not been designated in the project area; therefore, the project will not result in destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerhead, green, leatherback, hawksbill, or Kemp's ridley sea turtles:

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

2. Beach nourishment activities and dune restoration must not occur from May 16 through October 31, the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial or crushing of eggs;

3. If the beach nourishment project and dune restoration activities will be conducted during the period from March 1 through May 15, surveys for early nesting sea turtles must be conducted. If nests are constructed in the area of beach nourishment and dune restoration, the eggs must be relocated;

4. If the project will be conducted during the period from November 1 through November 30, daily early morning sea turtle nesting surveys must be conducted 65 days prior to project initiation and continue through September 30, or until the last nest in the project area hatches, whichever is later. Also, eggs must be relocated per the requirements in 3a and 3b below;

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

6. Immediately after completion of the project and prior to the next 3 nesting seasons, monitoring must be conducted to determine if escarpments are present and escarpments must be leveled as required to reduce the likelihood of impacting sea turtle nesting and hatching activities;

7. The Applicant must ensure that contractors doing the beach nourishment and dune restoration work fully understand the sea turtle protection measures detailed in this incidental take statement;

8. During the early (March 1 through May 15) and late (November 1 to November 30), construction equipment and pipes must be stored in a manner that will minimize impacts to sea turtles to the maximum extent practicable; and

9. During the early and late portions of the nesting season, lighting associated with the project must be minimized to reduce the possibility of disrupting and misdirecting nesting and/or hatchling sea turtles.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures

described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. All fill material placed must be sand similar to a native beach in the vicinity of the site that has not been affected by prior renourishment activities. The fill material must be similar in both coloration and grain size distribution (sand grain frequency, mean and median grain size, and sorting coefficient) to the native beach and must not contain:

   1a. Greater than 10 percent, by weight, silt, clay, or colloids passing the #200 sieve;

   1b. Greater than 5 percent, by weight, fine gravel or cobbles, exclusive of shell material (retained by the #4 sieve);

   1c. The more restrictive of 5 percent coarse gravel, cobbles, or material retained on the ¾-in sieve, or in a percentage or size greater than found on the native beach; and

   1d. Construction debris, toxic material or other foreign matter; and not result in contamination of the beach.

2. Project construction must be started after October 31 and be completed before May 15. During the May 16 through October 31 period, no construction equipment or pipes will be stored on the beach;

3. If the project will be conducted before May 1, daily early morning surveys for sea turtle nests must be conducted from March 1 through May 15 or until completion of the project (whichever is earliest). In the event a sea turtle nest is excavated during construction activities, all work shall cease in that area immediately and the permitted person responsible for egg relocation for the project should be notified so the eggs can be relocated per the following requirements:

   3a. Nesting surveys and egg relocations will only be conducted by personnel with prior experience and training in nesting survey and egg relocation procedures. Surveyors must perform under the supervision of a qualified professional with a valid FWC Marine Turtle Permit. Nesting surveys must be conducted daily between sunrise and 9 a.m. Surveys must be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures; and

   3b. Only those nests that may be affected by construction activities will be relocated. Nests requiring relocation must be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with construction activities must cease when construction activities no longer threaten nests. Nests deposited within areas where construction activities have ceased or will not occur for 65 days must be marked and left in place unless other factors threaten

the success of the nest. Any nests left in the active construction zone must be clearly marked, and all mechanical equipment must avoid nests by at least 10 ft.

4. If the project will be conducted during the period from November 1 through November 30, daily early morning sea turtle nesting surveys must be conducted until the last nest hatches. In the event a sea turtle nest is excavated during construction activities, all work shall cease in that area immediately and the permitted person responsible for egg relocation for the project should be notified so the eggs can be relocated per the requirements in 3A and 3B above;

5. Immediately after completion of the project (May 15)and prior to March 1 for 3 subsequent years, sand compaction must be monitored in the area of restoration in accordance with a protocol agreed to by the Service, the FWC, and the Applicant. At a minimum, the protocol provided under 5a and 5b below must be followed. If required, the area must be tilled to a depth of 36 in. All tilling activity must be completed prior to March 1. An annual summary of compaction surveys and the actions taken must be submitted to the Service. (NOTE: The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post-construction compaction levels. Also, out-year compaction monitoring and remediation are not required if placed material no longer remains on the beach.)

5a. Compaction sampling stations must be located at 500-ft intervals along the project area. One station must be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station must be midway between the dune line and the high water line (normal wrack line).

At each station, the cone penetrometer will be pushed to a depth of 6, 12, and 18 in three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates will be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth will be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final 6 averaged compaction values.

5b. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area must be tilled prior to March 1. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

6. Visual surveys for escarpments along the project area must be made immediately after completion of the project (May 15) and prior to March 1 for 3 subsequent years

if placed sand still remains on the beach. All scarps shall be leveled, or the beach profile shall be reconfigured, to minimize scarp formation. In addition, weekly surveys of the project area shall be conducted during the 3 nesting seasons following completion of fill placement as follows:

6a. The number of escarpments and their location relative to DEP reference monuments shall be recorded during each weekly survey and reported relative to the length of the beach surveyed (e.g., 50 percent scarps). Notations on the height of these escarpments shall be included (0 to 2 ft, 2 to 4 ft, and 4 ft or higher) as well as the maximum height of all escarpments; and

6b. Escarpments that interfere with sea turtle nesting or that exceed 18 in high for a distance of 100 ft must be leveled to the natural beach contour by April 15. Any escarpment removal shall be reported relative to R-monument locations. The Service must be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 in high for a distance of 100 ft occurs during the nesting and hatching season (May 1 to October 31) to determine the appropriate action to be taken. If it is determined escarpment leveling is required during the nesting or hatching season, the Service will provide a brief written authorization that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken must be submitted to the Service. (NOTE: Out-year escarpment monitoring and remediation are not required if placed material no longer remains on the dry beach.)

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

8. From March 1 through May 15 and November 1 through November 30, staging areas for construction equipment must be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment not in use must be off the beach to minimize disturbance to sea turtle nesting and hatching activities during this period. In addition, all construction pipes placed on the beach must be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Temporary storage of pipes must be off the beach to the maximum extent possible. Temporary storage of pipes on the beach must be in such a manner so as to impact the least amount of nesting habitat and must likewise not compromise the integrity of the dune systems (placement of pipes perpendicular to the shoreline is recommended as the method of storage).

9. From March 1 through May 15 and November 1 through November 30, all on-beach lighting associated with the project must be limited to the immediate area of active construction only and must be the minimal lighting necessary to comply with all

safety requirements. Lighting on offshore or onshore equipment must be minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast Guard and Occupational Safety and Health Administration (OSHA) requirements. Shielded low pressure sodium vapor lights are recommended for lights on offshore equipment that cannot be eliminated, and for illumination of the nesting beach and nearshore waters. Light intensity of lighting plants must be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields must be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (see Figure 3).

10. A lighting survey shall be conducted from the nourished berm prior to April 15 of the first nesting season following nourishment and action taken to ensure no lights or light sources are visible from the newly elevated beach. A report summarizing all lights visible, using standard survey techniques for such surveys, shall be submitted to the Service by May 15 and documenting all compliance and enforcement action. Additional lighting surveys shall be conducted monthly through August and results reported by the 15th of each month of the first nesting season after project completion;

11. A report describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the FWC, Imperiled Species Management Section, Tequesta office and the Tallahassee office as well as the South Florida Ecological Services Office, Vero Beach, Florida within 60 days of completion of the proposed work for each year when the activity has occurred. This report will include the dates of actual construction activities, names and qualifications of personnel involved in nest surveys and relocation activities, descriptions and locations of self-release beach sites, nest survey and relocation results, and hatching success of nests.

12. In the event a sea turtle nest is excavated during construction activities, all work shall cease in that area immediately and the permitted person responsible for egg relocation for the project must be notified so the eggs can be moved to a suitable relocation site;

13. Upon locating a dead, injured, or sick endangered or threatened sea turtle specimen, initial notification must be made to the FWC at 1-888-404-3922, and the South Florida Ecological Services Office biologist listed at the end of this biological opinion. Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure evidence intrinsic to the specimen is not unnecessarily disturbed.

The Service believes that incidental take will be limited to the 2.17 mi of beach will be impacted by the proposed project. The reasonable and prudent measures, with their implementing terms

and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that no more than the following types of incidental take will result from the proposed action: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a **one-time placement** of sand on the 2.17 mi of beach that have been identified for sand placement. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

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

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

2. Surveys for nesting success of sea turtles should be continued for a minimum of 3 years following beach nourishment to determine whether sea turtle nesting success has been adversely impacted; and

3. Educational signs should be placed where appropriate at beach access points explaining the importance of the area to shorebirds and sea turtles and/or the life history of shorebird and sea turtle species that nest in the area.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the reinitiation request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation and effort in protecting fish and wildlife resources. Should you have additional questions or require clarification regarding the findings and recommendations contained in this document, please contact Mr. Mike Carlson at 772-562-3909, extension 296.

Sincerely yours,

Paul Souza
Acting Field Supervisor
South Florida Ecological Services Office

cc:
Corps, South Permits Branch, West Palm Beach, Florida (Penny Cutt)
CPE, Boca Raton, Florida (Craig Kruempel)
DEP, Bureau of Beaches and Wetland Resources, Tallahassee, Florida (Steven MacLeod, Phil Sanders)
EPA, West Palm Beach, Florida
FWC, Bureau of Protected Species Management, Tallahassee, Florida (Robbin Trindell)
NOAA Fisheries, Miami, Florida (Jocelyn Karazsia)
Service, Jacksonville, Florida (Sandy MacPherson)

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Table 1. Sea Turtle Nesting Activity in Palm Beach County, Florida1988 through 2004 (FWC 2004).

Year	Nests	False Crawls (Non-Nesting Emergences)	Total Emergences
1988	5695	3514	9209
1989	7959	4703	12662
1990	13203	8748	21951
1991	12158	9473	21631
1992	15014	9821	24835
1993	9643	8176	17819
1994	13671	13097	26768
1995	14379	14419	28798
1996	16242	13374	29616
1997	11991	9189	21180
1998	15472	17641	33113
1999	13597	13094	26691
2000	16289	18088	34377
2001	14266	13096	27362
2002	15621	15712	31333
2003	14036	15946	29982
2004	11893	17130	29023

Table 2. Loggerhead (*Caretta caretta*) Sea Turtle Nesting Activity Within the Town of Palm Beach Reach 8 Project Area.

Year	Number of Non-Nesting Emergences	Number of Nests	Total Emergences
1993	1	3	4
1994	1	4	5
1995	0	2	2
1996	293	324	617
1997	149	189	338
1998	300	274	574
1999	207	323	530
2000	212	182	394
2001	210	236	446
2002	123	187	310
2003	258	181	439
2004	241	151	392

(FWC, 2004)

*Note: Available data for Kreusler Park, Par III/Kreusler, and Lake Worth Municipal Beach turtle survey areas are included in the table. Kreusler Park turtle survey area includes data for the years 1993-2004 excluding 1996, 1997, and 2003. Par III/Kreusler turtle survey area includes data for the years 1996-2004. Lake Worth Municipal Beach turtle survey area includes data for the years 1996-2004.

Table 3. Green (*Chelonia mydas*) Sea Turtle Nesting Activity Within the Town of Palm Beach Reach 8 Project Area.

Year	Number of Non-Nesting Emergences	Number of Nests	Total Emergences
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	11	26	37
1997	3	2	5
1998	20	15	35
1999	1	3	4
2000	12	22	34
2001	0	0	0
2002	8	23	31
2003	8	12	20
2004	13	8	21

(FWC, 2004)

*Note: Available data for Kreusler Park, Par III/Kreusler, and Lake Worth Municipal Beach turtle survey areas are included in the table. Kreusler Park turtle survey area includes data for the years 1993-2004 excluding 1996, 1997, and 2003. Par III/Kreusler turtle survey area includes data for the years 1996-2004. Lake Worth Municipal Beach turtle survey area includes data for the years 1996-2004.

Table 4. Leatherback (*Dermochelys coriacea*) Sea Turtle Nesting Activity Within the Town of Palm Beach Reach 8 Project Area.

Year	Number of Non-Nesting Emergences	Number of Nests	Total Emergences
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	3	9	12
1998	0	3	3
1999	3	15	18
2000	2	7	9
2001	1	6	7
2002	0	7	7
2003	1	14	15
2004	0	3	3

(FWC, 2004)

*Note: Available data for Kreusler Park, Par III/Kreusler, and Lake Worth Municipal Beach turtle survey areas are included in the table. Kreusler Park turtle survey area includes data for the years 1993-2004 excluding 1996, 1997, and 2003. Par III/Kreusler turtle survey area includes data for the years 1996-2004. Lake Worth Municipal Beach turtle survey area includes data for the years 1996-2004.

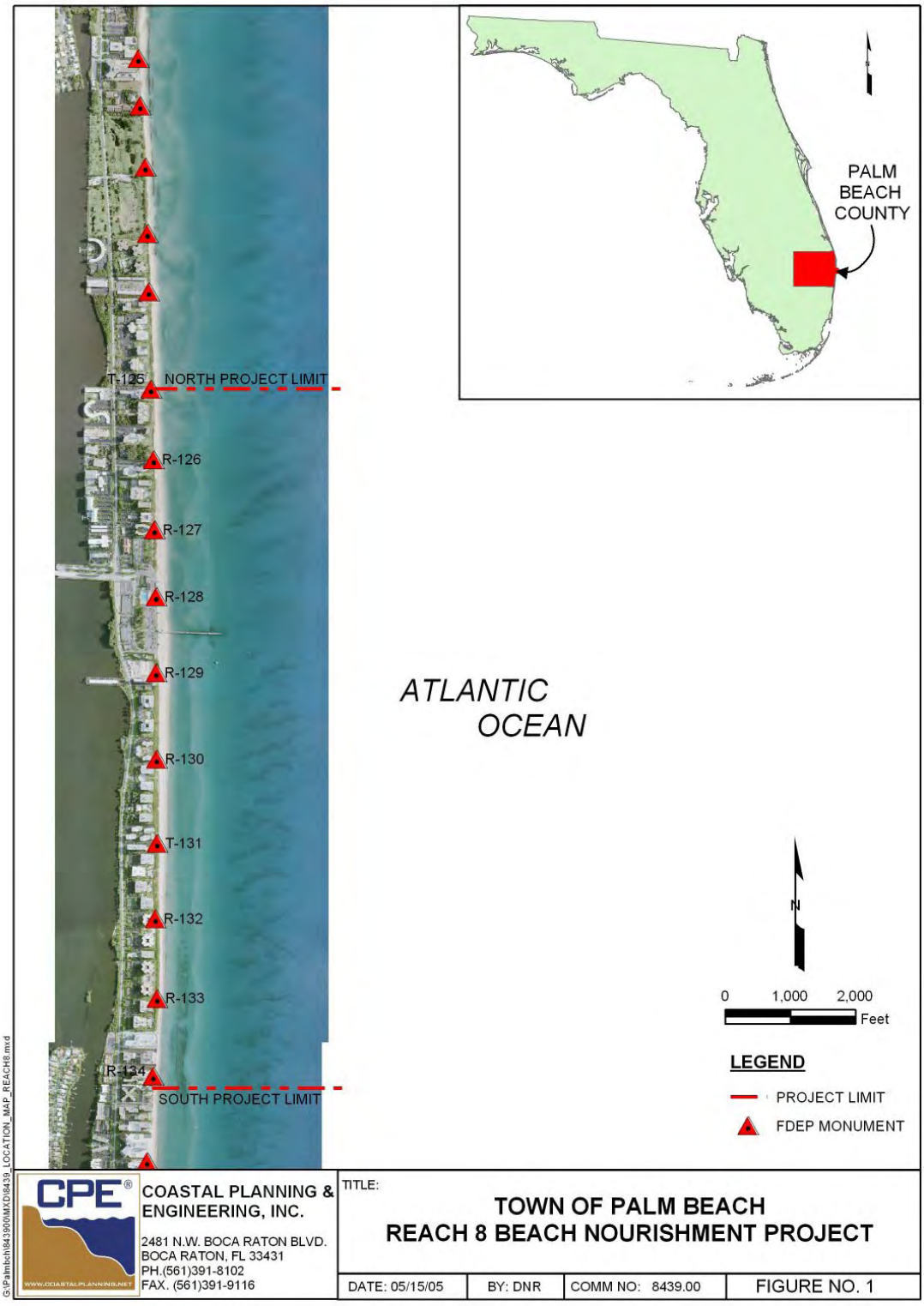

Figure 1. Project location, Palm Beach County, Florida, for Town of Palm Beach Reach 8 Beach Renourishment (Coastal Planning & Engineering, Incorporated).

Figure 2. Borrow Site Locations for the Town of Palm Beach Reach 8 Beach Renourishment Project, Palm Beach County, Florida (Coastal Planning & Engineering, Incorporated).

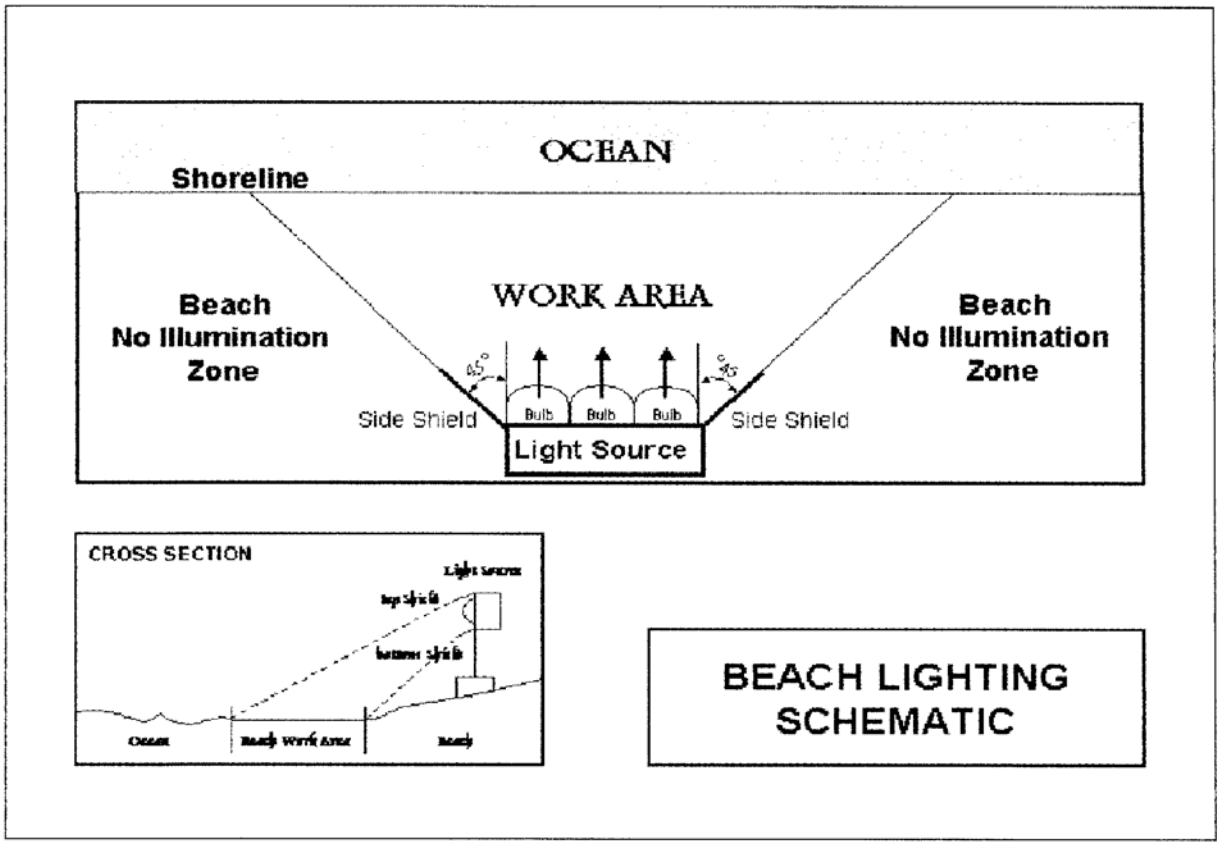

Figure 3. Beach Lighting Schematic for Lighting Protocol Proposed by the Service for Town of Palm Beach Renourishment Project, Palm Beach County, Florida (Coastal Planning & Engineering, Incorporated).