HNTB

FEASIBILITY REPORT FOR PROPOSED COASTAL PROJECT:

BS–3a CAERNARVON DIVERSION OUTFALL TO BIG MAR

DEPARTMENT OF NATURAL RESOURCES
COASTAL RESTORATION DIVISION

Feasibility Report

for

Proposed Coastal Project:

BS–3a
CAERNARVON DIVERSION OUTFALL TO BIG MAR

prepared by:
Howard Needles Tammen & Bergendoff
Architects Engineers Planners

MAY 1992

prepared for:
Coastal Restoration Division
Louisiana Department of Natural Resources
Baton Rouge, Louisiana

DNR Contract No. 25030–91–32

PROJECT
BS-3a CAERNARVON DIVERSION OUTFALL
(BIG MAR)

TABLE OF CONTENTS

Location Map 1

Vicinity Map 2

Plan View Map 3

I. Project Description 4

- A. Location
- B. Habitat Changes
- C. Soils
- D. Salinity
- E. Threatened and Endangered Species

II. Objectives and Goals 7

III. Evaluation of Structural and Non-Structural Measures 8

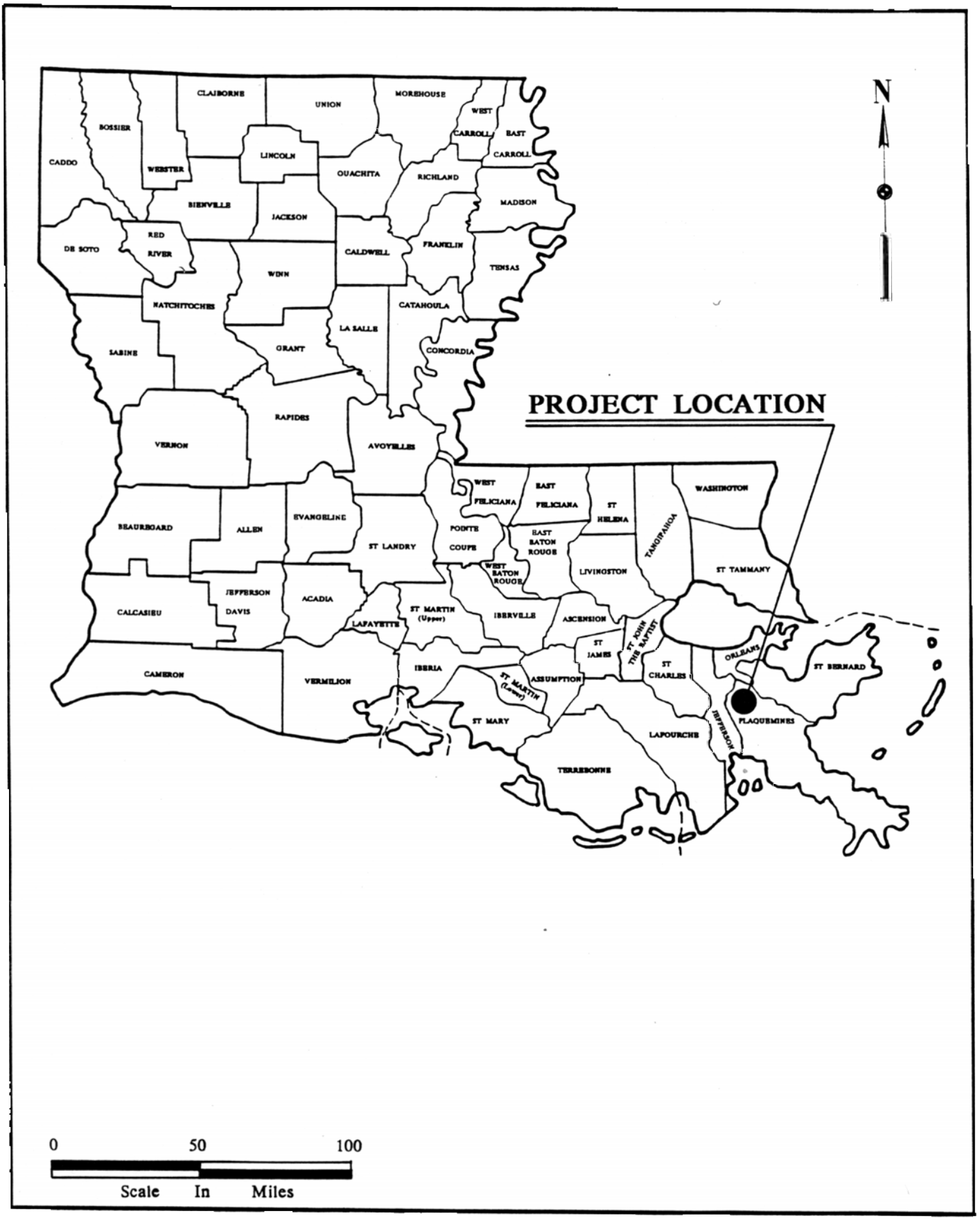
- A. Proposed Measures
- B. Project Costs
- C. Water Management Scheme
- D. Vegetation

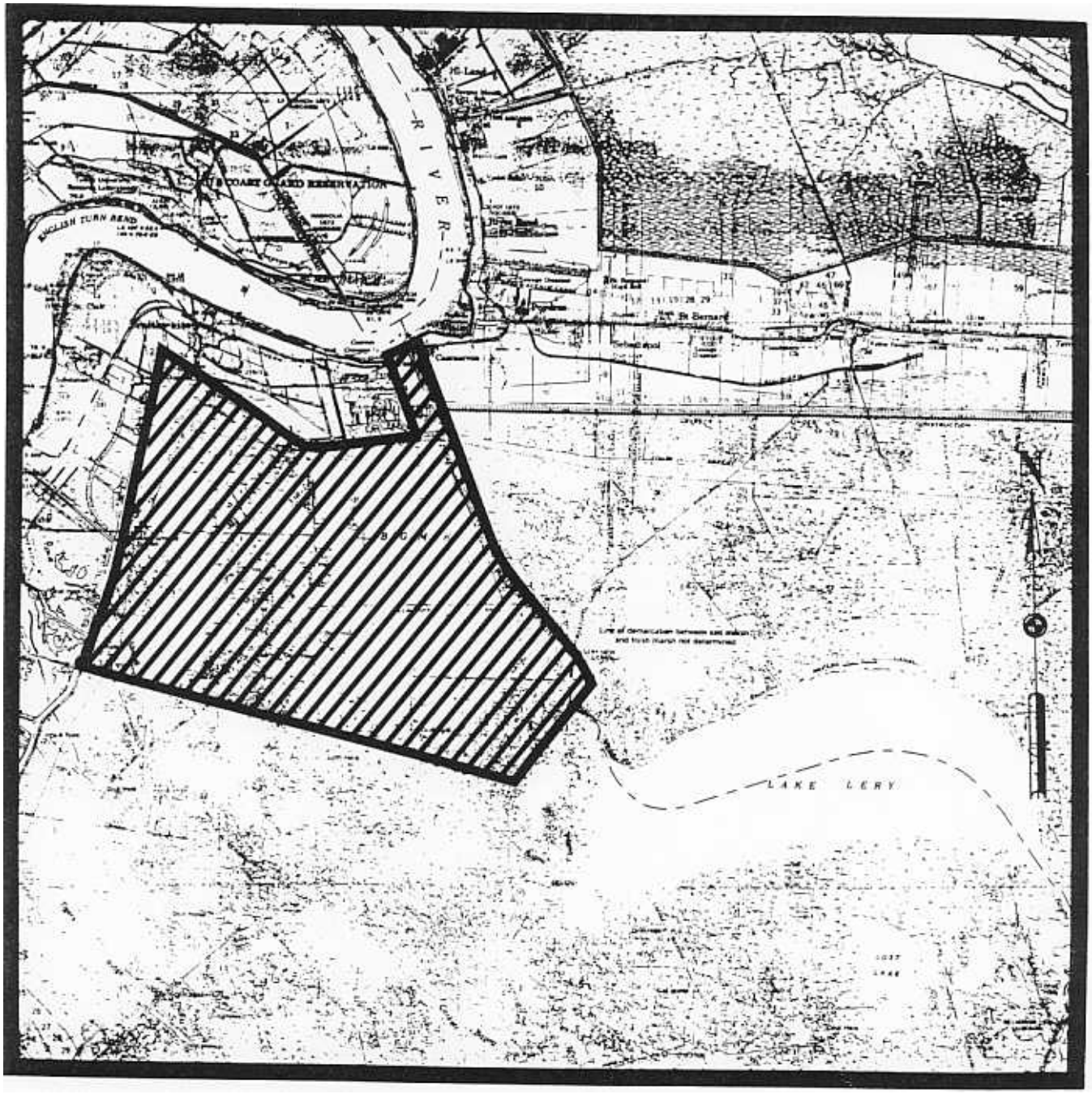
IV. Socio-Economic Concerns 13

V. Comments and Recommendations 14

Appendix A - Letters of Comments

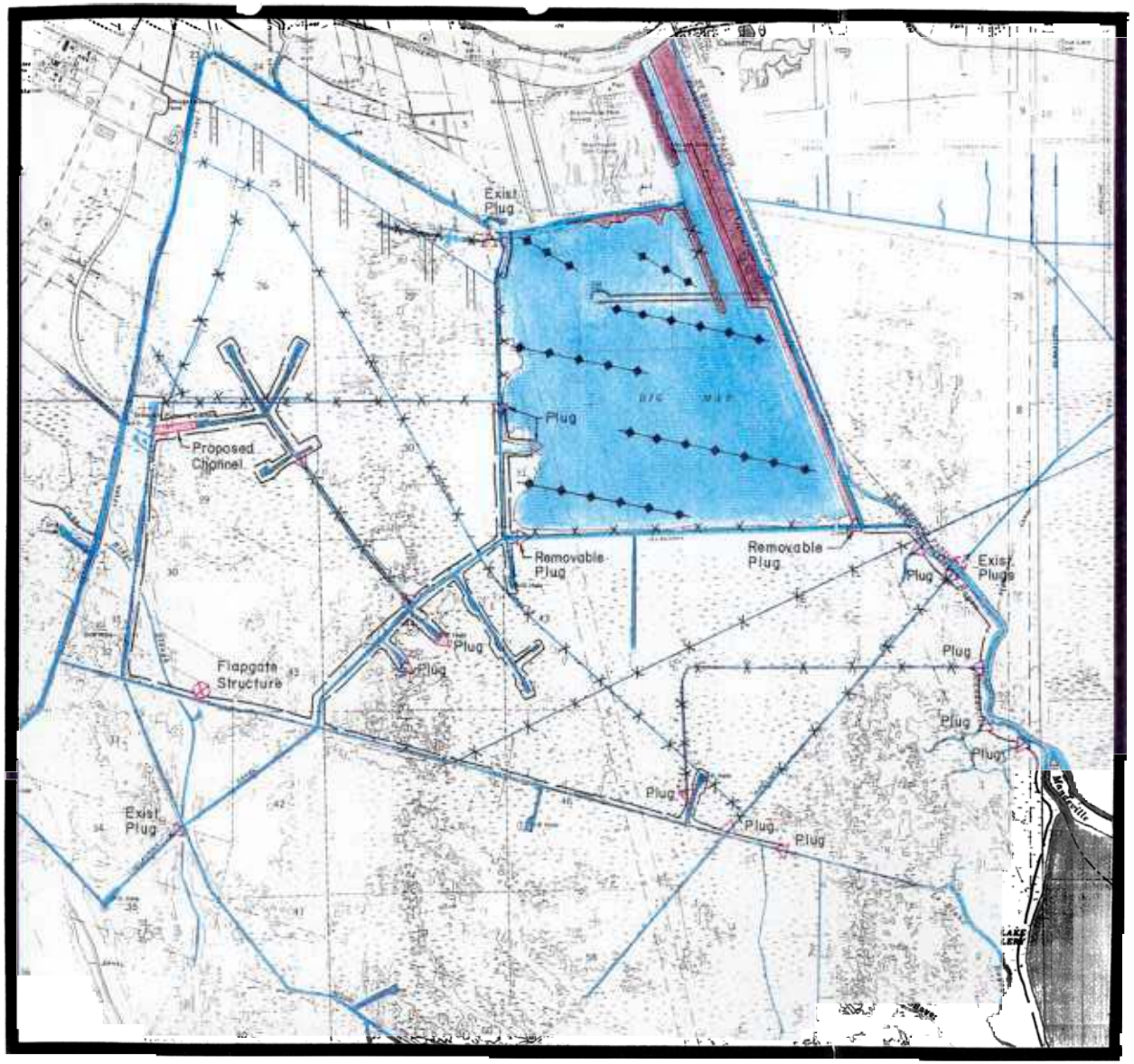
Appendix B - Support Information


PROJECT LOCATION
N
CADDO
BOSSIER
WEBSTER
CLAIBORNE
UNION
MOREHOUSE
WEST CARROLL
EAST CARROLL
LINCOLN
OUACHITA
RICHLAND
MADISON
BIENVILLE
JACKSON
DE SOTO
RED RIVER
CALDWELL
FRANKLIN
TENSAS
WINN
NATCHITOCHES
CATAHOULA
LA SALLE
SABINE
GRANT
CONCORDIA
RAPIDES
VERNON
AVOYELLES
WEST FELICIANA
EAST FELICIANA
ST HELENA
WASHINGTON
TANGIPAHOA
BEAUREGARD
ALLEN
EVANGELINE
ST LANDRY
POINTE COUPE
EAST BATON ROUGE
WEST BATON ROUGE
LIVINGSTON
ST TAMMANY
CALCASIEU
JEFFERSON DAVIS
ACADIA
LAFAYETTE
ST MARTIN (Upper)
IBERVILLE
ASCENSION
ST JOHN THE BAPTIST
ST JAMES
ORLEANS
ST BERNARD
CAMERON
VERMILION
IBERIA
ST MARTIN (Lower)
ASSUMPTION
ST CHARLES
ST MARY
LAPOURCHE
JEFFERSON
PLAQUEMINES
TERREBONNE
0
50
100
Scale In Miles



VICINITY MAP

FIGURE 1



N

LEGEND

- Spoil Bank Proposed 3' MSL
- Sediment Fence
- Proposed Ditches
- Removal of Existing Spoil Banks (Deposit In Adjacent Canals)

BS - 3a

CAERNARVON DIVERSION OUTFALL TO BIG MAR

BS-3a

CAERNARVON DIVERSION

OUTFALL

CAERNARVON DIVERSION OUTFALL
(BIG MAR)
BS-3a

I. PROJECT DESCRIPTION

A. Location

The Caernarvon Diversion Outfall project is located south of the communities of Braithwaite and Caernarvon (see Vicinity Map). The area is bounded on the north by the Forty Arpent Canal and Big Mar; the west by Forty Arpent Canal; the east by Caernarvon Canal and Bayou Mandeville (Plaquemines - St. Bernard Parish Line) and Lake Lery; and the south by Tigers Ridge, Casket Bayou and Bayou Duhuy (see Plan View Map). The project area and area benefitted are in excess of 25,400 acres of brackish and intermediate marsh located in all or parts of T-14S R-12E Sections 2-6, 23-29, 30-35 & 41-43, T-14S R-13E Sections 1-9, 27-29, 30, 31, 43-46 & 58-60, in the Breton Sound of Plaquemines Parish. The approximate location of the center of the project is longitude 89 degrees 55 minutes 00 seconds and latitude 29 degrees 48 minutes 00 seconds.

B. Habitat Changes

The wetlands in this project are deteriorating due to saltwater intrusion, oil field activities, subsidence, lack of sedimentation and reduced freshwater influx. This area has lost a considerable amount of acreage to open water between 1956 and 1984 (Table 1). Acres of broken marsh will soon convert to open water, due to the aforementioned factors. At the current rate of erosion and losses, this portion of the Breton Sound estuary will be lost within the foreseeable future.

Table 1

Wetland Type	1956 Acres	1978 Acres	1984 Acres
Water (Natural)	1,437	2,088	3,077
Water (Artificial)	234	2,171	0
Swamp	0	0	7
Broken Marsh	0	0	2,291
Fresh	930	4	23
Non-Fresh*	7,860	0	0
Intermediate	0	3,174	717
Brackish	0	2,741	4,280
Saline	0	0	0
Other	198	485	271
Totals	10,659	10,659	10,659

* Not Interpreted In 1956

	Open Water		Emergent Vegetation	
	Acres	%	Acres	%
1956	1,671	15.7	8,790	82.5
	4,259	40.0	5,919	55.5
	5,368	50.4	7,316	68.7

C.

project area is composed of several soil types, mainly Clovelly-Lafitte muck. These organic soils are characterized as being level, very poorly drained, very fluid and slightly saline. They are in brackish marshes and are ponded and flooded most of the time. Typically, the Clovelly muck surface layer is dark brown, very fluid muck about 50 inches thick. The underlying material, to a depth of approximately 70 inches, is gray, very fluid clay. The characteristics of the Lafitte muck are very similar to the Clovelly muck except the surface layer is very dark grayish brown, very fluid muck about 12 inches thick. The next layer extends to a depth of about 53 inches. It is very dark brown, very fluid muck in the lower part. The underlying layer is very dark gray, very fluid, mucky clay. Acreages of these types of soils are mainly used as habitat for wetland wildlife and for extensive forms of recreation. This Clovelly soil is in capability subclass VIIw (a soil having severe limitations that make the soil unsuitable for cultivation due to having water in or on the soil). The Lafitte soil is in capability subclass VIIIw (a soil having severe limitations that reduce the choice of crops and interferes with agricultural use by having water in or on the soil).

D. Salinity

The Louisiana Department of Wildlife and Fisheries (LDWF) was contacted regarding salinity data for Big Mar. According to LDWF personnel the closest sampling station to Big Mar is located at the confluence of Spanish Lake and River aux Chenes.

Sampling data for the period 1988 to 1990 reflects a wide range of values from a maximum of 12.6 parts per thousand (ppt) to a minimum of 1.5 ppt. Mean values

were 5.7 ppt in 1988, 5.1 ppt in 1989, and 5.6 ppt in 1990. These figures reflect adequate salinity conditions for fresh marsh vegetation.

E. Threatened and Endangered Species

Threatened or endangered species are not expected to be impacted by the proposed project. Existing habitat will be improved by allowing freshwater and sediment inflow which will increase overall marsh productivity.

II. OBJECTIVES AND GOALS

The objectives of this project are to enhance the overflow of freshwater and return the flow to as close to the historical sheet flow pattern, as possible; to abate saltwater intrusion and improve water quality; to decrease and prevent adverse increases of tidal exchange through tidal channels and breaching into ponds; and to reduce any further land loss. Specific goals needed to achieve these objectives are:

Maintain or recreate natural levees along lakes and boundaries to re-establish natural overland flow and historical hydrology in the areas and reduce rapid tidal exchange.

Moderate salinity levels and rapid tidal fluctuations through freshwater introduction and selective ditch placement.

Isolate active oil field canals from the marsh system to reduce the negative influence to the marsh hydrology.

Remove existing spoil banks on inactive canals and deposit in adjacent canals.

Allow ingress and egress of aquatic organisms to the extent possible without compromising the extent of the management system.

Increase sediments and nutrients into the project area.

III. EVALUATION OF STRUCTURAL AND NON-STRUCTURAL MEASURES

A. Proposed Measures

The plan is composed of the following components:

(1) 1,200 feet of proposed oil field channel. This dredging would provide a new access to the well sites near the Scarsdale pumping station.

(2) 100,000 feet of spoil bank repair (see Appendix B, Figure 1) for oil field isolation located in the west-southwest side of Big Mar. Isolation of the oil field canals will reduce saltwater intrusion and help hold the water inside the project area when needed.

(3) 144,000 feet of spoil bank removal to be deposited into adjacent canal locations as shown with the drawings included with this report. Degrading of the existing spoil banks to marsh level will allow the inflow of freshwater to free flow over the marsh and should allow the deposition of sediments from the Caernarvon Diversion structure discharge. See Appendix B, Figure 2 for typical spoil bank degradation.

(4) 24,200 feet of sediment/wave dampening fence (material will be determined during project design according to availability of Christmas trees or commercial type product) along the interior of Big Mar. The use of this sediment/wave dampening fence will accomplish three goals. It should reduce the wave reach and reduce erosion along Big Mar's shoreline. In addition, the wave dampening fence will promote a decrease in wave

velocity which will be conducive to allowing sediment to collect and form marshlands. Also, the fence will protect the vegetation growth.

Fourteen (14) plugs, located as shown on the drawings included with this report. The plugs will be installed in abandoned oil field canals and other openings into the project area to reduce tidal fluctuations and reduce saltwater intrusion. These plugs or dams will help maintain the desired water levels in the marsh interior. See Appendix B, Figure 3 for a typical earthen plug.

One (1) flap gate structure (see Appendix B, Figure 4) located on the DP Canal at the southwest corner of the project. This structure is to function as interior marsh level control only. This structure is to be opened and closed as shown in the water management scheme for water retainage inside the closed-off project area.

100 feet of retention levee removal on the west side of Caernarvon Diversion outfall channel. This cut in the levee will divert a portion of the freshwater discharge into the west side of the project and distribute the flow at a more uniform pattern. See Appendix B, Figure 5 for typical retention bank removal.

3,800 feet of proposed levee (see Appendix B, Figure 1) on the lower western edge of Big Mar. This will create a flow-way in the west marsh area.

Two (2) removable plugs located on the south side of Big Mar at the east and west ends of Delacroix Canal. These plugs are needed for access to oil field operations and were requested by a representative of the landowner. See Appendix B, Figure 6 for removable plug alternatives.

700 feet of discharge channels located in the northwest portion of the project area. These channels will distribute freshwater and sediments to the west side of the project.

32,200 cubic yards of dredged material located as shown on the attached drawings. Dredging of an existing channel will allow for passage to the proposed oil field channel.

3,800 feet of vegetative planting along the proposed levee shown on the drawings included in this report. Planting of vegetation will aid in the stabilization of the levee.

B. Project Costs

Estimated costs associated with this project are as follows:

			Initial Cost	Annual Cost
Design				
Engineering Design			$ 84,000	
Engineering and Design Supervision and Administration			$ 21,000	
(2) Construction				
Structures				
Oil Field Channel	1,200	Linear Feet	$ 48,000	
Spoil Bank Repair	100,000	Linear Feet	$ 150,000	
Spoil Bank Removal	144,000	Linear Feet	$ 216,000	
Sediment Fence	24,200	Linear Feet	$ 121,000	
Plugs	14	Each	$ 280,000	
Flap Gate Structures	1	Each	$ 5,000	
Retention Levee Removal	100	Linear Feet	$ 20,000	
Proposed Levee	3,800	Linear Feet	$ 29,000	
Removable Plugs	2	Each	$ 100,000	
Discharge Channels	700	Linear Feet	$ 4,000	
Dredged Material	32,200	Cubic Yards	$ 72,000	
Vegetative Planting	3,800	Linear Feet	$ 5,000	
Total Structure Cost			$1,050,000	
Supervision and Inspection			$ 84,000	
Operation and Maintenance				$ 21,000

C. Water Management Scheme

A combination of passive and active water control systems compose the water management scheme. Passive elements are: (1) spoil bank gapping, (2) spoil bank removal, (3) proposed ditches, (4) new oil field access channel, (5) earthen plugs, (6) spoil bank degradation, (7) creation of a short levee section, (8) closure in gaps in overflow or spoil banks, and (9) removable plugs in Delacroix Canal. Once installed, these water control measures will function without manipulation by man except for periodic maintenance; hence, no operational schedule is required. The elevations, widths, etc. determine the capacity of the passive elements to regulate or control the target water parameters of salinity, depth and sediment load.

The active water control element of this plan is a flap gated culvert. The gated culvert should function as a relief structure only and during the early operational stages of this project. This structure should be monitored to determine if a yearly management schedule should be incorporated, and, if placed on a schedule, the gated culvert would possibly allow temporary drawdowns for revegetation during the spring and summer months. It also would permit the ingress and egress of aquatic organisms without compromising the extent of the management system.

During the first year of operation, it is recommended that the project be inspected to determine if the hydraulic efficiency of the desired flow distribution has diminished. A small hydraulic dredge may be needed to conduct the necessary maintenance work consisting of deepening and cutting the bars on desirable distribution channels that may be formed during high discharges and stages.

D. Vegetation

Vegetative plantings are proposed for all areas of new levee construction. Vegetation serves to protect the levee by reducing (or hampering) erosive conditions facilitated by wind and water. Vegetation also provides wildlife habitat and a corridor for wildlife travel.

Proposed vegetation will consist of nursery grown stock provided by a reputable nursery and shall conform to current American Association of Nurseryman Standards for Nursery Stock. Species selected will be dependant upon such factors as water level, salinity, herbivory concerns, etc. Those species which grow rapidly and provide greater areal cover are preferred.

A conceptual planting plan will be provided to and approved by the Louisiana Department of Natural Resources prior to planting. The plan will include planting elevations, plant species to be utilized, plant densities, and a long-term (3 - 5 years) monitoring program.

Areas behind the levees will be allowed to revegetate naturally. Vegetation in these areas also serve to strengthen the levee and provide valuable wildlife habitat; as well as, decreasing the amount of open water within the project area.

IV. SOCIO-ECONOMIC CONCERNS

Following completion of design and prior to the commencement of construction, all permits for the project must be secured. Meetings were held with Plaquemines Parish representatives and a representative of the major landowner, Delacroix Corporation. We

received no negative comments to the project, but several good recommendations were taken under consideration. The Wetlands Conservation and Restoration Fund will provide the monies to pay for project design and construction. These funds will be distributed through the Louisiana Department of Natural Resources, Coastal Restoration Division to Plaquemines Parish which will actually administer the contracts for design and construction. Plaquemines Parish will be asked to provide any necessary rights-of-way or easements and to conduct annual maintenance.

The primary recommendation by a representative of the major landowner, Delacroix Corporation, was that the permanent earthen plugs on the east and west ends of Delacroix Canal be changed to removable plugs so that access could be made to the oil field areas. This report concurs that removable plugs should be used on Delacroix Canal.

V. COMMENTS AND RECOMMENDATIONS

It is felt that the objectives of this project can be met with the recommended plan. The operation of the Caernarvon Diversion Structure will allow freshwater and sediments to enter the project area. The removal of a small section of the outfall containment levee will allocate a portion of the freshwater into the northwest section of Big Mar. The sediment/wave dampening fences installed in Big Mar will trap sediments, reduce the wave reach, and protect the shorelines from further erosion. Spoil bank gradation should restore the historic hydrology to the marshes. Isolating the oil field canals and plugging all openings into the marsh area should reduce rapid tidal exchange and saltwater intrusion. Dredging

of new ditches on the north side of the project will distribute a portion of the Caernarvon discharge into the project's western marsh area.

APPENDIX A

Delacroix Corporation
Tuesday, May 5, 1992
BS-3a

Hugh Wilkinson, Jr.
Wilkinson & Wilkinson
Suite 4206
Place St. Charles
201 St. Charles Ave.
New Orleans, LA 70170

504-523-5067

Plaquemines Parish Government
LUKE A. PETROVICH, PARISH PRESIDENT

WALLACE J. BURAS, JR.
Engineering & Public Works

102 AVENUE G
BELLE CHASSE, LA 70037

(504) 392-6690
(504) 682-0081
(504) 564-2761
EXT. 1501

April 7, 1992
Coastal Wetlands Projects

WARREN MYERS - HNTB
JERRY BOLTON - HNTB

WALLY BURAS, JR.
PLAQ. PARISH GOV'T.

L. K. A. Petrovich
Plaquemines Parish President

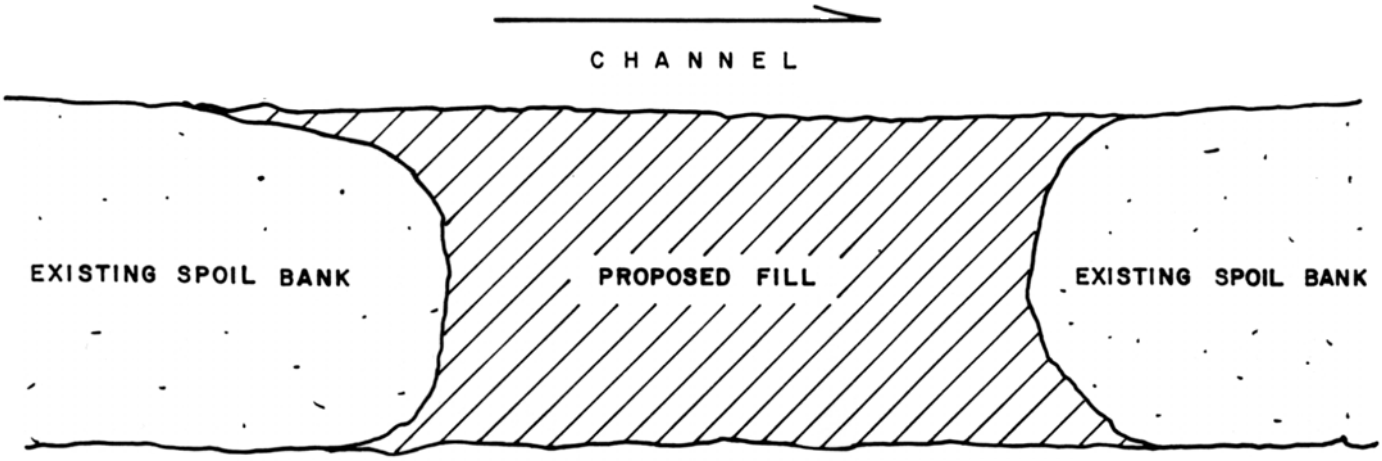
David A. Vigh
Brown Root, Inc.

John Williamson HNTB

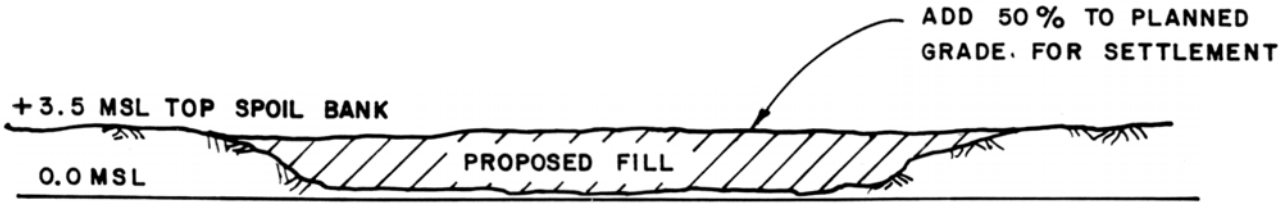
KEN FAUST
BROWN, ROO., NC.

APPENDIX B

FIGURE 1

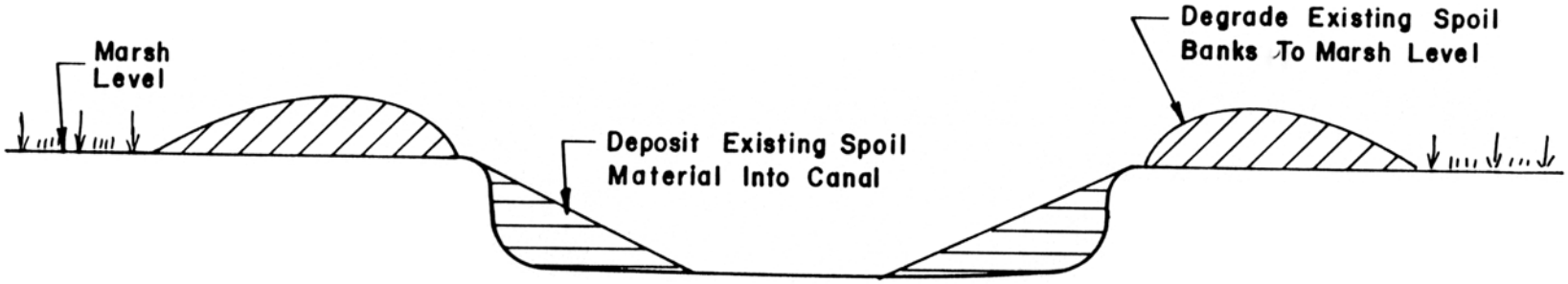


PLAN



ELEVATION

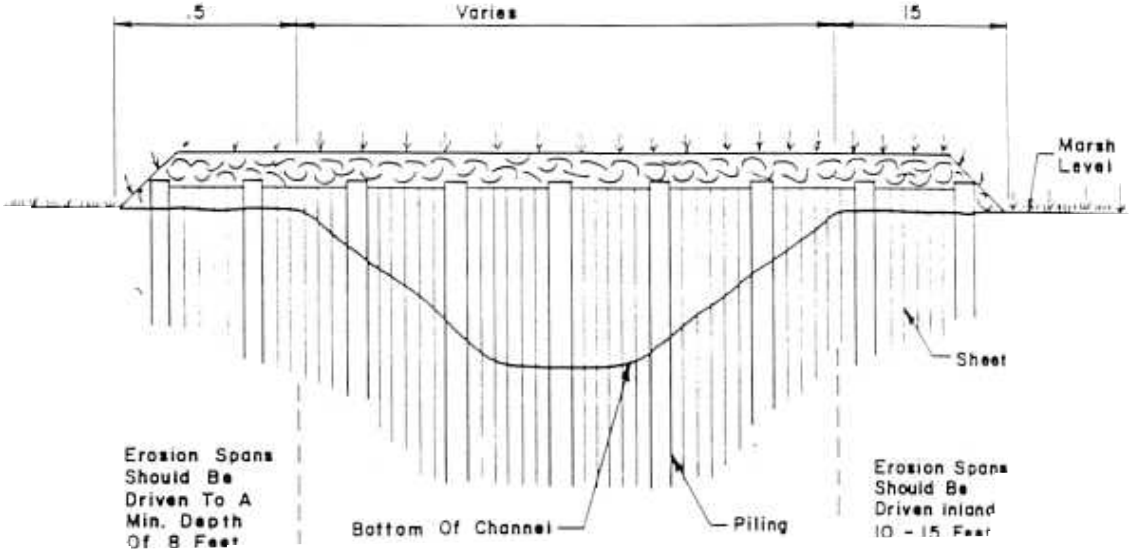
SPOIL BANK REPAIR



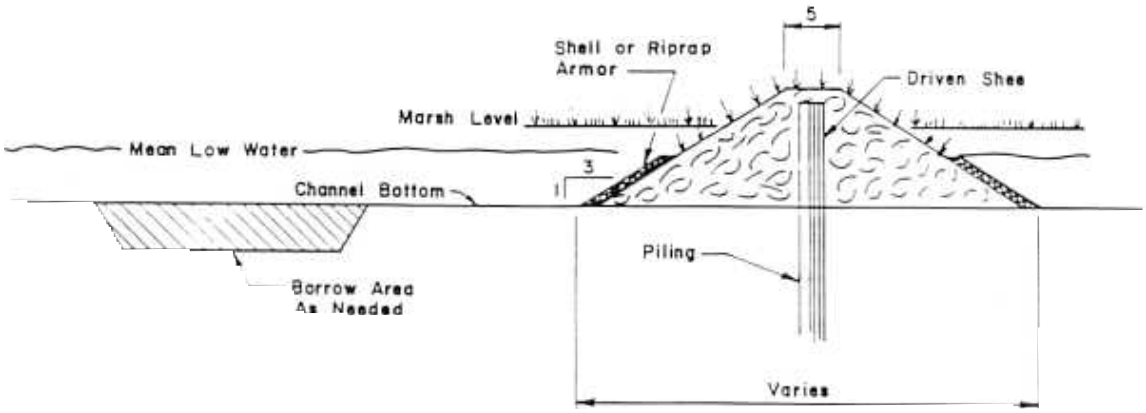
SPOIL BANK DEGRADATION

FIGURE 2

FIGURE 3

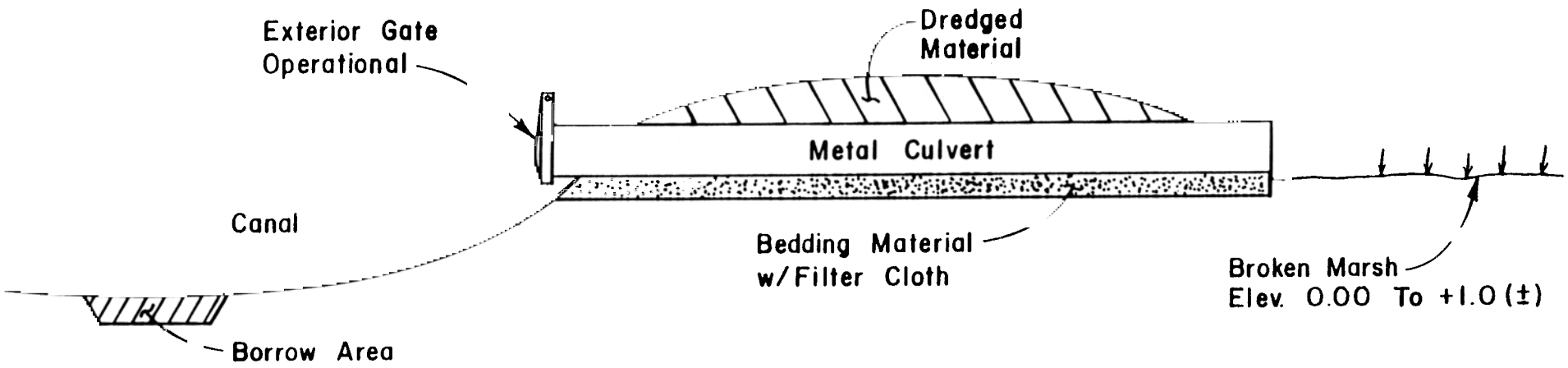


ELEVATION



SECTION

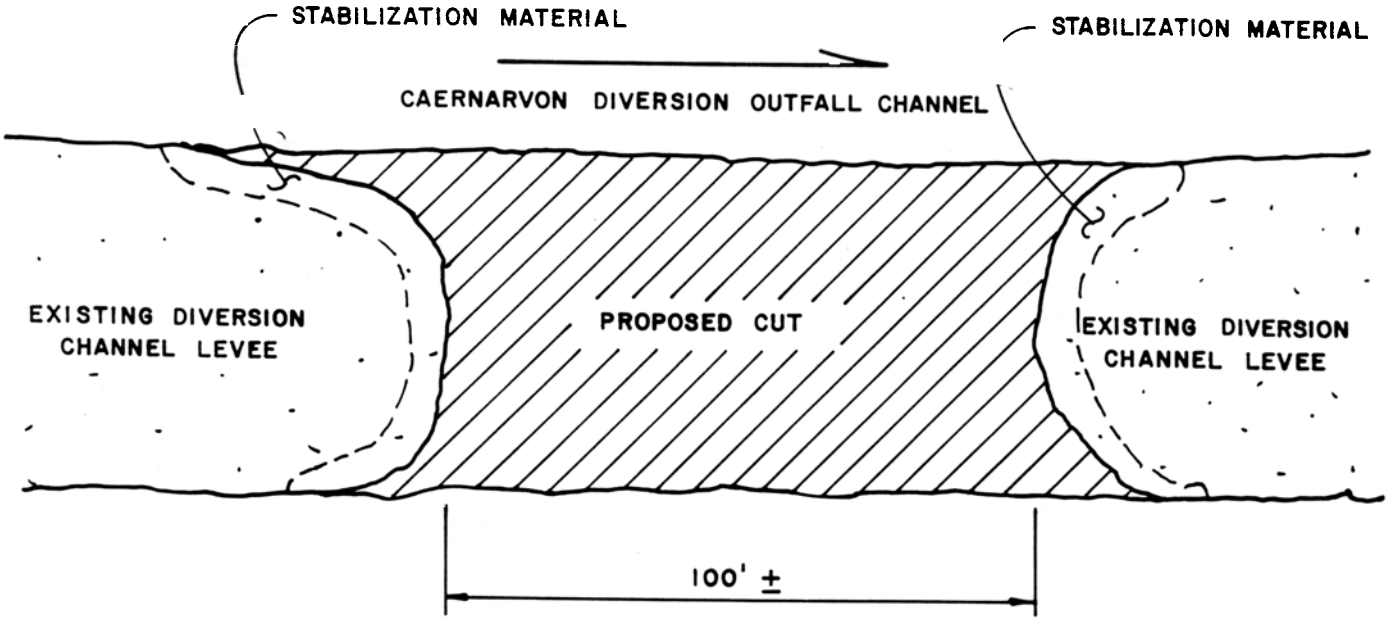
EARTHEN PLUG



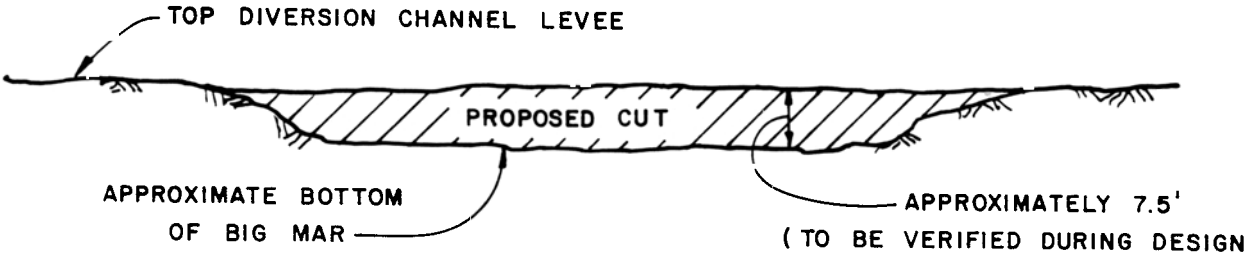
FLAPGATE STRUCTURE

FIGURE 4

FIGURE 5



PLAN



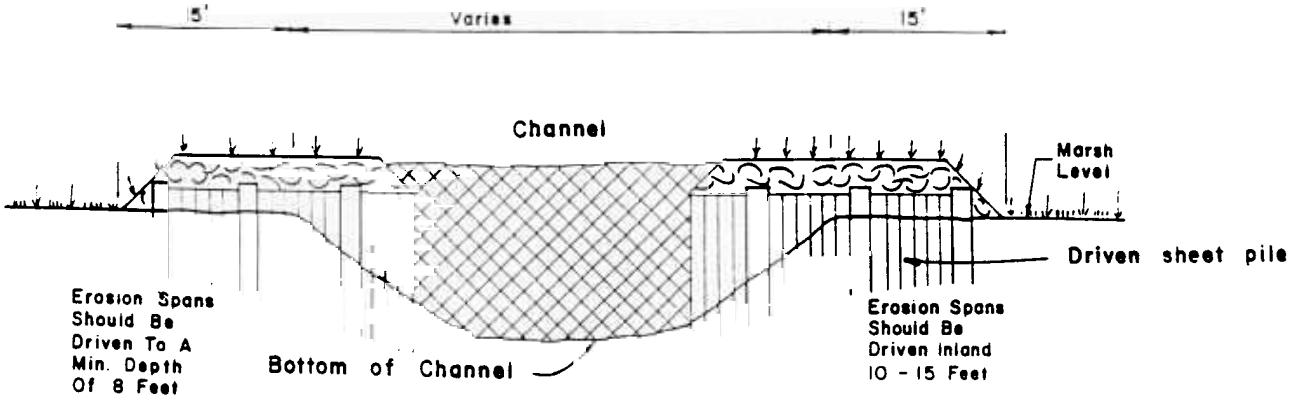
ELEVATION

PLANNING USE ONLY.
NOT TO BE USED FOR DESIGN

RETENTION LEVEE REMOVAL

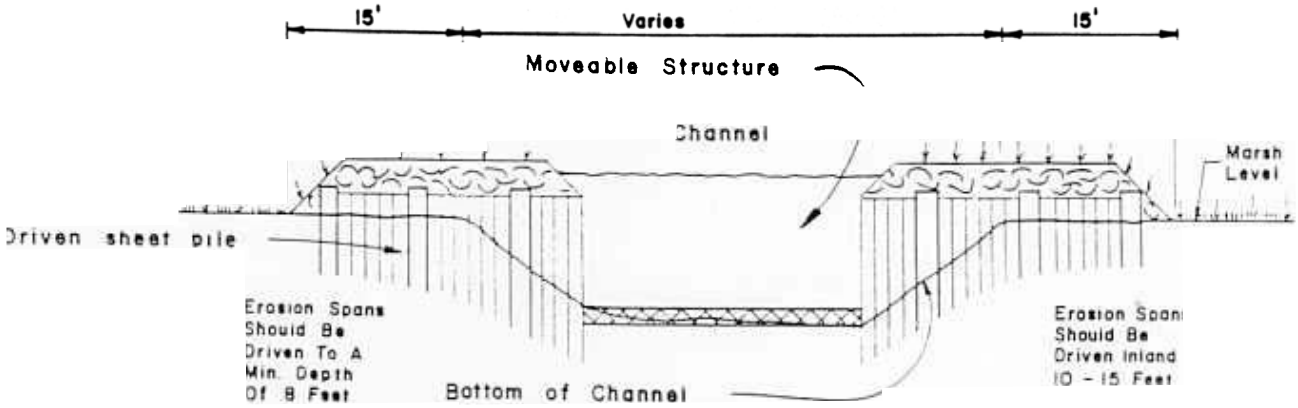
FIGURE 6

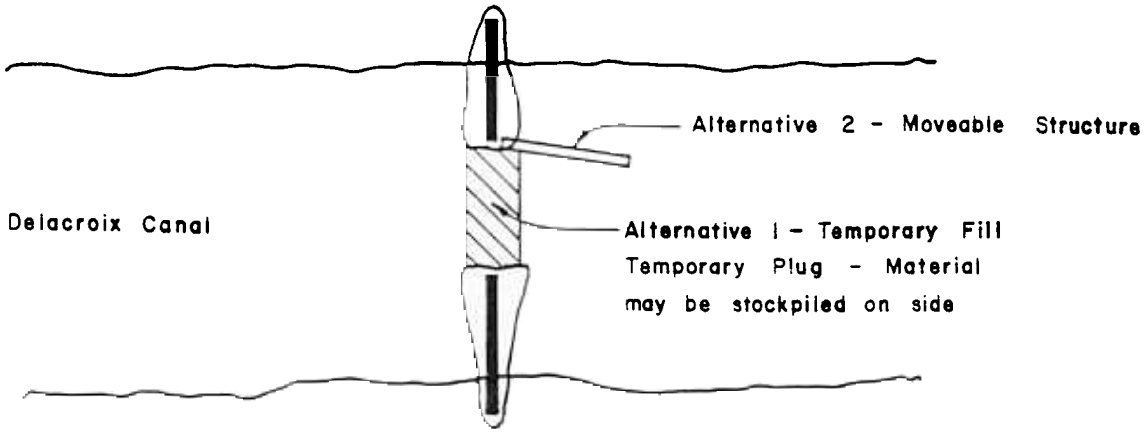
ALTERNATE NO. 1 Temporary plug which can be opened with material being stockpiled. Plug can be closed as needed.



ALTERNATIVE NO. 2 Moveable structure can be moved to allow for passage.

This alternative may be: 1) a gate/lock structure 2) a barge that can be sunk and floated: or 3) other moveable apparatus which creates a seal when closed and can be opened as needed.





PROPOSED PLUGS IN DELACROIX CANAL