Florida Power & Light Company, 6501 S. Ocean Drive, Jensen Beach, FL 34957

FPL

April 30, 2008

L-2008-090
10 CFR 50.4

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Re: St. Lucie Units 1 and 2
Docket Nos. 50-335 and 50-389
2007 Annual Environmental Operating Report

In accordance with Section 5.4.1.2 of the St. Lucie Units 1 and 2 Environmental Protection Plans (EPP), attached is the Annual Environmental Operating Report for the calendar year 2007.

Very truly yours,

Christopher R Costanzo for SVP

Gordon L. Johnston
Site Vice President
St. Lucie Plant

GLJ/KWF

Attachment

IE25
NRR

FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT

ANNUAL ENVIRONMENTAL

OPERATING REPORT

2007

FLORIDA POWER & LIGHT COMPANY

JUNO BEACH, FLORIDA

QUANTUM RESOURCES, INC.

PALM BEACH GARDENS, FLORIDA

ENVIRONMENTAL OPERATING REPORT

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1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

The St. Lucie Plant is an electric generating station on Hutchinson Island in St. Lucie County, Florida. The plant consists of two nuclear-fueled 850 net MWe units; Unit 1 was placed on-line in March 1976 and Unit 2 in April 1983. This document has been prepared to satisfy the requirements contained in Appendix B, Environmental Protection Plan (EPP); St. Lucie Units 1 and 2 Facility Operating Licenses No. DPR-67 and No. NPF-16. This report primarily discusses environmental protection activities related to sea turtles as required by Subsection 4.2 of the EPP. Other routine annual reporting requirements are addressed in Part II.

1.2 TURTLE NESTING SURVEY

Since monitoring began in 1971, there have been considerable year-to-year fluctuations in sea turtle nesting activity on Hutchinson Island. Data collected through 2007 have shown recent reductions in loggerhead nesting on the island that are consistent with state wide loggerhead nesting numbers. Power plant operation has had no significant effect on nesting near the plant. Low nesting activity in 1975 and again in 1981-1983 in the vicinity of the plant was attributed to nighttime construction activities associated with installation of plant intake and discharge structures. Nesting returned to normal or above normal levels following both periods of construction. During 1991, daytime construction activities associated with velocity cap repairs had no apparent effect on nesting. Formal requirements to conduct nesting surveys expired in 1986, but this program was continued through 1998 with agreement from federal and state agencies. In 1998, the continuation of the nesting survey program, as well as several other sea turtle protection activities, was mandated as part of the biological opinion and incidental take statement issued by the National Marine Fisheries Service (NMFS). An amendment to the Environmental Protection Plan was approved in 1999, which included this requirement. This requirement remains in place in accordance with the most recent biological opinion issued by NMFS in May 2001.

1.3 INTAKE CANAL MONITORING

Since plant operation began in 1976, 12281 sea turtles (including recaptures) representing five different species have been removed from the intake canal. The majority of the turtles captured (57.8%) were loggerheads. Variation in the number of turtles found during different months and years have been attributed primarily to natural variations in the abundance of turtles in the vicinity of the plant, rather than to operational influences of the plant itself. During 2007, 330 sea turtles were removed from the intake canal, including 227 loggerheads, 101 green turtles, one leatherback and one hawksbill. The majority of these turtles (94%) were captured alive and released back to the ocean. Fifteen turtles (4.5%) were taken to rehabilitation facilities for treatment of non-causal injuries or disease, three turtles (0.9%) were found dead and apparently were entrained into the canal system post-mortem and one sea turtle mortality (0.3%) was considered causal to power plant operation.

Turtles confined between the barrier net and intake headwalls typically reside in the canal for a relatively short period prior to capture, and most are in good to excellent condition when caught. In recent years, fresh scrapes have been observed on up to 80% of the sea turtles captured at the intake canal. A majority of these scrapes are minor and similar to the nicks and dings we find on sea turtles that inhabit high energy near shore reefs. However, some turtles incur severe scrapes during entrainment and are taken to rehabilitation facilities for treatment. These types of injuries are counted against the take limits issued by NMFS in accordance with the Endangered Species Act (ESA). In 2007, there were no turtles sent to rehabilitation for treatment of severe scrapes. The scrapes observed on turtles at the intake canal occur during transport into the canal system and are likely due to biofouling inside the intake pipes. Inspection of the intake pipes to identify any obstructions or biofouling was completed in May 2007. The inspection identified areas of the intake pipes where biofouling could be causing injuries to sea turtles. Cleaning of the pipes began in October of 2007 and is expected to be completed during the next outage in late 2008.

A 5-inch mesh barrier net completed in January 1996 substantially reduced sea turtle residence times in the intake canal. However, during major influxes of seaweed and jellyfish this net experienced design failure and caused mortalities. To prevent this problem, FPL constructed a new, improved barrier net with additional structural support. Construction of this net was completed in November 2002. This improved design and new net material have withstood the seaweed and jellyfish events that caused previous design failure of the old barrier net. Additionally, dredging of the intake canal (completed in 2005) has reduced current velocities around the new barrier net. These actions have significantly reduced the potential for sea turtle mortalities in the plant's intake canal. However, as stated in the 2006 annual report, the barrier net had degraded with time and crucial pieces of hardware were beginning to fail. The degraded condition of the net combined with a major influx of drift algae caused the primary barrier net to fail in the fall of 2007. A temporary barrier net was installed shortly after this incident and has effectively contained sea turtles to the eastern 200 m of the intake canal. Reconstruction of the primary barrier net with an improved hardware design is scheduled for April 2008. Maintaining the integrity of this net is essential to reducing mortality rates and residency times of entrained sea turtles and is mandated by the most recent Biological Opinion issued by the National Marine Fisheries Service.

In correspondence relevant to the Incidental Take Statement of the May 2001 Biological Opinion there is language that turtle injuries or mortalities in the canal shall be counted against the take limit if they were causal to power plant operation. In response to this requirement, the contract biologists at the power plant consult with personnel from Florida Fish and Wildlife Conservation Commission to determine if injuries or mortalities are causal to power. In mortality cases where cause of death is not readily apparent, the turtle is sent to a licensed veterinarian for necropsy. In 2007, there were four mortalities of sea turtles entrained at the power plant's intake canal for a mortality rate of 1.2%. One of these events was considered causal to power plant operation for a causal mortality rate of 0.3%.

1.4 OTHER SEA TURTLE PROTECTION ACTIVITIES

As participants in the Sea Turtle Stranding and Salvage Network (STSSN), the biologist routinely respond to sea turtle strandings in St. Lucie and Martin Counties. During 2007, biologists responded to 10 sea turtle strandings. All stranding reports were sent to Florida Fish and Wildlife Conservation Commission (FFWCC).

In addition, FPL conducted 15 public service turtle walks during the 2007 nesting season. This program allowed 643 members of the public to be exposed to relevant sea turtle protection issues and, in most cases, to actually view a nesting loggerhead sea turtle.

Collaborative efforts in 2007 included blood work analysis of turtles captured at the canal as part of a project with University of Florida to establish baseline blood parameters of sea turtles captured in the wild. Cooperative studies were also conducted with Florida Atlantic University and NMFS looking at sea turtle deterrents for the longline fishery. Satellite tracking of large green turtles was conducted in collaboration with University of Central Florida.

1.5 SECTION 7 CONSULTATION AND BIOLOGICAL OPINION

In 1999, FPL exceeded their anticipated incidental take limit established by the 1997 Biological Opinion (BO) set forth by NMFS. This required reinitiation of consultation under Section 7 of the Endangered Species Act. As part of this consultation, FPL, through Ecological Associates Inc., submitted a report entitled "Physical and Ecological Factors Influencing Sea Turtle Entrainment Levels at the St. Lucie Nuclear Power Plant: 1976-1998." NMFS received the report in March of 2000 and considered this new information when developing the new opinion. On May 4, 2001, NMFS issued its BO as part of the reinitiation of consultation subsequent to the 1997 BO.

In the new Opinion there were a number of changes, most importantly in the Incidental

Take Statement. This, in summary, states that FPL will exceed their take limits for a calendar year if: more than 1000 sea turtles are captured, or more than 1% of the total number of loggerhead and green turtles (combined) are injured/killed causal to plant operation, or more than two Kemp's ridley sea turtles are injured/killed causal to plant operation, or if any hawksbill or leatherback sea turtles are injured/killed causal to plant operation. In a case where 1% of the combined loggerhead and green turtle captures is not a whole number it is rounded up (e.g. 520 combined captures = take limit of 6). If any of these events occur, reinitiation of a Section 7 consultation will be required.

Based on the latest BO issued by NMFS, FPL did not exceed its take limit during 2007. However, in 2006, FPL exceeded their sea turtle take limit at the St. Lucie power plant and reinitiation of a Section 7 consultation was required. This consultation is currently ongoing between NMFS and the NRC. NMFS is expected to issue a new Biological Opinion in 2008.

2.0 INTRODUCTION

2.1 BACKGROUND

This document has been prepared to satisfy the requirements contained in Appendix B, Environmental Protection Plan for St. Lucie Unit 1 and 2 Facility Operating License No. DPR-67 and NPF-16, respectively.

St. Lucie Units 1 and 2 use the Atlantic Ocean as a source of water for once-through condenser cooling. Since 1971, the potential environmental effects resulting from the intake and discharge of this water have been the subject of FPL sponsored biotic studies at the site. Federal jurisdiction for sea turtle studies related to the St. Lucie power plant is with the NRC, which is considered to be the lead federal agency that interfaces with NMFS relative to consultation under the Endangered Species Act. Previous results dealing with sea turtle studies are contained in twenty four annual environmental operating reports covering the period from 1983 through 2006. This report describes the 2007 environmental protection activities related to sea turtles, as required by Subsection 4.2 of the St. Lucie Units 1 and 2 Environmental Protection Plans.

2.2 AREA DESCRIPTION

The St. Lucie Plant is located on a 457-hectare site on Hutchinson Island on Florida's east coast (Figures 1 and 2). The plant is approximately midway between Ft. Pierce and St. Lucie Inlets. It is bounded on the east side by the Atlantic Ocean and on the west side by the Indian River Lagoon. Hutchinson Island is a barrier island that extends 36 km between inlets and attains its maximum width of 2 km at the plant site. Elevations approach five meters atop dunes bordering the beach and decrease to sea level in the mangrove swamps that are common on the western side. The Atlantic shoreline of Hutchinson Island is composed of sand and shell hash with intermittent

rocky promontories protruding through the beach face along the southern end of the island. Submerged coquinoid rock formations parallel much of the island off the ocean beaches. The ocean bottom immediately offshore from the plant site consists primarily of sand and shell sediments. The Florida Current, which flows parallel to the continental shelf margin, begins to diverge from the coastline at West Palm Beach. At Hutchinson Island, the current is approximately 33 km offshore. Oceanic water associated with the western boundary of the current periodically meanders over the inner shelf, especially during summer months.

2.3 PLANT DESCRIPTION

The St. Lucie Plant consists of two 850 net MWe nuclear-fueled electric generating units that use near shore ocean waters for the plant's once-through condenser cooling system. Water for this system enters through three submerged intake structures located about 365 m offshore (Figure 2). The intake structures are equipped with a velocity cap to minimize fish entrainment. Water passes through these structures and into submerged pipes (two 3.7 m and one 4.9 m in diameter) running under the beach. It then passes into a 1,500 m long intake canal, which transports it to the plant. After passing through the plant, the heated water is discharged into a 670 m long canal that leads to two buried discharge pipelines. These pass underneath the dunes and along the ocean floor to the submerged discharges, the first of which is approximately 365 m offshore and 730 m north of the intake.

3.0 SEA TURTLE PROGRAM

3.1 INTRODUCTION

Hutchinson Island, Florida, is an important rookery for the loggerhead turtle, Caretta caretta, and also supports nesting of the green turtle, Chelonia mydas, and the

leatherback turtle, Dermochelys coriacea. All three species are protected by state and federal statutes. The federal government has classified the loggerhead turtle as a threatened species. The leatherback turtle and the Florida nesting population of the green turtle are listed by the federal government as endangered species. It has been a prime concern of FPL that the St. Lucie Plant would not adversely affect the Hutchinson Island rookery. Because of this concern, FPL has sponsored monitoring of marine turtle nesting activity on the island since 1971.

Daytime surveys to quantify nesting, as well as nighttime turtle tagging programs, were conducted in odd numbered years from 1971 through 1979. During daytime nesting surveys, nine 1.25 km-long survey areas were monitored five days per week (Figure 3). The St. Lucie Plant began operation in 1976; therefore, the first three survey years (1971, 1973, and 1975) were pre-operational. Though the power plant was not operating during 1975, St. Lucie Plant Unit No. 1 ocean intake and discharge structures were installed during that year. Installation of these structures included nighttime construction activities conducted offshore from and perpendicular to the beach. Construction had been completed and the plant was in full operation during the 1977 and 1979 surveys.

A modified daytime nesting survey was conducted in 1980 during the preliminary construction of the ocean discharge structure for St. Lucie Plant Unit 2. During this study, four of the previously established 1.25 km-long survey areas were monitored. Additionally, eggs from turtle nests potentially endangered by construction activities were relocated.

Every year from 1981 through 2007, 36 one-km-long survey areas comprising the entire island were monitored seven days a week during the nesting season (Figure 3). Since the 1994 nesting season, the southern half of the island has been surveyed by Ecological Associates of Jensen Beach, Florida, and their data are included in this report. The St. Lucie Plant Unit 2 discharge structure was installed during the 1981

nesting season. Offshore and beach construction of the Unit 2 intake structure proceeded throughout the 1982 nesting season and was completed near the end of the 1983 nesting season. Construction activities associated with installation of both structures were similar to those conducted when Unit 1 intake and discharge structures were installed. Eggs from turtle nests potentially threatened by construction activities were relocated.

During 1991, another major offshore construction project was undertaken to replace damaged velocity caps on the three intake structures. A large elevated platform, from which repair activities were conducted, was erected around the three structures. Construction occurred throughout the nesting season. However, in contrast to previous offshore projects, work was restricted almost entirely to daylight hours, nighttime lighting of the work area was minimal, and no equipment or materials were used on the beach. A sea turtle protection plan implemented in support of the project included caging of nests along a 1,500 m section of beach west of the platform and release of hatchlings to unaffected areas to the north and south. This plan was intended to mitigate any negative effects potentially resulting from required safety and navigational lighting on and near the platform.

Requirement 4.2.1 of the St. Lucie Unit 2 operating license Appendix B, Environmental Protection Plan, was complete with submission of the 1986 nesting survey data (ABI, 1987). The nesting survey was continued voluntarily through 1998 with agreement from federal and state agencies. In 1998, the continuation of the nesting survey program, as well as the participation in the Sea Turtle Stranding and Salvage Network and Public Service Turtle Walks were mandated as part of the Biological Opinion and Incidental Take Statement issued by the National Marine Fisheries Service. An amendment to the Environmental Protection Plan was approved in 1999, which included these requirements. Results of the 2007 nesting survey are presented in this report and discussed in relation to previous findings.

In addition to monitoring sea turtle nesting activities and relocating nests away from plant construction areas, removal of turtles from the intake canal has been an integral part of the St. Lucie Plant environmental monitoring program. Turtles entering the ocean intake structures are entrained with cooling water and rapidly transported through the intake pipes into an enclosed canal system where they must be manually captured and returned to the ocean. Since the plant became operational in 1976, turtles entrapped in the intake canal have been systematically captured, measured, weighed, tagged, and released.

Previous publications and technical reports have presented findings of the nesting surveys, nest relocation activities and canal capture program (ABI, 1994)(Quantum, 1995 - 2006). Results of studies to assess the effects of thermal discharges on hatchling swimming speed have also been reported (ABI, 1978). In July of 1994, responsibility for sea turtle research and conservation activities was transferred from Applied Biology, Inc. to Quantum Resources, Inc. Methodologies employed in both the nesting surveys and canal capture operations remained essentially unchanged so that data collected in 1994 through the present are directly comparable to previous years' data. The purpose of this report is to: 1) present 2007 sea turtle nesting survey data and summarize observed spatial and temporal nesting patterns since 1971, 2) document and summarize predation on turtle nests since 1971, and 3) present 2007 canal capture data and summarize comparable data collected since 1976.

3.2 MATERIALS AND METHODS

3.2.1 Nesting Survey

Methodologies used during turtle nesting surveys on Hutchinson Island are described in earlier reports (ABI 1994). In 2007, similar methods were used and surveys were designed to allow comparisons with these previous studies.

In 2007, only areas C-S were surveyed by the power plant sea turtle research group (Figure 3). Ecological Associates, Inc. surveyed areas A-C as part of a beach renourishment project south of Ft. Pierce inlet. Data from those areas as well as the south end of Hutchinson Island were supplied by Ecological Associates, Inc. and were used to provide whole island nesting totals.

From mid-March 2007 through April 14, 2007 several preliminary nest surveys were conducted along Hutchinson Island in areas A-S. Twenty-three leatherback nests were recorded in areas A-S prior to the beginning of formal nesting surveys on April 15, 2007. From April 15, 2007 through September 15, 2007, nest surveys were conducted on a daily basis. Biologists used all terrain vehicles to survey the island each morning. New nests, non-nesting emergences (false crawls), and nests destroyed by predators were recorded for each of the 1-km-long survey areas A - S (Figure 3).

Data collected from beach nesting surveys were reported to the Florida Fish and Wildlife Conservation Commission (FFWCC) as part of the FFWCC Index Nesting Beach Survey and the Statewide Nesting Beach Survey. In a cooperative effort, data from stranded turtles found during beach surveys were routinely provided to the FFWCC and the National Marine Fisheries Service (NMFS) through the Sea Turtle Stranding and Salvage Network.

3.2.2 Intake Canal Monitoring

Most turtles entrapped in the St. Lucie Plant intake canal were removed by means of large-mesh tangle nets fished near the intake canal headwalls at the extreme eastern end of the intake canal (Figure 2). Nets used during 2007 were from 30 to 40 m in length, 3 to 4 meters deep and composed of 40 cm stretch mesh multifilament nylon. Large floats were attached to the surface, and unweighted lines were used along the bottom. Turtles entangled in the nets generally remained at the water's surface until removed. Since its inception in 1976, the canal capture program has been under

continual review and refinement in an attempt to minimize both entrapment time and injuries/mortalities to entrapped sea turtles. Prior to April 1990, turtle nets were usually deployed on Monday morning and retrieved on Friday afternoon. During periods of deployment, the nets were inspected for captures at least twice each day (mornings and afternoons). Additionally, St. Lucie Plant personnel checked the nets periodically, and biologists were notified immediately if a capture was observed. Sea turtle specialists were on call 24 hours a day to retrieve captured turtles from the plant intake canal system.

Beginning in April 1990, after consultation with NMFS, net deployment was scaled back to daylight hours only. Concurrently, surveillance of the intake canal was increased and biologists remained on site for the duration of each day's netting activities. This measure decreased response time for removal of entangled turtles from nets and provided an opportunity to improve daily assessments of turtle levels within the canal. Records of daily canal observations were compared with capture data to assess capture efficiencies.

In 1978, a barrier net at the A1A bridge was constructed to confine turtles to the eastern most section of the intake canal, where capture techniques have been most effective. This net is constructed of large diameter polypropylene rope and has a mesh size of 20.3 cm x 20.3 cm. A cable and series of large floats are used to keep the top of the net above the water's surface, and the bottom is anchored by a series of concrete blocks. The net is inclined at a slope of 1:1, with the bottom positioned upstream of the surface cable. This reduces bowing in the center and minimizes the risk of a weak or injured turtle being pinned underwater by strong currents.

In the past, the integrity of the barrier net was occasionally compromised, and turtles were able to move west of A1A. These turtles were further constrained downstream by an underwater intrusion detection system (UIDS) consisting, in part, of a large barrier positioned perpendicular to the north-south arm of the canal (Figure 2). The UIDS

security barrier has a mesh size of 22.9 cm x 22.9 cm. Prior to completion of the UIDS in December 1986, turtles unconfined by the A1A barrier net were usually removed from the canal at the intake wells of Units 1 and 2 (Figure 2). There they were retrieved by means of large mechanical rakes or specially designed nets. Following construction of the UIDS barrier, only the smallest individuals were able to reach the intake wells. Improvements made to the A1A barrier net during 1990 had effectively confined all turtles larger than 32.5 cm carapace length (28.7 cm carapace width) to the eastern end of the canal.

In response to the large numbers of small green turtles entrained at the intake canal in the 1990s, an improved design, small mesh barrier net was erected 150 meters east of the A1A barrier net in January 1996. This barrier net was designed to confine all turtles with a carapace width greater than 18 cm to the extreme eastern portion of the intake canal. However, the integrity of this net was often compromised by incursions of seaweed, drift algae, jellyfish, and siltation. During these events, water velocities around the net increased dramatically creating an insufficient net slope that caused several sea turtle mortalities. To address this design problem and to further alleviate mortalities, FPL constructed a new net with stronger mesh and added support structures. Dredging of the canal east of the A1A net was also conducted to minimize water velocities around the new barrier net. Construction was completed in November 2002. These improvements have enabled the new net to withstand events that caused design failure of the old barrier net, thus reducing the potential for sea turtle mortalities. However, as stated in the 2006 annual report, the barrier net had degraded with time and crucial pieces of hardware were beginning to fail. The degraded condition of the net combined with an influx of drift algae caused the primary barrier net to fail in the fall of 2007. A temporary barrier net was installed shortly after this incident and has effectively contained sea turtles to the eastern 200 m of the intake canal. Reconstruction of the primary barrier net with an improved hardware design is scheduled for April 2008. Maintaining the integrity of this net is essential to reducing

mortality rates and residency times of entrained sea turtles and is mandated by the most recent Biological Opinion issued by the National Marine Fisheries Service.

In 2007, methods to remove sea turtles from the intake canal included the use of tangle nets, dip nets and hand capture by free diving. Long handled dip nets, employed from small boats, the canal banks and headwall structures were moderately effective in capturing turtles with carapace lengths of about 30 cm or less. Divers were employed to hand capture turtles whenever underwater visibility permitted. This technique has proven highly effective in the capture of turtles of all sizes, particularly less active individuals often found partially buried in the sediment in the vicinity of the barrier net. Hand capture efforts have had a significant impact in reducing entrapment times for turtles in the intake canal.

Regardless of capture method, all turtles removed from the canal were identified to species, measured, weighed, tagged and examined for overall condition (wounds, abnormalities, parasites, etc.). Beginning in July 1994, all turtles captured have been photographed dorsally and ventrally prior to release, and the photographs retained for future reference. Additionally, beginning in July 2001, Passive Integrated Transponder tags (PIT tags) were injected subcutaneously into the right front flipper of all captured turtles as outlined in the Biological Opinion issued by NMFS in May 2001. Healthy turtles were released into the ocean the same day of capture. Sick or injured turtles were treated and occasionally held for observation prior to release. When treatment was warranted, turtles were transported to an approved rehabilitation facility after consultation with FFWCC. Beginning in 1982, necropsies were conducted on all dead turtles found in fresh condition. Currently, all fresh dead turtles are held on ice for inspection and a necropsy is performed by a qualified veterinarian.

Beginning in July 2004, blood was drawn from all turtles captured at the canal as part of a collaborative effort with the University of Florida, the Marinelife Center of Juno Beach and the Clearwater Aquarium to catalog biochemical blood parameters for wild captured

sea turtles. Due to the potential sample size collected at the power plant, this will be the largest database of sea turtle blood profiles ever compiled. These blood profiles are posted monthly on a website designed for this project by the University of Florida and will aid researchers, veterinarians and rehabilitation facilities.

Florida Power & Light Company and Quantum Resources, Inc., continued to assist other sea turtle researchers in 2007. Since the program began, data, specimens and/or assistance have been given to the Florida Fish and Wildlife Conservation Commission, National Marine Fisheries Service, US Fish and Wildlife Service, Marine Turtle Specialist Group, US Army Corps of Engineers, Smithsonian Institution, South Carolina Wildlife and Marine Resources Division, Center for Sea Turtle Research (University of Florida), Florida Atlantic University, University of Central Florida, Texas A & M University, University of Rhode Island, University of South Carolina, University of Illinois, University of Georgia, Virginia Institute of Marine Science, Duke University Marine Lab, Western Atlantic Turtle Symposium, South Atlantic Fishery Management Council, Florida Marine Fisheries Commission, Harbor Branch Oceanographic Institution and the National Research Council.

3.3 RESULTS AND DISCUSSION

3.3.1 NESTING SURVEY

3.3.1.1 2007 Loggerhead Nesting Summary

In 2007, 4525 loggerhead turtle nests were recorded in the 36 one-kilometer segments comprising Hutchinson Island. This figure marks one of the lowest nest totals recorded for Hutchinson Island since whole island surveys began and is consistent with loggerhead nesting data collected by the Florida Fish and Wildlife Conservation Commission's Index Nesting Beach Survey. Those data have revealed a significant decline in nesting numbers around the state over the last ten years. The significant

decline in loggerhead nesting on Florida's beaches over the last decade is cause for concern. This recent downward trend could reflect real problems for one of the largest loggerhead rookeries in the world or it may merely be a reflection of the cyclic nature of loggerhead nesting observed over time (Figure 6).

3.3.1.2 Spatial Distribution of Loggerhead Turtle Nests

From 1981 through 2007, 36 one-km-long segments comprising the island's coastline have been surveyed. The distribution of nests among these 36 survey areas depicts an increase in nesting from north to south along the northern half of the island (ABI, 1987, 1994). Though beach dynamics may sometimes affect the selection of nesting sites by loggerhead turtles, relationships between spatial nesting patterns and specific environmental conditions are often difficult to establish.

Not all ventures onto the beach by a female turtle culminate in successful nests. These "false crawls" (non-nesting emergences) may occur for many reasons and are commonly encountered at other rookeries. Davis and Whiting (1977) suggested that relatively high percentages of false crawls may reflect disturbances or unsatisfactory nesting beach characteristics. Therefore, certain factors may affect a turtle's preference to emerge on a beach, while other factors may affect a turtle's tendency to nest after it has emerged. An index that relates the number of nests to the number of false crawls in an area is useful in estimating the post-emergence suitability of a beach for nesting. In the present study this index is termed "nesting success" and is defined as the percentage of total emergences that result in nests (Figure 5).

Historically, the distribution of loggerhead emergences on the island has been consistent with the distribution of nests (ABI, 1987-1994), with no difference in nesting success among areas. However, in recent years zones A through C have experienced lower nesting success due to beach renourishment activities conducted just south of Ft.

Pierce Inlet. This temporary drop in nesting success has been reported at other renourished beaches throughout Florida (Steinite et al. 1998; Herren, 1999).

A variety of environmental factors (i.e., offshore bottom contours, distribution of reefs, type and extent of dune vegetation, and human activity on the beach at night) may affect loggerhead turtle emergence patterns and several such factors have been reported to affect emergence patterns on Hutchinson Island (ABI, 1988, 1989). Undoubtedly, a combination of variables accounts for the overall distribution of emergences and therefore, the overall nesting pattern on the island.

Nesting surveys on Hutchinson Island were initiated in response to concerns that the operation of the St. Lucie Plant might negatively impact the local sea turtle rookery. Previous analysis, using log-likelihood tests of independence (G-test; Sokal and Rohlf, 1981) demonstrated that the construction of the plant's offshore intake and discharge structures significantly reduced nesting at the plant site during construction years - 1975, 1981, 1982, and 1983 (ABI, 1987). However, nesting at the plant consistently returned to levels similar to or greater than those at a control site in years following construction. During 1991 when offshore construction was restricted almost entirely to daylight hours, nests were more abundant at the plant site than at the control site. Data collected through 2007 have shown that power plant operation exclusive of nighttime intake/discharge construction has had no apparent effect on nesting. In 2007, there was a drop in loggerhead nesting in Zone O, at the north end of the power plant property. This was caused by destabilization of the beach during the hurricane season of 2004. Dune restoration efforts have proven ineffective in this area and severe erosion has persisted and increased over the last several years. This has affected the beach profile and available nesting habitat in this zone.

3.3.1.3 Long-Term Trends in Loggerhead Turtle Nesting

Various analysis were used during nesting surveys prior to 1981 to estimate the total number of loggerhead nests on Hutchinson Island based on the number of nests found in the nine 1.25 km-long survey areas (ABI, 1980a). Each of these methods was subsequently found to consistently overestimate island totals (ABI, 1987). Since whole-island surveys began in 1981, it has been possible to determine the actual proportion of total nests deposited in the nine areas. In 2001, these nine 1.25 km sections were abandoned and whole island surveys were conducted in the existing 36 one-kilometer segments.

From 1981 through 1994, the total number of nests in the nine areas ranged from 32.5 to 35.6 percent of the total number of nests on the island. This is slightly higher than the 31.3 percent that would be expected based strictly on the proportion of linear coastline comprised by the nine areas. Using the 13-year mean of 33.81 percent, estimates of the total number of nests on Hutchinson Island can be calculated by multiplying the number of nests in the nine areas by 2.958. This technique, when applied to the nine survey areas during the 13 years in which the entire island was surveyed, produced whole-island estimates within 5.3 percent of the actual number of nests counted. Since the proportion of nests recorded in the nine survey areas remained relatively constant over the last 13 years, this extrapolation procedure provides a fairly accurate estimate of total loggerhead nesting for years prior to 1981, and is used to generate data points for 1971 through 1979 in Figure 6.

It is clear that loggerhead nesting activity on Hutchinson Island fluctuates considerably from year to year (Figure 6). Annual variations in nest densities are also common at other rookeries, and probably result from non-annual reproductive behavior. No relationships between annual fluctuations in nesting activity and power plant operation or intake/discharge construction were found.

3.3.1.4 Seasonal Patterns of Loggerhead Turtle Nesting

The loggerhead turtle nesting season usually begins between mid-April and early May, attains a maximum during June or July, and ends by mid-September (ABI, 1987). Nesting activity during 2007 followed this same pattern.

Cool water intrusions frequently occur over the continental shelf of southeast Florida during the summer (Smith, 1982). Typically these cold water upwelling events last less than a week and can reduce nesting activity on a short term basis, however these upwellings have little affect on overall nest numbers for the season. While these natural fluctuations in temperature have been shown to have short term affects on nesting at Hutchinson Island, there has been no indication that power plant operation has had any affect on these temporal temperature patterns (ABI, 1988).

3.3.1.5 Predation on Loggerhead Turtle Nests

Since nest surveys began in 1971, raccoon predation has been the leading cause of turtle nest destruction on Hutchinson Island. Researchers at other locations have reported raccoon predation levels as high as 70 to nearly 100 percent (Hopkins et al., 1979). Raccoon predation of loggerhead turtle nests on Hutchinson Island has not approached this level during any study year, though levels for individual 1.25 km-long areas have been as high as 80 percent. Overall predation rates for survey years 1971 through 1977 were between 21 and 44 percent, with a high of 44 percent recorded in 1973. A pronounced decrease in raccoon predation occurred after 1977, and overall predation rates for the nine areas have not exceeded 10 percent since 1979. A decline in predation rates on Hutchinson Island may be attributable to trapping programs, construction activities, habitat loss, and disease.

When compared to the previous three years, raccoon predation of loggerhead nests decreased in zones A through S. In 2007, a total of 4 nests were depredated (Figure 7).

The decrease in raccoon predation in these zones suggests that an epizootic event may have affected the raccoon population and reduced their numbers on the island.
Ghost crabs have been reported by numerous researchers as important predators of sea turtle nests (Hopkins et al, 1979; Stancyk, 1982). Though turtle nests on Hutchinson Island probably have been depredated by ghost crabs since nesting surveys began in 1971, quantification of ghost crab predation did not begin until 1983.

Overall predation rates by ghost crabs have varied from 0.1 to 2.1 percent from 1983-2006. During 2007 six loggerhead nests in areas A-S were depredated by ghost crabs (Figure 7). Nests destroyed by a combination of raccoon and ghost crab predation have been included as raccoon predations in previous discussions. When these combination predations are included as crab predations, the overall predation rates by ghost crabs range from 0.1 to 4.7 percent. During 2007, there were no such combination predations recorded. However, due to the cryptic nature of these predators, ghost crab predation in areas A-S is potentially much greater than what has been presented here. Out of 45 sea turtle nests in which hatch success was determined, 13.3% had some sign of ghost crab predation. So it is clear that relying solely on visual observations during nesting surveys severely underestimates the rate of predation by ghost crabs.

3.3.1.6 <u>2007 Green and Leatherback Nesting Summary</u>

In 2007, 549 green turtle and 366 leatherback turtle nests were recorded in the 36 one-km segments comprising Hutchinson Island. The nesting total for green turtles in 2007 was the highest total recorded since whole island surveys began. On Hutchinson Island, green turtles have had alternating years of nesting; a high nesting year followed by a low nesting year with little fluctuation (Figures 8). This bimodal pattern is also seen at other green turtle rookeries throughout their nesting range. Regardless of variation in annual nest numbers, 2007 marks another year in an overall increasing trend of green turtle nesting on Hutchinson Island. This increasing trend has also been documented by FFWCC for overall statewide green turtle nesting.

Leatherback nesting in 2007 was the highest since whole island surveys began and remains consistent with an overall increase in nesting activity seen by this species (Figure 9). Although year to year fluctuations are common, the general trend since 1971 reflects an increase in the number of leatherback nests on Hutchinson Island and is consistent with a significant increase in nest counts statewide.

3.3.1.7 Trends in Green and Leatherback Turtle Nesting

Green and leatherback turtles nest on Hutchinson Island, but in fewer numbers than loggerhead turtles. Prior to 1981, both survey (nine 1.25 km-long sections) and inter-survey areas were monitored for the presence of green and leatherback nests. Thirty-one kilometers of beach from area 1 south to the St. Lucie Inlet were included in that effort. During whole-island surveys from 1981 through 1993, only 2.6 percent (7) of the leatherback nests (n=266) and only 1.4 percent (12) of the green turtle nests (n=831) were recorded on the five kilometers of beach north of area 1. Therefore, previous counts of green and leatherback nests within the 31 kilometers surveyed probably were not appreciably different from total densities for the entire island. Based on this assumption, green and leatherback nest densities may be compared among all survey years, except 1980, when less than 15 kilometers of beach were surveyed.

Since surveys began in 1971, the number of nests observed on the island has ranged from five to 549 for green turtles and from one to 366 for leatherbacks (Figures 8 and 9). Temporal nesting patterns for these species differ from the pattern for loggerhead turtles. Green turtles typically nest on Hutchinson Island from mid-June through the first or second week of September. Leatherback turtles usually begin nesting in March or April and continue to nest through early to mid-July. Considerable fluctuations in green turtle nesting on the island have occurred among survey years (Figure 8). This is not unusual since there are drastic year-to-year fluctuations in the numbers of green turtles nesting at other breeding grounds (Carr et al., 1982). Despite these fluctuations, data

collected through 2007 suggest an overall increase in nesting since 1971 and may reflect an increase in the number of nesting females in the Hutchinson Island area. Previous surveys have shown that green turtles typically nest in greater numbers along the southern half of the island, which was also the case during the 2007 nesting season. One exception was the 2005 nesting season where there were a greater number of nests found along the northern half of Hutchinson Island.

Leatherback turtle nest numbers for 2007 represent another above average year and are consistent with an increase in nesting densities on Hutchinson Island during recent years (Figure 9). This increase in leatherback nesting has not only been reported for Hutchinson Island, but for nesting beaches to the north and south and may reflect an overall increase in the number of nesting females on the Atlantic coast of Florida.

3.3.2 INTAKE CANAL MONITORING

Entrainment of sea turtles at the St. Lucie Plant has been attributed to the presumed physical attractiveness of the offshore structures housing the intake pipes rather than to plant operating characteristics (ABI, 1980b and 1986). The velocity caps, which are supported above the openings to each intake pipe, eliminate vertical water entrainment and substantially reduce current velocities near the structures by spreading horizontal draw over a wider area. Even when both units are operating at full capacity, turtles must actively swim into the mouth of one of the pipes before they encounter current velocities sufficiently strong enough to entrain them. Consequently, a turtle's entrapment relates primarily to the probability that it will detect and subsequently enter one of the intake structures.

3.3.2.1 2007 Canal Capture Summary

In 2007, 330 sea turtles were captured in the intake canal of the St. Lucie Plant. Captures included 101 green turtles, 227 loggerheads, one leatherback and one hawksbill. (Table 1).

3.3.2.2 Relative Abundance and Temporal Distribution

Since intake canal monitoring began in May 1976, 7103 loggerhead (including 528 recaptures), 5055 green (including 1704 recaptures), 32 leatherback, 45 Kemp's Ridley and 46 hawksbill turtle captures have taken place at the St. Lucie Plant. Annual catches of all species combined ranged from a low of 33 in 1976 (partial year of plant operation and monitoring) to 944 in 2003.

Historically loggerheads have been the most abundant species in the canal. Since 1977, the first full year of plant operation, the number of loggerheads captured each year ranged from 62 in 1981 to 623 in 2004 (Figure 10). Numbers have exhibited considerable year-to-year fluctuations, but since 1976 figures show a significant increase in loggerhead capture rates at the intake canal. However, the number of loggerheads captured (227) in 2007 represents the lowest annual total since 1997. The decrease in loggerhead captures in 2007 was likely the result of two extended power plant outages during the year. During these outages, when one unit was taken off line, water flow through the intake canal system was half the normal volume. This affects the number of turtles entrained into the canal system. Outages during 2007 encompassed the months of April, May, October, November and December and likely had an affect on the number of loggerheads captured during the year.

The number of green turtles captured each year since 1977 have ranged from 3 in 1979 to a record high of 673 in 1995 (Figure 10). The increased number of captures over recent years suggests that there has been an increase in the number of turtles

inhabiting the shallow coastal reefs adjacent to the power plant's offshore intake structures. Additional years of capture data will be required before any long-term trends can be established, but clearly there was a dramatic increase in green turtle captures during the mid 1990's and though annual capture numbers vacillate, that increase has been persistent when compared to data prior to 1994. However, the number of green turtles captured in 2007 was the lowest seen at the power plant since 1992. This was likely due to the extended outages seen at the power plant. These outages encompassed five months of the year and their impact on capture rates are explained in the previous paragraph.

During 2007, the monthly catch of loggerheads ranged from 4 in December to 48 in January, with a monthly mean of 18.9 (Table 2). Over the entire history of the capture program, monthly catches have ranged from 0 to 133, with the greatest number of captures occurring during March 2004. During 2007, the monthly catch of green turtles ranged from 4 in both April and September to 20 in October, with a monthly mean of 8.4 (Table 3). The March 1996 catch of 147 green turtles is the largest number of captures, for any species, for any month on record. In the past, seasonal abundance patterns of green turtles have typically been much more pronounced than for loggerheads, with over 50 percent of all captures occurring between January and March. From 1995 through 2007, this seasonal pattern was less defined, with captures distributed more evenly throughout the year.

Captures of leatherback, hawksbill, and Kemp's Ridley turtles have been infrequent and scattered throughout the years. Each species has shown rather pronounced seasonal occurrences; over 60 percent of all leatherbacks were captured in March and April, over 60 percent of the hawksbills were captured between July and September, and almost 90 percent of the Kemp's Ridley turtles were caught between December and April.

3.3.2.3 Size-Class Distributions and Sex Ratios

The size class distribution for loggerheads removed from the intake canal in 2007 is presented in Figure 11. The size class distribution for green turtles removed from the intake canal in 2007 are presented in Figure 12. The size of the hawksbill captured in 2007 was 46.9 cm SCL. The size of the leatherback captured in 2007 was 137.7 SCL.

Of the 227 loggerheads captured in 2007 for which straight line carapace lengths are available, 152 were juveniles with a straight line carapace length (SLCL) less than or equal to 70 cm, 19 were adults (SLCL $\geq$ 85 cm) and 56 were transitional (SLCL 70-85 cm) (Hirth, 1980). The latter group probably includes both mature and immature individuals. Of the 19 turtles classified as adults for whom sex was recorded, 17 were females and two were males, with females predominating by a ratio of 8.5:1.

Of the 101 green turtles captured in 2007, 100 were juveniles or sub-adults (SLCL < 83 cm) and one was an adult female (SLCL > 83 cm) (Whitherington and Ehrhart, 1989).

3.3.2.4 Capture Efficiencies

Netting methodologies have been under continual review and refinement as net materials, configurations, and placement have been varied in an effort to minimize sea turtle entrapment times. Current capture procedures have proven to provide a safe, efficient, and cost-effective program for removing entrapped turtles from the intake canal.

Formal daily inspections of the intake canal are conducted every day that capture nets are deployed, and the number, location and relative size of entrapped turtles are recorded on field observation forms. Better utilization of currents and eddies, adjustments to tethering lines, multi-net deployments and increased efforts to hand capture turtles have contributed to reduced entrapment times during recent years.

Entrapment times may be extended for turtles swimming past the A1A barrier net (ABI, 1987). Because capture efforts west of the A1A bridge were generally less effective than those near the intake headwalls, most turtles breaching the A1A barrier net were not caught until they entered the intake wells of Units 1 and 2. The new primary barrier net, with few exceptions, has performed as designed and effectively confined sea turtles to the eastern 200 meters of canal. One exception occurred in 2007, when the net experienced heavy algae loads that caused it to fail. This failure of the primary barrier net was caused by the heavy algae load and the deterioration of key components associated with the net, mainly above-water hardware and cables. Currently a temporary barrier net, suspended by large floats is effectively keeping sea turtles confined to the eastern 200 meters of the canal system. Repair and reinforcement of the primary barrier net is scheduled to begin in April 2008. In 2007, underwater inspections of the primary barrier net were conducted quarterly. However there was not a proper inspection program in place that addressed the above-water components of the barrier net. This contributed to the structural failure of the primary barrier net and will have to be addressed when the refurbished net is installed.

Because of their relatively small sizes, virtually all turtles reaching the intake wells are green turtles. During 2007, four of the 101 green turtle captures (4.0%) occurred at the intake wells. The substantial decrease in the percentage of captures at the plant intake wells compared to the 1995 figure of 14.5 percent is attributed to the effectiveness of the primary 5-inch barrier net which was installed in November 2002. When properly in place, with better support structures and stronger mesh material the net should effectively keep turtles from reaching the intake wells.

During 2007, 98.8 percent of all turtles entrapped in the canal were captured east of the A1A bridge; 288 by tangle nets, 14 at surface of primary barrier net, eight by dipnet, 12 by hand capture and four by special nets. The effective confinement of turtles east of A1A has been a major contributor to the high capture efficiency achieved during recent

years. The installation of the improved barrier net in November 2002 has aided in the increase capture efficiency by more effectively confining turtles of all sizes to an even smaller area (closer to the headwalls).

3.3.2.5 Barrier Net Maintenance

Barrier net maintenance is a critical component in reducing the opportunity for mortalities in the plant intake well area and in reducing residency times for turtles in the intake canal system. Daily inspections are performed from a small boat to remove floating debris and to repair holes near or at the water surface. A formal dive inspection is conducted quarterly and includes hole repair, debris removal, and airlift dredging of accumulated silt if needed. Maintenance conducted in 2007 included the repair of any holes in the mesh discovered during the daily and quarterly inspections and removal of any debris. The failure of the primary barrier net in 2007 resulted from a rapid build up of algae and the failure of above-water hardware components. Problems with the above-water components were noted in the 2006 annual report. The absence of an inspection regimen that addressed the above-water components of the primary barrier net likely contributed to the failure that occurred in 2007. In 2008, when the net is reconstructed with better hardware and cables, an inspection program which includes the above-water components will be implemented to maintain the integrity of the overall structure. Maintaining the integrity of the primary barrier net is essential to reducing mortality rates and residency times of entrained sea turtles and is mandated by the most recent Biological Opinion issued by the National Marine Fisheries Service. The Biological Opinion states "FP&L shall maintain a 5 inch barrier net across the intake canal, east of the existing 8 inch mesh barrier net".

3.3.2.6 Intake Pipe Cleaning and Maintenance

The number of sea turtles incurring scrapes during transit through the intake pipes has steadily increased since monitoring of these scrapes began in 2002. The scrapes vary

in degree of severity, with most being minor and similar to those found on sea turtles that inhabit near shore reefs. However, some of these scrapes are moderate to severe, causing some turtles to be sent to rehabilitation facilities for treatment. Any sea turtle sent for treatment was considered "take" and went against the take limit set by NMFS. This prompted FPL to inspect the intake pipes in April 2007 and schedule cleaning of biofouling and marine debris that were thought to be causing the scrapes to entrained sea turtles. In October 2007, cleaning of the intake pipes and offshore intake structures began. Work inside the intake pipes required relatively calm seas and during October, November and December there were only a limited number of days where seas were at an acceptable level for diver safety. Despite weather days, the project managed to complete the cleaning of one 12' intake pipe and offshore structure housing it, as well as the cleaning of the other 12' intake pipe offshore structure. Additionally, loose debris (concrete chunks..etc.) were removed from the second 12' intake pipe. The complete cleaning of the second 12' intake pipe and 16' pipe and associated offshore structure are scheduled for upcoming outages late in 2008. Other work completed during this project included sealing off two pipe openings that extended from the top of the two 12' intake pipes. These pipe openings were approximately 100' in from the headwall and had originally been planned to be part of a back flushing system that was abandoned during construction of the 12' intake pipes. These pipe openings were inspected and effectively sealed off.

3.3.2.7 Relative Condition

Turtles captured alive in the intake canal of the St. Lucie Plant were assigned a relative condition based on weight, activity, parasite infestation, barnacle coverage, injuries and any other abnormalities which might affect overall vitality. During 2007, 89.9% (204) of all loggerheads found in the canal were alive and in good condition. Only 8.8% (20) of all loggerheads involved individuals in fair or poor condition and 1.3% (3) were found dead. Of the 101 green turtles removed from the intake canal during 2007, 94.1% (95) were in good condition, 5.0% (5) were in fair or poor condition and 1.0% (1) were found

dead. Conditions for all other species of sea turtles captured at the intake canal in 2007 were categorized as good.

Relative condition ratings can be influenced by a number of factors, some related and others unrelated to entrainment and/or entrapment in the intake canal. A rating of good indicates that turtles have not been negatively impacted by their entrapment in the canal, at least as evidenced by physical appearance. Although ratings of fair or poor imply reduced vitality, the extent to which entrainment and entrapment is responsible is often indeterminable. In some instances, conditions responsible for lower ratings, such as boat collision or fisheries gear entanglement obviously were sustained prior to entrainment. However, in recent years turtles have been found with fresh scrapes and cuts, incurred during entrainment, which in some cases have had a negative effect on their relative condition rating. Of the 330 turtles removed from the intake canal during 2007, 271 (82%) were observed having fresh cuts and scrapes.

Of the 326 live removals during 2007, 311 were released into the ocean on the day of capture. Thirteen loggerheads and two green turtles in obvious ill health or suffering serious injuries were transported to either Sea World of Florida, the Marinelife Center of Juno Beach, the Turtle Hospital in Marathon, Volusia Science Center, or to Clearwater Aquarium for treatment and rehabilitation. One green turtle with fibropapilloma tumors was captured and released from the canal to the ocean that same day.

3.3.2.8 Mortalities and Injuries

Sea turtle mortalities have been closely monitored throughout the life of the capture program at the canal in an attempt to assign probable causes and take appropriate remedial action to minimize future occurrences. Previous analyses of capture data identified drowning in nets (A1A barrier net, UIDS barrier, and tangle nets), drowning in the intake pipes during periods of reduced intake flow, injuries sustained from dredging operations and injuries sustained from the mechanical rakes used in the intake wells as

probable mortality factors (ABI,1987)(FPL, 1995). Since that analysis design changes have addressed each of these problem areas and have reduced mortalities significantly. Since 1996, mortalities from drowning in nets have been reduced to 0.13% of all captured turtles, mortalities associated with the intake wells have been reduced to 0.05%, mortalities caused by drowning in the intake pipes have been reduced to 0.02% of all turtles captured and there have been no injuries or mortalities associated with dredging operations in the intake canal.

Over the entire monitoring program's history, 148 (2.1%) of the 7103 loggerheads and 75 (1.5%) of the 5055 green turtles entrapped in the canal were found dead. Mortalities spanned the range of size classes for loggerheads (SLCL = 39.8-108.0 cm), while green turtle mortalities primarily involved juveniles less than 48 cm in length. One exception was an adult male green turtle that was injured upon entrainment and was sent to a rehabilitation facility where it later expired. The four Kemp's Ridley mortalities documented at the plant during 1987 and 1988 were the only deaths for this species to date; no dead leatherback or hawksbill turtles have ever been recorded at the St. Lucie Plant.

Modifications to capture procedures, improvements to barrier nets and virtual elimination of low flow conditions within the intake pipes have resulted in a substantial reduction in sea turtle mortalities over the life of the canal capture program. Mortality rate, expressed as the percentage of total captures involving dead animals, declined from 7.8 percent during the period 1976-1984 to less than 1.0% since 1990 (Table 1).

In 2007, four mortalities were recorded at the St. Lucie power plant intake canal; three loggerheads and one green turtle. One of these mortalities was considered causal to power plant operation. An immature green turtle was found dead near the surface of the primary barrier net on June 6. The turtle was transported to a rehabilitation facility where a necropsy was performed by Dr. Nancy Mettee. Based on the gross necropsy and pathology findings, it was determined that there was no evidence of any pre-

existing disease and that the cause of death was by drowning. This mortality was causal to power plant operation and went against the take limit established under the current Section 7 Biological Opinion set forth by NMFS.

The other three mortalities observed during 2007 were considered not causal to power plant operations. These determinations were made after discussing the incidents, in detail with personnel from FFWCC. The first event occurred on January 2 when a severely decomposed sub-adult loggerhead was found at the surface of the primary barrier net. This loggerhead was too severely decomposed to conduct a necropsy that would definitively explain cause of death and was considered not causal to power plant operation. Observations of turtles are recorded during each day and if a sick or injured turtle was in the relatively small area between the primary barrier net and the headwall it would have been identified. Due to the hours of observation and netting effort conducted by the biologist at the intake canal it is likely that this turtle was entrained into the canal system in post mortem condition. A second event occurred on September 20 when a moderately decomposed sub-adult loggerhead was found at the surface of the primary barrier net. The turtle was too decomposed to definitively give an explanation to the cause of death. After consultation with personnel from FFWCC it was determined that this turtle was likely entrained into the canal system in the condition it was found and the event was not causal to power plant operation. The third mortality was observed on October 10, where a moderately decomposed, subadult loggerhead was found floating just west of the 12' intake pipe headwall. Again, this turtle was too decomposed to conduct a necropsy to determine cause of death, but this turtle was observed by biologist as it came through the intake pipes and into the canal system in the decomposed condition it was found. Given the level of decomposition and the amount of flow coming through the pipes, we can definitively say that this turtle was entrained in a post mortem condition. After consultation with personnel from FFWCC it was determined that this event was not causal to power plant operation. The overall morality rate for 2007 was 1.2%.

Injuries causal to power plant operation are recorded and go against the take limit established in the Biological Opinion set forth by NMFS. In 2007, there were no injuries that were considered causal to power plant operation.

3.3.2.9 NMFS Section 7 Consultations

In 1999, FPL exceeded their anticipated incidental take limit established by the 1997 Biological Opinion (BO) set forth by NMFS. This required reinitiation of consultation under Section 7 of the Endangered Species Act. As part of this consultation FPL, through Ecological Associates Inc., submitted a report entitled "Physical and Ecological Factors Influencing Sea Turtle Entrainment Levels at the St. Lucie Nuclear Power Plant: 1976-1998." NMFS received the report in March 2000 and considered this new information when developing the new Opinion. On May 4, 2001, NMFS issued it's BO as part of the reinitiation of consultation subsequent to the 1997 BO. In the new Opinion, there were a number of changes, most importantly in the Incidental Take Statement. This in summary, stated that FPL will exceed their take limits for a calendar year if: more than 1000 sea turtles are captured, or 1% or more of the total number of loggerhead and green turtles (combined) are injured or killed causal to plant operation, or more than two Kemp's Ridley sea turtles are injured or killed causal to plant operation, or if any Hawksbill or leatherback sea turtles are injured or killed causal to plant operation. In a case where 1% of the combined loggerhead and green turtle captures are not a whole number, it is rounded up (e.g. 520 combined captures = take limit of 6). If any of these events occur, reinitiation of a Section 7 consultation will be required. In 2006, seven injuries and one mortality were considered causal to power plant operation and went against the take limit described above. Additionally, 21 hatchlings during one event in 2006 were found dead in the intake wells and went against the take limit. Those injuries and mortalities exceeded the take limit established by NMFS and required reinitiation of a Section 7 consultation between the NRC and NMFS. Currently, that consultation is ongoing and a new Biological Opinion

will be issued by NMFS in the coming months. In 2007, FPL did not exceed their take limit as outlined in the most current Biological Opinion.

3.3.2.a Recapture Incidents

Since the St. Lucie Plant capture program began, most turtles removed from the intake canal have been tagged and released into the ocean at various locations along Hutchinson Island. Consequently, individual turtles can be identified as long as they retain their tags. Over the history of the program at the St. Lucie Plant, 2232 recapture events (528 loggerheads and 1704 green turtles) have occurred. The recapture rate for green turtles in 2007 was 61.4% and the recapture rate for loggerheads was 10.1%. The large number of green turtle recaptures probably reflects the saturation of the local green turtle aggregation by turtles tagged at the St. Lucie Plant. Occasionally, turtles are captured that have been tagged by other researchers. There were two such captures in 2007 which included one loggerhead and one leatherback. These turtles were originally captured and tagged in Florida.

3.4 OTHER SEA TURTLE PROTECTION ACTIVITIES

As participants in the Sea Turtle Stranding and Salvage Network (STSSN), biologists routinely respond to sea turtle strandings in St. Lucie and Martin Counties. During 2007, biologists responded to 10 sea turtle strandings. All stranding reports were sent to Florida Fish and Wildlife Conservation Commission (FFWCC).

In addition to stranding efforts, FPL conducted 15 public service turtle walks during the 2007 nesting season. This program allowed 643 members of the public to be exposed to relevant sea turtle protection issues and, in most cases, to actually view a nesting loggerhead sea turtle.

3.5 SUMMARY

A gradient of increasing loggerhead turtle nest densities from north to south along the northern half of Hutchinson Island has been shown during most survey years. This gradient may result from variations in beach topography, offshore depth contours, distribution of near shore reefs, onshore artificial lighting, and human activity on the beach at night. Low nesting activity in the vicinity of the power plant during 1975 and from 1981 through 1983 was attributed to nighttime construction activities associated with installation of power plant intake and discharge structures. Nesting returned to normal or above normal levels following both periods of construction. During 1991, daytime construction activities associated with velocity cap repairs had no apparent effect on nesting. Statistical analyses indicate that power plant operation, exclusive of nighttime construction, has had no significant effect on nest densities near the plant.

During the 2007 nesting season 4525 loggerhead turtle nests were recorded on Hutchinson Island. This marks one of the lowest loggerhead nesting years recorded since whole island surveys began and is consistent with statewide totals reported by FFWCC. There have been considerable year-to-year fluctuations in loggerhead nesting activity on Hutchinson Island from 1971 through 2007. These fluctuations are common at other rookeries and may result from non-annual reproductive behavior. However, no relationship between total nesting on the island and power plant operation or intake/discharge construction has been indicated by past studies.

Temporal nesting patterns of the Hutchinson Island population may be influenced by natural, large scale fluctuations in water temperature, such as those produced by the cool water intrusions that frequently occur over the continental shelf of southeast Florida during the nesting season. However, localized fluctuations in water temperature associated with power plant operation have had no apparent effect on nesting.

Since nesting surveys began in 1971, raccoon predation has been the leading cause of turtle nest destruction on Hutchinson Island. From 1971 through 1977, overall predation

rates in the nine survey areas were between 21 and 44 percent. However, a pronounced decrease in raccoon predation occurred after 1977, and overall predation rates in the nine survey areas have not exceeded 10 percent since 1979. In 2007, there were four documented raccoon predations within areas A-S. As noted above it is possible that an epizootic, possibly distemper, reduced raccoon populations on the north half of Hutchinson Island and the newly recruited raccoons have not yet learned how to exploit sea turtle nests for food. Ghost crab predation of turtle nests on Hutchinson Island remained low in 2007. However, due to their cryptic nature, ghost crab predation may be more significant than previously documented.

During 2007, 549 green turtle and 366 leatherback turtle nests were recorded on Hutchinson Island. Nesting activity by these two species has exhibited considerable annual fluctuation, as has been recorded at other rookeries, but there has been an increasing trend in recent years. This may reflect an overall increase in the number of nesting green and leatherback turtles in the Hutchinson Island area.

During 2007, 227 loggerheads, 101 green turtles, one leatherback, and one hawksbill were removed from the St. Lucie Plant intake canal. Since monitoring began in May of 1976, 7103 loggerheads, 5055 greens, 32 leatherbacks, 46 hawksbills and 45 Kemp's ridley's have been captured and tagged. Over the life of the monitoring program, annual catches for loggerhead turtles have ranged from 33 in 1976 (partial year of plant operation and monitoring) to a high of 623 in 2004. Yearly catches of green turtles have ranged from 0 in 1976 to 673 in 1995. Differences in the number of turtles entrapped during different years and months are attributed primarily to natural variation in the occurrence of turtles in the vicinity of the offshore intake structures, rather than to plant operation characteristics.

Size-class distributions of loggerhead turtles removed each year from the canal have consistently been predominated by juveniles between 50 and 70 cm in straight line carapace length. Over 65 percent of all green turtles entrapped in the canal were

juveniles 45 cm or less in length. For both species, the largest number of captures for all years combined occurred during the winter months. These seasonal peaks have generally been more pronounced for green turtles, but since 1995, green turtle captures have tended to be distributed more evenly throughout the year.

During 2007, 89.9% (204) of all loggerheads found in the canal were alive and in good condition. Only 8.8% (20) of all loggerheads involved individuals in fair or poor condition and 1.3% (3) were found dead. Of the 101 green turtles removed from the intake canal during 2007, 94.1% (95) were in good condition, 5.0% (5) were in fair or poor condition and 1.0% (1) was found dead. Conditions for all other species of sea turtles captured at the intake canal in 2007 were categorized as good. However, fresh scrapes incurred during transport through the intake pipes have increasingly been noted on the carapace and soft tissue of sea turtles. Some of these injuries were severe and resulted in causal events reported to the NRC. In 2007, there were no injuries or severe scrapes that went against the take limit established by NMFS. Once in the canal, turtles confined east of the new barrier net had very brief residency times and were not adversely affected by their time in the intake canal.

In 2007, four mortalities were recorded at the St. Lucie power plant intake canal; three loggerheads and one green turtle. One of these mortalities was considered causal to power plant operation and went against the take limit established by NMFS in the latest Biological Opinion. The causal mortality rate for 2007 was 0.3%. In 2006, FPL exceeded their take limit and reinitiated a Section 7 consultation between the NRC and NMFS. This consultation is ongoing and a new Biological Opinion is expected from NMFS in 2008.

Program modifications, including continual surveillance of tangle nets during periods of deployment, improvements to the integrity of the barrier net system and greater effort to hand capture turtles have contributed to a substantial decline in sea turtle mortalities during recent years. However in 2007, the primary barrier net experienced heavy algae

loads that caused it to fail. This failure was caused by the heavy algae load and the deterioration of key components associated with the net, mainly above-water hardware and cables. Currently a temporary barrier net, suspended by large floats is effectively keeping sea turtles confined to the eastern 200 meters of the canal system. Repair and reinforcement of the primary barrier net is scheduled to begin in April 2008. Keeping this barrier net system maintained and functioning is imperative to keeping mortality rates and residency times to a minimum.

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5.0 FIGURES

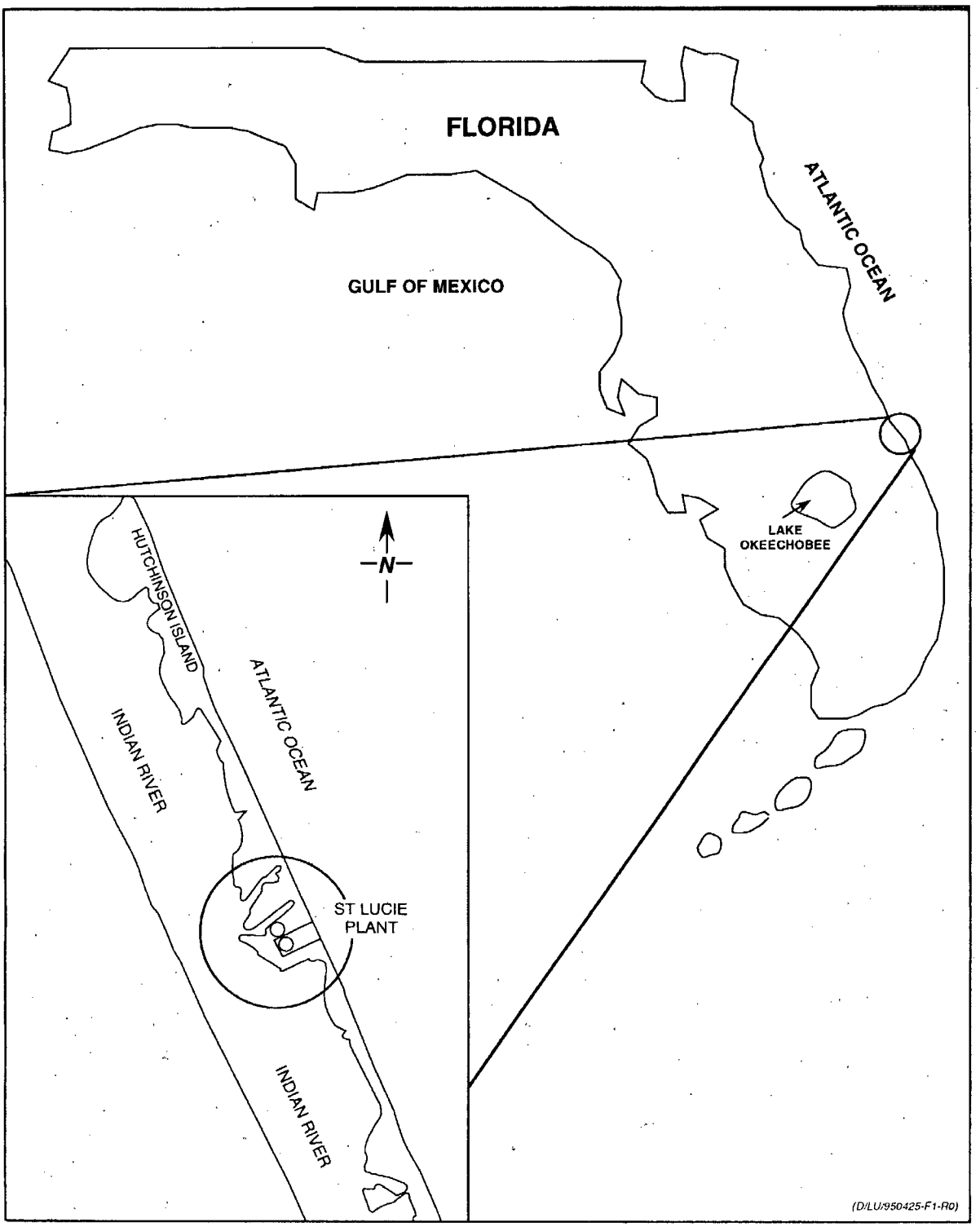

Figure 1. Location of St. Lucie Plant on Hutchinson Island, Florida.

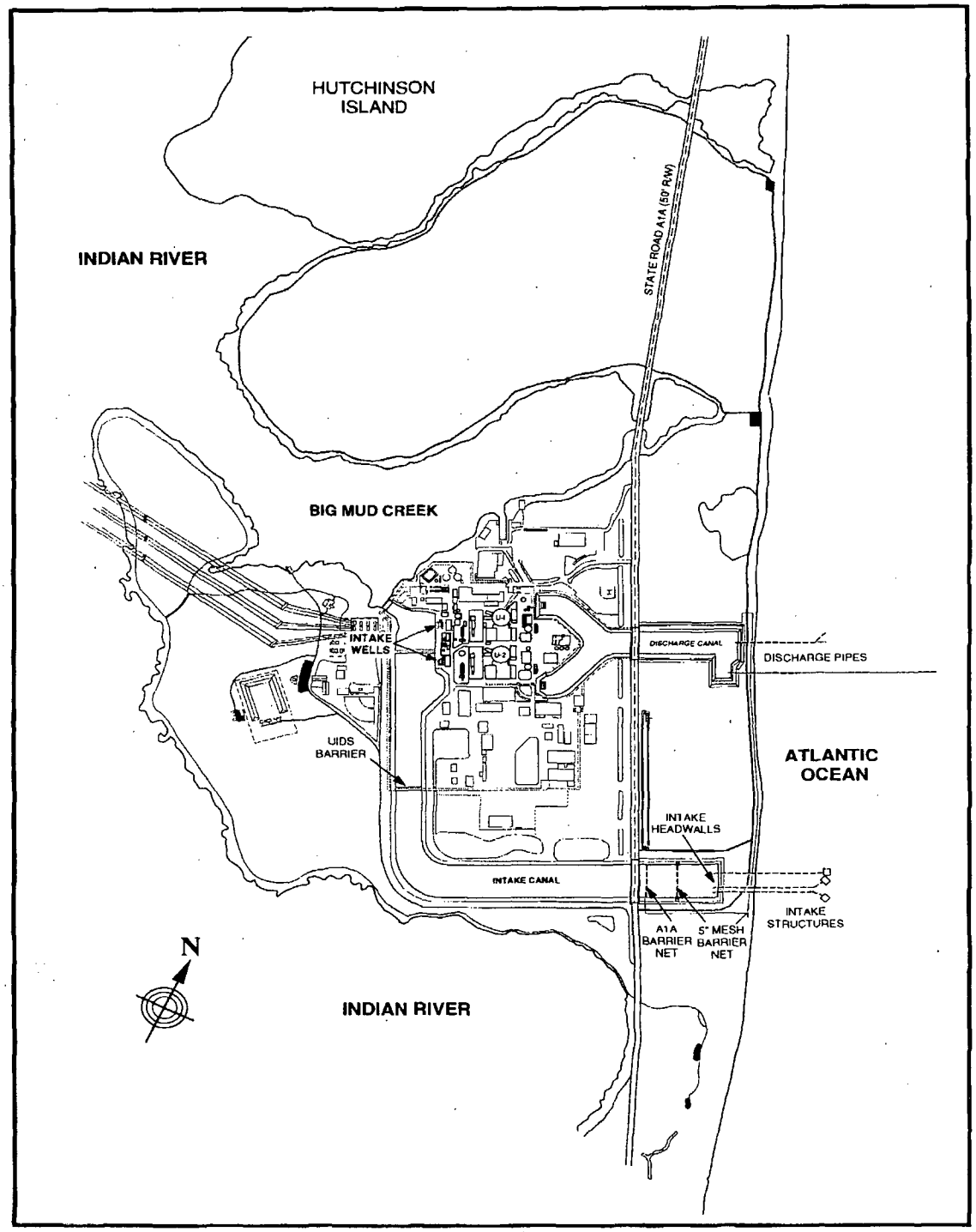

Figure 2. St. Lucie Plant Cooling Water Intake and Discharge System

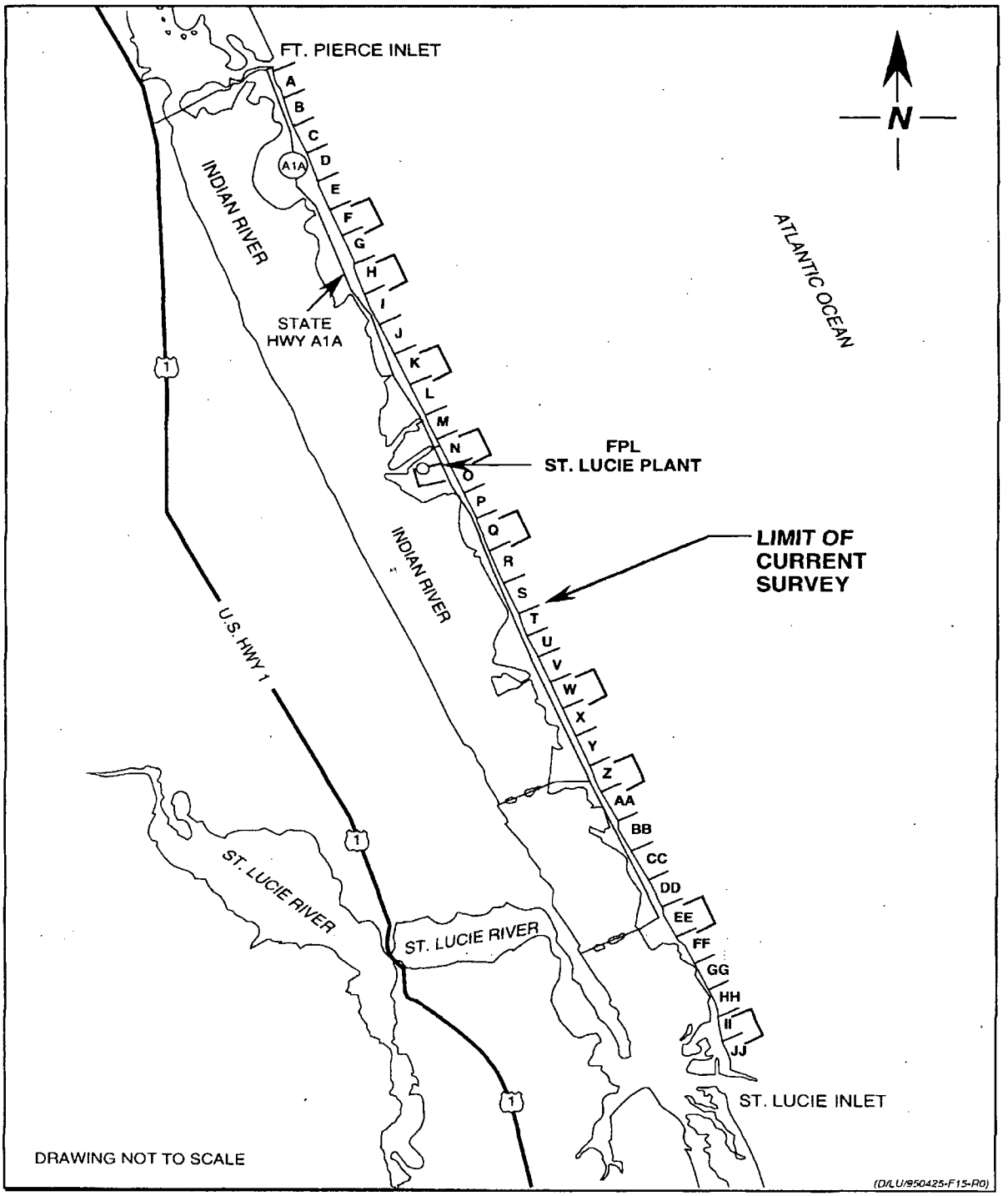

Figure 3. Designation and Location of Nine 1.25-Km Segments and Thirty-Six 1-Km Segments Surveyed for Sea Turtle Nesting, Hutchinson Island. 1971-2007.

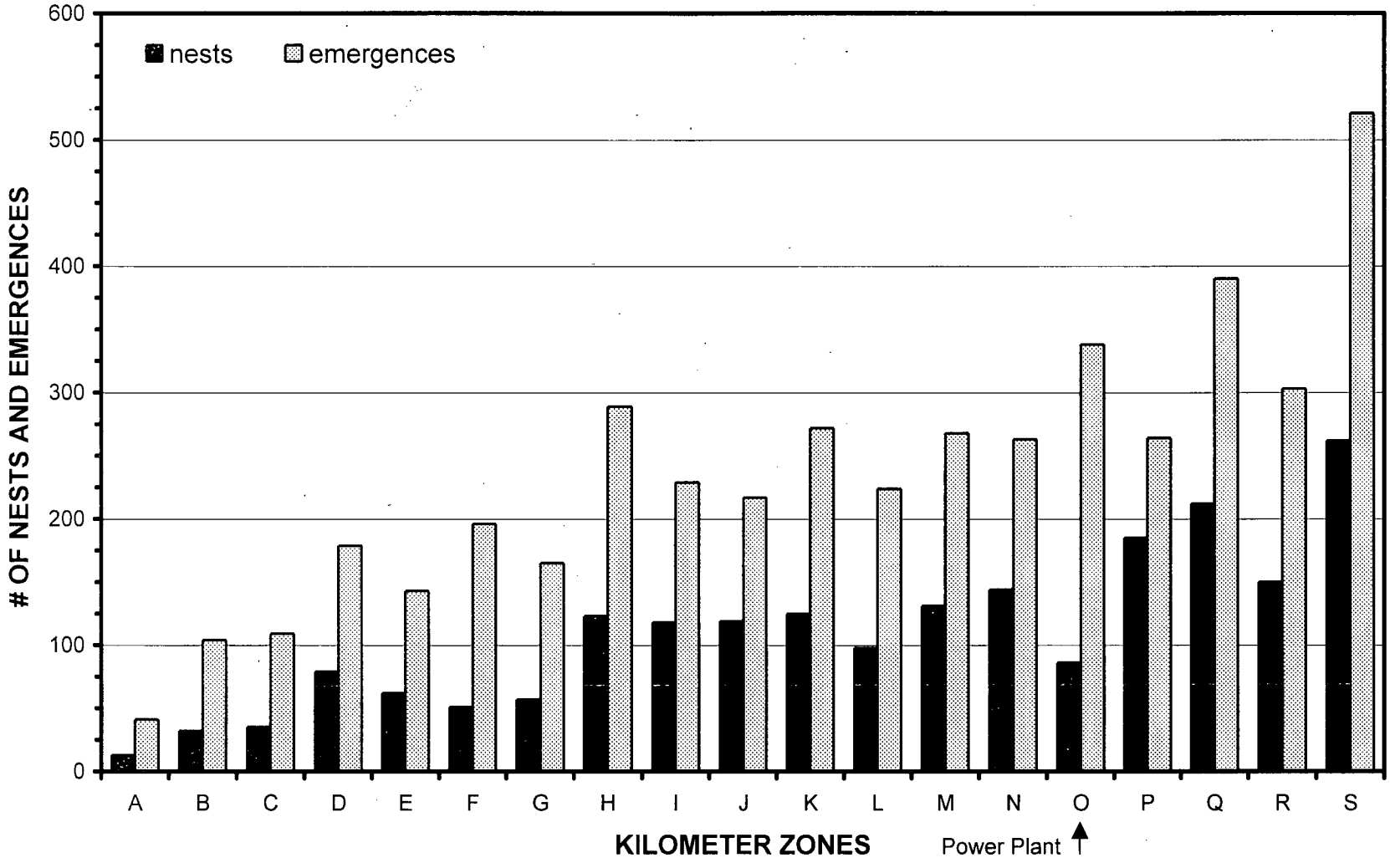

Figure 4. Number of loggerhead turtle nests and emergences for kilometer zones A through S (North to South), Hutchinson Island, April through September 2007.

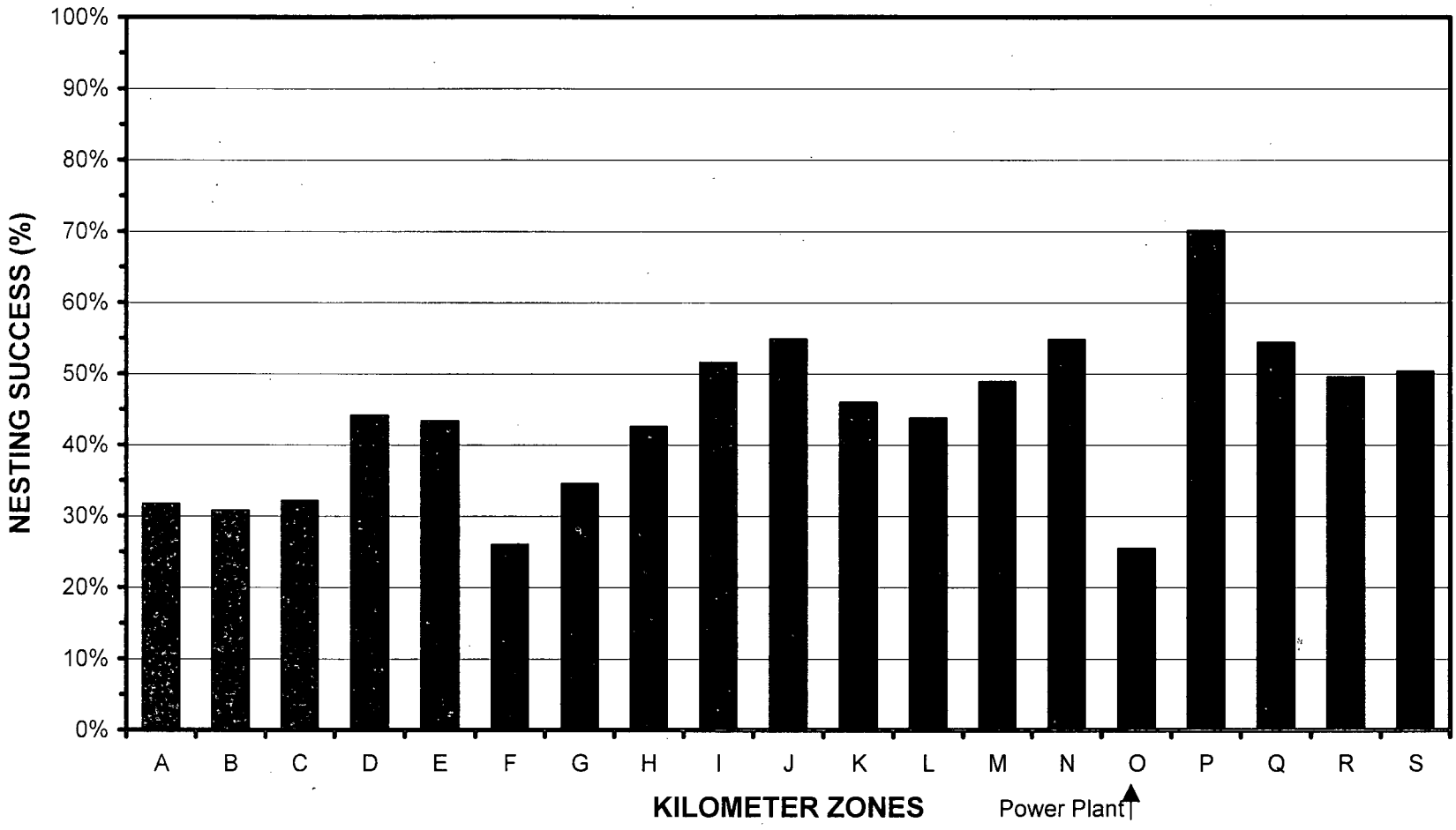

Figure 5. Loggerhead turtle nesting success (percentage of emergences resulting in nests) for kilometer zones A through S (North to South), Hutchinson Island, April through September 2007.

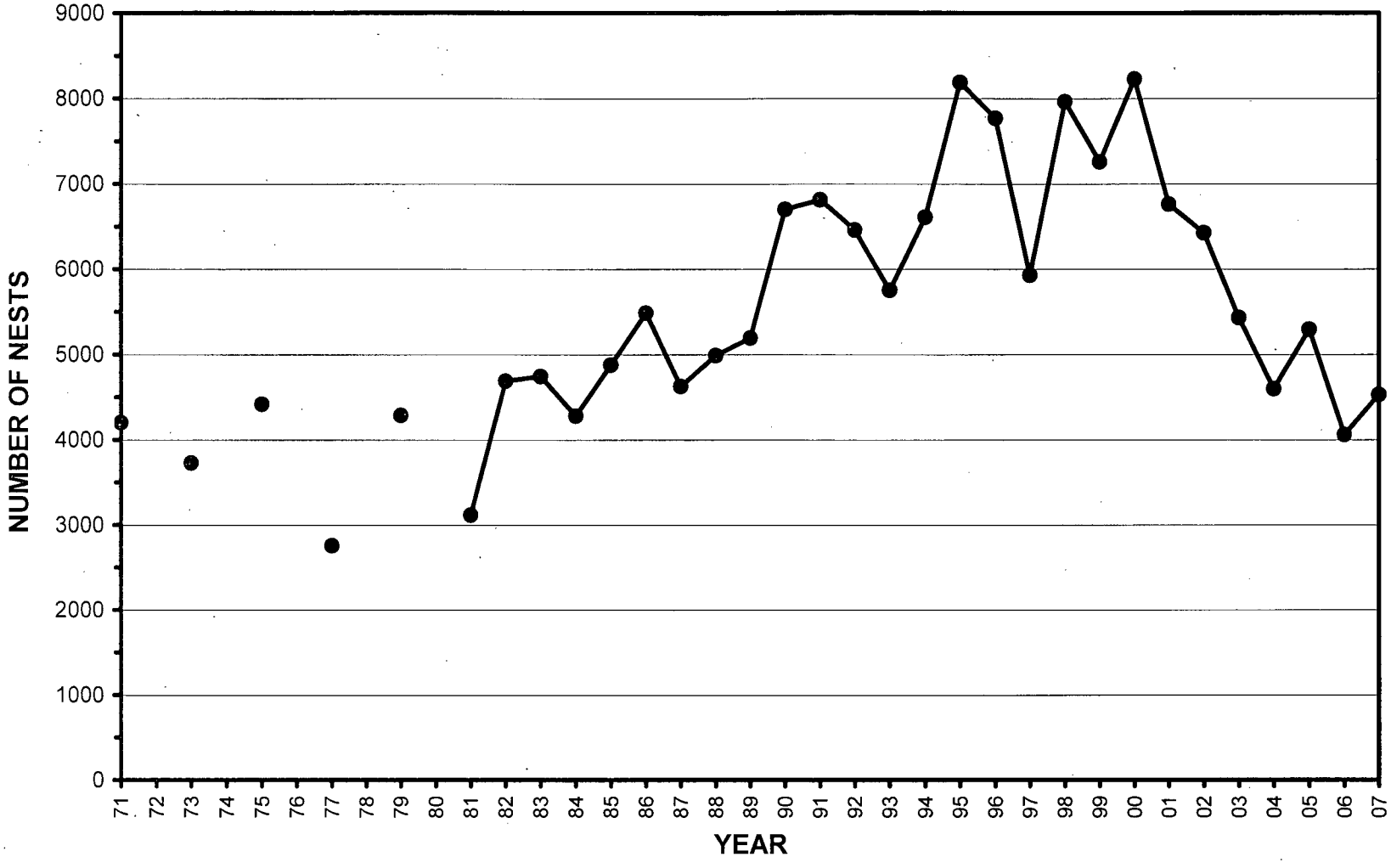

Figure 6. Number of loggerhead turtle nests, Hutchinson Island 1971 through 2007. Values for 1971 through 1979 are estimates (see text), values for 1981 through 2007 are from whole island surveys.

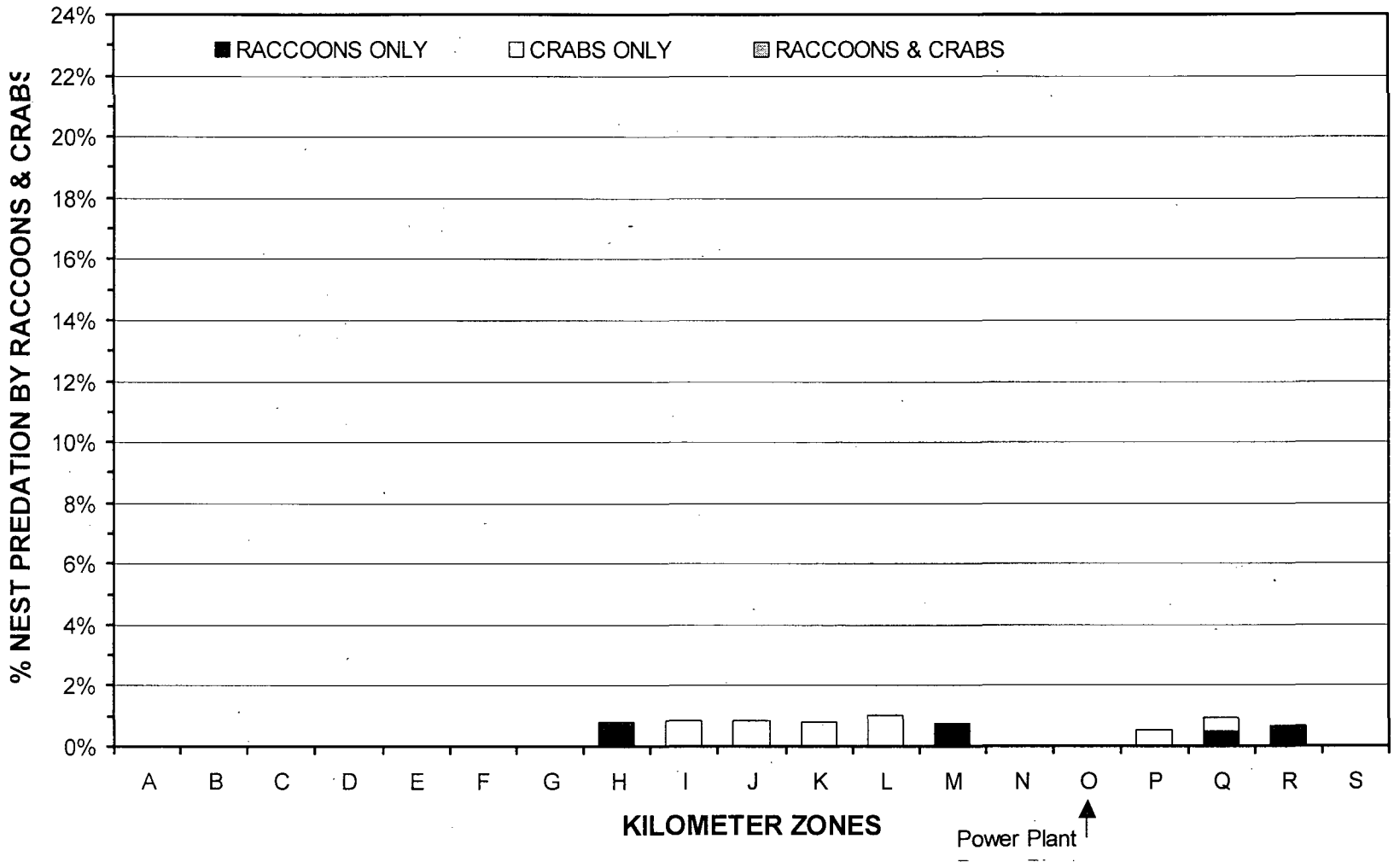

Figure 7. Percentage of loggerhead turtle nests depredated by raccoons and/or ghost crabs in kilometer zones A through S (North to South), Hutchinson Island, April through September 2007.

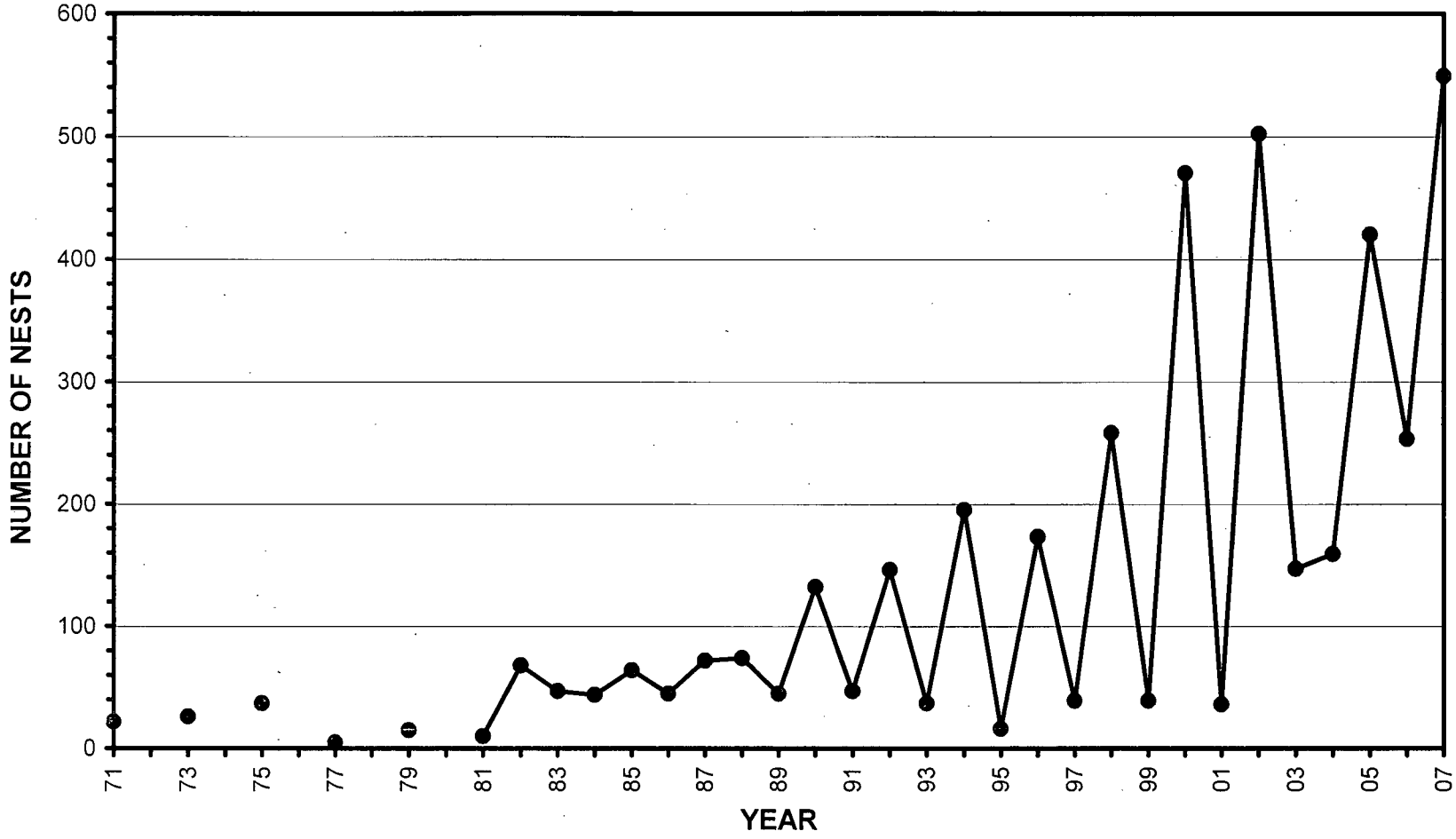

Figure 8. Number of green turtle nests, Hutchinson Island, 1971 through 2007. Values for 1971 through 1979 are estimates (see text). Values for 1981 through 2007 are from whole island surveys.

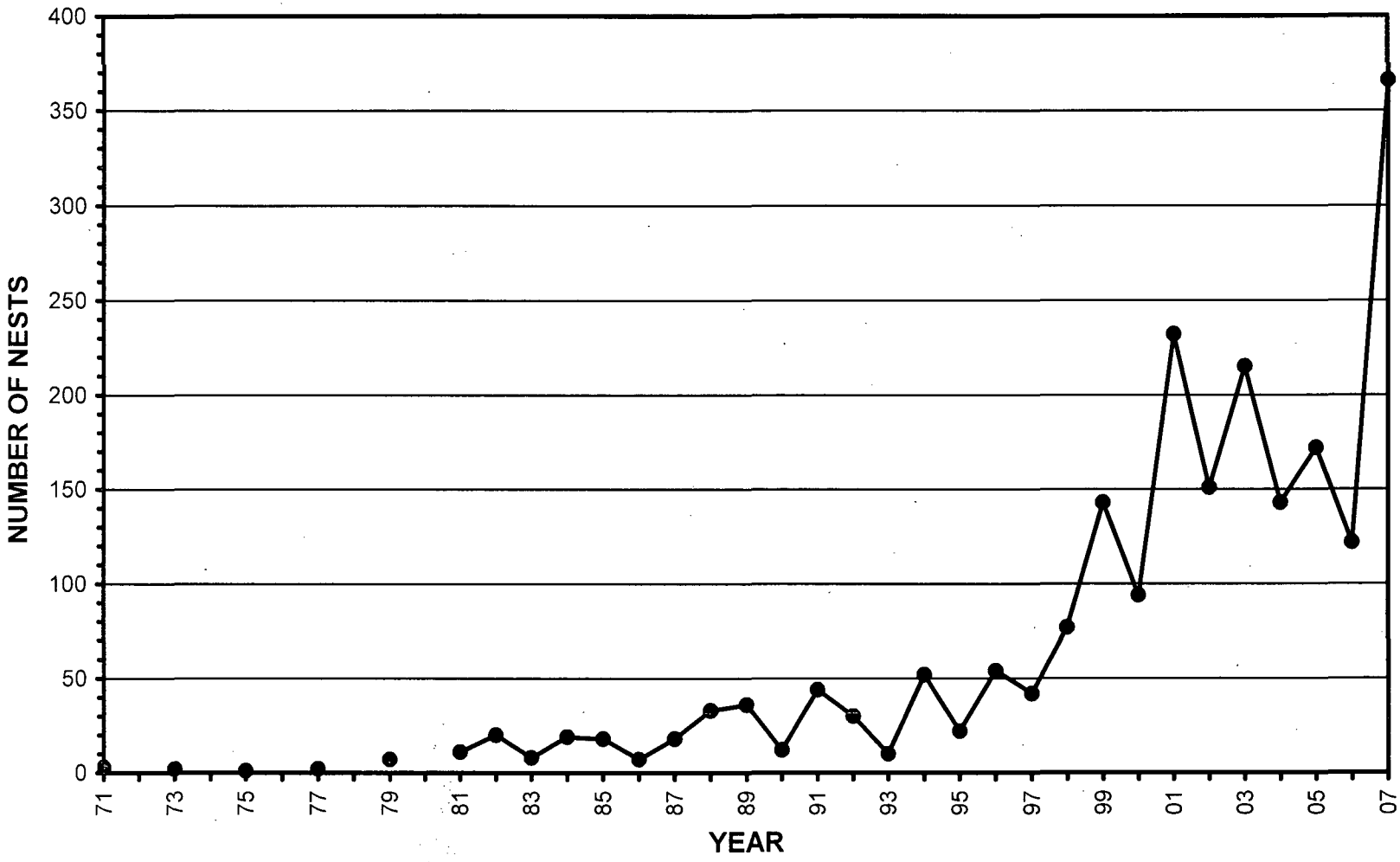

Figure 9. Number of leatherback turtle nests, Hutchinson Island, 1971 through 2007. Values for 1971 through 1979 are estimates (see text). Values for 1981 through 2007 are from whole island surveys.

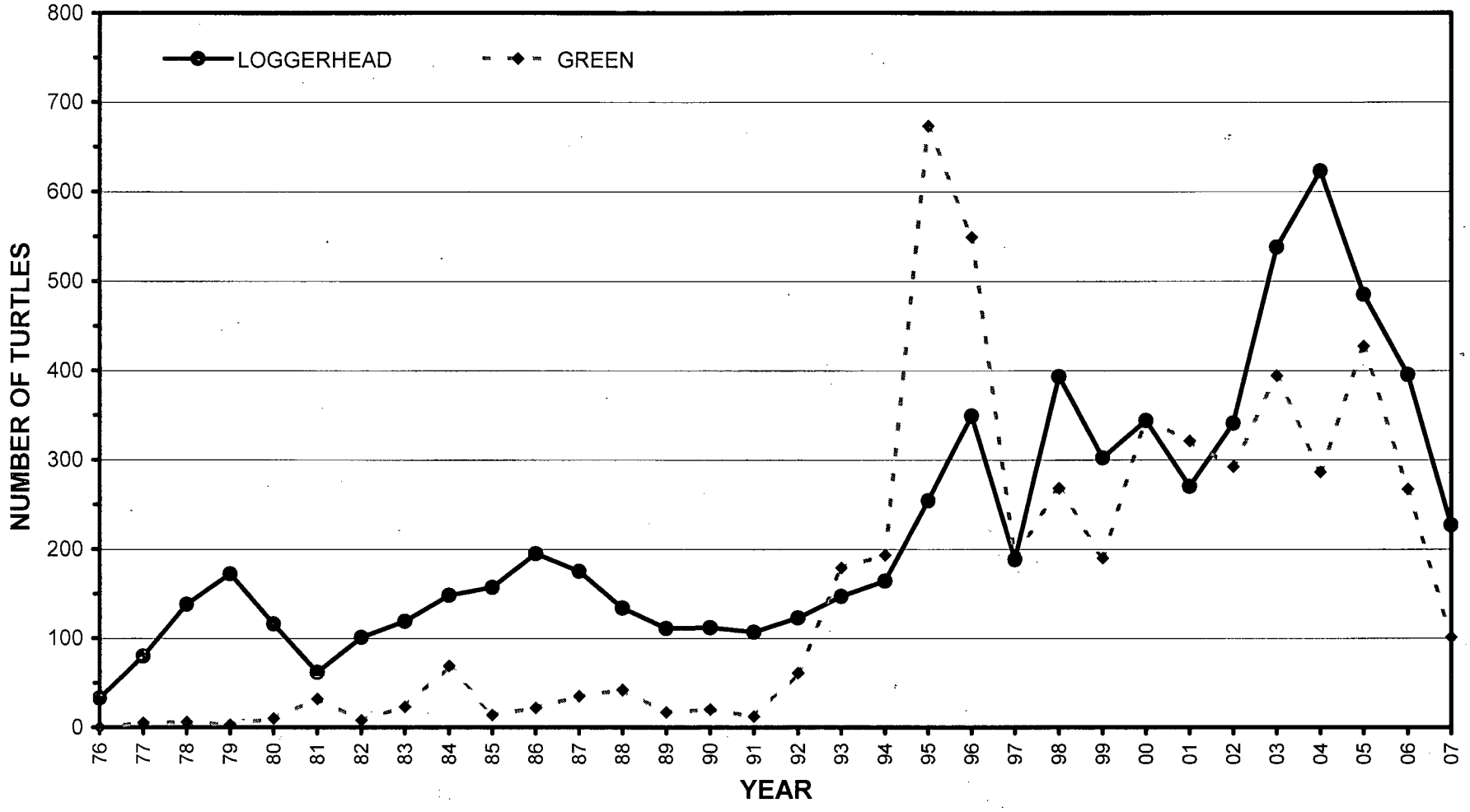

Figure 10. Number of loggerhead and green turtles removed each year from the intake canal at the St. Lucie Power Plant, 1976 through 2007.

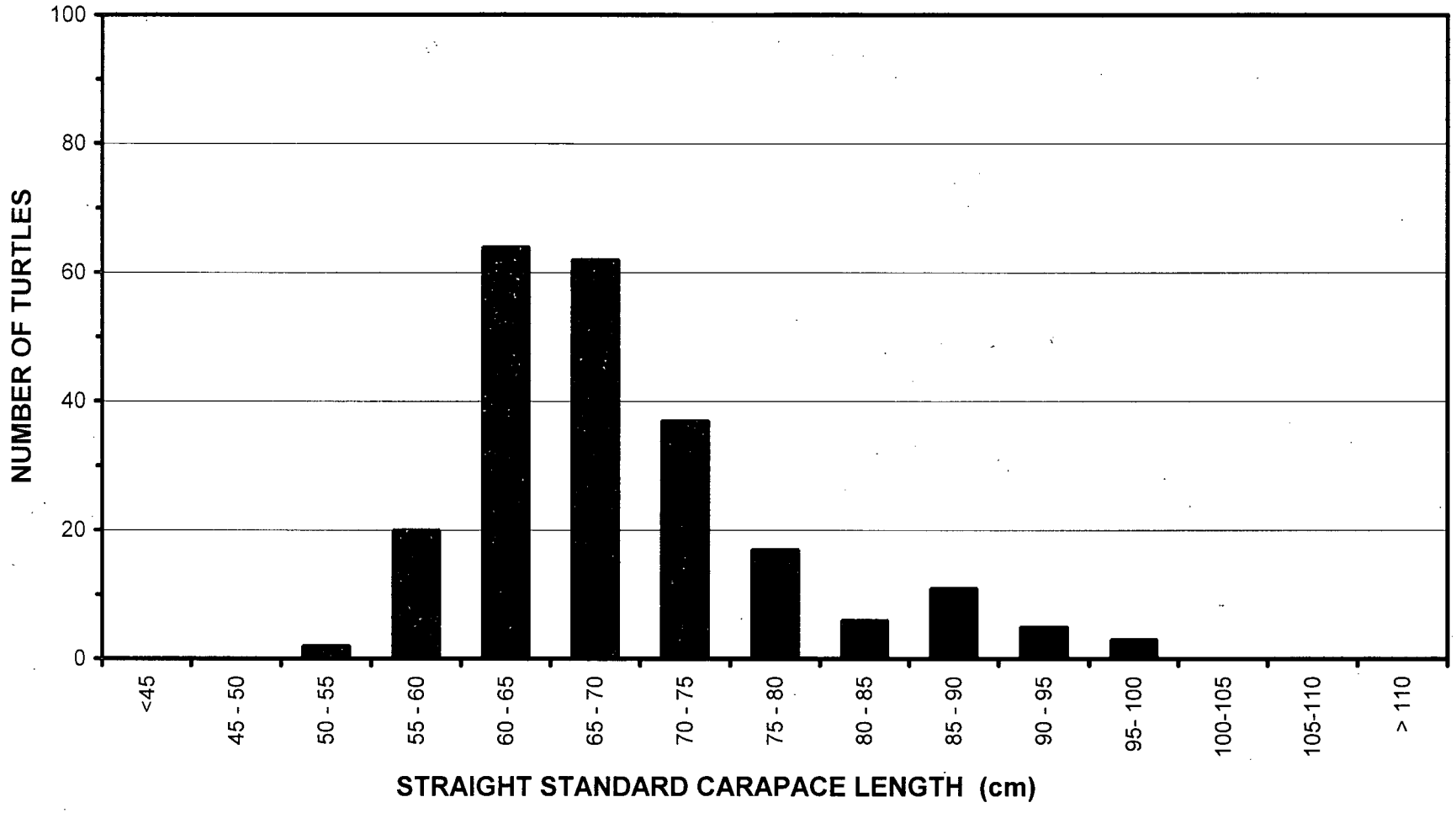

Figure 11. Size distribution (SSCL) of loggerhead turtles (n = 227) removed from the intake canal, St. Lucie Plant, 2007.

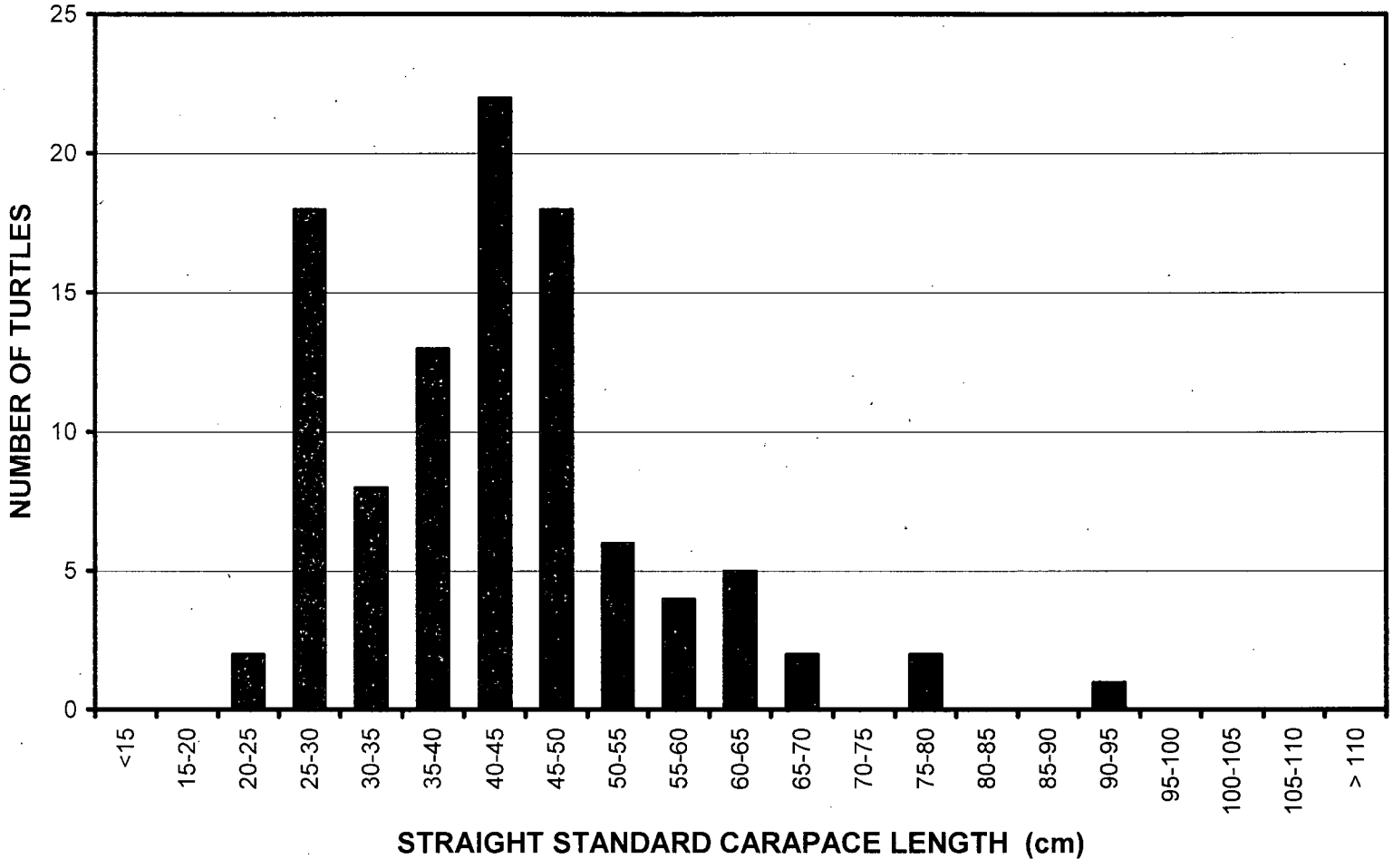

Figure 12. Size distribution (SSCL) of green turtles (n = 101) removed from the intake canal, St. Lucie Plant, 2007.

6.0 TABLES

Year	Species					Total
	Loggerhead	Green	Leatherback	Hawksbill	Kemp's ridley	
1976 - 1981	601 (51)	56 (9)	6	1	1	665 (60)
1982	101 (16)	8	1			110 (16)
1983	119 (4)	23 (4)				142 (8)
1984	148 (3)	69 (2)		1	2	220 (5)
1985	157 (4)	14		1		172 (4)
1986	195 (27)	22 (1)	1	1	1	220 (28)
1987	175 (11)	35		2	6 (2)	218 (13)
1988	134 (6)	42 (2)			5 (2)	181 (10)
1989	111 (4)	17 (1)	1	2	2	133 (5)
1990	112 (1)	20 (2)				132 (3)
1991	107 (1)	12		1	1	121 (1)
1992	123 (2)	61 (2)	1	2		187 (4)
1993	147	179 (1)	5	2	4	337 (1)
1994	164	193 (4)	2		2	361 (4)
1995	254 (1)	673 (15)	1		5	933 (16)
1996	349 (3)	549 (4)		5	3	906 (7)
1997	188	191 (5)	2	1		382 (5)
1998	393 (1)	268	1	2	2	666 (1)
1999	302 (2)	190 (4)	1	1	1	495 (6)
2000	344 (2)	345 (2)		2		691 (4)
2001	270 (1)	321 (5)	2	6	1	600 (6)
2002	341	292 (3)		3		636 (3)
2003	538	394 (3)	4	6	2	944 (3)
2004	623 (2)	286 (1)	2	2	1	914 (3)
2005	485 (2)	427 (2)		2	3	917 (4)
2006	395 (1)	267 (2)	1	2	3	668 (3)
2007	227 (3)**	101 (1)	1	1		330 (4)
Total	**7103** (145)	**5055** (75)	**32**	**46**	**45** (4)	**12281** (227)
Annual Mean*	228.1	163.1	1.0	1.5	1.5	395.1

* Excludes 1976 (partial year of plant operation).
** Excludes 21 loggerhead hatchling mortalities (not entrained from offshore)

Table 1. Total number of captured turtles removed from the intake canal, St. Lucie Plant, 1976 through 2007. Number of mortalities are in parentheses.

Month	Number of Captures	Percent of All Captures	Minimum	Maximum	Mean	Standard Deviation	2007
January	711	10.1%	6	48	22.9	12.5	**48**
February	662	9.4%	5	38	21.4	17.3	**19**
March	775	11.0%	1	60	25.0	27.2	**34**
April	716	10.1%	0	71	23.1	19.7	**9**
May	622	8.8%	0	61	20.1	15.5	**12**
June	737	10.4%	3	66	23.8	18.2	**19**
July	900	12.7%	0	124	29.0	28.3	**28**
August	637	9.0%	2	43	20.5	14.5	**22**
September	419	5.9%	1	26	13.5	10.8	**14**
October	334	4.7%	0	27	10.8	7.6	**12**
November	266	3.8%	0	18	8.6	7.0	**6**
December	291	4.1%	1	24	9.4	6.6	**4**
Total*	**7070**		**0**	**124**			**227**
Mean	589.2				19.0		18.9
Std. Deviation	208.9				6.7		12.7

* Excludes 33 loggerhead captures from 1976 (partial year)

Table 2. Total number of loggerhead turtles removed each month from the intake canal, St. Lucie Plant 1977 through 2007.

Month	Number of Captures	Percent of All Captures	Minimum	Maximum	Mean	Standard Deviation	2007
January	568	11.2%	0	61	18.3	19.3	**9**
February	530	10.5%	0	64	17.1	18.2	**5**
March	569	11.3%	0	147	18.4	30.6	**5**
April	384	7.6%	0	64	12.4	16.3	**4**
May	373	7.4%	0	91	12.0	19.9	**11**
June	353	7.0%	0	55	11.4	16.7	**5**
July	321	6.4%	0	61	10.4	16.0	**5**
August	344	6.8%	0	64	11.1	15.3	**8**
September	390	7.7%	0	77	12.6	18.8	**4**
October	473	9.4%	0	54	15.3	17.8	**20**
November	389	7.7%	0	50	12.5	14.5	**13**
December	361	7.1%	0	68	11.6	14.4	**12**
Total*	**5055**		**0**	**147**			**101**
Mean	421.3				13.6		8.4
Std. Deviation	89.4				2.9		4.9

* Excludes 1976 (partial year)

Table 3. Total number of green turtles removed each month from the intake canal, St. Lucie Plant, 1977 through 2007.

ANNUAL ENVIRONMENTAL OPERATING REPORT

PART II

1.0 INTRODUCTION

The St. Lucie Units 1 & 2 Environmental Protection Plans (EPP) require the submittal of an annual report for various activities at the plant site including the reporting on sea turtle monitoring programs, and other matters related to Federal and State environmental permits and certifications.

2.0 SEA TURTLE MONITORING AND ASSOCIATED ACTIVITIES

Surveillance and maintenance of the light screen to minimize sea turtle disorientation as required by Section 4.2.3 of the EPP is ongoing. The vegetation light screen located on the beach dune between the power plant and the ocean is routinely surveyed to determine its overall vitality. Evidence of sea turtle disorientation that occurs would also indicate any significant problems. Trees, vegetation or shade cloth are replaced as necessary to maintain the overall integrity of the light screen. Plant parking lot lighting is also designed and maintained to minimize light levels on the beach.

3.0 TAPROGGE CONDENSER TUBE CLEANING SYSTEM OPERATION

A Taprogge condenser tube cleaning system (CTCS) became operational on St. Lucie Unit 2 in January 1996 and on Unit 1 in July 1996. This system utilizes sponge balls, approximately 23 mm in diameter, to clean the condenser tubes through which seawater flows to cool steam after its pass through the plant's turbines. This system improves plant performance while reducing the need for chemical treatments such and biocides or chlorine to control biofouling.

Normally, the St. Lucie CTCS utilizes about 1800 sponge balls, which are continually re-circulated through each of four "water boxes" on each unit. These sponge balls are

retained in the system by a ball strainer located on the outlet of each water box. The ball strainers (mesh size 5 mm) are opened routinely to discharge debris, which can decrease flow and obstruct sponge ball movement through the system. The sponge balls are collected prior to opening, or back flushing, the ball strainers. At that time, the sponge balls are examined and replaced if they are worn to the point that they can no longer effectively clean the condenser tubes.

Sponge ball inventories and estimates of sponge ball loss to the environment have been performed since system start-up on both units. Number of ball strainer back flushes has also been tracked. In addition, daily beach surveys have been performed on plant property (approximately 2.5 miles) to note any sponge balls that may occur as a result of loss from the plant. This survey area has been extended during the turtle nesting season to almost 12 miles.

The results of the program for 2007 are presented in Table 1. Spikes in sponge ball loss have been identified as single events involving only one Unit. Two sponge ball loss events were recorded on Unit 1 in February and June. The event in February was potentially due to prolonged use of sponge balls. The June event was recorded as a ball loss, but may be attributed to a malfunction of the ball counter. One sponge ball loss event was recorded on Unit 2. This event occurred in April, and can be attributed to a sudden influx of algae in the circulating water system. When the ball strainers become matted with algae, the sponge balls cannot be retrieved from the system and are lost during back flushing. The June 2007 sponge ball loss event was later identified to be the result of a ball counter that could not be calibrated to count both abrasive and non-abrasive sponge balls, and may not be an actual loss event. This was discovered when non-abrasive balls were hand counted after the June event. The sponge ball counter will be repaired or replaced in 2008. Of the total lost sponge balls, only 22 sponge balls were found whole in the environment near the plant in 2007. This number indicates that few balls actually reach the environment whole.

4.0 OTHER ROUTINE REPORTS

The following items for which reporting is required are listed by section number from the plant's Environmental Protection Plan:

5.4.1.2(a) EPP Noncompliance Incidents and Corrective Actions Taken

No incidents of noncompliance under EPP Section 5.4.1(a) were determined to have occurred during 2007.

5.4.1.2(b) Changes In Station Design or Operation, Tests, and Experiments In Accordance With EPP Subsection 3.1

No plant site activities were determined to be reportable under Section 5.4.1(b) during 2007.

5.4.1.2(c) Non-routine Reports Submitted to the NRC for the Year 2007 in Accordance with EPP Subsection 5.4.2

At the conclusion of 2006 the St. Lucie Plant determined that the Incidental Take for sea turtles, as defined in the National Marine Fisheries Service (NMFS) Biological Opinion dated May 4, 2001 was exceeded. This was reported to the NRC on February 1, 2007 by FPL letter L-2007-009. The incident was also mentioned in the 2006 Annual Environmental Operating Report.

On May 25, 2007 the St. Lucie Units 1 and 2 Annual Environmental Operating Report for the calendar year 2006 was reported to the NRC by FPL letter L-2007-074.

On July 3, 2007 a request for a minor revision to the St. Lucie Industrial Wastewater Facility Permit was granted by the Florida Department of Environmental Protection. Notification of the revision was submitted to the NRC by FPL letter L-2007-117.

On July 31, 2007 a request was submitted to the Florida Department of Environmental Protection to rescind Specific Condition VI.3. Of the Florida Power & Light Company St. Lucie Plant Industrial wastewater Permit No. FL 0002208 (suspension of 316(b) Phase II rule). This event was reported to the NRC by FPL letter L-2007-119.

On June 6, 2006 a juvenile green sea turtle (Chelonia mydas) was found dead in the plant intake canal. A final necropsy report determined the mortality to be causal to plant operations. The event was reported to the NRC by FPL letter L-2007-118.

During an internal environmental audit the 2005 and 2006 Annual (non-Radiological) Environmental Operating reports were found to contain administrative clerical errors. The amendments to the 2005 and 2006 Annual Environmental Operating Reports were reported to the NRC on October 12, 2007 by FPL letter L-2007-159.

Request for a minor revision to the St. Lucie Plant Industrial Wastewater Facility Permit pursuant to the requirements of Section 3.2.3 of the St. Lucie Units 1 and 2 Environmental Protection Plans. The revision was approved on October 15, 2007 and submitted to the NRC by FPL letter L-2007-190.

On December 13, 2007 a request for a minor revision to the St. Lucie Plant Industrial Wastewater facility permit was submitted to the Florida Department of Environmental protection. The revision request is pursuant

to sections 3.2.4 of the St. Lucie Unit 1 and 2 Environmental protection Plans. The NRC was notified of the request by FPL letter L-2007-200.

TABLE 1

2007 ST. LUCIE PLANT CONDENSER TUBE CLEANING SYSTEM SUMMARY

	Strainer Back Flushes		Estimated Ball Loss		Balls Found
Month	Unit 1	Unit 2	Unit 1	Unit 2	On Beach
January	19	19	167	325	0
February	15	13	1664	205	0
March	16	16	74	447	3
April	0##	17	0	+48	4
May	1##	19	0	241	0
June	9	16	1481	385	11
July	18	18	364	325	1
August	15	16	592	656	0
September	12	11	239	127	0
October	14	0#	297	81	1
November	11	0#	206	0	0
December	12	0#	174	0	2
Total	142	145	5258	2744	22

\# Unit 2 system shutdown during refueling
Unit 1 system shutdown during refueling
\+ Net gain in inventory.
* Loss of abrasive balls.

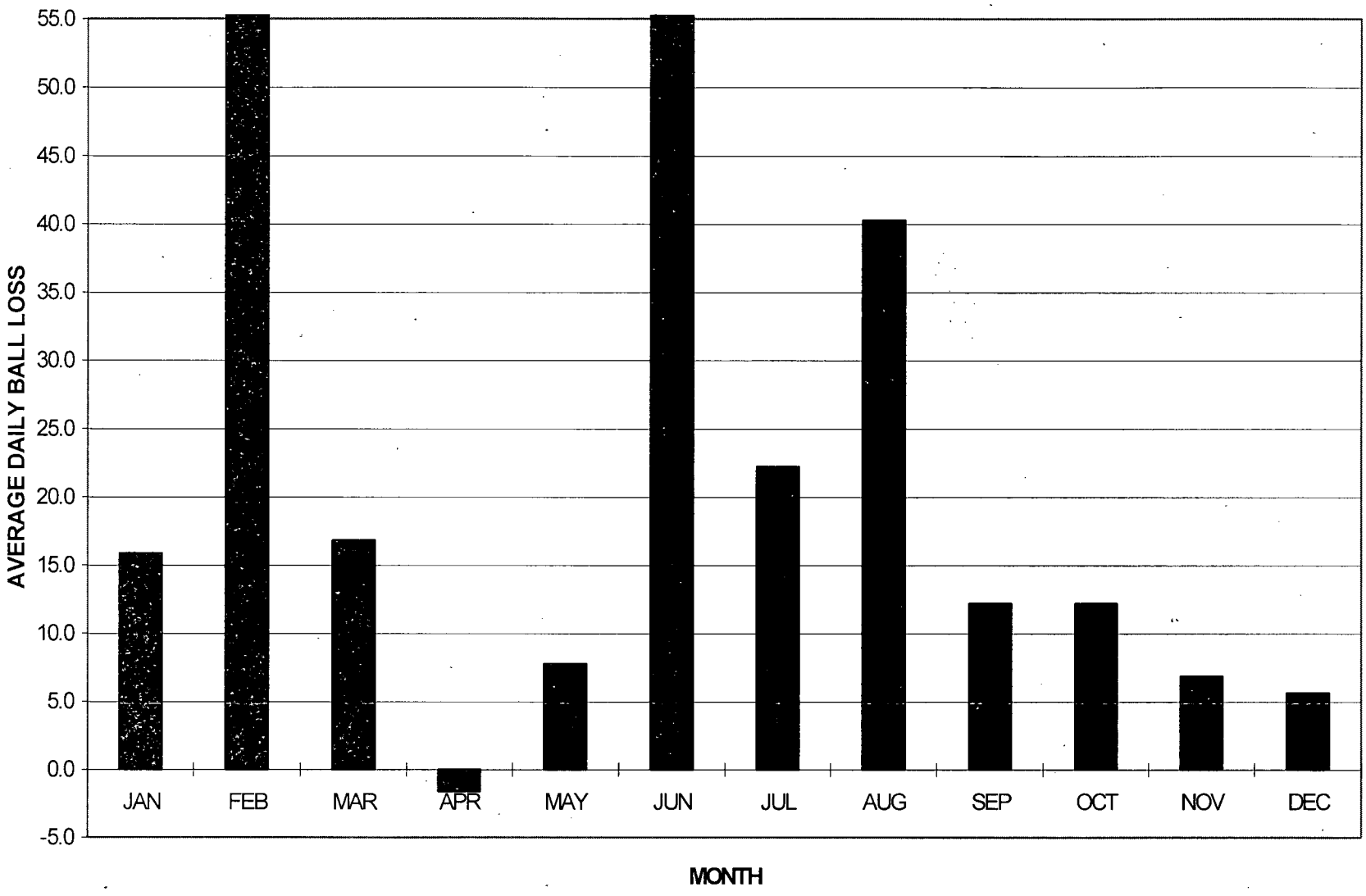

Figure 1. Estimated Average Daily Sponge Ball Loss by Month from St. Lucie Plant (Both Units) for 2007.

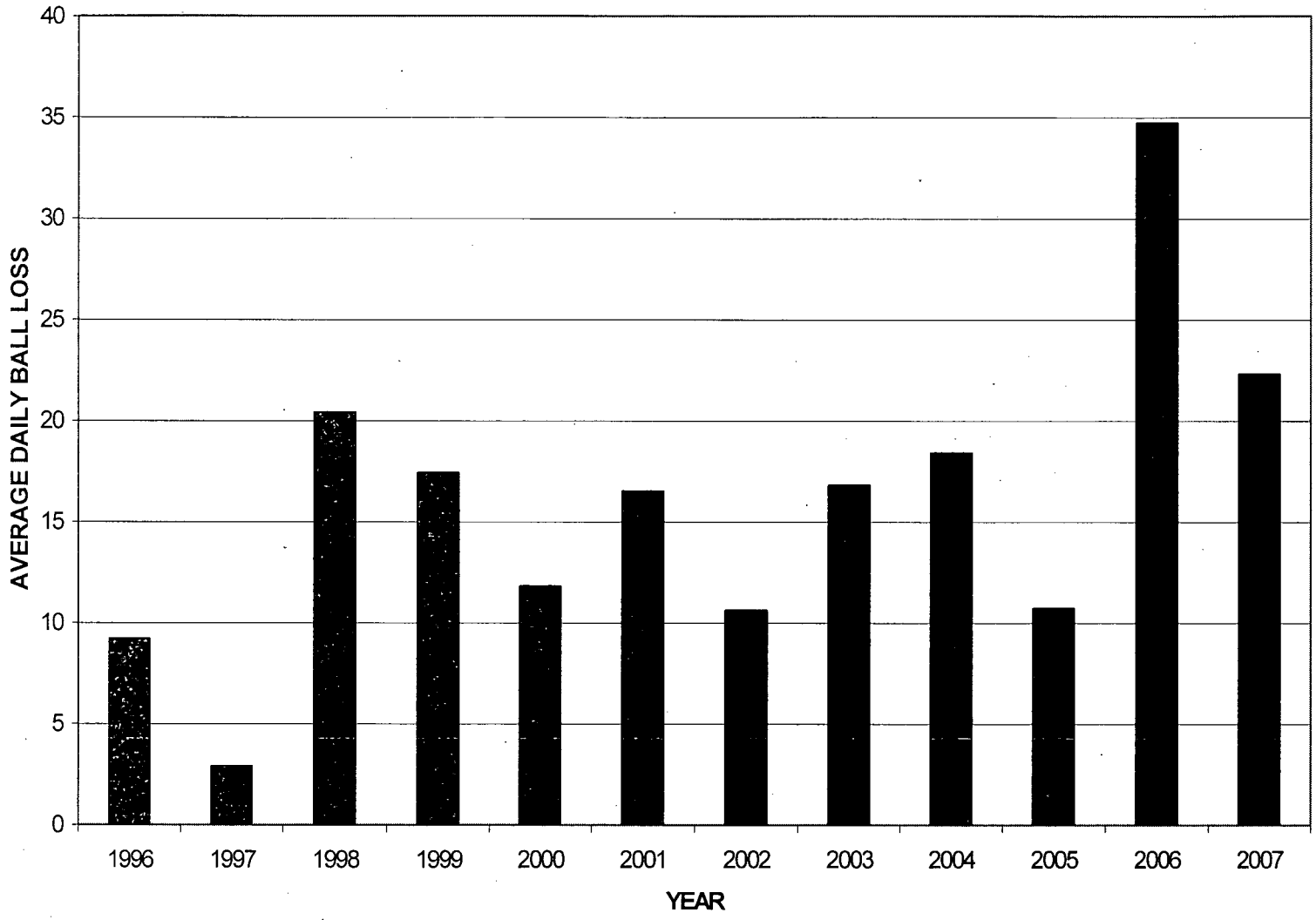

Figure 2. Average Daily Sponge Ball Loss from the St. Lucie Plant (Both Units) Since System Start-Up (January 1996).