



**DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019**

REPLY TO
ATTENTION OF

**MAINTENANCE DREDGING
PORT EVERGLADES
BROWARD COUNTY, FLORIDA**

FINDING OF NO SIGNIFICANT IMPACT

The proposed project is the maintenance dredging of the Entrance Channel of Port Everglades, Broward County, Florida and placement of the dredged material on John U. Lloyd State Park. I have reviewed the Environmental Assessment (EA) of the proposed action. This Finding incorporates by reference all discussions and conclusions contained in the EA enclosed hereto. Based in the information analyzed in the EA, reflecting pertinent information obtained from other agencies and special interest groups having jurisdiction by law and/or special expertise, I conclude that the proposed action will have no significant impact on the quality of the human environment. Reasons for this conclusion are, in summary:

1. The work will be conducted in accordance with the Biological Opinion issued by the US Fish and Wildlife Service for impacts to manatees and nesting sea turtles, and the Regional Biological Opinion issued by the National Marine Fisheries Service for impacts to sea turtles in the water. The propose action does not jeopardize the continued existence of any threatened or endangered species or adversely impact any designated critical habitat.
2. In accordance with the Florida State Historic Preservation Officer, it was determined that the proposed dredging and beach placement will not impact any sites of cultural or historical significance.
3. The Florida Department of Environmental Protection has issued a Joint Coastal Permit for this project. The conditions contained within this permit will be addressed in the plans and specifications. Therefore, the state water standards will be met.
4. The proposed work has been determined to be consistent with the Florida Coastal Zone Management Program (CZMP).
5. Measures to eliminate, reduce, or avoid potential impacts to fish and wildlife resources will be implemented during project construction.
6. Benefits to the public will be the maintenance of the navigation channel, continued economic stimulus, increased recreational benefits and erosion protection from replacing lost beach area, and increased nesting habitat for sea turtles.

In consideration of the information summarized, I find that the proposed action will not significantly affect the human environment and does not require an Environmental Impact Statement.

5 JAN 04
Date

Robert M Carpenter
ROBERT M. CARPENTER
Colonel, U.S. Army
District Engineer

NOVEMBER 2003

MAINTENANCE DREDGING

PORT EVERGLADES ENTRANCE CHANNEL
BROWARD COUNTY, FLORIDA

ENVIRONMENTAL ASSESSMENT



**U.S. Army Corps
of Engineers**
Jacksonville District
South Atlantic Division

**ENVIRONMENTAL ASSESSMENT
ON
MAINTENANCE DREDGING
PORT EVERGLADES ENTRANCE CHANNEL
BROWARD COUNTY, FLORIDA**

TABLE OF CONTENTS

TABLE OF CONTENTS I

1 PROJECT PURPOSE AND NEED 1

 1.1 INTRODUCTION 1

 1.2 PROJECT AUTHORITY..... 2

 1.3 DECISION TO BE MADE..... 2

 1.4 RELEVANT ISSUES 2

 1.5 NEPA DOCUMENTATION..... 2

 1.6 PERMITS REQUIRED..... 3

 1.7 METHODOLOGY 3

2 ALTERNATIVES..... 6

 2.1 INTRODUCTION 6

 2.2 DESCRIPTION OF ALTERNATIVES 6

 2.2.1 NO-ACTION ALTERNATIVE 6

 2.2.2 DREDGING ALTERNATIVE 6

 2.3 PREFERRED ALTERNATIVE 6

 2.4 ALTERNATIVES ELIMINATED FROM DETAILED ANALYSIS..... 6

 2.5 COMPARISON OF ALTERNATIVES 6

3 AFFECTED ENVIRONMENT..... 9

 3.1 INTRODUCTION 9

 3.2 GENERAL ENVIRONMENTAL SETTING..... 9

 3.2.1 AREAS TO BE DREDGED 9

 3.2.2 BEACH PLACEMENT SITE – JOHN U. LLOYD BEACH STATE PARK..... 9

3.3	WATER QUALITY	9
3.3.1	WATER USE CLASSIFICATION	9
3.3.2	WATER COLUMN ANALYSIS	10
3.3.3	SEDIMENT ANALYSIS	10
3.4	THREATENED, ENDANGERED AND PROTECTED SPECIES	10
3.4.1	MANATEES	10
3.4.2	SEA TURTLES	11
3.4.2.1	Nesting Habitat	11
3.4.3	DOLPHINS AND WHALES	12
3.5	WILDLIFE RESOURCES OTHER THAN THREATENED, ENDANGERED AND PROTECTED SPECIES	12
3.5.1	BEACH AND DUNE HABITAT	12
3.5.2	INLET COMMUNITIES	13
3.5.3	NEARSHORE SOFT BOTTOM COMMUNITIES	13
3.5.4	FISHES	14
3.5.4.1	Nearshore community	14
3.6	ESSENTIAL FISH HABITAT	14
3.7	CULTURAL RESOURCES	15
3.8	RECREATION	15
3.9	NAVIGATION (COMMERCIAL & MILITARY)	15
3.10	ECONOMICS	15
3.11	AESTHETICS	16
4	ENVIRONMENTAL EFFECTS	16
4.1	INTRODUCTION	16
4.2	WATER QUALITY	16
4.2.1	NO-ACTION ALTERNATIVE	16
4.2.2	DREDGING ALTERNATIVE	16
4.3	THREATENED, ENDANGERED AND PROTECTED SPECIES	16
4.3.1	NO-ACTION ALTERNATIVE	16
4.3.2	DREDGING ALTERNATIVE	17
4.3.2.1	Manatees	17
4.3.2.2	Sea turtles	18
4.3.2.3	Dolphins and Whales	18
4.4	WILDLIFE RESOURCES OTHER THAN THREATENED, ENDANGERED AND PROTECTED SPECIES	19
4.4.1	NO-ACTION ALTERNATIVE	19
4.4.2	DREDGING ALTERNATIVE	19
4.4.2.1	Beach and Dune habitat	19
4.4.2.2	Inlet Communities	20
4.4.2.3	Nearshore Soft Bottom Communities	20
4.4.3	FISHES	20
4.4.3.1	Nearshore Community	20
4.5	ESSENTIAL FISH HABITAT	21
4.5.1	NO-ACTION ALTERNATIVE	21
4.5.2	DREDGING ALTERNATIVE	21

4.6	CULTURAL RESOURCES	22
4.6.1	NO-ACTION ALTERNATIVE	22
4.6.2	DREDGING ALTERNATIVE	22
4.7	RECREATION	22
4.7.1	NO-ACTION ALTERNATIVE	22
4.7.2	DREDGING ALTERNATIVE	22
4.8	NAVIGATION (COMMERCIAL AND MILITARY).....	23
4.8.1	NO-ACTION ALTERNATIVE	23
4.8.2	DREDGING ALTERNATIVE	23
4.9	ECONOMICS.....	23
4.9.1	NO-ACTION ALTERNATIVE	23
4.9.2	DREDGING ALTERNATIVE	23
4.10	AESTHETICS	24
4.10.1	NO-ACTION ALTERNATIVE	24
4.10.2	DREDGING ALTERNATIVE.....	24
4.11	CUMULATIVE IMPACTS.....	24
4.12	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES	24
4.12.1	IRREVERSIBLE	24
4.12.2	IRRETRIEVABLE	25
4.13	UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS.....	25
4.14	ENVIRONMENTAL COMMITMENTS	25
4.15	COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS	25
4.15.1	NATIONAL ENVIRONMENTAL POLICY ACT OF 1969	25
4.15.2	ENDANGERED SPECIES ACT OF 1973	25
4.15.3	FISH AND WILDLIFE COORDINATION ACT OF 1958	26
4.15.4	NATIONAL HISTORIC PRESERVATION ACT OF 1966 (INTER ALIA)	26
4.15.5	CLEAN WATER ACT OF 1972	26
4.15.6	CLEAN AIR ACT OF 1972	26
4.15.7	COASTAL ZONE MANAGEMENT ACT OF 1972.....	26
4.15.8	FARMLAND PROTECTION POLICY ACT OF 1981	26
4.15.9	WILD AND SCENIC RIVER ACT OF 1968	27
4.15.10	MARINE MAMMAL PROTECTION ACT OF 1972	27
4.15.11	ESTUARY PROTECTION ACT OF 1968	27
4.15.12	FEDERAL WATER PROJECT RECREATION ACT.....	27
4.15.13	FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976.....	27
4.15.14	SUBMERGED LANDS ACT OF 1953	27
4.15.15	COASTAL BARRIER RESOURCES ACT AND COASTAL BARRIER IMPROVEMENT ACT OF 1990.....	27
4.15.16	RIVERS AND HARBORS ACT OF 1899.....	27
4.15.17	ANADROMOUS FISH CONSERVATION ACT	28
4.15.18	MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT	28
4.15.19	MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT.....	28
4.15.20	MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT.....	28
4.15.21	E.O. 11990, PROTECTION OF WETLANDS	28
4.15.22	E.O. 11988, FLOOD PLAIN MANAGEMENT	28
4.15.23	E.O. 12898, ENVIRONMENTAL JUSTICE	28
4.15.24	E.O. 13089, CORAL REEF PROTECTION	29
5	LIST OF PREPARERS	30
5.1	PREPARERS	30
5.2	REVIEWERS	30

6	PUBLIC INVOLVEMENT	30
6.1	SCOPING	30
6.2	COMMENTS RECEIVED AND RESPONSE	31
	APPENDIX A - SECTION 404(B) EVALUATION	36
	APPENDIX B - COASTAL ZONE MANAGEMENT CONSISTENCY.....	45
	APPENDIX C - PERTINENT CORRESPONDENCE.....	40
	APPENDIX D – DRILLING LOGS – SEDIMENT CORE BORINGS COLLECTED FROM ENTRANCE CHANNEL SHOAL.....	54

LIST OF FIGURES

Figure 1. Location Map and Plan View.	4
Figure 2. Results of 2002 Corps Survey of Port Everglades Entrance Channel Shoal.....	5

LIST OF TABLES

Table 1. Summary of Direct and Indirect Impacts of Alternatives Considered.....	8
--	---

**ENVIRONMENTAL ASSESSMENT
ON
MAINTENANCE DREDGING
PORT EVERGLADES ENTRANCE CHANNEL
BROWARD COUNTY, FLORIDA**

1 PROJECT PURPOSE AND NEED

1.1 INTRODUCTION

The U.S. Army Corps of Engineers (Corps), Jacksonville District, proposes to continue conducting routine maintenance dredging of the Port Everglades Entrance Channel, Broward County, Florida (see Figure 1, Plan View and Location Map). Approximately 100,000 cubic yards of sediment, resulting from shoaling, will be removed from the harbor's entrance channel. As part of its navigation mandate, the Corps conducts annual surveys of the Federal Navigation channel. During the 2002 survey, it was determined that sediment being transported around the north jetty is shoaling in the Entrance Channel and currently has encroached into 25% of the channel's width (Figure 2), thus increasing navigation difficulty and decreasing vessel safety while entering and leaving the Port. The Corps had originally planned to conduct this dredging as part of the planned Port Everglades expansion currently being studied by the Jacksonville district under the Port Everglades Feasibility Study. Due to study delays, the proposed expansion of the Port may not be initiated until 2005 or 2006. The Port pilots have noted a change in channel depths on the north side of the channel near the end of the jetty. Based on the 2002-channel survey conducted by the Jacksonville District, the shoal is 600 feet in length and approximately 120 feet in width. The channel is authorized to a depth of - 45ft + 2 additional feet of overdepth. The north side of the channel currently has a controlling depth of -24.6 ft mean lower low water.

The Corps approached Broward County to determine if they have an interest in utilizing the beach quality sediment as part of the Shore Protection Project (SPP) recently initiated by the county. The county has expressed an interest in utilizing the sediment in lieu of sediment that will be dredged from offshore borrow areas identified in the Draft Environmental Impact Statement for the Broward County Shore Protection Project completed in April, 2002. The Final EIS will be completed in late 2003 or early 2004. Utilization of this beach-quality sediment by the county will reduce the amount of sediment that must be dredged from offshore borrow areas, thus reducing the impacts to those borrow areas, and the surrounding coral reef environments. In the Broward County SPP DEIS, the Corps and County state that various types of dredging equipment, possibly including a hopper dredge, will be used to accomplish the above task of dredging from the offshore borrow sites. The Corps would also likely utilize a hopper dredge to remove the shoal material in the entrance channel. Excavated material consisting of suitable sand may be placed on the John U. Lloyd Beach State Park, part of segment III of the SPP. Dredging the entrance channel also serves the navigational needs of vessels utilizing Port Everglades. Should the county choose to utilize the sediments in the Entrance channel, the costs associated with the dredging will be incurred as part of the Shore Protection Project. If the County opts not to dredge the Entrance channel, the Corps will be initiating an Operations and Maintenance (O&M) event with Federal O&M funding.

1.2 PROJECT AUTHORITY

Maintenance dredging of Port Everglades Entrance Channel was initially authorized under House Document 357/71/2 (July 1930), as well as subsequent authorizations associated with Port Expansion activities in 1935, 1938, 1946, 1958, 1974 and 1990. A Comprehensive list of these authorizations can be found at the District's Digital Project Notebook homepage (http://www.saj.usace.army.mil/digitalproject/dpn/sajn_020.htm).

1.3 DECISION TO BE MADE

This Environmental Assessment will evaluate whether to have Broward County conduct the maintenance dredging and place the sediment on John U. Lloyd Beach State Park as part of the SPP, in lieu of the Corps dredging the entrance channel as an individual maintenance event.

1.4 RELEVANT ISSUES

The following issues were identified as relevant to the proposed action and appropriate for detailed evaluation: (1) water quality degradation, especially in regards to turbidity and sediment contaminants; (2) impacts to endangered and threatened species occurring within the project area (i.e. manatees and sea turtles); (3) alteration of other wildlife resources; (4) potential damage to Essential Fish Habitat which may cause a reduction in standing stocks of certain managed species; (5) deleterious effects to benthos; (6) impacts to cultural resources; (7) beneficial or adverse effects to recreation; (8) impacts to navigation; (9) socio-economic effects to individuals, families, and businesses harmed by or benefiting by the project, especially in regards to commercial and recreational navigation; and (10) impacts to aesthetics.

1.5 NEPA DOCUMENTATION

Pursuant to the National Environmental Policy Act (NEPA), this Environmental Assessment was prepared by the Corps in order to address all of the current Port Everglades entrance channel dredging and disposal alternatives. Maintenance dredging of the entrance channel was previously covered in two NEPA documents. Related environmental documents include the following:

USACE, 1990. Navigation Study for Port Everglades Harbor, Florida, 10207 Feasibility Report and Environmental Assessment. EA for deepening and widening of 8,000 feet of the SAC and creation of a 750-foot by 900-foot TN; and Port Everglades.

USACE, 1987. Final Environmental Impact Statement, Proposed Expansion Port Everglades, Broward County, Florida. EIS for deepening and widening the SAC, bulkheading Port land, creation of the Turn Notch.

Additionally, the Corps is currently preparing a Feasibility Study for Port Everglades.

Placement of sand on Broward County beaches for shore protection activities is covered in three previous NEPA documents:

USACE, 2002. Broward County Shore Protection Project, Segments II and III. Draft Environmental Impact Statement. April 2002.

USACE, 1998. Beach Erosion Control and Hurricane Protection Project, Dade County, Florida Modifications at Sunny Isles, Final Environmental Impact Statement, Jacksonville District.

USACE, 1996. Coast of Florida Erosion and Storm Effects Study, Region III: Feasibility Report with Draft Environmental Impact Statement.

1.6 PERMITS REQUIRED

If the Corps performs the maintenance dredging operations, in accordance with Section 401 of the Clean Water Act of 1977, as amended, a Water Quality Certification will be required from the Florida Department of Environmental Protection (FDEP) for the proposed dredging activity. However, if the County performs the dredging operations in lieu of the Corps, they will either modify their existing Department of the Army Permit (# 199905545) and their State of Florida Consolidated Joint Coastal Permit and Intent to Grant Sovereign Submerged Lands Authorization #0163435-0010JC issued by the FLDEP on May 12, 2003 (Appendix C) or apply for new permits to allow for the use of the shoal material as part of the SPP.

1.7 METHODOLOGY

This EA will compile information from two sources – the Broward County Shore Protection Project Draft Environmental Impact Statement (EIS) and the Draft Feasibility Study and EIS currently in preparation by the Corps addressing the impacts of expansion activities at Port Everglades. Both of these NEPA documents relied on an interdisciplinary team using a systematic approach to analyze the affected area, to estimate the probable environmental effects, and to prepare the EIS's. This included a literature search, coordination with agencies having expertise in certain areas, and on-site field investigations. This EA will compile information from the two projects since it combines aspects of both.

FIGURE 1: LOCATION MAP AND PLAN VIEW

Figure 1: Location Map and Plan View

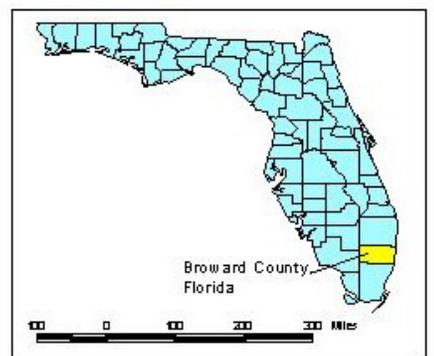
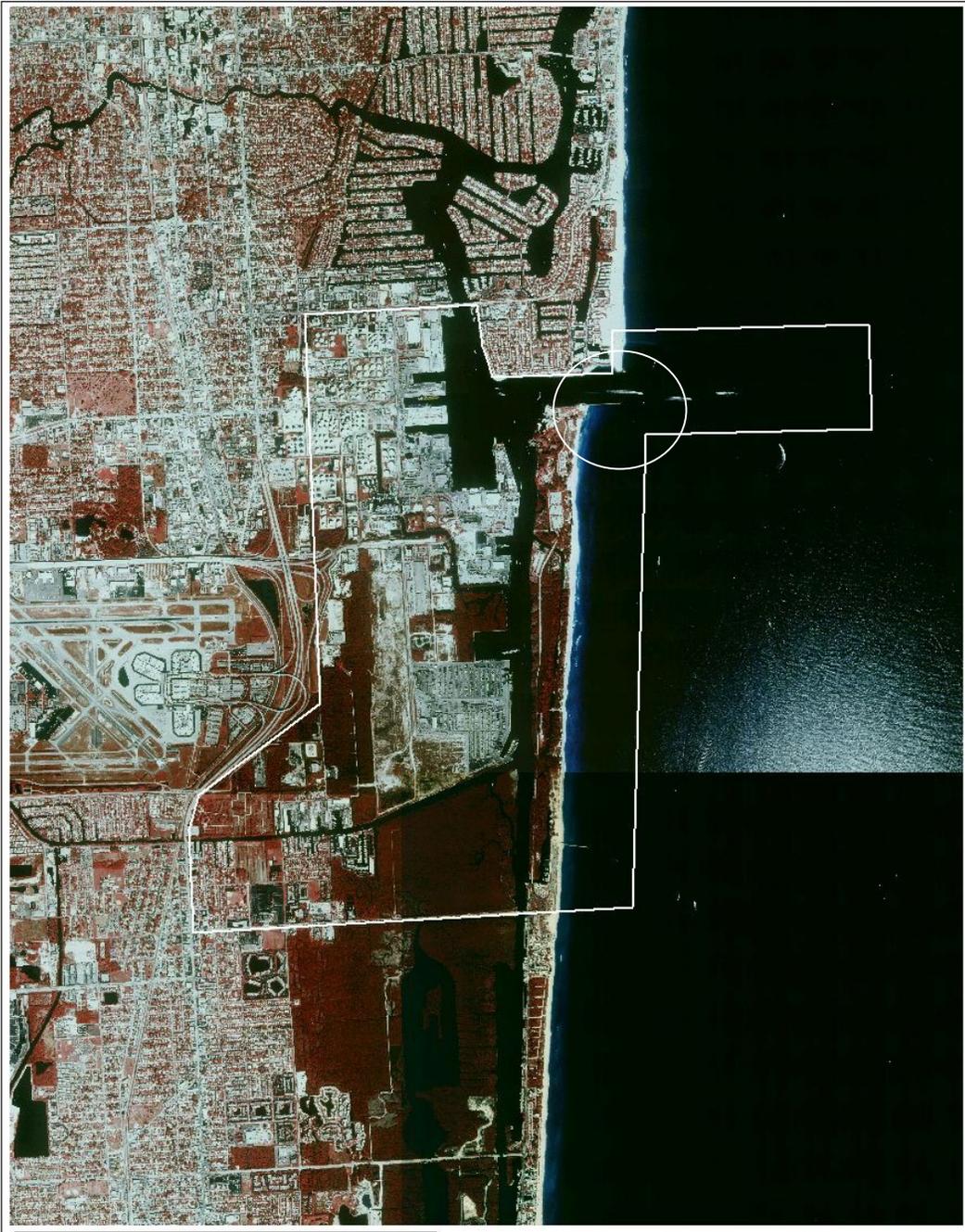
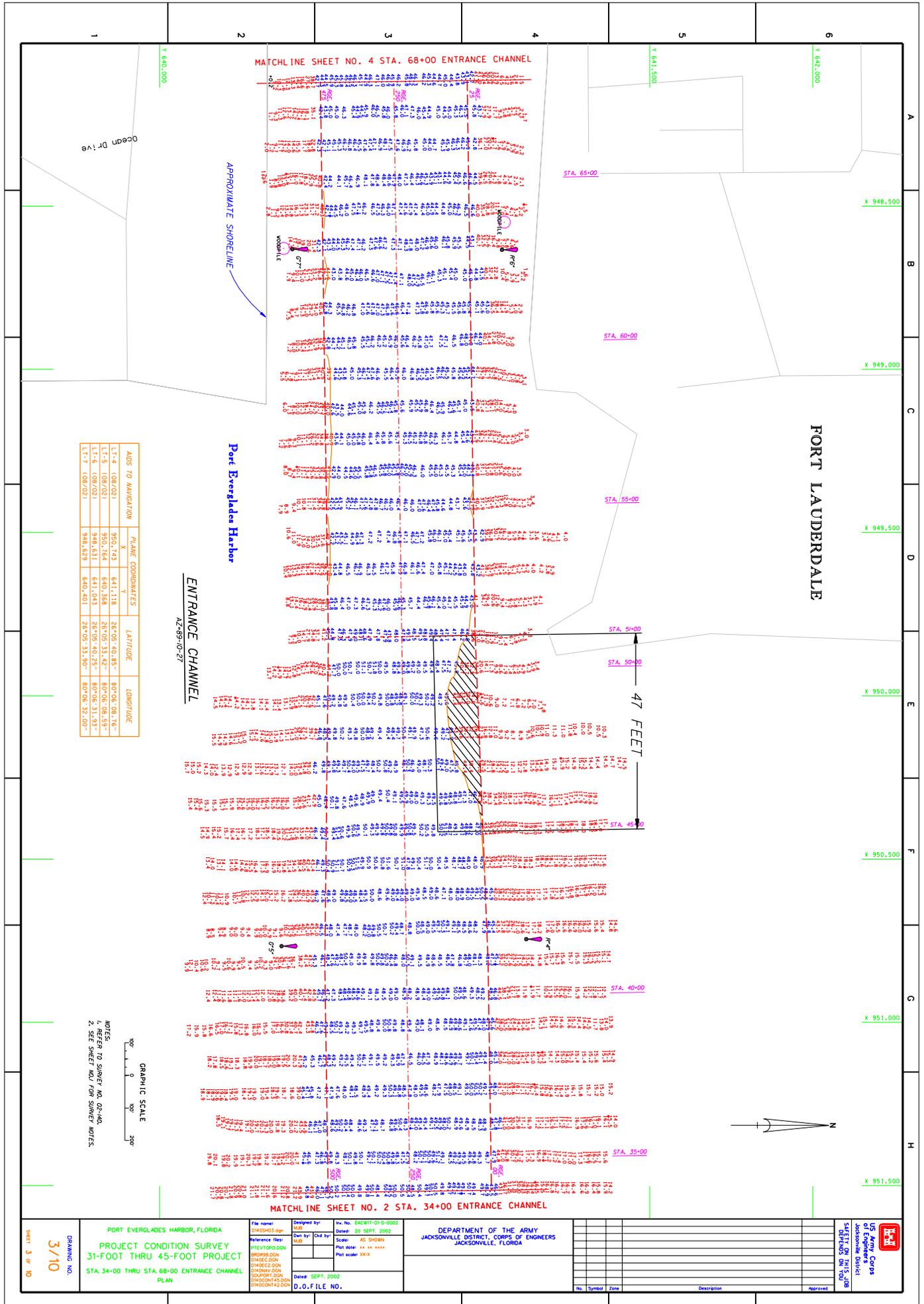


FIGURE 2: RESULTS OF 2002 CORPS SURVEY OF PORT EVERGLADES ENTRANCE CHANNEL SHOALING



AIDS TO NAVIGATION	PLANE COORDINATES	LATITUDE	LONGITUDE
	X	Y	
L1-4 (08/02)	950,743	641,118	80°06'08.76"
L1-5 (08/02)	950,764	640,368	80°06'08.59"
L1-6 (08/02)	948,631	641,043	80°05'40.25"
L1-7 (08/02)	948,629	640,401	80°06'32.00"

GRAPHIC SCALE
 0 100 200
 NOTES:
 1. REFER TO SHEET NO. 02-40.
 2. SEE SHEET NO. FOR SHEET NOTES.

PORT EVERGLADES HARBOR, FLORIDA
 PROJECT CONDITION SURVEY
 31-FOOT THRU 45-FOOT PROJECT
 STA. 34+00 THRU STA. 68+00 ENTRANCE CHANNEL
 PLAN

File name: 20-SEP-2002
 Reference file: PTEVTOPODON
 Date: SEPT. 2002
 D.O.F FILE NO.

DESIGNED BY: []
 DRAWN BY: []
 CHECKED BY: []
 DATE: SEPT. 2002
 PROJECT: PORT EVERGLADES HARBOR, FLORIDA
 DRAWING NO. 3/10

DEPARTMENT OF THE ARMY
 JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
 JACKSONVILLE, FLORIDA

No.	Symbol	Zone	Description	Approved

US Army Corps of Engineers
 JACKSONVILLE DISTRICT
 JACKSONVILLE, FLORIDA

2 ALTERNATIVES

2.1 INTRODUCTION

The Alternatives Section is perhaps the most important component of this Environmental Assessment. It describes the no-action alternative, the proposed dredging alternatives, as well as the dredged material disposal options. The beneficial and adverse environmental effects of the alternatives are presented in comparative form, providing a clear basis for choice to the decision maker and the public. A preferred alternative was selected based on the information and analysis presented in the sections on the Affected Environment and Probable Impacts .

2.2 DESCRIPTION OF ALTERNATIVES

2.2.1 NO-ACTION ALTERNATIVE

The Entrance Channel of Port Everglades would not be dredged by Broward County as a source of sediment for the Broward County Shore Protection Project. The Corps would dredge the Entrance Channel at a later date as a stand-alone maintenance-dredging project or the Corps would dredge it as part of the Port Everglades expansion project currently undergoing development.

2.2.2 DREDGING ALTERNATIVE

Approximately 100,000 cubic yards of beach quality material would be removed from the Federal navigation channel. Broward County, under their Shore Protection Project would dredge the shoal material from the entrance channel and place it on John U. Lloyd Beach State Park, in Segment III of the SPP in lieu of dredging 100,000 cubic yards of material from one of the four authorized borrow sites discussed in the DEIS.

2.3 PREFERRED ALTERNATIVE

The preferred alternative is to have Broward County dredge the Port Everglades Entrance Channel as a sediment source for the Broward County Shore Protection Project, thus reducing the amount of material to be removed from the offshore borrow sites, and reducing the impacts to the corals adjacent to those sites.

2.4 ALTERNATIVES ELIMINATED FROM DETAILED ANALYSIS

Two other dredge material placement alternatives were eliminated from detailed analysis. 1) Placement of the shoaled sediments in an Offshore Dredged Material Disposal Site (ODMDS) – currently there is not a designated ODMDS for Port Everglades. 2) Upland Disposal – currently there is not an authorized upland disposal site for dredged material in Broward County.

2.5 COMPARISON OF ALTERNATIVES

Table 1 lists alternatives considered and summarizes the major features and consequences of the proposed action and alternatives. See Section 4.0, Environmental Effects, for a more detailed discussion of impacts of alternatives.

Table 1: Summary of Direct and Indirect Impacts

ALTERNATIVE	NO-ACTION ALTERNATIVE	DREDGING WITH BEACH PLACEMENT AT JUL
ENVIRONMENTAL FACTOR		
WATER QUALITY	No impact until Corps can initiate separate dredging project to clear shoal.	Short-term localized increase in turbidity at the dredge site and in the surf zone along the beach placement areas. Turbidity impacts are expected to be minimal since the source of the material is mostly the beachfront littoral system where the fines content is typically less than 2 percent.
MANATEES	No impact until Corps can initiate separate dredging project to clear shoal.	No impact with implementation of standard protection conditions.
SEA TURTLES	No impact until Corps can initiate separate dredging project to clear shoal.	Incidental take may occur if a hopper dredge is used. Minor short-term adverse impact on turtle nesting from placing the sand on the beach may occur. Increase in the overall available nesting habitat.
WHALES	No impact.	No adverse effects are anticipated.
WILDLIFE RESOURCES (OTHER THAN T&E SPECIES)	No impact until Corps can initiate separate dredging project to clear shoal.	Minor short-term disturbance.
ESSENTIAL FISH HABITAT	No impact until Corps can initiate separate dredging project to clear shoal.	Minor short-term disturbance.
BENTHOS	No impact until Corps can initiate separate dredging project to clear shoal.	Minor short-term disturbance.
CULTURAL RESOURCES	No impact until Corps can initiate separate dredging project to clear shoal.	No adverse effects are anticipated.

ALTERNATIVE ENVIRONMENTAL FACTOR	NO-ACTION ALTERNATIVE	DREDGING WITH BEACH PLACEMENT AT JUL
RECREATION	Moderate long-term impact to recreational boating from loss of navigable capacity of channel until Corps can initiate separate dredging project to clear shoal.	Moderate long-term benefit to recreational boating from maintaining the channel. Short-term impact to recreational boat traffic from construction vessel congestion. Increase in available beach for recreation.
NAVIGATION (COMMERCIAL & MILITARY)	Major long-term reduction in navigable capacity of channel until Corps can initiate separate dredging project to clear shoal.	Major long-term benefit from maintaining the channel. Short-term impact caused by construction vessel congestion.
ECONOMICS	Major long-term impact from loss of commercial port facilities and reduced recreational boating.	Major long-term benefit from maintaining commercial port facilities and recreational boating opportunities.
AESTHETICS	No impact until Corps can initiate separate dredging project to clear shoal.	No adverse impacts are anticipated.

3 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

The Affected Environment Section succinctly describes the existing environmental resources of the areas that would be affected if any of the alternatives were implemented. This section describes only those environmental resources that would affect or that would be affected by the alternatives if they were implemented, not the entire existing environment. This section and the description of the "no-action" alternative provide the basic information for determining the environmental impacts of the proposed action and reasonable alternatives.

3.2 GENERAL ENVIRONMENTAL SETTING

3.2.1 AREAS TO BE DREDGED

The Port Everglades Harbor is a major seaport located on the southeast coast of Florida. It is located within the cities of Hollywood, Dania Beach and Fort Lauderdale, with immediate access to the Atlantic Ocean. The entrance of the Port is approximately 27 nautical miles north of Miami Harbor, Florida and 301 nautical miles south of Jacksonville Harbor, Florida. The existing Port Everglades Federal Navigation Project provides for an Outer Entrance Channel (OEC) that is 45 feet deep and 500 feet wide.

3.2.2 BEACH PLACEMENT SITE – JOHN U. LLOYD BEACH STATE PARK

East of the Port is John U. Lloyd State Park (JUL) which is dedicated for recreational use. The area is vegetated with mangroves and upland species, which include coastal hardwood hammocks, and exotics such as Australian pines and Brazilian peppers. JUL offers the visitors to its facilities many opportunities to enjoy themselves. These activities include swimming, picnicking, sunbathing, hiking, bicycle riding, fishing from the shoreline or the south fishing jetty, canoeing and boating. JUL is also in an area of high erosion rates. The Florida Department of Environmental Protection estimated that 80,000 cubic yards should be bypassing the inlet channel from north to south to maintain the beaches in JUL (Dean, 1987). The Entrance Channel is a complete littoral barrier, with all sand moving south being accreted on beaches north of the north jetty, or moving into the channel. The DEIS provides a detailed discussion of John U. Lloyd Beach State Park and the history of beach nourishment activities in Section 3.0 of the DEIS.

3.3 WATER QUALITY

3.3.1 WATER USE CLASSIFICATION

Waters within the proposed dredging area have been designated by the state of Florida as Class III Waters, suitable for recreation as well as propagation and maintenance of a healthy and well-balanced population of fish and wildlife. In addition to this

classification, the waters within JUL (Whiskey Creek) have also been designated by the state as Outstanding Florida Waters. According to the Florida Department of Environmental Protection, “the intent of an Outstanding Florida Water designation is to maintain ambient water quality, even if these designations are more protective than those required for the classification of the individual water body.”

3.3.2 WATER COLUMN ANALYSIS

Water which passes through the Port is conveyed via the New River System to the north, the Intracoastal Waterway to the south and the Dania Cutoff Canal, south of the Port which collects water from areas west of the Port. In addition, there are storm water collection systems both within the Port and in areas west and north of the Port which discharge into the Port. This water then flows out of the Entrance Channel on outgoing tides to the Atlantic Ocean.

Monitoring data indicate that water quality varies on a seasonal basis, and the physical parameters are influenced by freshwater run-off normally associated with the summer months.

Historical chemical analysis has indicated that some pesticides have been found in trace amounts. However, the Port does not handle fertilizers or pesticides as a bulk cargo and it is felt that the minor presence of these compounds may be associated with the urban run-off surrounding the Port.

No changes in salinity or flushing actions due to the increased channel opening from the removal of the shoal material are expected to occur. Additionally, no changes in water quality of receiving waters, estuarine habitats and species located west of the entrance channel shoal are expected to occur.

3.3.3 SEDIMENT ANALYSIS

The shoal material encountered in the area is mostly poorly graded carbonate sand with shell. It meets the criteria for beach placement as it contains less than 10% silt and clay materials (fines). In core boring CB-PEH03-2 a 2 foot thick shell bed was encountered at elevation –42.9 feet. This appears to be local, as it does not appear within the other nearby borings. Also, in the same boring some silty sand was encountered but it was below grade at elevation –49.9 feet. The drill logs for the core borings collected for in the shoal material are located in Appendix D.

3.4 THREATENED, ENDANGERED AND PROTECTED SPECIES

3.4.1 MANATEES

The West Indian manatee (*Trichechus manatus*) has been listed as a protected mammal in Florida since 1893. The manatee is also federally protected under the Marine Mammal Protection Act of 1972 and the ESA of 1973. The manatee was listed as an endangered species throughout its range in 1967 (32 FR 4061) and received

federal protection with the passage of the ESA in 1973. Critical habitat was designated in 1976 for the Florida subspecies (*Trichechus manatus latirostris*) (50 CFR 19.95(a)), there is no designated critical habitat in the project area. Florida provided further protection in 1978 by passing the Florida Marine Sanctuary Act designating the state as a manatee sanctuary and providing signage and speed zones in Florida's waterways.

Within Broward County there exists both a permanent and transient population of manatees. Surveys show that during the winter months when temperatures drop, manatees from north Florida and Miami-Dade County will migrate to the Florida Power and Light (FP&L) power plant at the Port (Deutsch 2000). During cold weather as many as 234 manatees have been recorded at the FP&L power plant at one time (Broward County 1992). During the summer months when the water warms, manatees return to the counties to the north and south to forage and reproduce, however, telemetry and aerial surveys confirm manatees are present within Broward County all year (Deutsch 2000 and Mezich 2001). Manatees reside and feed mainly in the estuarine areas and around inlets, and are only occasionally observed in the open ocean. No significant foraging habitat is known to exist in the areas around the project sites in Broward County (USACE, 2002), nor have West Indian manatees been known to congregate in the nearshore environments within Broward County (USACE, 1996).

3.4.2 SEA TURTLES

Broward County is within the normal nesting areas of three species of sea turtles: loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), and leatherback sea turtle (*Dermochelys coriacea*). Additionally, two of the seven hawksbill nests laid in the State of Florida between the years 1979 and 1998 were in Broward County: one nest in 1994, and one in 1997 (Florida Marine Research Institute, 1999). The loggerhead (*C. caretta*) is listed as a threatened species, while all other sea turtles are listed as endangered under the U.S. Endangered Species Act of 1973. The nesting season for all species of sea turtles, as defined by the Florida Fish and Wildlife Conservation Commission, is between March 1 and October 31 in Broward County.

3.4.2.1 Nesting Habitat.

Overall, 2,073 nests were recorded in 2002 over the 24-mile beach from the Palm Beach County/Broward Line south to the Broward County/Dade County Line. Total nests recorded for the previous seven nesting seasons (2001, 2000, 1999, 1998, 1997, 1996, 1995) were 2,385; 2,942; 2,620; 2,857; 2,288; 2,810; and 2,634, respectively. The distribution of nests among species in 2002 was 2,070 loggerhead nests, 216 green sea turtle nests, and 18 leatherback nests. The distribution of nests among species during the 1998 season was 2,643 loggerhead nests, 200 green sea turtle nests, and 14 leatherback nests (Burney & Margolis, 1999). The distribution of nests among species during the 1997 season was 2,216 loggerhead nests, 29 green sea turtle nests, 42 leatherback nests, and one nest was confirmed as hawksbill (Burney & Margolis, 1998).

The Florida statewide nesting database provides the nesting results of Florida's surveyed beaches for the years 1979 through 2002. A total of 1,216,471 loggerhead nests (an average of 50,686 per nesting season); 42,241 green sea turtle nests (an average of 1,760 per nesting season); 5,160 leatherback nests (an average of 215 per nesting season); and 7 hawksbill nests were documented on Florida beaches between 1979 and 2002. Two of the seven hawksbill nests were laid in Broward County, one in 1994, and one in 1997 (Florida Marine Research Institute, 1999).

Due to the heavily developed nature of the Broward County coastline, the relative location of Highway A-1-A to the beach, and extensive beach front lighting, all of which have the potential to negatively impact nesting sea turtles and their hatchlings, Broward County has relocated all discovered nests at Pompano Beach, Deerfield Beach, Hollywood-Hallandale, and Fort Lauderdale since the inception of its sea turtle conservation program in 1978 (Burney and Margolis, 1998). In 1998, hatching success was at its lowest level since the nest relocation program was initiated. However, loggerhead-hatching success was slightly higher in relocated nests than *in situ* nests, lending credence to the hypothesis those environmental factors, such as the unusually high early summer temperatures in 1998, negatively affected early loggerhead nests (Sterghos, 1998).

3.4.3 DOLPHINS AND WHALES

Rare, threatened, or endangered whale species that are infrequent visitors to the coastal waters off Broward County during their migration patterns include the finback whale, *Balaenoptera physalus*; humpback whale, *Megaptera novaeangliae*, northern right whale, *Eubalaena glacialis*; sei whale, *Balaenoptera borealis*; and the sperm whale, *Physeter macrocephalus catodon* (USACE, 1996). A total of 21 stocks of marine mammals have been reported offshore of the project area (NMFS, 2002).

3.5 WILDLIFE RESOURCES OTHER THAN THREATENED, ENDANGERED AND PROTECTED SPECIES

3.5.1 BEACH AND DUNE HABITAT.

Very few birds utilize the beach and dunes in the project area due to intense coastal development. Several species of protected birds have been observed at JUL, including the Southeastern American Kestrel (*Falco sparverius paulus*), Eastern brown pelican (*Pelecanus occidentalis*), least tern (*Sterna antillarum*), little blue heron (*Egretta caerulea*), snowy egret (*Egretta thula*), tri-colored heron (*Egretta tricolor*), Roseate spoonbill (*Ajaia ajaja*), and osprey (*Pandion haliaetus carolinensis*) (Coastal Technology Corporation, 1994; Florida Game and Fresh Water Fish Commission, 1991).

Based upon database reports of the Florida Fish and Wildlife Conservation Commission, there are over 80 species of birds listed in the Federal Migratory Bird Treaty Act that have been recorded as inhabiting the southeast Florida coastline (Palm Beach, Broward, and Dade counties) between the surf zone and densely vegetated

forest of the back dune for at least part of the year (USACE, 1996). However, very few species utilize the beach and dune areas in this area due to intense coastal development. Sanderlings (*Calidris alba*) and ruddy turnstones (*Arenaria interpres*) are generally the only wintering species that are commonly observed foraging and resting on the beaches along Broward County. Royal terns (*Sterna maxima*), ring-billed gulls (*Larus delawarensis*), laughing gulls (*Larus atricilla*) and herring gulls (*Larus argentatus*) also winter along the southeast Florida coastline and are generally observed foraging and resting near fishing piers and on beaches adjacent to piers (USACE, 1996).

The beaches of Broward County are typical of southeast Florida beaches that receive the full impact of wind and wave action. The diversity of species that can survive in this environment is low, but the population density of the few resident species that are specialized to survive in this high-energy environment is usually very high. The upper portion of the beach, or subterrestrial fringe, is dominated by talitrid amphipods and ghost crab (*Ocypode quadrata*). In the midlittoral zone (beach face of the foreshore), polychaetes, isopods, and haustoriid amphipods are the dominant organisms. In the surf zone, coquina clams (*Donax* spp.) and mole crabs (*Emerita talpoida*) typically dominate the beach fauna (Spring, 1981; Nelson, 1985; and USFWS, 1997).

3.5.2 INLET COMMUNITIES.

The area of vegetated estuarine wetlands surrounding Port Everglades Inlet is also limited due to the extensive development of the Port and adjacent urban areas, absence of stable substrate, and excessive water depth

Corals (*Siderastrea* spp., *Porites* sp., *Montastrea* sp., *Oculina* sp., and *Leptogorgia setacea*) and sponges (*Cliona* sp. and *Spherospongia vesparium*) are sparsely distributed in some inlets in southeast Florida. Species commonly observed in association with jetty structures include fireworm (*Hermodice carunculata*), Cuban stone crab (*Menippe nodifrons*), flat crab (*Plagusia depressa*); sponges (*Haliclona* sp.), colonial anemone (*Zoanthus sociatus* and *Palythoa variabilis*), hydroids, and the octocoral, *Telesto riisei*. (CPE, 1992).

3.5.3 NEARSHORE SOFT BOTTOM COMMUNITIES.

Shallow subtidal soft bottom habitat (0 to 3 feet deep) are dominated by a relatively even mix of polychaetes (primarily spionids), gastropods (*Oliva* sp., *Terebra* sp.), portunid crabs (*Arenaeus* sp., *Callinectes* sp., and *Ovalipes* sp.) and burrowing shrimp (*Callinassa* sp.). In slightly deeper water (3 to 10 feet deep), the dominant fauna are polychaetes, haustoriid and other amphipod groups, and bivalves (*Donax*, sp. and *Tellina* sp.) (Marsh et al. 1980; Goldberg et al., 1985; Gorzelany and Nelson, 1987; Nelson, 1985; Dodge et al., 1991). Dexter (1972), Croker (1977), and Shelton and Robertson (1981) have indicated that there is no latitudinal pattern of diversity and species distribution among the tropical intertidal sand beach macrofauna (USACE, 1996).

3.5.4 FISHES.

3.5.4.1 Nearshore community.

The inshore surf zone fish community consists mainly of small species or juveniles (Modde, 1980). A relatively few species typically dominate the surf zone area (Modde and Ross, 1981; Peters and Nelson, 1987). Common surf zone fish include Atlantic threadfin herring (*Opisthonema oglinum*); blue runner (*Caranx crysos*); spotfin mojarra (*Eucinostomus argenteus*); southern stingray (*Dasyatis americana*); greater barracuda (*Sphyræna barracuda*); yellow jack (*Caranx bartholomæi*) and the ocean triggerfish (*Canthidermis sufflamen*); none of which are of local commercial value (USACE, 1998).

A mixture of coastal pelagic, surf zone, and reef fishes are attracted to the shelter and food source provided by the nearshore hardbottom along southeast Florida (USACE, 1996). Coastal pelagic species observed are primarily migratory species that include Spanish mackerel, *Scomberomorus maculatus*; bluefish, *Pomatomus saltatrix*; mullets, *Mugil* spp.; and jacks, *Caranx* spp. Only Spanish mackerel and mullet are of commercial value (USACE, 1996). Typical surf zone fishes observed in association with the rock outcrops of southeast Florida include Atlantic croaker, *Micropogonias undulatus*; pompano, *Trachinotus carolinus*; jacks, *Caranx* spp.; snook, *Centropomus undecimalis*; anchovies, *Anchoa* spp.; and herrings, *Clupea* spp. (USACE, 1996). Common snook (*C. undecimalis*) is listed as a species of special concern by the State of Florida. These species are not confined to the nearshore hardbottom areas and can be found along the sandy periphery of the rocks in the nearshore zone (Herrema, 1974; Futch and Dwinnel, 1977; Gilmore, 1977; Gilmore et al., 1981). In contrast to surf zone fishes, reef fishes are always associated with some form of natural or artificial bottom structure. The offshore reefs support the largest populations of reef fish. Reef species often observed along the nearshore rock outcrops include grunts, snappers, groupers, wrasses, damselfish, blennies, gobies, angelfishes, and parrot fishes. Only snapper and grouper are of commercial value (USACE, 1996).

Detailed surveys of fish abundance and densities were conducted as part of the BCSSP and details of those surveys can be located in Section 3.5.5.1 and 3.5.5.2 of the DEIS.

3.6 ESSENTIAL FISH HABITAT

The SAFMC (1998) has designated nearshore hardbottom areas within the study area as EFH. The nearshore bottom of southeastern Florida has also been designated as EFH-HAPC (SAFMC 1998). Managed species that commonly inhabit the study area include pink shrimp (*Penaeus duorarum*), and spiny lobster (*Panularis argus*). These shellfish utilize both the inshore habitats within the study area. Members of the 73 species snapper-grouper complex that commonly use the inshore habitats for part of their life cycle include blue stripe grunts (*Haemulon sciurus*), French grunts (*Haemulon flavolineatum*), mahogany snapper (*Lutjanus mahogoni*), yellowtail snapper (*Ocyurus chysurus*), and red grouper (*Epinephelus morio*). These species utilize the inshore habitats as juveniles and sub-adults and as adults utilize the hardbottom and reef

communities offshore. In the offshore habitats, the number of species within the snapper-grouper complex that may be encountered increases. Other species of the snapper-grouper complex commonly seen offshore in the study area include gray triggerfish (*Balistes capriscus*) and hogfish (*Lachnolaimus maximus*). Coastal migratory pelagic species also commonly utilize the offshore area adjacent to the study area. In particular, the king mackerel (*Scomberomorus cavalla*) and the Spanish mackerel (*Scomberomorus maculatus*) are the most common. As many as 60 species of corals can occur off the coast of Florida (SAFMC 1998) and all of these fall under the protection of management plans.

3.7 CULTURAL RESOURCES

In accordance with the recommendations of the State Historic Preservation Officer, the proposed dredging area was surveyed for underwater historical properties using a magnetometer for both the Broward County Shore protection project and the pending Port Everglades Feasibility Study. Both studies were granted concurrence from Florida State Historic Preservation Officer.

3.8 RECREATION

Recreational boaters and divers use the Port Everglades Entrance channel primarily for accessing the offshore coral reefs and deep waters off of Broward County. Fishing, sailing and SCUBA diving these waters remains extremely popular. In addition to the commercial port facilities, there are several large marinas to the north and south of the Port. All of the beaches in the area support a wide variety of recreational activities such as surf fishing, swimming, and sun bathing.

3.9 NAVIGATION (COMMERCIAL & MILITARY)

Port Everglades is the second largest port facility on Florida's Atlantic coast. More than 5,400 ships call at Port Everglades in a year forming the basis of a diverse maritime operation that includes a thriving cruise industry, containerized cargo, a major petroleum storage and distribution hub and South Florida's primary bulk cargo depot (Broward County, 2003).

Port Everglades has long been a favorite liberty port of call for U.S. Naval vessels. The port is a site for official ceremonies and a location for operational exercises in conjunction with the port-located U.S. Navy's South Florida Testing Facility. The port's deep harbor -- the only commercial port south of Norfolk, VA, that can handle aircraft carriers at its docks make it an ideal stop for vessels operating in Atlantic and Caribbean waters.

3.10 ECONOMICS

Maintenance dredging of Port Everglades Entrance Channel is necessary to allow deep-draft vessels continued safe access to the port. The port, in turn, provides employment and also produces income for the local community through the purchase of goods and materials. Channel dredging maintains safe navigation conditions for commercial fishermen, commercial dive boat operators and recreational boating enthusiasts as well.

Boating opportunities and maintained beaches offer the local tourism industry attractions for generating revenue.

3.11 AESTHETICS

Beach State Park is enjoyed by thousands of visitors every year, and commercial and recreational fisherman and divers to access the offshore coral reefs utilize the Entrance Channel.

4 ENVIRONMENTAL EFFECTS

4.1 INTRODUCTION

This section describes how the implementation of each alternative would affect the environmental resources listed in Section 1.4. A summary of these impacts can be found in Table 1 of Section 2.0. The following anticipated changes to the existing environment include direct, indirect, and cumulative effects.

4.2 WATER QUALITY

4.2.1 NO-ACTION ALTERNATIVE

There will be no impact to water quality if Broward County does not dredge the Entrance Channel. There may be impacts to water quality when the Corps dredges the Entrance Channel as either a separate project or part of the Feasibility Study. A separate NEPA document will be prepared for that action and that document will evaluate the effects of the Corps actions.

4.2.2 DREDGING ALTERNATIVE

The only anticipated change in water quality at the proposed dredge site will be a temporary increase in turbidity. According to the state of Florida's water quality standards, turbidity levels during dredging are not to exceed 29 nephelometric turbidity units (NTUs) above background levels within a 150-meter mixing zone. In order to comply with this standard, turbidity will be monitored according to state protocols during the proposed dredge work. If at any time the turbidity standard is exceeded, those activities causing the violation will cease. A permit issued by the Florida DEP includes the requirements for water quality during dredging activities (Appendix C).

4.3 THREATENED, ENDANGERED AND PROTECTED SPECIES

4.3.1 NO-ACTION ALTERNATIVE

There will be no impact to threatened and endangered species if Broward County does not dredge the Entrance Channel. There may be impacts to threatened and endangered species when the Corps dredges the Entrance Channel as either a separate project or part of the Feasibility Study. A separate NEPA document will be prepared for that action and that document will evaluate the effects of the Corps actions.

4.3.2 DREDGING ALTERNATIVE

Coordination with the U.S. Fish and Wildlife Service (USFWS) was conducted regarding possible impacts to the manatee and sea turtles caused by the proposed project (see Appendix C). The USFWS stated that the project is not likely to adversely affect the manatee if the precautions listed below are implemented, whereas the project may affect the loggerhead, leatherback and green sea turtles. Precautions regarding nesting sea turtles, as listed in the biological opinion of the USFWS, will be implemented. Coordination with the National Marine Fisheries Service (NMFS) was conducted via the public notice. All standard precautions for hopper dredge use, as stated in the regional biological opinion of the NMFS, will be incorporated in the project plans and specifications should one be utilized.

4.3.2.1 Manatees

The following standard protection measures will be implemented to minimize potential impacts to manatees:

- (1) The contractor will instruct all personnel associated with the construction of the project about the presence of manatees in the area and the need to avoid collisions with manatees. All construction personnel shall be responsible for observing water-related activities for the presence of manatees and shall implement appropriate precautions to ensure the protection of manatees.
- (2) All construction personnel shall be advised that there are civil and criminal penalties for harming, harassing or killing manatees, which are protected under the Marine Mammals Protection Act of 1972, the Endangered Species Act of 1973, and the Florida Sanctuary Act. The contractor shall be held responsible for any manatee harmed, harassed, or killed as a result of the construction of the project.
- (3) Prior to the commencement of construction, the construction contractor shall construct and install at least two temporary signs concerning manatees. These signs shall read "Caution: Manatee Habitat. Idle Speed is required if operating a Vessel in the Construction Area" and "Caution: Manatee Habitat. Equipment must be Shutdown Immediately if a Manatee Comes Within 50 Feet of Operation".
- (4) All vessels associated with the project will be required to operate at "no wake" speeds at all times while in waters where the draft of the vessel provides less than four feet of clearance from the bottom. All vessels shall follow routes of deep water whenever possible.
- (5) If a manatee is sighted within a hundred yards of the construction area, appropriate safeguards will be taken, including suspension of construction activities, if necessary, to avoid injury to manatees. These precautions

shall include the operation of all moving equipment no closer than 50 feet of a manatee.

- (6)The contractor shall maintain a log detailing sightings, collisions, or injuries to manatees should they occur during the contract. Any collision with and/or injury to a manatee shall be reported immediately to the Florida Marine Patrol at 1-800-DIAL-FMP (1-800-342-5367) and U.S. Fish and Wildlife Service in Vero Beach.

4.3.2.2 Sea turtles

Considering that a hopper dredge will be utilized to clear the shoal in the Port Everglades Entrance Channel, compliance with all recommendations and requirements of the 1997 NMFS Biological Opinion regarding hopper dredging will be required to assure that incidental take of sea turtles are minimized during hopper dredging operations (Appendix C). The sea turtle deflecting draghead is required for all hopper-dredging projects during the months that turtles may be present, unless a waiver is granted by the USACE in consultation with NMFS. The 1997 amended Biological Opinion mandates that year round, one-hundred percent observer coverage is necessary for beach nourishment project in southeast Florida. One hundred percent inflow screening is required, and one-hundred percent overflow screening is recommended when observers are required on hopper dredges. If conditions prevent one hundred percent inflow screening, inflow screening can be reduced, but one hundred percent outflow screening is required, and an explanation must be included in the preliminary dredging report. Preliminary dredging reports which summarize the results of the dredging and any sea turtle take must be submitted within 30 working days of completion of any given dredging project. Logs of any sea turtle injuries or deaths due to hopper dredging activities will be maintained, with immediate notification to the USACE, Jacksonville District, the USFWS and NMFS as appropriate, and the FFWCC.

The Corps and Broward County agree to comply with the reasonable and prudent measures and non-discretionary terms and conditions stated in the U.S. Fish and Wildlife Biological Opinion for the proposed Broward County Shore Protection Project (dated March 11, 2002 – copy provided in Appendix C). The reasonable and prudent measures and terms and conditions as stated in the Biological Opinion will be implemented to minimize take of the loggerhead, leatherback, and green sea turtle.

4.3.2.3 Dolphins and Whales

The proposed project is not expected to have any effect on dolphins and whales that inhabit the waters offshore of Broward County.

4.4 WILDLIFE RESOURCES OTHER THAN THREATENED, ENDANGERED AND PROTECTED SPECIES

4.4.1 NO-ACTION ALTERNATIVE

There will be no impact to wildlife resources other than threatened, endangered and protected species if Broward County does not dredge the Entrance Channel. There may be impacts to wildlife resources other than threatened, endangered and protected species when the Corps dredges the Entrance Channel as either a separate project or part of the Feasibility Study. A separate NEPA document will be prepared for that action and that document will evaluate the effects of the Corps actions.

4.4.2 DREDGING ALTERNATIVE

Placement of dredged sand at the designated beach placement sites will have a temporary impact on aquatic and shore life. Species of birds that use these beaches for resting or feeding will be temporarily displaced but should quickly return once the work is terminated. Nearshore free-swimming organisms will also avoid the construction zone and should eventually recolonize the area. Turbidity levels along the placement site will temporarily increase, but will return to normal after beach equilibrium is achieved. Because the beach placement areas occur within a surf zone, naturally occurring turbidity levels are high. Organisms inhabiting this zone will be impacted by run-off from the disposal area but are adapted for survival in such conditions. Thus, impacts will be minor. Any losses due to the project should be replaced within a short time.

4.4.2.1 Beach and Dune habitat.

Very few birds utilize the beach and dunes in the project area due to intense coastal development. Several species of protected birds have been observed at JUL, including the Southeastern American Kestrel (*Falco sparverius paulus*), Eastern brown pelican (*Pelecanus occidentalis*), least tern (*Sterna antillarum*), little blue heron (*Egretta caerulea*), snowy egret (*Egretta thula*), tri-colored heron (*Egretta tricolor*), Roseate spoonbill (*Ajaia ajaja*), and osprey (*Pandion haliaetus carolinensis*) (Coastal Technology Corporation, 1994; Florida Game and Fresh Water Fish Commission, 1991).

Based upon database reports of the Florida Fish and Wildlife Conservation Commission, there are over 80 species of birds listed in the Federal Migratory Bird Treaty Act that have been recorded as inhabiting the southeast Florida coastline (Palm Beach, Broward, and Dade counties) between the surf zone and densely vegetated forest of the back dune for at least part of the year (USACE, 1996). However, very few species utilize the beach and dune areas in this area due to intense coastal development. Sanderlings (*Calidris alba*) and ruddy turnstones (*Arenaria interpres*) are generally the only wintering species that are commonly observed foraging and resting on the beaches along Broward County. Royal terns (*Sterna maxima*), ring-billed gulls (*Larus delawarensis*), laughing gulls (*Larus atricilla*) and herring gulls (*Larus argentatus*) also winter along the southeast Florida coastline and are generally observed foraging and resting near fishing piers and on beaches adjacent to piers (USACE, 1996).

The beaches of Broward County are typical of southeast Florida beaches that receive the full impact of wind and wave action. The diversity of species that can survive in this environment is low, but the population density of the few resident species that are specialized to survive in this high-energy environment is usually very high. Talitrid amphipods and ghost crab (*Ocypode quadrata*) dominate the upper portion of the beach, or subterrestrial fringe. In the midlittoral zone (beach face of the foreshore), polychaetes, isopods, and haustoriid amphipods are the dominant organisms. In the surf zone, coquina clams (*Donax* spp.) and mole crabs (*Emerita talpoida*) typically dominate the beach fauna (Spring, 1981; Nelson, 1985; and USFWS, 1997).

4.4.2.2 Inlet Communities.

The area of vegetated estuarine wetlands surrounding Port Everglades Inlet is also limited due to the extensive development of the Port and adjacent urban areas, absence of stable substrate, and excessive water depth

Corals (*Siderastrea* spp., *Porites* sp., *Montastrea* sp., *Oculina* sp., and *Leptogorgia setacea*) and sponges (*Cliona* sp. and *Sphaciospongia vesparium*) are sparsely distributed in some inlets in southeast Florida. Species commonly observed in association with jetty structures include fireworm (*Hermodice carunculata*), Cuban stone crab (*Menippe nodifrons*), flat crab (*Plagusia depressa*); sponges (*Haliclona* sp.), colonial anemone (*Zoanthus sociatus* and *Palythoa variabilis*), hydroids, and the octocoral, *Telesto riisei*. (CPE, 1992).

4.4.2.3 Nearshore Soft Bottom Communities.

Shallow subtidal soft bottom habitat (0 to 3 feet deep) are dominated by a relatively even mix of polychaetes (primarily spionids), gastropods (*Oliva* sp., *Terebra* sp.), portunid crabs (*Arenaeus* sp., *Callinectes* sp., and *Ovalipes* sp.) and burrowing shrimp (*Callinassa* sp.). In slightly deeper water (3 to 10 feet deep), the dominant fauna are polychaetes, haustoriid and other amphipod groups, and bivalves (*Donax*, sp. and *Tellina* sp.) (Marsh et al. 1980; Goldberg et al., 1985; Gorzelany and Nelson, 1987; Nelson, 1985; Dodge et al., 1991). Dexter (1972), Croker (1977), and Shelton and Robertson (1981) have indicated that there is no latitudinal pattern of diversity and species distribution among the tropical intertidal sand beach macrofauna (USACE, 1996).

4.4.3 FISHES.

4.4.3.1 Nearshore Community.

The inshore surf zone fish community consists mainly of small species or juveniles (Modde, 1980). A relatively few species typically dominate the surf zone area (Modde and Ross, 1981; Peters and Nelson, 1987). Common surf zone fish include Atlantic threadfin herring (*Opisthonema oglinum*); blue runner (*Caranx crysos*); spotfin mojarra (*Eucinostomus argenteus*); southern stingray (*Dasyatis americana*); greater barracuda

(*Sphyraena barracuda*); yellow jack (*Caranx bartholomaei*) and the ocean triggerfish (*Canthidermis sufflamen*); none of which are of local commercial value (USACE, 1998).

A mixture of coastal pelagic, surf zone, and reef fishes are attracted to the shelter and food source provided by the nearshore hardbottom along southeast Florida (USACE, 1996). Coastal pelagic species observed are primarily migratory species that include Spanish mackerel, *Scomberomorus maculatus*; bluefish, *Pomatomus saltatrix*; mullets, *Mugil* spp.; and jacks, *Caranx* spp. Only Spanish mackerel and mullet are of commercial value (USACE, 1996). Typical surf zone fishes observed in association with the rock outcrops of southeast Florida include Atlantic croaker, *Micropogonias undulatus*; pompano, *Trachinotus carolinus*; jacks, *Caranx* spp.; snook, *Centropomus undecimalis*; anchovies, *Anchoa* spp.; and herrings, *Clupea* spp. (USACE, 1996). Common snook (*C. undecimalis*) is listed as a species of special concern by the State of Florida. These species are not confined to the nearshore hardbottom areas and can be found along the sandy periphery of the rocks in the nearshore zone (Herrema, 1974; Futch and Dwinnel, 1977; Gilmore, 1977; Gilmore et al., 1981). In contrast to surf zone fishes, reef fishes are always associated with some form of natural or artificial bottom structure. The offshore reefs support the largest populations of reef fish. Reef species often observed along the nearshore rock outcrops include grunts, snappers, groupers, wrasses, damselfish, blennies, gobies, angelfishes, and parrot fishes. Only snapper and grouper are of commercial value (USACE, 1996).

Detailed surveys of fish abundance and densities were conducted as part of the BCSSP and details of those surveys can be located in Section 3.5.5.1 and 3.5.5.2 of the DEIS.

4.5 ESSENTIAL FISH HABITAT

4.5.1 NO-ACTION ALTERNATIVE

There will be no impact to Essential Fish Habitat if Broward County does not dredge the Entrance Channel. There may be impacts to Essential Fish Habitat when the Corps dredges the Entrance Channel as either a separate project or part of the Feasibility Study. A separate NEPA document will be prepared for that action and that document will evaluate the effects of the Corps actions.

4.5.2 DREDGING ALTERNATIVE

All coastal inlets, such as the Port Everglades entrance channel, are considered by the South Atlantic Fishery Management Council to be habitat areas of particular concern for some commercially important species. A detailed analysis of the effects to Essential Fish Habitat as a result of placing sediment on the beach at JUL has been analyzed in the Broward County SPP DEIS (Section 4.6).

Removal of the shoal material from the entrance channel will temporarily affect EFH in the channel. The most obvious direct of this alternative on managed species is the potential for mortality and/or injury of individuals through the dredging process. Species in the project area's habitats are susceptible. Fishes and invertebrates are at risk at any

life-history stage; eggs, larvae, juveniles, and even adults may be inadvertently killed, disabled, or undergo physiological stress, which may adversely affect behavior or health. Forms that are less motile, such as juvenile shrimp, are particularly vulnerable. However, historic dredging episodes have shown that these species recolonize fairly quickly; so much of the impact would be temporary.

Impacts to the water column can have widespread effects on marine and estuarine species. Hence, it is recognized as EFH. The water column is a habitat used for foraging, spawning, and migration by both managed species and organisms consumed by managed species. Water quality concerns are of particular importance in the maintenance of this important habitat.

Temporary impacts to populations of managed species would occur due to dredging softbottom habitats, such as this sandy bottom area. Dredging would remove benthic organisms used as prey by managed species and temporarily lower the carrying capacity of the project area for certain species, such as red drum, that largely forage on such taxa.

4.6 CULTURAL RESOURCES

4.6.1 NO-ACTION ALTERNATIVE

There will be no impact to cultural resources if Broward County does not dredge the Entrance Channel.

4.6.2 DREDGING ALTERNATIVE

An underwater cultural resource survey has been conducted for the project area. No historic properties were located as a part of this study. Based on this study a determination of no historic properties was made. The Florida State Historic Preservation Officer concurred with this determination (Division of Historic Resources #2002-09147, Appendix C).

4.7 RECREATION

4.7.1 NO-ACTION ALTERNATIVE

Recreational boating, and access to offshore fishing and SCUBA diving would be impacted if the Port Everglades Entrance Channel were not dredged by Broward County because of increased shoaling and decreased navigable capacity of the project channel. This increased shoaling will restrict recreational vessel access when larger commercial or military vessels are in the channel, since the larger vessels will have even more limited maneuverability and channel width to use while entering and exiting the port.

4.7.2 DREDGING ALTERNATIVE

Recreational boat traffic would experience temporary delays due to construction traffic and congestion. Minor temporary impacts would also occur to recreational beach

activities because of sand placement construction activities. However, recreational boat traffic would benefit from the increased navigable capacity of the channel. Recreational beach activities would benefit from the increased beach area resulting from the dredging and beach placement.

Section 4.10 of the Broward County SPP DEIS presents a detailed analysis of placing sandy beach quality sediment on the JUL beaches.

4.8 NAVIGATION (COMMERCIAL AND MILITARY)

4.8.1 NO-ACTION ALTERNATIVE

Sediment would continue to accumulate in the entrance channel south of the north jetty due to littoral drift until the Corps could complete the necessary planning and coordination necessary to initiate the project. Sediment accumulation would continue to hamper vessel navigation through the entrance channel, continuing to effect vessel safety. The channel is currently restricted to one-way vessel traffic and during periods of high traffic or inclement weather it is imperative that vessels have full latitude within the channel to make necessary emergency maneuvers and course corrections. Due to budgetary constraints, it may take as long as two-years for the Corps to be prepared to begin maintenance dredging operations in the channel.

4.8.2 DREDGING ALTERNATIVE

Dredging will maintain the full two-way navigable capacity of the project channel for deep-draft vessels.

4.9 ECONOMICS

4.9.1 NO-ACTION ALTERNATIVE

Sediment accumulation in the entrance channel hampers vessel navigation and increases transportation costs in two ways: first, vessel groundings would become more likely and frequent, resulting in additional costs for not only the grounded vessels, but also those vessels delayed by the obstruction; and second, deeply-laden vessels would incur delay costs awaiting tide for the necessary additional channel depth to enter/depart Port Everglades. The increased transportation costs are factored into businesses' decisions to locate or expand operations, reducing the competitive advantage offered by Port Everglades.

4.9.2 DREDGING ALTERNATIVE

Maintenance dredging of the project channel will allow full access to Port Everglades. Transportation of commodities through the port creates a stimulus for attracting new business to the area. Recreational boaters as well as commercial fishing and diving enterprises also rely on the navigable capacity of the project channel for access purposes. Additionally, the port provides jobs and generates revenue for the surrounding community through the purchase of goods and materials. Maintained beaches provide attractions that generate revenue for the local tourist industry.

4.10 AESTHETICS

4.10.1 NO-ACTION ALTERNATIVE

There will be no impact to aesthetics if Broward County does not dredge the Entrance Channel. There may be impacts to aesthetics when the Corps dredges the Entrance Channel as either a separate project or part of the Feasibility Study. A separate NEPA document will be prepared for that action and that document will evaluate the effects of the Corps actions.

4.10.2 DREDGING ALTERNATIVE

Construction activities within the project channel and at the disposal sites would temporarily impact the aesthetic appeal of the area. Permanent impacts to the aesthetics of the area caused by the construction are not anticipated.

4.11 CUMULATIVE IMPACTS

Cumulative impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7).

Port Everglades was authorized as a Federal project in 1930 (see section 1.2 for more detail on the history of authorization of the project and subsequent improvements). The port has undergone numerous maintenance events and various navigation improvements. We fully expect the port to remain viable for many years and to continue undergoing maintenance and navigation improvements. An EIS addressing proposed navigation improvements is underway. The Notice of Intent to prepare the Draft EIS appeared in the Federal Register on March 23, 2001. Cumulative impacts relative to placing sand on the Broward County shoreline have been addressed in earlier and current EISs (see EIS on the Coast of Florida Study, Region III (October 1996) and the Broward County Shore Protection Project (March 2001, draft)). Information on these and other NEPA documents can be viewed on the Internet at

<http://www.saj.usace.army.mil/pd/envdocs/envdocsb.htm>. Maintenance dredging is an ordinary and reoccurring event for the port. The proposed maintenance dredging is not expected to represent a substantial increment of cumulative impact to the area.

4.12 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

4.12.1 IRREVERSIBLE

An irreversible commitment of resources is one in which the ability to use and/or enjoy the resource is lost forever. The only irreversible commitment of resources associated with the proposed project would be the expenditure of federal funds to complete the work.

4.12.2 IRRETRIEVABLE

An irretrievable commitment of resources is one in which, due to decisions to manage the resource for another purpose, opportunities to use or enjoy the resource as they presently exist are lost for a period of time. Placement of dredged sand at the beach disposal sites would temporarily disrupt the normal use of these areas.

4.13 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

There may be short-term degradation of water quality due to turbidity caused by dredging and dredged material disposal operations. The potential exists for the incidental taking of sea turtles during dredging operations. However, the implementation of standard protective measures should minimize and mitigate for this potential.

4.14 ENVIRONMENTAL COMMITMENTS

The U.S. Army Corps of Engineers and Broward County are committed to avoiding, minimizing or mitigating for adverse effects during construction activities by including the following commitments in the contract specifications.

The Broward County SPP DEIS has a complete list of all of the environmental commitments the Corps and County have made that will be applied to this project. A discussion of these commitments is located in the SPP DEIS in section 4.34.

The Corps and Broward County will comply with all requirements of the 1997 NMFS Regional Biological Opinion for the Continued Hopper Dredging of Channels and Borrow Areas in the Southeastern United States dated September 25, 1997.

Additional actions will be taken in order to comply with the following environmental requirements.

4.15 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

4.15.1 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

Environmental information on the project has been compiled and this Environmental Assessment has been prepared. It is available to any interested parties. The project is in compliance with the National Environmental Policy Act.

4.15.2 ENDANGERED SPECIES ACT OF 1973

Consultation was initiated with the US Fish and Wildlife Service on February 3, 2000, and completed on March 11, 2002 (see Appendix C). Dredging operations have also been coordinated with the National Marine Fisheries Service (NMFS) by letter dated February 28, 2000, NMFS responded by letter dated March 10, 2000 referring the Corps to utilize the Regional Biological Opinion for hopper dredging within the southeastern United States (September 29, 1997). All special conditions pertaining to the use of a hopper dredge will be implemented should one be used. This project was

fully coordinated under the Endangered Species Act and is therefore, in full compliance with the Act.

4.15.3 FISH AND WILDLIFE COORDINATION ACT OF 1958

This project has been coordinated with the U.S. Fish and Wildlife Service (USFWS). A Coordination Act Report was not required for this project. A Coordination Act Report was prepared for the Shore Protection Project as well as the Port Everglades Feasibility Study. This project is in full compliance with the Act.

4.15.4 NATIONAL HISTORIC PRESERVATION ACT OF 1966 (INTER ALIA)

(PL 89-665, the Archeology and Historic Preservation Act (PL 93-291), and executive order 11593) Archival research, channel surveys, and consultation with the Florida State Historic Preservation Officer (SHPO), have been conducted for the shore protection project and the proposed Port Everglades Feasibility Study in accordance with the National Historic Preservation Act, as amended; the Archeological and Historic Preservation Act, as amended and Executive Order 11593. The project is in full compliance with the Act.

4.15.5 CLEAN WATER ACT OF 1972

A Section 401 water quality certification will be required from the Florida Department of Environmental Protection. All state water quality standards would be met. A Section 404(b) evaluation is included in this report as Appendix A. Public notices (Department of the Army and State of Florida Department of Environmental Protection) were issued in a manner, which satisfies the requirements of Section 404 of the Clean Water Act.

4.15.6 CLEAN AIR ACT OF 1972

No air quality permits would be required for this project.

4.15.7 COASTAL ZONE MANAGEMENT ACT OF 1972

A federal consistency determination in accordance with 15 CFR 930 Subpart C is included in this report as Appendix B. The Corps has determined that the project would have no unacceptable impacts and would be consistent with the Florida Coastal Management Plan. In accordance with the Memorandum of Understanding (1979) and the Addendum to the Memorandum (1983) concerning acquisition of Water Quality Certifications and other state authorizations, the preliminary Environmental Assessment and Section 404 (b)(1) Evaluation have been submitted to the state in lieu of a summary of environmental impacts to show consistency with the Florida Coastal Zone Management Plan. Final state concurrence will be received with the issuance of the Water Quality Certification.

4.15.8 FARMLAND PROTECTION POLICY ACT OF 1981

No prime or unique farmland would be impacted by implementation of this project. This Act is not applicable.

4.15.9 WILD AND SCENIC RIVER ACT OF 1968

No designated Wild and Scenic River reaches would be affected by project related activities. This Act is not applicable.

4.15.10 MARINE MAMMAL PROTECTION ACT OF 1972

The Corps does not anticipate the take of any marine mammals during any activities associated with the project. However, should a marine mammal be identified within the project boundaries, they will be provided protections equal the ESA species that have had consultations completed, and as a result of this, the Corps believes that they are in compliance with the MMPA.

4.15.11 ESTUARY PROTECTION ACT OF 1968

No designated estuary would be affected by project activities. This Act is not applicable.

4.15.12 FEDERAL WATER PROJECT RECREATION ACT

There is no recreational development proposed for maintenance dredging or disposal. Therefore, this Act does not apply.

4.15.13 FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976

Coordination with the National Marine Fisheries Service (NMFS) has been accomplished during review of the Broward County SPP DEIS. The project will be in compliance with this Act.

4.15.14 SUBMERGED LANDS ACT OF 1953

The project will occur on submerged lands of the State of Florida. The project has been coordinated with the State and will be in compliance with the act. The FDEP released a notice of intent to issue for Segment III on October 17, 2002, and issued a joint coastal permit and intent to grant sovereign submerged lands authorization on May 13, 2003.

4.15.15 COASTAL BARRIER RESOURCES ACT AND COASTAL BARRIER IMPROVEMENT ACT OF 1990

John U Lloyd State Park is listed as undeveloped coastal barriers as defined by the Coastal Barriers Resources Act. These parcels require coordination with the U.S. Fish and Wildlife Service prior to nourishment activities. The Corps completed this coordination on April 30, 2002 as part of the EIS process for the Shore protection project.

4.15.16 RIVERS AND HARBORS ACT OF 1899

The proposed work would not obstruct navigable waters of the United States. The proposed action has been subject to the public notice, public hearing, and other evaluations normally conducted for activities subject to the act. The project is in full compliance.

4.15.17 ANADROMOUS FISH CONSERVATION ACT

Anadromous fish species would not be affected. Coordination with the National Marine Fisheries Service (NMFS) has been accomplished during review of the Broward County SPP DEIS. The project will be in compliance with this Act

4.15.18 MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT

No migratory birds would be affected by project activities. The project is in compliance with these Acts.

4.15.19 MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT

The term "dumping" as defined in the Act (333 U.S.C. 1402](f)) does not apply to the disposal of material for beach nourishment or to the placement of material for a purpose other than disposal (i.e. placement of rock material as an artificial reef or the construction of artificial reefs as mitigation). Therefore, the Marine Protection, Research and Sanctuaries Act does not apply to this project. The disposal activities addressed in this DEIS have been evaluated under Section 404 of the Clean Water Act.

4.15.20 MAGNUSON-STEVENSON FISHERY CONSERVATION AND MANAGEMENT ACT

This act requires preparation of an Essential Fish Habitat (EFH) Assessment and coordination with the National Marine Fisheries Service (NMFS). Pursuant to the Magnuson-Stevens Act, Essential Fish Habitat (EFH) consultation with the National Marine Fisheries Service for the proposed placement of the sediment on the beach was initiated by coordination of the Broward County SPP DEIS. The project will be in full compliance with this act.

4.15.21 E.O. 11990, PROTECTION OF WETLANDS

No wetlands would be affected by project activities. This project is in compliance with the goals of this Executive Order.

4.15.22 E.O. 11988, FLOOD PLAIN MANAGEMENT

The project is in the base flood plain (100-year flood) and is being evaluated in accordance with this Executive Order. Project will be in compliance with this Act.

4.15.23 E.O. 12898, ENVIRONMENTAL JUSTICE

The proposed action would not result in adverse health or environmental effects. Any impacts of this action would not be disproportionate toward any minority. The activity does not (a) exclude persons from participation in, (b) deny persons the benefits of, or (c) subject persons to discrimination because of their race, color, or national origin. The activity would not impact "subsistence consumption of fish and wildlife."

4.15.24 E.O. 13089, CORAL REEF PROTECTION

This EO refers to "those species, habitats, and other natural resources associated with coral reefs."

The reef distribution pattern for southeast Florida north of Key Biscayne consists of three separate parallel reef flats. The nearshore hardbottom epibenthic communities landward of the equilibrium toe of fill do not represent irreplaceable resources; and with proper placement of mitigative artificial reefs, suitable replacement habitat can be created for nearshore epibenthic species. The proposed project will be in compliance with this Executive Order.

5 LIST OF PREPARERS

5.1 PREPARERS

Preparer	Discipline	Role
Terri Jordan	Biologist	Principal Author
Brian Brodehl	Engineer	Engineering
Grady Caulk	Archaeologist	Historic Properties

5.2 REVIEWERS

Reviewer	Discipline	Role
Steve Higgins	Beach Erosion Control Administration, Policy, Interagency Coordination	Principal Contact – Broward County Shore Protection Project
Charles Stevens	Engineer	Corps of Engineers – Project Manager – Broward County Shore Protection Project
Steven Ross	Engineer	Corps of Engineers – Project Manager – Port Everglades Feasibility Study
Allan Sosnow	Marine Biologist	Environmental Manager – Port Everglades
Kenneth Dugger	Biologist	Assistant Chief, Environmental Branch – Jacksonville District, COE

6 PUBLIC INVOLVEMENT

6.1 SCOPING

A public notice for a Department of the Army Permit (199905545) dated April 26, 2000 was issued for the Shore Protection Project and the Florida Department of Environmental Protection issued a notice of intent to issue a joint coastal permit (File No. 0163435-001-JC) dated October 17, 2002, and issued the joint coastal permit on May 12, 2003 (Appendix C). Additional scoping was conducted on the SPP via a notice in the Federal Register (64 FR 58351) and Notices were mailed to appropriate local, state, and federal agencies as well as environmental groups. New public notices will

be prepared by the Corps of Engineers – Regulatory Branch and the FLDEP for their respective permits issued to Broward County to address this maintenance-dredging event as a component of the Shore Protection Project. A draft of this Environmental Assessment dated June 26, 2003 was distributed to the resource agencies and other interested parties for review and comment.

6.2 COMMENTS RECEIVED AND RESPONSE

Comments received on the June 2003 Draft Environmental Assessment have been incorporated into this EA. In addition, numerous comments were received on the DEIS issued for the Shore Protection Project and all of the comments were addressed in the FEIS. The Corps-Regulatory Branch and the FLDEP will address any comments received on the new public notices.

REFERENCES

- Broward County, 2003. Port Everglades Website. <http://www.broward.org/port>. Accessed on May 29, 2003.
- Burney, C. and W. Margolis. January 1998. Sea Turtle Conservation Report 1997 (Technical Report 97-08). Nova Southeastern University. Broward County Board of County Commissioners, Department of Natural Resource Protection Biological Resource Division. Dania, Florida.
- Burney, C. and W. Margolis. March 1999. Sea Turtle Conservation Report 1998 (Technical Report 99-09). Nova Southeastern University. Broward County Board of County Commissioners, Department of Natural Resource Protection Biological Resource Division. Dania, Florida.
- Coastal Planning & Engineering, Inc. (CPE). July 1992. Hillsboro Inlet Management Plan. Prepared for the Hillsboro Inlet Improvement and Maintenance District. Coastal Planning & Engineering: Boca Raton, Florida.
- Coastal Technology Corporation. March 1994. Port Everglades Inlet Management Plan. Prepared for the Department of Natural Resource Protection, Broward County, Florida. Coastal Technology Corporation: Coral Gables, Florida.
- Croker, R.A. 1977. Macroinfauna of Northern New England Marine Sand: Long-term Intertidal Community Structure. Pp. 439-450 in: B.C. Coull, ed., Ecology of Marine Benthos. University of South Carolina Press: Columbia, South Carolina
- Dean, Robert G., Director. Division of Beaches and Shores. Personal correspondence to Thomas J. Campbell, Coastal Planning & Engineering, Inc., January 22, 1987.
- Dexter, D.M. 1972. Comparison of the Community Structure in a Pacific and Atlantic Panamanian Sandy Beach. Bulletin of Marine Science. 22: 449-462.
- Deutsch, C.J. 2000. Winter movements and use of warm-water refugia by radio-tagged West Indian manatees along the Atlantic Coast of the United States. Final Report prepared for Florida Power and Light Company and U.S. Geological Survey. 74pp. + append.
- Dodge, R. E., S. Hess, and C. Messing. January 1991. Final Report: Biological Monitoring of the John U. Lloyd Beach Renourishment: 1989. Prepared for Broward County Board of County Commissioners Erosion Prevention District of the Office of Natural Resource Protection. NOVA University Oceanographic Center: Dania, Florida. 62 pp. plus appendices.

Florida Game and Fresh Water Fish Commission. 1991. Nongame Wildlife Program Technical Report #10, Florida Atlas of Breeding Sites for Herons and Their Allies, UPDATE 1986-89. September 1991

Florida Marine Research Institute (FMRI). May 1999. Reported Sea Turtle Nesting Activity in Florida, 1993-1998.

Futch, C.R. and S.E. Dwinell. 1977. Nearshore Marine Ecology at Hutchinson Island, Florida: 1971-1974. Vol. IX, Lancelets and Fishes. Florida Marine Research Publication No. 25. 23 pp.

Gilmore R.G. 1977. Fishes of the Indian River Lagoon and Adjacent Waters, Florida. Bulletin of the Florida State Museum, Biological Science, 22(3): 101-148.

Gilmore R.G., J.C. Donahue, D.W. Cooke, and D.J. Herrema. 1981. Fishes of the Indian River Lagoon and Adjacent Waters, Florida. Harbor Branch Foundation, Inc., Technical Report No. 41. 36 pp.

Goldberg, W. M., P.A. McLaughlin, and S. Mehadevan. 1985. Long Term Effects of Beach Restoration in Broward County, Florida, A Three-Year Overview. Part II: Infaunal Community Analysis. Coral Reef Associates, Inc./Florida International University, Miami, Florida/Mote Marine Laboratory, Sarasota, Florida. 31 pp.

Gorzelay, J. F. and W. G. Nelson. 1987. The Effects of Beach Nourishment on the Benthos of a Subtropical Florida Beach. Marine Environmental Research. 21: 75-94.

Herrema, D. J. 1974. Marine and Brackish Water Fishes of Southern Palm Beach and Northern Broward Counties, Florida. MS Thesis, Florida Atlantic University. 257 pp.

Marsh, G. A., P. R. Bowen, D. R. Deis, D. B. Turbeville, and W.R. Courtenay. 1980. Evaluation of Benthic Communities Adjacent to a Restored Beach, Hallandale (Broward County), Florida, Vol. 11, Ecological Evaluation of a Beach Nourishment Project at Hallandale (Broward County), Florida, MR 80-1(11), U.S. Army Corps of Engineers, Coastal Engineering Research Center.

Mezich, R.R. 2001. Manatees and Florida Power and Light's Lauderdale and Port Everglades Power Plants. A Report Developed for the Florida Fish and Wildlife Conservation Commission, Office of Environmental Services. Bureau of Protected Resources.

Modde, T. 1980. Growth and Residency of Juvenile Fishes Within a Surf Zone Habitat in the Gulf of Mexico. Gulf Research Report 6:377-385.

Modde, T. and S. T. Ross. 1981. Seasonality of Fishes Occupying a Surf Zone Habitat in the Northern Gulf of Mexico. Fisheries Bulletin 78:911-922.

National Marine Fisheries Service. 1997. Regional biological opinion-hopper dredging-South Atlantic coast.

National Marine Fisheries Service. 2002. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2002. NOAA Technical Memorandum NMFS-NE-169.

Nelson, W. G. 1985. Guidelines for Beach Restoration Projects. Part I - Biological. Florida Sea Grant College. SGC-76. 66 pp.

Odell, Daniel K. 1991. A Review of the Southeastern United States Marine Mammal Stranding Network: 1978-1987. *In*: Reynolds, J.E., III and D. K. Odell (eds.) Marine Mammal Strandings in the United States: Proceedings of the Second Marine Mammal Stranding Workshop; 3-5 December 1987, Miami Florida. *NOAA Technical Report NMFS 98*, pp. 19-23.

Peters, D. J. and W. G. Nelson. 1987. The Seasonality and Spatial Patterns of Juvenile Surf Fishes of the Florida East Coast. *Florida Scientist* 50(2): 85-99.

Shelton, C.R. and P.B. Robertson. 1981. Community Structure of Intertidal Macrofauna on Two Surf-exposed Texas Sandy Beaches. *Bulletin of Marine Science* 31: 833-842.

South Atlantic Fishery Management Council. 1998. Habitat plan for the South Atlantic region: essential fish habitat requirements for fishery management plans of the South Atlantic Fishery Management Council. 457 pp.

Spring, Keith D. June 1981. A Study of Spatial and Temporal Variations in the Nearshore Macrobenthic Populations of the Central Florida East Coast. A Thesis submitted to Florida Institute of Technology, Department of Oceanography and Ocean Engineering, Bio-Environmental Oceanography.

Sterghos, N. 1998. Great Balls O' Fire: Heat Records Set South Florida gets an August heat wave in June. *Sun-Sentinel*. Ft. Lauderdale, Florida. June 15, 1998.

U.S. Army Corps of Engineers (USACE). 1990. Broward County, Florida Shore Protection Project Segment III (Port Everglades to South County Line), General Design Memorandum, Addendum II (Hollywood/Hallandale First Renourishment), Vol. 1.

U.S. Army Corps of Engineers (USACE). 1996. Coast of Florida Erosion and Storm Effects Study, Region III, Feasibility Report with Final Environmental Impact Statement.

U.S. Army Corps of Engineers (USACE). July 1998. Beach Erosion Control and Hurricane Protection Project Dade County, Florida, Modifications at Sunny Isles, Final Environmental Impact Statement.

U.S. Fish and Wildlife Service. 1997. Fish and Wildlife Coordination Act Report, Modifications to: Sunny Isles Beach Project, Dade County, Florida. September 1997.