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RECONNAISSANCE REPORT

SMALL NAVIGATION PROJECT
SECTION 107

PALMETTO AND SOLDIER CREEKS
BALDWIN COUNTY, ALABAMA



**US Army Corps
of Engineers**

Mobile District

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RECONNAISSANCE REPORT

SECTION 107

PALMETTO AND SOLDIER CREEKS

BALDWIN COUNTY, ALABAMA

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**PALMETTO AND SOLDIER CREEKS, ALABAMA
SECTION 107 RECONNAISSANCE REPORT**

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AUTHORITY AND BACKGROUND

This reconnaissance report is submitted under the authority contained in Section 107 of the River and Harbor Act of 1960 as amended. It is in response to a letter dated 19 August 1981 from the County Commission of Baldwin County, Alabama, requesting a navigation and shoreline erosion control study for the area in the vicinity of the mouths of Palmetto and Soldier Creeks. The Mobile District responded by letter dated 9 September 1981 that the study could be initiated in March 1982, and requested that the County Commission furnish information on vessel use on the channels. This information was not received and the study lay dormant until May 1986 when a meeting was held by local residents in Foley, Alabama. After that meeting, work began on an initial appraisal report which was submitted to the South Atlantic Division in May of 1987 and recommended preparation of a reconnaissance report. The South Atlantic Division approved preparation of the reconnaissance report in June 1987 and work on this report was initiated. Pertinent correspondence is included in Appendix A to this report.

DESCRIPTION OF THE STUDY AREA

Physical Setting. Palmetto and Soldier Creeks are both tidal streams located in Baldwin County, Alabama, on the West Bank of Perdido Bay. The creeks flow south into Perdido Bay about six miles north of Perdido Pass. Perdido Pass connects Perdido Bay to the Gulf of Mexico. The study area is located about 18 miles west of Pensacola, Florida and 55 miles southeast of Mobile, Alabama. See Plate 1.

Socioeconomic Profile. In 1985, Baldwin County had a civilian labor force of 37,580 with total employment of 34,670 and unemployment of 2,910 or 7.7 percent. The county's economy is dominated by agriculture, with commercial fishing and tourism being strong in the coastal and southern portions. Available skilled labor and proximity to the Gulf of Mexico are very attractive to the commercial fishing and tourism industries and to their related industries, such as boat building and repair and seafood processing. Agriculture is most prevalent in the interior portions of the county. Major crops include soybeans, corn, pecans and various other fruits and vegetables. Industrial development in Baldwin County includes light to medium manufacturing. Goods produced include dental equipment, furniture, ladies undergarments, mens trousers and nylon. According to The 1987 Economic Abstract of Alabama, Baldwin County had 120 manufacturing firms with a total employment of 4,300. The commercial fishing industry in Baldwin County is quite large, with most of the activity concentrated in the southern area of the county, and is primarily focused on the harvesting of shrimp, crabs and oysters. Data provided by

Alabama Department of Conservation and Natural Resources shows that 420 commercial fishing vessel owners listed a Baldwin County address indicating that a similar number of vessels are berthed in the county or nearby. Per capita income for Baldwin County in 1984 was \$10,331.

Physiography. The study area is in the Coastal Lowlands district of the Gulf Plain physiographic province. The deposits in this area are of the Quaternary age overlying the Pleistocene aged Citronelle Formation. Surface materials in the area are highly erodible, being composed predominantly of quartz sand.

Climate. The study area has an average annual temperature of 68°F with a climate that is generally humid sub-tropical. Rainfall is abundant and well distributed throughout the year, averaging about 60 inches annually and occurring 112 days per year. Snow is infrequent. Hurricanes or intense tropical storms with a central barometric pressure of 29 inches of mercury or lower, accompanied by winds of 74 miles per hour or more, pass within a radius of 150 miles of Perdido Pass at an average time interval of about three years. Tides in the area are diurnal and the mean range in the Gulf opposite Perdido Pass is estimated to be 1.1 feet. Mean range in the bay is approximately 0.5 feet.

Project Setting. The southern mile and one-half of Palmetto Creek and the southern 2 miles of Soldier Creek are estuarine. These lower portions of the creeks have depths of about 9 to 10 feet and are 500 to 600 feet in width. The small community of Perdido Beach is located on the 5000 foot wide peninsula located between these two creeks. Only the southern end of the peninsula, which is exposed to wave action on Perdido Bay, has a small beach. The upland terrain in the immediate vicinity of the beach is relatively flat and low, being mostly about elevation 5 feet. There is an abrupt drop of 3 or 4 feet along most of the shoreline where residents have constructed bulkheads. Perdido Bay is one of the smaller embayments located along the Gulf Coast which is nearly enclosed by land. Perdido Bay is about 13 miles long, from 1 to 3 miles wide, up to 16 feet deep and covers an area of 27,200 acres. Access to the Gulf of Mexico is afforded through Bayou St. John and Perdido Pass, a natural inlet where jetties have been constructed as part of the Federal navigation project for Perdido Pass. Perdido Bay is fed by the Blackwater and Perdido Rivers and by several other small non-silt bearing streams. The Alabama-Florida state line passes through the center of the bay. An aerial photograph of the study area taken in March 1986 is shown on Plate 2. There are no species listed as endangered or threatened by the U. S. Department of the Interior that would be affected by the potentially feasible project. Although the bald eagle (Haliaeetus leucocephalus) and the peregrine falcon (Falco peregrinus) are occasional migratory visitors to the project area, neither species nests or resides in the vicinity of the proposed project. Critical habitat for the

endangered Perdido Key beach mouse (Peromyscus polionotus trissyllepsis) has been designated on Perdido Key several miles south of the project area. It would not be affected by the proposed action.

Cultural Resources. The lands surrounding Perdido Bay, including its tributaries such as Palmetto and Soldier Creeks, were extensively occupied throughout prehistoric times. The early inhabitants exploited the rich resources of the area, gathering shellfish and hunting and fishing the lands and waters of the area. Remains of their camps and villages are often seen eroding from stream banks and beaches in the area. Most often these sites are found on lands elevated above and adjacent to the water's edge or bordering low swamps and marshes. No major archeological surveys have been conducted in this area, although several sites have recently been recorded south of the mouth of Palmetto Creek by the University of West Florida. Based on the descriptions of these sites and general knowledge of the region, sites in this area may contain artifacts dating from as early as 1000 B.C. up through historic times. Historically, the area in the vicinity of Palmetto and Soldier Creeks has been primarily agricultural with local fishing communities using Perdido Bay as a source of seafood and a route to the open waters of the Gulf. Early exploration and colonization activities of the Spanish appear to have bypassed the Perdido Bay area in favor of Pensacola Bay. A review of the National Register of Historic Places indicates no sites or properties listed on, eligible for listing or being nominated to the Register exist within any of the lands under consideration by this study. No previously recorded archeological sites are known for any of the areas under consideration. Several previously recorded archeological sites are present south of Palmetto Creek on the shore of Perdido Bay. Evidence indicates that other, as yet undiscovered, archeological resources are present within this area. Historically, Perdido Bay and its tributaries have been used by small fishing craft and pleasure boats. The remains of these small craft can be expected in the general study area. No reported shipwrecks are known for the areas being considered for dredging, nor are any historically significant ones anticipated. Significant underwater archeological resources, such as boat wrecks, are not anticipated to be present within the areas being considered for dredging. Remains of recent fishing and pleasure craft may be present, but these are not considered to be potentially significant.

PLAN FORMULATION

Navigation Needs and Problems. The commercial and recreational vessels located on both Palmetto and Soldier Creeks have difficulty navigating through the inlets of the two creeks. These inlets are narrow and shallow and passage into or out of these creeks is possible only during high tide for the many of

the small craft located on these two streams. This causes delays and lost revenue for the commercial vessels and lost recreational opportunities for the recreation vessels.

Without Project Condition. The inlet from Perdido Bay into Palmetto Creek will maintain a natural stable depth of about 4 feet below mean low water over the 50 year project life. Soldier Creek has a controlling depth of about 4 feet below mean low water and this depth will remain stable over the 50 year project life. These natural controlling depths may be interrupted by storm events or by dredging, but tidal action will bring these channels back to the controlling depths over time. This is supported by hydraulic analysis, interviews with local residents and observations of these two tidal inlets. Private interests have dredged these two inlets in the past. These one time dredging operations have not been repeated, and for the purpose of this analysis, it is assumed that private interests will not have the financial capability to continue dredging operations in the future.

Economic Analysis. In order to facilitate an accurate economic assessment of the problems occurring at Palmetto and Soldier Creeks, the study area was divided into two segments and each analyzed independently of the other to eliminate the possibility of benefits accruing to one segment having some influence on conditions at the other. Both channels have shoaling in their mouths where they flow into Perdido Bay. From a field survey in June 1988, it was determined that the bottom materials in the shoaled areas is firmly compacted fine, white sand and the water in the channels is clear. Vessels traversing these channels are very careful when they have minimum underkeel clearance and very little damage occurs to vessels using the two channels and this is expected to remain true in the future. However, due to the shallow depths in the shoaled areas, vessels using these two channels experience delays. The methodology for the economic analysis involves computation of existing condition delay costs as vessels are forced to wait for high tide before the channels can be navigated. Based on the economic assumption that delay costs avoided are economic benefits, channel depths were theoretically deepened at one foot increments and the benefits were computed for each waterway. Based on field surveys conducted in June 1988, vessel fleets were determined and the economic analysis was prepared using this data. The Economic Analysis is attached as Appendix B and is summarized below:

a. Soldier Creek is the home port for two medium size commercial shrimping vessels. Both vessels are approximately 25 feet in length and have drafts of 4 feet. These vessels are reported to navigate the channel with only moderate frequency. Soldier Creek is also the home of 17 sailing craft, 5 with drafts of 6 feet, 2 with drafts of 5 feet and 10 with drafts of 3 feet. There is 1 large motor yacht with draft of 4 feet and there are

11 sportfishers with drafts of 3 feet. Runabouts in Soldier Creek total 30 vessels with drafts of 2 and 3 feet. The larger sailboats and the large yacht are able to navigate the channel at high tide only, and because of the narrow curve at the entrance to the creek, there is a great deal of navigational skill involved. The smaller vessels, although not often hampered by insufficient depth, must also exercise caution in navigating the channel. The owners of the recreational fleet complain that the entrance is hazardous and one-way traffic is necessary. The results of the economic analysis for Soldier Creek are summarized in Table 1 below:

TABLE 1
SOLDIER CREEK
WITH PROJECT CONDITION ANNUAL BENEFITS

PROJECT DEPTHS	5.0'	6.0'
COMMERCIAL VESSELS-DELAY		
REDUCTION	\$0	\$500
RECREATIONAL VESSELS-		
RECREATION INCREASE	\$900	\$1,000
TOTAL BENEFITS	\$900	\$1,500

b. Palmetto Creek is the home port for 3 vessels whose chief activity is harvesting finfish from nearby bays and inlets in addition to reef fishing in the Gulf of Mexico. Two of the vessels are about 30 feet in length and draw approximately 2 feet. As a result they encounter only a moderate degree of difficulty navigating the channel. Also located on Palmetto Creek is a small boatyard engaging in both the repair of older vessels and the construction of new vessels. The boatyard has the capacity to repair and construct vessels with lengths up to 60 feet and drafts of 4, 5 and 6 feet. These vessels encounter delays both entering the channel for repairs and exiting the channel when repairs are complete. There is a further inconvenience since the boatyard is not able to perform normal sea trials on these vessels because of channel constraints. The recreation fleet based at Palmetto Creek consists of 73 vessels. There is only one large motor yacht, with a length of 40 feet and draft of 5 feet. There are 5 sportfishers, 22 to 25 feet in length with drafts of 4 feet. There are 12 inboard, inboard/outboard and outboard vessels with lengths up to 22 feet and drafts up to 4 feet. There are also 5 sailboats between 20 and 25 feet with drafts of 3 to 4 feet. Each of these vessels are hampered by inadequate depth. Palmetto Creek is also the home of 50 runabouts less than 20 feet in length and drafts of 2 to 3 feet. These boats are not affected to any significant degree by the depth of the channel. The results of the economic analysis for Palmetto Creek is shown in Table 2:

TABLE 2
PALMETTO CREEK
WITH PROJECT CONDITION ANNUAL BENEFITS

PROJECT DEPTH	5.0'	6.0'
COMMERCIAL VESSELS-DELAY REDUCTION	\$56,100	\$68,500
RECREATION VESSELS- RECREATION INCREASE	<u>\$800</u>	<u>\$300</u>
TOTAL	\$56,900	\$69,300

c. Study Results. Based on the results of the economic analysis, it was apparent that the very small annual benefits for Soldier Creek would not justify channel improvements. Therefore, Soldier Creek was dropped from further study after completion of the economic analysis. Palmetto Creek, on the other hand, had sufficient economic benefits to justify further study.

Channel Design. The objective of design for the navigation channel in Palmetto Creek is to provide a safe and efficient project for small vessels. Development of the design rationale is in accordance with EM 1110-2-1615, Hydraulic Design of Small Boat Harbors, the USACE Coastal Engineering Research Center's Shore Protection Manual (SPM), the USACE Waterways Experiment Station (WES) technical report, "Effects of Depth on Dredging Frequency", and information and experience within the Mobile District:

a. Site Conditions. Palmetto Creek empties into Perdido Bay approximately 5 miles northeast of Perdido Pass. The mouth of the creek is an inlet subject to the tidal prism, the volume of water entering or exiting the creek on ebb or flood tide. The tidal range in the bay is approximately 0.5 feet. Tidal currents produced by this fluctuation are considered significant only to maintain the inlet opening against the longshore transport which acts to close it. Wind rose data compiled by the National Weather Service, Pensacola, Florida, indicate the prevailing direction of wind at this site is from east-southeast, with velocities of 15 miles per hour or more less than 10 percent of the time. The bay is a sheltered body of water, and the maximum fetch length is approximately 5 miles. Due to the nature of the design vessels for this project, further analysis of wave action is not warranted, as wind waves will not constitute a navigation hazard in terms of maneuverability.

b. Sedimentary Processes. The primary mechanism of sediment movement (littoral drift) at this site is longshore transport. The predominant direction of transport at Perdido Pass, and along the Gulf Coast in general, is west. However, it is evident from aerial photography that a small ebb-tidal delta is located just bayward of the Palmetto Creek inlet (see Plate 2). Typically, this formation is offset; i.e., the accumulation of material

protrudes farther bayward on the downdrift side than on the updrift side of the inlet. This information, along with field observations, indicates a predominantly eastern direction of littoral drift. The material is a fine sand, typical of that found along the coast. The Palmetto Creek inlet interrupts longshore transport, causing shoaling of the creek channel. Depths in the channel have shoaled to about 4 feet below mean lower low water and this depth remains stable due to tidal flow in and out of the inlet, unless interrupted by either major storms or by dredging activities. Hydraulic dredging was performed by local interests in 1986. Records of this dredging and subsequent monitoring of the area provide the basis for estimating an average shoaling rate for the existing channel of approximately 1,780 cubic yards per year.

c. Design. Plan and typical section of the project channel are shown on Plate 3. Minimum required channel widths in terms of beam width and vessel controllability are based on recommendations in EM 1110-2-1615. The widths for the Palmetto Creek channel are sized for one-way traffic only. Channel alignment was selected to provide the shortest route to deep water, the least new work dredging and to minimize the number of bends. Bend widening is required to allow a safe turn in the lower approach of the channel from the bay. Channel depth should be adequate for vessel draft, squat and safety clearance. Depths below mean lower low water are calculated in the following manner: vessel draft plus squat plus safety clearance is equal to project channel depth. Advance maintenance (1, 2 and 3 feet) and allowable overdepth (1 foot) are provided in addition to the project depth. Freshwater sinkage is not a consideration due to the nature of the design vessels. See Plate 3 for the channel alignment and a schematic showing the channel cross section.

d. Maintenance. Shoaling of the Palmetto Creek channel is a continuous process. Advance maintenance is provided as a means of reducing the frequency of dredging and still providing reliable channel depth over longer periods of time. Justification for advance maintenance is based on channel depth reliability and economy of less frequent dredging. Several depths of advance maintenance were considered to optimize dredging costs. It should be noted, however, that with greater depths, shoaling rates will increase. The referenced WES report provides the methodology for predicting the effect of depth on dredging requirements. The basic premise is that the increase in the shoaling rate caused by deepening is proportional to the increase in the wetted perimeter of the channel. With project shoaling rates were obtained by multiplying the existing shoaling rate estimated in paragraph b. by a ratio of the wetted perimeters. Table 3 contains both new work and maintenance dredging quantities.

TABLE 3
DREDGING QUANTITIES (NEW WORK AND MAINTENANCE)

DEPTH (FT)	PROJECT CHANNEL		DREDGING	
	WIDTH (FT)	VESSEL DRAFT (FT)	NEW WORK (CU YD)	MAINTENANCE (CU YD/YR)
4	30	2	0	0
5	40	3	503	503
6	40	3.5	1769	1769
7	40		3321	2281
7 (W/ 2' ADV. MAINT.)			5395	2532
7 (W/ 3' ADV. MAINT.)			7819	2783

e. Selection of Dredged Material Disposal Site. On 2 May 1989, a site visit was made to select a dredged material site. The County Engineer from Baldwin County and representatives from the Mobile District (environmental, regulatory, operations and planning) examined potential dredged material disposal sites. Two sites were examined, one located on the north side of the peninsula on the east side of the inlet into Palmetto Creek and the second disposal area was located on the south side of the peninsula. Disposal of the dredged material would be along and adjacent to the shoreline. The site on the south side of the peninsula is a larger area and the location is such that the dredged material will drift away from the proposed channel. Maintenance material can be added to this site since littoral drift will be moving eastward. The site on the north side of the peninsula had some sparse emergent vegetation along the shoreline. In addition, there is no littoral movement on the north side of the peninsula. The disposal site on the south side of the peninsula will be able to accommodate the original dredged material and periodic maintenance dredged material for the 50 year project life. The disposal area on the south side of the peninsula was therefore selected. See Plate 3 for the design and location of the disposal area.

Project Cost Computations. The dredging costs are based on the use of a 12" hydraulic dredge. The dredge would be a portable dredge and would be moved to the site by the use of a flat bed truck. The material to be dredged is assumed to be sand and gross yardages are 125% of the yardages computed in Table 4. The dredged material is to be placed seaward of the mean high tide elevation and is to be evenly spread throughout the disposal area. The calculations reveal that dredging costs are dependent on the length of channel to be dredged rather than the quantity of material to be dredged. Except for the 7' channel with 3' advance maintenance, dredging costs for both new work and for maintenance dredging are the same for all alternatives. Until dredging quantities reach the level for the 7' channel with 3' advance maintenance, the critical factor is the time it takes the dredge to "walk" through the project rather than the quantity of

material to be dredged. Mechanical dredges were not considered since the disposal area is located far enough from the channel that the material would have to be rehandled. Open water disposal was not considered since it was desired to move the dredged material far enough away so that tides and littoral drift would not cause the dredged material to reenter the channel. The preceding assumptions apply to both the new work dredging and maintenance dredging costs. Frequency for maintenance dredging was computed by using the shoaling rates in Table 3 and assuming that the material would be deposited evenly over the excavated channel area. Table 4 contains the new work dredging costs and Table 5 contains the costs of the maintenance dredging. Annual costs were computed based on a 50 year project life and 8 7/8% interest rate.

TABLE 4
NEW WORK DREDGING COSTS

CHANNEL DEPTH	5'(1'AD MA)	6'(1'AD MA)	7'(1'AD MA)	7'(2'AD MA)	7'(3'AD MA)
INITIAL DREDGING	\$27,500	\$27,500	\$27,500	\$27,500	\$36,200
MOB/DEMOB	\$35,300	\$35,300	\$35,300	\$35,300	\$35,300
SUBTOTAL	\$62,800	\$62,800	\$62,800	\$62,800	\$71,500
CONTINGENCIES(25%)	\$15,700	\$15,700	\$15,700	\$15,700	\$17,900
SUBTOTAL	\$78,500	\$78,500	\$78,500	\$78,500	\$89,400
E & D	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000
S & A	\$8,000	\$8,000	\$8,000	\$8,000	\$8,000
TOTAL COST	\$106,500	\$106,500	\$106,500	\$106,500	\$117,400
ANNUAL COSTS	\$9,600	\$9,600	\$9,600	\$9,600	\$10,600

TABLE 5
MAINTENANCE DREDGING COSTS

CHANNEL DEPTH	5'(1'AD MA)	6'(1'AD MA)	7'(1'AD MA)	7'(2'AD MA)	7'(3'AD MA)
INITIAL DREDGING	\$27,500	\$27,500	\$27,500	\$27,500	\$30,800
MOB/DEMOB	\$35,300	\$35,300	\$35,300	\$35,300	\$35,300
SUBTOTAL	\$62,800	\$62,800	\$62,800	\$62,800	\$66,100
CONTINGENCIES(25%)	\$15,700	\$15,700	\$15,700	\$15,700	\$16,500
SUBTOTAL	\$78,500	\$78,500	\$78,500	\$78,500	\$82,600
E & D	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000
S & A	\$8,000	\$8,000	\$8,000	\$8,000	\$8,000
TOTAL COST	\$106,500	\$106,500	\$106,500	\$106,500	\$110,600
DREDGING FREQ (YEARS)	3.0	1.0	1.0	1.5	2.0

Computation of Benefit/Cost Ratio. Table 6 summarizes annual costs and annual benefits for the various depth channels considered. Installation of navigation aids is expected to cost \$3,900 for Palmetto Creek with an annual maintenance cost of \$400.

TABLE 6
COMPUTATION OF BENEFIT/COST RATIO
COMPARISON OF ANNUAL CHARGES TO ANNUAL BENEFITS
50 YEAR PROJECT LIFE AT 8 7/8% INTEREST RATE

CHANNEL DEPTH	5'(1'AD MA)	6'(1'AD MA)	7'(1'AD MA)	7'(2'AD MA)	7'(3'AD MA)
ANNUAL CHARGES					
INITIAL DREDGING	\$9,600	\$9,600	\$9,600	\$9,600	\$10,600
MAINT DREDGING	\$32,400	\$106,500	\$106,500	\$79,800	\$53,000
NAVIGATION AIDS					
INSTALLATION	\$400	\$400	\$400	\$400	\$400
MAINTENANCE	\$400	\$400	\$400	\$400	\$400
TOTAL ANNUAL COSTS	\$42,800	\$116,900	\$116,900	\$90,200	\$64,400
ANNUAL BENEFITS	\$56,900	\$69,300	\$69,300	\$69,300	\$69,300
BENEFIT/COST RATIO	1.3	0.6	0.6	0.8	1.1

Based on the comparison of annual costs and annual benefits, the 5 foot channel with one foot advance maintenance is the plan which yields the maximum benefit/cost ratio. A deeper channel is also justified due to reduced maintenance dredging frequency.

IDENTIFICATION OF IMPACTS

Environmental Impacts of Potentially Feasible Project.

Environmental impacts associated with dredging a navigation channel at Palmetto Creek include both dredging and disposal impacts. Impacts associated with dredging activities are primarily short-term and localized and include, but are not limited to, destruction of sediment-dwelling organisms in the channel, an increase in turbidity near the point of discharge, an increase in noise levels in the vicinity of the dredging operations, aesthetic impacts in the project area due to the presence of the dredge and its associated equipment, and possible impacts to navigation due to the dredge being located in the channel. Disposal impacts for shoreline disposal include lateral transport of fine sediment, an increase in turbidity, minor effect on primary productivity, and disruption and coverage of benthic communities.

Environmental Impacts of Project Alternatives. The impacts of the other alternatives, excluding the no action alternative,

would be similar to the impacts of the proposed plan. The impacts associated with the no action alternative would result in the continuation of the constricted water flow in and out of Palmetto Creek. If the inlet is allowed to remain in its current condition, the result would be a continuation of the reduced water circulation and improper flushing action in the creek would persist.

Socioeconomic Impacts of Proposed Project. The proposed project would increase the income to the commercial fishermen using the channel because of increased opportunity and elimination of delays. In addition there will be greater recreation opportunity which will enhance the free time activities of the residents of the area. The beneficial economic impacts for the channel depths studied is shown in summary form in Table 7. The benefits to commercial fishermen and the recreation interests will not accrue under the Without Project Condition.

POTENTIALLY FEASIBLE PLAN

Plan Selection. Based on the analysis of costs, benefits, environmental and socioeconomic impacts of the various channel depths and the Without Project Alternative, the plan with the best potential is the 5 foot channel with 1 foot advance maintenance. Table 7 contains the cost estimate for this plan. Plate 3 contains the layout, cross section and location of the disposal area for the potentially feasible plan.

Environmental Coordination of the Potentially Feasible Plan. There has been preliminary coordination of the potentially feasible plan and disposal site with Baldwin County. A preliminary environmental assessment has been prepared and is contained in Appendix C. If the study progresses to the feasibility phase, an environmental assessment and 404(b)(1) will be prepared and appropriately coordinated. Water quality and coastal zone consistency certification would be obtained from the State of Alabama during the feasibility phase.

Table 7
 Cost Estimate of Potentially Feasible Plan
 5 Foot Channel with 1 Foot Advance Maintenance
 (April 1990 Prices)

<u>ACCOUNT NUMBER</u>	<u>DESCRIPTION</u>	<u>QTY</u>	<u>UNIT</u>	<u>UNIT COST</u>	<u>TOTAL COST</u>
12.O.A.-	Mobilization, Demobilization and Preparatory Work	1	JOB	\$35,300.00	\$35,300
12.O.2.-	Pipeline Dredging Subtotal	503	cy	\$54.67	<u>\$27,500</u> \$62,800
12.O.2.-	Contingencies (25%)				\$15,700
30.H.-.-	Plans and Specifications				\$20,000
31.-.-.-	Construction Management				<u>\$ 8,000</u>
	Subtotal				\$106,500
	Aids to Navigation				<u>\$ 3,900</u>
	Total Project Cost				\$110,400

SCOPE AND COST OF FEASIBILITY STUDY

Feasibility studies for this project would consist of a verification of the economic analysis, preparation of the environmental studies and documentation required for construction, engineering studies and soil borings to determine subsurface conditions, preparation of a draft Local Cooperation Agreement (LCA), coordination of this agreement with and approval by Baldwin County and preparation of the Feasibility Report for this project. There is an assumption made in the formulation of the recommended plan with shoreline disposal that the material to be dredged in Palmetto Creek is sand. This may not be the case and soil borings will be required in the feasibility phase to verify the material is sand. If the material is not sand and depending on its depth, this could affect the depth of the channel because of the environmental problems associated with disposal of the non-sandy material. If the material is sand, the environmental analysis during the feasibility phase will be about \$13,500 less since the extensive chemical analyses required for non-sandy material will not be required. The cost estimate for the preparation of the Feasibility Report for this project is \$100,000 and is attached in Appendix D.

COST SHARING BY BALDWIN COUNTY

An approved Feasibility Cost Sharing Agreement (FSCA) would be required prior to initiating a feasibility study. If a feasibility study were initiated, Baldwin County would have to furnish 50% of the costs of this study, either in cash or in kind services, or a combination thereof. Baldwin County's share is currently estimated at \$50,000.

An approved Local Cooperation Agreement (LCA) would have to be in effect prior to initiation of construction. This agreement would contain the following requirements for Baldwin County as local sponsor for this project:

a. Provide, during the period of construction, a cash contribution equal to 10 percent of the total cost of construction of the general navigation features of this project:

b. Provide to the Government all lands, easements, and rights-of-way, including dredge material disposal areas that may be required for the construction, operation or maintenance of the project;

c. Repay with interest, over a period not to exceed 30 years following completion of the period of construction of the project, an additional 0 to 10 percent of the general navigation features assigned to commercial navigation. Any costs incurred by Baldwin County for lands, easements, rights-of-way and dredge

material disposal areas may be credited to this additional 10 percent. If the credit allowed for such items is less than 10 percent of the total cost of construction of the general navigation features, Baldwin County shall repay a percentage of said total cost equal to the difference between 10 percent of the total cost and the percentage of the total costs represented by the value of such items. If the credit allowed is equal or greater than 10 percent of said total cost, Baldwin County shall not be required to repay any additional percentage of the total cost;

d. Perform all relocations determined to be necessary for the construction of the project;

e. Hold and save the United States free from damages due to the construction, operation and maintenance of the project when not the fault of the United States; and

f. Fulfill the applicable requirements of non-Federal cooperation as specified in the terms and conditions of the Uniform Relocation Assistance Real Property Acquisition Policies Act of 1970 (Public Law 91-646), as amended.

Based on the cost estimate in Table 8, the current estimate for the cash contribution of 10 percent of initial construction cost (10% of \$110,400) to be paid by Baldwin County is \$11,040. In addition, it is anticipated that Baldwin County must pay an additional \$11,040 (10% of project cost of \$110,400) which may be repaid to the Federal Government over a 30 year period.

CONCLUSIONS

A deepened channel through the inlet from Perdido Bay into Soldier Creek is not economically justified at this time.

Based on this reconnaissance level study, a navigation channel from Perdido Bay through the inlet into Palmetto Creek is economically justified with a benefit-cost ratio of 1.3 to 1.

Local interests have dredged the channel from Perdido Bay through the inlet into Palmetto Creek in the past when they felt it necessary. A study assumption for the without project condition is that local interests would not dredge the channel in the future. This may not be true in which case the economic benefits for channel deepening would be reduced.

Due to the small quantities of dredging, the cost of mobilizing and demobilizing a dredge, and the time required for the dredge to "walk" through the project, dredging unit costs are very expensive.

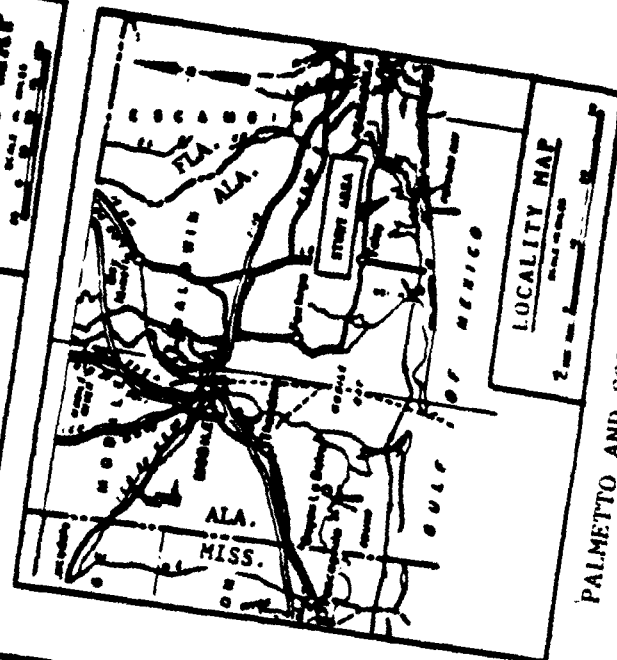
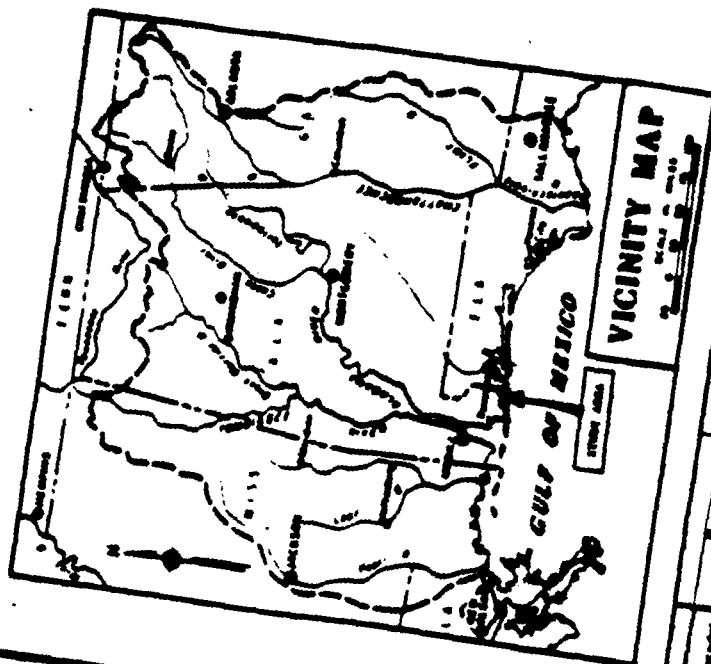
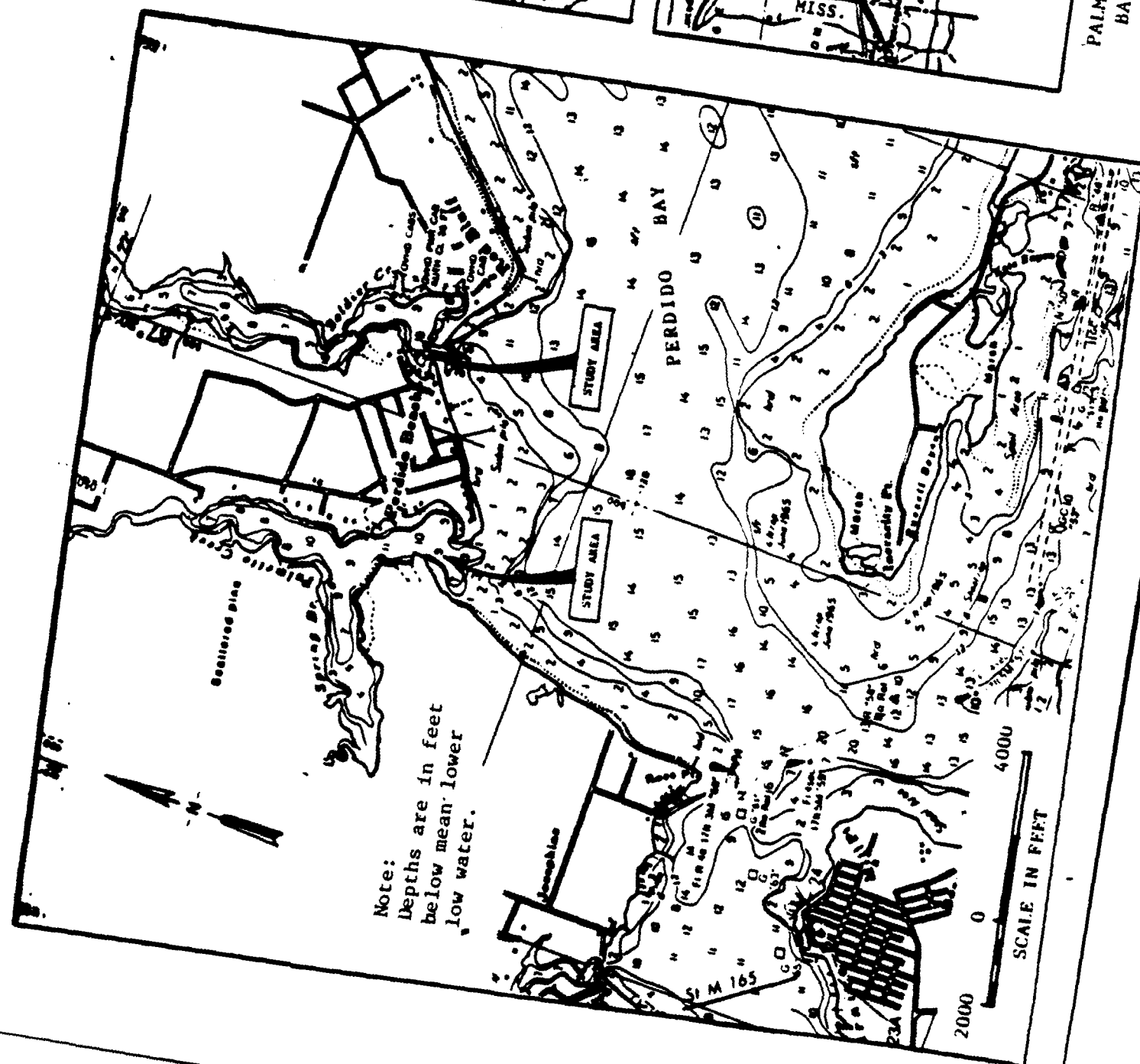
The initial cost for dredging the channel through the inlet into Palmetto Creek is estimated to cost \$110,400 of which \$20,000 is for preparation of plans and specifications and \$8,000 is for construction management. The cost of feasibility studies for this project is estimated at \$100,000. This means that study, design and construction management costs exceed the construction cost for dredging the channel through the inlet from Perdido Bay into Palmetto Creek. It is policy under the Continuing Authorities program (this includes Section 107 of the River and Harbor Act of 1960, as amended), that when study and design costs exceed the construction cost, there is no Federal interest in further study of the project.

RECOMMENDATION

It is recommended that the Section 107 study of navigation improvements in Palmetto and Soldier Creeks in Baldwin County Alabama be terminated.

for
acting

LARRY S. BONINE *MAS*
Colonel, Corps of Engineers
District Engineer



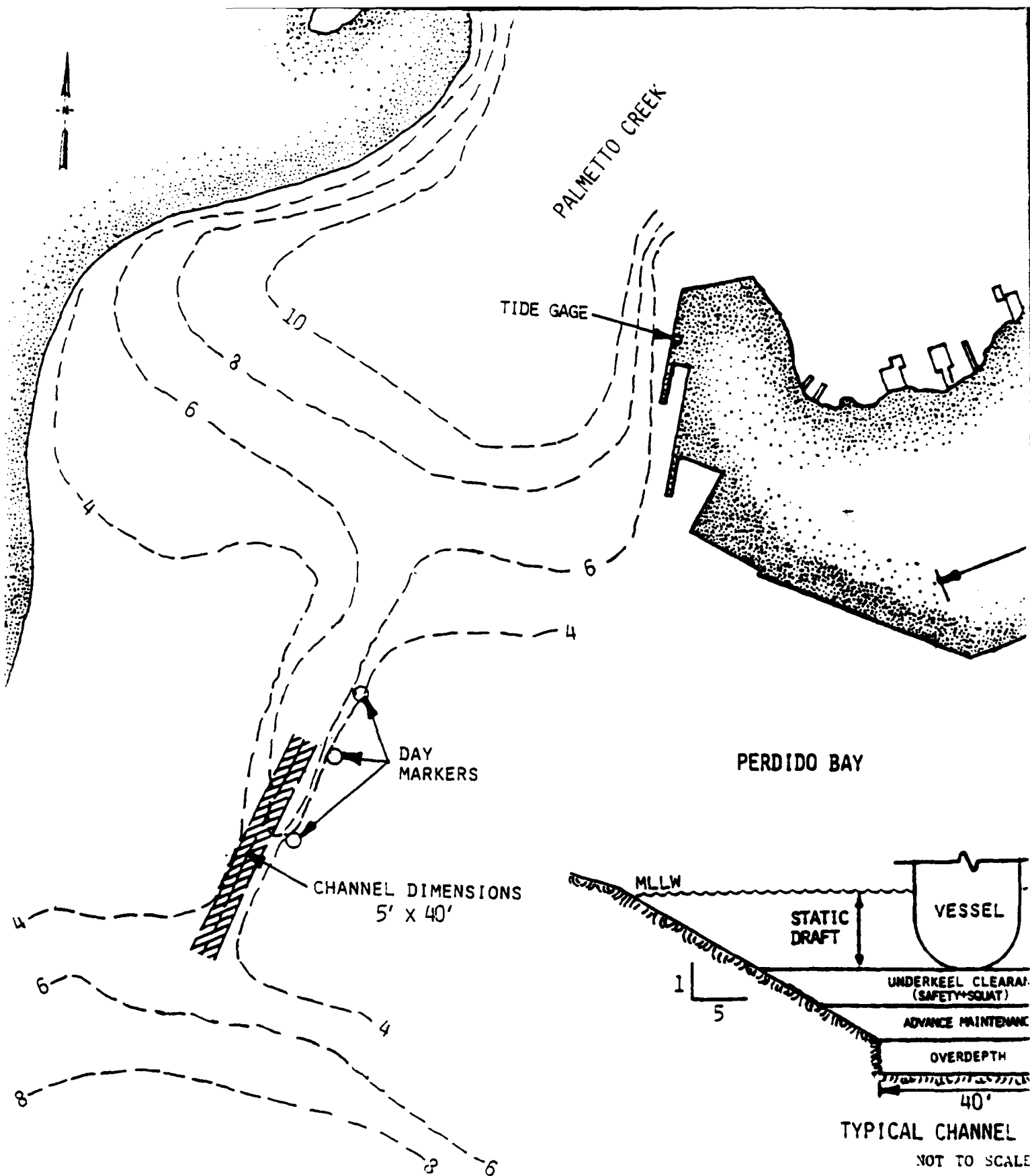
PALMETTO AND SOLDIER CREEKS
BALDWIN COUNTY, ALABAMA
STUDY AREA



Note:
Aerial Photograph
taken March 1986.

Scale: 1" = 2000'

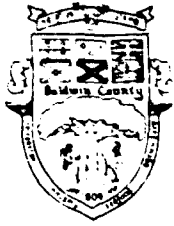
PALMETTO AND SOLDIER CREEKS
BALDWIN COUNTY, ALABAMA
AERIAL PHOTOGRAPH
PLATE 2



1072

PERTINENT CORRESPONDENCE

APPENDIX A



COUNTY COMMISSION

BALDWIN COUNTY

P. O. BOX 148
BAY MINETTE, ALA.

36507
205/ 937-9561

MEMBERS

NEIL LAUDER
WILLIAM B. COOPER
JAMES J. BOYINGTON
STEPHEN R. STILL JR.
ADMINISTRATOR
DAVID C. WOOD

August 19, 1981

Corps of Engineers
Mobile District
P. O. Box 2288
Mobile, Alabama 36628

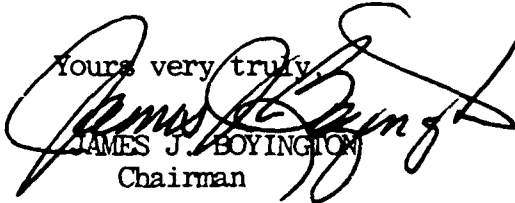
Attention: Colonel Drake

Dear Colonel: Re: Palmetta and Soldier Creeks

The County Commission respectfully requests that the Corps of Engineers perform a reconnaissance study to see if it would be feasible to have the mouths of the two creeks referred to above dredged in order to improve water navigation as well as erosion control. The Commission requests that this study be performed as authorized by law, and we await your response.

Thanking you,

Yours very truly,


JAMES J. BOYINGTON
Chairman

JJB:ow

SAMPD-N

9 September 1981

Mr. James J. Boyington, Chairman
County Commission of Baldwin County
PO Box 148
Bay Minette, AL 36507

Dear Mr. Boyington:

This is in response to your letter of 19 August 1981, requesting a reconnaissance investigation of Palmetto and Soldier Creeks to determine the feasibility of improvements in the interest of navigation and erosion control. As you may be aware, the Mobile District completed on 13 February 1981, a reconnaissance investigation under the authority of Section 103 of the River and Harbor Act of 1962, to determine the feasibility of implementing measures to alleviate erosion problems between Palmetto Creek and Soldier Creek. That study, a copy of which was furnished the Commission by letter dated 24 March 1981, concluded that provision of shore protection works is not considered to be in the Federal interest at this time due to the lack of economic and environmental justification.

Navigation problems in Palmetto and Soldier Creeks could possibly be examined under authority of Section 107 of the River and Harbor Act of 1960. Your letter of 19 August 1981 is considered adequate formal request to authorize investigations of navigation problems under Section 107. Due to the current heavy workload in Mobile District, however, it will not be possible for a member of my staff to contact you until after March 1982. You will be contacted upon initiation of the study. For your information, I have inclosed a copy of an information sheet on the Section 107 program.

In the interim, it would be helpful to have a more detailed description of the navigation problems being experienced in Palmetto and Soldier Creeks. More specifically, your assistance by providing the following information would be greatly appreciated:

- a. Identification of the types and numbers of vessels, e.g. sailboats, outboards, inboards, navigating on Palmetto and Soldier Creeks, including their size (length, width, and draft).
- b. Specification of typical origins and destinations of vessel trips and whether they are commercial or recreational vessels.

SAMPD-N

Mr. James J. Boyington

9 September 1981

c. Availability of public and private facilities providing boating access to the streams or providing services to the boating public.

d. Number of trips by various types of vessels over Palmetto and Soldier Creeks.

e. Records of complaints about vessel damages or accidents.

We look forward to receiving information you can send us on this matter. Should you have any questions, please feel free to contact Mr. Roger Burke, Chief, Coastal Branch at 694-3809.

Sincerely,

1 Incl
As stated

LAWRENCE R. GREEN
Chief, Planning Division

CF:
PD (Jim Merwin)

15 May 1986

MEMORANDUM FOR RECORD

SUBJECT: Soldier Creek, Alabama - Meeting With Local Interests

1. On 14 May 1986, at the South Baldwin County Chamber of Commerce office in Foley, Alabama, I met with the following:

Daniel Autrey, Congressman Callahan's staff
Steve McMillan, Representative, Alabama Legislature
Neil Lauder, Baldwin County Commission
Percy C. Nixon, Baldwin County Engineer
Albert P. Elebash, The Point Club, Soldier Creek
Berkely H. Smith, representing Soldier Creek Residents
H.P. Southey, Attorney, Soldier Creek Association

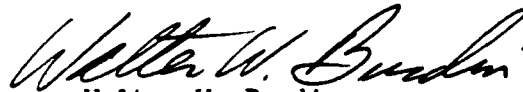
2. Soldier Creek is the southwestern boundary of the peninsula which is the site of the community of Perdido Beach, in Baldwin County, Alabama. The northeastern boundary is formed by Palmetto Creek and the southeastern end, fronting Perdido Bay, is sand beach. The residents' representatives said that increased wave action from the several hurricanes which passed through this region in the fall of 1985 eroded the beach and transported into the channel at the mouth of Soldier Creek, reducing the depth at the shoal from about 9 feet to about 3 feet. This has locked in the larger boats and is also causing water quality problems in Soldier Creek. (This latter problem may also be linked to the current drought.) In addition, they say that the shallow shelf fronting the beach was also eroded, resulting in more wave energy reaching the beach.

3. Mr. Elebash, representing the Point Club, has applied for a permit to dredge the shoal and place the sand on the eroded beach within the club property. (Joe Compton, OP-SP, told me today that their permit is enroute for signature.) However, those residents who pledged funds to support this work have been less than enthusiastic in honoring their pledges. They estimated the removal of 1500 cubic yards and their best bid to date is \$15,000. Both Mr. Elebash and Mr. Southey believe that they will be able to raise the money on a onetime emergency basis, but they are concerned about the life of this work and about future costs. They state that the local residents cannot support costs of this magnitude over the long term.

3. Mr. Lauder and Mr. Nixon have been investigating other sources for some of the funds and believe they have located some at a state agency. Mr. McMillan is supporting this effort. Mr. Autrey indicated the support of Mr. Callahan.

4. Since we already have a request for a Section 107 study for Palmetto and Soldier Creeks, I said that we could initiate a reconnaissance level investigation at once. I noted, however, that current policy would not support a recreational project. In response, the residents' representatives stated that about 6 fishing boats are based in Soldier Creek. That being the case, in 3 or 4 months we could tell them whether or not a small navigation project appeared to be economically feasible. As part of this effort, we would prepare a cost estimate for the second phase of the study. A local sponsor would then have to share in half the cost for the feasibility phase of the study. Assuming that all went well, the final report could be submitted in about a year and review would take about another 6-9 months. In, say about 2 years, they could have an approved project, subject to funding for construction. It was improbable that the channel would shoal to impassibility in that time.

5. After further discussion the meeting adjourned.



Walter W. Burdin
Civil Engineer

ECONOMIC ANALYSIS

APPENDIX B

ECONOMIC ANALYSIS OF PALMETTO AND SOLDIER CREEKS

This report identifies and evaluates the economic costs associated with inadequate depth of the channels in Palmetto and Soldier Creeks. Such costs are the benefits creditable to various projects planned to reduce those costs. Within this report are nine sections, as follows:

- a. Socio-Economic Profile
- b. General
- c. Existing Condition Vessel Operations
- d. Methodology
- e. Without Project Condition Vessel Costs
- f. Alternatives Considered
- g. With-Project Condition Benefits
- h. Summary
- i. Sensitivity Analysis

SOCIO-ECONOMIC PROFILE

Palmetto and Soldier Creeks are small tidal streams located in the southernmost portion of Baldwin County, Alabama. Both creeks flow into Perdido Bay from the north. The community of Perdido Beach lies directly between the two creeks, with Palmetto Creek lying to the west and Soldier Creek to the east. The creeks and Perdido Beach are located roughly 6 miles north of Perdido Pass, which separates Alabama Point and Florida Point and forms the connection between Perdido Bay and the Gulf of Mexico. The study area is approximately 18 miles to the west-southwest of Pensacola, Florida, and roughly 55 miles southeast of Mobile, Alabama.

In 1985, Baldwin county had a civilian labor force of 37,580 with total employment of 34,670 and unemployment of 2910 or 7.7 percent. The county's economy is dominated by agriculture, with commercial fishing and tourism experiencing strength in the coastal and southern areas. As a result, 17,570 of the 21,490 persons earning a wage or salary do so in nonmanufacturing jobs. Available skilled labor and proximity to the Gulf of Mexico are extremely attractive to commercial fishing and tourism as well as their related industries. Such related industries include boat building and repair and seafood processing. Agriculture is dominant in the interior and northern portions of the county. Major crops include corn, soybeans and pecans in addition to a variety of fruits and vegetables grown on a relatively smaller scale. The total market value of all agricultural products sold in 1982 was \$44,569,000. Industrial development in Baldwin County consists almost totally of light to medium manufacturing. Goods produced include dental equipment, furniture, clothing and nylon. In 1985, the county had 120 manufacturing firms with a total employment of 4,300. Per capita income was \$10,331, and family median income was \$19,426. Population statistics for the state, county and study area appear in Table B-1.

The commercial fishing industry in Baldwin County is quite large and

experiencing growth. Recent data provided by Alabama Department of Conservation and Natural Resources shows that 420 commercial fishing vessel owners listed a Baldwin County address, indicating that a similar number of vessels are berthed in the county or nearby. Most of these vessels' activities are concentrated in the southern coastal region and the focus on the harvesting of shellfish, finfish and mollusks.

GENERAL

Palmetto Creek is a tidal stream approximately 1.8 miles long and 1.0 mile wide at its broadest point. An estuary known as Spring Branch flows into Palmetto Creek from the west and extends in a westerly direction for approximately 1.0 mile from its confluence with Palmetto. Soldier Creek is also a tidal stream and is roughly 2.35 miles long and .375 miles wide. The maximum depth of both creeks is 10 feet Mean Low Water (MLW). Navigable depths of at least 7 feet extend for nearly the entire length of Palmetto Creek and its tributary. However, the depth decreases sharply in the vicinity of the mouth of the creek to 4 feet and this depth is maintained for roughly 300 yards. Soldier Creek has depths of at least 6 feet which extend for nearly its entire length as well. However, there are numerous depressions in which the depth approaches 20 feet. Most of these depressions are in the estuarine areas upstream. At the mouth of this creek, is a narrow spit of sand about 1500 feet in length. This spit's growth in addition to tidal action and occasional tropical cyclones have created a narrow, sharply bending natural channel. The controlling depth of this channel is 4 feet MLW.

The Gulf Intracoastal Waterway, a Federal Project which provides a protected channel with minimum dimensions of 12 by 125 feet between Carrabelle, Florida, and Brownsville, Texas, diagonally traverses Perdido Bay approximately 3 miles southwest of the study area.

In order to facilitate an accurate economic assessment of the problems occurring at Palmetto and Soldier Creeks, the study area was divided into two segments and each analyzed separately. Each creek was analyzed independently to eliminate the possibility of benefits accruing to one segment having some influence on conditions at the other.

EXISTING CONDITION VESSEL CHARACTERISTICS

Commercial Vessels: Field data obtained in June 1988 revealed that Palmetto Creek is the home port for 3 vessels whose chief activity is harvesting finfish from nearby bays and inlets in addition to reef fishing in the Gulf of Mexico. Two of the vessels are less than 30 feet in length and draw approximately 2 feet. As a result, they encounter only a moderate degree of difficulty navigating the channel. The third vessel is a large vessel with a draft of 5 feet. This vessel encounters difficulty and often is unable to navigate the channel. Also located in Palmetto Creek is a small boatyard engaging in both the repair of older vessels and construction of new vessels. The boatyard has the capacity to repair and construct vessels with lengths up to 60 feet. However, due to the existing channel constraint, no work is being performed on vessels that would encounter difficulty

navigating the channel.

The same field data showed that Soldier Creek is the home port for 2 medium size commercial shrimping vessels. Both vessels are approximately 25 feet in length and draw 4 feet. These vessels are reported to navigate the channel with only moderate frequency.

Recreational vessels: The recreational fleet based at Palmetto Creek consists of 73 vessels. There is only one large motor yacht, with a length of 40 feet and draft of 5 feet. There are 5 sportfishers, 22 to 25 feet in length and drafts of 4 feet, and 12 inboard, inboard/outboard or outboard vessels up to 22 feet in length and drafts of up to 4 feet. There are also 5 sailboats between 20 and 25 feet that have drafts of 3 to 4 feet. Each of these vessels are hampered by inadequate depth. Palmetto Creek is also the home of 50 runabouts less than 20 feet in length and drafts of 2 to 3 feet. These boats are not affected to any significant degree by the depth of the channel.

Soldier Creek is the home of 17 sailing craft, 5 with drafts of 6 feet, 2 with drafts of 5 feet and 10 with drafts of 3 feet. There is 1 large motor yacht drafting 4 feet and there are 11 sportfishers with drafts of 3 feet. Runabouts in Soldier Creek total 30 vessels and drafts are 2 to 3 feet. The larger sailboats and the large yacht are able to navigate the channel at high tide only, and because of the narrow curve that characterizes the entrance to the creek, there is a good deal of navigational skill involved. The smaller vessels, although not often hampered by insufficient depth, must also exercise caution in navigating the channel. The owners of the recreational fleet complain that the entrance is hazardous and one way traffic is necessary.

From the field survey in June 1988, it was determined that the bottom material of the mouths of both creeks is fine white sand, that when saturated is not easily pushed out by vessel keels. As a result, navigation of the channel with no underkeel clearance is extremely difficult. Often, vessels become stuck on the bottom if the operator is inexperienced or unaware of channel conditions. Because underkeel clearance is needed to ensure safe passage, and since the water is relatively clear, underkeel obstructions are identified quickly and avoided or removed. In addition, the sand of both channel bottoms is moved about by a combination of factors, including vessel wakes, "prop wash", tidal and wave action and occasional storms. The effect of such action is to hold the channels' controlling depth fairly constant. The effect of new material that appears is offset by tidal and wave action to a large degree and as is common in such situations as those at Palmetto and Soldier Creeks, vessels will travel at higher speeds than usual through the channels to assist in maintaining depth and width.

Due to the combination of water clarity, bottom material and the factors discussed above, very little damage occurs to vessels using the two channels and this is expected to remain true in the future. Some damage has occurred as a result of collisions, but such instances are reported to be sporadic and infrequent.

METHODOLOGY

The methodology for evaluating economic benefits is consistent with Water Resources Council's Principles and Guidelines (Corps of Engineers Regulation ER 1105-2-40). Under the without-project condition, additional economic costs are being incurred by commercial vessels. These costs are associated with inadequate depth and can be identified through field interviews and be expressed in dollar terms. The cost evaluation for commercial vessels concentrated primarily on delay costs of vessel operators. Interviews were conducted with local residents and detailed information on the economic parameters of vessel operations was obtained from the Draft Report on Commercial Fishing Cost Return Profiles for Gulf Coast Areas, Centaur Associates, 1975. Also a detailed evaluation of tidal flow in the study area was performed in order to accurately determine the time intervals during which sufficient depth was not available. Calculations in determining commercial vessel delay costs were then computed for the future without-project condition.

Recreational costs were computed using the economic concept of lost opportunities. To determine the value of lost opportunities to recreational users of Palmetto and Soldier Creeks, the "Unit Day Value Method" (UDV) was employed. Although more sophisticated techniques are available and may illustrate the value of recreational activities in greater detail, the limited number of vessels and modest geographical area involved warrants the use of the less sophisticated UDV model.

The economic costs associated with insufficient depth under the without-project condition are benefits that are creditable to the various plans for reducing or eliminating those costs. The proposed plan is to dredge the existing channels to 6 feet MLW at both sites. The benefits of this proposal are analyzed incrementally. A procedure is created whereby the economic costs associated with the without-project condition are shown to have been reduced incrementally by each of the with-project scenarios. The net reduction of costs for each scenario is the cumulative net benefit attributable to that particular phase. This procedure is begun at the base condition, and the respective channels are hypothetically "dredged" one foot at a time, with the net reduction of costs analyzed at each stage of the process. The hypothetical dredging is stopped at the point at which no more benefits accrue; i.e., all costs associated with inadequate depth have been eliminated.

WITHOUT-PROJECT CONDITION VESSEL OPERATING COSTS

The existing condition at Palmetto and Soldier Creeks is such that most of

the vessels at Palmetto and several at Soldier have drafts that exceed the depth of the respective channel constraints at MLW, and that navigability of the channel is limited at other tides as well. Consequently, these vessels experience delays while waiting for sufficient depth to enter and/or exit the creeks. Because of the composition of the channel bottoms, entries and departures are attempted only when required depth is exceeded. Further, because both delays and damages are costly to the vessel operator, some value is assigned to the ability to navigate the channel upon arrival and with no damage. Therefore, the vessel operator will attempt navigation only when the expected value of potential damage events is less than the marginal cost of waiting for adequate depth. Since water clarity causes channel depths to be known with a high degree of accuracy, expected damage probabilities will be high, implying high expected value of damage events. With the operator viewing damage as being likely, it is reasonable to assume that navigation will be attempted only when adequate depth exists. However, it is also reasonable to assume that such navigation will be attempted immediately, since delays too are costly. Therefore, vessel operators will attempt navigation as soon as and/or until channel depth equals vessel draft. Navigation will never be attempted if depth is less than draft and always be attempted if depth exceeds draft, regardless of the level of exceedance. For this reason damage events resulting from inadequate depth are infrequent enough so that no significant benefits accrue as a result of damage reduction. "

Between 1990 and 2040, the time period during which a project could be in place, it was determined that the resources within the study area will continue to be in high demand. The ratio of commercial to recreational vessels however, may be expected to change, since there are few commercial vessels located in the two creeks. These vessels may move to an alternative port, and consideration of this possibility is contained in this analysis. The boatyard at Palmetto Creek indicated its intention to remain in business at its present site regardless of conditions and shift its emphasis to trailered vessels and not utilize its capacity to handle larger vessels. The owner indicated that such a shift would not adversely affect his profitability. Since the controlling depth of the two channels is assumed to remain constant, the drafts of commercial vessels are assumed to remain unchanged as well. Thus real operating costs that are associated with delays to commercial vessels are not expected to grow over the time period.

The existing condition channels have controlling depths of 4 feet MLW for Palmetto Creek and 4 feet MLW for Soldier Creek. A graphical depiction of the daily tides for 1986 appears in Figures B-2 through B-13. The graphs display a plot of actual (lunar plus wind effect) tides for each day of 1986. Also shown are the channel constraints for each segment and the depths necessary for safe navigation of various vessel drafts. The graphs were constructed to illustrate the points in time during which a vessel with a given draft could navigate the channel safely. These representations illustrate the change in water surface elevation from its high tide peak to its lowest elevation at low tide and the return to the next peak elevation.

The graphs were derived from the 1986 series of low and high tides and based on daily extreme tides occurring at Terry Cove, which is approximately 8 miles southwest of the study area. Tides at Terry Cove are assumed to be similar in duration, height and elevation to those within the study area. Elevations for those tides were referenced to MLW and converted to National Geodetic Vertical Datum (NGVD) heights. The actual tide gauge data were used and frequency analyses were performed to determine the percentage of time that required water depths were available. The gauge located at Terry Cove records the heights of daily tides and the data used spans a time period of record from 1976 to June 1987. The percentage of time channel depth was adequate reflects the actual percent of the tide cycle that a given water surface elevation was recorded over the entire time period of record.

Examination of the plots for each month clearly illustrates that vessels encounter difficulty quite often. Also shown are long periods of successive days during which the channel depth fails to reach a level sufficient for safe navigation. Only the shallow draft vessels appear to be able to navigate the channel with any frequency.

Due to channel conditions at each of the two segments, the vessels operating within the study area are incurring additional costs from delays. This inefficiency is quantified in Table B-2. The table shows total annual equivalent delay costs of \$68,511. The following paragraphs illustrate how tidal data and vessel operating costs were combined to arrive at the costs of delays.

The vessels based at Palmetto and Soldier Creeks depart and arrive at random (various departure times and trip duration). Delays experienced by vessels are quite common, and the costs associated with those delays are computed by comparing actual water surface elevations recorded over the entire time period to vessel draft and computing the percent of time adequate depth was not available. This product was multiplied by the annual number of trips an average vessel of that draft makes to determine the total number of trips per year that are delayed. Trips delayed are multiplied by the average hours per trip delayed. Average hours were found by comparing the NGVD elevation to the required depth of a given vessel draft to determine if the vessel had adequate depth. The result of this comparison was then assigned a value which represented its proportion to a 24 hour day. The proportions for each day were summed and an arithmetic mean was taken for each month and then for the year. This process was repeated for each vessel draft. The result is a very close approximation of the actual availability of a given water surface elevation on a randomly selected day of a representative year, 1986 in this case. The average hours at the given water surface elevation was then subtracted from 24 to arrive at average hours per trip delayed. This result was multiplied by total number of trips delayed per year to determine the total annual hours delayed. This in turn was multiplied by the number of vessels within that draft category and the product is multiplied by the hourly variable operating cost of the vessel to produce the total annual delay cost. The formula appears below (See Table B-2).

$$P \times Ty = Td$$

$$Td \times Ha = Ht$$

$$Ht \times N \times Cv = Ct$$

Where: P = Percent of time not available
 Ty = Trips per year
 Td = Total trips per year delayed
 Ha = Average hours per delay
 Ht = Total hours delayed annually
 N = Number of vessels
 Cv = Variable operating cost
 Ct = Total annual delay cost

Recreational vessels: To estimate the willingness of recreational users to pay for the resources at Palmetto and Soldier Creeks the UDV method was used in conjunction with the percent of time without adequate depth discussed above. In the UDV method, ranges of points are assigned to various criteria that would ordinarily be used to evaluate a particular site for recreational value. The data are then assembled into a matrix and the site is given a total score based on its features and how they are scored by the matrix.

The total score is then converted to dollar values in order to determine "unit day values per recreational trip. The lost recreational opportunities under the without-project condition are treated as costs incurred by recreational users whose activities are restricted by insufficient depth. These costs are computed as the annual average number of lost boating opportunities multiplied by the UDV outlined above. Under ordinary circumstances, larger vessels can accommodate a larger number of recreational passengers, resulting in higher UDV's for those vessels. The following are the criteria used to judge the features of the study area, as well as their score and an explanation of these scores.

- a. Recreational experience: 4 points. There are two general activities in the study area, recreational boating and sportfishing, which is reported to be excellent.
- b. Availability of opportunity: 3 points. Palmetto and Soldier Creeks are located in a general area characterized by a great deal of recreational facilities.
- c. Carrying capacity: 7 points. There is a well maintained public launching facility at Perdido Beach near the Mouth of Palmetto Creek. Users of both study segments use this facility with regularity.
- d. Accessibility: 11 points. The road to the launching facility is reported to be in good condition, and can be accessed fairly easily via U.S. Highway 98 to County Road 97, a paved route from 98 into Perdido Beach.

e. Environmental quality: 12 points. Both segments are tidal streams with estuarine areas. Although there is moderate residential and a small amount of commercial development, the creeks are clean and most of the natural beauty remains.

Palmetto and Soldier Creeks scored 37 out of a possible 98. Using 1989 Water Resource Council Guidelines, this score converts to a dollar value of \$3.32 per person. Since the two creeks offer similar recreational resources and are served by the same facilities, The explanations above are assumed to adequately describe conditions at both creeks. The study area is home to 132 recreational vessels, 73 in Palmetto Creek and 59 in Soldier Creek. However only the larger sailing and power craft are experiencing lost boating activities. The total value of lost boating opportunities is \$800 for the vessels based in Palmetto and \$1000 for those at Soldier. Operators of these vessels also attempt navigation only when adequate depth is available, therefore damage events are rare and are expected to remain so.

ALTERNATIVES CONSIDERED

The study area was analyzed as two project segments, consisting of the two creeks themselves. The plans evaluated herein begin with channels in both Palmetto and Soldier Creeks, with bottom widths of 60 feet and depths of 5 feet MLW. Depths of the channels are increased by one foot increments in both segments until full benefits accrue. Benefits are analyzed by vessel draft at each increment for each segment.

WITH-PROJECT CONDITION BENEFITS

The benefits of three alternatives for Palmetto Creek and two for Soldier Creek are illustrated in the following paragraphs. The plans are for channel depths of 5 and 6 feet MLW at Palmetto creek and depths of 5 and 6 feet MLW at Soldier Creek. There are two types of benefits attributable to the plans considered: delay reduction and increased recreational opportunities. Benefits derived are displayed in Tables B-4 through B-7 by project segment, vessel draft and vessel type (commercial or recreational). Another type of benefit, reduced travel costs, is discussed in the Sensitivity Analysis section.

Commercial vessels: Benefits credited to delay reduction were calculated based upon the extent each alternative allows a vessel of a given draft to navigate the channels at random with a minimum of underkeel clearance. Both alternatives are assessed for the commercial fleet in Tables B-4 and B-5. Benefits that accrue to each alternative are based on the probability of inadequate depth being encountered as a result of the new channel. This factor is substituted into the equation on page B-7 and a new delay cost is computed for each alternative and for each segment. Cumulative net benefits are shown in the far right column. Full benefits accrue at channel depths of 6 feet MLW for each segment.

Recreational vessels: Lost recreational boating opportunities are computed

by multiplying the unit day value of recreational activities at Palmetto and Soldier Creeks by the number of visitors (number of vessels times the number of visitors per year). The product is then multiplied by the percent of time without adequate depth to determine the total value of lost opportunities. Recreational benefits are displayed in Tables B-6 and B-7. The cumulative net benefit of each phase is displayed in the far right column.

SUMMARY

A summary of the costs incurred under the without-project condition and the benefits accruing to each alternative appears in Tables B-9 and B-10, respectively. Table B-9 shows the costs by segment, vessel draft and vessel type. Table B-10 shows the benefits similarly but includes an incremental breakdown of cumulative net benefits for each phase as well as the cost remaining. The sum of the cost remaining and the with-project benefits for each phase equal the without-project costs. Benefits of a 5 foot channel accruing to commercial vessels total \$56,100 for Palmetto and \$500 for Soldier. Recreational benefits of the plan total \$800 for Palmetto and \$900 for Soldier. Benefits of a 6 foot channel accruing to commercial vessels total \$68,500 for Palmetto and remain at \$500 for Soldier. Recreational benefits remain at \$800 for Palmetto and increase to \$1,000 for Soldier. Total benefits for the two alternative are \$57,800 for the 5 foot channel and 70,800 for the 6 foot channel.

SENSITIVITY ANALYSIS

The estimated average annual benefit of \$70,800 is based on an implicit assumption that the existing condition fleet of commercial vessels will remain within the study area. Also implicit is the assumption that the controlling depths of the channels will remain constant. Given the conditions imposed by these assumptions, this report illustrates the maximum potential benefit creditable to the project. The assumption of constant channel constraints may be relaxed and the vessels located at Palmetto and Soldier Creek allowed to react to worsening conditions, the most logical reaction being diversion to an alternative port. Bon Secour is the nearest such alternative, and is located roughly 20 miles from the study area. The costs then under the without-project condition would be the travel costs associated with travelling to and from Bon Secour. The very small number of commercial vessels located within the study area causes the assumption that they would all relocate. Therefore, the lowest alternative costs to those presented in the previous discussion is \$1,089 and is illustrated in Table B-11.

With the upper and lower ends of the range of possibilities defined, probabilities can be assigned to each possibility. This in fact can be done repeatedly an infinite number of times, with either of the two possible outcomes receiving a successively greater probability of occurrence, while the other receives a successively smaller probability.

A weighted average can be calculated for each repetition, which is simply the sum of all possible outcomes multiplied by their assigned probabilities

expressed as a proportion of 1. These weighted averages can be plotted to illustrate a sensitivity curve. While it is impossible to predict the outcome of relaxing the constant depth assumption (the depth at which the fleet will move), it is possible to calculate the expected value of the infinite number of possibilities along the curve, which is done by taking a mean of the weighted averages. This mean is thus the expected annual average benefits that would accrue to the project if the without-project condition assumption of constant channel depth were relaxed. However, this is not the level of benefits that actually accrues to the project. Rather, it is the expected outcome of a range of possible outcomes, each with different probabilities of occurring. Because it is impossible to predict the outcome of relaxing the assumption, the level of benefits that would actually accrue to the project is indeterminate if the assumption were relaxed.

Therefore, the lowest alternative costs to those presented in this report total \$1,089 and the expected value of the range of possibilities between \$1,089 and \$70,800 is \$63,735.

TABLE B-1
POPULATION STATISTICS FOR
PALMETTO & SOLDIER CREEKS

CITY/TOWN	POPULATION	PERCENT OF AREA	PERCENT OF TOTAL
BALDWIN COUNTY (TOTAL)	86,900		
FAIRHOPE	7,720	33.58%	8.89%
FOLEY	4,330	18.83%	4.98%
DAPHNE	3,830	16.66%	4.41%
ROBERTSDALE	2,450	10.66%	2.82%
GULF SHORES	2,020	8.79%	2.32%
LOXLEY	860	3.74%	0.99%
SILVERHILL	620	2.70%	0.71%
SUMMERDALE	610	2.65%	0.70%
ELBERTA	550	2.39%	0.63%
TOTALS	22,990	100.00%	26.46%

TABLE B-2
WITHOUT-PROJECT CONDITIONS
AVERAGE ANNUAL VESSEL LOSSES BY DRAFT DUE TO DELAYS

WITHOUT PROJECT CONDITIONS HARBOR/VESSEL/DRAFT	CHANNEL DEPTH	1/ HOURS AT DEPTH	2/ % TIME W/OUT AREB. DEPTH	3/ NO OF YR TRIPS	4/ NO ANNUAL TRIPS DELAYED	5/ AVG HRS DELAYED ON TRIP DELAYED	6/ TOTAL HRS VSL DELAY	7/ VARIABLE OPER COST	1986 TOTAL ANNUAL DELAY COST
PALMETTO CREEK, AL 4.0' MLW GENERAL FISHING & CHARTER									
5' DRAFT FULLY LOADED	4.0'	15.9	36.742	60	22	23.8	525.0	1 929.70	\$15,592
2' DRAFT FULLY LOADED	4.0'	25.1	0.028	74	0	0.1	0.0	2 929.70	90
VESSEL REPAIRS									
6' DRAFT FULLY LOADED	4.0'	2.1	91.694	3	3	24.0	74.8	18 923.62	\$31,811
5' DRAFT FULLY LOADED	4.0'	15.9	36.742	3	1	23.8	29.7	19 923.62	\$13,351
4' DRAFT FULLY LOADED	4.0'	20.0	20.209	3	1	17.2	11.8	10 923.62	\$5,032
VESSEL CONSTRUCTION									
5' DRAFT FULLY LOADED	4.0'	15.9	36.742	6	2	23.8	48.1	2 923.62	92,273
SUBTOTAL								60	\$68,060
SOLDIER CREEK, AL. 4.0' MLW COMMERCIAL SHRIMP									
4' DRAFT FULLY LOADED	4.0'	20.0	20.209	72	15	2.41	35.1	2 86.42	\$451
TOTALS								62	\$68,511

1/: PERCENT OF TIME NOT EXCEEDED (1975-1987 TERRY COVE GUAGE HIGH DURATION) MULTIPLIED BY 25.1 HOURS (1986 TERRY COVE GUAGE EXTREME TIDES).

2/: TIDAL GUAGE DATA FOR PERIOD OF RECORD (1975 THRU 1987) AS A PERCENT OF THE TIME THAT VESSELS CANNOT ADEQUATELY NAVIGATE THE GIVEN DEPTH.

3/: DRAFT REPORT ON COMMERCIAL FISHING COST RETURN PROFILES FOR GULF COAST AREA, CENTAUR ASSOCIATES 1975, AND/OR A FIELD SURVEY;
RECREATIONAL AND REPAIR/CONSTRUCTION VESSEL TRIPS ARE BASED ON A FIELD SURVEY.

4/: PROBABILITY OF DELAY MULTIPLIED BY THE NUMBER OF TRIPS

5/: DAILY TIDES MEASURED PEAK TO PEAK TO DETERMINE ACCESS OF DRAFT, IF GREATER THAN 48 HRS, DELAY=48 HR PER MONTH; IF 24 HRS OR LESS, DELAY =6 HR A MONTH.

THE WEIGHT OF THE TOTAL DELAY WAS BY THE COMBINED DELAYS FOR COMMERCIAL BOATS, RECREATIONAL CRAFT DELAYS WERE BASED ON SHORT (6 HR) DELAYS.

6/: NO OF TRIPS DELAYED MULTIPLIED BY AVERAGE ANNUAL DELAY.

7/: TABLE 5, COMMERCIAL ANNUAL VARIABLE COSTS (INCLUDING CAPTAINS WAGES) WERE DIVIDED BY THE ANNUAL HOURS FISHING.

HOURS WORKED PER TRIP FOR 3' TO 6' DRAFT SHRIMPERS WERE ESTIMATED TO BE THE DAYS FISHED MULTIPLIED BY 24 HRS FOR SHRIMPERS / 12 HRS FOR CRABBERS AND 2' DRAFT SHRIMPERS.
RECREATIONAL BOAT DELAY COSTS WERE BASED ON UNIT DAY VALUES. BOAT BUILDING/REPAIR WAS TAKEN FROM A FIELD SURVEY.

TABLE B-3
AVERAGE ANNUAL LOST RECREATIONAL OPPORTUNITIES
WITHOUT PROJECT CONDITIONS

HARBOR/VESSEL/DRAFT	UNIT DAY VALUE	NUMBER ANNUAL TRIPS	1/ ANNUAL VALUE OF RECREATIONAL OPPORTUNITIES	NUMBER OF VESSELS	2/ NUMBER OF VISITORS PER VESSEL	TOTAL ANNUAL RECREATIONAL VALUE	3/ PERCENT OF TIME W/O ADEQUATE DEPTH	TOTAL ANNUAL DELAYS
PALMETTO CREEK								
5.0' DRAFT FULLY LOADED	3.32	12	\$39.84	1	5.5	\$200	36.742	\$100
4.0' DRAFT FULLY LOADED	3.32	12	\$39.84	22	3.5	\$3,100	20.209	\$600
3.0' DRAFT FULLY LOADED	3.32	12	\$39.84	50	2.5	\$5,000	1.023	\$100
SUBTOTAL						\$8,300		\$800
SOLDIER CREEK								
6.0' DRAFT FULLY LOADED	3.32	12	\$39.84	3	6.0	\$700	91.694	\$600
5.0' DRAFT FULLY LOADED	3.32	12	\$39.84	3	5.5	\$700	36.742	\$300
4.0' DRAFT FULLY LOADED	3.32	12	\$39.84	0	3.5	\$0	20.209	\$0
3.0' DRAFT FULLY LOADED	3.32	12	\$39.84	49	2.5	\$4,900	1.023	\$100
SUBTOTAL						\$5,600		\$1,000
PALMETTO & SOLDIER TOTAL						\$13,900		\$1,800

1/: UNIT DAY VALUE OF A TRIP TO WEEKS BAY TIMES THE NUMBER OF ANNUAL TRIPS

2/: "BUREAU OF OUTDOOR RECREATION STANDARDS BOOK"; OUTDOOR RECREATION SPACE STANDARDS FOR ALL TYPES OF ACTIVITIES, APRIL 1967.

3/: FROM TABLE 2 COLUMN 3

TABLE B-4
WITH-PROJECT CONDITIONS DREDGED TO 4 & 5 FT.
AVERAGE ANNUAL VESSEL LOSSES BY DRAFT DUE TO DELAYS

WITH PROJECT CONDITIONS HARBOUR/VESSEL/DRAFT	CHANNEL DEPTH	1/ HOURS AT DEPTH	2/ TIME W/OUT AGEB. DEPTH	3/ NO OF YR TRIPS	NO ANNUAL TRIPS DELAYED	5/ AVG HRS DELAYED ON TRIP DELAYED	6/ TOTAL HRS VSL DELAYED	NO OF VESSELS	7/ VARIABLE OPER COST	TOTAL ANNUAL DELAY COST	TOTAL ANNUAL DELAY REDUCED
PALMETTO CREEK, AL. 5.0' MLW GENERAL FISHING & CHARTER											
5' DRAFT FULLY LOADED	5.0'	20.0	20.209	60	12	17.2	208.9	1	929.70	96,204	99,388
2' DRAFT FULLY LOADED	5.0'	25.1	0.000	74	0	0.1	0.0	2	929.70	90	90
VESSEL REPAIRS											
6' DRAFT FULLY LOADED	5.0'	25.1	0.000	3	0	23.8	0.0	18	923.62	90	931,811
5' DRAFT FULLY LOADED	5.0'	20.6	20.209	3	1	17.2	11.8	19	923.62	95,312	98,039
4' DRAFT FULLY LOADED	5.0'	25.1	0.000	3	0	2.4	0.0	18	923.62	90	95,032
VESSEL CONSTRUCTION											
5' DRAFT FULLY LOADED	5.0'	20.0	20.209	6	1	17.2	19.1	2	923.62	9905	91,369
SUBTOTAL											
								2		912,420	955,640
SOLDIER CREEK, AL. 5.0' MLW COMMERCIAL SHRIMP											
4' DRAFT FULLY LOADED	5.0'	24.8	1.023	72	1	0.1	0.1	2	96.42	91	9450
TOTALS											
										912,421	956,090

1/: PERCENT OF TIME NOT EXCEEDED (1975-1987 TERRY COVE GUAGE HIGH DURATION) MULTIPLIED BY 25.1 HOURS (1986 TERRY COVE GUAGE EXTREME TIDES).

2/: TIDAL GUAGE DATA FOR PERIOD OF RECORD (1975 THRU 1987) AS A PERCENT OF THE TIME THAT VESSELS CANNOT ADEQUATELY NAVIGATE THE GIVEN DEPTH.

3/: DRAFT REPORT ON COMMERCIAL FISHING COST RETURN PROFILES FOR GULF COAST AREA, CENTAUR ASSOCIATES 1975, AND/OR A FIELD SURVEY;

RECREATIONAL AND REPAIR/CONSTRUCTION VESSEL TRIPS ARE BASED ON A FIELD SURVEY.

4/: PROBABILITY OF DELAY MULTIPLIED BY THE NUMBER OF TRIPS

5/: DAILY TIMES MEASURED PEAK TO PEAK TO DETERMINE ACCESS OF DRAFT, IF GREATER THAN 40 HRS, DELAY=40 HR PER MONTH; IF 24 HRS OR LESS, DELAY =6 HR A MONTH.

THE WEIGHT OF THE TOTAL DELAY WAS BY THE COMBINED DELAYS FOR COMMERCIAL BOATS, RECREATIONAL CRAFT DELAYS WERE BASED ON SHORT (6 HR) DELAYS.

6/: NO OF TRIPS DELAYED MULTIPLIED BY AVERAGE ANNUAL DELAY.

7/: TABLE 5, COMMERCIAL ANNUAL VARIABLE COSTS (INCLUDING CAPTAINS WAGES) WERE DIVIDED BY THE ANNUAL HOURS FISHING.

HOURS WORKED PER TRIP FOR 3' TO 6' DRAFT SHRIMPERS WERE ESTIMATED TO BE THE DAYS FISHED MULTIPLIED BY 24 HRS FOR SHRIMPERS / 12 HRS FOR CRABBERS AND 2' DRAFT SHRIMPERS.

RECREATIONAL BOAT DELAY COSTS WERE BASED ON UNIT DAY VALUES. BOAT BUILDING/REPAIR WAS TAKEN FROM A FIELD SURVEY.

TABLE B-5
WITH-PROJECT CONDITIONS DREDGED TO 5 & 6 FT.
AVERAGE ANNUAL VESSEL LOSSES BY DRAFT DUE TO DELAYS

WITH PROJECT CONDITIONS		1/	2/	3/	4/	5/	6/	7/	
HARBOUR/VESSEL/DRAFT	CHANNEL DEPTH	HOURS AT DEPTH	Z TIME W/OUT ABER. DEPTH	NO OF YR TRIPS	NO ANNUAL TRIPS DELAYED	AVG HRS DELAYED ON TRIP	TOTAL HRS VSL DELAY	VARIABLE OPER COST	TOTAL ANNUAL DELAY REDUCED
PALMETTO CREEK, AL. 6.0' MLM									
GENERAL FISHING & CHARTER									
5' DRAFT FULLY LOADED	6.0'	25.1	0.000	60	0	0.1	0.0	1 \$29.70	\$0
2' DRAFT FULLY LOADED	6.0'	25.1	0.000	74	0	0.0	0.0	2 \$29.70	\$0
VESSEL REPAIRS									
6' DRAFT FULLY LOADED	6.0'	25.1	0.000	3	0	2.4	0.0	18 \$23.62	\$0
5' DRAFT FULLY LOADED	6.0'	25.1	0.000	3	0	0.1	0.0	19 \$23.62	\$0
4' DRAFT FULLY LOADED	6.0'	25.1	0.000	3	0	0.0	0.0	18 \$23.62	\$0
VESSEL CONSTRUCTION									
5' DRAFT FULLY LOADED	6.0'	25.1	0.000	6	0	0.1	0.0	2 \$23.62	\$0
SUBTOTAL									
									\$68,060
SOLDIER CREEK, AL. 6.0' MLM									
COMMERCIAL SHRIMP									
4' DRAFT FULLY LOADED	6.0'	25.1	0.000	72	0	0.0	0.0	2 \$6.42	\$0
TOTALS									\$68,511

1. PERCENT OF TIME NOT EXCEEDED (1975-1987 TERRY COVE GAUGE HIGH DURATION) MULTIPLIED BY 25.1 HOURS (1986 TERRY COVE GAUGE EXTREME TIDES).

27: TIDAL GAUGE DATA FOR PERIOD OF RECORD (1975 THRU 1987) AS A PERCENT OF THE TIME THAT VESSELS CANNOT ADEQUATELY NAVIGATE THE GIVEN DEPTH.

3/ DRAFT REPORT ON COMMERCIAL FISHING COST RETURN PROFILES FOR GULF COAST AREA, CENTAUR ASSOCIATES 1975, AND/OR A FIELD SURVEY;

RECREATIONAL AND REPAIR/CONSTRUCTION VESSEL TRIPS ARE B

4/: PROBABILITY OF DELAY MULTIPLIED BY THE NUMBER OF TRIPS

5/: DAILY TIMES MEASURED PEAK TO PEAK TO DETERMINE ACCESS OF DRIFT, IF GREATER THAN 100 INCH, DELAYS TO IN PER MINUTE, OF 10 MINUTE DELAY.
THE WEIGHT OF THE TOTAL DELAY WAS BY THE COMBINED DELAYS FOR COMMERCIAL BOATS. RECREATIONAL CRAFT DELAYS WERE BASED ON SHORT (6 HR) DELAYS.

THE WEIGHT OF THE TOWING VESSEL AND BY THE CONSTANT FACTOR
 C/: NO OF TRIPS DELAYED MULTIPLIED BY AVERAGE ANNUAL DELAY.

77: TABLE 5. COMMERCIAL ANNUAL VARIABLE COSTS (INCLUDING CAPTAINS WAGES) WERE DIVIDED BY THE ANNUAL HOURS FISHING.

BOAT BUILDING/REPAIR WAS TAKEN FROM A FIELD SURVEY. RECREATIONAL BOAT DELAY COSTS WERE BASED ON UNIT DAY VALUES. BOAT BUILDING/REPAIR WAS TAKEN FROM A FIELD SURVEY.

TABLE B-6
AVERAGE ANNUAL LOST RECREATIONAL OPPORTUNITIES
WITH-PROJECT CONDITION CHANNELS: 5.0' MLW

HARBOR/VESSEL/DRAFT	UNIT DAY VALUE PER PERSON	NUMBER ANNUAL TRIPS	1/ ANNUAL VALUE OF RECREATIONAL OPPORTUNITIES	NUMBER OF VESSELS	2/ NUMBER OF VISITORS PER VESSEL	TOTAL ANNUAL RECREATIONAL VALUE	3/ PERCENT OF TIME W/O ADEQUATE DEPTH	TOTAL ANNUAL DELAYS	TOTAL ANNUAL DELAY REDUCED
PALMETTO CREEK									
5.0' DRAFT FULLY LOADED	3.32	12	\$39.84	1	5.5	\$200	20.209	\$0	\$100
5.0' DRAFT FULLY LOADED	3.32	12	\$39.84	22	3.5	\$3,100	1.023	\$0	\$600
4.0' DRAFT FULLY LOADED	3.32	12	\$39.84	50	2.5	\$5,000	0.028	\$0	\$100
SUBTOTAL						\$8,300		\$0	\$800
SOLDIER CREEK									
6.0' DRAFT FULLY LOADED	3.32	12	\$39.84	3	6.0	\$700	20.209	\$100	\$500
5.0' DRAFT FULLY LOADED	3.32	12	\$39.84	3	5.5	\$700	1.023	\$0	\$300
4.0' DRAFT FULLY LOADED	3.32	12	\$39.84	0	3.5	\$0	0.028	\$0	\$0
3.0' DRAFT FULLY LOADED	3.32	12	\$39.84	49	2.5	\$4,900	0	\$0	\$100
SUBTOTAL						\$5,600		\$100	\$900
PALMETTO & SOLDIER TOTAL						\$13,900		\$100	\$1,700

1/: UNIT DAY VALUE OF A TRIP TO WEEKS BAY TIMES THE NUMBER OF ANNUAL TRIPS

2/: "BUREAU OF OUTDOOR RECREATION STANDARDS BOOK"; OUTDOOR RECREATION SPACE STANDARDS FOR ALL TYPES OF ACTIVITIES, APRIL 1967.

3/: FROM TABLE 4 COLUMN 3

TABLE B-7
AVERAGE ANNUAL LOST RECREATIONAL OPPORTUNITIES
WITH-PROJECT CONDITION CHANNELS: 6.0' MLW

HARBOR/VESSEL/DRAFT	UNIT DAY VALUE PER PERSON	NUMBER ANNUAL TRIPS	1/ ANNUAL VALUE OF RECREATIONAL OPPORTUNITIES	NUMBER OF VESSELS	2/ NUMBER OF VISITORS PER VESSEL	TOTAL ANNUAL RECREATIONAL VALUE	3/ PERCENT OF TIME W/D ADEQUATE DEPTH	TOTAL ANNUAL DELAYS	TOTAL ANNUAL DELAY REDUCED
PALMETTO CREEK									
5.0' DRAFT FULLY LOADED	3.32	12	\$39.84	1	5.5	\$200	1.023	\$0	\$100
4.0' DRAFT FULLY LOADED	3.32	12	\$39.84	22	3.5	\$3,100	0.028	\$0	\$600
3.0' DRAFT FULLY LOADED	3.32	12	\$39.84	50	2.5	\$5,000	0	\$0	\$100
SUBTOTAL						\$8,300		\$0	\$800
SOLDIER CREEK									
6.0' DRAFT FULLY LOADED	3.32	12	\$39.84	3	6.0	\$700	1.023	\$0	\$600
5.0' DRAFT FULLY LOADED	3.32	12	\$39.84	3	5.5	\$700	0.028	\$0	\$300
4.0' DRAFT FULLY LOADED	3.32	12	\$39.84	0	3.5	\$0	0	\$0	\$0
3.0' DRAFT FULLY LOADED	3.32	12	\$39.84	49	2.5	\$4,900	0	\$0	\$100
SUBTOTAL						\$5,600		\$0	\$1,000
PALMETTO & SOLDIER TOTAL						\$13,900		\$0	\$1,800

1/: UNIT DAY VALUE OF A TRIP TO WEEKS BAY TIMES THE NUMBER OF ANNUAL TRIPS

2/: "BUREAU OF OUTDOOR RECREATION STANDARDS BOOK"; OUTDOOR RECREATION SPACE STANDARDS FOR ALL TYPES OF ACTIVITIES, APRIL 1967.

3/: FROM TABLE 5 COLUMN 3

TABLE B-8
MATRIX FOR COMPUTATION
OF UNIT DAY VALUE

CRITERIA

RECREATION EXPERIENCE POINTS POSSIBLE: 30 PALMETTO/SOLDIER: 4	TWO GENERAL ACTIVITIES	SEVERAL GENERAL ACTIVITIES	SEVERAL; ONE OF HIGH QUALITY	SEVERAL; MORE THAN ONE HIGH QUALITY	MANY HIGH QUALITY; A FEW GENERAL	
SCALE	0-4	5-10	11-16	17-23	24-30	
OPPORTUNITY AVAILABILITY POINTS POSSIBLE: 18 PALMETTO/SOLDIER: 3	SEVERAL WITHIN 1 HR; A FEW WITHIN 1/2 HR	SEVERAL WITHIN 1 HR; NONE WITHIN 1/2 HR	1 OR 2 WITHIN 1 HR; NONE WITHIN 3/4 HR	NONE WITHIN 1 HOUR	NONE WITHIN 2 HOURS	
SCALE	0-3	4-6	7-10	11-14	15-18	
CARRYING CAPACITY POINTS POSSIBLE: 14 PALMETTO/SOLDIER: 7	MINIMUM FACILITY DEVELOPMENT	BASIC FACILITY DEVELOPMENT	ADEQUATE FACILITY W/O HURTING ACTIVITY	OPTIMUM FACILITY DEVELOPMENT	ULTIMATE FACILITY DEVELOPMENT	
SCALE	0-2	3-5	6-8	9-11	12-14	
ACCESSIBILITY POINTS POSSIBLE: 18 PALMETTO/SOLDIER: 11	LIMITED ACCESS TO OR WITHIN SITE	FAIR ACCESS; POOR ROADS TO; LIMITED WITHIN SITE	FAIR ACCESS, FAIR ROADS TO SITE; FAIR ACCESS, GOOD WITHIN	GOOD ACCESS, GOOD ROADS TO SITE; FAIR ACCESS, GOOD WITHIN	GOOD ACCESS, VERY GOOD ROADS TO; GOOD ROADS WITHIN SITE	
SCALE	0-3	4-6	7-10	11-14	15-18	
ENVIRONMENTAL QUALITY POINTS POSSIBLE: 18 PALMETTO/SOLDIER: 12	LOW ESTHETIC FACTORS THAT SIGNIFICANTLY LOWER QUALITY	AVERAGE ESTH- ETIC QUALITY; MINOR DEGREE OF REDUCTION	ABOVE AVERAGE QUALITY; LIMITING FAC- TORS RIGHTED REASONABLY	HIGH ESTHETIC QUALITY; NO FACTORS THAT LOWER QUALITY	OUTSTANDING ESTHETICS; NO FACTORS THAT LOWER QUALITY	
SCALE	0-2	3-6	7-10	11-14	15-18	
TOTAL POINTS POSSIBLE: 98 TOTAL PALMETTO/SOLDIER: 37						
POINTS :	0	10	20	30	40	
CONVERSION FACTORS: ---						
DOLLARS :	\$1.95	\$2.25	\$2.60	\$3.00	\$3.45	
POINTS :	50	60	70	80	90	100
CONVERSION FACTORS: ---						
DOLLARS :	\$4.15	\$4.45	\$4.80	\$5.15	\$5.45	\$5.80

TABLE B-9
SUMMARY OF WITHOUT-PROJECT COSTS

CATEGORY BY VESSEL TYPE	PALMETTO CREEK	SOLDIER CREEK	TOTAL
COMMERCIAL VESSELS			
DELAY COSTS	\$68,500	\$500	\$69,000
RECREATIONAL VESSELS			
LOST RECREATION	\$800	\$1,000	\$1,800
WITHOUT-PROJECT TOTALS	\$69,300	\$1,500	\$70,800

TABLE B-10
SUMMARY OF WITH-PROJECT BENEFITS

SEGMENT & CATEGORY	W/O PROJ COSTS	COST REMAINING			WITH-PROJECT CONDITION BENEFITS	
PALMETTO CREEK	4.0'	5.0'	6.0'		5.0'	6.0'
COMMERCIAL VESSELS						
DELAY REDUCTION	\$68,500	\$12,400	\$0		\$56,100	\$68,500
RECREATIONAL VESSELS						
RECREATION INCREASE	\$800	\$0	\$0		\$800	\$800
SUBTOTAL	\$69,300	\$12,400	\$0		\$56,900	\$69,300
SOLDIER CREEK						
COMMERCIAL VESSELS						
DELAY REDUCTION	\$500	\$0	\$0		\$0	\$500
RECREATIONAL VESSELS						
RECREATION INCREASE	\$1,000	\$100	\$0		\$900	\$1,000
SUBTOTAL	\$1,500	\$100	\$0		\$900	\$1,500
TOTALS	\$70,800	\$12,500	\$0		\$57,800	\$70,800

TABLE B-11
COST OF COMMUTING TO BON SECOUR
COMMERCIAL FISHING AND SHRIMPING VESSELS

SEGMENT AND VESSEL DRAFT	1/ NUMBER OF VESSELS	2/ ANNUAL TRIPS FISHING	ROUND TRIP MILEAGE	3/ OPERATING COST/MILE	TOTAL COST PER YEAR
PALMETTO					
5' DRAFT	1	60	40.14	0.133	\$320
SOLDIER					
4' DRAFT	2	72	40.14	0.133	\$769
TOTALS	3	132	40.14	0.133	\$1,089

1/: PAGE 3

2/: TABLE 2

3/: "COST OF OPERATING AUTOMOBILES AND VANS, 1988"
 U.S. DEPARTMENT OF TRANSPORTATION.

ENVIRONMENTAL STUDIES

APPENDIX C

SECTION 107
PRELIMINARY ASSESSMENT
NAVIGATION CHANNEL FOR PALMETTO CREEK
BALDWIN COUNTY, ALABAMA

1. DESCRIPTION OF STUDY AREA. Palmetto Creek is a tidal stream located in Baldwin County, Alabama, on the west bank of Perdido Bay. The creek flows southward into Perdido Bay about six miles north of Perdido Pass. The pass is situated between Alabama Point and Florida Point, which connects Perdido Bay with the Gulf of Mexico. The study area is approximately 18 miles west southwest of Pensacola, Florida, and about 55 miles southeast of Mobile, Alabama.

The southern mile and one-half of Palmetto Creek is an estuary. This lowermost portion is approximately 500 to 600 feet in width and has depths of about 9 to 10 feet. This creek forms the western boundaries of the peninsula known as Perdido Beach.

2. DESCRIPTION OF THE PROPOSED PROJECT. The proposed Palmetto Creek navigation channel would be dredged to achieve a bottom width of 40 feet and a depth of -5 feet mean low water (mlw) and 1 foot advance maintenance. The channel would begin at about the 5-foot contour in Perdido Bay and extend up through Palmetto Creek for approximately 400 feet. Approximately 500 cubic yards (cy) of new work material would be dredged from the channel. Channel maintenance would be performed approximately every 5 years with the removal of approximately 2,700 cy dredged material. Disposal would occur along the shoreline on the south side of the Perdido Beach just east of the channel if the dredged material is determined to be beach quality. The material would be placed in this site only after the sediment has been determined to be beach quality.

3. ALTERNATIVE PLANS TO THE PROPOSED PROJECT. The alternatives to the proposed project include other various channel depths along the same alignment and no action. The alternatives are discussed below.

a. No Action (Without Project Condition). In the no action alternative, no channel construction responsive to the problems and needs of the local interest would be accomplished by the Federal Government. Shoaling at the mouth of Palmetto Creek has stabilized at a depth of about 4 feet. This constricts flow into and out of Palmetto Creek and reduces circulation and proper flushing in the creek.

b. Other channel depths. Various channel depths were considered. They include (1) a 6-foot depth with 1-foot advance maintenance, (2) a 7-foot depth with 1-foot advance maintenance, (3) a 7-foot depth with 2-feet advance maintenance, and (4) a 7-foot depth with 3-feet advance maintenance. The proposed project depth was chosen because it produced the maximum benefit-cost ratio.

c. Beach nourishment site. Another shoreline disposal site was identified during a field trip on 2 May 1989. This site was determined

to be environmentally unacceptable because of sparse marshes along the shoreline.

4. ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT. Environmental impacts associated with dredging a navigation channel at Palmetto Creek include both dredging and disposal impacts. Impacts associated with dredging activities are primarily short-term and localized and include, but are not limited to, destruction of sediment-dwelling organisms in the channel, an increase in siltation and turbidity near the point of discharge, an increase in noise levels in the vicinity of the dredging operations, aesthetic impacts in the project area due to the presence of the dredge and its associated equipment, and possible impacts to navigation due to the dredge being located in the channel. Disposal impacts for beach nourishment include lateral transport of fine sediment, an increase in turbidity, minor effect on primary productivity, and disruption and coverage of benthic communities.

5. ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES. The impacts of the other alternatives, excluding the no action alternative, would be similar to the impacts of the proposed project. The impacts associated with the no action alternative is a continuation of the constriction in the water flow in and out of the Palmetto Creek and a reduction in water circulation and proper flushing action in the creek.

ANALYSES OF SEDIMENT, WATER,
AND ELUTRIATE SAMPLES FROM PALMETTO CREEK, ALABAMA

GOVERNMENT COST ESTIMATE

A. Analysis of Samples (All unit prices include overhead, and direct labor) 4 Stations.

<u>ITEM</u>		<u>AMOUNT</u>
1.	8 Sediment Grain Size @ \$30 ea	\$ 240.00
2.	32 Sediment Nutrient Analyses	
	8 Total Organic Carbon @ \$48 ea	384.00
	8 Total Kjeldahl Nitrogen @ \$36 ea	288.00
	8 Ammonia Nitrogen @ \$25 ea	200.00
	8 Total Phosphorus @ \$40 ea	320.00
3.	8 Sediment Phenol Analyses @ \$48 ea	384.00
4.	72 Sediment Heavy Metal Analyses	
	8 Mercury @ \$50 ea	400.00
	8 Cadmium @ \$15 ea	120.00
	8 Lead @ \$15 ea	120.00
	8 Copper @ \$50 ea	400.00
	8 Arsenic @ \$15 ea	120.00
	8 Zinc @ \$15 ea	120.00
	8 Nickel @ \$15 ea	120.00
	8 Chromium @ \$15 ea	120.00
	8 Iron @ \$15 ea	120.00
5.	8 Sediment Oil & Grease @ \$30 ea	240.00
6.	32 Water Column Nutrient Analyses	
	8 Total Organic Carbon @ \$36 ea	288.00
	8 Total Kjeldahl Nitrogen @ \$36 ea	288.00
	8 Ammonia Nitrogen @ \$15 ea	120.00
	8 Total Phosphorus @ \$30 ea	240.00
7.	8 Water Column Phenol Analyses @ \$36	288.00
8.	72 Water Column Heavy Metal Analyses	
	16 Mercury and Copper @ \$40 ea	640.00
	56 Other Heavy Metals @ \$15 ea	840.00
9.	4 Elutriant Preparations @ \$100 per station	400.00
10.	32 Elutriant Nutrient Analyses	
	Same prices as for Water Column	936.00
11.	8 Elutriant Phenol Analyses @ \$36 ea	288.00
12.	72 Elutriant Heavy Metal Analyses	
	16 Mercury and Copper @ \$40 ea	640.00
	56 Other Heavy Metals @ \$15 ea	840.00
	SUBTOTAL	9,504.00
13.	12% Profit	1,141.00
	TOTAL	10,645.00

B. Collection of Samples

1. Direct Labor

a. Environmental Scientist - 16 hours \$ 654.80
b. Field Assistants (2) - 16 hrs 785.32
 @ \$9.66/hr

SUBTOTAL \$ 1,440.12

2. Supplies \$ 100.00

3. 18-foot boat - 2.5 days @ \$225/day
 (includes gas and operator) \$ 562.50

SUBTOTAL \$ 2,102.62

PROFIT (12%) \$ 252.31

TOTAL \$ 2,354.93

C. Report Preparation

1. Direct Labor

a. Environmental Scientist - 8 hours \$ 327.40
 @ \$16.11/hr

2. Miscellaneous Supplies \$ 100.00

SUBTOTAL \$ 427.40

PROFIT (12%) 64.00

TOTAL \$ 491.40

D. Total Cost

1. Analyses \$10,645.00
2. Sample Collection 2,354.93
3. Report Prep. 491.40
TOTAL COST \$13,491.86

I. The cost for the Environmental Scientist and field assistants are figured as follows:

$(\$16.11/\text{hr}) * (8 \text{ hrs}/\text{day}) = \$128.88/\text{day}$
 $\$128.88/\text{day} * (1.42 \text{ multiplier}) = \$183.01/\text{day}$
 $\$183.01/\text{day} + (\$183.01/\text{day}) * (0.279 \text{ Overhead}) +$
 $(\$183.01/\text{day}) * (0.51 \text{ technical indirect}) = \$327.40/\text{day}$

The overhead and technical indirect rates are those given by RM in Memorandum dated 21 April 1989. Multiplier beginning 25 June 1989.

ANALYSES OF SEDIMENT SAMPLES FROM PALMETTO CREEK, ALABAMA

GOVERNMENT COST ESTIMATE

A. Analysis of Samples (All unit prices include overhead, and direct labor) 4 Stations.

<u>ITEM</u>	<u>AMOUNT</u>
1. 8 Sediment Grain Size @ \$30 ea	\$ 240.00
2. 12 % Profit	<u>28.80</u>
	\$ 268.80

B. Collection of Samples

1. Direct Labor	
a. Environmental Scientist - 16 hours	\$ 654.80
b. Field Assistants (2) - 16 hrs	<u>785.32</u>
@ \$9.66/hr	
SUBTOTAL	\$ 1,440.12
2. Supplies	\$ 100.00
3. 18-foot boat - 2.5 days @ \$225/day (includes gas and operator)	\$ <u>562.50</u>
SUBTOTAL	\$ 2,102.62
PROFIT (12%)	\$ <u>252.31</u>
TOTAL	\$ 2,354.93

C. Report Preparation

1. Direct Labor	
a. Environmental Scientist - 8 hours	\$ 327.40
@ \$16.11/hr	
2. Miscellaneous Supplies	\$ 100.00
SUBTOTAL	\$ 427.40
PROFIT (12%)	<u>64.00</u>
TOTAL	\$ 491.40

CESAM-PD-EC
Morgan

Date Prepared:
15 August 1989

D. Total Cost

1. Analyses	\$ 268.80
2. Sample Collection	2,354.93
3. Report Prep.	<u>491.40</u>
TOTAL COST	\$ 3,115.13

STUDY COST ESTIMATE
FOR
FEASIBILITY STUDY

APPENDIX D

STUDY COST ESTIMATE (PB-6) (9000) Per use of this form, see EN 11-2-229		APPROPRIATION TITLE: General Investigations		NAME OF STUDY Palmetto and Soldier Creeks, Baldwin County, AL			
CATEGORY Continuing Authority Section 107		CLASS Navigation Study		SUBCLASS			
SUBACCOUNT		CURRENT COST ESTIMATE				PREVIOUS FEDERAL ESTIMATE AND DATE APPROVED ()	REMARKS
NUMBER	TITLE	RECON. NOISSANCE PHASE	FEDERAL FEASIBILITY PHASE	NON- FEDERAL FEASIBILITY PHASE	TOTAL FEASIBILITY PHASE		
1	.01	Public Involvement	2.0	2.0	4.0		
2	.05	Environmental Studies	12.0	12.0	24.0*		
3	.06	Fish and Wildlife Studies	4.0	4.0	8.0		*If sandy material is found amount would be reduced by \$13,500.
4	.07	Economic Studies	4.0	4.0	8.0		
5	.08	Surveying and Mapping	3.0	3.0	6.0		
6	.09	Hydrology and Hydraulics	2.0	2.0	4.0		
7	.10	Foundation and Materials Inv.	4.0	4.0	8.0		
8	.11	Design and Cost Estimate	2.0	2.0	4.0		
9	.13	Study Management	8.0	8.0	16.0		
10	.15	Report Preparation	5.0	5.0	10.0		
11	.31	Supervision & Administration	4.0	4.0	8.0		
12							
13							
14			50.0	50.0	100.0		
DATE PREPARED April 90		DIVISION South Atlantic		REGION Perdido Bay Coastal Streams Drainage		Page 1 of 1	

REPLACES ENG FORM 2204-R, APR 77 WHICH IS OBSOLETE.