project from Jacksonville to Miami, Florida. There are a total of ten tidal inlets within Region III which connect the Atlantic Ocean to the inland waters, four of which are federal navigation projects. The inlets are shown in Figure 1. There are eight engineered inlets, both Federal and non-Federal, and two unaltered inlets. The engineered inlets from north to south include Jupiter Inlet, Lake Worth Inlet, South Lake Worth Inlet or Boynton Inlet, Boca Raton Inlet, Hillsboro Inlet, Port Everglades, Bakers Haulover Inlet and Government Cut. The natural inlets are Norris Cut which separates Fisher Island and Virginia Key and Bear Cut which separates Virginia Key and Key Biscayne. The inlets are discussed in greater detail later in this report and in Appendix D (Engineering Appendix).

EXISTING FEDERAL PROJECTS

23. Federal civil works water resource development projects within the Region III shoreline include seven beach erosion control, shore protection and hurricane protection type projects and five navigation projects. Three of the federal navigation projects are deep draft ports. Approximately 33.4 miles of shoreline in Region III have been nourished by placement of 28,648,000 cubic yards of sand at a total cost of $144,454,000, with a Federal contribution of $74,682,000. Approximately 110 miles of federal navigation channels have been constructed, with a total first cost plus operation and maintenance cost of $174,509,000. Project maps for these projects are included in Appendix A. A description of the Federal projects are included in the following paragraphs and in the Engineering Appendix (Appendix D). Table 1 summarizes project data for all Federal storm damage reduction, shore protection and beach erosion control projects in Region III. PCA's associated with these projects are provided in Appendix H. Table 2 summarizes project data for the Federal navigation projects.

Palm Beach County Authorized Shore Protection Projects

24. There are two beach erosion control projects authorized for Palm Beach County. The segment of Palm Beach County from Lake Worth Inlet to South Lake Worth Inlet was authorized in 1958. The segment from the Martin County Line to Lake Worth Inlet and from South Lake Worth Inlet to Broward County Line was authorized in 1962. Palm Beach County is the non-Federal sponsor for each of the primary authorized projects; the Cities of Delray Beach and Boca Raton are sponsors for their respective project segments.

25. Lake Worth Inlet to South Lake Worth Inlet. The beach erosion control project for Lake Worth Inlet to South Lake Worth Inlet, or Palm Beach Island, was authorized in 1958 by PL 85-500. The project, described in House Document (HD)

TABLE 1
SUMMARY DATA
REGION III FEDERAL SHORE PROTECTION PROJECTS

(shit)

Project Name	Year Authorized	Length (miles)	Amount of Fill Placed to Date (1000)(cy)	Cost to Date		
				Federal (1000)($)	Non-Federal (1000)($)	Total (1000)($)
Palm Beach County Lake Worth Inlet (LWI) to South Lake Worth Inlet (SLWI) [1]	1958	15.6	None	648	1,132	1,780
PBC-Martin County Line to LWI and SLWI to Broward County Line [2]	1962	12.8 [3]	4,949 [4]	8,100	8,000	16,100
Broward County	1965	8.9	7,562 [5]	19,100 [6]	19,600	38,700
Dade County	1968 [7]	13.0	15,226	44,000	38,900	82,900
Virginia Key and Key Biscayne [8]	1962	3.7	490	1,700 [9]	826	2,526
Key Biscayne [10]	1985	2.4	421 [11]	1,100	1,300	2,400
Bill Baggs Cape Florida State Recreation Area	1967	N/A [12]	None --- 28,648 [13]	34 --- 74,682	14 --- 69,772	48 --- 144,454

[1] This project includes construction and operation of a sand transfer plant at LWI. Costs shown are for the construction and operation and maintenance of the sand transfer plant only.

[2] This project includes operation and maintenance of the existing sand transfer plant at SLWI following initial improvement of the project beach. To date, there has been no Federal participation in the sand transfer plant feature of this project.

[3] The project is authorized for 12.8 miles of initial beach fill with nourishment of these shores and other eroding shores throughout the county as needed.

[4] The Boca Raton segment of this project has had 875,000 cy placed and the Delray Beach segment has had 4,074,000 cy placed.

[5] Segment II of this project has had 2,780,000 cy placed and Segment III has had 4,782,000 cy placed.

[6] This amount includes $26,884 for Federal operation and maintenance costs through Oct 1993.

[7] This project was modified by the Water Resources Development Act (WRDA) of 1974, the Supplemental Appropriations Act of 1985 and WRDA of 1986.

[8] This project includes Federal participation in the cost of deferred construction of groins when experience indicated their justification.

[9] This amount includes $1,022 Federal operation and maintenance costs through 30 September 1979.

[10] This project authorization includes construction of a terminal groin at the southern limit of the beach fill and additional toe protection for the revetment at the Cape Florida Lighthouse.

[11] This amount (421,000 cy) represents the beach fill quantity. The stone quantities for the terminal groin construction are as follows: 1,473 tons bedding stone; 1,796 tons core stone; 4,714 tons armor stone and 933 tons toe protection stone.

[12] This project provides for a 283 foot stone revetment.

[13] The stone quantities for construction of the revetment are as follows: 1,150 tons filter and bedding stone and 620 tons armor stone. These quantities do not include the stone that was salvaged from prior corrective action performed by non-Federal interests at the lighthouse.

TABLE 2

SUMMARY DATA FOR REGION III FEDERAL NAVIGATION PROJECTS

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Navigation Project	Earliest Authorization	Channel Length (Miles)	Channel Width (Feet)	Tonnage (1989) 2/ (1993)	Cost to Date 1/ (Sept 1992)	Year of Completion Of Initial Construction
Palm Beach Harbor (Lake Worth Inlet)	July 3, 1930	1.6	300–400	2,519,000 2,816,000	$21,020,925	1967
Port Everglades Harbor	July 3, 1990	1.6	300–500	14,684,700 16,297,000	$56,174,377	1984
Bakers Haulover Inlet	July 14, 1960	1.0	100–200	Unknown	$428,923	1964
Miami Harbor (Government Cut)	July 3, 1930	15.3	200–500	4,492,400 6,696,000	$38,925,199	1975
Intracoastal Waterway (Miami to Jacksonville)	January 21, 1927	370.0	125	536,400 1,029,000	$57,959,482	1965
			Total Cost through Sept 1992 =		$174,508,906	
			Total Tonnage for 1989 =	22,232,500 tons		
			Total Tonnage for 1993 =	26,838,000 tons		

1/ Total first cost plus operation and maintenance costs both Federal and Non–Federal.

2/ First number listed is tonnage for 1989. The second number listed is tonnage for 1993. Tonn increased 21 percent from 1989 to 1993.

342/85/2, provides for Federal participation in the cost of initial restoration and periodic nourishment of 15.6 miles of shoreline on Palm Beach Island and the construction and operation of a sand transfer plant at Lake Worth Inlet. The project is authorized for non-Federal construction with subsequent Federal reimbursement. Project construction to date has been limited to construction and operation of the sand transfer plant at Lake Worth Inlet. The sand transfer plant was completed by non-Federal interests in 1958 at a cost of $577,000. The Federal share was $111,000 (19.3 percent). The total cost of plant operation through 1968 was $842,000. The Federal share was $176,000 (20.9 percent). Federal participation in the operation and maintenance costs of the sand transfer plant expired on 30 June 1968. The operation and maintenance of the sand transfer plant since 1968 has been a non-Federal responsibility. This beach erosion control project is currently inactive.

26. Martin County Line to Lake Worth Inlet and South Lake Worth Inlet to Broward County Line. The beach erosion control project for Martin County Line to Lake Worth Inlet and from South Lake Worth Inlet to Broward County Line, was authorized in 1962 by the River and Harbor Act of 1962 (PL 87-874). The project, described in HD 164/87/1, provides for Federal participation in the cost of initial improvement at four different locations totaling approximately 12.8 miles outside of Palm Beach Island; nourishment of those and other eroding shores as needed throughout the county and operation and maintenance costs of the existing sand transfer plant at South Lake Worth Inlet following initial improvement of the project beach. The project is authorized for non-Federal construction with subsequent Federal reimbursement.

27. Construction has been limited to initial beach fill and periodic nourishment for a 2.65 mile segment at Delray Beach in August 1973; to initial construction of a 1.45 mile segment at Boca Raton in August 1988; and to initial construction of a 1.5 mile beach at Jupiter/Carlin in May, 1995. All were constructed by non-Federal interests with subsequent Federal reimbursement. Federal reimbursement at Jupiter/Carlin is pending. The Delray Beach segment was renourished in 1979, 1984 and 1992 by non-Federal interests with subsequent Federal reimbursement. Total construction costs to date for the Boca Raton segment are $3.5 million ($1.7 million Federal share and $1.8 million non-Federal share). Total construction costs (initial fill and periodic nourishment) for the Delray Beach segment are $12.6 million ($6.4 million Federal share and $6.2 million non-Federal share). Actual construction costs for Jupiter/Carlin and the federal share are awaiting the results of an audit. To

date, there has been no Federal participation in the operation and maintenance costs of the sand transfer plant at South Lake Worth Inlet.

28. The Jupiter/Carlin and Ocean Ridge segments are included in the 1962 authorization. The Ocean Ridge segment consists of 1.5 miles of initial beach fill and periodic nourishment as needed. Preconstruction, engineering and design is being accomplished by Palm Beach County. Initial construction of the Jupiter/Carlin segment was completed in April/May 1995. The Ocean Ridge segment is presently in pre-construction engineering and design.

29. A study to review the Federal interest in the 1958 and 1962 authorized projects was completed in 1987 and is presented in the General Design Memorandum (GDM) for Palm Beach County (USACE, 1987). The purpose of the study was to reformulate the project with current laws and regulations. The GDM recommendations differ from the original authorizations in that the total length of beach fill was reduced from 27.6 miles to 23.7 miles and overall Federal participation increased from 4.35 percent to 39.7 percent.

Broward County Authorized Shore Protection Projects

30. The Broward County and Hillsboro Inlet project, described in HD 91/89/1, was authorized by the River and Harbor Act of 1965 (PL 89-298). The authorization combines beach erosion control, including periodic nourishment, for 8.9 miles of shoreline in Broward County and navigation improvement at Hillsboro Inlet. Three separable project segments were identified in the authorizing document: I) the north Broward County line to Hillsboro Inlet, II) Hillsboro Inlet to Port Everglades Inlet and III) Port Everglades Inlet to the south county line. The navigation features provide for a channel 8 feet deep and 100 feet wide from the ICWW to a point 1,500 feet oceanward in Hillsboro Inlet, thence 10 feet deep and 150 feet wide to deep water in the Atlantic Ocean; jetties on the north and south sides of the ocean entrance; and a permanently based floating dredge to maintain the navigation channel and transfer sand across the inlet with the provision that the dredge be replaced by a trestle-mounted sand transfer plant if the dredge proves to be unsatisfactory. The project is authorized for non-Federal construction with subsequent Federal reimbursement. Broward County is the non-Federal project sponsor.

31. Segment I (Deerfield Beach) has not been constructed. The county initially completed a 3.2 mile project segment at Pompano Beach (Segment II) in 1970. In 1983 the project shoreline was expanded to 5.3 miles to include Lauderdale-

by-the-Sea. The county initially constructed a 1.5 mile beach segment at J.U. Lloyd Park in 1976 (Segment III) and 5.2 miles of beach at Hollywood and Hallandale (the remainder of Segment III) in 1979. The county completed the first nourishment of J.U. Lloyd Park in 1989 and the first nourishment of Hollywood and Hallandale in 1991. All work was performed by the county with subsequent Federal reimbursement. Total construction costs to date for Segment II are $11.8 million ($5.7 million Federal share and $6.1 million non-Federal share). Total construction costs for Segment III are $26.9 million ($13.4 million Federal share and $13.5 million non-Federal share). In addition, Federal operation and maintenance costs through 1993 are $26,884.

32. A re-evaluation study was completed for Segments II and III in April 1994 and October 1990, respectively, under the authority of Section 156 of WRDA of 1976 (PL 94-587), as amended by Section 934 of WRDA of 1986 (PL 99-662). Under this authority, the Assistant Secretary of the Army for Civil Works (ASA(CW)), acting through the Chief of Engineers, was granted discretionary authority to extend Federal participation to the fiftieth year after the date of initial construction of a project. Broward County requested the re-evaluation study be conducted for Segments II and III in September 1990 and February 1988, respectively. In September 1992, the ASA(CW) approved extension of Federal participation in Segment III. A decision by the ASA(CW) on the Section 934 report recommendations for Segment II is pending.

Dade County Authorized Shore Protection Projects

33. There are four authorized shore protection projects in Dade County: 1) the Dade County Beach Erosion Control and Hurricane Protection Project, 2) the Virginia Key and Key Biscayne Beach Erosion Control Project, 3) the Key Biscayne Section 103 project and 4) the Bill Baggs Cape Florida State Recreation Area Shore Protection Project. These projects are discussed below.

34. Dade County Beach Erosion Control and Hurricane Protection Project. The Dade County Beach Erosion Control and Hurricane Protection Project, described in HD 335/90/2, was authorized by the Flood Control Act (FCA) of 1968 (PL 90-483) and modified by the WRDA of 1974 (PL 93-251), the Supplemental Appropriations Act of 1985 and WRDA of 1986 (PL 99-662). Shore protection improvements authorized by the FCA of 1968 provide for 1) beach fill along 1.2 miles of shoreline at Haulover Beach Park, 2) combined beach erosion control and hurricane surge protection fill for 9.3 miles of shoreline between Government Cut and Bakers Haulover Inlet, 3) Federal participation in periodic nourishment of both of

the above reaches for the first ten years of project life and 4) credit to non-Federal interests for the pre-project costs of construction for beach fills and groin previously provided by them at Bal Harbour and Haulover Beach Park.

35. Due to advanced erosion, Bal Harbour Village officials completed construction of their 0.85 mile project reach in July 1975. This construction included extension of the south jetty at Bakers Haulover Inlet. Congressional authorization for reimbursement of the Federal share of initial construction costs at Bal Harbour is provided by the Water Resources Development Act of 1974.

36. Construction of the remainder of the Dade County project was initiated in 1977. The first of five contracts was completed August 1978, the second was completed August 1979, the third was completed October 1980, the fourth contract was completed December 1981 and the last contract was completed January 1982.

37. The first Addendum to the Dade County Beach Erosion Control and Hurricane Protection Project GDM was completed in 1981. This addendum recommended raising and sand tightening the north jetty at Government Cut in order to eliminate excessive loss of beach fill material from the project shoreline north of the inlet. These jetty modifications (raising, widening and sand tightening) were completed in 1983.

38. The second Addendum to the Dade County Beach Erosion Control and Hurricane Protection Project GDM was completed in 1984. This addendum was prepared to delineate the work necessary for the first nourishment of the Dade County Beach Erosion Control Project, which included rehabilitation of the north jetty at Bakers Haulover Inlet and extending it about 325 feet. These jetty modifications were completed in 1986. The first nourishment of the Dade County project took place between 1987 and 1990. The majority of the project shoreline was renourished in 1987 and the Bal Harbour segment was renourished in 1990.

39. A subsequent study of the shoreline along the northern part of Dade county (Sunny Isles), completed in 1982, recommended restoration of a protective beach along 2.5 miles of shoreline north of Haulover Beach Park with periodic nourishment as needed. The recommended plan also provided for extension of the period of Federal participation in the cost of nourishing the existing Dade County project from ten years to the life of the project. These modifications to the project were authorized by the Supplemental Appropriations Act of 1985 and the WRDA of 1986. Initial construction of the Sunny Isles project was

completed in 1989. In 1990, additional material was placed at Sunny Isles in conjunction with the Bal Harbour renourishment, discussed above. In 1991, beach quality material from maintenance dredging of the ICWW was placed on the Sunny Isles shoreline.

40. Total construction costs to date, including initial beach fill and periodic nourishments and jetty modifications and rehabilitations for Government Cut and Bakers Haulover Inlet, as discussed above, for the Dade County Beach Erosion Control and Hurricane Protection Project are $82.9 million. The Federal share of these costs is $44.0 million and the non-Federal share is $38.9 million.

41. Hurricane Andrew in August 1992 eroded approximately 475,000 cubic yards of sand from the Dade County project shoreline. Under the authority of PL 84-99, the project is being restored to pre-storm dimensions at Federal expense under two separate contracts (Sunny Isles and Surfside). These contracts are scheduled for completion during 1995 and 1996.

42. Virginia Key and Key Biscayne Beach Erosion Control Project. The Virginia Key and Key Biscayne Beach Erosion Control Project, described in HD 561/87/2, was authorized by the River and Harbor Act of 1962 (PL 87-874). This authorization provided for Federal participation in the cost of periodic nourishment of 1.8 miles of shoreline on Virginia Key and 1.9 miles of shoreline on Key Biscayne for an initial period of ten years and in the cost of deferred construction of groins when experience indicated their justification. Construction was completed in 1969 when approximately 160,000 cubic yards of material was placed on Virginia Key and 130,000 cubic yards of material was placed on Key Biscayne. At the time of project construction, it was determined that approximately 2,000 feet of shoreline located in central Crandon Park on Key Biscayne did not require beach fill as the existing natural beach width in that area approximated the proposed design beach both north and south of this segment. The presence of a large shoal located approximately 650 feet offshore of this area sheltered the beach from wave action thereby allowing for accretion of material at the beach on the leeward side of the shoal.

43. In 1972, the beach at Virginia Key was renourished with 100,000 cubic yards of material dredged for navigation improvements at Government Cut. Thirteen groins were also constructed at that time. Total cost for the Virginia Key and Key Biscayne, Florida Beach Erosion Control Project are $2.5 million ($1.7 million Federal share and $826,000 non-Federal share). In addition, Federal operation and

maintenance costs through 30 September 1979 were $1,022. The project was deauthorized in January 1, 1990 in accordance with Section 1001 of the 1986 WRDA

44. Key Biscayne Beach Erosion Control Project. The Key Biscayne Beach Erosion Control Project was authorized by the Chief of Engineers under the provisions of Section 103 of the 1962 Rivers and Harbor Act in August 1985. It provided for initial beach fill and periodic renourishment of the southern 2.4 miles of shoreline at Key Biscayne between the southern boundary of Crandon Park and the Cape Florida Lighthouse, excluding a 1,600 foot shoreline segment within Bill Baggs Cape Florida State Park. The 1,600 foot reach received no fill due to natural accretion in the area and extensive seagrass beds directly offshore. Also included in the authorized project was construction of a terminal groin at the southern limit of the initial fill, with additional rock to be placed as subtidal habitat and additional toe protection for the revetment at the Cape Florida Lighthouse. Construction of the beach fill and groin was completed in 1987 at a total cost of $2,400,000 ($1,100,000 Federal share and $1,300,000 non-Federal share). Of this total amount, the terminal groin cost was $743,000 ($520,000 Federal share and $223,000 non-Federal share) and the beach fill cost was $1,700,000 ($574,000 Federal share and $1,100,000 non-Federal share).

45. In August 1992, Hurricane Andrew displaced approximately 390 tons of armor stone and 280 tons of foundation stone from the terminal groin. Under the authority of PL 84-99, the groin has been rehabilitated at Federal expense. This work was completed in August 1994 at a total project cost, including planning, preconstruction, engineering, design and construction, of $84,500.

46. Bill Baggs Cape Florida State Recreation Area. Bill Baggs Cape Florida State Recreation Area (formerly called the Cape Florida State Park) is a fully developed recreation area which occupies the southerly 1.2 miles of Key Biscayne. In 1966, state park officials requested an investigation under small projects authority to determine remedial measures needed to stop shoreline recession due to ambient erosion and to prevent undermining and storm damage to the historic lighthouse at the southerly end of Key Biscayne. The study was subsequently completed and the Cape Florida State Park Beach Erosion Control Project was approved on 21 June 1967 by the Chief of Engineers under the provisions of Section 103 of PL 87-874. The authority provided for Federal participation in the initial construction costs of a 283 foot stone revetment. Under existing law, Federal participation is limited to initial construction of the structure. Non-Federal interests are required to maintain

the revetment. The revetment was completed in 1968 at a total construction cost of $48,000 ($34,000 Federal share and $14,000 non-Federal share).

47. In August 1992, Hurricane Andrew partially damaged the revetment protecting the Cape Florida Lighthouse. Under the authority of PL 84-99, the revetment has been rehabilitated at Federal expense. This work was completed in December 1993 at a total project cost, including planning, preconstruction, engineering, design and construction, of $72,000

48. The estimated cost of the remaining nourishment of the previously restored beaches in Region III for the remaining economic life of each Federal shore protection project is shown in Table 3. The year of expiration of Federal participation in each project is also listed. One new start project segment, Jupiter/Carlin, was approved for construction in 1995, and is shown in Table 4. Federal participation in this project segment is limited to 10 years following completion of construction. Two project segments are in preconstruction, engineering and design, and are listed in Table 5. Authorized projects which have not been funded for construction are listed in Table 6. These projects total $571 million in construction costs. One shore protection project in Region III, the Virginia Key/Key Biscayne project, has been completed, and was deauthorized under the provisions of the 1986 Water Resources Development Act, as shown in Table 7.

Authorized Federal Navigation Projects

49. There are five authorized Federal navigation projects within Region III. Project maps for these Federal projects are included in Appendix A. A summary of these Federal projects are included in the following paragraphs. A detailed description of the projects is contained in the Engineering Appendix (Appendix D). Figure 2 provides the location of the Federal navigation projects as well as the three non-Federal navigation projects which are located in Region III. Table 2 summarized pertinent data for the Federal navigation projects.

50. Bakers Haulover Inlet. Bakers Haulover Inlet connects the upper end of Biscayne Bay and the Intracoastal Waterway with the Atlantic Ocean. It is located about 9 miles north of the entrance to Miami Harbor and is used primarily by recreational craft. The project provides for jetties north and south of the entrance channel, to help maintain the project depth in the entrance channel and reduce maintenance costs. It also provides for dredging, when necessary, a

TABLE 3
CONTINUING CONSTRUCTION PROJECTS

Project	Year Expiration	Remaining Project Costs (Oct 1993)
Palm Beach County, FL (62) (Delray Beach Segment)	2023	$20,556,000
(Boca Raton Segment) 1/	1998	$4,243,000
Broward County, FL (Segment III)	2028	$62,585,000
Dade County, FL	2039	$144,967,000
	Total	$232,351,000

1/ Project is limited to 10 years Federal participation. Nourishment costs beyond the period of Federal participation are $21,215,000 for years 11 to 50.

TABLE 4
APPROVED NEW START PROJECTS

Project	Year Expiration	Remaining Project Costs (Oct 1993)
Palm Beach County, FL (62) 1/ (Jupiter Carlin Segment)	2005	$7,143,000

1/ Project is limited to 10 years Federal participation. Nourishment costs beyond the period of Federal participation are $22,367,000 for years 11 to 50.

TABLE 5
PROJECTS IN PRECONSTRUCTION, ENGINEERING AND DESIGN

Project	Year Expiration	Remaining Project Costs (Oct 1993)
Palm Beach County, FL (62) Ocean Ridge – See next table		
Broward County, FL (Segment II)	2020 1/	$129,827,000

1/ Federal Participation expired in 1985. A Section 934 Report is under Department of Army review. The economic life of the project ends in 2020.

TABLE 6
AUTHORIZED BUT NOT FUNDED PROJECTS

Project	Year Expiration	Remaining Project Costs (Oct 1993)
Palm Beach County, FL (62) 1/		$454,552,000
Palm Beach County, FL (58) M/ (45%)		$32,124,000
Broward County, FL (Segment I)		$46,200,000
Key Biscayne, FL (Section 103)	2037 2/	$38,196,000
	Total	$571,072,000

1/ Includes remaining nourishment costs beyond the 10 year period of Federal participation of $21,245,000 for the Boca Raton segment, and $22,367,000 for the Jupiter Carlin segment. It also includes the Ocean Ridge segment. PED for Ocean Ridge segment is underway, and is being funded and performed by the non-Federal sponsor.

2/ Federal limitation under Section 103 authority ($1 million) has been met. This study may recommend additional Federal participation for future nourishments.

M/ = Mitigation is included in project by increasing Federal share of project construction. About 45 percent of the erosion for the north end of the Palm Beach County (58) project is caused by the Palm Beach Harbor Federal navigation project at Lake Worth Inlet.

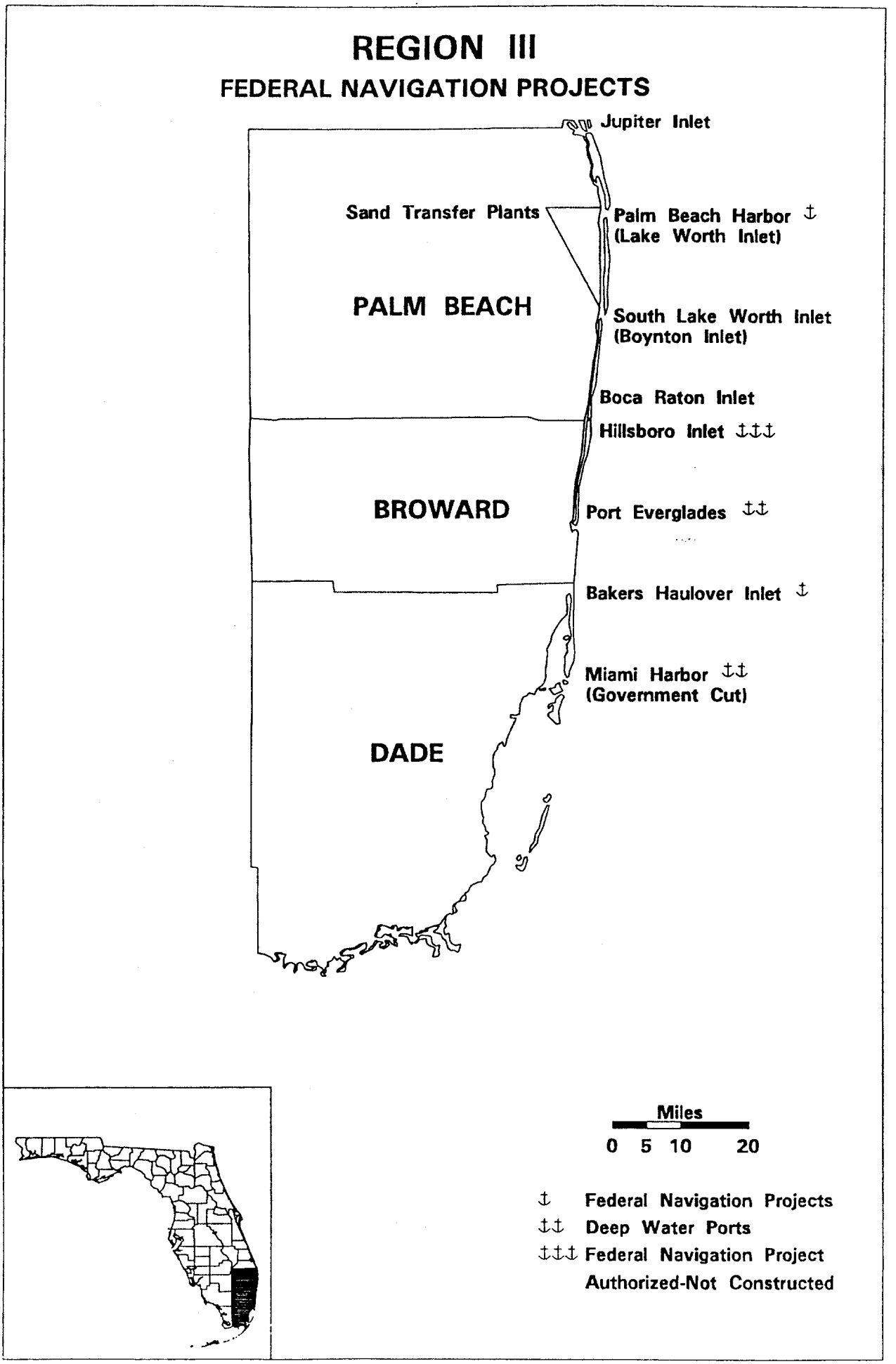
TABLE 7
DEAUTHORIZED PROJECTS

Project	Year Expiration	Remaining Project Costs (Oct 1993)
Virginia Key/Key Biscayne 1/	2019 2/	$7,332,000

1/ This project has been completed, and was deauthorized under the provisions of the 1986 Water Resources Development Act.

2/ The project was completed in 1969. The economic life of the project ends in the year 2019. Federal participation, which was limited to 10 years following completion of construction, expired in 1979.

FIGURE 2


REGION III
FEDERAL NAVIGATION PROJECTS
Jupiter Inlet
Sand Transfer Plants
Palm Beach Harbor
(Lake Worth Inlet)
PALM BEACH
South Lake Worth Inlet
(Boynton Inlet)
Boca Raton Inlet
Hillsboro Inlet
BROWARD
Port Everglades
Bakers Haulover Inlet
Miami Harbor
(Government Cut)
DADE
Miles
0 5 10 20
Federal Navigation Projects
Deep Water Ports
Federal Navigation Project
Authorized-Not Constructed

channel 11 feet deep and 200 feet wide through the 300-foot section of the inlet, thence 8 feet deep and 100 feet wide west and north to and including a marina basin 200 feet wide and thence 8 feet deep and 100 feet wide both west and north to the Intracoastal Waterway.

51. The project was completed in December 1964. Periodic surveys of the Intracoastal Waterway indicate some shoaling has occurred.

52. Intracoastal Waterway, Jacksonville to Miami. The Intracoastal Waterway from Jacksonville to Miami is a major segment of the federal inland waterway system which serves both commercial barges and recreational boats. In addition to maintenance of the waterway and side channels, the U.S. Army Corps of Engineers has maintenance responsibility for the bridge which spans the waterway at Palm Valley in St. Johns County. The existing project was completed in 1965. The 1993 traffic was 1,029,000 tons.

53. Miami Harbor. The Miami Harbor project is actually interrelated projects: the main ship channel adjacent to Miami port facilities on Dodge Island serves cruise ships and deep draft commercial ships; the channels in and adjacent to Miami River serve small commercial ships, recreational boats and commercial barges. The 15.3 miles authorized by the project consist of 7.7 miles in the main ship channel, 5.8 miles in Miami River, and 1.8 miles of connecting channels. The main ship channel is protected by jetties north and south of it, and has a turning basin 1,700 feet long and 1,650 feet wide adjacent to Biscayne Boulevard. The main channel serves a large number of cruise ships, making Miami the recognized leader for Caribbean cruises. The actual dredging of Miami Harbor to its authorized 38- and 36-foot depth is now complete.

54. The Water Resources Development Act of 1990 authorized modification of the Miami Harbor project to provide for deepening the Outer Bar cut, the Bar Cut and Government Cut to 44 feet. The new Fishermans Channel and Lummus Island turning basin would be deepened to 42 feet. Fishermans Channel would be constructed to a width of 400 feet and the Lummus Island turning basin would be 1,600 feet in diameter. The Corps' Waterways Experiment Station conducted a ship simulator study to verify the recommended improvements. Under the Corps' recommended plan, all dredged material would be placed in an EPA-approved offshore disposal site. With non-federal sponsor concurrence, the project was identified as a candidate project meeting the criteria of Section 404 of WRDA 90, where non-federal interests can construct the federally authorized project, or a portion thereof, to demonstrate the benefits of such action. The

non-federal sponsor submitted a formal proposal to proceed with the entire project under Section 404 by constructing the channel and turning basin with two separate contracts. An agreement for this action was signed November 1, 1991, and the sponsor is proceeding with the construction. The first phase, which entails upland disposal, was completed July 15, 1993. The traffic was 6,696,000 tons in 1993.

55. Lake Worth Inlet (Palm Beach Harbor). The project consists of a channel from the Atlantic Ocean through Lake Worth Inlet, then across Lake Worth and terminating with a turning basin in front of the port of Palm Beach. The project serves commercial and recreational craft.

56. The existing project was completed in 1967, with maintenance authorized for a locally provided turning basin to a depth of 24 feet in 1986. The 1993 traffic was 2,816,000 tons.

57. Port Everglades Harbor. The present Port Everglades Harbor project provides for a channel 45 feet deep and 500 feet wide through the ocean bar, tapering to 450 feet wide and 42 feet deep between the rubblestone entrance jetties, and continuing at those dimensions to an irregularly flared entrance and a turning basin of the same depth, and maintenance of the entrance jetties. Widening of the entrance channel required the removal of a portion of the existing north jetty. The authorized project will also provide a 36-foot depth in front of Berth 18 in the north-south extension of the inner harbor and turning basin. The remainder of the extension will keep its present 31-foot depth. A channel extension 400 feet wide and 36 feet deep connects with the main harbor basin. The deeper depths over 40 feet will more economically serve deep-draft ships carrying primarily petroleum products. Pier 7 channel will serve general cargo and cruise ships while the Berth 18 channel is primarily for general cargo vessels. The funds to initiate work were appropriated for fiscal year 1979, and construction was initiated. The first of two contracts was awarded July 18, 1979. All channel deepening was completed in April 1984.

58. A feasibility report recommending Federal assumption of maintenance for non-Federal navigation improvements at Port Everglades Harbor has been completed. The Chief of Engineers submitted the report to the Secretary of the Army on September 23, 1991. The project was authorized in the Water Resources Development Act of 1992 and provides for Federal assumption of the channel and turning notch, which are now authorized for the harbor. The WRDA 92 also directs the Corps to examine the constructed works and determine the federal interest in reimbursement. Funds have not been

provided for this provision. The 1993 traffic was about 16,297,000 tons.

PROBLEMS, NEEDS AND OPPORTUNITIES

59. Shoreline recession continues to be a problem along Florida's coastline. The net long-term (over numbers of years) sediment transport rate along the east coast of Florida is generally from north to south, with some localized flow reversals associated with complex hydrodynamic interactions at tidal inlets and/or some localized net long-term cross-shore (onshore or offshore) transport associated with localized bathymetric irregularities and/or resulting wave focusing. In general, as a result of the reduced wave climate (shielding from the Bahama Banks), the sediment transport rate is reduced from the north to the south. Sea-level rise, coastal storms and other natural and man-induced activities that influence the natural sediment transport processes will tend to maintain shoreline recession.

60. Tidal inlets have a tendency to interrupt the normal littoral transport of sediments along the coastline. If left to nature, over the long-term, inlets would naturally bypass sediments along the coast. Conflicts occur as a result of the multi-purpose uses desired in the coastal zone. The need to maintain inlet channels for commercial and recreational navigation, improve water quality, fisheries/nursery interchange characteristics within the interior water bodies, and maintain recreational uses of the adjacent beaches, often result in conflicting and competing interests.

61. The COFS provides the first opportunity to examine and evaluate coastal engineering problems on a regional basis in Florida since the 1974 National Shoreline Study. Environmental awareness, issues and constraints have also greatly increased since the development and authorization of these earlier projects. New laws, regulations and requirements for project development and new technological approaches to coastal shoreline erosion protection have been developed and instituted since some of the earlier shore damage reduction projects were approved. Previous beach erosion control protection and storm damage reduction projects were developed on a project by project basis that may have been limited by imposed jurisdictional boundaries or other constraints.

62. Improved management of the coastal zone is critical with increasing pressures associated with the continued growing population demands and shrinking natural and economic resources. The regional approach to project

formulation and the systems approach to examining coastal processes and natural resources should provide the means for developing enhanced, cost effective and efficient shore protection storm damage reduction projects and related navigation projects.

Federal Prospective

63. The Federal Government is interested in reducing the cost of construction, nourishment, operation and maintenance of shore protection and navigation projects along the coastline of Region III. As previously discussed, $90 million for initial restoration and $54 million for periodic nourishment, totaling $144 million ($71 million Federal and $74 million non-Federal) has been spent on Region III for 33.4 miles of federal shore protection projects between 1958 and October 1993. The cost to complete the unconstructed portions of the authorized projects, and continue nourishment in Region III totals $490 million.

64. An examination of the regional coastal processes affecting the shoreline of Region III using state-of-the-art numerical modeling techniques to assess project impacts is needed. Coupling these engineering studies with a regional system-wide analysis approach provided by GIS technology would provide the means to analyze and determine more efficient and cost effective project modifications.

65. An additional underlying study objective from the federal prospective is to better coordinate shore protection projects with navigation projects in an attempt to mitigate negative impacts at inlets. Until this present study, beach projects and navigation projects have basically been separately formulated, authorized and constructed. Increasing the sand bypassing at each of the inlets within Region III is a primary goal of this study. Where applicable, improved sand transfer systems will be recommended for approval. Near-shore sites for beach quality maintenance dredged material disposal will also be developed for the eight maintained navigation inlets.

66. The development and use of near-shore berm technology has recently been satisfactorily applied at some test locations along the Atlantic and Gulf coasts. The use of this technique may prove to be feasible along the Region III shoreline in specific situations. For example, nearshore berms may provide a reasonable alternative for shore protection in areas where environmental and/or other constraints prohibit or limit on-beach renourishment. This application approach is assessed in this report on a case by case basis.

67. Development of the authorized comprehensive body of knowledge on the coastal processes and natural resources in Region III, as documented in the database design (USACE, Phase III) and accessible through the COFS GIS database central repository maintained by DEP, will provide long-term benefits to the management of the coastal zone in Florida. The improved understanding of project impacts or effects on the shorelines and on the environment will help reduce or mitigate negative impacts as needed. The database will also help reduce project time from authorization to construction with the ability to provide detailed data and maps needed for design and contract plans and specifications, such as real estate lands, access points, locations of borrow areas, existing structures and environmental resources.

State Perspective

68. The State of Florida is critically dependent on a carefully balanced approach to coastal zone management for maintaining its economic soundness and well-being. The beaches of Florida are one the most valuable resources of the State and a primary source of State revenue. Navigation, including recreational and commercial shipping and cruise shipping are also extremely important industries within the State. As a result, the State has adopted a very aggressive and proactive approach to shoreline management. To support this increased interest, the State has spent over $146 million between its erosion control trust fund and its beach management trust fund through its 94-95 fiscal year. About 83 percent of this amount has been spent during the last 15 years (1980 - 1981 to 1994 - 1995). As shown in Table 8, $107 million in state funds have been spent specifically for beach nourishment, $18 million for sand transfer, and $9.4 million for dune restoration.

69. The State has adopted three primary avenues for addressing management issues along the coastline. These are: 1) the regulation of development along the shoreline, 2) restoration of eroded beaches, and 3) purchase of undeveloped coastal lands.

FEDERAL OBJECTIVES

The Planning Process

70. The process that has evolved on a Federal level to assist in formulating and evaluating water resource projects is the National Economic Development objective, or NED. The underlying fundamental economic problem is that we cannot do everything. The NED principle is a policy developed to guide Federal water resource planners in their choice of problem solutions. Choice is the fundamental business of

TABLE 8
STATE OF FLORIDA EROSION CONTROL TRUST FUND AND
BEACH MANAGEMENT TRUST FUND PROJECT EXPENDITURES
(ACTUAL DOLLARS)

State Fiscal Year	Beach Nourishment	Sand Transfer	Dune Protection	Structural Solutions	Beach Management	Inlet Management	Research and Other	Annual Total
58 – 65	90,768	0	0	65,000	0	13,650	143,000	312,418
65 – 66	0	25,000	0	130,811	0	0	0	155,811
66 – 67	146,720	0	0	24,660	0	12,100	93,596	277,076
67 – 68	24,000	46,366	0	0	0	0	15,388	85,754
68 – 69	0	159,650	0	9,000	0	0	114,514	283,164
69 – 70	88,089	0	0	0	0	0	1,875	89,964
70 – 71	667,761	121,500	0	0	0	14,810	1,247	805,318
71 – 72	125,058	119,309	0	52,705	0	0	21,926	318,998
72 – 73	325,578	27,046	0	0	0	0	0	352,624
73 – 74	1,670,063	0	0	140,000	0	1,911	27,950	1,839,924
74 – 75	1,453,526	254,877	5,000	0	0	92,270	47,223	1,852,896
75 – 76	1,612,297	0	0	57,124	0	0	59,552	1,728,973
76 – 77	2,367,245	82,840	40,860	0	0	0	21,158	2,512,103
77 – 78	4,478,630	45,000	47,348	0	0	0	32,265	4,603,243
78 – 79	495,851	0	17,829	0	0	0	37,944	551,624
79 – 80	7,129,293	1,658,169	195,323	0	8,620	0	39,438	9,030,843
80 – 81	3,943,819	0	203,001	0	117,468	0	5,100	4,269,388
81 – 82	6,991,800	944,250	161,956	0	0	0	82,551	8,180,557
82 – 83	1,200,000	1,418,177	294,638	72,000	149,793	0	0	3,134,608
83 – 84	3,394,259	2,030,010	2,699,415	225,675	0	0	305,572	8,654,931
84 – 85	1,331,000	735,777	208,022	318,750	0	0	0	2,593,549
85 – 86	250,000	80,000	1,009,975	267,971	61,274	85,679	18,000	1,772,899
86 – 87	7,981,032	1,000,000	58,616	32,000	0	0	0	9,071,648
87 – 88	7,836,813	2,375,000	0	260,000	0	0	125,000	10,596,813
88 – 89	12,595,000	2,263,000	491,117	1,000,000	0	0	75,419	16,424,536
89 – 90	10,191,233	1,564,687	1,104,846	1,762,500	0	0	500,000	15,123,266
90 – 91	13,957,941	2,281,375	3,202,447	280,500	0	0	0	19,722,263
91 – 92	4,903,147	103875	0	0	0	1,896,125	0	6,903,147
92 – 93	0	400,000	0	0	0	0	0	400,000
93 – 94	8,839,500	948,000	0	0	0	1,058,000	721,500	11,567,000
94 – 95	2,500,000	0	0	0	0	0	0	2,500,000
95 – 96								
TOTALS	106,590,423	18,683,908	9,740,393	4,698,696	337,155	3,174,545	2,490,218	145,715,338

economics. Because all resources are scarce, we are forced to make choices when they are used. Choose more of one thing and you simultaneously are choosing less of another. The process of developing a plan for the use of a water resource is an exercise in dealing with the fundamental economic problem of scarcity. The NED principle ensures that a project will be constructed only if the project outputs - the benefits to the Nation from the use of the resource - exceeds the cost of using it.

71. The Federal planning process consists of the following major steps:

a. Specification of the water and related land resources problems and opportunities associated with the Federal objective and specific state, county and municipal concerns.

b. Inventory, forecast and analysis of water and related land resource conditions within the planning area relevant to the identified problems and opportunities. The identification of problems, opportunities and needs was discussed earlier in the report.

c. Formulation of alternative plans.

d. Evaluation of the effects of the alternative plans.

e. Comparison of alternative plans.

f. Selection of a recommended plan based on the comparison of alternative plans.

Planning Objectives and Constraints

72. Principles and Guidelines. The "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" (The Principles and Guidelines, or P&G) are the principle guidelines for planning by Federal agencies involved in water resource development (USWRC, 1983). Although each project and project setting presents unique problems and opportunities, the U.S. Army Corps of Engineers applies a consistent set of decision criteria to participation in project planning and construction. There are three basic criteria:

(1) that there be an economically justified and environmentally acceptable project. Widespread use of benefit-cost analysis as a test of a project's economic worth is generally considered to have grown out of the Flood Control Act of 1936. In this Act, Congress required that

the U.S. Army Corps of Engineers recommend a project only "if the benefits to whomsoever they may accrue are in excess of the estimated costs and if the lives and social security of people are otherwise adversely affected."

If there is an economically justified project, decisions on whether and to what extent there should be Federal participation are guided by a concept of the Federal interest that has evolved from legislation, from precedent in project authorization and construction, and from Administration budget priorities.

(2) Federal participation must be otherwise warranted. Federal participation is limited in circumstances where there are special and local benefits which accrue to a limited number of identifiable beneficiaries. The Federal government does not participate in facilities which produce outputs incidental to basic project purposes.

(3) The project must meet current Administration budget priorities. The Administration does not budget for a project unless a significant proportion of the project outputs have a high budget priority.

73. The Federal objective, as stated in the P&G, is to contribute to national economic development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. In other words, economic benefits to the Nation must exceed project costs, without unnecessary sacrifice of environmental resources.

Federal planning concerns other than economic include environmental protection and enhancement, human safety, social well being, and cultural and historic resources. Environmental and safety considerations are of prime importance. In developing project modifications or proposed new projects, the Corps:

a. Provides for full consideration of measures to protect, enhance and restore ecological, esthetic, historical and cultural resources;

b. Attempts to obtain the best available information on the environmental effects of plans through an exchange of views and information with resources agencies at all levels of government, affected interests and the public;

c. Provides equal consideration throughout planning for environmental, economic, social, financial and engineering factors in plan scoping, development, evaluation

and modification of the authorized projects or new proposed projects;

d. Attempts to minimize adverse environmental effects, including irreversible commitments of resources, and to mitigate unavoidable losses to the extent appropriate, concurrent with project construction.

74. Federal Environmental Objectives. The Corps complies with all environmental laws and executive orders. The Corps considers carefully and seeks to balance the environmental and development needs of the Nation in full compliance with NEPA and other authorities provided by Congress and the Executive Branch. Alternative means of meeting competing demands generated by human water resources needs are examined and their environmental values examined fully, along with the economic, engineering and social factors.

75. Public participation is encouraged early in the planning process to define environmental problems and elicit public expression of needs and expectations. Municipal, county, state and other Federal agencies are contacted early for their views and provided timely information before making recommendations. Significant environmental resources and values that would likely be impacted, favorable as well as adversely, by alternative being considered are identified early in the planning process. All plans are formulated to avoid to the fullest extent practicable any adverse impact on significant resources.

76. Those significant adverse impacts that cannot be avoided are mitigated as required by Section 906(d) of the Water Resources Development Act of 1986. Section 906(d) requires the Secretary of the Army to include in reports submitted to Congress for authorization of construction a specific plan to mitigate fish and wildlife losses or a determination that the project will have a negligible effect on fish and wildlife. The NEPA document in this report describes the environmental impacts of the authorized projects and proposed project modifications and summarize compliance with the Federal statutes and regulations.

77. Historic Shoreline. Participation in shore protection projects is limited to beach restoration and protection, not beach creation or improvement unless such improvement is needed for engineering purposes. The term "restoration" was substituted for "improvement" in the amendment of July 28, 1956 (P.L. 826, 84th Congress, 70 Stat. 702) so that the basis for Federal concern became "restoration and protection" as opposed to creation of new lands (House Report No. 2544 and Senate Report No. 2691, 84th Congress). Accordingly, Federal participation in restoration is limited

to the historic shoreline. It does not provide for Federal cost sharing in extending a beach beyond its historic shoreline unless required for protection of upland areas.

78. In addition, the Federal cost share is reduced proportionately to the extent that a project protects private shores from beach erosion and land loss. Section 103(d) of the 1986 Water Resources Development Act specifically prohibits Federal participation in project costs assigned to benefits to privately owned shores, where use of such shores is limited to private interests, or to prevention of losses of private lands.

79. Federal Project Purposes. Shore protection projects have been authorized for a variety of purposes: beach erosion control, shore/shoreline protection, flood control, hurricane/hurricane wave protection and storm protection. The WRDA of 1986 now assigns costs of Federal projects to appropriate project purposes. Projects which provide hurricane and storm damage reduction are assigned a 65 percent Federal share. Projects which provide for separable recreation were assigned a 50 percent Federal share. The costs for construction projects or measures for beach erosion control and water quality enhancement are assigned to either hurricane and storm damage reduction, or recreation. The Federal Government does not participate in any work relating to recreation facilities at shore protection projects.

80. Recreation is not considered to be high priority output or primary project output under current Department of Army policy. This policy precludes federal funds to support construction of shore or hurricane protection projects which depend on separable recreation benefits for economic justification, or for which incidental recreation benefits are greater than 50 percent of the total benefits unless the project is economically justified based on primary outputs alone, or based on the combination of primary benefits and an equivalent amount of incidental recreation benefits.

81. Geographic Applicability. Storm damage reduction, beach erosion control and hurricane and abnormal tidal flooding authorities are applicable to the shores of the U.S., including the estuaries and bays directly connected therewith. Authority for shore protection project activities extend only the distance up tributary streams where it can be demonstrated that the dominant causes of erosion and damage are ocean tidal action (or Gulf of Mexico or Great Lakes water motion) and wind-generated waves. Erosion at upstream locations caused by stream flows or vessels are not included. Lake flood protection activities are generally limited to the Great Lakes.

82. Additional Federal Guidelines. The general Federal objectives dealing primarily with broad planning guidelines are described above. Other general study objectives assure that any new project recommended for construction, or proposed modifications to existing hurricane and storm damage reduction projects are formulated to:

a. Meet the specific needs and concerns of the general public within the project area.

b. Be part of or developed in conjunction with a "systems approach." Alternative plans that consider a broad range of possible impacts including impacts that occur on larger scale, were developed. The combined effectiveness and economic efficiency of the shore protection, navigation maintenance and dredged material disposal programs can then be optimized.

c. Respond to expressed public desires and preferences.

d. Be flexible to accommodate changing economic, social, and environmental patterns and changing technologies.

e. Integrate with and be complementary to other related programs in the study area.

f. Be implementable with respect to financial and institutional capabilities and public consensus.

83. A plan that reasonably maximizes net national economic development benefits, consistent with the Federal objective, is the goal of the Federal plan formulation and analysis process. This plan will be identified as the NED plan. The NED plan must also meet the test of four additional criteria:

a. Completeness. The extent to which a given modification of the authorized project provides and accounts for all necessary investments or other actions to ensure the realization of storm damage reduction.

b. Effectiveness. The extent to which a given modification of the authorized project contributes to a solution to the shoreline erosion and storm damage problems and achieves protection from storm damages.

c. Efficiency. The extent to which a given modification of the authorized project is the most cost effective means of providing storm damage protection, consistent with protecting the Nation's environment.