United States Department of the Interior

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

March 12, 2007

Colonel Paul L. Grosskruger
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Attention: Robert Tewis

Service Federal Activity Code:	41420-2006-FA-1412
Service Consultation Code:	41420-2006-F-0602
Corps Application No.:	SAJ-1999-4512 (IP-RMT)
Date Received:	November 18, 2005
Applicant:	Hidden Harbor Development, LLC
County:	Lee

Dear Colonel Grosskruger:

This document is the Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed project known as Hidden Harbor Development, LLC, located in Lee County, Florida, and its effects the West Indian (= Florida) manatee (*Trichechus manatus*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*), the Marine Mammal Protection Act of 1972, as amended (MMPA) (16 U.S.C. 1361 *et seq.*), and the provisions of the Fish and Wildlife Coordination Act of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*). No other listed species will be affected by the proposed action.

This biological opinion is based on information provided by the Corps, the Corps' Reach Characterization (Corps 2001), the *Florida Manatee Recovery Plan* (Service 2001), the *South Florida Multi-Species Recovery Plan* (Service 1999), data supplied by the Florida Fish and Wildlife Conservation Commission (FWC) and by the Florida Marine Research Institute (FMRI), and other sources of information. A complete administrative record of this consultation is on file at the Service's South Florida Ecological Services Office in Vero Beach, Florida.

Consultation History

The Service received a letter, dated November 15, 2005, from the Corps requesting concurrence on their "may affect" determination for the manatee and the initiation of formal consultation for the proposed action which is the construction of 56 single-family docks in a borrow pit connected to Ten Mile Canal in Lee County, Florida. Enclosed was a copy of a letter dated June 2, 2005, from Lee County stating the proposed project was inconsistent with the County's Manatee Protection Plan (MPP).

The Service transmitted an email, dated March 23, 2006, to the consultant (Phoenix Environmental Group) requesting additional information regarding the proposed project.

On March 27, 2006, the Service received project-related materials from another consultant (Hans Wilson & Associates), including a manatee monitoring report and a manatee protection plan.

The Service received a copy of an email with attachments, dated April 3, 2006, between Hans Wilson & Associates and FWC regarding the manatee monitoring report of Hidden Harbor (November 2002-March 2006) and other related materials.

The Service received an email, dated April 20, 2006, from Hans Wilson & Associates responding to the Service's request for additional information.

The Service received a copy of an email, dated May 15, 2006, between Hans Wilson & Associates and Mote Marine Laboratory discussing several aspects of the State's permit approving the Hidden Harbor project.

In a letter to DNA Environmental Logistics Corporation, dated August 2, 2006, Lee County stated that the 56 single-family docks permitted by the South Florida Water Management District (District) were exempt from review by the county's MPP.

The Service received a facsimile, dated June 7, 2006, of Save the Manatee Club's June 7, 2006, letter to FWC objecting to the applicant's request for a permit extension of the Hidden Harbor project.

The Service received an email, dated August 8, 2006, from Hans Wilson & Associates responding to the Service's request for additional information.

The Service received an email, dated September 7, 2007, from DNA Environmental Logistics Corporation proposing modifications to the Hidden Harbor project.

The Service transmitted an email, dated October 5, 2006, to the Corps acknowledging that formal consultation on the manatee had been initiated (50 CFR 402.14).

The Service received an email, dated October 6, 2006, from the Corps' clarifying information regarding the proposed action.

The Service received a copy of an email with a draft letter attached, dated October 23, 2006, between DNA Environmental Logistics Corporation and the Corps requesting modifications to the Hidden Harbor permit application.

The Service received an email, dated October 25, 2006, from DNA Environmental Logistics Corporation proposing manatee protection measures to be implemented by the applicant.

The Service received an email, dated November 2, 2006, from the Phoenix Environmental Group proposing additional manatee protection measures to be implemented by the applicant.

The Service received an email, dated November 28, 2006, from the Phoenix Environmental Group listing a number of project-related issues the applicant has addressed.

The Service received an email, dated February 20, 2007, from DNA Environmental Logistics Corporation acknowledging a willingness to commit to a staggered construction schedule designed to eliminate or minimize direct effects of the proposed action on the manatee.

The Service received the manatee monitoring report of Hidden Harbor from Hans Wilson & Associates covering the period from March through December 2006.

FISH AND WILDLIFE RESOURCES

Based on the information provided, the Service believes the proposed activity will not significantly impact fish and wildlife resources.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The applicant proposes to construct 56 single-family docks along the shoreline of a 35-acre borrow pit connected to Ten Mile Canal in Lee County, Florida. If authorized, the proposed action would result in the construction of a T-shaped dock consisting of a 30-foot long by 4-foot wide access ramp attached to a 25-foot long by 4-foot wide floating terminal platform for each of the 56 waterfront lots. According to the public notice, the length of shoreline along the borrow pit is 6,455 feet. The borrow pit varies in depth from 30 to 34 feet deep and, because of its depth, there are no seagrasses present. The project will provide new moorings for 56 boats. Additional information from the consultant indicates that the actual length of shoreline along the borrow pit is 5,234 linear feet. The Corps has assigned application number SAJ-1999-4512 (IP-RMT) to this project. The proposed project is located in a borrow pit adjacent to Ten Mile Canal in Section 07, Township 46 South, Range 25 East, Lee County, Florida.

The proposed action resulted in a "may affect" determination after processing through the Corps' July 2005 Manatee Key. [Note - Service concurrence for the key was provided in letters to the Corps dated July 12, 2005, and September 30, 2005.] Though the proposed action is the authorization to construct 56 single-family docks within the borrow pit, the manatee key allows the Corps and the Service to review multiple single-family docks as a single multi-slip facility. Thus, the Service acknowledges the Corps' determination of "may affect" for the manatee.

We selected the Corps' Reach Characterization of Florida waters as the basis for our geographic area analysis. The Corps compiled existing data relevant to the evaluation of the potential effects of watercraft access projects on manatees. The information contained in the Reach Characterization included manatee use data such as aerial surveys and radio telemetry; manatee habitat

characteristics such as warmwater sites, seagrass distributions, and bathymetry; human use characteristics such as relative dock densities, boat densities, and navigation channels; and existing manatee protection measures (speed zones). Throughout Florida, the Corps defined 80 segments or "reaches" based on manatee use, manatee habitat characteristics, and human use characteristics and compiled this information into its Geographic Information System (GIS) database. The Corps also provided the Service with the applicant's completed Manatee Checklist which provides additional site-specific information on the factors defined in the Reach Characterization database. In addition, as a requirement of the State permit issued by the District, the applicant has provided data on the manatee utilization of the borrow pit.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. The Service has determined that the action area for this project includes the coastal waters of Lee County within Reach 30 of the Corps' Reach Characterization analysis. Reach 30 encompasses the waters of Ten Mile Canal, Mullock Creek, Hendry Creek, Spring Creek, Hell Peckney Bay, Hurricane Bay, Matanzas Pass, Imperial River and Estero Bay. The proposed project is located within a borrow pit adjacent to Ten Mile Canal which connects to Mullock Creek, a tributary of Estero Bay. Vessels associated with the single-family residential development would travel through Ten Mile Canal and Mullock Creek to access Estero Bay and the Gulf of Mexico.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/Critical Habitat Description

Manatees are large fusiform-shaped mammals with skin that is uniformly dark grey, wrinkled, sparsely haired, and rubber-like. Manatees possess paddle-like forelimbs, no hind limbs, and a spatulate, horizontally flattened tail. Females have two axillary mammae, one at the posterior base of each forelimb. Their bones are massive and heavy with no marrow cavities in the ribs or long bones of the forearms (Odell 1982). Adults average about 10 feet in length and 2,200 pounds in weight, but may reach lengths of up to 15 feet (Gunter 1941) and weigh as much as 3,570 pounds (Rathbun et al. 1990). Newborns average 4 to 4.5 feet in length and weigh about 66 pounds (Odell 1981). The nostrils located on the upper snout, open and close by means of muscular valves as the animal surfaces and dives (Husar 1977; Hartman 1979). A muscular flexible upper lip is used with the forelimbs to manipulate food into the mouth (Odell 1982). Bristles are located on the upper and lower lip pads. Molars designed to crush vegetation form continuously at the back of the jaw and move forward as older ones wear down (Domning and Hayek 1986). The eyes are very small, close with sphincter action, and are equipped with inner membranes that can be drawn across the eyeball for protection. The ears are external, minute, with no pinnae. The anatomy of the internal ear structure indicates they can hear sounds within a relatively narrow low frequency range that their hearing is not acute, and they have difficulty in localizing sound (Ketten et al. 1992). However, Gerstein (1995) suggested manatees may have greater low-frequency sensitivity than other marine mammal species that have been tested.

Sea cows (*Protosiren*) first appeared during the Eocene period about 55 million years before the present when flowering plants first evolved. The family Trichechidae appeared in South America in the early Miocene (15 million years before present), about the same time as whales, apes and grazing animals (Domning 1982, Domning *et al.* 1982). During the Pliocene (12 million years before present), the time period when large carnivores evolved, members of Trichechidae first appeared in Atlantic North America (Reinhart 1951, 1959). Pleistocene *Trichechus* fossils have been recovered along the United States' east coast from Florida to Maryland (Simpson 1932).

Critical habitat for the Florida manatee was designated in 1976 (50 CFR 17.95). Critical habitat for any species is described as the specific area within the geographic area occupied by the species, at the time it is listed under the provisions of section 4 of the Act, on which are found those physical or biological features (*i.e.*, constituent elements): (1) essential to the conservation of the species; and (2) which may require special management considerations or protection. No specific primary or secondary constituent elements were included in the critical habitat designation. However, researchers agree that essential habitat features for the manatee include seagrasses for foraging, shallow areas for resting and calving, channels for travel and migration, warmwater refuges during cold weather, and fresh water for drinking (Service 2001).

Designated critical habitat on the west coast of Florida includes Crystal River in Citrus County, portions of the Little Manatee River in Hillsborough County, the Manatee River in Manatee County, the Myakka River in Sarasota and Charlotte Counties, the Peace River in DeSoto and Charlotte Counties, and the Caloosahatchee River in Lee County. It also includes all the coastal waters in Lee, Collier, and Monroe Counties between Gordon's Pass (Collier County) and Whitewater Bay (Monroe County). While critical habitat has been designated for the Caloosahatchee River, there is no critical habitat designating the tributaries, including the Orange River, that connect to the Caloosahatchee River.

Designated critical habitat on the east coast of Florida includes those intracoastal waters connecting rivers and bays from the Florida/Georgia border south to Key Largo in Monroe County, excluding those waters in Broward County and northern Miami-Dade County.

Life History

Like many large mammals, manatees have a potentially long life span (~60 years), relatively old age at maturity (4 to 7 years), a low reproductive rate (one calf every 3 years, 11-13 month gestation), and a high parental investment (2-year calf dependency). (O'Shea and Hartley 1995, Marmontel 1995, Odell et al. 1995, Rathbun et al. 1995, Reid et al. 1995, Marmontel et al. 1996) For species with this life-history strategy to persist, adult survival rates need to be high and stable. Long-term photo-identification studies show that adult manatees have an annual survival rate of about 96 percent in certain subpopulations that have relatively low human-related mortality (Langtimm et al. 2004). Accordingly, manatee populations are vulnerable to elevated mortality rates. Florida manatees have a low level of genetic diversity, possibly resulting from a founder effect or a population bottleneck (Garcia-Rodriguez et al. 1998). This means individual manatees are genetically very similar to one another. This similarity can result if the population

was started by only a few individual, or if there was a time when the population decreased to only a few individuals. Lack of genetic diversity within a population can result in inbreeding and a decrease in reproductive fitness.

Manatees are herbivores that feed opportunistically on a wide variety of aquatic vegetation. Feeding rates and food preferences depend, in part, on the season and available plant species. Manatees frequently feed in water depths of 3 to 9 feet where aquatic vegetation is abundant. Seagrasses appear to be a staple of the manatee diet in coastal areas (Ledder 1986, Provancha and Hall 1991, Kadel and Patton 1992, Koelsch 1997, Lefebvre et al. 2000). Manatees can remain submerged for several minutes with the longest submergence record lasting 24 minutes (Reynolds 1981).

Breeding takes place when one or more males (ranging from 5 to 22 individuals) are attracted to an estrous female to form a temporary mating herd (Rathbun et al. 1995). Mating herds can last up to 4 weeks, with different males joining and leaving the herd daily (Hartman 1979, Bengston 1981, Rathbun et al. 1995, Rathbun 1999). Permanent bonds between males and females do not form. During peak activity, the males in mating herds compete intensely for access to the female (Hartman 1979). Successive copulations involving different males have been reported. Some observations suggest that larger, presumably older, males dominate access to females early in the formation of mating herds and are responsible for most pregnancies (Rathbun et al. 1995). Although breeding has been reported in all seasons, Hernandez et al. (1995) reported histological studies of reproductive organs from carcasses of males found evidence of sperm production in 94 percent of adult males found between March and November. Females appear to reach sexual maturity by about age 5, but have given birth as early as 4 (Marmontel 1995, Odell et al. 1995, O'Shea and Hartley 1995, Rathbun et al. 1995) and males may reach sexual maturity at 3 to 4 years of age (Hernandez et al. 1995). Manatees may live in excess of 50 years (Marmontel 1995), and evidence for reproductive aging is unclear (Marmontel 1995, Rathbun et al. 1995).

Calf dependency usually lasts 1 to 2 years after birth (Hartman 1979, O'Shea and Hartley 1995, Rathbun et al. 1995, Reid et al. 1995). Calving intervals vary greatly among females, with an average birth cycle of 2 to 2.5 years, but may be considerably longer depending on age and perhaps other factors (Marmontel 1995, Odell et al. 1995, Rathbun et al. 1995, Reid et al. 1995). Females that abort or lose a calf due to perinatal death (small manatees, less than 60 inches in length) (O'Shea and Hartley 1995), may become pregnant again within a few months (Odell et al. 1995) or even weeks (Hartman 1979).

Population Dynamics

The total population size of manatees in Florida is unknown. Annual synoptic surveys suggest a minimum population in excess of 3,000 animals statewide. Adult manatee survival rates are considered to be the most important indicator of maintaining a stable and secure manatee population (Langtimm et al. 2004). Given the low reproductive rate described in the previous section, manatees would be slow to recover from extensive depletions of their numbers.

Long-term studies suggest four regional subpopulations of manatees in Florida: (a) the Northwest subpopulation encompasses the counties along the Gulf of Mexico from Escambia

County east and south to Pasco County; (b) the Upper St. Johns River subpopulation occurs in the river from Palatka south; (c) the Atlantic subpopulation extends along the entire east coast from Nassau County south to Florida Bay and the Florida Keys in Monroe County and includes the St. Johns River north of Palatka; and (d) the Southwest subpopulation encompasses counties along the Gulf of Mexico from Pasco County south to Whitewater Bay in Monroe County. These regional units are based primarily on documented manatee use of wintering sites and from radio-tracking studies of individuals' movements (Bengston 1981, Marine Mammal Commission 1988, Rathbun et al. 1990, Reid et al. 1991, Beck and Reid 1995, Rathbun et al. 1995, Reid et al. 1995, Deutsch et al. 1998, Service 2001, Weigle et al. 2001, Deutsch et al. 2003).

Status and Distribution

According to the Manatee Population Status Working Group's 2004 assessment of the biological population of the Florida manatee, the distribution of manatees among these four regions is 11 percent in the Northwest, 4 percent in the Upper St. Johns, 44 percent in the Atlantic, and 41 percent in the Southwest. The Northwest and Upper St. Johns subpopulations exhibit similar dynamics: mortality is low, adult survival and reproduction rates are high, and growth rate is positive. The Atlantic subpopulation is less clear with higher mortality, moderate rates of adult survival and reproduction, and a growth rate that is inconclusive. The Southwest subpopulation appears to be the most vulnerable to decline with high mortality, adult survival rate is low and the growth rate estimates indicate the subpopulation appears to be declining. However, the data series for this subpopulation is limited which means the survival and reproductive estimates are less precise than for the other subpopulations.

Based on telemetry studies, aerial surveys, photo-identification studies, and other research over the past 20 years, manatee distribution in the southeastern United States is better understood (Beeler and O'Shea 1988; O'Shea 1988; Marine Mammal Commission 1984, 1986; Lefebvre et al. 1989; Ackerman 1995; Lefebvre et al. 1995). Manatees can be found in Florida waters throughout the year, and nearly all manatees use the waters of peninsular Florida during the winter months. In winter months, most manatees rely on warm water from industrial discharges and natural springs for warmth. In warmer months, they expand their range and occasionally are seen as far north as Rhode Island on the Atlantic Coast and as far west as Texas on the Gulf Coast (Powell and Rathbun 1984, Schwartz 1995, Fertl et al. 2005).

Manatees often use secluded canals, creeks, embayments, and lagoons, particularly near the mouths of coastal rivers and sloughs, for feeding, resting, playing, mating, and calving (Marine Mammal Commission 1986, 1988). Manatees frequent coastal, estuarine, and riverine habitats and are capable of extensive north-south migrations. These north-south migrations are largely determined by water temperatures below 68°F (20°C).

Manatees depend on areas with access to natural springs, manmade warmwater refugia, areas with vascular plants, and freshwater sources. Manatees normally migrate along shorelines and use deeper corridors to access shallow water feeding and resting areas. When ambient water temperatures drop below 68EF in autumn and winter, manatees aggregate within the confines of natural or artificial warmwater refuges (Lefebvre et al. 1989) or move to the southern tip of

Florida (Snow 1991). Most warmwater artificial refuges are created by outfalls from power plants or paper mills. As water temperatures rise, manatees disperse from these winter aggregation areas. While some remain near their winter refuges, others undertake extensive migrations along the coast of Florida and far up rivers and canals. Many manatees return to the same warmwater refuges each year. However, some manatees use different refuges in different years, and others use two or more refuges in the same winter (Reid and Rathbun 1984, Rathbun et al. 1990, Reid et al. 1991). There are numerous lesser known, minor aggregation areas used as temporary thermal refuges. Many of these areas are canals or boat basins where warmwater temperatures persist as temperatures in adjacent bays and rivers decline.

Manatee distribution and dispersal patterns as well as numbers of individuals within an area can vary considerably from year-to-year and season-to-season. This variability in dispersal patterns is dependent on a variety of biotic and abiotic factors, such as warmwater discharges, freshwater sources, foraging areas, and mating season. At the end of winter, manatees leave warmwater aggregation sites and head for warm weather use areas. There appears to be no significant spring aggregation areas on the east coast. During the summer, manatees can be found throughout Florida where water depths and access channels are greater than 1 to 2 meters (3.3 to 6.6 feet) (O'Shea 1988).

Summer use areas are generally typified by extensive foraging resources. Seagrasses and other food sources occur throughout coastal Florida. There are an estimated 3.73 million acres of open water habitat in coastal and interior areas, of which an estimated 1.1 million acres are designated manatee critical habitat (FWC and Service GIS data). Almost 57,000 acres of known manatee aggregation habitat exists in the State, 85 percent of which is located in the Atlantic and Southwest subpopulations.

Reasons for Legal Protection

In 1967, both the Florida and Antillean subspecies of manatees (*T. manatus latirostris* and *T. manatus manatus*) were listed as endangered (32 FR 4061) and received Federal protection with the passage of the Act in 1973. However, since the manatee was designated as an endangered species prior to enactment of the Act, there was no formal listing package identifying threats to the species, as required by section 4(a)(1) of the Act. However, since that time, threats to the manatee (discussed below) have been identified.

Manatees are also protected under the MMPA. The MMPA establishes, as national policy, maintenance of the health and stability of marine ecosystems and, whenever consistent with this primary objective, obtains and maintains optimum sustainable populations of marine mammals. It also establishes a moratorium on the taking of marine mammals, which includes harassing, hunting, capturing, killing, or attempting to harass, hunt, capture, or kill any marine mammal. Section 101(a)(5)(A) of the MMPA allows the Service, upon request, to authorize by specific regulation the incidental, unintentional take of marine mammals by persons engaged in identified activities within specific geographic areas, if the Service determines that such taking would have a negligible impact on the species or subpopulation. Since the manatee, which is comprised of the Florida and Antillean manatee subpopulations, is currently listed as "endangered" under the Act, they are considered "depleted" under the MMPA.

Section 115(b) of the MMPA requires that conservation plans be developed for marine mammals considered "depleted." In the case of the Florida manatee, the Service developed the initial recovery plan for the manatee in 1980. This initial plan focused primarily on manatees in Florida, but included Antillean manatees in the Commonwealth of Puerto Rico and the United States Virgin Islands. In 1986, the Service adopted a separate recovery plan for manatees in Puerto Rico. To reflect new information and planning needs for manatees in Florida, the Service revised the original plan in 1989 and focused exclusively on the Florida manatee. This first revision covered a 5-year planning period ending in 1994. The Service revised and updated the plan again in 1996, which again covered a 5-year planning period ending in 2000. In 1999, the Service initiated the process to revise the plan for a third time. An 18-member recovery team, consisting of representatives of the public, agencies, and groups that have an interest in manatee recovery and/or could be affected by proposed recovery actions, was established to draft the third revision. The latest manatee recovery plan, which also covers a 5-year planning period, was finalized in October 2001.

Threats

The two most significant threats to the Florida manatee population statewide are collisions with watercraft and the loss of warm water habitat. All other threats are relatively minor in comparison. Mortality from watercraft collisions accounts for 25 percent of all manatee mortalities statewide (Ackerman et al. 1995). Warm water habitat is essential for manatee survival during cold weather. Prolonged exposure to cold water temperatures can result in debilitation and/or death due to "cold stress syndrome" (Bossart et al. 2002). However, when compared to all other threats, including the loss of warm water habitat, watercraft-related mortality poses the most serious long-term risk to the growth and resilience of the manatee population.

Other threats to manatees include crushing or entrapment in gates and locks, entanglement in ropes, lines, and nets, ingestion of fishing gear or debris, vandalism, poaching, and exposure to red tide brevetoxin (Bossart et al. 1998). Red tide represents a major natural source of mortality for manatees in the Southwest region.

Protection Measures

Through 2005 with more than 1,000,000 vessels registered in the State of Florida and an estimated 400,000 out-of-state vessels, over 1.4 million watercraft use Florida's waterways annually, and the popularity of watercraft recreation continues to grow. While every new watercraft access facility may not directly equate to a watercraft added to the water, cumulatively, the addition of watercraft access points result in increased watercraft use and, in some cases, changes in watercraft travel patterns and modification of manatee behavior.

Watercraft speed zones were established in some coastal Florida counties with high manatee-watercraft collision rates to slow watercraft to reduce collisions. Anecdotal information indicates that when manatees detect the presence of an oncoming boat, they often but not always dive and/or swim rapidly out of its path. Their ability to effectively elude the oncoming boat is largely determined by the speed of the approaching boat. Given ample time, manatees should be

able to avoid lethal and injurious encounters with boats. As such, slow-moving boats are less of a threat to manatees. To control boat speeds and limit boater access to sensitive manatee areas, the State's "Florida Manatee Sanctuary Act" was enacted in 1978. This act designated the State of Florida as a manatee sanctuary and allowed for the regulation of boating activity within State waters. Since its inception, manatee protection zones have been established in 26 counties.

Prior to Shapiro (2001), there were no definitive studies assessing the effectiveness of the protection zones during the more than 20 years that some of the zones have been in place. Initially, the manatee carcass salvage program was used as a measure to gauge the effectiveness of these zones. The results were very discouraging with watercraft-related deaths continue to occur and increase in excessive numbers in the counties with manatee speed zones.

When gauging the effectiveness of these zones, other factors in addition to the number of watercraft-related deaths must be included in any such evaluation. These factors include, but are not limited to: (1) the types of zones; (2) the volume of vessel traffic; (3) vessel type and size; (4) season/day of week/time of day; and (5) the presence of enforcement [*i.e.*, compliance].

To date, ten compliance studies have been conducted to measure the extent to which boaters comply with manatee protection zones. These studies were conducted in several counties as well as several sites throughout peninsular Florida and demonstrated compliance rates ranging from a low of 26 percent compliance within study areas to a high of 79 percent compliance within study areas for the duration of the various monitoring periods. Four of the studies concluded that the presence of law enforcement officers on-the-water during their sampling period increased levels of compliance. Furthermore, one researcher concluded that "consistent law enforcement presence will ensure consistent compliance." Another researcher concluded that low levels of enforcement, few citations, and poor signage were responsible for poor compliance.

- Kinnaird (1983) reviewed protection strategies for manatees by examining the number of watercraft-related deaths that had occurred in certain areas before and after they were designated as protection zones. Because the number of deaths was relatively unchanged, she was not able to conclude that they were an effective means to reduce these collisions. However, she believed that the zones "are of critical importance in the reduction of manatee harassment and injury as well as the prevention of habitat degradation." Furthermore, she believed that the zones "may be the most effective short-term strategy for reducing [harassment] and the number of manatee/boat collisions." She encouraged an increase in funding for enforcement and sign maintenance and recommended measures for enhancing the effectiveness of law enforcement activities.

- Morris (1994) conducted the first boater compliance survey to assess boater compliance with manatee protection zones. The surveys were conducted in Brevard County from April 1993 to April 1994. Morris believed that, based on the low number of observations of law enforcement vessels in certain areas and the fact that few citations had been issued in these same areas, boater compliance with these protection zones was poor. He further attributed poor compliance with unclear and confusing signage in manatee protection zones.

- Gorzelany (1996) monitored boater compliance with manatee protection zones in Sarasota County during January-December 1995. Conclusions reached as a result of this study include: (1) areas with a frequent law enforcement presence have the highest level of boater compliance; and (2) observed levels of compliance were higher (74 percent vs. 61 percent) and levels of blatant noncompliance lower (8 percent vs. 18 percent) in the presence of enforcement vessels. A "cautious" interpretation of other data appears to demonstrate that, when a law enforcement vessel was present in a protection zone, average boat speeds were lower, suggesting an overall slow down in aggregate boat speeds. Gorzelany concludes that "a larger allocation of funds, personnel, and resources toward enhancing marine enforcement in Florida" are necessary to promote "effective coastal waterway management."

- Gorzelany (1998) monitored boater compliance in Lee County during 1997-1998. General trends and problem areas were identified in the report. Statistically significant comparisons between compliance levels and the presence or absence of law enforcement activities were determined. Specifically, Gorzelany demonstrated that "the presence of a law enforcement vessel influenced the speed and compliance of vessels."

- Tyson and Combs (1999) conducted a 6-month assessment of boater compliance in Brevard County during May-October 1997 and concluded that (1) compliance was best when law enforcement officers were on the water and (2) consistent law enforcement presence will result in consistent compliance. Tyson and Combs urged the Service to continue its task force initiatives to supplement local law enforcement activities and, thereby, reduce the threat of speeding vessels to manatees.

- Shapiro (2001) focused on boater compliance in evaluating the effectiveness of speed zones at several sites throughout Florida from July 2000 to June 2001. This approach was designed to provide a synoptic view of statewide vessel traffic and boater compliance data. The study consisted of two components: (1) a baseline evaluation that assessed the number of vessels in compliance with posted speed zones, including the size and types of vessels, the season, and time of day; and (2) an enforcement evaluation that assessed how the presence of law enforcement affects boater behavior and compliance. Shapiro reported that (1) compliance increased with increasing vessel size; (2) sailboats were the most compliant, whereas, personal watercraft were the least compliant; (3) compliance was lower when vessel traffic was greater in the afternoon, on weekdays, and during the fall [for those sites along the Atlantic Intracoastal Waterway]; and (4) compliance increased significantly (as high as 89 percent at one location) when law enforcement was present.

- Gorzelany (2002) evaluated boater compliance with two new speed zones in Lee County between February and August 2002 and, similar to Shapiro (2001), observed that (1) compliance increased with increasing boat size and (2) levels of compliance varied with boat types [*i.e.*, personal watercraft the least compliant]. Gorzelany also found that while compliance was 66 percent with one newly established speed zone, compliance was only 26 percent at the second new speed zone (in Mullock Creek) and concluded the absence of law enforcement was the reason for the high level of non-compliance.

- Gorzelany (2004) evaluated a series of boater compliance studies performed in 1995 and in 1998 in order to assess the effectiveness of existing speed zones designed to protect manatees in Sarasota and Lee counties. Overall boater compliance was 63 percent in Sarasota County (1995) and 58 percent in Lee County (1998). Compliance varied significantly with vessel type and size. Compliance increased as vessel size increased in both counties. Differences in compliance among survey sites were also significant and were related to travel patterns, traffic volume, vessel composition, sign placement, level of speed restriction, and law enforcement presence.

- Gorzelany (2005) conducted a study to assess boating recreational activity and boater compliance on three waterways in Broward County. All three survey sites were located within manatee speed zones. Overall compliance ranged from 52 to 59 to 78 percent, respectively. Though compliance was moderate for two of the three sites, blatant non-compliance was very low (3 and 2 percent, respectively). For all three survey sites, the operators of smaller boats (less than 26 feet) tended to be less compliant than operators of larger vessels (26 feet and greater).

- Viera-Alwell and McDonald (2006) evaluated boat traffic and boater compliance in the St. Sebastian River, Indian River County. Over 90 percent of the boats observed in the study were less than 26 feet in length. Boater compliance increased more than 10 percent over a similar study conducted 5 years earlier in the same location (Shapiro 2001). Yachts in the 26- to 40-foot length category were 100 percent compliant with the posted speed limits. Higher compliance rates and increasing trends in compliance rates in the St. Sebastian River may be linked to community environmental stewardship and social pressures.

Manatee Protection Plans

Concerned with an increased number of manatee mortalities and boating accidents, the Governor and Cabinet directed the Florida Department of Natural Resources (DNR) in June 1989 to make recommendations for specific actions to protect the manatee and its habitat and to make the State's waterways safer for the boating public. DNR's final report, *Recommendations to Improve Boating Safety and Manatee Protection on Florida Waterways*, found over 80 percent of all watercraft-related manatee mortality occurred in 10 counties: Brevard, Broward, Citrus, Collier, Miami-Dade, Duval, Lee, Martin, Palm Beach, and Volusia. Though watercraft-related mortality was not high for St. Lucie, Indian River, and Sarasota, these three counties were considered important areas as travel corridors as well as foraging and resting areas for manatees.

Subsequent to this report, the Governor and Cabinet directed each of these 13 coastal (= key) counties to develop an MPP. The purpose of an MPP is to present a summary of existing information about manatee use and watercraft use within the county and to develop strategies to balance manatee protection, resource protection, waterway uses, boating facility siting, speed zones and signage, boating safety, and to educate the boating public. The final report recommended new or expanded boating facilities in these key counties should be limited to one powerboat slip per 100 linear feet of shoreline (the 1:100 ratio) until the county implements its State-approved MPP, including a boating facility siting component. Watercraft access projects consistent with a

county's MPP provides levels of boater access and activities within the capacity of the manatee protection measures established. Projects not consistent with a MPP may exceed the capacity of these protective measures and, therefore, may result in incidental take of manatees. Countywide MPPs are identified in the *Florida Manatee Recovery Plan* (Service 2001) as a method for protecting manatees and manatee habitat.

Citrus County was the first county to have a State-approved MPP in 1991. The county's MPP identified actions that address manatee mortality and included a boating facility siting plan. The MPP also discussed conservation measures to protect manatee habitat. Subsequent to its approval, the State established regulatory speed zones for watercraft. The State of Florida subsequently approved MPPs for Collier County in May 1995 followed by Miami-Dade County in December 1995; Duval County in June 1999; Indian River County in August 2000 which was amended in February 2002; St. Lucie County in March 2002; Martin County in June 2002; Brevard County in February 2003; Sarasota County in February 2004; Lee County in August 2004; and Volusia County in October 2005.

The Florida Legislature recognized the importance of site planning for marinas in passing Chapter 296-2002, Laws of Florida, which became effective on May 31, 2002. This law amended Section 380.06(24), Florida Statutes, to establish a process for exempting marinas from the Development of Regional Impact (DRI) review process, provided that certain planning requirements are met. Specifically, marinas are exempt if the local government comprehensive plan includes a boating facility siting plan that incorporates appropriate siting criteria as referenced in the statute. A boating facility siting plan allows local governments to direct marinas, boat ramps, and other boating facilities to suitable locations that minimize impacts to marine resources. Rather than addressing the impacts of a proposed marina through the DRI process, the new law establishes a process for adopting criteria to ensure marinas are sited in a manner that minimizes regional impacts to marine resources. Through a boating facility siting plan, local governments can encourage marinas at appropriate locations, while directing marinas away from sites that would adversely impact important resources.

The Service believes county MPPs are one of the best vehicles to address such issues as boating facilities (marinas, docks, boat ramps, and dry storage areas); boating activity patterns; manatee information; a boat facility siting plan; manatee protection measures; and an education and awareness program for the boating public. They are valuable planning tools and provide an excellent venue for local manatee protection efforts. In addition, it is our view an effective MPP must contain components that address manatee protection areas (*e.g.*, manatee refuges), speed zone enforcement, funding for manatee protection efforts, and a reporting/monitoring element. Implementation of a State-approved MPP will have met State standards and addressed our concerns in maximizing benefits to the manatee while providing regulatory certainty to the public.

Analysis of the species/critical habitat likely to be affected

Due to the increase in the number of new boat moorings and new boat access resulting from the proposed action, the Corps has determined that the proposed project "may affect" the manatee,

but "is not likely to adversely modify" designated critical habitat for the manatee. While we concur with the Corps effect determination for critical habitat, we do not concur with the Corps' effect determination for the manatee and have performed a more comprehensive analysis of the effects of the proposed action in order to determine whether or not the proposed activity is likely to jeopardize the continued existence of the Florida manatee.

The construction of this single-family residential development resulting in 56 single-family docks may affect the manatee by increasing watercraft and human presence in the action area. These actions may disrupt, disturb, or delay manatee migration to warmwater refugia, freshwater drinking sources, and cause additional stress to manatees and calves present in the action area. An analysis of these project-related effects will be considered further in the remaining sections of this document.

ENVIRONMENTAL BASELINE

This section analyzes all past and ongoing human and natural factors leading to the current status of the manatee and its critical habitat in the action area. In 2000, the Save the Manatee Club, other environmental groups, and several individuals filed suit in the District of Columbia against the Corps and the Service. Plaintiffs alleged violations of the ESA, the National Environmental Policy Act, the MMPA, and the Administrative Procedure Act, with regard to the manatee, and alleged that the Corps' Clean Water Act Section 404 permitting of Florida boating facilities was responsible for watercraft-related manatee mortality in Florida's coastal counties.

A settlement agreement was signed by all parties of the lawsuit on January 5, 2001, containing the following elements to which the Service agreed to complete and/or implement: (1) revision of the manatee recovery plan; (2) designation of manatee refuges and sanctuaries as manatee protection areas in peninsular Florida; (3) promulgation of a rule for incidental take of manatees under the MMPA; and (4) development of an interim guidance document to be used in section 7 consultations pending completion of the MMPA rule. The designation of refuges and sanctuaries as well as the interim strategy were short-term measures intended to address recent levels of mortality and that a long-term solution to address historic levels of mortality depended on the development of small take regulations under the MMPA.

Based on an analysis of manatee mortality data, the Service identified four prerequisites necessary to ensure incidental take would be unlikely to occur. These four prerequisites are: (1) appropriate speed zones; (2) appropriate signage; (3) speed zone enforcement to prevent watercraft collisions with manatees from occurring as a result of the proposed project; and (4) the establishment of these measures prior to project implementation. If any one of these prerequisites is absent, the Service believes a new watercraft facility in the area would result in the take of manatees and identified the area as an "area of inadequate protection" or AIP.

Because of the absence of the prerequisites (described above), the Service designated several waterbodies within Lee County as AIPs in 2001 and 2002. Since designating these waterways as such, the Service has worked with the State and Lee County to ameliorate the watercraft collision threat specific to these areas. With the implementation of a State-approved MPP for Lee County

June 2004); the establishment of Federal manatee refuges (Shell Island Manatee Refuge in November 2002, Caloosahatchee River-San Carlos Bay Manatee Refuge in August 2003, Pine Island-Estero Bay Manatee Refuge in April 2005); signage improvements for existing speed zones (Imperial River, Mullock Creek-Ten Mile Canal); and increased coordinated enforcement by the Service, FWC, and the Lee County Sheriff's Office, the AIP designations have been removed for all sites.

Status of the species within the action area

The Southwest subpopulation of manatees migrates through the waters of Lee County. Manatee distribution and dispersal patterns as well as numbers of individuals within an area can vary considerably from year-to-year and season-to-season. This variability in dispersal patterns is dependent on a variety of biotic and abiotic factors, such as warmwater discharges, freshwater sources, foraging areas, and mating season.

Manatee abundance in Lee County has been documented repeatedly through aerial surveys conducted during 1984-1985, 1994-1995, 1997-1998, and 2002-2004 as well as telemetry data recorded during 1985-2001 and 1991-2001. The aerial surveys and telemetry data indicate manatees occur year-round in Lee County.

Manatees generally aggregate at warm-water discharges from December through February (and to a lesser extent in adjacent months) and then disperse to other areas during spring and summer months (Garrott et al. 1994). The major warmwater refuge in Lee County is the Florida Power and Light (FPL) power plant with a cooling intake on the Caloosahatchee River and discharge into the Orange River (Packard et al. 1985), a tributary of the Caloosahatchee River. During the 5-year period from 2001 to 2005, a total of 1,762 manatees have been observed from a series of aerial surveys at the Fort Myers power plant for an average of 352 manatees per survey (Reynolds 2005). As many as 434 manatees have been counted at the power plant discharge area in a single day (FWC 2002). FPL's Fort Myers power plant has a State-approved manatee plan with prescribed actions to minimize the complete loss of warm-water for emergency shut-down events or planned maintenance during the winter months.

Manatees also use other waterways in Lee County as warmwater refugia. These areas include the Franklin Lock, Matlacha Isles, Eight Lakes, and Ten Mile Canal (FWC 2002). Many of these connecting tributaries and artificial waterways are also used by manatees for freshwater sources and as areas of minimal disturbance for resting and calving (FWC 2002).

The enclosed table contains aerial survey data recorded from January 1997 through January 1998. Specifically, the table lists the number of manatees counted during the latter half of each of the monthly survey periods countywide, within Reach 30, and within a 1-mile radius of the project site. For instance, during late January 1997, 241 manatees were observed countywide. Of this total, 38 manatees were observed within Reach 30, of which 36 individuals were recorded within 1-mile of the project site. Conversely, during late June 1997, 124 manatees were observed countywide of which 34 individuals were recorded within Reach 30 and none within 1-mile of the project site.

Survey period	Jan 1997	June 1997	July 1997	August 1997	Jan 1998
Countywide	241	124	109	151	221
Reach 30	38	34	34	35	21
Project site	36	0	0	1	15

FWC's (2002) assessment of manatee use in Ten Mile Canal-Mullock Creek and Estero Bay is consistent with the 1997-1998 aerial survey data. The highest number of manatees in Ten Mile Canal-Mullock Creek occurs in the winter when the animals are using the borrow pit as a warm water refuge. The lowest number of manatees in canal-creek occurs in the summer when the animals are foraging in seagrasses throughout Estero Bay.

The applicant and previous developers of the project have been conducting a study of the utilization of the borrow pit by manatees. Hans Wilson and Associates, one of a number of consultants for the project, recorded manatee presence and abundance in the borrow pit from 2002 through 2006. Listed below is the range of manatees recorded in the borrow pit for any observation event during the winter months (December-February) for each survey period. For instance, the number of manatees recorded in the borrow pit during the winter months of 2002-2003 ranged from 0 (lowest count) to 17 (highest count). The survey concluded at the end of December 2006.

Survey period	Range of individual manatees
2002-2003	0 – 17
2004-2005	4 – 78
2005-2006	10 – 35
2006	0 – 23

Though Reach 30 is designated as manatee critical habitat, the designation does not include specific primary or secondary constituent elements. However, important components of manatee critical habitat include areas of submerged vegetation for foraging, shallow areas for resting and calving, channels for travel and migration, warmwater refugia for cold weather events, and fresh water for drinking. Ten Mile Canal provides a source of warm water and fresh water as well as an area for resting. While it is unlikely seagrasses are present in Ten Mile Canal and Mullock Creek, extensive seagrass beds cover the northern and southern sections of Estero Bay, whereas, the remainder of the bay has either patchy seagrasses or is unvegetated (FWC 2002).

Factors Affecting Species Environment Within the Action Area

Watercraft

Commercial and recreational boat use in the action area are increasing. According to information provided by the State of Florida, the total number of registered vessels in Lee County from 2001 to 2005 is as follows:

Year	2001	2002	2003	2004	2005
Registered vessels	43,444	45,145	47,036	47,896	50,307

Gorzelany (2002) noted that 83 percent of the vessels using Mullock Creek were 16-25 feet in length and 43 percent of the vessels observed were open fisherman types. Gorzelany (2002) also noted that the volume of boat traffic in this waterway was relatively low with less than two boats per hour during each survey period and that almost half of the vessels observed were repeat sightings. Based on these observations, Gorzelany suggested that a small group of year-round resident boaters were the primary users of this waterway.

Lee County, along with the West Coast Inland Navigation District and the University of Florida Sea Grant Program, conducted a waterway management evaluation of Estero Bay and its adjoining tributaries and canal systems (Swett et al. 2000). This evaluation was designed to analyze the human ecosystem (= watercraft user) and the environment (= waterway system) to facilitate boating safety and reduce boating impacts on natural resources. The study measured several variables including the number of moorings within this regional waterway. For the purposes of the study, moorings were defined as anchorage, boat lift, davits, dry stack, hoist, mooring, ramp, seawall, trailer, and wet slip. Of the 5,385 moorings identified in the action area, only 3,321 (62 percent) were occupied by watercraft. Of this total, there were 461 moorings and 321 vessels recorded for the Mullock Creek/Ten Mile Canal waterway. The Hidden Harbor residential development would add 56 moorings to the Ten Mile Canal/Mullock Creek waterway. New watercraft resulting from the proposed project will likely travel within the waters of Ten Mile Canal, Mullock Creek, Estero Bay, and the Gulf of Mexico.

Mortality

From January 1, 2001, to December 31, 2005, 69 manatees died as a result of a watercraft collision in Lee County with 11 dead manatees in Reach 30 and 3 dead manatees within a 2-mile radius of the project site.

Year	2001	2002	2003	2004	2005
Lee County	23	13	9	13	11
Reach 30	2	1	2	1	5
Project site	1	0	0	0	2

The preliminary manatee mortality data for 2006 lists 19 manatees killed from watercraft collisions countywide with at least 2 dead manatees in Reach 30. Because the data is preliminary, we do not know the locations where the manatee carcasses were recovered within Reach 30.

Speed Zones and Manatee Refuges

The State of Florida passed a rule establishing manatee speed zones throughout Lee County in November 1999 (68C-22.005 Florida Administrative Code). Zone types and locations were

based on manatee aggregation data, manatee mortality data, manatee habitat data, and watercraft usage data. The speed zones in Mullock Creek/Ten Mile Canal were amended in 2001. The Ten Mile Canal section of this waterway system is a year-round, slow speed zone, whereas, Mullock Creek has two speed zones with (1) a slow speed year-round zone from U.S. 41 downstream to channel marker 18 and (2) a 25 mph in the channel zone from channel marker 18 to the mouth of the creek. Mullock Creek also has a depth-dependent year-round zone between channel markers 18 and 47. Whenever the water depth is greater than 2 feet, boats must travel slow speed in this section, whereas, whenever the water depth is less than 2 feet, boats may travel up to 25 mph between these two markers.

All posted speed zone signs in Lee County are in compliance with both the State-approved design parameters and Chapter 68D-23 "Uniform Waterway Markers in Florida Waters." The intent of Chapter 68D-23 is to provide for uniformity in design, construction, and coloring of markers so that all vessel operators may readily recognize, identify, and distinguish between authorized markers and unlawfully placed markers, and to provide a means by which the FWC law enforcement officers and all other law enforcement officers charged with the enforcement of this chapter may determine with reasonable certainty which boating areas are lawfully established and marked. Signage associated with the zones in Mullock Creek was determined to be incorrect and inconsistent until November 2002 when Lee County reconciled the inaccuracies.

A number of Lee County boaters were cited for speeding in manatee speed zones in 2002 (dates unknown). The boaters sued FWC claiming that the State speed zones were unconstitutional because they were not based on sound science. On November 12, 2002, the Circuit Court ruled in favor of the boaters. The Court's ruling eliminated speed zones in Estero Bay (Reach 30), Matlacha Pass, the southwest side of Pine Island, eastern San Carlos Bay, and the mouth of the Caloosahatchee River. The absence of zones and enforcement in these areas increased the potential for manatees to suffer injury and death from watercraft collisions.

The Court's ruling did not affect Federal speed zones in Lee County. The Service established Shell Island as a manatee refuge in November 2002 (67 FR 68450) and the Caloosahatchee River-San Carlos Bay as a manatee refuge in August 2003 (68 FR 46870).

In response to the court's decision, the Service exercised its authority under the Act and the MMPA to establish manatee protection areas to replace the former State speed zones through an emergency designation process. Under an emergency designation, the process to establish manatee protection areas, also known as sanctuaries or refuges, is expedited because there is substantial evidence that these areas are necessary to prevent the take of one or more manatees. Established in April 2004, the emergency manatee protection areas corresponded exactly to the State's former speed zone designations. With the emergency designation in place, the Service initiated the formal rule-making process to make the designation permanent in December 2004. The final rule establishing the Pine Island-Estero Bay Manatee refuge was published in April 2005 (70 FR 17864).

At the same time the Service implemented the emergency process to designate a manatee protection area while proposing a rule to establish the Pine Island-Estero Bay Manatee Refuge,

the State was considering amendments to the rule to re-promulgate zones in the areas affected by the County Court order and to also consider changes to the countywide rule. As required by Florida Statutes, Lee County formed a Local Rule Review Committee (LRRC) in June 2004. After having met seven times during which they assessed the existing speed zones and considered new speed zones within the county, the LRRC submitted its final report to FWC in August 2004. Subsequent to reviewing the LRRC report, FWC recommended proposed amendments to the countywide rule which were approved in June 2005. The State's new speed zones were almost identical with the boundaries of the Pine Island-Estero Bay Manatee Refuge.

It should be noted the hurricanes in 2004 and 2005 damaged or removed multiple manatee speed zone signs and posts throughout Lee County. The repair and/or replacement of signage associated with the speed zones in the rest of the county, was completed in November 2006. The absence of such signs may have led to the increase in watercraft-related manatee mortality observed in 2005-2006.

Enforcement

The importance and significance of the posting of speed zones and appropriate signage is observed in the enforcement of the zones by law enforcement personnel and increased compliance by local boaters. To effectively increase the law enforcement presence throughout Lee Count's waterways, the Sheriff's Office deputized maritime police officers with the cities of Fort Myers, Cape Coral and Sanibel. According to FWC's Division of Law Enforcement, there are 22 full time officers assigned to patrol Lee and Charlotte counties with the majority of the officers patrolling Lee County. Since January 2003, the Lee County Manatee Law Enforcement Task Force (Task Force), comprised of law enforcement personnel from FWC, the Sheriff's Office (six deputies), Fort Myers (one officer), Cape Coral (six officers), and Sanibel (one officer) have patrolled State and local speed zones posted throughout the county. This unit of maritime officers is now patrolling 12-hour shifts each day, 7 days per week, thereby, effectively increasing enforcement throughout the county. Since January 2003, the Sheriff's Office submits to the Service monthly and quarterly reports of their law enforcement activities conducted throughout the county's waterways.

The Service's Office of Law Enforcement (special agents and manatee refuge officers) established the Manatee Enforcement Program to enhance manatee protection efforts in the State of Florida. This program has 3 fulltime manatee refuge officers responsible to conduct patrol efforts statewide. In addition to the Service's coordination efforts through established task force events, our manatee refuge officers coordinate enforcement efforts with State and County counterparts year-round, increasing the law enforcement presence in manatee protection areas throughout the State.

Over the 3-day holiday weekend for Martin Luther King's Birthday in January 2007, more than 40 Federal, State and local law enforcement agencies, including FWC, patrolled the waters of 11 coastal counties as part of Operation Mermaid. The enforcement operation was designed to remind boaters to slow down for migrating manatees. Officers on more than 140 patrol boats talked to more than 5,000 boaters on approximately 1,700 boats in Brevard, Indian River,

St. Lucie, Martin, Palm Beach, Broward, Miami-Dade, Monroe, Lee, Charlotte, and Citrus counties. Officers wrote at least 377 boating citations, criminally charged 19 people and issued warnings to 757 people. While most citations were for manatee speed zone violations, boating safety also played a key role in the officers' message.

As a member of the Task Force, the Service's Office of Law Enforcement contributes to the enforcement of speed zones in Lee County. The Task Force targets their patrol efforts (= events) on Federal and State manatee speed zones where the risk to manatees encountering non-compliant boaters has been high. These task force events have been conducted in the county since 2001. Presently, law enforcement personnel from the Sheriff's Office, FWC, and the Service conduct patrols in Estero Bay and its connecting tributaries, including Mullock Creek and Ten Mile Canal. The Service, FWC, County and local law enforcement agencies have made and will continue to make a substantial commitment to enforcing manatee protection areas within the County.

Compliance

This increased enforcement action has resulted in a noticeable increase in boater compliance. Based on the task force events conducted since January 2003, Service Law Enforcement personnel have observed that boater compliance with the posted speed zones was greater than 90 percent. In the Shell Island Manatee Refuge, compliance has increased from an observed average of 80 percent during the January-March task force events to an observed estimate of approximately 99 percent during the May-June events. The observed increase in boater compliance is in the same area where the FWC (2002) conducted its compliance rate study which noted a 35 percent compliance rate with boat traffic peaking in excess of over 400 boats per hour.

According to Gorzelany (1998), a total of 3,676 vessels were evaluated from 216 hours of field surveys in Lee County. Ten sites in the Caloosahatchee River were surveyed including the Orange River, the FPL discharge canal, and the FPL intake site. Levels of compliance ranged from to 30 to 77 percent among the ten different survey sites. Overall boater compliance was 58 percent, technically noncompliant boaters comprised 26 percent of all boaters surveyed, and blatantly noncompliant boaters comprised 16 percent. Compliance ranged from 68 to 77 percent for the three sites above, respectively. The study concluded that the relationship between enforcement presence and compliance levels was statistically significant.

Gorzelany (1998) monitored boater compliance in Lee County during 1997-1998. General trends and problem areas were identified in the report. Statistically significant comparisons between compliance levels and the presence and absence of law enforcement activities were determined. Specifically, Gorzelany demonstrated that "the presence of a law enforcement vessel influenced the speed and compliance of vessels." This is particularly important since the applicant has proposed to the Corps that the permit be conditioned to require enforcement of the speed zone inside the basin during the winter months by the homeowners association.

Gorzelany's (2002) study of Mullock Creek found that, during their 12 survey events in this waterway, non-compliance with the existing speed zone was 74 percent. In addition to this finding, FWC noted during their survey events that there were no law enforcement officers

observed patrolling this waterway. Lee County stated the reason for the high degree of non-compliance with the zone and the lack of enforcement was due to inconsistent signage associated with the zone. Law enforcement officers did not focus their patrol efforts on Mullock Creek because any citation issued for violating the zone would probably be thrown out in court. The County corrected the signage problems for Mullock Creek in November 2002. Since then, FWC officers and Lee County deputies have maintained patrols in this waterway.

In general, smaller powered vessels, particularly personal watercraft, consistently had the lowest levels of compliance while larger powered vessels such as yachts and cabin cruisers were consistently among the most compliant vessel types. This was also observed in other boater compliance studies performed in Florida (Morris 1994, Tyson and Combs 1999, Shapiro 2001) and may suggest a statewide trend.

Education

Aside from enforcement, another factor influencing boater compliance is education. In 2005, the county mailed almost 50,000 copies of the Lee County Boater's Guide to every person who registered a vessel with an address in the county. The guide is periodically updated to show the latest information on manatee protection and vessel speed regulations and is the only comprehensive source for this information available to the public in the county. These guides are distributed to all area marinas, bait shops, boat dealers, realtors, and chambers of commerce. Excerpts from the Boater's Guide have been used in kiosks placed at all local public boat ramps. The signage depicts an overview of Lee County and its speed zones as well as a detailed view of the area specific to the location where a sign is installed. The Boater's Guide is also available on the County's web site.

Lee County has also worked extensively to supplement manatee education by producing a Boaters Environmental Education Module for new boaters. The intent is to make this module available for use by all groups conducting boater education classes, including the local Power Squadrons and Coast Guard Auxiliaries. These additional materials are integrated into current programs, thereby supplementing information presently provided in boater's education classes.

Summary

Designated manatee critical habitat is present within the action area and important components of manatee critical habitat are also present. These components, although not identified as primary or secondary constituent elements of critical habitat, include seagrasses for foraging, shallow areas for resting and calving, channels for travel and migration, and refugia for cold weather events. Manatees forage in the extensive seagrass beds present throughout Estero Bay and use the borrow pit in Ten Mile Canal as a warm water refuge, source for fresh water and a resting area.

During the period from January 2001 through December 2005, 11 manatee carcasses were recovered within the action area (Reach 30), including three carcasses within 1 mile of the borrow pit. Caution must be used when interpreting data on carcass locations resulting from watercraft collisions because such locations do not indicate where an animal was struck or injured or died (FWC 2002). Currents, tides and wind also play a role in moving carcasses to where they are actually recovered.

Reach 30 (Estero Bay and its tributaries) has been appropriately posted as a manatee protection area with speed restrictions since 2002. In response to the court's decision to eliminate the State's speed zones throughout Estero Bay, the Service, through an emergency designation and final rule, established the Pine Island-Estero Bay Manatee Refuge in April 2005. To address the Court's decision that some speed zones within the county were not valid, the State proposed to re-promulgate the affected zones and to consider changes to the countywide rule. FWC approved both new speed zones to replace those eliminated by the Court's ruling and revisions to some existing manatee speed zones in June 2005.

EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action on the manatee and its interrelated and interdependent activities.

Factors to be considered

New watercraft access projects may have a number of direct and indirect effects on manatees and manatee habitat. Direct impacts include potential direct harm or harassment of manatees during construction activities and are generally addressed through application of the *Standard Manatee Construction Conditions* (FWC 2005). Anticipated direct impacts to habitat, such as the presence of seagrasses within the project footprint may be minimized through modifications in the project design during the permit review process and/or the application of *Dock Construction Guidelines for Florida* (Corps and NOAA Fisheries 2001). These two minimization efforts are routinely included as conditions for the Department of the Army permits issued for construction projects in manatee habitat and have previously undergone section 7 consultation.

Indirect effects to manatees include effects to routine movement and migration patterns to fresh water, foraging, calving, and breeding areas, and associated behavior patterns. Indirect effects also include effects to manatee habitat caused by operation of the proposed watercraft access project. Construction of the proposed watercraft access project may provide increased access by watercraft to areas frequented by manatees or may alter watercraft traffic patterns in such a way as to increase watercraft-manatee interactions. The lack of protective measures for manatees, such as speed zones, signage, and enforcement, may lead to increased harassment of manatees or increased watercraft collisions with manatees. Depending on the location, construction of watercraft access projects may encourage watercraft to travel through important manatee habitat features such as submerged aquatic vegetation, warmwater refugia, and freshwater, foraging, calving, and breeding areas, thereby potentially altering manatee habitat and manatee habitat use patterns.

The proposed action is in an area that is occupied by the manatee. Though manatees may be found in and around the project site during any time of the year, they are likely to be present in the borrow pit during the colder months and unlikely to be present during the warmer months. Historically, the borrow pit has been used by local boaters for recreational activities, *e.g.*, water skiing, jet skiing, and fishing.

The timing of construction (in-water work) for this project as it relates to sensitive periods of the manatee's life cycle is unknown. However, the applicant has stated that, based on the dock design plans, no in-water work equipment is necessary and that all of the dock construction-related activities will be conducted from the uplands, thereby, minimizing any in-water work. Furthermore, if the project is authorized, it is the applicant's intent to construct the single-family docks as the waterfront lots associated with them are sold. As such, the docks are likely to be staggered in their completion as construction will occur in stages ranging from a few months to a few years depending on fluctuations in the real estate market in Lee County.

Each dock project is likely to be constructed in a single, disruptive event, which can take from 1-2 days to 4-5 days for the single-family docks. Once construction is completed, perpetual activities certain to follow include maintenance of the dock structure and watercraft entering and leaving the borrow pit through its one access. According to the marine industry, the decking on docks (single-family and multi-slip) lasts from 10-15 years whereas the undercarriage of a dock (the pilings and framework) lasts 20-30 years. Despite the absence of in-water work associated with the construction of these single-family docks, the applicant has volunteered to confine the dock construction activities during the non-winter months (March-November) in order to avoid any potential disturbance to the manatees using the borrow pit during the winter months (December-February).

Analyses for effects of the action

The Corps has determined that the proposed project is located within Reach 30 as defined by the Corps' Reach Characterization. Manatees are found in the waters in and around the project site. Designated manatee critical habitat is present within the action area and important components of manatee critical habitat are also present. These components, although not identified as primary or secondary constituent elements of critical habitat, include seagrasses for foraging, shallow areas for resting and calving, channels for travel and migration, warmwater refugia for cold weather events, and fresh water for drinking. Seagrasses are distributed throughout the action area.

One tool available for the resource agencies to use in evaluating the effects of multi-slip facilities on manatees is the Lee County MPP. As an integral part of their MPP, Lee County developed a screening process (= marine facilities siting element) as a way to evaluate potential impacts to manatees from the development of new boating facilities. The goal of this screening process is to reduce manatee/vessel interaction that could lead to manatee injury or death. The siting element pertains to the development of new sites and includes the expansion, rehabilitation and reconfiguration of existing sites; however, there are some instances in which the review process does not apply.

The proposed action is the authorization to construct 56 single-family docks within the borrow pit; however, the county's MPP does not consider single-family docks with less than five wet slips as "boat facilities" and exempts such structures from the plan's marine facilities siting element screening process. Regardless of this exemption, the Corps and the Service have elected to review these multiple single-family docks as a single multi-slip facility.

In 2005, the Service and FWC developed and implemented Interim II, a collaborative review process that addresses Federal and State permit issues as they relate to manatees. According to

the Interim II guidance, the outcome for single family docks in Florida (with a couple of exceptions) is "may affect, not likely to adversely affect." However, since the Corps and Service elected to review the proposed action as a 56-slip facility, the evaluation procedure specifies the necessity for a comprehensive site-specific review. With a shoreline length of 5,234 feet along the borrow pit, the proposed 56 slips exceeds the 1:100 density threshold (1 boat per 100 linear feet of shoreline). To be consistent with the 1:100 density threshold, the consultant agreed to the Service's suggestion to review the proposed action for 53 new slips. Thus, the Service conducted a comprehensive review of the information (manatee abundance and distribution, vessel activities, manatee mortality, speed zones and enforcement) to determine the likelihood of take of manatees in the action area (Reach 30) from boats associated with 53 new slips.

In their initial review of the Hidden Harbor project, Lee County evaluated the project as a multi-slip facility and determined that the project location did not meet the minimum depth requirements for ingress and egress corridors in accordance with the county's MPP. In response to this determination, the applicant suggested a draft restriction of 24 inches for all vessels associated with the single-family docks in the borrow pit. Subsequent reviews by Lee County have determined that (1) if the connection to the borrow pit was dredged to the required depth of -4 feet mean low water, the project would qualify for 260 slips under the MPP and (2) the 56 single-family docks permitted by the District were exempt from review by the MPP. The applicant has decided not to dredge the entrance (thereby foregoing the extra 204 slips) and intends to establish a draft restriction with a 1-foot clearance between the deepest draft of the vessel (with the engine in the down position) and the unvegetated bottom. The applicant has proposed, and the Corps has agreed, to incorporate this draft restriction as a special condition to the Department of the Army (DA) permit.

Since the proposed project is associated with a residential development, the State's authority to approve the project is delegated to the District. In its review of the Hidden Harbor project as a multi-slip facility, FWC submitted a number of recommendations for the District to consider during its evaluation of the permit application, including:

1. Establishing a draft restriction of 24 inches for all vessels associated with the project;
2. Limiting the project to a maximum of 56 slips;
3. Provide for increased law enforcement hours as outlined in the MPP; and
4. Any remaining undeveloped shoreline in the project area be placed under a conservation easement to prevent any further construction of slips.

The applicant is willing to comply with all of the conditions above except the law enforcement component since the project is not subject to the requirements of the County's MPP.

Beneficial Effects - There are no known beneficial effects to manatees from the proposed action. However, there may be a potential benefit from the project in that any waterborne activities occurring in the borrow pit are currently unregulated, whereas, if the project were approved, then waterborne activities in the borrow pit would be limited to primarily the residents of Hidden Harbor Estates.

Direct Effects - Direct effects are those effects that are caused by implementation of the proposed action at the time of construction. The direct effects of watercraft access facilities on manatees and essential features of manatee habitat (such as seagrasses), include those arising from the location, design, and construction of watercraft access facilities, and associated dredging and filling for the construction of those facilities. In examining such effects, including those on seagrasses and other important features of manatee habitat, the Service analyzes the extent to which such effects are addressed by local MPPs, State review, and other protective conservation measures, such as standard precautions to protect manatees during construction. The *Standard Manatee Construction Conditions* (FWC 2005) have been used throughout the range of the manatee for more than a decade and have proven to reduce the direct effects to manatees and their habitat within the facility footprint. The direct effects that this project will have on the manatee and critical habitat within the action area include noise from the operation of construction equipment and the placing and securing dock support structures and mooring piles. The proposed project will not directly affect seagrasses as there are none present within the borrow pit.

Though the potential for construction-related effects to the manatee will be reduced, the Corps has agreed to include as a condition of the DA permit, if approved, the *Standard Manatee Construction Conditions* (FWC 2005). The permittee shall comply with the following conditions intended to protect manatees from direct project effects:

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

b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a 4-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

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

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

e. Any collision with or injury to a manatee shall be reported immediately to the FWC Hotline at 888-404-FWCC. Collision and/or injury should also be reported to the Fish and Wildlife Service in Jacksonville (904-232-2580) for north Florida or Vero Beach (772-562-3909) for south Florida.

f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Awareness signs that have already been approved for this use by FWC must be used. One sign measuring at least 3 feet by 4 feet which reads *Caution: Manatee Area* must be posted. A second sign measuring at least 8." by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities.

In addition to the standard conditions, the applicant has proposed and the Corps has agreed to incorporate the following as a special condition to the DA permit, if approved. The following program is proposed to be implemented within the Declaration of Covenants, Conditions and Restrictions for Hidden Harbor Estates.

1. Manatee Observation Program: The Hidden Harbor Estates Homeowners Association shall implement a Manatee Observation Program designed to increase boater awareness of manatees and notify boaters of the presence of manatees within the boat basin of Hidden Harbor Estates. This program shall be implemented upon the completion of the first 20 single-family docks along with the transfer of the Hidden Harbor Estates Homeowners Association from the developer to the homeowners. The program shall be limited to the boat basin of Hidden Harbor Estates and shall include the following stipulations:

    a. The Hidden Harbor Estates Homeowners Association shall assign a Manatee Observation Captain to receive the proper training and/or certification to observe and verify the presence of manatees.

    b. The Manatee Observation Captain shall conduct training course(s) on a yearly basis to the Hidden Harbor Estates Homeowners Association members on the proper techniques for observation and verification of the presence of manatees.

    c. The Manatee Observation Captain shall implement a program that provides observers during daylight hours from November 15 to March 31, to notify boaters immediately of the presence of manatees and to proceed with caution within the Hidden Harbor Estates borrow pit (= boat basin).

2. Manatee Speed Zone signs: The permittee shall install appropriate signs at the entrance to the basin warning of the possible presence of manatees during the winter, the "slow speed, no wake" requirement, and the requirement to place the vessel motor in neutral, or turn the engine off, and to proceed without power if a manatee is observed within 50 feet of the vessel.

The manatee speed zone for the boat basin is slow speed, year-round [68C-22.005(2)(d)8 FAC]. The applicant proposes to post the appropriate signage at the entrance to the boat basin. Prior to doing so, the applicant will need to coordinate with FWC and Lee County regarding the approval and installation of regulatory signs on the waterway. The Hidden Harbor Estates Homeowners Association will function as a community watch over the boat basin.

Interrelated and Interdependent Actions - There are no interdependent or interrelated actions associated with the proposed activity that is expected to impact manatees.

Indirect Effects - Indirect effects are those long-term effects that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Authorizing a dock or marina or boat ramp in some manatee-inhabited areas indirectly affects manatees by increasing the likelihood of manatee mortality and injury resulting from collisions with new vessels associated with the permitted facility. The placement of watercraft access points has the potential to concentrate boating activities to a particular vicinity. If this area is frequented by manatees, the likelihood of watercraft collisions with manatees is increased proportional to the number of watercraft using the area, given that the boats operate at a speed that could result in collisions with manatees. Also, take in the form of harassment from watercraft could increase in certain areas with the addition of more sublethal watercraft-manatee interactions. However, the likelihood of take is reduced if the adequate and appropriate regulatory measures (*i.e.*, designated manatee speed zones with the appropriate signage coupled with the necessary speed zone enforcement to prevent watercraft collisions with manatees from occurring as a result of the proposed project) are in place.

The Service has determined the proposed 53 single-family docks will increase the number of watercraft in the action area and provide them access to Estero Bay and the Gulf of Mexico via Ten Mile Canal and Mullock Creek. Vessels in the action area are typically used for fishing and sight-seeing mostly by local residents year-round.

Species response to the proposed action

The installation of 53 single-family docks may affect the manatee by introducing watercraft and human presence in the action area. New watercraft resulting from the proposed project will likely travel downstream through Ten Mile Canal and Mullock Creek into Estero Bay and the Gulf of Mexico. The most likely effects to manatees caused by increased watercraft traffic are deaths or injuries from collisions with vessels and potential disturbance in a warm water refuge. Manatee distributions have been found to be affected by boat traffic in at least one study, with manatees moving into established sanctuary areas during periods of heavy boat traffic (Buckingham et al. 1999).

The Service believes the disruption of behavioral patterns on the manatee population from the addition of these 53 single-family docks resulting will not be significant because the waters in and around these docks are designated as slow speed year-round within Ten Mile Canal and slow speed tidal-dependent year-round in Mullock Creek, no seagrasses are present in the project site, speed zones and signs are in place and enforcement is provided by a combination of State and local law enforcement personnel.

Furthermore, there is no evidence the presence of boats in a warm water refuge, operating appropriately or moored, disturb or prevent manatees from using the same waterbody. The enclosed table lists the number of manatees counted at secondary warm water sites within the County during aerial surveys taken between two winter periods (January 1997 and January

1998). The table includes watercraft-related mortality within a 1-mile radius of each warm water site for the same periods as well as the number of moorings and boats associated with each of these secondary sites, though this data is more recent and does not reflect the same time periods (Swett et al. 2000). Based on the telemetry data, manatees continue to revisit these same sites during the winter months despite the presence of boats.

Warm water sites	1997	1998	Mortality	Moorings	Boats
Franklin Lock	1	1	0	498	285
Matlacha Isles	42	40	0	461	297
Eight Lakes	4	23	0	2,780	1,400
Ten Mile Canal	12	16	0	461	321

It should be noted the 53 single-family docks proposed by the project is consistent with the 1:100 density threshold outlined in the Interim II permit review guidance.

The Corps has agreed to include as conditions of the DA permit, if approved, and the applicant has agreed to implement, the *Standard Manatee Construction Conditions*, a maximum draft restriction of 24 inches for all vessels associated with Hidden Harbor, and the development and implementation of a community manatee observation program. The applicant's proposal to post speed zone signs associated with the boat basin will require review and approval from FWC and coordination with Lee County.

CUMULATIVE EFFECTS

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

In August 1999, the Service conducted a workshop to: (1) review what is known about the manatees' winter use of natural and industrial warmwater sites, (2) discuss the status and future of these sites, and (3) discuss information and management needs necessary to ensure the availability of warm water for wintering manatees (Service 2000). Well over half of the manatee population relies on industrial warmwater discharges for warmth during the winter. While these discharges are reliable sources of warmth, they are ephemeral in nature, restricted by the life span of generating facilities, operational limitations, fluctuating demand for power, and pending deregulation of the power generation industry. This, in combination with the fact that some industrial discharges have attracted manatees outside of their traditional wintering habitat, has put this species at risk.

One of the presentations at the workshop reported the results of a study on the manatees' response to the elimination of a warmwater refuge in north Florida. Of the 15 animals that were radio-tagged and tracked in this study, six manatees died and two were rescued between October

1997 and March 1998. A couple of the preliminary conclusions are that five of the six manatee deaths were due to prolonged exposure to colder temperatures and not all manatees migrate south to warmwater aggregation sites once their current source of warm water is eliminated. As discussed earlier in this biological opinion, manatees use this borrow pit as a warmwater refuge during the winter months. Also, as discussed earlier in this opinion, manatees use the Fort Myers Power Plant discharge as a warmwater refuge during the winter months. If the power plant were to shutdown during the winter, thereby eliminating the warmwater discharge, then hundreds of manatees would be at risk to chronic exposure to colder temperatures. As an alternate warmwater site in the action area, this borrow pit in Ten Mile Canal may become more important for manatees seeking warm water during the colder months. Thus the Service acknowledges the importance of enforcement during the winter months.

CONCLUSION

After reviewing the current status of the manatee, the environmental baseline for the action area, the effects of the proposed actions, and the cumulative effects, it is the Service's biological opinion that the actions, as proposed, are not likely to jeopardize the continued existence of the manatee and are not likely to adversely modify designated critical habitat.

In reviewing the proposed action, we evaluated the baseline data regarding manatee abundance and distribution, manatee travel patterns, manatee mortality, manatee habitat (warmwater refugia, freshwater sources, seagrasses), the number of registered vessels, boating traffic patterns, boating activities, manatee protection measures (speed zones), law enforcement, compliance, education, Lee County's MPP, and the Interim II permit review guidance.

Subsequently, we have determined that with: (1) the proposed number of docks consistent with 1:100 density threshold established in the Interim II permit review guidance; (2) the construction of single family docks consistent with the Interim II permit review guidance; (3) all dock construction activities, including any in-water work, restricted to the warmer months of the year; (4) the establishment and appropriate posting of speed zones in Ten Mile Canal, Mullock Creek, and Estero Bay; (5) the coordinated presence of law enforcement from multiple agencies in the project's vicinity and throughout Reach 30; (6) the increase in compliance by all boaters once the signage problems were corrected in 2002; (7) the low volume of vessel traffic using the Ten Mile Canal-Mullock Creek waterway; and (8) the applicant's commitment to have numerous protection measures incorporated as conditions of the Corps permit, the Service believes that the proposed action to construct 53 single-family docks is not reasonably certain to result in the take of manatees in the form of additional deaths and injuries.

INCIDENTAL TAKE STATEMENT

The Service does not anticipate the proposed action will result in the incidental take of manatees. Furthermore, the Service is not including an incidental take authorization for marine mammals at this time because the incidental take of marine mammals has not been authorized under section 101(a)(5) of the MMPA and/or its 1994 Amendments. Following issuance of such regulations or authorizations, the Service may amend this biological opinion to include an incidental take statement for marine mammals, as appropriate.

REINITIATION NOTICE

As provided in 50 CFR 402.15, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained 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 listed species or critical habitat that was 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. If you have any questions regarding this project, please contact Kalani Cairns at 772-562-3909, extension 240.

Sincerely yours,

Paul Souza
Field Supervisor
South Florida Ecological Services Office

cc:
Corps, Fort Myers, Florida (Skip Bergman and Robert Tewis)
FWC (BPSM), Tallahassee, Florida (Carol Knox)
NOAA Fisheries, St. Petersburg, Florida
Regional Solicitor, DOI, Atlanta, Georgia (Delores Young)
Service, Atlanta, Georgia (Joe Johnston) electronic copy
Service, Jacksonville, Florida (Dave Hankla)

LITERATURE CITED

Ackerman, B.B. 1995. Aerial surveys of manatee: A summary and progress report. Pages 13-33 *in* T.J. O'Shea, B.B. Ackerman, and H.F. Percival, (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington D.C.

Ackerman, B.B., S.D. Wright, R.K. Bonde, D.K. Odell, and D.J. Banowetz. 1995. Trends and patterns in mortality of manatees in Florida, 1974-1992. Pages 13-33 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival, (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Beck, C.A. and J.P. Reid. 1995. An automated photo-identification catalog for studies of the life history of the Florida manatee. Pages 120-134 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Beeler, I.E. and T.J. O'Shea. 1988. Distribution and mortality of the West Indian manatee (Trichechus manatus) in the southeastern United States: A compilation and review of recent information. Prepared by the U.S. Fish and Wildlife Service for the U.S. Army Corps of Engineers. Document No. PB 88-207 980/AS. National Technical Information Service. Springfield, Virginia.

Bengston, J.L. 1981. Ecology of manatees (Trichechus manatus) in the St. Johns River, Florida. Ph.D. Thesis. University of Minnesota, Minneapolis, Minnesota.

Bossart, G.D., D.G. Baden, R.Y. Ewing, B. Roberts, and S.D. Wright. 1998. Brevetoxicosis in manatees (Trichechus manatus latirostris) from the 1996 epizootic: gross, histologic, and immunohistochemical features. Toxicologic Pathology Volume 26(2):276-282.

Bossart, G.D., R.A. Meisner, S.A. Rommel, Shin-je Ghim, and A. Bennett Jenson. 2002. Pathological features of the Florida manatee cold stress syndrome. Aquatic Mammals 29:9–17.

Buckingham, C.A., L.W. Lefebvre, J.M. Schaefer, and H.I. Kochman. 1999. Manatee response to boating activity in a thermal refuge. Wildlife Society Bulletin 27(2):514-522.

Deutsch, C.J., R.K. Bonde, and J.P. Reid. 1998. Radio-tracking manatees from land and space: Tag design, implementation, and lessons learned from long-term study. Marine Technology Society Journal 32(1):18-29.

Deutsch, C.J., J.P. Reid, R.K. Bonde, D.E. Easton, H.I. Kochman, and T.J. O'Shea. 2003. Seasonal movements, migratory behavior and site fidelity of West Indian manatees along the Atlantic Coast of the United States. Wildlife Monographs 151:1-77.

Domning, D.P. 1982. Evolution of Manatees: A Speculative History. Journal of Paleontology 56(3):599-619.

Domning, D.P., G.S. Morgan, and C.E. Ray. 1982. North American Eocene sea cows (Mammalia: Sirenia). Smithsonian Contributions to Paleobiology; Washington, D.C.

Domning, D.P. and L-A.C. Hayek. 1986. Interspecific and intraspecific morphological variation in manatees (Sirenia: Trichechus). Marine Mammal Science 2(2):87-144.

Fertl, D., A.J. Schiro, G.T. Regan, C.A. Beck, N. Adimey, L. Price-May, A. Amos, G.A.J. Worthy, and R. Crossland. 2005. Manatee occurrence in the Northern Gulf of Mexico, west of Florida. Gulf and Caribbean Research 17:69-74.

Florida Fish and Wildlife Conservation Commission. 2002. A special study of manatees in Mullock Creek and the Caloosahatchee River eastward to the Edison Bridge. St. Petersburg, Florida. 89 pages.

Florida Fish and Wildlife Conservation Commission. 2005. *Standard Manatee Construction Conditions* <http://floridaconservation.org/psm/permit/construct.htm>. Tallahassee, Florida.

Garcia-Rodriguez, A.I., B.W. Bowen, D.P. Domning, A.A. Mignucci-Giannoni, M. Marmontel, R.A. Montoya-Ospina, B. Morales-Vela, M. Rudin, R.K. Bonde, and P.M. McGuire. 1998. Phylogeography of the West Indian manatee (*Trichechus manatus)*: how many populations and how many taxa? Molecular Ecology 7(9):1137-1149.

Garrott, R.A., B.B. Ackerman, J.R. Cary, D.M. Heisey, J.E. Reynolds, III, P.M. Rose, and J.R. Wilcox. 1994. Trends in counts of Florida manatees at winter aggregation sites. Journal of Wildlife Management 58(4):642-654.

Gerstein, E.R. 1995. The underwater audiogram of the West Indian manatee (Trichechus manatus latirostris). M.S. Thesis. Florida Atlantic University, Boca Raton, Florida.

Gorzelany, J.F. 1996. Evaluation of boater compliance with speed regulations in Sarasota County, Florida. Final report submitted to the Florida Department of Environmental Protection. Tallahassee, Florida. 106 pages.

Gorzelany, J.F. 1998. Evaluation of boat traffic patterns and boater compliance in Lee County, Florida. Final report submitted to the Florida Department of Environmental Protection. Tallahassee, Florida. 109 pages.

Gorzelany, J.F. 2002. Evaluation of boater compliance in association with new boat speed regulations at two locations in Estero Bay. Final report submitted to the Florida Fish and Wildlife Conservation Commission. St. Petersburg, Florida. 36 pages.

Gorzelany, J.F. 2004. Evaluation of boater compliance with manatee speed zones along the Gulf Coast of Florida. Coastal Management 32:215-226.

Gorzelany, J.F. 2005. Recreational boat traffic surveys of Broward County, Florida. Final report submitted to the Florida Fish and Wildlife Conservation Commission. St. Petersburg, Florida. 102 pages.

Gunter, G. 1941. Occurrence of the manatee in the United States, with records from Texas. Journal of Mammalogy 22(1):60-64.

Hartman, D.S. 1979. Ecology and behavior of the manatee (Trichechus manatus) in Florida. American Society of Mammalogists Special Publication No. 5.

Hernandez, P., J.E. Reynolds, III, H. Marsh, and M. Marmontel. 1995. Age and seasonality in spermatogenesis of Florida manatees. Pages 84-97 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Husar, S.L. 1977. The West Indian manatee (Trichechus manatus). U.S. Fish and Wildlife Service. Wildlife Resource Report No. 7:1-22.

Kadel, J.J. and G.W. Patton. 1992. Aerial studies of the West Indian manatee (Trichechus manatus) on the west coast of Florida from 1985-1990: A comprehensive 6-year study. Mote Marine Laboratory Technical Report No. 246.

Ketten, D.R., D.K. Odell, and D.P. Domning. 1992. Structure, function, and adaptation of the manatee ear. Pages 77-95 in J. Thomas, R. Kastelein, and A. Supin (eds.). Marine mammal sensory systems. Plenum Press, New York, New York.

Kinnaird, M.F. 1983. Evaluation of potential management strategies for the reduction of boat-related mortality of manatees. Research Report Number 3, Florida Cooperative Fish and Wildlife Research Unit, U.S. Fish and Wildlife Service.

Koelsch, J.K. 1997. The seasonal occurrence and ecology of Florida manatees (Trichechus manatus latirostris) in coastal waters near Sarasota, Florida. M.S. Thesis. University of South Florida, Tampa, Florida.

Langtimm, C.A., C. Beck, H. Edward, B. Ackerman, K. Fick, and S. Barton. 2004. Survival estimates for Florida manatees from the photo-identification of individuals. Marine Mammal Science 20(3):438-463.

Ledder, D.A. 1986. Food habits of the West Indian manatee (Trichechus manatus latirostris) in south Florida. M.S. Thesis, University of Miami, Coral Gables, Florida.

Lefebvre, L.W., T.J. O'Shea, G.B. Rathbun, and R.C. Best. 1989. Distribution, status, and biogeography of the West Indian manatee. Pages 567-609 in C.A. Woods (ed.). Biogeography of the West Indies: Past, Present, and Future. Sandhill Crane Press. Gainesville, Florida.

Lefebvre, L.W., B.B. Ackerman, K.M. Portier, and K.H. Pollock. 1995. Aerial survey as a technique for estimating trends in manatee population size - problems and prospects. Pages 63-74 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Lefebvre, L.W., J.P. Reid, W.J. Kenworthy, and J.A. Powell. 2000. Characterizing manatee habitat use and seagrass grazing in Florida and Puerto Rico: Implications for conservation and management. Pacific Conservation Biology 5(4):289-298.

Marine Mammal Commission. 1984. Marine Mammal Commission Annual Report to Congress 1983. Washington, D.C.

Marine Mammal Commission. 1986. Habitat protection needs for the subpopulation of West Indian manatees in the Crystal River area of northwest Florida. Document No. PB86-200250, National Technical Information Service. Silver Spring, Maryland.

Marine Mammal Commission. 1988. Preliminary assessment of habitat protection needs for West Indian manatees on the east coast of Florida and Georgia. Document No. PB89-162002, National Technical Information Service. Silver Spring, Maryland.

Marmontel, M. 1995. Age and reproduction in female Florida manatees. Pages 98-119 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Marmontel, M., T.J. O'Shea, H.I. Kochman, and S.R. Humphrey. 1996. Age determination in manatees using growth-layer-group counts in bone. Marine Mammal Science 12(1):54-88.

Morris, J.G. 1994. An investigation of compliance to boat speed regulations in manatee protection zones in Brevard County, Florida. Final report submitted to the Florida Department of Environmental Protection. Tallahassee, Florida. 74 pages.

Odell, D.K. 1981. Growth of a West Indian manatee, Trichechus manatus, born in captivity. Pages 131-140 in R. L. Brownell, Jr. and K. Ralls (eds). The West Indian manatee in Florida. Proceedings of a workshop held in Orlando, Florida, 27-29 March 1978. Florida Department of Natural Resources, Tallahassee, Florida.

Odell, D.K. 1982. The West Indian manatee, Trichechus manatus linnaeus. Pages 828-837 in J.A. Chapman and G.A. Feldhammer (eds.). Wild Mammals of North America. Johns Hopkins University Press, Baltimore, Maryland.

Odell, D.K., G.D. Bossart, M.T. Lowe, and T.D. Hopkins. 1995. Reproduction of the West Indian manatee in captivity. Pages 192-193 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

O'Shea, T.J. 1988. The past, present, and future of manatees in the southeastern United States: Realities, misunderstandings, and enigmas. Pages 184-204 in Odium, R.R., K.A. Riddleberger, and J.C. Ozier (eds.). Proceedings of the Third Southeastern Nongame and Endangered Wildlife Symposium. Georgia Department of Natural Resources. Social Circle, Georgia.

O'Shea, T.J. and W.C. Hartley. 1995. Reproduction and early-age survival of manatees at Blue Spring, Upper St. Johns River, Florida. Pages 157-170 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Packard, J.M., R.C. Summers, and L.B. Barnes. 1985. Variation of visibility bias during aerial surveys of manatees. Journal of Wildlife Management 49(2):347-351.

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

Provancha, J.A. and C.R. Hall. 1991. Observations of associations between seagrasses and manatees in East Central Florida. Florida Scientist 54(2):87-98.

Rathbun, G.B. 1999. Sirenians. Pages 390-399 in Chapter 8: Behavior. J.E. Reynolds, III, and S.A. Rommel (eds.). Biology of Marine Mammals. Smithsonian Institution Press, Washington, D.C.

Rathbun, G.B., J.P. Reid, and G. Carowan. 1990. Distribution and movement patterns of manatees (Trichechus manatus) in Northwestern peninsular Florida. Florida Marine Research Publication No. 48.

Rathbun, G.B., J.P. Reid, R.K. Bonde, and J.A. Powell. 1995. Reproduction in free-ranging Florida manatees. Pages 135-156 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Reid, J.P. and G.B. Rathbun. 1984. Manatee identification catalogue, October 1984 update. Unpublished progress report prepared by the U.S. Fish and Wildlife Service, Sirenia Project, Gainesville, Florida, for the Florida Power and Light Company.

Reid, J.P., G.B. Rathbun, and J.R. Wilcox. 1991. Distribution patterns of individually identifiable West Indian manatees (Trichechus manatus) in Florida. Marine Mammal Science 7(2):180-190.

Reid, J.P., R.K. Bonde, and T.J. O'Shea. 1995. Reproduction and mortality of radio-tagged and recognizable manatees on the Atlantic Coast of Florida. Pages 171-191 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Reinhart, R.H. 1951. A new genus of sea cow from the Miocene of Columbia. University of California, Department of Geological Science series B 28:203-213.

Reinhart, R.H. 1959. A review of the Sirenia and Desmostylia. University of California Publications of Geological Science 36:1-146.

Reynolds, J.E. 1981. Behavior patterns in the West Indian manatee, with emphasis on feeding and diving. Florida Scientist 44(4):233-241.

Reynolds, J.E. 2005. Distribution and abundance of Florida manatees (*Trichechus manatus latirostris*) around selected power plants following winter cold fronts: 2004-2005. Mote Marine Laboratory Technical Report No. 1011, Sarasota, Florida. 49 pages.

Schwartz, F.J. 1995. Florida manatees, *Trichechus manatus* (Sirenia: Trichechidae) in North Carolina 1919-1994. Brimleyana 22:53-60.

Shapiro, S.L. 2001. Assessing boater compliance with manatee speed zones in Florida. Final report to the U.S. Fish and Wildlife Service. Jacksonville, Florida. 75 pages + appendices.

Simpson, G.G. 1932. Fossil Sirenia of Florida and the evolution of the Sirenia. Bulletin of the American Museum of Natural History 59:419-503.

Snow, R.W. 1991. The distribution and relative abundance of the Florida manatee in Everglades National Park, an annual report, October 1, 1991. South Florida Research Center, Everglades National Park, Homestead, Florida.

Swett, R.A., D.A. Fann, G.A. Antonini, and L. Carlin-Alexander. 2000. Regional Waterway Management System for Lee County, Phase 1. Florida Sea Grant, University of Florida, Gainesville, Florida.

Tyson, S. and L.R. Combs. 1999. Canaveral Barge Canal boater activity and compliance study Brevard County, Florida. Final report submitted to the Florida Department of Environmental Protection. Tallahassee, Florida. 86 pages.

U.S. Army Corps of Engineers. 2001. The U.S. Army Corps of Engineers, Jacksonville District's Reach Characterization of Florida's Waters. (Last updated June 26, 2003) <http://www.saj.usace.army.mil/permit/hot_topics/manatee/charaabstract.htm>.

U.S. Army Corps of Engineers. 2005. The U.S. Army Corps of Engineers, Jacksonville District, Effect determination key for the manatee in Florida, July 12, 2005. U.S. Army Corps of Engineers, Jacksonville, Florida.

U.S. Army Corps of Engineers and National Marine Fisheries Service. 2001. Dock Construction Guidelines in Florida for docks and other minor structures constructed in or over submerged aquatic vegetation, marsh, or mangrove habitat.

U.S. Fish and Wildlife Service. 1996. Florida Manatee Recovery Plan (Trichechus manatus latirostris), Second Revision. Atlanta, Georgia.

U.S. Fish and Wildlife Service. 1999. South Florida multi-species recovery plan. Atlanta, Georgia.

U.S. Fish and Wildlife Service. 2000. Florida manatees and warm water: Proceedings of the warmwater workshop. Jupiter, Florida; August 24-25, 1999. Jacksonville, Florida.

U.S. Fish and Wildlife Service. 2001. Florida Manatee Recovery Plan (Trichechus manatus latirostris), Third Revision. Atlanta, Georgia.

Viera-Atwell, J.L. and S.L. McDonald. 2006. Re-evaluation of boater traffic and compliance rates in the Saint Sebastian River, Brevard County, Florida. Final report submitted to the U.S. Fish and Wildlife Service. 19 pages.

Weigle, B.L., I.E. Wright, M. Ross, and R.O. Flamm. 2001. Movements of radio-tagged manatees in Tampa Bay and along Florida's west coast, 1991-1996. Florida Marine Research Institute Technical Report TR-7. St. Petersburg, Florida. 156 pages.

Wright, S.D., B.B. Ackerman, R.K. Bonde, C.A. Beck, and D.J. Banowetz. 1995. Analysis of watercraft-related mortality of manatees in Florida, 1979-1991. Pages 259-268 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington D.C.