U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
SILVER SPRING, MARYLAND

ENVIRONMENTAL ASSESSMENT OF LAKE CHAPEAU SEDIMENT INPUT AND HYDROLOGIC RESTORATION CWPPRA PROJECT PTE-23/26a

TERREBONNE PARISH, LOUISIANA

DECEMBER 1997

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ENVIRONMENTAL ASSESSMENT
OF
LAKE CHAPEAU SEDIMENT INPUT
AND HYDROLOGIC RESTORATION

Terrebonne Parish, Louisiana

1.0 INTRODUCTION

This Environmental Assessment (EA) was prepared to evaluate the impacts of a project to reestablish a hydrologic separation of the Locust and Alligator Bayou watersheds by restoring their wetland boundaries using dredged material. The sediment will be strategically placed by means of dredge-fill operations and stabilized by sediment fences or hay bales. The Project also will restore island hydrology on Point au Fer Island by means of weir construction, spoil bank gapping and maintenance dredging of a natural bayou.

This project is part of the Coastal Wetlands Planning, Protection, and Restoration Act (16U.S.C.SS77c, 3951-3956) of 1990. Five federal agencies and the State of Louisiana have combined in a Task Force to implement a "comprehensive approach to restore and prevent the loss of coastal wetlands in Louisiana" mandated by CWPPRA. The five federal agencies involved are: the U.S. Army Corps of Engineers (COE); the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS); the U.S. Department of Interior, Fish and Wildlife Service (FWS); the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS); and the U.S. Environmental Protection Agency (EPA). The Lake Chapeau Sediment Input and Hydrologic Restoration project was included in the Louisiana Coastal Wetlands Restoration Plan and the Third Priority Project List Report (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 1993a and b) and will soon be ready for construction.

1.1 Technical Background

The Louisiana Coastal Zone contains 7.9 million acres of which about 3 million acres are coastal marshes. These marshes are currently being converted to open water at a rate of 22,336 acres per year (Barras *et al.*, 1994). This rate is similar to that measured in previous years by Gagliano *et al.*, 1981 and DeLaune *et al.*, 1991. This conversion is the result of natural and anthropogenic factors that have altered the hydrology and physical integrity of these wetlands and still persist today.

The primary pattern of land loss in the Louisiana Coastal Zone results from the submergence of coastal marshes and subsequent conversion to open water (Turner, 1990). Generally, submergence occurs when the rate of vertical

accretion, including mineral sediment deposition and organic matter accumulation, does not equal or exceed the rate of geologic subsidence and eustatic sea level rise. Consequently, these marshes begin to break apart and create shallow ponds within the marsh interior. This ponding increases until the entire marsh area has converted to open water.

Coastal marshes are constructed and nourished by hydrological processes that influence site-specific chemical, physical, and biological processes which affect plant growth and mineral sediment deposition (Mendelssohn and Burdick, 1988). Because these processes are interrelated, the site specific factors influencing conversion of marsh to open water may vary widely and are difficult to assess.

Natural factors associated with coastal land loss include subsurface compaction and subsidence, eustatic sea level rise, physical substrate scouring and erosion, and periodic tropical cyclonic storms (Craig *et al.*, 1979; Boesch *et al.*, 1983). In addition, site-specific natural influences such as increased herbivore activity can promote land loss within coastal marshes (Nyman *et al.*, 1993).

A geologic process currently affecting sediment distribution within the Louisiana Coastal Zone is the channel shift occurring within the Mississippi River Delta complex. In 1900, the Atchafalaya River captured 13 percent of the Mississippi River's flow at the point of convergence with the Atchafalaya River near Simmesport, Louisiana, approximately 70 miles northeast of Lafayette, Louisiana (Morgan *et al.*, 1953). By 1952, the distributary had captured up to 30 percent of the Mississippi River's flow and increased sedimentation was observed within the lower Atchafalaya Basin (Adams and Baumann, 1980). In 1963, the construction of the Old River Control Structure by the COE near Simmesport, Louisiana was completed to maintain a 30/70 percent split of the channel flow between the Atchafalaya and Mississippi Rivers during normal river stages. During floods or high river stages, more of the flow can be diverted down the Atchafalaya River.

Anthropogenic activity accounted for 26 percent of total wetland loss within Louisiana between 1955 and 1978 (Turner and Cahoon, 1988). These direct losses were caused by dredging canals and creating spoil banks, draining land, and expanding agricultural and urban areas.

Turner and Cahoon (1988) attribute indirect causes of wetland loss to (1) temporal trends in estuarine salinity, (2) saltwater intrusion in waterways, (3) saltwater movement in marshes, (4) plant responses to salinity change and submergence, and (5) subsidence, water level rise and sediments. Indirect losses were exacerbated by levee construction for flood protection along the Mississippi River (Templet and Meyer-Arendt, 1988), extensive canal construction associated with oil and gas exploration (Turner *et al.*, 1982; Turner *et al.*, 1984), and navigation channel development and maintenance dredging. These large-scale

perturbations altered existing patterns of surface hydrology and sediment distribution over large areas and facilitated saltwater intrusion into coastal marshes.

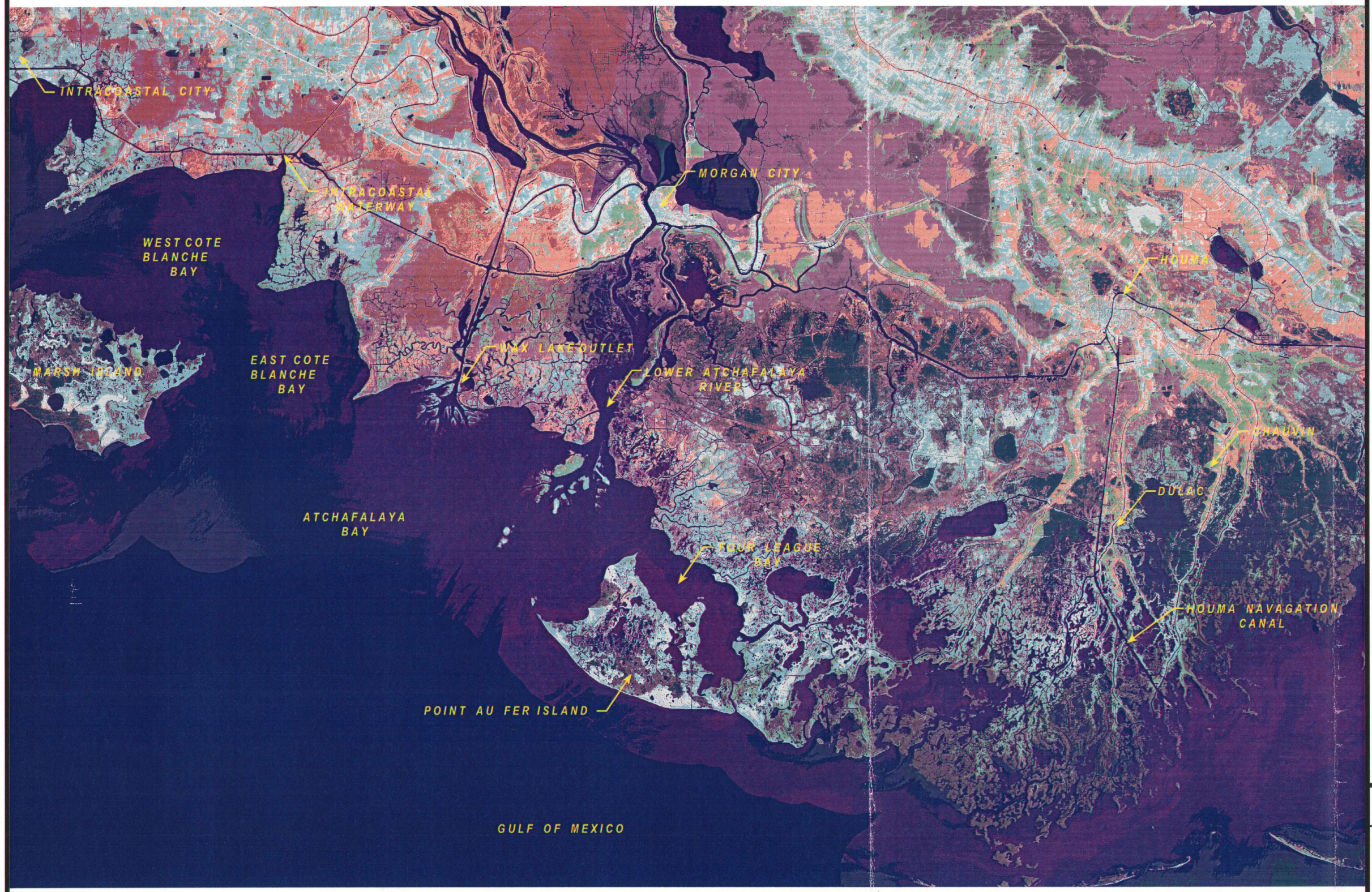
Point au Fer Island has lost about 15 percent of its marsh since the 1930s, however, the loss rate apparently has slowed since 1978. Currently, about 15 acres per year of marsh are being converted to open water, primarily in the area surrounding Lake Chapeau. This loss is due to the combination of subsidence, ponding impacts, erosion of marsh adjacent to water bodies, and scouring caused by strong tidal exchanges between southeastern Atchafalaya Bay and Four League Bay. Marsh loss due to scouring is a result of man-made oil and gas access canals intersecting natural waterways, bypassing the naturally-winding bayou systems, and establishing a more direct hydrologic connection between the bays. Furthermore, spoil banks associated with canal excavation tend to artificially impound water in some areas and generally disrupt natural hydrologic patterns.

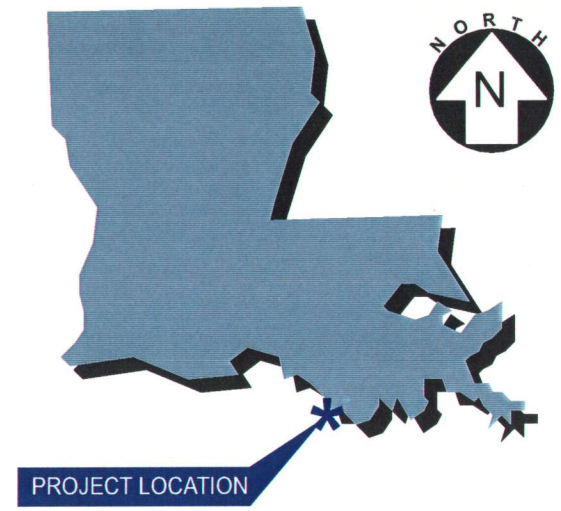
1.2 Project Location

Point au Fer Island, an island made of coastal marshes and deteriorating beach front, is approximately 52,000 acres in size (Department of the Interior, 1990) located off the mainland of southwest Terrebonne Parish, 13 miles south and east of the mouth of the Atchafalaya River. The project area encompasses approximately 13,500 acres on Point au Fer Island (Figure 1) in the vicinity of Lake Chapeau.

1.3 Project Funding

Seventy-five percent of the funding for this project is provided through CWPPRA with 25 percent cost sharing by the State of Louisiana Department of Natural Resources (DNR). The project is administered by cooperative agreement between the DNR and NMFS.





NOTE:
BASE MAP DIGITAL IMAGE TAKEN FROM 1993 LANDSAT TM-30 SCENE.

10.5 MILES 0 10.5 MILES

SCALE: 1" =10.5 MILES

GOTECH, INC.

CONSULTING ENGINEERS

LAKE CHAPEAU SEDIMENT INPUT AND HYDROLOGIC RESTORATION

LOCATION MAP

TERREBONNE PARISH

C-K ASSOCIATES • INC
BATON ROUGE, LOUISIANA

Drawn:	TPL/FH/PC\GIS
Checked:	PML
Approved:	DJL
Date:	11/21/96D
Dwg. No.:	B34-104-01

FIGURE 1

IMAGE: PTAUFREV3

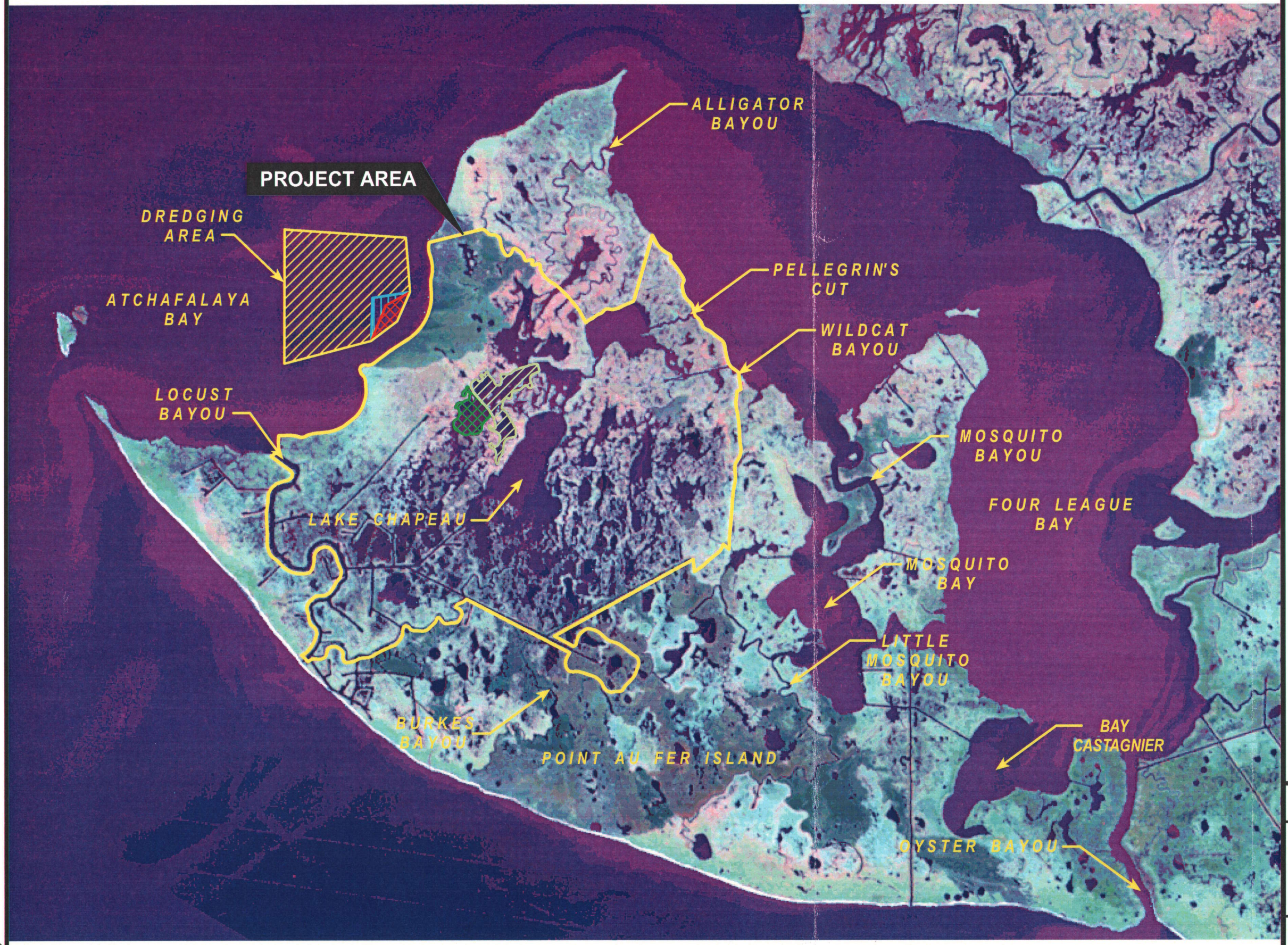
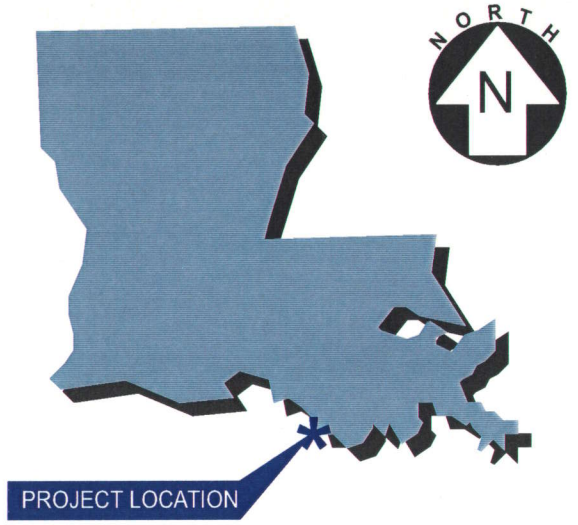


IMAGE: SM-IMAGE4



LEGEND

- 50 ACRE BASELINE DREDGING AREA
- 78- ACRE ALTERNATE DREDGING AREA
- 1,000 ACRE TOTAL PERMITTED DREDGING AREA
- BASELINE FILL AREA
- ALTERNATE FILL AREA

NOTE:
BASE MAP DIGITAL IMAGE TAKEN ROM 1993 LANDSAT TM-30 SCENE.

7 MILES 0 7 MILES

SCALE: 1" =7 MILES

GOTECH, INC.
CONSULTING ENGINEERS

LAKE CHAPEAU SEDIMENT INPUT AND HYDROLOGIC RESTORATION

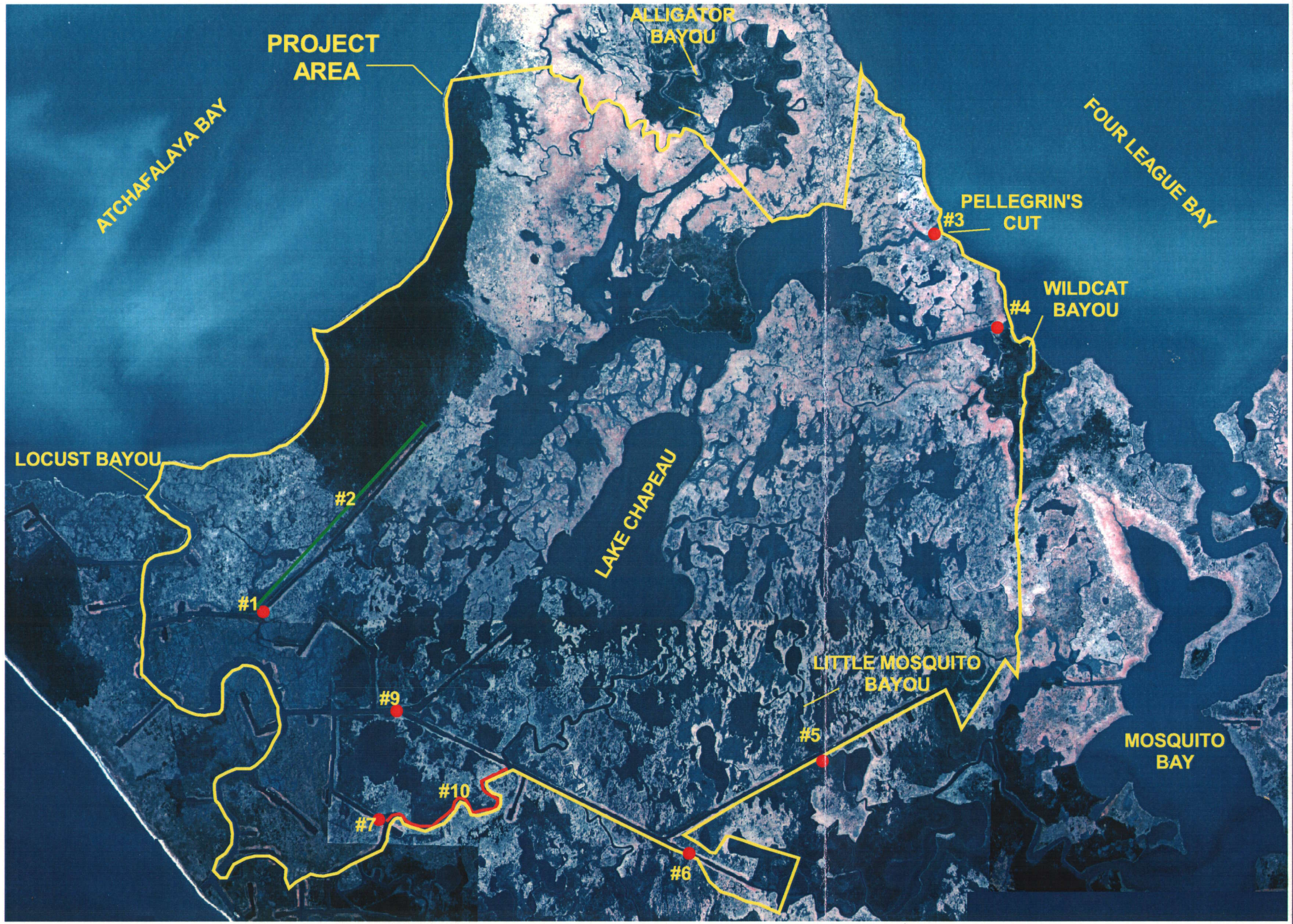
DREDGE AND CONTAINMENT AREA MAP

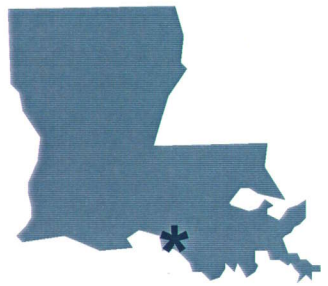
TERREBONNE PARISH

CK ASSOCIATES • INC
BATON ROUGE, LOUISIANA

Drawn:	TPL/FH/PC/GIS
Checked:	PML
Approved:	DJL
Date:	08/11/97C
Dwg. No.:	B34-104-02

FIGURE 2





NORTH

N

LEGEND

- WEIR SITE LOCATION
- MAINTENANCE DREDGING
- SPOIL BANK GAPPING

3000 0 3000 6000

Feet

NOTE:

1995 Aerial Photography obtained from U.S.G.S

GOTECH, INC.
CONSULTING ENGINEERS

LAKE CHAPEAU SEDIMENT INPUT AND HYDROLOGIC RESTORATION

PLUG, SPOIL BANK GAPPING, AND MAINTENANCE DREDGING LOCATION MAP

TERREBONNE PARISH

C-K ASSOCIATES, INC
BATON ROUGE, LOUISIANA

Drawn:	PML/GIS
Checked:	DJL
Approved:	MHS
Date:	12/11/97B
Drawing No.:	B34-104-03

FIGURE 3

2.0 PURPOSE AND NEED FOR ACTION

2.1 Purpose

The major goal of CWPPRA is to "restore and prevent the loss of coastal wetlands in Louisiana." The purpose of the Lake Chapeau Sediment Input and Hydrologic Restoration project is to partially reestablish a hydrologic separation of the two watersheds in the project area by utilizing sediment input by means of dredging and fill operations (Figure 2) and to restore island hydrology by means of weir construction, spoil bank gapping, and maintenance dredging a natural bayou (Figure 3). By reestablishing hydrologic control points (e.g., weirs), tidal water level fluctuations and water flow velocities would be reduced, thereby allowing suspended sediments to settle out and rebuild wetland areas. The weirs also would restore flow through natural waterways and promote growth and sustenance of wetland communities.

2.2 Need for Action

The need to protect and restore Point au Fer Island emanates from its significant natural resource value. The magnitude of these resources corresponds to the island's size and strategic location within the Louisiana Coastal Zone. Because of the ample sediment load generated by the Atchafalaya River, attention has focused on oil and gas activity as the primary source of land loss on Point au Fer Island. Numerous oil and gas access and pipeline canals have been constructed primarily in the southwestern portion of the island, although several long canals have been constructed in the east and northeast sections. These canals provide maritime access to numerous well sites and have caused extensive hydrologic modifications. These modifications include shoreline erosion, the increased flushing of inland marshes, unintentional impoundment and the advancement of saline water into existing intermediate-brackish marshes. These influences may have adversely impacted physical marsh integrity and resulted in the conversion of inland marsh to open water.

The NMFS conducted an investigation in February 1993 to develop a preliminary design for a series of canal weirs on Point au Fer Island, Terrebonne Parish, Louisiana. The DNR subsequently completed preliminary design engineering in September 1996 using barriers (weirs) with an elevation below marsh level.

2.2.1 Protection from Storm Surge and Flooding

The protection from hurricanes and storms provided by beach front and barrier islands off the Louisiana coast is well documented (U.S. Army Corps of Engineers, 1984). Point au Fer Island is fronted on the south by the Gulf of Mexico, on the north and west by the Atchafalaya Bay; and

on the north and east by Four League Bay. This large remnant beach island provides protection to inland areas on the opposite bay shores by buffering the effects of storm surges and subsequent flooding associated with hurricanes and tropical storms.

2.2.2 Protection of Highly Productive Intermediate-Brackish Marsh

The loss of intermediate-brackish marsh in the Louisiana Coastal Zone from 1956 to the present represents a significant natural resource loss. Intertidal marshes are among the most productive ecosystems on earth and their rapid disappearance may significantly impact the economy of south Louisiana.

2.2.3 Long-term Resource Benefits

Point au Fer Island represents a significant natural resource due to its size and relative stability. This 52,000-acre island is significantly larger than the nearby barrier islands in Terrebonne Parish and has a comparatively lower rate of land loss. In addition, recent data from various points on the island indicate that the current rate of vertical accretion equals the rate of subsidence. Because of this stability, the use of public funds to implement restoration projects that prevent the rapid degradation of Point au Fer Island represents cost-effective programs that are more likely to provide long-term benefits to the State of Louisiana.

2.2.4 Valuable Wildlife Habitat

Historically, the island was an established fur and hide producing area for muskrat, raccoon, otter, mink, and alligator. Marsh burning is practiced as a method to promote the growth of preferred vegetation for furbearers. Thus, Point au Fer Island has long provided the State of Louisiana with valuable, high quality wildlife habitat.

2.2.5 Marine Fisheries Habitat

The Atchafalaya Bay and the inland marshes of Point au Fer Island provide significant estuarine habitat for marine-transient and resident fishery species. This estuary, near the Gulf of Mexico spawning areas, provides nursery and foraging habitats that support the production of commercial and recreational fish and shellfish. Point au Fer Island, with its extensive marshes, is a significant part of the Louisiana estuarine system.

2.3 Authorization

The NMFS is the federal sponsor for implementation of the Lake Chapeau Sediment Input and Hydrologic Restoration project which was included on the Third Priority Project List (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 1993b). This responsibility includes conducting the evaluation and other activities involved for final decision-making in compliance with the National Environmental Policy Act (NEPA) of 1969. To meet NEPA compliance requirements, an EA must be conducted for each wetland project site that is modified or restored.

The Lake Chapeau Sediment Input and Hydrologic Restoration project, identified as PTE-23/26a in the CWPPRA Restoration Plan, is located in Terrebonne Parish, Louisiana. It is classified as a critical, short-term project (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 1993a).

3.0 ALTERNATIVES INCLUDING PROPOSED ACTION

The project area and scope were identified by NMFS as part of Task Force submittals on the Third Annual Priority Project List. This project is one of several selected by the Task Force for the Terrebonne Basin. It complements the recently completed Point au Fer Island Hydrologic Restoration project. Other proposed activities (e.g., plugs, spray dredging) for Point au Fer Island would augment the benefits of this project (e.g., sediment input and weirs). Lake Chapeau and the canals involved in this project are the major areas of open water within Point au Fer Island. Because of the ample sediment load from the Atchafalaya River and the presence of manmade channels on Point au Fer Island, hydrologic restoration and sediment input were selected restoration techniques.

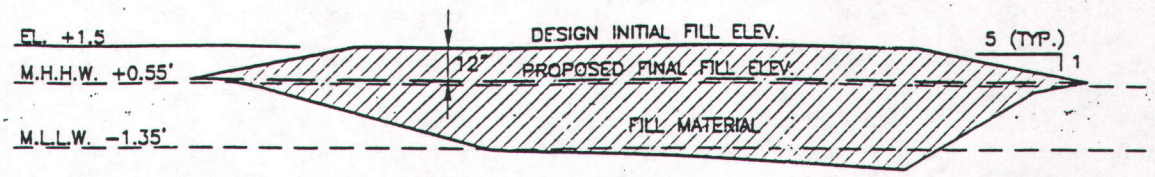
Alternatives weighed, but not considered in detail, were marsh management and sediment diversion. Marsh management (water level manipulation) was not considered as an alternative because:
1) there are significant adverse impacts to marine fishery production;
2) studies (Turner and Cahoon, 1988) indicate that brackish marsh would become water logged;
3) sediment input would be interrupted; and,
4) operation of variable-crest structures would be prohibitively expensive because of the distance from port to structure sites. A sediment diversion probably is not feasible because of the distance from a location where sediment-laden water could be diverted onto the marshes of Point au Fer Island and the anticipated costs.

The project site and scope were reviewed and approved by the Louisiana Coastal Wetlands Conservation and Restoration Task Force (1993a) and are included in the Third Priority Project List. A DNR-contracted Engineering Design Report and Engineering Summary for the Lake Chapeau Sediment Input and Hydrologic Restoration project was prepared by Burk-Kleinpeter, Inc. in October 1996 (Contract No. 25085-95-23).

The range of alternatives for meeting the hydrologic restoration objective are discussed below. Consequences of the alternatives and proposed action are discussed in Section 5.0.

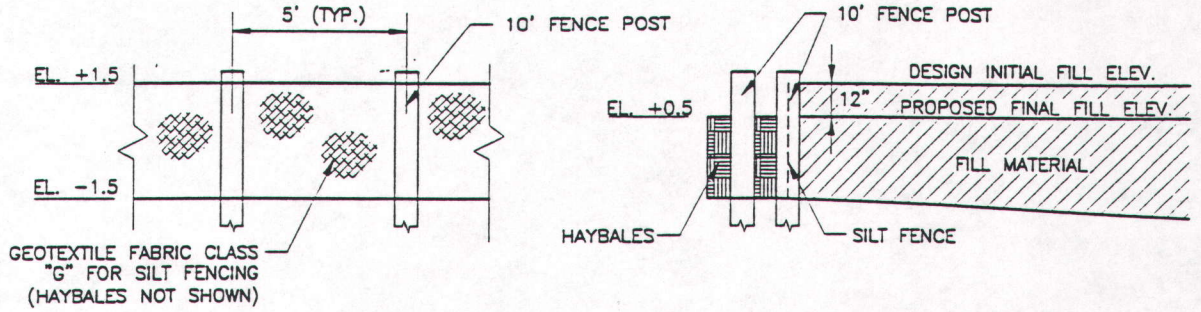
3.1 No-Action Alternative

The no-action alternative would fail to protect valuable coastal wetlands that provide and protect other resources in Louisiana. Specifically, failure to provide sediment input and hydrologic restoration would not reduce the adverse impacts of tidal fluctuations and water flow velocities. Therefore, tidal flushing of its inland marshes would intensify deterioration of this remnant beach island. Implementation of the no-action alternative is contrary to the recommendations of the Louisiana Coastal Wetlands Restoration Plan which were approved by the Task Force. Also, no action would be contrary to the recommendations in other



TYPICAL CONTAINMENT AREA SECTION
NOT TO SCALE

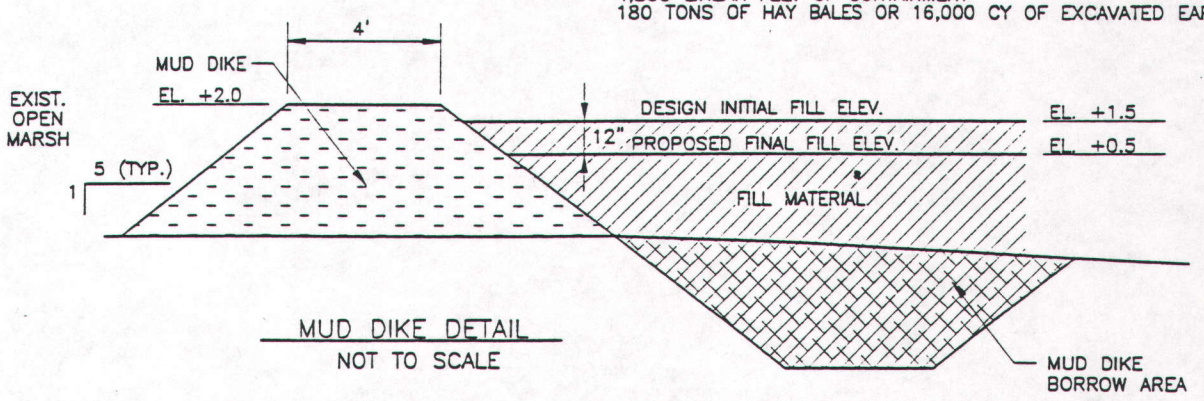
NOTE: FILL TO BE CONTAINED BY NATURAL EMERGENT MARSH EXCEPT WHERE SPECIFIED ON SHEET 4. CONSTRUCTED CONTAINMENT SYSTEMS MAY BE EITHER SILT FENCE WITH HAYBALES OR MUD DIKE EXCAVATED FROM WITHIN CONTAINMENT AREA.



SILT FENCE DETAILS
NOT TO SCALE

CONTAINMENT NOTES:

1. SILT FENCING AND HAYBALES SHALL BE AS PER SECTION 204 OF THE "LOUISIANA STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES," 1992 ED.
2. EARTH FOR CONTAINMENT DIKE SHALL BE EXCAVATED FROM WITHIN OPEN MARSH AREA.
3. BASE BID QUANTITIES :
   4,960 LINEAR FEET OF CONTAINMENT
   200 TONS OF HAY BALES OR 17,640 CY OF EXCAVATED EARTH
4. ALTERNATE BID QUANTITIES :
   4,500 LINEAR FEET OF CONTAINMENT
   180 TONS OF HAY BALES OR 16,000 CY OF EXCAVATED EARTH



MUD DIKE DETAIL
NOT TO SCALE

SHEET 4A OF 8
TYPICAL CONTAINMENT SECTIONS

LAKE CHAPEAU SEDIMENT INPUT
AND HYDROLOGIC RESTORATION

PARISHES OF ST. MARY AND TERREBONNE
STATE OF LOUISIANA

APPLICATION BY NATIONAL MARINE FISHERIES SERVICE
BATON ROUGE, LOUISIANA – JUNE 1997

PREPARED BY
BURK-KLEINPETER, INC.
ENGINEERS, ARCHITECTS, PLANNERS, ENVIRONMENTAL SCIENTISTS
4176 CANAL STREET, NEW ORLEANS, LOUISIANA 70119-5994
(504) 486-5901 FAX (504) 488-1714

FIGURE 4

long-term plans (Edwards *et al.*, 1995; Gagliano, 1994; van Heerden, 1994) for protecting or restoring Louisiana's coastal wetlands.

Due to the public need to protect and restore Point au Fer Island marshes as evidenced by the public funding through the CWPPRA, the no-action alternative was not the preferred alternative.

3.2 Alternatives Considered

There are four basic technique involved in coastal engineering to achieve protection, restoration or creation of wetlands. Each of the four techniques - vegetative, structural, sedimentary and hydrologic - were considered as remedies for the various problems previously specified for the Lake Chapeau Sediment Input and Hydrologic Restoration project. A previous plan of marsh management involving impoundments in the north western part of Point au Fer Island had been withdrawn. Alternatives considered for this project involved different types of structures at various locations and the necessity of maintenance dredging to restore more natural hydrology to Locust and Alligator Bayous, and the height, placement, and source of dredged material to create marsh and nourish wetlands to separate watersheds.

3.3 Preferred Alternative

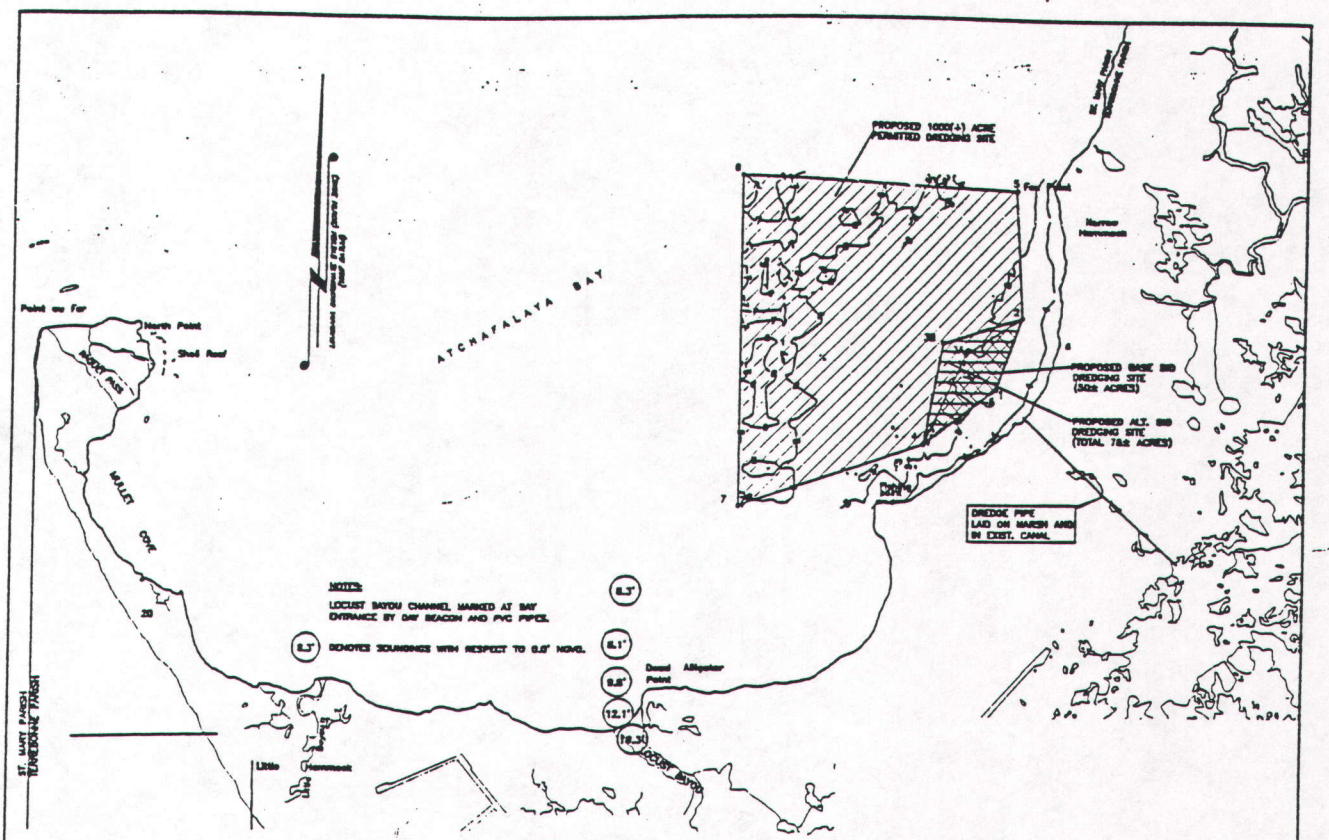
This section presents the proposed action for this project. There are two basic components of this project:

1) Sediment input by means of dredging and fill operations (Figure 2); and,
2) Hydrologic restoration by means of weir construction, spoil bank gapping, and maintenance dredging a natural bayou (Figure 3).

The construction sequence should be as follows:

1) Deepening the segment of Locust Bayou from Site 7 east to the intersection of the access canal to allow free flow of water through the bayou and restore the bayou to a depth of -6 feet.
2) Construction of weirs listed in Component 2; and,
3) Hydraulic dredging and filling in Component 1.

Most of the following discussion comes from the preliminary design engineering report prepared by Burk-Kleinpeter, Inc. (1996). The first component involves the placement of dredged material to reestablish the western shoreline of Lake Chapeau, restore marshes west of Lake Chapeau, and reestablish a land bridge or hydrologic separation of the upper part of Locust Bayou and Alligator Bayou watersheds. This project would create a minimum of 168 acres of marsh. Surrounding broken intermediate marsh would be enhanced over the duration of



DREDGE AREA LOCATIONS

POINT No.	X-COORD.	Y-COORD.	DIST. FROM POINT AU FER SHORELINE	DIST. FROM PVC MARKER AT CHANNEL
1	2,016,801.2680	240,670.8585	900'	2700'
2	2,017,429.1118	243,581.3299	900'	3800'
3A	2,018,020.9842	241,880.0038	2100'	3800'
3B	2,015,447.9841	241,962.9105	2700'	4400'
4	2,014,949.2458	238,561.3611	900'	3800'

PERMITTED DREDGE SITE

POINT No.	X-COORD.	Y-COORD.	DIST. FROM POINT AU FER SHORELINE	DIST. FROM PVC MARKER AT CHANNEL
1	2,016,801.2680	240,670.8585	900'	2700'
5	2,017,244.5694	243,611.8808	900'	6800'
6	2,010,467.0182	248,828.0851	7000'	10,800'
7	2,010,467.0182	238,036.8104	3300'	8300'

NOTES:

1. THE PROJECT BASELINE DREDGE AREA SHOWN CORRESPONDS TO A BAY BOTTOM SURFACE AREA OF OVER 50 ACRES.
2. ASSUMING AN AVERAGE DREDGING DEPTH OF 10 FEET, THE BASELINE DREDGE AREA WILL PRODUCE APPROXIMATELY 812,500 CUBIC YARDS OF MATERIAL.
3. ASSUMING AN AVERAGE FILL DEPTH OF 3 FEET IN THE CONTAINMENT AREA, AND TAKING INTO ACCOUNT SETTLEMENT AND SHRINKAGE OF THE FILL, THE BASELINE DREDGE AREA WILL PRODUCE APPROXIMATELY 168 ACRES OF LAND FILL (SEE SHT. 4).
4. THE ALTERNATE DREDGE AREA SHOWN CORRESPONDS TO A SURFACE AREA OF APPROXIMATELY 78 ACRES.
5. ASSUMING AN AVERAGE DREDGING DEPTH OF 10 FEET, THE ALTERNATE DREDGE AREA WILL PRODUCE APPROXIMATELY 1,258,400 CUBIC YARDS OF MATERIAL.
6. ASSUMING AN AVERAGE FILL DEPTH OF 3 FEET IN THE CONTAINMENT AREA, AND TAKING INTO ACCOUNT SETTLEMENT AND SHRINKAGE OF THE FILL, THE ALTERNATE DREDGE AREA WILL PRODUCE APPROXIMATELY 280 ACRES OF LAND FILL (SEE SHT. 4).
7. AVERAGE DEPTH IN BASELINE AND ALTERNATE DREDGE AREAS IS 8 FEET. ADDITIONAL PERMITTED DREDGE AREA IS PROVIDED IF GREATER DRAFT IS REQUIRED FOR DREDGE VESSEL.
8. WATER DEPTHS IN ATCHAFALAYA BAY ARE ADEQUATE FOR ACCESS TO PERMITTED DREDGING SITE.
9. DREDGING CONTRACTOR MUST MAINTAIN A MINIMUM DISTANCE OF 900' OFF THE WESTERN POINT AU FER SHORELINE FOR ALL DREDGING OPERATIONS.
10. IN NO CASE SHALL THE CONTRACTOR DREDGE BELOW 12 FEET BELOW THE EXISTING BAY BOTTOM.
11. DREDGING SEQUENCE SHALL BEGIN AT THE EXTREME SOUTHEASTERN POINT (POINT 1) AND PROCEED IN A NORTHWESTERLY DIRECTION.

SCALE IN FEET
1000' 0 1000' 2000' 3000'

LEGEND:
- 50(+)– ACRE BASELINE BID DREDGING AREA
- 78– ACRE ALTERNATE BID DREDGING AREA
- 1,000(+)– ACRE TOTAL PERMITTED DREDGING AREA

SHEET 3 OF 8
DREDGE AREA SITE PLAN

LAKE CHAPEAU SEDIMENT INPUT AND HYDROLOGIC RESTORATION

PARISHES OF ST. MARY AND TERREBONNE
STATE OF LOUISIANA

APPLICATION BY NATIONAL MARINE FISHERIES SERVICE
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(504) 486-5901 FAX (504) 486-1714

FIGURE 5

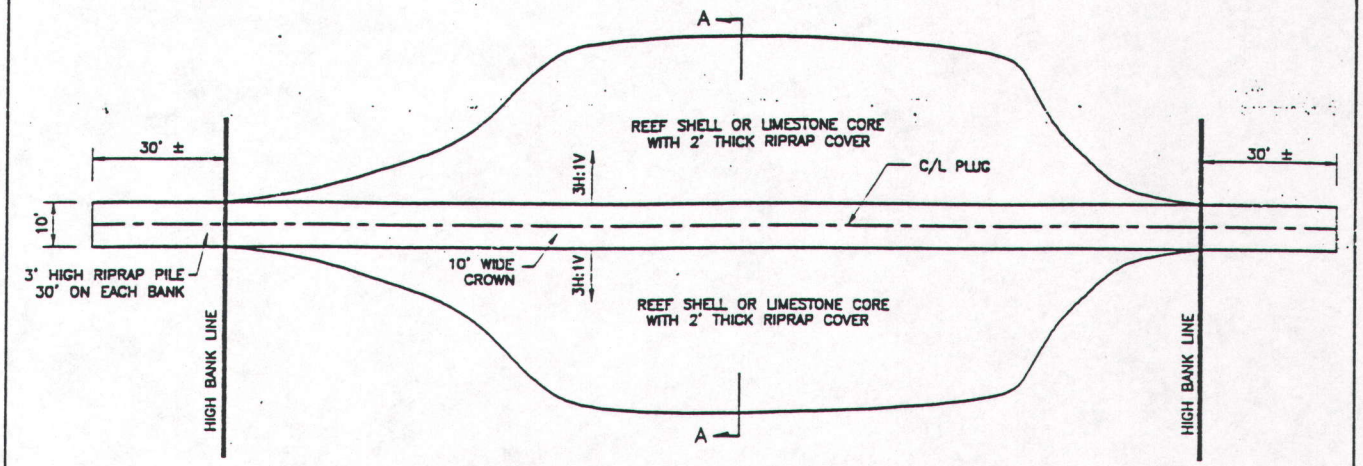
the project due to direct sediment input and leakage from the fill area, and surrounding fringe would be enhanced over the duration of the project due to increased rates of natural sedimentation and accretion. In addition, this project would protect interior marsh from wind and wave-induced erosion. If sufficient funds are available, a supplemental plan would involve creation of 92 acres of marsh. The additional marsh created would increase the overall project benefits to 260 acres - the size originally proposed.

Containment of sediments (Figure 4) would be required in the fill area due to the fluidity of the hydraulically-pumped material. Sediment or silt fences would be placed around the inland perimeter of the containment area in open water areas. Hay bales also may be required to provide additional lateral stability behind the silt fences in open water areas. Subsequent to final filling and consolidation of the fill material, it may be necessary to seed with Bermuda and rye grass and fertilize the fill area to prevent loss of material into surrounding water bodies. Seeding is not included in the plans because similar projects have vegetated naturally soon after filling. The necessity for seeding can only be determined some time after construction is complete.

Sediment input would be accomplished by hydraulically dredging material from Atchafalaya Bay, pumping and depositing that material into the broken marsh and open water areas adjacent to Lake Chapeau. A minimum of 812,500 cubic yards of hydraulically-dredged material would be required to create 168 acres of land in the marsh area west of Lake Chapeau. The supplemental plan, adding 92 acres to the project, would require a minimum of 1,258,400 cubic yards of material to create a total of 260 acres of marsh.

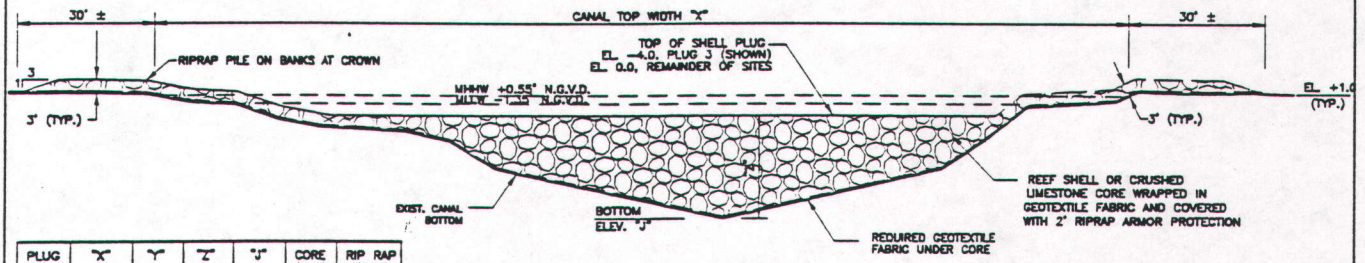
The dredged material would be spread to an average thickness of approximately 3 feet (Figure 4) using a marsh buggy to move the discharge pipe. The average open water elevation in the proposed containment area is approximately -1.35 feet National Geodetic Vertical Datum (NGVD) and the average marsh elevation in the area is +0.5 feet NGVD. The desired final fill elevation is also +0.55 feet NGVD. This would be achieved by spreading the material to a fill height of approximately 3 feet in the containment area. An average cut-to-fill ratio of 1.5:1 allows for consolidation, settlement, and shrinkage of the material.

Dredging operations would occur off the northwestern portion of the Point au Fer Island (Figure 2). A 1,000-acre dredge site was selected at this location because it would provide the shortest distance of pumping to the proposed containment site. A distance of 300 yards from the western shoreline of Point au Fer Island would be maintained in order to prevent creation of a deep hole near the shoreline which may change the hydrology and wave characteristics in the area.



SHELL PLUG PLAN VIEW

NOT TO SCALE



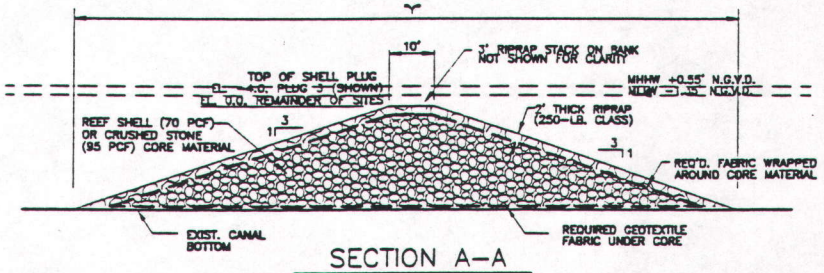
SHELL PLUG ELEVATION

NOT TO SCALE

PLUG SITE	"X"	"Y"	"Z"	"J"	CORE (C.Y.)	RIP RAP (C.Y.)
1	147.5'	56'	7.5'	-7.5	300	400
3	229.1'	150'	23.3'	-27.3	5,200	1,200
4	173.8'	113'	17.1'	-17.1	3,800	1,100
5	70.0'	32'	3.7'	-3.7	20	200
6	145.1'	37'	4.5'	-4.5	100	400
7	157.1'	67'	9.5'	-9.5	600	500
9	240.4'	74'	10.7'	-10.7	1,800	1,000

STONE SIZE (LBS.)	% OF STONE SMALLER THAN
1250	100
500	45–100
250	15–50
80	0–15

RIPRAP GRADATION
250–LB. CLASS



SECTION A–A

NOT TO SCALE

SHEET 6 OF 8

TYPICAL SECTION – PLUG STRUCTURE

LAKE CHAPEAU SEDIMENT INPUT
AND HYDROLOGIC RESTORATION

PARISHES OF ST. MARY AND TERREBONNE
STATE OF LOUISIANA

APPLICATION BY NATIONAL MARINE FISHERIES SERVICE
BATON ROUGE, LOUISIANA – JUNE 1997

PREPARED BY

BURK-KLEINPETER, INC.

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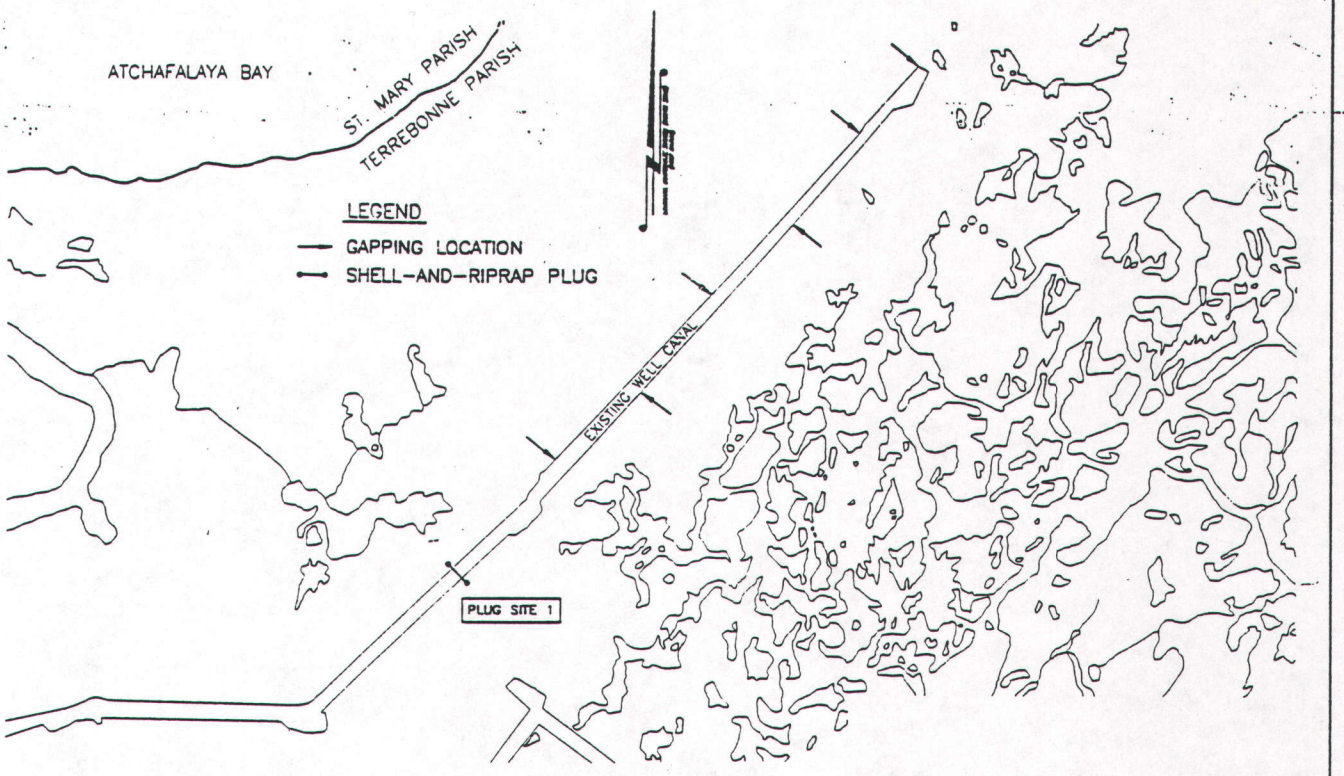
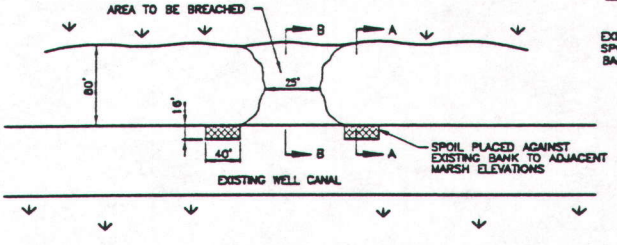
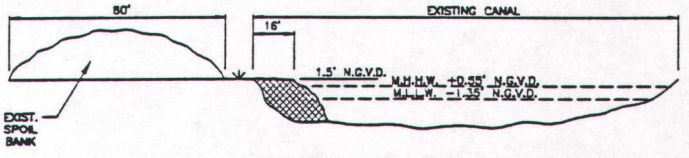
FIGURE 6



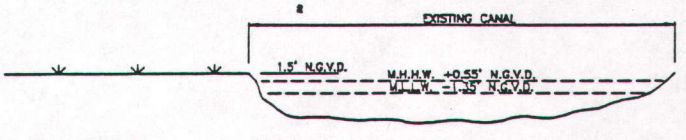
GAPPING LOCATION PLAN
NOT TO SCALE



GAPPING DETAIL
NOT TO SCALE



TYPICAL CROSS SECTION – A
NOT TO SCALE



TYPICAL CROSS SECTION – B
NOT TO SCALE

NOTE :
TOTAL OF 1,350 CUBIC YARDS (CY) OF SPOIL BANK TO BE EXCAVATED (AVERAGE OF 225 CY PER GAP SECTION).

SHEET 7 OF 8

SPOIL BANK GAPPING – SITE 2

LAKE CHAPEAU SEDIMENT INPUT AND HYDROLOGIC RESTORATION

PARISHES OF ST. MARY AND TERREBONNE
STATE OF LOUISIANA

APPLICATION BY NATIONAL MARINE FISHERIES SERVICE
BATON ROUGE, LOUISIANA – JUNE 1997

PREPARED BY
BURK-KLEINPETER, INC.
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FIGURE 7

The dredge area was selected to yield the desired fill quantities if dredged to a depth of 10 feet (Figure 5). This is considered the minimum depth of the dredging to obtain the most cost-efficient operation. Turbidity due to dredging operations in the Atchafalaya Bay is not a concern due to the naturally high sediment load of these waters. The displacement of some shallow water organisms, the covering of some other individuals and any increased turbidity are either considered minor or short-term consequences of any created material project and are generally conceived to be offset by the increases in the emergent material that forms the resource base of viable marshes.

The second component of this project would involve the installation of seven weirs in manmade canals and a natural bayou around the perimeter of the project area (Figure 3). In addition, excavating gaps in an existing spoil bank and maintenance dredging in a natural bayou would be performed. The weirs and spoil bank gapping would help reestablish hydrologic control and restore the natural circulation and drainage patterns within Point au Fer Island.

The main effect of the weirs would be to reduce extreme water level fluctuations and tidal exchanges as well as rapid water movement through the island interior. The benefits derived from water level stabilization and flow reduction would include reduction of interior marsh erosion, enhanced habitat for wildlife, and encouraged growth of vegetation. By restoring natural sediment pathways, the project would encourage marsh nourishment by allowing suspended sediments from the Atchafalaya River to enter more distant marshes. In addition, reduction in flow velocities would allow these sediments to settle out and reduce the export of sediments suspended during frontal passage. This would result in enhancement of existing wetlands as well as protection of wetlands against tidal scour and wave erosion.

The preferred alternative for weir construction is a shell or limestone weir with a geotextile fabric under the core and covered with an outer layer of riprap. A typical cross-section of a weir is provided in Figure 6. Deciding factors involved in selection of weir type and materials include economics, stability and longevity, soil conditions, tidal variations, channel cross-section, and human interaction. Weirs would be located at Sites #1, 3, 4, 5, 6, 7, and 9 (Figure 3). The weirs would be set at elevation 0.0 feet NGVD, except at Site #3 which would be set at -4.0 feet NGVD.

Spoil bank gapping at Site 2 off of Locust Bayou would help restore natural hydrologic patterns and stop marsh loss by removing sections of an artificial levee which creates an impoundment around lower-lying marsh areas. The spoil banks prevent the transfer of waters between the outlying marsh areas and the bayou, a natural process which is beneficial to the enhancement of wetlands.

Maintenance dredging at Site 10, combined with weir installation, would restore the natural flow of water through Locust Bayou and provide boat access.

The location of the specific work sites of the second component of the Lake Chapeau Sediment Input and Hydrologic Restoration project are summarized below and shown on Figure 3.

Site #1. A weir would be located at approximately 2,000 feet east of the dogleg of the oil access canal that heads northeast from Locust Bayou into the brackish marshes west of Lake Chapeau. The canal cross-section at the location measures nearly 148 feet wide by 8 feet deep. This plug would aid in restoring the flow of Atchafalaya Bay water and sediment through Locust Bayou.

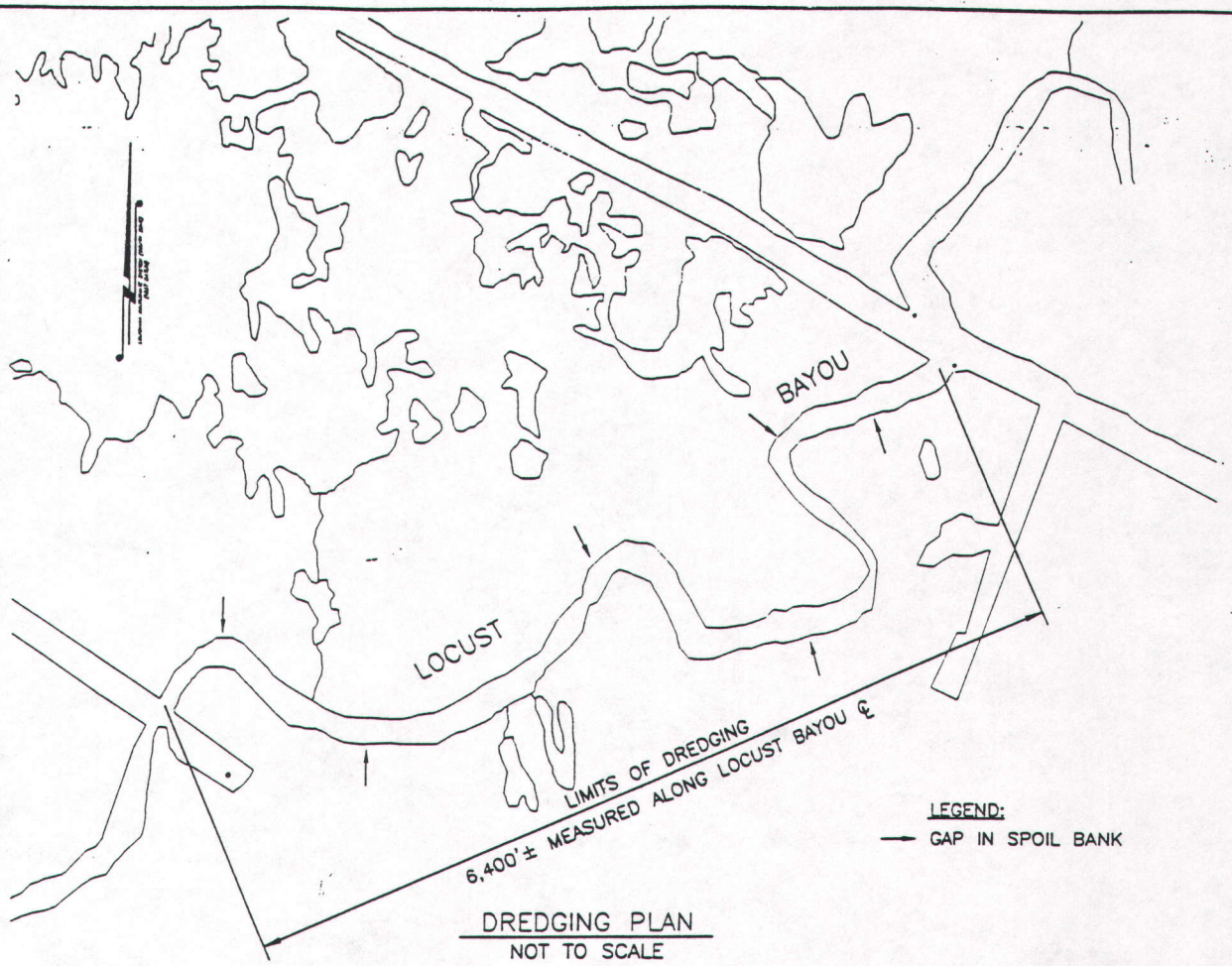
Site #2. Spoil banks northeast of Site #1 would be gapped at six locations to allow sheet flow across brackish marsh on either side of the canal (Figure 7). Gaps would prevent hydrologic isolation of water in the canal behind weir Site #1, and allow interchange of sediment-rich waters within the Lake Chapeau watershed when the canal water level rises high enough to overtop the gaps. The removal of spoil to create gaps should only be done to marsh level to avoid tidal scour and increased erosion.

Site #3. A weir would be located in Pellegrin's Cut in a brackish marsh at the extreme northeast of the project area. This channel, originally cut by a trapper, has become very large (230 feet wide by 28 feet deep) due to high-velocity flows. The weir would be placed close to the mouth to limit water flow and prevent erosion around the sides of the structure. Construction of this weir would reduce tidal exchange from Four League Bay and, due to the reduction of fast-moving currents through Pellegrin's Cut, would benefit areas northwest of Lake Chapeau, along the fringes of the Alligator Bayou watershed.

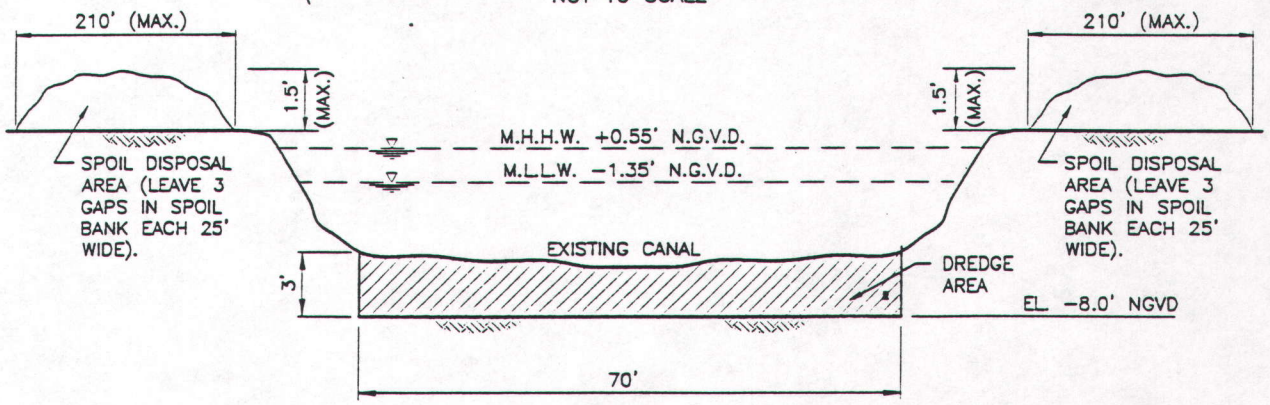
Site #4. A weir would be located in the abandoned mineral access canal, located on the boundary of brackish and intermediate marsh, near the mouth of Wildcat Bayou in the northeast of the project area and south of Pellegrin's Cut. This wide and deep canal (175 feet wide by 17 feet deep) also has high velocity water flows and placement of the weir near Four League Bay would prevent most of the flow from entering the channel.

Site #5. A weir would be located in a small natural distributary of Little Mosquito Bayou immediately southeast of its junction with a mineral access canal. This site in brackish marsh would take advantage of good spoil banks existing along the southeast banks of the access canal, the narrow channel (70 feet wide by 4 feet deep), and low-velocity flows. Location of this weir would aid in hydrologic separation of the Locust Bayou and Mosquito Bayou watersheds.

Site #6. A weir would be located in an access canal in the southernmost portion of the project area in brackish marsh. A plug, now deteriorated, was constructed in this canal several years ago and its presence resulted in silt being deposited so that the canal is now 5 feet deep and 145 feet wide. Nevertheless, the deterioration of the old plug allows a mild current to flow through the canal. The



DREDGING PLAN
NOT TO SCALE



NOTE :
TOTAL OF 51,000 CUBIC YARDS (CY) OF DREDGE MATERIAL TO BE DISPOSED ALONG NORTH AND SOUTH BANKS.

DREDGING SECTION
NOT TO SCALE

NOTE:
PERMITTEE SHALL CONTACT "LOUISIANA ONE CALL" (1−800−272−3020) AT LEAST 48 HRS. PRIOR TO THE START OF DREDGING ACTIVITY.

SHEET 8 OF 8
LOCUST BAYOU DREDGING PLAN

LAKE CHAPEAU SEDIMENT INPUT
AND HYDROLOGIC RESTORATION

PARISHES OF ST. MARY AND TERREBONNE
STATE OF LOUISIANA

APPLICATION BY NATIONAL MARINE FISHERIES SERVICE
BATON ROUGE, LOUISIANA − JUNE 1997

PREPARED BY

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FIGURE 8

new weir would aid in hydrologic separation of the Locust Bayou and Mosquito Bayou watersheds. In addition, the silt that currently is deposited in the canal may be pushed inland toward Lake Chapeau through natural waterways.

Site #7. A weir would be located in an access canal at its junction with Locust Bayou in an area of brackish marsh. The canal's cross section measures approximately 157 feet wide by 10 feet deep with moderate water flows. This structure would allow waters carrying sediment from Atchafalaya Bay to continue through Locust Bayou to nourish more distant marshes.

Site #8. Deleted. The intended location was the junction of Locust Bayou and the southeast-trending access canal. This location is east of Site #7 and northwest of Site #6.

Site #9. A weir would be located in an access canal southwest of Lake Chapeau beyond a camp situated in brackish marsh. The canal cross-section measures 240 feet wide by 11 feet deep with moderate current. This weir would encourage sedimentation and accumulation of organic material in an area of fragile marsh where much land loss is occurring. Since this may be the area of the meeting points of cross currents from Four League Bay and Atchafalaya Bay, a weir would reduce or prevent cross currents and their erosive effects.

Site #10. Maintenance dredging would be performed on a 6,700-foot reach of Locust Bayou (Figure 8) where the bayou is about 70 feet wide and 3 feet deep. This area has accumulated as much as 3 feet of silt due to the altered flow patterns through Point au Fer Island. The maintenance dredging to restore the natural depth of Locust Bayou would be the first construction activity to allow for crew boat access, since weir #7 would block the canal. Natural flows after the construction of weir #7 should maintain the depth of Locust Bayou. Spoil would not be placed on the six areas indicated on Figure 8(25 feet at each area) to provide "gaps" mentioned in the plan. No digging into existing banks would be necessary to provide the overflow required by this document.

3.3.1 Alternative Locations for Dredging Operations

Primary Dredge Site 1 - Atchafalaya Bay Borrow Area

Atchafalaya Bay sediment is considered a renewable resource. Atchafalaya Bay adjacent to Point au Fer Island has shallowed since the mid-1970s, thus sediment could be mined from the bay and spread on the island without adversely impacting the bay. This would mimic the natural sedimentation processes which are occurring in areas immediately adjacent to Atchafalaya Bay, Four League Bay, and Oyster Bayou.

The main advantage of this dredge site is that material can be pumped the short distance from the borrow area to the western shoreline of Lake Chapeau by one dredge without the necessity of booster pumps. Thus, operation costs would be significantly lower than dredging from more remote sites.

However, it remains to be determined how much sand can be obtained from this borrow area, and to what areal extent dredging would be necessary to obtain the volume of quality fill required for the project, taking shrinkage and settlement into account. Seasonally, there may be operational concerns that the water is not deep enough to float the dredge.

Alternate Dredge Site 2 - Atchafalaya Bay Navigation Channel

The COE operates regular maintenance dredging in the Atchafalaya Bay Navigation Channel, which is located about 10 miles from the proposed Lake Chapeau fill area. Good quality sand is plentiful in this location, and utilizing this source of material would lower mobilization costs significantly if coordinated with maintenance dredging activities. Spoil from this dredging operation has previously been used to create artificial wetland areas in the vicinity of the Atchafalaya Bay Navigation Channel.

However, based on COE estimates, utilizing this option would not be cost-effective, due to both the distance of the dredging operation from the proposed project site and the difficulty of pumping the heavy sand removed by dredging operations. As many as three booster pumps may be required along the length of the dredge pipe to keep the sediments in motion.

Alternate Dredge Site 3 - East Pass

East Pass is a channel on the eastern side of the Atchafalaya Bay Navigation Channel. The natural tendency of the Atchafalaya River to flow through East Pass has pushed much sediment through the channel, and deposited good quality sand south of East Pass. The COE reports that it would like to see this channel dredged so that more fresh water could pass through. Therefore, East Pass is a possible source of fill material for this project.

The East Pass site is closer to the proposed fill area than the Atchafalaya Bay Navigation Channel, but the sand is very heavy and difficult to pump in this location and the distance is still great enough to necessitate the use of booster pumps. Dredging costs are expected to be somewhat lower than that of Site 2, but still significantly higher than that of Site 1.

Alternate Dredge Site 4 - Atchafalaya Bar Channel

The Atchafalaya Bar Channel lies south of the Atchafalaya Bay Navigation Channel, extending several miles southwest from the Point au Fer Shell Reef. The bottom in this location is chiefly fine silts and clayey materials, not particularly desirable for the proposed fill operations. Sediment characteristics combined with distance from the fill site render this site infeasible for this project.

3.3.2 Alternate Locations Considered for Weir Plug Sites

Alternate Weir Site #5

The alternative location for Weir Site 5 would have been located in a small natural distributary of Little Mosquito Bayou immediately north of Little Mosquito Bayou's junction with a northeast trending mineral access canal. The preferred alternative, located immediately southeast of Little Mosquito Bayou's junction with the canal, would provide a better hydrologic separation of the Locust Bayou and Mosquito Bayou watersheds. The preferred location would be more cost-effective because at that point, the bayou has a reduced cross-section, thus requiring less weir material.

Alternative Weir Site #8

This weir would have been located at the junction of Locust Bayou and a southeast trending oil access canal. This structure would help ensure that sediment-laden waters would flow in Locust Bayou to reach marshlands. This weir site has been removed from the project because of the placement of a weir at Site #9 which makes this weir no longer necessary to achieve the goals of reducing tidal scouring and encouraging sedimentation in marshlands.

3.3.3 Structural Alternatives for Weir Construction

All of the following types of weirs were considered prior to deciding to use riprap structures for the hydrologic restoration portion of the Lake Chapeau project. The structures selected would require no maintenance.

Riprap

A riprap weir (Figure 6) is constructed by mounding rock or shell across a channel and covering with an outer layer of riprap. The deeper the channel, the wider the riprap mound, due to the trapezoidal shape of the structure as the rocks seek their natural angle of repose. These heavy

structures would require a firm mat of mineral soil, or at a minimum a bed of geotextile fabric on the soil bed to minimize settlement and prevent loss of material into the soft bottom.

A riprap structure is durable and, generally, maintenance-free. In addition, the designer may choose the size and gradation of riprap pieces. The disadvantages of these structures include large equipment requirements for construction, availability of material, and the necessity of a firm soil foundation. Advantages include the versatility of such material to conform to any channel cross-section, as well as the ease of taking apart and rebuilding such a structure in the event that access is desired beyond the weir.

Sheet Pile Bulkheads

Sheet pile bulkheads are constructed across a channel and extend into the natural earth embankments on each side to prevent bank erosion. The length of sheet piling required is determined by soil conditions and availability. Timber pole pilings located on the downstream side of the structure provide additional stability. Pilings for weirs should be driven into a material of reasonable resistance, such as firm clay. For this reason, the application of sheet pile bulkheads is limited by the required depth of the structure and the soil conditions at the site. The typical maximum pile length used is 60 feet. Batter piles may also be used for additional support in poor soil conditions, or where added stability is needed for lateral resistance against high current velocities.

Where conditions warrant (e.g., significant currents), wingwalls and constructed embankments are required to prevent water from diverting around the ends of the structure, resulting in structural failure. Armor plating may also be used to protect exposed embankment faces from wave action. Armor plating eliminates frequent maintenance on the structure.

Cost estimates show that the specific canal cross-sections encountered in this project require sheet pile bulkhead sections that are not cost-efficient. In addition, there are concerns about longevity due to both natural effects and human interaction, as well as ease of maintenance.

Concrete Barges

Old concrete barges have been salvaged for use as plugs or weirs on some hydrologic restoration projects in the past. Typically, the barges are rectangular in shape, 50 feet by 100 feet. Hollowed out, they may be 12 feet in depth. The barges are brought to the proposed location site, sunk in place, and then filled with rock or riprap. A standard oil access canal

measures 80 feet in bottom width, so the banks may have to be notched slightly to fit the barge in place.

Concrete Canal Closures

A new development in hydrologic restoration technology is a huge hollow rectangular structure called a concrete canal closure. The structure measures 80 feet by 20 feet by 12 feet deep. This heavy structure would require firm soil conditions, and still settlement is likely to occur. Further, the typical cross-section of the canals in this project area is incompatible with the geometry of the concrete structure, and multiple and/or partial structures would be required at each site. The cost of such construction, including supply and transportation to the site, renders this type of structure not feasible with respect to other types of weir construction.

3.3.4 Structural Alternatives for Weir Construction Material

The following materials were considered along with the different types of weirs. However, subsequent to selection of riprap weirs for this project, alternative materials were eliminated.

Riprap

Riprap should be heavy stone from an approved source in order to provide a high degree of protection to the structure under the relatively strong lateral pressures experienced. Crushed concrete rubble is not allowable for riprap protection because of the desired unit weight of the specified riprap class.

Reef shell is preferred as a construction material, if available, for the interior core of the riprap structure. Crushed limestone may be substituted if supply and delivery of shell is prohibitive. The core material should be wrapped in fabric before placement of the outer layer of protective riprap.

The main drawback of this type of construction is the availability and supply of the material. Otherwise, riprap reef structures with interior cores of lightweight material prove to provide a relatively inexpensive, durable, and effective system of hydrologic control.

Timber

Timber is the most popular construction material for channel structures. Susceptibility to the effects of corrosive environments require treatment of all timber with either creosote and chromated copper arsenate. Timber bulkheads are superior to other types in their economy and ease of construction.

Typically, boards 2 inches by 8 or 10 feet are nailed together in multiple overlapping rows, with each row spliced over the seams of the previous row. This forms a stiffer, stronger integral unit which is less susceptible to bending or deformation. These structural timber units are driven together to a depth determined by geotechnical analysis to provide the necessary resistance against overturning.

As may be expected, timber has a shorter life expectancy than the other construction materials considered here, due to the relative lack of durability and susceptibility to fire and weather, but a well-designed and constructed timber structure should outlast the 20-year design life of the project.

Metal

Aluminum or steel sheet piling is used where structural strength is most important, usually in situations where large overturning moments are created on cantilever piles by excessive channel depth. Disadvantages include corrosivity and high costs.

Concrete

While concrete sheet piling is the most durable material under a wide range of environmental conditions, it is also the most expensive. Concrete sheet piles require a site that is easily-accessible with heavy equipment.

Concrete barges or canal closure structures have proven to be cost-prohibitive for this project.

4.0 AFFECTED ENVIRONMENT

The Lake Chapeau Sediment Input and Hydrologic Restoration project is located in the coastal area of south-central Louisiana within the Penchant Subbasin of the Terrebonne Basin. This subbasin (503,700 acres) is south of Bayous Boeuf and Black, between the Atchafalaya River and Bay on the west and Bayou du Large on the east (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 1993a). Point au Fer Island forms the southwestern tip of the Penchant Subbasin and is separated from surrounding wetlands by the Atchafalaya Bay to the north and west and Four League Bay to the north and east. The Gulf of Mexico adjoins the island on the south.

The 52,000-acre island is composed of 42,070 acres of intermediate, brackish and saline intertidal marsh and nearly 10,000 acres of open water. Until the construction of oil and gas canals, hydrology of Point au Fer Island was dominated by four bayou systems, including Locust Bayou in the southwest, Alligator Bayou in the north, Burkes Bayou in the south central area, and Little Mosquito Bayou in the southeast (Figure 2). Lake Chapeau is located in the central portion of the island. Mosquito Bay and Bay Castagnier connect the eastern portion of the island with Four League Bay. Lake Chapeau is the headwater for Locust Bayou which flows into Atchafalaya Bay. Little Mosquito Bayou drains into Mosquito Bay.

Point au Fer Island is strongly influenced by the adjacent Atchafalaya River and its prograding delta. From the early 1950s until 1973, prodelta clays and silty clays aggraded the bay bottom seaward of the lower Atchafalaya River. The 1973 flood resulted in the transport and deposition of abundant quantities of sediments to the Atchafalaya Bay. Prior to that flood, only a few small shoals were exposed at low tide, and these areas were primarily from maintenance of the navigational channel. The 1973 flood resulted in the creation of subaerial lobes on the eastern and western sides of the river outlet, initiating delta development. Since that time, sands have been prograding over finer delta clays and silts and marshlands have expanded rapidly in Atchafalaya Bay (Roberts and van Heerden, 1983). This prograding delta has affected the regional hydrologic regime by reducing the storage capacity of Atchafalaya Bay and confining water movement over a smaller surface area. Water circulation patterns have been altered and the freshwater influence in the general vicinity, including the northwestern portion of Point au Fer Island, has increased.

As typical of most marshes within the Louisiana Coastal Zone, marshes of Point au Fer Island have experienced significant land loss primarily within inland areas (U.S. Department of the Interior, 1990). Land loss has occurred in the central area of Point au Fer Island despite increased fresh water influences and sediment loads in the adjacent surface waters.

Britsch and Kemp (1990) calculated land loss rates for three time periods, 1930s to 1956-58, 1956-58 to 1974, and 1974 to 1983. They reported average loss in square miles per year for the Point au Fer quadrangle map as 0.11, 0.16 and 0.17 for the three time periods respectively. This map includes approximately the western half of the island.

Although some research suggests that the prograding delta restricts sediment deposition within the inland marshes, recent investigations from various researchers suggest the island is not submerging as rapidly as other Louisiana coastal wetlands. Data (Nyman and DeLaune, 1991) from 23 sampling sites near Mosquito Bay in the eastern section of the island indicates a mineral deposition rate between 1,385 and 1,594 grams per square meter per year, exceeding the amount needed to offset a 1 centimeter per year submergence rate (Penland *et al.*, 1988) for brackish marshes. In addition, there were no visible signs of plant stress in the study area suggesting an adequate rate of organic accumulation. These data indicate that adequate mineral sediment is transported into some areas of the island by flooding events such as overbank flooding and winter storms. In addition, a zero accretion deficit suggests that access canals may exert the major role affecting inland land loss on Point au Fer Island.

The Lake Chapeau Sediment Input and Hydrologic Restoration project area is bounded geographically by Four League Bay on the northeast, Atchafalaya Bay on the northwest, Locust Bayou on the west and south, and oil field access canals on the south and Wildcat Bayou on the east. Hydrologically, the project area comprises much of the Locust Bayou watershed and is bounded by the Alligator Bayou watershed to the north and east, and the Mosquito Bayou watershed to the south and east. According to the engineering design report, the total area measures approximately 21 square miles in area, consisting of 5,900 acres of brackish marsh, 4,000 acres of intermediate marsh, and 3,600 acres of open water for a total of 13,500 acres (Figure 2).

Specific work sites of the Lake Chapeau Sediment Input and Hydrologic Restoration project are divided into three types of habitat: (1) deteriorated marshes and open water areas, (2) manmade canals, and (3) bay bottom. Because of the characteristics of work and related equipment needs, plans are divided into two components. The first component consists of pumping sediments from Atchafalaya Bay water bottoms and depositing the mined material in the project area. This would restore marshes west of Lake Chapeau, and reestablish a land bridge between the Locust Bayou and Alligator Bayou watersheds. In the second component, seven weirs will be constructed and six gaps will be excavated in some existing high spoil banks to reestablish hydrologic control and restore the natural circulation and drainage patterns within the central portion of Point au Fer Island.

4.1 Physical Environment

4.1.1 Geology, Soils and Topography

Geologically, Point au Fer Island is located in the western portion of the recent Mississippi River Deltaic Plain where three periods of active sediment deposition have occurred during the past 8,000 years. This alluvial sediment deposition primarily resulted from westward channel shifting of the Mississippi River and subsequent emergence of the

Maringouin, Teche, and Lafourche delta complexes. Since 1972, the emergence and growth of the Atchafalaya Delta have caused changes to the wetlands, inland waters, and the near-shore Gulf of Mexico around Point au Fer Island. Satellite imagery recorded during high-water events reveals that sediments readily move into the Point au Fer marshes, down Four League Bay and through Oyster Bayou into the Gulf of Mexico. Deposition of coarse material seaward of the Point au Fer shell reef has resulted in the development of a subaqueous marine delta. Some of this material is moving northeast and is being deposited so that portions of the Point au Fer Island shoreline are starting to prograde due to tidal mud flat formation.

A typical soil profile of Point au Fer Island would indicate deep alluvial deposits of shell, sand, and clay comprising the subsurface stratum, overlain with organic plant material at varying stages of decomposition. Lafitte, Clovelly, Scatlake and Banker are the soil types in the project area (U.S. Department of Agriculture, 1972; in press). These soils occur in the low natural levee ridges at near-gulf level and are subject to frequent tidal flooding. Marsh association soils have a peat and muck surface and subsoil layers which are 2 to 5 feet thick underlain mostly by very dark gray and gray semifluid clay (U.S. Department of Agriculture, 1972). As reported in the engineering design report, soil borings drilled on May 28 and 29, 1996, showed that the top stratum is composed of highly organic soils for a depth of a few feet below the mud line, and the remainder of the sample is gray clay. The consistency of this clay increases with depth from extremely soft near the mud line to soft at the bottom of the boring. Four sediment cores from Atchafalaya Bay showed sandy material in the upper 2 feet with bioturbated bay bottom facies dominating the remainder of the sample.

The topography of Point au Fer Island, a receding beach front, differs from nearby barrier islands because of the greater distance between the gulf and bay shorelines. Similarities to barrier islands include: (1) the highest elevations are located along the gulf shoreline ranging between 4.6 and 6.0 NGVD; (2) interior marsh elevation is between 0 and 1 foot NGVD and can be completely submerged during storm events; and (3) spoil banks along dredged access channels are elevated 2 to 3 feet above mean water level in the canals.

4.1.2 Climate and Weather

The Point au Fer Island area has a hot, subtropical climate. It is characterized by long, hot and humid summers, and short, mild and humid winters. Temperatures between May and October average between 88° to 90° Fahrenheit (F). Temperatures of 90° F or higher occur approximately

100 days between May and October with an average humidity of 62 percent. Winter temperatures between November and April average 69° F with relative humidity between 30-85 percent. Cold spells usually last no more than three days due to the dominance of warm gulf air moving inland from the coast year round. A winter temperature of 32° F or less is expected 15 days per year and there is a 20 percent chance of temperatures falling below 20° F during the winter.

Copious rains fall throughout the year as a result of the dominant coastal air masses moving inland and mixing with continental air. Average annual rainfall is 62 inches per year and heavy thunderstorms occur frequently. Less rainfall usually occurs in the fall months and snow only occurs at intervals of decades. During the past 90 years, six hurricanes and eight tropical storms have passed over the delta, the latest being Hurricane Andrew in August 1992.

4.1.3 Air Quality

Air quality over Point au Fer Island is good. Air masses are highly unstable in this area due to coastal activity. There are no industrial or automotive air emissions in the area.

4.1.4 Surface Water Resources

The water quality of surface waters within Point au Fer Island is good. Surface water resources within Point au Fer Island include a series of natural bayous and man-made access canals. The designated uses for these waters are primary-contact recreation (e.g., swimming), secondary-contact recreation (e.g., fishing and boating), fish and wildlife propagation, and oyster propagation (Department of Environmental Quality, 1996).

Areas of oil and gas exploration on Point au Fer Island would be the only concern for water quality. This influence is isolated and does not significantly affect the overall water quality of the island.

Proximity to the Atchafalaya basin, which is the most stable region in Louisiana in terms of salinity (Boesch *et al.*, 1994) has had a freshening influence on Point au Fer Island. Large amounts of fresh water enter the island from the northwestern (Atchafalaya Bay) side. Approximately 5,000 acres of brackish marsh have converted to intermediate marsh according to vegetation maps (Chabreck and Linscombe, 1978, 1988). Saltwater flooding from the gulf occurs especially during storm tides. Typical salinities in an intermediate marsh range from less than 1 part per thousand (ppt) to nearly 10 ppt with a mean of 3.3 ppt. Brackish salinities

are higher, ranging from less than 1 ppt to 28 ppt with a mean of 8 ppt (U.S. Department of Agriculture, 1977).

4.1.5 Storm and Flood Protection

Point au Fer Island is the outermost land area in western Terrebonne Parish and acts as the first line of defense against seasonal cyclonic storms. The north to south width of Point au Fer Island provides greater stability of this island than any barrier island in the Parish. Stabilization of the marshes will improve the capacity of the island to buffer tidal surges, thereby providing limited protection for inland areas.

Approximately 15 acres per year of marsh are being lost in the area surrounding Lake Chapeau due to natural processes of subsidence and shoreline erosion. The scouring in the vicinity of Lake Chapeau caused by strong tidal exchanges between southeastern Atchafalaya Bay and Four League Bay is probably the greatest contributing factor to marsh loss on the island.

The location of Point au Fer Island at the terminus of the Atchafalaya River suggests that high potential exists for a gradual reversal of land loss rates and natural marsh recovery due to increased regional sediment loading (van Heerden and Roberts, 1988; Roberts and van Heerden, 1983).

4.2 Biological Environment

4.2.1 Vegetative Communities

Because of the size of the island, vegetative communities on Point au Fer Island are extensive. Beginning at the shoreline, these include vegetative communities associated with dunes and washover sands (beach rim marsh), saline marsh, brackish marsh and intermediate marsh. Data from 1990 indicate that there were 4,490 acres of intermediate marsh, 21,557 acres of brackish marsh, and 4,135 acres of saline marsh on Point au Fer Island (U.S. Department of the Interior, 1990). In addition to these marshes, spoil banks adjacent to dredged canals provide upland sites vegetated by upland species. Brackish and intermediate marsh types are found within the project area.

More than 40 species of vegetation have been identified in unmanaged brackish marsh. However, much of the brackish marsh on Point au Fer Island has been managed by fire (note dark blue land areas on Figure 3); therefore, three cornered grass (*Scirpus olneyi*), leafy three-square or coco (*Scirpus robustus*), and wiregrass (*Spartina patens*) remain dominant

species. Other brackish marsh species in the project area include hog cane (*Spartina cynosuroides*), marsh purslane (*Sesuvium maritimum*), and the submerged aquatic, widgeongrass (*Ruppia maritima*).

In some areas, intermediate marsh is replacing brackish marsh on Point au Fer Island. There was no recorded intermediate marsh on the island in 1968 or 1978, whereas there were approximately 5,000 acres of intermediate marsh in 1988 (Chabreck and Linscombe, 1968, 1978 and 1988; U.S. Department of Interior, 1990). This increase in intermediate marsh is the result of fresh water influences from the Atchafalaya River and its prograding delta. Vegetative species typical of intermediate marsh and occurring in the project area include wiregrass, cattail, (*Typha domingensis*), deer pea (*Vigna repens*), wild millet (*Echinohloa walteri*), bullwhip (*Scirpus californicus*), sawgrass (*Cladium jamaicense*), dwarf spikerush (*Eleocharis parvula*), and bearded sprangletop (*Leptochloa fascicularis*).

4.2.2 Fish and Wildlife Resources

Few studies of fish and crustacean populations have been conducted on Point au Fer Island. Juneau and Barrett (1975) and Hoese (1976) sampled Vermilion and Atchafalaya Bays with gill nets and an otter trawl. Thompson and Deegan (1983) sampled fishes with a trawl or seine in channels and creeks associated with natural and artificial islands in the Atchafalaya Delta. Those researchers reported that the nekton community consisted of freshwater, estuarine, estuarine-marine, and marine fishes and crustaceans with more than 100 species recorded. In the waters northwest of Point au Fer Island, which generally are fresh or low salinity, blue catfish (*Ictalurus furcatus*), freshwater drum (*Aplodinotus grunniens*), channel catfish (*Ictalurus punctatus*), and sunfishes (*Lepomis sp.*) are most likely to occur (Fur and Refuge Division, 1990).

Point au Fer Island provides high quality habitat for a variety of estuarine and estuarine-dependent marine finfish, mollusks, and crustaceans. Brackish and intermediate marshes are utilized throughout the coastal zone as nursery habitat by larval and juvenile aquatic organisms and certain adult species during specific seasons of the year (Zimmerman *et al.*, 1987, Herke *et al.*, 1987). The marshes provide tremendous quantities of detrital material which form the base of the food web in the Atchafalaya Bay estuary and contributes toward maintaining a high level of fisheries productivity in the northern Gulf of Mexico. Aquatic resources of national importance found at the project site include Atlantic croaker (*Micropogonias undulatus*), red drum (*Sciaenops ocellata*), sand seatrout (*Cynoscion arenarius*), spotted seatrout (*Cynoscion nebulosus*), southern flounder (*Paralichthys lethostigma*), gulf menhaden (*Brevoortia patronus*),

spot (*Leiostomus xanthurus*), striped mullet (*Mugil cephalus*), brown shrimp (*Penaeus azetecus*), white shrimp (*Penaeus setiferus*), and blue crab (*Callinectes sapidus*) (Hoese, 1976). These resources are species of "national economic importance" in accordance with Section 906(e)(1) of PL 99-602, the Water Resources Development Act of 1986.

Although not as heavily utilized as the nearby Atchafalaya River Delta, Point au Fer Island would be expected to provide habitat for mallard (*Anas platyrhynchos)*, canvasback (*Aythya valisineria*), pintail (*Anas acuta*), green-winged teal (*Anas crecca carolinensis*), blue-winged teal (*Anas discors*), gadwall (*Anas strepera*), mottled duck (*Anas fulvigula*), coot (*Fulica americana*), and snow goose (*Chen caerulescens*) (Sasser and Fuller, 1988).

In 1990 a census of wading birds and seabird nesting colonies was conducted in Louisiana. Twenty-seven species of colonial nesting waterbirds were studied (Martin and Lester, 1990). At the two sample stations on Point au Fer Island, no nesting colonies were reported in 1990. During the 1983 survey, colonies of black skimmer (*Rynchops niger*) and least tern (*Sterna antillarum*) were identified as containing between 2 and 100 adult birds each (Martin and Lester, 1990). Both these sample sites are outside the project area as are similar habitat areas which might be colonized.

Point au Fer Island is important for migratory song birds as winter habitat and during spring migrations. The beach rim area is the first landfall north of the Mexican coast and during migration or inclement weather, large numbers of trans-gulf migrants seek refuge on woody vegetation of the elevated spoil banks and natural levees. A site to rest, feed, and obtain fresh water is critical to the survival of these birds.

Project area marshes and spoil banks historically have provided extensive habitat for fur bearers, especially muskrat (*Ondatra zigethicus*), although nutria (*Myocastor coypus*) has predominated in more recent years. Other wildlife using the area include raccoon (*Procyon lotor*), coyote (*Canis latrans*), rabbit (*Sylvilagus aquaticus*), and the American alligator (*Alligator mississippiensis*).

4.2.3 Threatened and Endangered Species

The current list of endangered or threatened species was reviewed as part of this assessment (U.S. Fish and Wildlife Service, 1992). The project area is in the defined range for eagles and sea turtles. Bald eagles (*Haliaeetus leucocephalus*) have been spotted feeding on Point au Fer Island; however, there are no nests in the immediate area.

Although the northern Gulf of Mexico is within the range of five species of sea turtles, the Kemp's ridley (*Lepidochelys kempi*), which is a federally-listed endangered species, is the only one that frequents the area. Point au Fer Island marshes and open water areas may serve as foraging and development sites for the Kemp's ridley sea turtle. Dundee and Rossman (1989) report that Kemp's ridley occasionally appears along the Louisiana Gulf coast. Possible factors related to this occurrence include the widespread availability of shallow water marine and estuarine habitat with high turbidity levels from proximity to the Mississippi and Atchafalaya Rivers (Frazier, 1980).

To determine the extent to which another project, Point au Fer Island Hydrologic Restoration project (CWPPRA Project PTE 22/24), would affect the Kemp's ridley, literature documenting known occurrences within NMFS statistical zones along the Louisiana coast was examined and summarized in the environmental assessment (U.S. Department of Commerce, 1995). That assessment stated "no unusually high incidences of occurrence were noted in NMFS Statistical Zone 15 in general, or at Point au Fer Island specifically." Since the Lake Chapeau Sediment Input and Hydrologic Restoration project site is located in more inland waters and marshes than the earlier project, there is less likelihood of Kemp's ridley sea turtles utilizing these areas.

Of the other four species of endangered sea turtles, the green turtle (*Chelonia mydas*), and the loggerhead turtle (*Caretta caretta*) are relatively common in the nearshore waters of the Gulf of Mexico. The hawksbill turtle (*Dermochelys coriacea*) is uncommon in nearshore waters and the leatherback turtle (*Dermochelys coriacea*) is found in open waters of the Gulf. None of these are expected in the Lake Chapeau Sediment Input and Hydrologic Restoration project area.

4.3 Cultural Environment

4.3.1 Historical or Archaeological Resources

The Louisiana coastal waters have been traversed by watercraft since the earliest colonization by Europeans of the region. It is possible that vessels of Native Americans utilized these waters also. At present, 42 recorded wrecks have occurred in Louisiana coastal waters and seven have occurred in the Atchafalaya Bay. This includes the sinking of the Chancellor in 1841 near Point au Fer Island (U.S. Army Corps of Engineers, 1987; U.S. Army Corps of Engineers, 1994). Due to the dependence on ship travel during the colonization of south Louisiana and the frequency of

tropical storms in the area, there is the potential that historical ship remains may be located beneath the sediments that have accumulated during the past four or five decades.

There is the possibility of inundated prehistoric archaeological sites on Point au Fer Island. Native Americans of the Chitimacha Tribe of Louisiana hunted and fished the entire Atchafalaya Basin. Although the Chitimacha were known to have communities near Grand Lake and the mouth of the Atchafalaya River, no permanent sites have been located in the project area (Faine and Bohlander, 1986). During the 19th century, trappers and hunters frequented the island hunting mink, muskrat, raccoon, and alligator.

4.3.2 Economics (Employment and Income)

Wetlands on Point au Fer Island have great value as forage, cover, and nursery habitat for the diverse and abundant assemblage of finfish and invertebrates that are harvested by Louisiana's commercial and recreational fishermen. About 90 percent of the fish harvested from the Gulf of Mexico rely on aquatic habitats such as those found on Point au Fer Island. The project area's direct economic value, in terms of fishery production alone, is estimated to be in the range of $675,000 annually (Josephson, 1993).

Point au Fer Island is located between Intracoastal City, Morgan City-Berwick, and Dulac-Chauvin which are three of the top ten ports in the United States for quantity of commercial fishery landings. These three areas reported 429.9 million pounds of fishery products landed in 1995; 765.4 million pounds in 1994; and 492.6 million pounds in 1993 (U.S. Department of Commerce, 1996). For value of commercial fishery landings, Point au Fer Island is located between four ports (Dulac-Chauvin, Delcambre, Morgan City-Berwick and Intracoastal City) listed in the top 50 in the United States. Dockside value at these ports was $90.3 million in 1995; $110.2 million in 1994; and $84.8 million in 1993 (U.S. Department of Commerce, 1996). These landings, however, do not indicate where the fishery resources were harvested, only where brought to port for sale.

In addition to the economic impact from the commercial fishing industry, revenue is generated from recreational wildlife and fisheries activities on or near Point au Fer Island. In 1987, each of the 268 tags issued on Point au Fer Island for alligators was used (Ensminger, 1988). The entire island is leased for waterfowl hunting. Many businesses in Terrebonne and St. Mary Parishes market equipment, bait, food, and gas necessary to harvest natural resources on Point au Fer Island.

There are existing oyster leases in Locust Bayou and also in Bay Castagnier, located immediately east of the project area. These leases are not expected to be productive at this time due to the increasing freshwater input from the Atchafalaya River. Access and construction activities will be coordinated with all potentially affected lease holders.

Oil and gas exploration has been conducted on Point au Fer Island for many decades. Numerous canals have been dredged to access various drilling locations. Several pipelines have been constructed on Point au Fer Island to accommodate the production of minerals from local wells. In addition, two large offshore pipelines have been constructed across the eastern end of the island in a north-south direction. Parish revenues and employment resulting from oil and gas exploration and production on and near Point au Fer Island reached their highest level between 1970 and 1985. Following the decline in the oil and gas industry since the mid-1980s, the economic benefits resulting from oil and gas exploration on Point au Fer Island have decreased also. Currently there are numerous producing wells on Point au Fer Island (Ensminger, 1996).

4.3.3 Land Use

The majority of property on Point au Fer Island is owned by the John M. Smyth Company and the Roman Catholic Church except for the 16th section of each township and range, which are owned by the Terrebonne Parish School Board. The project area encompasses approximately 21 square miles in the north central portion of Point au Fer Island. The anticipated benefits of the project should benefit the longevity of the entire island. Since 1910, when the island was purchased by the Smyth family, there has been an annual trapping season for muskrat, nutria, raccoon, and mink (Ensminger, 1988). Waterfowl hunting leases are awarded for the entire island. Present and historical land use is restricted to fish and wildlife resource management and harvest and hydrocarbon exploration and production.

4.3.4 Recreation

Access to Point au Fer Island is by boat only, usually launched near Morgan City, 25 miles to the north, or Falgout Canal to the northeast. Because of the remoteness of the island, recreation is limited to fishing and hunting and perhaps bird watching. Waterfowl hunting leases are awarded for the entire island and vary in size from a few hundred acres to several thousand (Ensminger, 1988). The most important species are green-winged teal, mallard, gadwall, and mottled duck.

Because of the large size and many water bodies on Point au Fer Island, fishing activities are abundant. Fishing varies dramatically with species and time of year. Shrimping open season is from May through August and occurs mainly in Atchafalaya and Four League Bays. Sport fishing generally is centered around red drum, and occurs where there is some salinity influence. Crabbing occurs from March through October.

Nutria is the most common furbearer on Point au Fer Island although historical trapping was directed at muskrat. From 1979 through 1987, the number of alligator tags assigned to Point au Fer ranged from 140 to 300. In most years that quota was met, usually within the first week of the season (Ensminger, 1988, 1996).

4.3.5 Noise

Point au Fer Island is a privately-owned, remote area that has no industry other than oil wells and several oil production platforms. Ambient noise in the area would result from oil and gas exploration and production, boats, hunters, or wildlife.

4.3.6 Infrastructure

As shown on Figure 2, natural bayous and oil and gas access canals constitute the entire transportation network within Point au Fer Island.

5.0 ENVIRONMENTAL CONSEQUENCES

The adverse environmental consequences of the no-action alternative are extensive compared to the benefits of the preferred alternative. Adverse impacts to marsh (conversion of vegetated areas to open water) due to subsidence, erosion and tidal scouring can be offset by restoration projects. All structural and non-structural alternatives, including the preferred, have short-term localized impacts during construction, yet offer highly significant long-term environmental benefits.

It should be noted that the no-action alternative could increase the loss of marsh due to tidal scouring. Selection of weir sites, construction alternatives, location and type of fill material, the necessity of dredging to deepen channels or gap spoil banks, and the placement of dredged material were evaluated from both an engineering and cost viewpoint. A thorough assessment of the environmental consequences of the preferred alternative is, therefore, provided below.

5.1 Physical Environment

5.1.1 Geology, Soils and Topography

The proposed activity will have no impact on geology, soils, or topography. The material used for construction of the weirs include shell or limestone and local dredged material (shell, sands, and clay sediment). The weirs, except Site #3 which would be set at -4 feet NGVD, are to be set at 0.0 NGVD. Since the weirs would not be watertight, their purposes would be to prevent large tidal effects; but not completely cut off flow, create hydrologic isolation, or force silt deposition and accumulation at the structures. Site #3 would allow boat access into inland waters.

Materials dredged from Atchafalaya Bay borrow locations would be used to partially reestablish hydrologic separation (land bridge) between the two watersheds in the project area. The dredged material consists of naturally occurring material deposited in Atchafalaya Bay over time by riverine and estuarine processes. The sources of this material are expected to be identical to the sources of sediment-laden waters washing into and over Point au Fer Island. No potential for contamination is anticipated by use of these sediments since the drainage area has little or no industrial activity. Borrow areas would be a minimum of 300 yards from the western shoreline of Point au Fer Island and to depths of less than 15 feet.

Impacts from access dredging would be minimal, localized, and short-term. Dredged materials removed from borrow areas would be rapidly replaced by natural processes.

5.1.2 Climate and Weather

The canal weirs are designed to maintain their structural integrity for a minimum of 20 years under standard weather conditions. The weirs are not designed to withstand hurricane conditions and could be damaged by such events. Repair would be covered by the operation and maintenance part of this project. Inclement weather could temporarily delay the implementation of the proposed activity. The areas filled with dredged material should vegetate and remain unaffected by weather after compaction.

5.1.3 Air Quality

Minor adverse impacts would result from the proposed activity. Exhaust emissions from construction equipment with airborne pollutants should be quickly dissipated by prevailing winds and be limited to the construction phase of the project.

5.1.4 Surface Water Resources

Short-term adverse impacts to surface water resources would be limited to the designated dredge sites in the Atchafalaya Bay and fill areas during construction. The weirs, to be constructed of shell and riprap, would cause increased turbidity during construction. These impacts are minor and would be limited to the construction phase of the project. There are no oyster beds in the immediate vicinity of any proposed construction.

The long-term benefits to surface water resources resulting from the proposed activities include: (1) restoration and revegetation of open water areas to marsh elevation between two watersheds; (2) reduction of extreme water level fluctuations, tidal exchanges, and high flow rates of water; (3) accumulation of sediments that would eventually encourage and promote the growth of aquatic vegetation; and (4) creation of wetlands that provide important water quality functions such as pollutant and sediment removal and floodwater retention.

The Wetland Valuation Assessment (WVA) team predicted 509 acres of marsh would be created or protected, 725 acres of submerged aquatic vegetation would be restored, and 880 acres of marsh would be enhanced (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 1993b).

5.1.5 Storm and Flood Protection

The proposed activity would improve long-term storm and flood control resources of Point au Fer Island. This island is the outermost land area in western Terrebonne Parish and acts as the first line of defense against seasonal cyclonic storms. Stabilizing and protecting inland marshes from excessive erosion would improve the capacity of the island to buffer tidal surges, thereby providing protection for mainland areas.

5.2 Biological Environment

5.2.1 Vegetative Communities

The proposed activity would result in positive long-term impacts on vegetative communities within the project area of Point au Fer Island. Placing weirs in canals that are adversely impacting inland marshes would contribute to long-term protection of its various vegetative communities. Because the accumulation of organic material is a primary factor influencing vertical accretion, protecting the inland marshes from excessive erosion and tidal scour would increase the overall health and stability of the island.

Project implementation unavoidably would adversely impact some emergent wetlands and shallow open water area. Traffic areas (marsh buggy paths, dredge disposal line mobilization route, hay bale and silt fence placement sites) and discharge areas would be adversely impacted. Vegetative recovery of the area impacted by the discharge pipe should be within one growing season. Spoil deposition along Locust Bayou should revegetate with wetland species and so should the fill area separating the two water sheds. The areas temporarily impacted would be approximately 30 acres along Locust Bayou, 12 acres along the discharge pipe route, probably 1 acre at each weir site, and the 168 acres of the baseline fill area or 260 acres if the alternate area is filled.

5.2.2 Fish and Wildlife Resources

Short-term adverse impacts to fish and wildlife would occur during the construction phase of the project. These impacts include impingement of slow-moving fishes and benthic animals during dredging, and smothering of non-mobile benthic organisms in the deposition sites (the fill area, each weir site, and placement of material removed from the spoil banks). Increased turbidity would occur in waters near the designated dredge and fill sites. These impacts are minor and would be limited to the immediate vicinity of action and only for the duration of construction of the project.

Minor long-term adverse impacts would occur to resident flora and fauna within the canals or to migratory fauna that use the canals to access inland estuaries. Weirs in canals would force organisms to use longer and shallower routes to and from nursery areas if they could not swim over the sills of the structures. These impacts are minor and could be considered beneficial, since natural bayous rather than manmade canals would provide access to these marshes.

Offshore areas used as a source for dredged material would have brief localized impacts due to dredging and localized increases in turbidity. Since these areas would be no closer than 300 yards from the Point au Fer Island shoreline and would involve less than 15-foot depths, impacts would be minimal. Due to ample sediment loads, the dredged areas would be replenished with natural material.

The proposed activities would improve fishery resource habitats by partially reestablishing the land bridge between two watersheds, and stabilizing and protecting the inland marshes from increased deterioration attributed to erosion and tidal scour. Detrital material, formed by the breakdown of emergent or submerged vegetation, would contribute to the aquatic food web of Lake Chapeau and the Atchafalaya and Four League Bay ecosystems. In addition to benefiting fishery resources, protected inland marsh would provide critical habitat for wildlife species during storm events or flooding.

5.2.3 Threatened and Endangered Species

Although bald eagles have been sighted in the area, no adverse impacts would be anticipated to this threatened species due to the absence of nesting sites within the project area. The Kemp's ridley probably would avoid increased turbidity and activity surrounding construction sites.

The WVA team predicted that implementation of the project would create or protect over 500 acres of marsh habitat. Marshes are nursery areas for fish and blue crab, the primary food source of the bald eagle and the Kemp's ridley, respectively.

5.3 Cultural Environment

5.3.1 Historical or Archaeological Resources

No impacts would be anticipated to historical or archaeological resources within the project area.

5.3.2 Economics (Employment and Income)

No impacts to economic resources would result from the proposed activity.

5.3.3 Land Use

No impacts to current land use would result from the proposed activity.

5.3.4 Recreation

Some temporary adverse short-term impacts to recreation would occur as a result of dredging activity. These include increased turbidity of surface water and increased noise within the project area during the time of construction.

5.3.5 Infrastructure

No impacts to regional infrastructure are anticipated. Pellegrin's Cut, the deepest channel and one most used by fishermen, still would be navigable.

6.0 CONCLUSIONS

This EA finds that no significant adverse environmental impacts are anticipated by the implementation of the Lake Chapeau Sediment Input and Hydrologic Restoration project. This conclusion is based on a comprehensive review of relevant literature, site-specific data, and project-specific engineering reports. This finding supports the recommendation of the CWPPRA Task Force, including NMFS, the sponsoring agency. The natural resource benefits anticipated from the implementation of the Lake Chapeau Sediment Input and Hydrologic Restoration project would enhance and sustain the diverse ecosystem found within the Terrebonne Basin.

7.0 PREPARERS

This EA was prepared by GOTECH, Inc. and C-K Associates, Inc. under contract to NMFS. Sections were written by Mr. Bruce Dyson and Ms. Peggy Jones of GOTECH, Inc., and Mr. Jeff Heaton, Mr. Douglas LaBar, and Ms. Laurie Pierce of C-K Associates, Inc., under the direction and guidance of Dr. Teresa McTigue of NMFS. In addition to Dr. McTigue, invaluable reference material and guidance were provided by Mr. Rickey Ruebsamen, Mr. Tim Osborn, and Dr. Erik Zobrist of NMFS.

8.0 FINDING OF NO SIGNIFICANT IMPACT

Based on the conclusion of this document and the available information relative to the Lake Chapeau Sediment Input and Hydrologic Restoration project, there would be no significant environmental impacts from this action. Furthermore, preparation of an Environmental Impact Statement on this action is not required by the National Environmental Policy Act or its implementing regulations.

_____ _____

Roland A. Schmitten
Assistant Administrator for Fisheries
National Marine Fisheries Service

Date

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1335 East-West Highway
Silver Spring, MD 20910
THE DIRECTOR

APR 20 1998

MEMORANDUM FOR: Susan B. Fruchter
Acting NEPA Coordinator

FROM: for Rolland A. Schmitten Dark Evans

SUBJECT: Transmittal of the Environmental Assessment for the Lake Chapeau Sediment Input and Hydrologic Restoration Project, Terrebonne Parish, Louisiana

Based on the subject environmental assessment, I have determined that no significant environmental impacts will result from the proposed action. I request your concurrence in this determination by signing below. Please return this memorandum for our files.

1. I concur. Susan Fruchter 4/27/98
Date

2. I do not concur. _____
Date

Attachments

THE ASSISTANT ADMINISTRATOR
FOR FISHERIES

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

APR 17 1998

MEMORANDUM FOR: F - Rolland A. Schmitten

THRU: F/HC - Garry F. Mayer

FROM: F/HC - James P. Burgess

SUBJECT: Recommendation of the Issuance of a Finding of No Significant Impact (FONSI) for the Environmental Assessment for the Lake Chapeau Sediment Input and Hydrologic Restoration Project, Terrebonne Parish, Louisiana

Under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) of 1990, the U.S. Department of Commerce is part of a multi-agency Task Force responsible for implementing a comprehensive approach to restore and prevent the loss of coastal wetlands in Louisiana. NMFS is the Federal sponsor for implementing the CWPPRA-funded Lake Chapeau Sediment Input and Hydrologic Restoration Project, Terrebonne Parish, Louisiana. The Office of Habitat Conservation (F/HC) has coordinated the development of engineering plans and construction was initiated late 1997, and will be completed in late 1998.

F/HC recently reviewed the final environmental assessment (EA) for the project. The EA now must be formally submitted to the Ecology and Conservation Office for its concurrence.

On the basis of the information presented in the EA for the Lake Chapeau Sediment Input and Hydrologic Restoration Project, we believe that no significant impact to the environment will result from the proposed restoration actions.

NOAA Administrative Order 216-6 requires that the request for a FONSI comes from the Assistant Administrator. We hereby request your concurrence with our recommendation and the formal submittal of the EA.

Attachments

APPENDIX A

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LITERATURE CITED

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APPENDIX B

ASSESSMENT REPORTS

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
9721 Executive Center Drive N.
St. Petersburg, FL 33702

OCT 23 [illegible] F/SER3:CCC:jbm

Dr. Teresa McTigue
Lafayette Field Office
Fishery Ecology Division
Southeast Fisheries Science Center
P.O. Box 4251
Lafayette, LA 70504

Dear Dr. McTigue:

Your letter dated August 26, 1997 and the Environmental Assessment (EA) prepared for the Lake Chapeau Sediment Input and Hydrologic Restoration Project (PTE-23/26a) in Terrebonne Parish, Louisiana have been reviewed pursuant to Section 7 of the Endangered Species Act (ESA) regarding impacts to listed marine species. The loss of wetlands at Point au Fer, which is located off the Louisiana mainland of southwest Terrebonne Parish, has occurred at high rates due to both natural and anthropogenic causes. This project will restore the wetland boundaries separating the Locust and Alligator Bayou watersheds along the northwestern shore of Point au Fer Island through the placement of dredge-fill. Plug construction, spoil bank gapping, and maintenance dredging of natural bayous will also be conducted to restore the island hydrology.

We believe that, while endangered and threatened sea turtles may occur in the vicinity of the project area, the Lake Chapeau restoration project described in the August 1997 EA is not likely to adversely affect these listed species. Dredging in the Atchalafaya Bay will be conducted with hydraulic dredges, which can easily be avoided by sea turtles. Benthic habitat alterations within the Bay will be temporary, and turbidity caused by dredging is not likely to be significant beyond the naturally high sediment loads in these waters. Indirect benefits to sea turtles may ensue the completion of this project if the improved habitats of Point au Fer result in increased production of crabs and other sea turtle forage species in these Louisiana nearshore waters.

This concludes consultation responsibilities under Section 7 of the ESA. However, consultation should be reinitiated if new information reveals impacts of the identified activity that may affect listed species or their critical habitat, a new species is listed, the identified activity is subsequently modified or critical habitat determined that may be affected by the proposed activity.

If you have any questions or concerns about this matter, please contact Colleen Coogan, Protected Resources Division, at 813-570-5312.

Sincerely,

Andrew J. Kemmerer
Regional Administrator

cc: F/PR

United States Department of the Interior

FISH AND WILDLIFE SERVICE
825 Kaliste Saloom Road
Brandywine Bldg. II, Suite 102
Lafayette, Louisiana 70508

September 30, 1997

Teresa McTigue, Ph.D.
Fisheries Biologist, Southeast Fisheries Center
National Marine Fisheries Service
USL, Post Office Box 42451
Lafayette, Louisiana 70504

Dear Dr. McTigue:

We have reviewed the draft Environmental Assessment (EA) for the Lake Chapeau Sediment Input and Hydrologic Restoration Project (PTE-23/26a) in Terrebonne Parish, Louisiana. That EA was transmitted by your August 25, 1997, letter to this office. The project is being funded by the Coastal Wetlands Planning, Protection and Restoration Act. The following comments are provided in accordance with provisions of the National Environmental Policy Act of 1969 and the Endangered Species Act of 1973, as amended.

Overall, the EA adequately describes the impacts of the project to fish and wildlife resources. The Fish and Wildlife Service concurs in the findings of the EA and supports implementation of the project, which will create, protect, and enhance wetlands.

Please contact Gerry Bodin of this office (318) 262-6662, extension 244, if questions arise.

Sincerely,

Russell C. Watson
Acting Field Supervisor

cc: EPA, Dallas, TX
NMFS, Baton Rouge, LA
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources (CMD), Baton Rouge, LA
US Army Corps of Engineers, New Orleans, LA

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF:
CEMVN-OD-SW

September 9, 1997

Subject: Lake Chapeau Sediment Input and Hydrologic Restoration Project (CWPPRA Project No. PTE-23/26a)

Dr. Teresa McTigue
National Marine Fisheries Service
University of Southwestern Louisiana
Post Office Box 42451
Lafayette, Louisiana 70504

Dear Dr. McTigue:

This letter is in reference to the Environmental Assessment (EA) prepared for the subject project sponsored by the National Marine Fisheries Service to restore and protect wetlands on Point au Fer Island, at a location central to a point approximately 28 miles southwesterly from Morgan City, Louisiana, in Terrebonne Parish. As this project is presently being evaluated to determine compliance with Section 10 and 404 permit regulations promulgated by the Department of the Army, I offer the following comments on the EA from the regulatory perspective.

The alternatives analysis provides a thorough examination of options considered relative to closure types, materials, and siting, as well as the possible sources of dredged material for restoring wetlands west of Lake Chapeau. It mentions other approaches, such as marsh management and sediment diversion, which have potential to achieve project objectives, yet gives these only cursory comment. The analysis should address these alternatives in greater detail.

Project implementation will unavoidably and detrimentally impact some wetland acreage in the work area during construction. Mobilization of the discharge line, operation of marsh buggies, and dredged material discharges into the west Lake Chapeau baseline/alternate fill areas and onto the banks of Locust Bayou will damage fragile marsh surfaces through crushing, matting, slurry propulsion and direct fill placement. The wetland acreage potentially impacted as a result of project construction should be quantified.

The opportunity to review this document is appreciated. Clarification of these points will assist with completing review of your permit application in a timely manner. If you have any questions, please call me at (504) 862-2276.

Sincerely,

Martin S. Mayer

Martin S. Mayer
Western Evaluation Section

cc. Rickey N. Ruebsamen, NMFS Habitat Conservation Division

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF:

September 24, 1997

Planning Division
Environmental Analysis Branch

Theresa McTigue, Ph.D.
National Marine Fisheries Service
University of Southwestern Louisiana
P.O. Box 42451
Lafayette, Louisiana 70504

Dear Dr. McTigue:

We have reviewed the Environmental Assessment for the Lake Chapeau Sediment Input and Hydrologic Restoration Project (PTE-23/26a) in Terrebonne Parish, Louisiana. The U.S. Army Corps of Engineers is processing the Section 10 and Section 404 permits required for this project. We have no additional comments to offer regarding this document.

Sincerely,

R. H. Schroeder, Jr.
Chief, Planning Division

KATHLEEN BABINEAUX BLANCO
LIEUTENANT GOVERNOR

State of Louisiana

OFFICE OF THE LIEUTENANT GOVERNOR
DEPARTMENT OF CULTURE, RECREATION & TOURISM
OFFICE OF CULTURAL DEVELOPMENT

PHILLIP J. JONES
SECRETARY

GERRI HOBDY
ASSISTANT SECRETARY

September 12, 1997

Dr. Teresa McTigue
U.S. Department of Commerce
National Marine Fisheries Service
Southeast Fisheries Center
Lafayette Office
University of Southwestern Louisiana
P.O. Box 42451
Lafayette, Louisiana 70504

Re: Lake Chapeau Sediment Input and Hydrologic Restoration Project (PTE-23/26a)
Terrebonne Parish, Louisiana

Dear Dr. McTigue:

Reference is made to your letter dated August 26, 1997, concerning the above. A review of our files indicates that there are no sites or properties either listed on or which have been determined eligible for listing on the National Register of Historic Places in the proposed project area. In addition, there are no other known cultural resources in this area. As we anticipate no impact to significant cultural resources, we have no objections to the proposed project. However, should any archaeological material be uncovered during ground altering activities, we request that work in that area be halted and this office be notified immediately.

If we may be of further assistance, please contact Mr. Mike Mahady in the Division of Archaeology at (504) 342-8170.

Sincerely,

Gerri Hobdy
State Historic Preservation Officer

GH:MM:s

c: Mr. Stehle Harris
Louisiana Department of Natural Resources
Coastal Restoration Division
P.O. Box 94396
Baton Rouge, Louisiana 70804-9396