ENVIRONMENTAL ASSESSMENT

WEST LAKE BOUDREAUX SHORELINE PROTECTION AND MARSH CREATION TE-46

TERREBONNE PARISH, LOUISIANA

U.S. FISH AND WILDLIFE SERVICE

ECOLOGICAL SERVICES

LAFAYETTE, LOUISIANA

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ENVIRONMENTAL ASSESSMENT

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CWPPRA Project TE-46
Terrebonne Parish, Louisiana

SECTION 1.0 PURPOSE AND NEED FOR PROPOSED ACTION

The purpose of the proposed project is to halt shoreline erosion through the construction of a foreshore rock dike along a major portion of the western shoreline of Lake Boudreaux. In addition, the project will create emergent wetlands by hydraulically dredging sediments from Lake Boudreaux and depositing that material in shallow open-water areas to the west of the rock revetment. The project area has experienced a tremendous loss of emergent vegetation primarily from subsidence and wind/wave erosion. The need to address coastal Louisiana's severe wetland loss has been identified in numerous restoration plans, programs, and State and Federal laws; implementation of the proposed project would help fulfill that need.

SECTION 1.1 INTRODUCTION

Louisiana accounts for 90 percent of the coastal marsh loss in the lower 48 states (Dahl 2000). Coastal land loss in Louisiana has been reported to be from approximately 25 square miles per year (Dunbar et al. 1992) to 35 square miles per year (Barras et al. 1994) and accounts for 80 percent of the coastal wetland loss in the United States (Louisiana Coastal Wetlands Conservation and Restoration Task Force 1998a). Causes of wetlands loss include sea level rise, subsidence, sediment deprivation, channelization, saltwater intrusion, and altered hydrology (Turner and Cahoon 1987, Turner 1990). Concern over Louisiana's loss of coastal wetlands prompted President George Bush in 1990 to sign into law the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA). CWPPRA provides over $50 million per year for the planning, design and construction of coastal restoration projects in Louisiana. Each year, a list of projects is selected for implementation and funds are approved for engineering and design. That annual list is referred to as the Priority Project List. On January 16, 2002, the West Lake Boudreaux Shoreline Protection and Marsh Creation Project was approved for funding as part of the 11th Priority Project List and was approved for Phase II funding on February 8, 2006.

In 1998, the Louisiana Coastal Wetlands Conservation and Restoration Task Force (LCWCRTF) and the Wetlands Conservation and Restoration Authority (WCRA) developed the Coast 2050 Plan which serves as the official restoration plan for coastal Louisiana (LCWCRTF and WCRA 1998*a*). The Coast 2050 Plan divided the Louisiana coastal zone into four regions encompassing nine hydrologic basins, and restoration strategies were developed for each region. Each basin was also divided into subbasins or mapping units for which additional strategies were developed. The Coast 2050 Plan will be implemented using a number of different funding sources including the CWPPRA, the Water Resources Development Act, and the State's Coastal Wetlands Conservation and Restoration Fund.

The West Lake Boudreaux Shoreline Protection and Marsh Creation Project is located within Region 3 which encompasses the Terrebonne, Atchafalaya, and Teche-Vermilion Basins. The

Terrebonne basin contains nine hydrologic subbasins including the Timbalier Subbasin, which is bounded on the west by Bayou du Large, Bayou Lafourche on the East, the Gulf of Mexico on the south, and the Gulf Intracoastal Waterway (GIWW) on the north. This basin contains an extensive zone of living cypress swamps, dead swamps and low-salinity marshes, which grade into brackish and saline marshes to the south. The hydrology of this basin is strongly influenced by the Atchafalaya River and the Houma Navigation Canal (HNC) which shunts large amounts of Atchafalaya River water from the GIWW towards Terrebonne Bay.

SECTION 1.3 PURPOSE OF PROPOSED ACTION

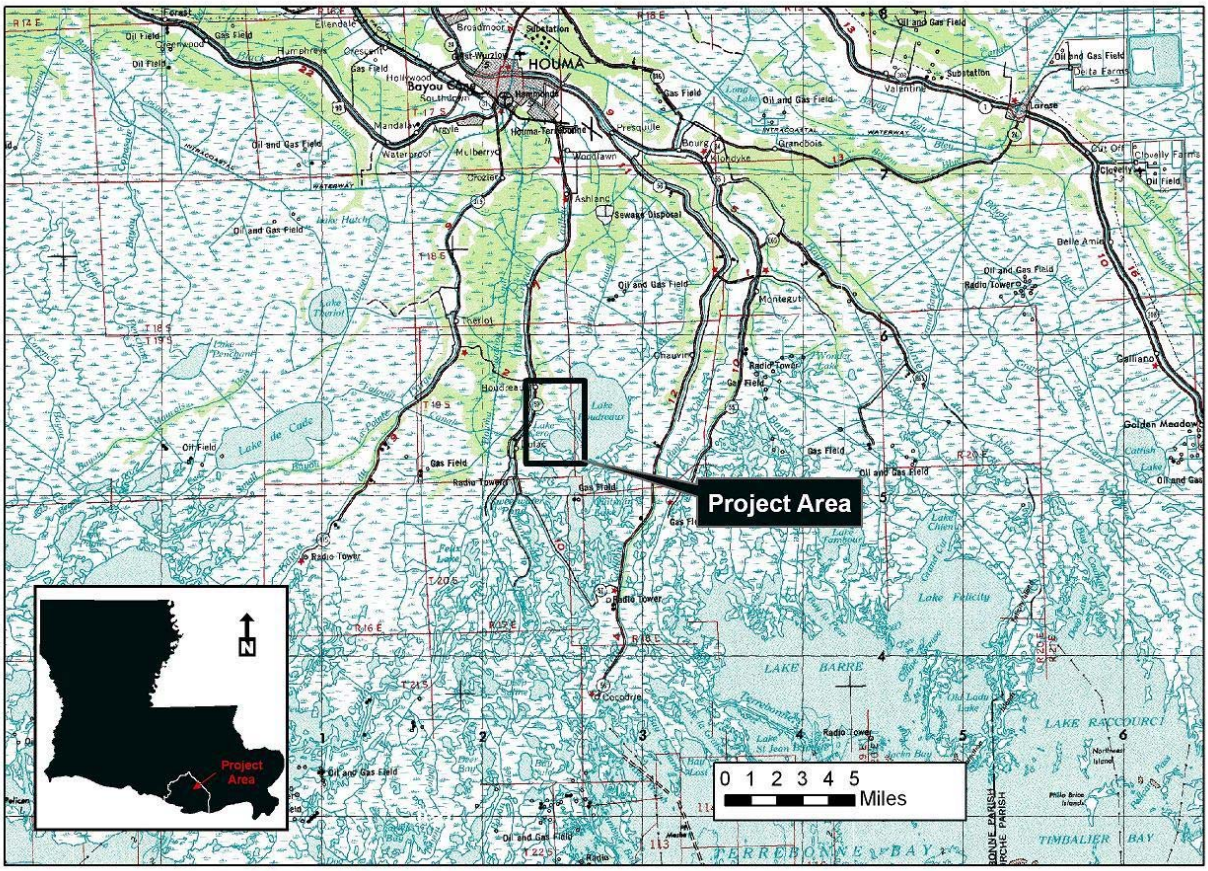
The purpose of the shoreline protection feature of this project is to halt the wave-induced erosion along a portion of the western shoreline of Lake Boudreaux through the creation of a shoreline revetment. The purpose of the projects marsh creation feature is to re-create historical emergent marshes through hydraulically dredging bottom sediments in Lake Boudreaux and placing that material in shallow open-water and fragmented marsh areas. Specific goals of the project are to: 1) protect approximately 148 acres of emergent marsh and protect submerged aquatic vegetation (SAV) habitat; and, 2) create approximately 284 acres of emergent marsh by filling open-water areas and fragmented marsh with dredged material.

SECTION 1.4 NEED FOR PROPOSED ACTION

The Louisiana Coast 2050 Plan divides the Timbalier Basin into 11 mapping units including the Boudreaux mapping unit. That mapping unit contains 48,000 acres of emergent marshes and open-water areas (LCWCRTF and WCRA 1998*b*), of which approximately 10,330 acres of emergent marsh were lost from 1932 to 1990. The primary causes of that loss were dredging, subsidence, wave action, and saltwater intrusion due to altered hydrology. The project area is located within the Boudreaux mapping unit and is bordered by Bayou Grand Caillou to the west, Bayou Petit Caillou to the east, and Louisiana Highway 57 to the south (Figure 1). The western portions of Lake Boudreaux contain intermediate marsh and a large expanse of SAV in the open water immediately west of that marsh.

During the early 1900's, numerous man-made canals were dredged for navigation and to access oil and gas drilling sites in coastal Louisiana. Two of these canals, Boudreaux and Robinson, hydrologically connected Petit Caillou and Terrebonne Bayou to Lake Quitman and Lake Boudreaux, which caused basin-wide hydrologic changes. Those canals increased tidal exchange and facilitated the intrusion of salt water into interior marshes, resulting in long-term sublethal salt-stress and a reduction in vegetative growth (Waisel 1972, Chabreck 1981, and Delaune *et al.* 1983). Wetlands in the Terrebonne Basin were historically nourished by fresh water, sediments, and nutrients delivered via overbank flooding of the Mississippi and Atchafalaya Rivers' distributary channels. Since the mid 1800's, flows of fresh water and sediments from the Mississippi and Atchafalaya Rivers were restricted by flood protection levees. Having been deprived of riverine sediment and fresh-water for decades, the interior fresh and low-salinity marshes, comprised largely of organic sediments, are very vulnerable to hydrological changes and increased salinity. Over time, these stressed organic marshes are more susceptible to adverse effects of high wave energy and storm surges.

Figure 1. Vicinity Map West Lake Boudreaux Shoreline Protection and Marsh Creation Project.



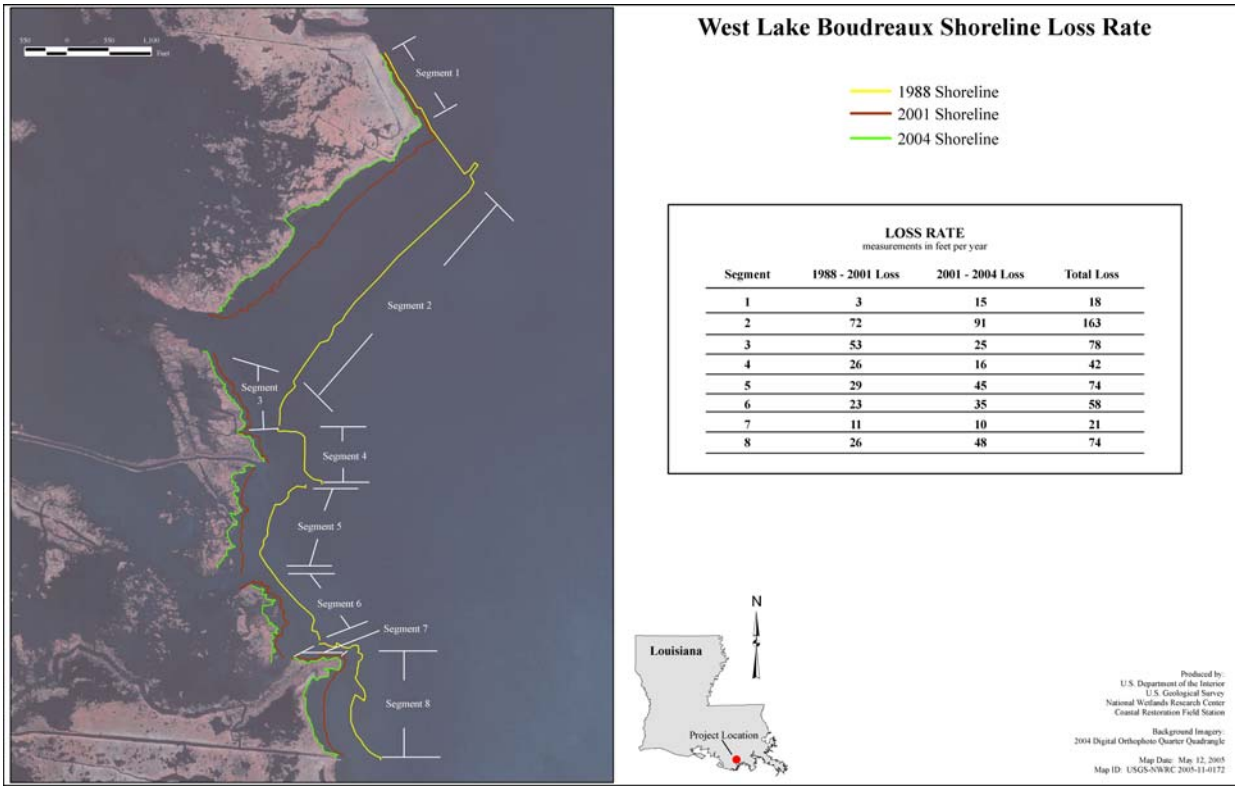
An analysis of shoreline erosion rates by USGS using 1988 to 2004 aerial photography indicates that high shoreline erosion rates occur within the project area. Those rates range from 10 ft/yr (southwest shoreline) to 91 ft/yr (northwest shoreline), resulting in a total weighted average erosion rate of 42 ft/yr (Figure 2)

The interior low-salinity marshes experienced their greatest loss during the 1980s (Table 1) with an estimated loss rate of 3.68 percent per year from 1983-1990 (USGS 2001), while more recent (1978-2000) loss rates have been estimated at 2.3 %/yr. The purpose of the proposed action is to stop shoreline erosion along the western shoreline of Lake Boudreaux while re-creating interior marshes along that shoreline.

Table 1. Interior land loss rates from Corps of Engineers

Year of interior marsh loss	Acreage Lost	Percent Loss
1955-1974	546	2.57
1974-1990	346	2.35
1983-1990	199	3.68
1978-2000	N/A	2.3

Figure 2. West Lake Boudreaux Shoreline Loss Rates 1988-2004.



LOSS RATE
measurements in feet per year

Segment	1988 - 2001 Loss	2001 - 2004 Loss	Total Loss
1	3	15	18
2	72	91	163
3	53	25	78
4	26	16	42
5	29	45	74
6	23	35	58
7	11	10	21
8	26	48	74

SECTION 1.5 REQUIRED DECISIONS

The decision to implement the Preferred Alternative will be made only after a thorough public review and full consideration of all comments. Opportunities for public comment occurred at public meetings conducted during the project development and selection stages of the CWPPRA planning process. Opportunity for public comment was also provided through review of the draft Environmental Assessment (EA) which was sent to the appropriate Federal, State, and local agencies, and other interested parties in November 2005.

SECTION 1.6 COORDINATION AND CONSULTATION

Planning, engineering and design of this project were coordinated with all LCWCRTF agencies, the Louisiana Department of Wildlife and Fisheries, Terrebonne Parish officials, and area landowners. This project was nominated and selected as part of the 11th Priority Project List of CWPPRA. Projects on the 11th Priority Project List were nominated and developed at a series of public meetings held in March of 2001. Meeting participants included the LCWCRTF agencies, members of the CWPPRA Academic Advisory Group, landowners, environmental groups, Terrebonne Parish officials, and members of the general public. The CWPPRA Technical Committee met publicly on May 30, 2001, to consider preliminary costs and project benefits, and selected 19 projects for further evaluation as candidate projects. Interagency evaluations of those projects occurred from May to November 2001. Upon completion of project evaluations, public

meetings were held across the coastal zone on November 27, 28, and 29, 2001, to allow the opportunity for public comment. The CWPPRA Technical Committee again met publicly on December 12, 2001, to select projects for recommendation to the CWPPRA Task Force. The CWPPRA Task Force selected 11 projects, including this one, for funding of engineering and design at a public meeting on January 16, 2002. Details concerning the plan formulation process for the 11th Priority Project List and the CWPPRA Standard Operating Procedures Manual are available at www.mvn.usace.army.mil/pd/cwppra_mission.utm.

Engineering and design review meetings were held on April 5, 2004, November 30, 2004, March 28, 2005, June 16, 2005, and November 8, 2005. LCWCRTF agencies were invited to attend those meetings. Support for the project has been expressed by all entities involved.

SECTION 2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

Several alternatives were formulated and coordinated with the CWPPRA agencies regarding materials to be used and alignment of the shoreline protection. Alternatives including the location of created marsh and the height of that created marsh were also evaluated. Those alternatives and the No Action alternative are discussed in the following sections.

SECTION 2.1 ALTERNATIVE 1 - NO ACTION

Under this alternative, no action would be taken to stop the erosion of the western shoreline of Lake Boudreaux, no interior marsh would be created west of the western shoreline of Lake Boudreaux, and the opening in the northern access canal would be left open.

SECTION 2.2 ALTERNATIVE 2 - PREFERRED ALTERNATIVE

The preferred alternative includes two primary components, i.e., shoreline protection along the western shoreline of Lake Boudreaux and the creation of emergent marsh within the interior open-water and fragmented marshes west of the hard shoreline protection areas (Figure 3).

A. Shoreline Protection

The shoreline stabilization feature would consist of installation and maintenance of approximately 14,000 linear feet of rock foreshore dike lakeward of, and parallel to, the present Lake Boudreaux northwestern shoreline on the -1 foot contour. This foreshore rock dike would be constructed to a height of +3.5 feet North American Vertical Datum of 1988 (NAVD 88) and a +0.5-foot overbuild, a 5-foot crown with a 2:1 side slope (2.5:1 side slope in the southern section).

A floatation canal would be dredged for barge access during construction of the rock dike. That canal would be approximately 80 feet wide and 5 feet deep with a 40-foot berm between the floatation canal and the toe of the rock dike. Placement of the material dredged from the floatation canal would be used to construct an earthen containment dike interior of, and adjacent to, the rock dike. Any extra material would be side-cast into the marsh creation site to a maximum height of +2.5 feet NAVD 88. A magnetometer survey was conducted in the proposed access and floatation channel to identify pipelines and other hazards.

Figure 3. Project Features

B. Marsh Creation

The marsh creation feature would consist of hydraulically dredging Lake Boudreaux bottom sediments and pumping that material into interior open-water and fragmented marshes within the project area to create approximately 284 acres of intertidal emergent marsh. Approximately 15,000 acres of water bottoms in Lake Boudreaux would be dredged to a maximum depth of -20 feet NAVD 88. A magnetometer survey was conducted in the borrow area to identify pipelines and other hazards.

The target height of the marsh creation platform would be +3.2 feet NAVD 88 which is based on sediment consolidation curves prepared as part of the geotechnical investigation (Cooley and Dennis 2003). The consolidation curves indicate the amount of settlement and shrinkage of dredged material expected to occur over time as it dewaters, and takes into consideration the physical characteristics of the dredged material, fill area, and borrow area. The geotechnical investigation indicates that the marsh platform should settle to a height conducive for the growth of marsh within 5 years.

All marsh creation sites would be completely contained with an earthen containment dike. The containment dikes would be built with a bucket dredge to a maximum elevation of +6.0 feet NAVD 88. Borrow material to construct the containment dikes would come from within the marsh creation sites and would be filled with material dredged for marsh creation. Borrow material for the containment dikes adjacent to the rock dikes would come from the construction of the floatation canal and would also be built to a height of + 6.0 NAVD 88. Low-level, interior containment dikes may be built by the construction contractor to compartmentalize the fill sites into manageable units.

C. Access Canal Earthen Plug

An earthen plug would be built in the oil and gas access canal located north of the marsh creation cells. Material for the earthen plug would be bucket dredged from within the access canal and built to a height of +4.0 feet NAVD 88.

SECTION 2.3 OTHER ALTERNATIVES CONSIDERED

Prior to the analysis of the geotechnical information, the soils in the project area were considered too poor to support a foreshore rock dike. Alternatives such as geotubes with lightweight aggregate and concrete panels were considered. After the geotechnical investigation revealed that the soils in the project area would support the weight of a rock foreshore dike, the geotubes and concrete panels were eliminated because of their higher cost.

<u>Decreased Fill Height</u>

Several initial fill elevations between +2.5 feet NAVD 88 and +3.2 feet NAVD 88 were considered for the marsh creation sites. After analyzing the settlement curves provided in the geotechnical report, the +2.5 foot NAVD 88 fill height was eliminated because marsh elevation at Target Year 20 would be below the current marsh elevation (i.e., marsh elevation was estimated to be below the height of healthy marsh).

Dredging with Two Lifts

After analyzing the settlement curves for the fill material provided in the geotechnical report, it was decided to continue with the one lift feature. Data from the settlement curves revealed that after the estimated 6 months it would take to complete the first lift, there would only be a 3 tenths compaction of the fill material. It was felt that the 3 tenths gained did not warrant the expenditure of money for a second lift.

Vegetative Plantings

Vegetative plantings in the marsh creation sites were considered in the early stages of project design. After a thorough review of field data, historic salinity data, and habitat maps, it was concluded that future salinities within the project area would be more supportive of an intermediate marsh than a brackish marsh. Therefore, vegetative plantings were rejected because fresh-to-low salinity marshes tend to revegetate very quickly and the need to expend additional funds for vegetative planting is unnecessary.

SECTION 3.0 AFFECTED ENVIRONMENT

SECTION 3.1 PHYSICAL ENVIRONMENT

A. Regional Hydrology

In the early 1900's, Lake Boudreaux was a land-locked lake with little or no direct linkage to Bayou Grand Caillou to the west and Bayou Petit Caillou to the east. Fresh water entered into the northern marshes of the Lake Boudreaux Basin during high river stages, and eventually flowed into the lake. Salt water exchange took place through over-marsh sheetflow of saline waters via Lake Quitman, or via overbank flooding of Petite Caillou during storms or strong southerly winds. In 1949, wetlands within the Lake Boudreaux subbasin were classified as fresh and intermediate; however, the marshes in the southern half of the subbasin had become brackish by 1968. By 1988, the entire subbasin consisted mainly of brackish marsh and open water, with the exception of a small amount of fresh marsh located in the northeast corner of Lake Boudreaux (LCWCRTF and WCRA 1998*b*).

This change in salinity can be attributed to changes in hydrology that resulted from dredging the Robinson and Boudreaux Canals. High-salinity water is now able to exchange directly with Lake Boudreaux through the Boudreaux Canal and directly with Lake Quitman through the Robinson Canal. The marshes separating Lake Boudreaux and Lake Quitman have also eroded to a point where there is direct exchange between the two lakes.

B. Water Quality

As part of its surface water quality monitoring program, the Louisiana Department of Environmental Quality (LDEQ) routinely monitors several parameters (Table 2) and 31 volatile organic compounds (such as benzene, toluene, and vinyl chloride) on a monthly or bi-monthly basis at a number of sites. There are several long-term sites on larger water bodies throughout the State; currently, sites are monitored intensely for 1 year, and that protocol is repeated on a 5 year cycle (LDEQ 2002). The surface waters of the Terrebonne Basin were monitored intensively in the year 2000.

Table 2. Parameters monitored for the monthly ambient surface water quality network for the LDEQ.

pH and temperature	field conductivity	total suspended solids	lead*
dissolved oxygen	specific conductance	arsenic*	total nitrogen
salinity	sodium	cadmium	nitrate and nitrite
alkalinity	chlorides	chromium*	ammonium nitrogen
hardness	true color	copper*	total phosphorus
secchi disk	sulfates	nickel*	total organic carbon
turbidity	total dissolved solids	mercury*	coliform bacteria

* Metals sampling and analysis is conducted quarterly.

Based upon those data and the use of less-continuous information, such as fish tissue contaminants data, complaint investigations, and spill reports, the LDEQ has assessed water quality fitness in Lake Boudreaux for the following uses: primary contact recreation (swimming), secondary contact recreation (boating and fishing), fish and wildlife propagation, and oyster production. Based upon existing data and the more subjective information, water quality is determined either to fully support, to partially support, or not to support those uses. The water quality in Lake Boudreaux fully supports primary and secondary contact recreation, but is not supportive of fish and wildlife propagation and oyster production (LDEQ 2002). Suspected causes are low dissolved oxygen and total fecal coliform bacteria, while the suspected sources were retention of domestic sewage, on-site treatment systems, and package plant or other permitted small flow discharges (LDEQ 2002).

Salinity and turbidity are important factors which can influence submerged and emergent plant communities in a given area. The interior marshes and open-water portions of the project area have intermediate salinities and non-turbid waters, while the open waters of Lake Boudreaux normally have brackish salinities and turbid waters.

SECTION 3.2 BIOLOGICAL ENVIRONMENT

A. Vegetation

The project area is classified as intermediate marsh, although it has shifted between fresh, intermediate, and brackish marsh (Chabreck and Linscombe 2001, 1997, 1988, 1978, 1968 and O'Neil 1949). With the combination of less fresh water flowing into the project area from the northern marshes and higher salinity water flowing in from the south (i.e., Boudreaux Canal and Robinson Canal), all fresh marshes within the project area have either converted to intermediate/brackish marsh or subsided. Emergent marsh vegetation found within the project area consists of smooth cordgrass, marshhay cordgrass, big-leaf sumpweed, leafy three-square, camphorweed, saltgrass, and dwarf spikesedge. The marsh adjacent to the shoreline of Lake Boudreaux also has a substantial growth of wax myrtles. Submerged plants are dominated by wideongrass, but some coontail can be found along the western and northern portions of the project area.

B. Fisheries

The interior marshes within the project area contain extensive amounts of submerged vegetation as well as emergent vegetation which serve as nursery and feeding habitat for several species of fishes and shellfishes. Several of these resident fishes include the striped mullet, Atlantic croaker, several species of killifish, gar and others. These marshes also support many commercially and recreationally important non-resident fish and shellfish species including red drum, black drum, sheepshead, southern flounder, Gulf menhaden, sand and spotted trout, blue crab, white shrimp, and brown shrimp.

C. Essential Fish Habitat

This project is located in an area identified as Essential Fish Habitat (EFH) for postlarval, juvenile and sub-adult stages of brown shrimp, white shrimp, and juvenile red drum. EFH requirements vary depending upon species and life stage (Table 3). Categories of EFH in the project area include estuarine emergent wetlands, estuarine water column, submerged aquatic vegetation, and estuarine water bottoms. Detailed information on Federally managed fisheries and their EFH is provided in the 1998 generic amendment of the Fishery Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council (GMFMC), which was prepared as required by the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (P.L. 104-297)

Table 3. EFH Requirements for managed species that occur in the project area.

Species	Life Stages	EFH
brown shrimp	post larval/juvenile	marsh edge, SAV, tidal creeks, inner marsh
	subadult	mud bottoms, marsh edge
white shrimp	post larval/juvenile	marsh edge and ponds, SAV, inner marsh
	subadult	same as post larval/juvenile
red drum	post larval/juvenile	SAV, estuarine mud bottoms, marsh/water interface

In addition to being designated as EFH for white shrimp, brown shrimp, and red drum, aquatic habitats that may be affected provide nursery and foraging habitats for a variety of economically important fishery species including Atlantic croaker, striped mullet, Gulf menhaden, and blue crab. These estuarine-dependent species serve as prey for other species managed under the MSFCMA by the GMFMC (e.g., red drum, mackerels, snappers, and groupers) and highly migratory species (e.g., billfishes and sharks) managed by the National Marine Fisheries Service (NMFS).

D. Wildlife

The project area provides important habitat for several species of wildlife, including waterfowl, wading birds, shorebirds, mammals, reptiles and amphibians. The project area provides wintering habitat for migratory puddle ducks including mallard, gadwall, northern pintail, blue-winged teal, green-winged teal, American widgeon, and northern shoveler. The resident mottled

duck, which nests in fresh to brackish marshes along the coast, is found throughout the year within project area marshes.

Common wading bird species which utilize the project area include the great blue heron, little blue heron, green heron, tricolored heron, great egret, snowy egret, cattle egret, yellow-crowned night-heron, black-crowned night-heron, glossy ibis, and white ibis. Mudflats and shallow-water areas provide habitat for numerous species of shorebirds and seabirds. Shorebirds include the killdeer, American avocet, willet, black-necked stilt, dowitchers, common snipe, and various species of sandpipers. Seabirds include the white pelican, brown pelican, herring gull, laughing gull, and several species of terns.

Other common bird species found in the project area include boat-tailed grackle, red-winged blackbird, seaside sparrow, northern harrier, osprey, belted kingfisher, and marsh wrens. Besides migratory waterfowl, other game birds which occur within the area include the clapper rail, sora, Virginia rail, American coot, and common snipe.

Other commercially and economically significant animals that occur in the project area include nutria, muskrat, mink, raccoon, and the American alligator.

E. Threatened and Endangered Species

No known endangered brown pelicans colonies occur within the project area; however, this species may feed in the shallow estuarine waters, as well as use mud flats within the interior portions of the project area as rest and roost sites. Major threats to this species include chemical pollutants, colony site erosion, disease, and human disturbance. No other listed species, or their critical habitat are presently known to occur in the project area.

SECTION 3.3 CULTURAL AND RECREATIONAL RESOURCES

Various cultural resources occur throughout the Louisiana coastal zone, including both prehistoric and historic sites. The Louisiana Department of Culture, Recreation and Tourism maintains catalogues of numerous cultural resource sites, but many areas have never been surveyed and the significance or eligibility of some sites for inclusion in the National Register of Historic Places has not been determined. A review of the proposed project was conducted by the Louisiana Office of Cultural Development, Division of Archeology; that review indicated that no archeological sites were found within the project area.

Recreational use of the project area is oriented primarily toward hunting, fishing, and crabbing. Access to the project area is primarily by boat, but access can also be obtained by a road located along the forced drainage levee on the western side of the project. There are no boat launches along Lake Boudreaux, but access to the lake is provided by boat launches along Highway 57 in Dulac, Louisiana, and along Highway 56 south of Chauvin, Louisiana.

SECTION 3.4 ECONOMIC RESOURCES

Coastal wetlands like those within the project area provide essential nursery habitat for commercially and recreationally important fishes and shellfishes such as Gulf menhaden, red drum, black drum, spotted seatrout, southern flounder, brown shrimp, white shrimp, blue crab and others. National Marine Fisheries Service statistics for the last 20 years indicate that coastal Louisiana contributes approximately 20 percent of the nation's total commercial fisheries harvest (LCWCRTF and WCRA 1998*a*). The total economic value of Louisiana's commercial fishery landings approaches $1 billion annually. Shrimp, oyster, blue crab and Gulf menhaden account for 98 percent of that value. Additionally, Louisiana's shrimp and oyster harvests comprise approximately 35 to 40 percent of the national total for those species (LCWCRTF 1993). Recreational fishing in Louisiana's coastal marshes has an estimated annual economic impact of $500 million (LCWCRTF 1993). Currently Lake Boudreaux does not support any commercial or recreational oyster production, but there is one commercial oyster lease located near the project boundary. Louisiana's coastal wetlands also produce more wild furs than any other state in the nation as well as providing substantial economic value associated with waterfowl hunting.

There are two pipelines within the project area as well as one access canal used to access an oil well that has been abandoned.

SECTION 4.0 ENVIRONMENTAL CONSEQUENCES

SECTION 4.1 ALTERNATIVE 1 - NO ACTION

A. Physical Environment

Hydrology and Water Quality
Under the No Action Alternative, no changes to regional hydrology are expected. Salt water would continue to enter Lake Boudreaux from Boudreaux Canal and Robinson Canal via Lake Quitman. Some fresh or low salinity water would continue to enter Lake Boudreaux through Bayou Dulac, and freshwater runoff would enter the marshes north of the project area from Bayou Chauvin. The western shoreline of Lake Boudreaux would continue to erode allowing an increasing amount of turbid, brackish water from the lake to enter the interior marshes and open-water areas located within the project boundary.

B. Biological Environment

Vegetation
In the No Action Alternative, water exchange between Lake Boudreaux and the interior marsh and open-water areas would increase, and water salinity and turbidity within the interior portions of the project area would also increase. The increase in water turbidity would reduce the amount of SAV located in the interior open-water areas. The increase in salinity would shift the highly diverse intermediate marsh to a less diverse brackish marsh.

Fisheries
The continued erosion of the western shoreline of Lake Boudreaux would reduce marsh edge habitat, increase salinity, and increase turbidity, which would effectively lower the amount of SAV habitat available for juvenile fish. This decrease in SAV habitat and continued erosion of emergent marsh would directly affect important commercial and recreational fisheries; thus, continued erosion of emergent marsh coupled with stressed or dying SAV, which is essential to estuarine fish populations, could reduce those populations.

Essential Fish Habitat
Intermediate marsh and SAV is considered by the NMFS to be EFH for several estuarine-dependent species. The continued loss of this habitat over time without restoration could contribute to decreased fish stocks.

Wildlife
Under the No Action Alternative, the continued loss of marsh and submerged aquatic vegetation to shoreline erosion would reduce habitat values for a variety of wildlife species. The many ducks and other wetland-associated birds that utilize the marsh, marsh edge, and submerged aquatic vegetation for food and cover would be negatively impacted, as would game mammals, fur animals, reptiles and amphibians.

Threatened and Endangered Species
The endangered brown pelican may feed in the shallow estuarine waters of the project area, as well as use mud flats as resting and roosting areas. The potential for brown pelicans using the project area would continue under the No Action Alternative, but resting and roosting habitat could potentially decrease with the increased transport of materials including sediments from the project area to Lake Boudreaux.

C. Cultural and Recreational Resources
Because there are no archeological sites located within the project area, no adverse affects to archeological sites are expected. Recreational hunting and fishing opportunities would however, decrease with the loss of SAV habitat and emergent marsh.

D. Economic Resources
The continued loss of emergent and submergent vegetation in the project area would contribute to the decline of recreational hunting and fishing as well as commercial fishing that currently occur in the project area.

SECTION 4.2 ALTERNATIVE 2 - PREFERRED ALTERNATIVE

A. Physical Environment

Hydrology and Water Quality
As in the No Action Alternative, no significant changes to the regional hydrology are expected under the Preferred Alternative. Salt water would continue to enter Lake Boudreaux from Boudreaux Canal and Robinson Canal via Lake Quitman. Some fresh or low salinity water

would continue to enter Lake Boudreaux through Bayou Dulac and freshwater runoff would enter the marshes north of the project area from Bayou Chauvin.

Water quality would, however, be affected under the Preferred Alternative. Dredging activities in Lake Boudreaux, the placement of dredged material in the project area, and the construction of containment and foreshore rock dikes would increase turbidity as bottom sediments are disturbed. However, the increased turbidity would only occur during periods of active dredging and is expected to dissipate rapidly upon completion of construction. In addition, turbidities may increase after rainfall events as water runs off the unvegetated marsh platform, especially immediately after dredged material deposition.

B. Biological Environment

Vegetation

Under the Preferred Alternative, approximately 284 acres of marsh would be created. Very little emergent vegetation would be present immediately after construction as most of the project area would be unvegetated dredged material and complete revegetatation of the marsh platform may take 3 to 5 years. Vegetative communities would likely be very similar to those currently found within the project area with a highly diverse brackish-to-intermediate marsh community. Smooth and marshhay cordgrass would likely be the dominant species along with leafy three-square, camphorweed, and dwarf spikesege. Sparse amounts of other species such as bulltongue, cattail, and California bulrush could also become more prevalent.

Under the Preferred Alternative, shoreline erosion within the project area would be halted, but marsh loss through subsidence would continue, albeit at a reduced rate. The WVA prepared by the CWPPRA Environmental Work Group projected that land loss for created marshes would continue at a rate of 1.15 percent per year compared to the 2.3 percent per year under the No Action Alternative (i.e., a 50 percent reduction). Erosion rates for existing marshes would be reduced to 1.72 percent per year (i.e., a 25 percent reduction). Within the project area, 455 acres of marsh would remain at the end of the 20-year project life under the Preferred Alternative, compared to only 178 acres under the No Action Alternative**,** and a substantial acreage of marsh would remain within the project area for many years after the project life.

Submerged plant species are expected to remain the same as those currently found in the project area (i.e., wigeon grass and coontail); however, as direct water exchange between the open water areas of the project area with Lake Boudreaux is substantially reduced, other species typical of intermediate marsh (watercelery, fanwort, and bladderwort) may begin to populate the area. The WVA indicates that the coverage of SAV is projected to increase from 5 percent of the open water with the No Action Alternative, to 50 percent of the open water with the Preferred Alternative at the end of the 20-year project life. The smaller, shallower ponds which would form within the marsh platform would be more conducive for the establishment of submerged aquatic vegetation. Those smaller water bodies would also be less susceptible to increases in turbidity from wind generated waves.

Fisheries
Under the Preferred Alternative, the creation of intertidal marsh would increase fish and shellfish habitat and the protection of that marsh through the construction of a foreshore dike would ensure that the project area continues to provide important nursery functions well beyond the 20-year project life. Several studies indicate that vegetated habitats (i.e., emergent marsh and submerged aquatic vegetation beds) generally support higher densities of fish and crustaceans than unvegetated habitat (Castellanos and Rozas 2001, Rozas and Minello 2001, Minello and Rozas 2002). Those vegetative habitats provide an important nursery function for several species including blue crab, Gulf menhaden, red drum, brown shrimp, and spotted seatrout. With the implementation of the Preferred Alternative, an additional 277 acres of emergent marsh will result when compared to the No Action Plan.

Essential Fish Habitat Assessment
Estuarine emergent wetland is the primary type of EFH that would increase significantly under the Preferred Alternative; such habitat would be created in open-water areas and deteriorated marsh. According to the WVA, an additional 277 acres of emergent marsh would exist at the end of the project life under the Preferred Alternative, compared to the No Action Alternative. Coverage of submerged aquatic vegetation is also expected to increase. Increases in those habitat types would benefit postlarval/juvenile and subadult brown shrimp; postlarval/juvenile and subadult white shrimp; and, postlarval/juvenile red drum.

The creation of estuarine emergent wetlands would result in the loss of mud bottom and estuarine water column as emergent marsh would replace those habitat types. Loss of mud bottom EFH could result in negative impacts to subadult brown shrimp and postlarval/juvenile, red drum. Although adverse impacts would occur to some types of EFH, more productive types of EFH (i.e., estuarine emergent wetlands) would be created under the Preferred Alternative. In addition, open-water habitat would form within the marsh platform as ponds and other waterbodies develop as a result of natural marsh loss processes. Open-water habitats are expected to contain dense coverage (i.e., 50 percent per the 2001 WVA) of submerged aquatic vegetation compared to only 5 percent under the No Action Alternative. Therefore, the Preferred Alternative would result in a net positive benefit to all managed species that occur in the project area.

Wildlife
The Preferred Alternative would result in improved habitat conditions for several species of wildlife including migratory and resident waterfowl, shorebirds, wading birds, and furbearers. Migratory waterfowl utilizing the project area would benefit from a greater food supply resulting from the increased abundance and diversity of emergent and submerged plant species. Habitat for the resident mottled duck would also improve considerably as the marsh platform would provide more desirable nesting habitat.

Intertidal marsh and marsh edge would also provide increased foraging opportunities for shorebirds and wading birds. Small fishes and crustaceans are often found in greater densities along vegetated marsh edge (Castellanos and Rozas 2001, Rozas and Minello 2001), and many of those species are important prey items for wading birds such as the great blue heron, little blue heron, great egret, black-crowned night-heron, and snowy egret. Mudflats and shallow water habitat created by the deposition of dredged material would provide increased foraging

opportunities for shorebirds such as least sandpipers, killdeer, and the American avocet. Those species feed on tiny invertebrates and crustaceans found on mudflats which are exposed at low tide and in shallow-water areas of the appropriate depth.

Furbearers (such as the nutria and muskrat) which feed on vegetation would benefit from the increased marsh acreage in the project area. Representative furbearers such as the mink, river otter, and raccoon have a diverse diet and feed on many different species of fishes and crustaceans. Those species often feed along vegetated shorelines which provide cover for many of their prey species.

Threatened and Endangered Species
The Preferred Alternative would have minimal impacts on endangered brown pelicans which may feed in the shallow estuarine waters of the project area. Any displacement of brown pelicans during project construction would be temporary because of the immense amount of suitable habitat in the vicinity of the project area. The Service will conduct an Intra-Service Section 7 Endangered Species Act consultation prior to issuing the Finding of No Significant Impact (FONSI) and Environmental Action Statement (EAS) for this project.

C. Cultural and Recreational Resources
There are no archeological sites located within the area of potential project effects. By letter dated January 21, 2004, the Louisiana Department of Culture, Recreation and Tourism indicated that they have no objection to implementation of the Preferred Alternative.

Recreational opportunities within the project area, such as hunting and bird watching, may increase with the increased formation of emergent marsh and other fish and wildlife habitats. An increase in habitat value would likely result in increased fish and wildlife usage of the project area.

D. Economic Resources
By increasing emergent wetlands, and subsequently fish and wildlife resources, the Preferred Alternative would help to maintain that portion of the local economy dependent on the recreational and commercial fish and wildlife resources found within the project area. Project-area waterfowl hunting, trapping, and commercial and recreational fishing are important components of the local economy, and creation of emergent marsh, and other important fish and wildlife habitats could increase the ability of the project area to support those activities. The increased acreage of emergent wetlands would also act as a storm buffer for oil and gas facilities in the area as well as a levee that protects the town of Boudreaux.

SECTION 5.0 DISCUSSION OF ALTERNATIVES

SECTION 6.0 RATIONAL FOR SELECTING PREFERRED ALTERNATIVE

Currently, marsh elevations across the project area, particularly in areas of fragmented marsh, are not conducive to the continued existence of the dominant plant species, saltmeadow cordgrass, which prefers higher elevations. Ponding and prolonged inundation, due to subsidence, have

resulted in the deterioration of those areas and the formation of shallow, open-water habitat. Continued subsidence would result in the future deterioration of the remaining stands of healthy, unfragmented marsh. Elevation surveys conducted at three sites within the project area indicate an average marsh elevation of +1.3 feet NAVD 88 (PENSCO, Inc. 2004). However, it should be noted that those surveys were conducted in sites supporting relatively unfragmented, healthy stands of marsh and do not represent average marsh elevations across the entire project area. An average marsh elevation for the entire project area, including fragmented areas of marsh, would be somewhat lower than +1.3 feet. With the current design elevation of +3.2 feet, the marsh platform would reach +1.3 feet within 10 to 20 years after construction. Elevations supporting emergent vegetation would persist throughout the 20-year project life.

Dedicated dredging to create marsh in shallow, open-water areas has been successfully used as a restoration technique across coastal Louisiana. Since CWPPRA was authorized in 1990, several marsh creation projects have been constructed (Table 4) and many more are authorized for engineering and design, or construction, by the LCWCRTF (Belhadjali and Stead 2003). Also, several barrier island restoration projects have been constructed which utilize hydraulic dredging to create dune and marsh habitats. In addition, many other marsh creation projects have been constructed by the State of Louisiana through its Coastal Restoration Program as mitigation for wetland impacts under Section 404 of the Clean Water Act, and by the Corps of Engineers under other authorities such as Sections 204 and 1135 of the Water Resources Development Act.

Table 4. Marsh Creation Projects Constructed/Authorized under CWPPRA.

Project Name	Acres Benefited	Construction Completion Date
Bayou Labranche Wetland Creation	203	1994
Atchafalaya Sediment Delivery	2,232	1998
Big Island Mining	1,560	1998
West Belle Pass Headland Restoration	474	1998
Lake Chapeau Sediment Input and Hydrologic Restoration, Point Au Fer Island	509	1999
Sabine Refuge Marsh Creation	993	Increment 1 completed in 2002. Increments 2-5 are pending.
Barataria Waterway Wetland Restoration	9	1996
East/West Grand Terre Islands Restoration	472	Pending
Little Lake Shoreline Protection/Dedicated Dredging near Round Lake	713	Pending
Mississippi River Sediment Delivery System	400	Pending
Castille Pass Channel Sediment Delivery	589	Pending
North Lake Mechant Landbridge	604	Pending

Restoration		
Dedicated Dredging on Barataria Landbridge	1,217	Pending

Scientific studies in coastal Louisiana also provide support for the use of dedicated dredging to restore coastal wetlands. Most research conducted on dedicated dredging projects in coastal Louisiana has occurred within saline marsh habitats. Although the project area supports an intermediate to brackish marsh community, the project results should be similar to those observed in saline marsh. Marshes created at the correct elevation take only a few years to develop vegetative communities similar to those in natural marshes (Edwards and Proffitt 2003). Percent vegetative cover also equals that found in natural marshes, but only after several years of growth (Proffitt and Young 1999). However, soil characteristics between created and natural marshes are often very different, with created marshes being lower in organic matter and higher in bulk density (Edwards and Proffitt 2003).

The Preferred Alternative is supported by the LCWCRTF, which approved funding for engineering and design at their January 2002 meeting. The Preferred Alternative would create emergent marsh in the project area, increase its habitat value for fish and wildlife resources, and result in a net gain of 277 acres of marsh at the end of the project life, compared to the No Action Alternative. The Preferred Alternative also supports the restoration strategies recommended for this region in the Coast 2050 Plan. It is not anticipated that land rights issues would preclude construction of project features.

The Preferred Alternative would reduce shoreline erosion to protect 80 acres of emergent marsh along the western shoreline of Lake Boudreaux which helps protect the interior low-salinity marshes and aquatic grassbeds from the high wave energy and turbidity found in Lake Boudreaux. This shoreline also protects the forced drainage levee along the eastern side of Dulac, Louisiana. This alternative would also initially create 284 acres of emergent marsh along the shoreline and interior marshes through deposition of dredged material.

The Preferred Alternative is supported by the Terrebonne Parish Council and many of the local landowners. This project has also received support from several natural resource agencies, including USFWS, LDNR, LDWF, NMFS, EPA, COE, and NRCS.

SECTION 7.0 COMPATIBILITY WITH CWPPRA AND COMMUNITY OBJECTIVES

The Preferred Alternative would help to achieve CWPPRA objectives for protection and restoration of Louisiana's coastal wetlands, and community infrastructure protection objectives would likely be enhanced by the proposed project. Common socioeconomic goals include conservation of sustainable fishing, shrimping, crabbing, and hunting opportunities. The general public also supports wetland restoration and preservation for fish and wildlife habitat, and for recreational, esthetic, and other nonconsumptive uses.

SECTION 8.0 COMPLIANCE WITH LAWS, REGULATIONS, AND POLICIES

This Environmental Assessment was prepared in compliance with the National Environmental Policy Act of 1969 (NEPA). It is consistent with the NEPA-compliance procedures contained in the Fish and Wildlife Service Manual (550 FW 1-3), and employs a systematic, interdisciplinary approach. The proposed action alternative involves disposal of fill material into waters or wetlands; therefore, an evaluation under Section 404(b)(1) of the Clean Water Act of 1977, as amended, is required, as well as State of Louisiana water quality certification under Section 401. By letter dated April 22, 2006, a Clean Water Act Section 404 permit was received from the U.S. Army Corps of Engineers, as well as Water Quality Certification from the Louisiana Department of Environmental Quality dated February 20, 2006.

The proposed action is located within the Louisiana Coastal Zone, but involves no construction activities that would result in significant direct, indirect, or cumulative adverse impacts to coastal waters or wetlands. By letter dated January 19, 2006, the Louisiana Department of Natural Resources indicated that the Preferred Alternative is consistent with the Louisiana Coastal Resources Program.

Under the MSFCMA, the Service initiated consultation with the National Marine Fisheries Service upon submission of the draft Environmental Assessment and has evaluated project-related impacts to EFH within the project area. Although the Preferred Alternative would result in adverse impacts to some categories (i.e., mud bottom and estuarine water column) of EFH, more productive categories of EFH, such as estuarine emergent wetlands, would be created. Therefore, the Service finds that the Preferred Alternative would not result in net adverse impacts to habitats designated as EFH under the MSFCMA.

There are no cultural resource sites located within the footprint of the proposed action. By letter dated January 21, 2004, the Louisiana Department of Culture, Recreation and Tourism indicated that they have no objection to implementation of the Preferred Alternative. The project is also in compliance with the National Historic Preservation Act of 1966, as amended.

Pursuant to Executive Order 12898 (Environmental Justice for Minority Populations), the Service has determined that the Preferred Alternative will not result in disproportionately high and adverse human health or environmental impacts on minority and low-income populations.

Other Federal and state issues reviewed for compliance for the proposed action include, but are not limited to: the Endangered Species Act of 1973, as amended; Archeological and Historic Preservation Act of 1974; Executive Order 11988 (Floodplain Management); Executive Order 11990 (Protection of Wetlands); and Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds). Full compliance with relevant laws and regulations has been achieved with review of this Environmental Assessment by appropriate agencies and interested parties, and the signing of a Finding of No Significant Impact and Environmental Action Statement.

SECTION 9.0 PREPARER

This Environmental Assessment was prepared by Robert Dubois, Fish and Wildlife Biologist with the U.S. Fish and Wildlife Service, Lafayette Field Office, Lafayette, Louisiana.

SECTION 10.0 LITERATURE CITED

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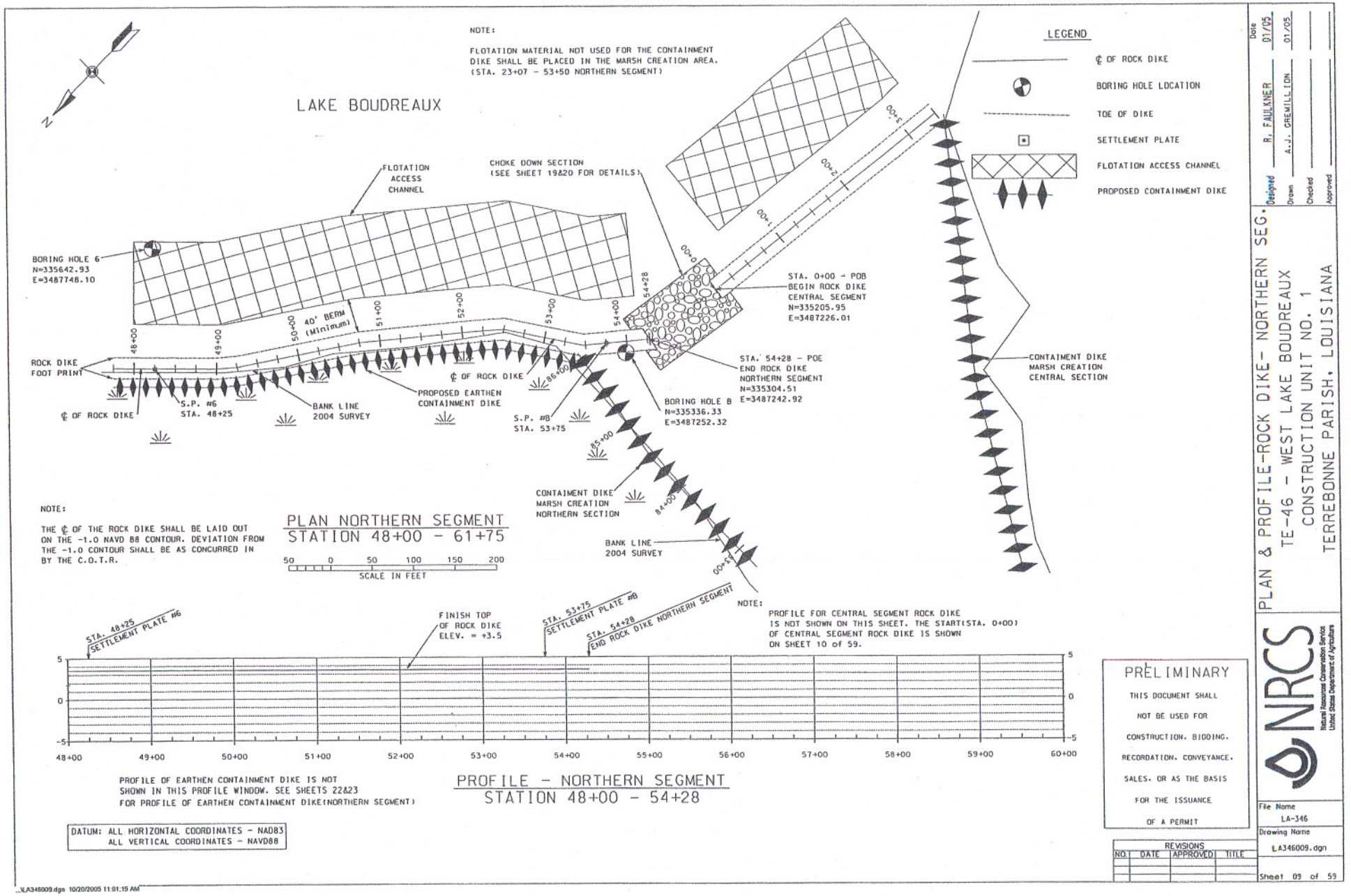
APPENDIX A- Detailed Illustrations of Project Features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PROPOSED EARTHEN CONTAINMENT DIKE
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STA. 0+00 - POB
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CENTRAL SEGMENT
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END ROCK DIKE
NORTHERN SEGMENT
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BORING HOLE B
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CONTAIMENT DIKE
MARSH CREATION
NORTHERN SECTION
BANK LINE
2004 SURVEY
LEGEND
℄ OF ROCK DIKE
BORING HOLE LOCATION
TOE OF DIKE
SETTLEMENT PLATE
FLOTATION ACCESS CHANNEL
PROPOSED CONTAINMENT DIKE
CONTAIMENT DIKE
MARSH CREATION
CENTRAL SECTION
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SCALE IN FEET
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STA. 53+75 SETTLEMENT PLATE #8
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ALL VERTICAL COORDINATES - NAVD88
PRELIMINARY
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REVISIONS
NO. DATE APPROVED TITLE
Date
Designed R. FAULKNER 01/05
Drawn A.J. GREWILLION 01/05
Checked
Approved
PLAN & PROFILE-ROCK DIKE- NORTHERN SEG.
TE-46 - WEST LAKE BOUDREAUX
CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA
NRCS
Natural Resources Conservation Service
United States Department of Agriculture
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Sheet 09 of 59
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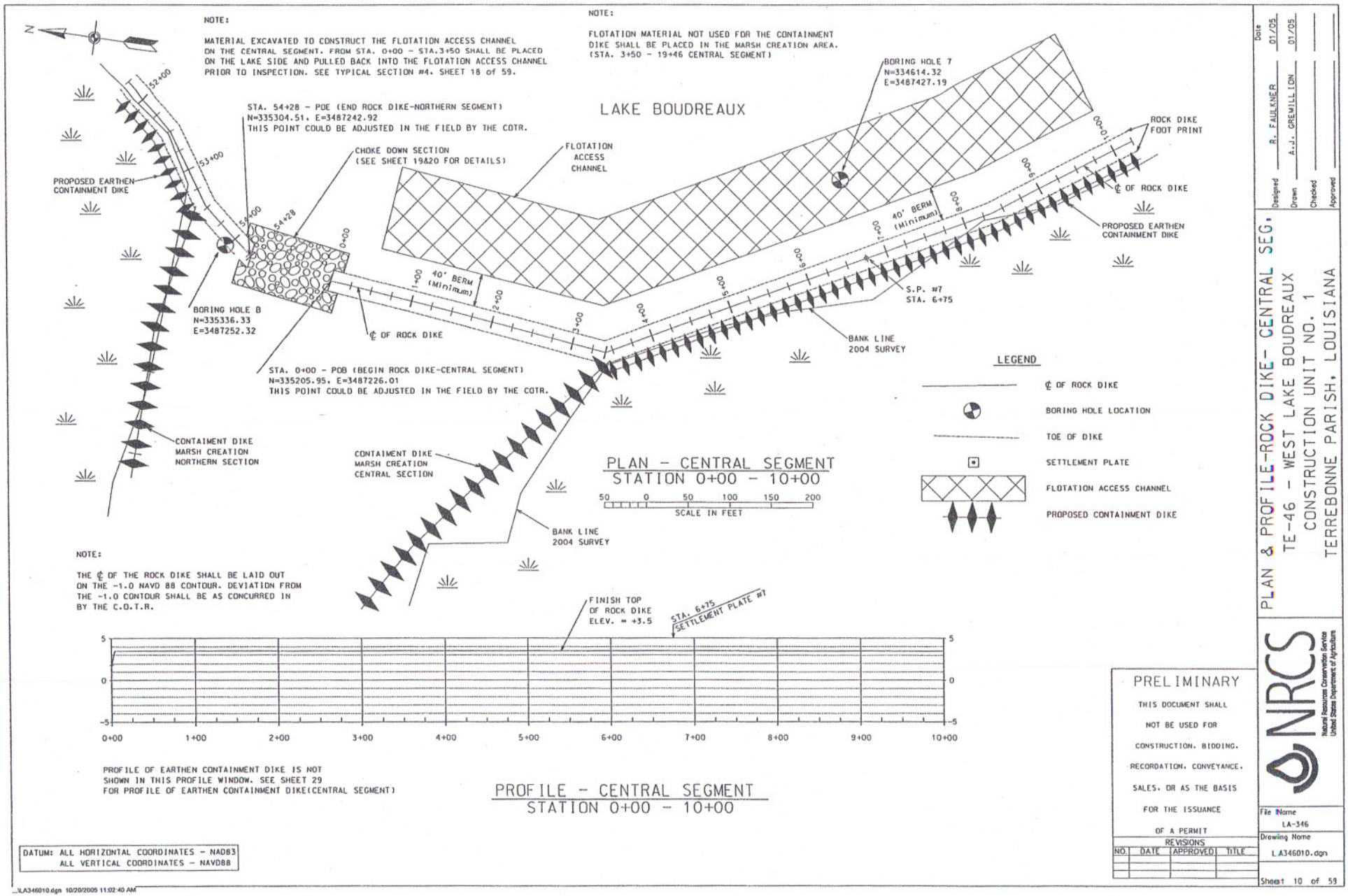
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CHOKE DOWN SECTION
(SEE SHEET 19&20 FOR DETAILS)
FLOTATION ACCESS CHANNEL
ROCK DIKE FOOT PRINT
PROPOSED EARTHEN CONTAINMENT DIKE
℄ OF ROCK DIKE
40' BERM (Minimum)
PROPOSED EARTHEN CONTAINMENT DIKE
BORING HOLE 8
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BANK LINE
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CONTAIMENT DIKE MARSH CREATION NORTHERN SECTION
CONTAIMENT DIKE MARSH CREATION CENTRAL SECTION
BANK LINE
2004 SURVEY
LEGEND
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BORING HOLE LOCATION
TOE OF DIKE
SETTLEMENT PLATE
FLOTATION ACCESS CHANNEL
PROPOSED CONTAINMENT DIKE
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REVISIONS
NO. DATE APPROVED TITLE
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Drawn A.J. CREMILLION 01/05
Checked
Approved
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TE-46 - WEST LAKE BOUDREAUX
CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA
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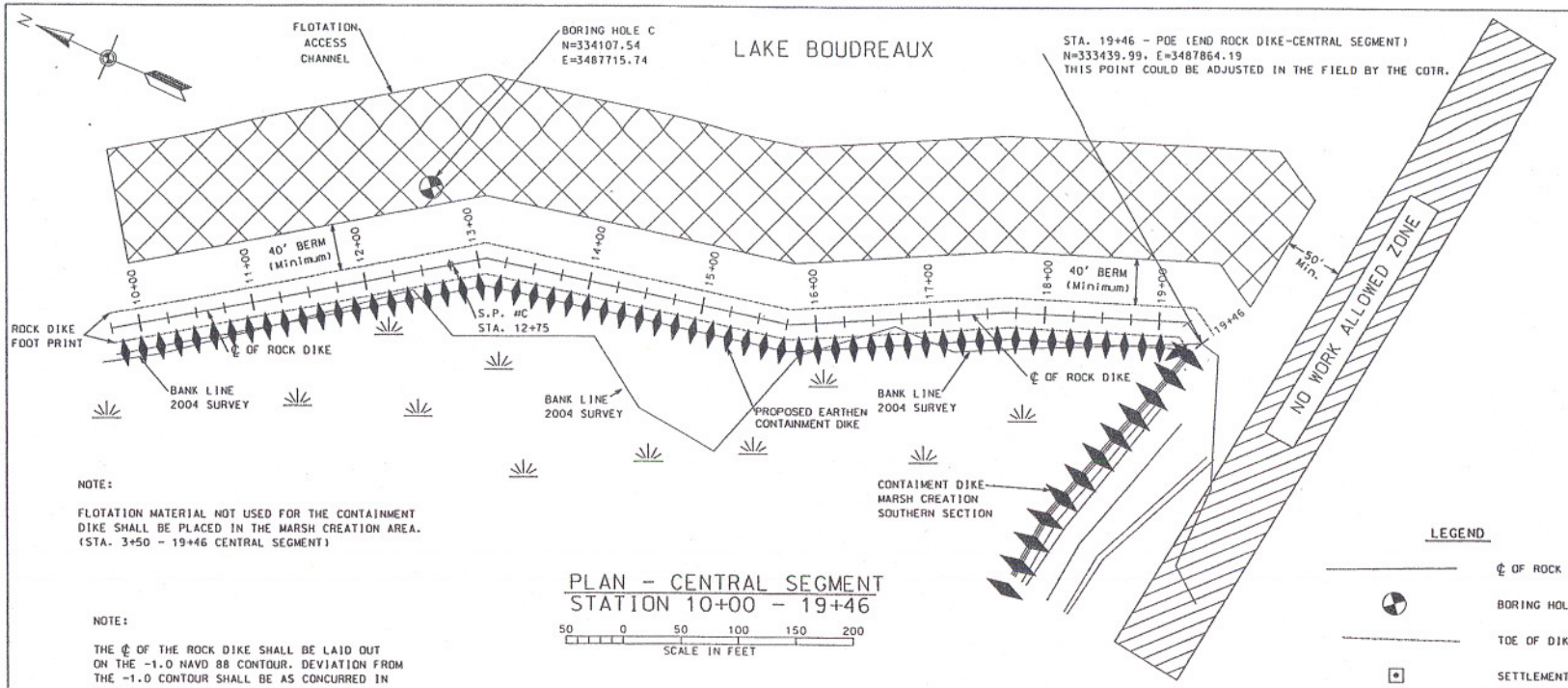

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LEGEND

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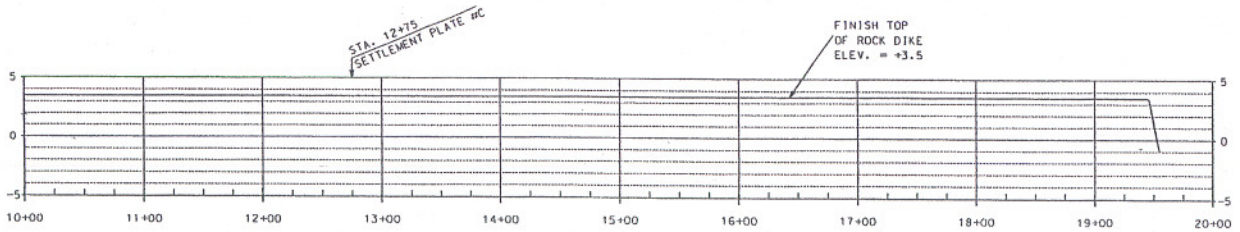

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Date
Designed R. FAULKNER 01/05
Drawn A.J. GREWILLION 01/05
Checked
Approved

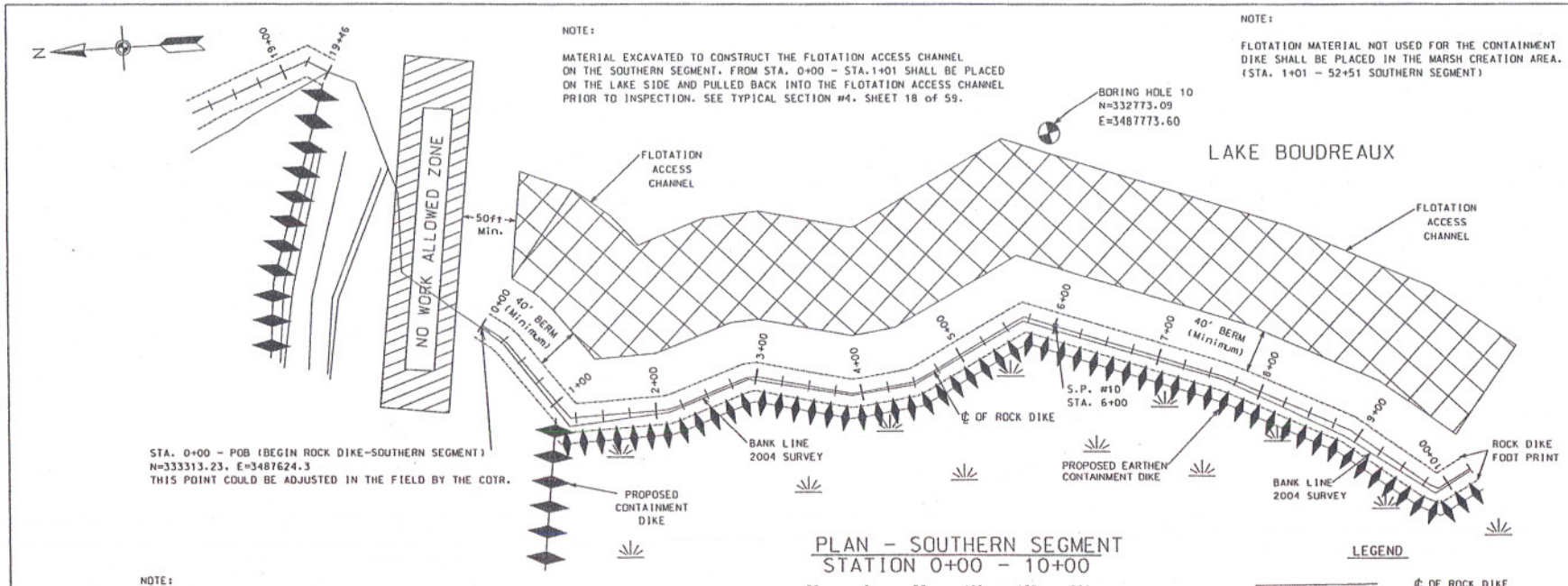
PLAN & PROFILE-ROCK DIKE- CENTRAL SEG.
TE-46 - WEST LAKE BOUDREAUX
CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA

NRCS Natural Resources Conservation Service, United States Department of Agriculture

File Name LA-346
Drawing Name LA346011.dgn

Sheet 11 of 59

LA346011.dgn 10/20/2005 11:03:48 AM



NOTE:

MATERIAL EXCAVATED TO CONSTRUCT THE FLOTATION ACCESS CHANNEL ON THE SOUTHERN SEGMENT, FROM STA. 0+00 - STA.1+01 SHALL BE PLACED ON THE LAKE SIDE AND PULLED BACK INTO THE FLOTATION ACCESS CHANNEL PRIOR TO INSPECTION. SEE TYPICAL SECTION #4, SHEET 18 of 59.

NOTE:

FLOTATION MATERIAL NOT USED FOR THE CONTAINMENT DIKE SHALL BE PLACED IN THE MARSH CREATION AREA. (STA. 1+01 - 52+51 SOUTHERN SEGMENT)

PLAN - SOUTHERN SEGMENT
STATION 0+00 - 10+00

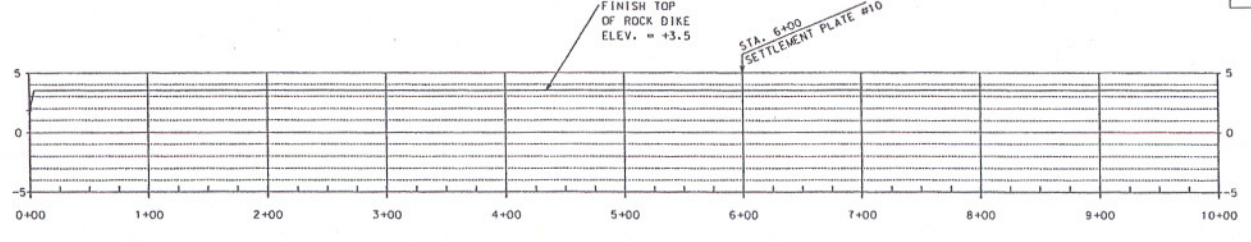
50 0 50 100 150 200
SCALE IN FEET

NOTE:

THE ℄ OF THE ROCK DIKE SHALL BE LAID OUT ON THE -1.0 NAVD 88 CONTOUR. DEVIATION FROM THE -1.0 CONTOUR SHALL BE AS CONCURRED IN BY THE C.O.T.R.

LEGEND

- ℄ OF ROCK DIKE
- BORING HOLE LOCATION
- TOE OF DIKE
- SETTLEMENT PLATE
- FLOTATION ACCESS CHANNEL
- PROPOSED CONTAINMENT DIKE



PROFILE OF EARTHEN CONTAINMENT DIKE IS NOT SHOWN IN THIS PROFILE WINDOW. SEE SHEETS 33&34 FOR PROFILE OF EARTHEN CONTAINMENT DIKE(SOUTHERN SEGMENT)

PROFILE - SOUTHERN SEGMENT
STATION 0+00 - 10+00

DATUM: ALL HORIZONTAL COORDINATES - NAD83
ALL VERTICAL COORDINATES - NAVD88

PRELIMINARY

THIS DOCUMENT SHALL NOT BE USED FOR CONSTRUCTION, BIDDING, RECORDATION, CONVEYANCE, SALES, OR AS THE BASIS FOR THE ISSUANCE OF A PERMIT

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Approved		

PLAN & PROFILE-ROCK DIKE- SOUTHERN SEG.
TE-46 - WEST LAKE BOUDREAUX
CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA

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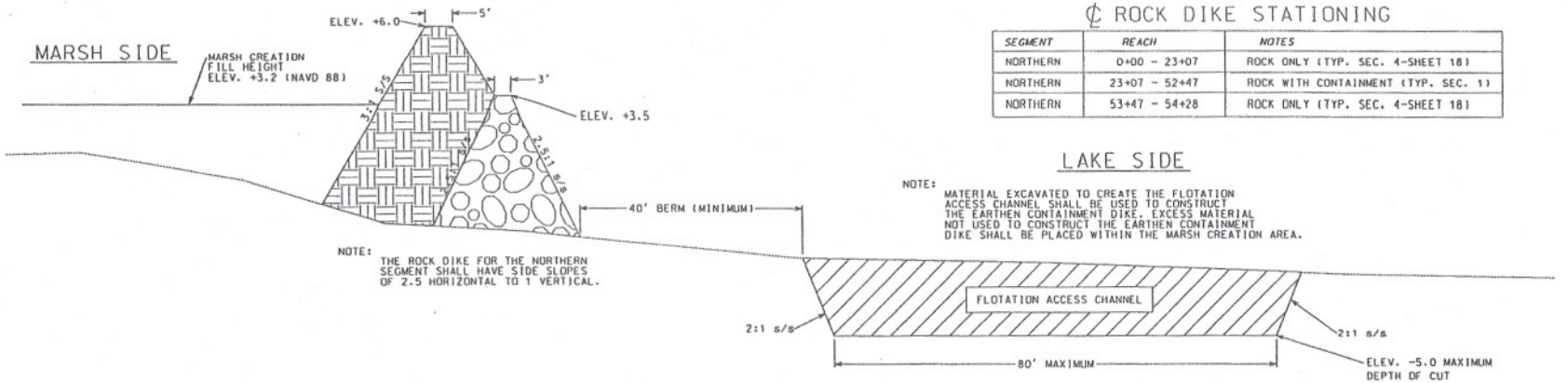
File Name
LA-346

Drawing Name
LA346012.dgn

Sheet 12 of 59

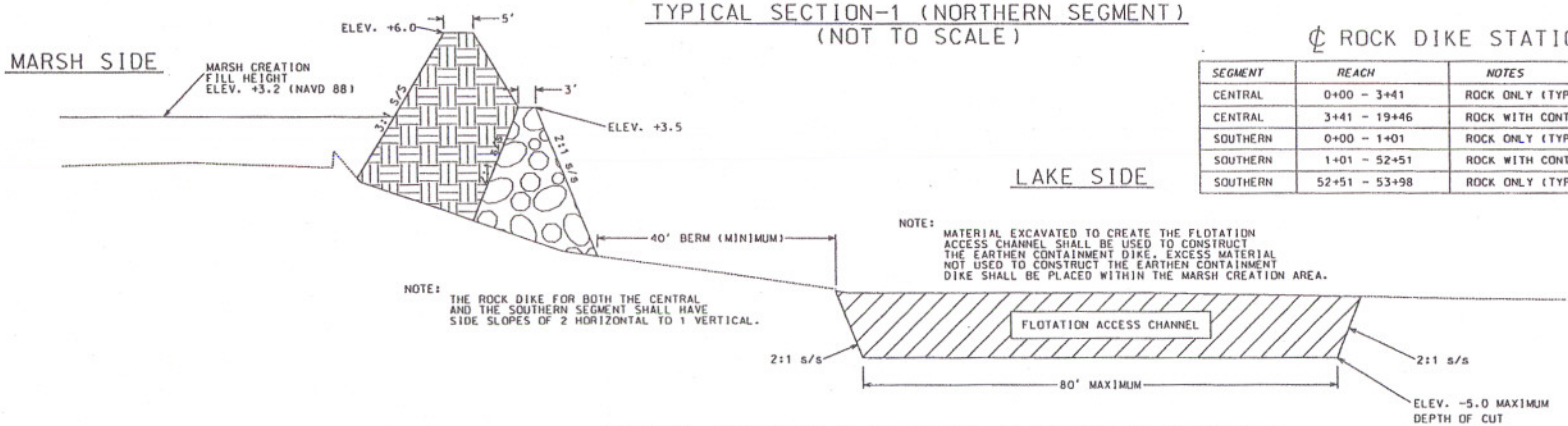
LA346012.dgn 10/20/2005 11:05:10 AM



TYPICAL SECTION-1 (NORTHERN SEGMENT)
(NOT TO SCALE)

℄ ROCK DIKE STATIONING

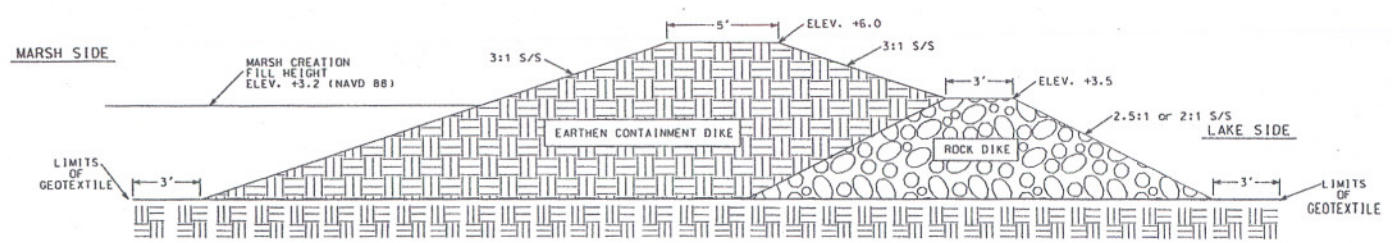
SEGMENT	REACH	NOTES
NORTHERN	0+00 - 23+07	ROCK ONLY (TYP. SEC. 4-SHEET 18)
NORTHERN	23+07 - 52+47	ROCK WITH CONTAINMENT (TYP. SEC. 1)
NORTHERN	53+47 - 54+28	ROCK ONLY (TYP. SEC. 4-SHEET 18)



TYPICAL SECTION-2 (CENTRAL & SOUTHERN SEGMENT)
(NOT TO SCALE)

℄ ROCK DIKE STATIONING

SEGMENT	REACH	NOTES
CENTRAL	0+00 - 3+41	ROCK ONLY (TYP. SEC 4-SHEET 18)
CENTRAL	3+41 - 19+46	ROCK WITH CONTAINMENT (TYP. SEC. 2)
SOUTHERN	0+00 - 1+01	ROCK ONLY (TYP. SEC. 4- SHEET 18)
SOUTHERN	1+01 - 52+51	ROCK WITH CONTAINMENT (TYP. SEC. 2)
SOUTHERN	52+51 - 53+98	ROCK ONLY (TYP. SEC. 4-SHEET 18)



DETAILS-ROCK DIKE WITH ADJOINING EARTHEN CONTAINMENT DIKE
(NOT TO SCALE)

PRELIMINARY

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Drawn A.J. GREMILLION 01/05
Checked
Approved

TYPICAL SECTIONS
TE-46 - WEST LAKE BOUDREAUX
CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

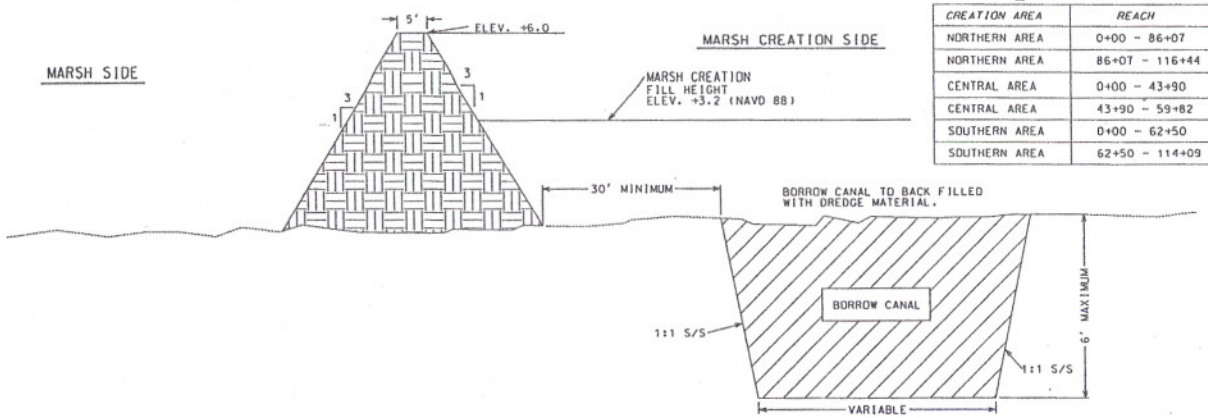
File Name
LA-346
Drawing Name
LA346017.dgn

Sheet 17 of 59

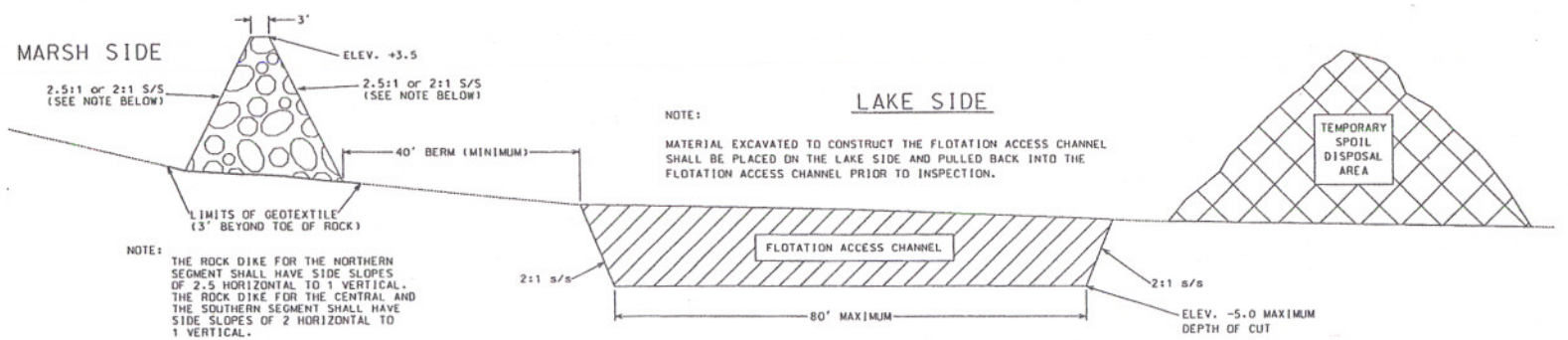
LA346017.dgn 10/20/2005 11:11:45 AM

℄ EARTHEN CONTAINMENT DIKE STATIONING

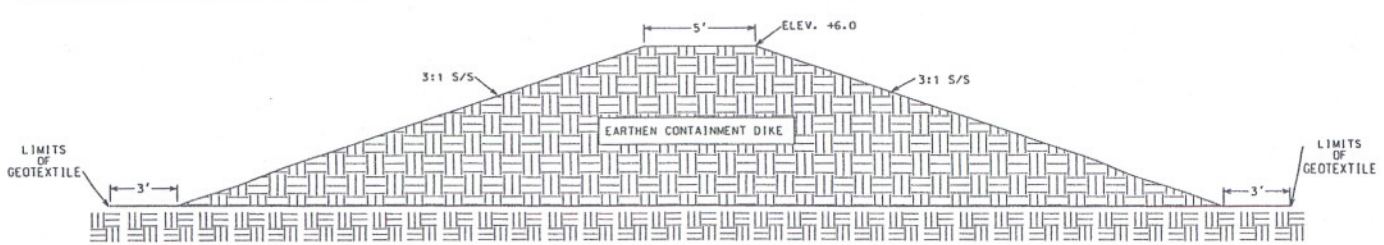
CREATION AREA	REACH	NOTES
NORTHERN AREA	0+00 - 86+07	EARTHEN CONTAINMENT ONLY (TYP. SECTION 3)
NORTHERN AREA	86+07 - 116+44	EARTHEN CONTAINMEN W/ADJOINING ROCK (TYP. SECTION 1)
CENTRAL AREA	0+00 - 43+90	EARTHEN CONTAINMENT ONLY (TYP. SECTION 3)
CENTRAL AREA	43+90 - 59+82	EARTHEN CONTAINMENT W/ADJOINING ROCK (TYP. SECTION 2)
SOUTHERN AREA	0+00 - 62+50	EARTHEN CONTAINMENT ONLY (TYP. SECTION 3)
SOUTHERN AREA	62+50 - 114+09	EARTHEN CONTAINMENT W/ADJOINING ROCK (TYP. SECTION 2)



TYPICAL SECTION-3 (NORTHERN, CENTRAL & SOUTHERN AREAS) EARTHEN CONTAINMENT ONLY
(NOT TO SCALE)



TYPICAL SECTION-4 (ROCK ONLY)
(NOT TO SCALE)



DETAILS-EARTHEN CONTAINMENT DIKE ONLY
(NOT TO SCALE)

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Approved		

TYPICAL SECTIONS
TE-46 - WEST LAKE BOUDREAUX CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA

NRCS Natural Resources Conservation Service, United States Department of Agriculture

File Name: LA-346

Drawing Name: LA346017.dgn

Sheet 18 of 59

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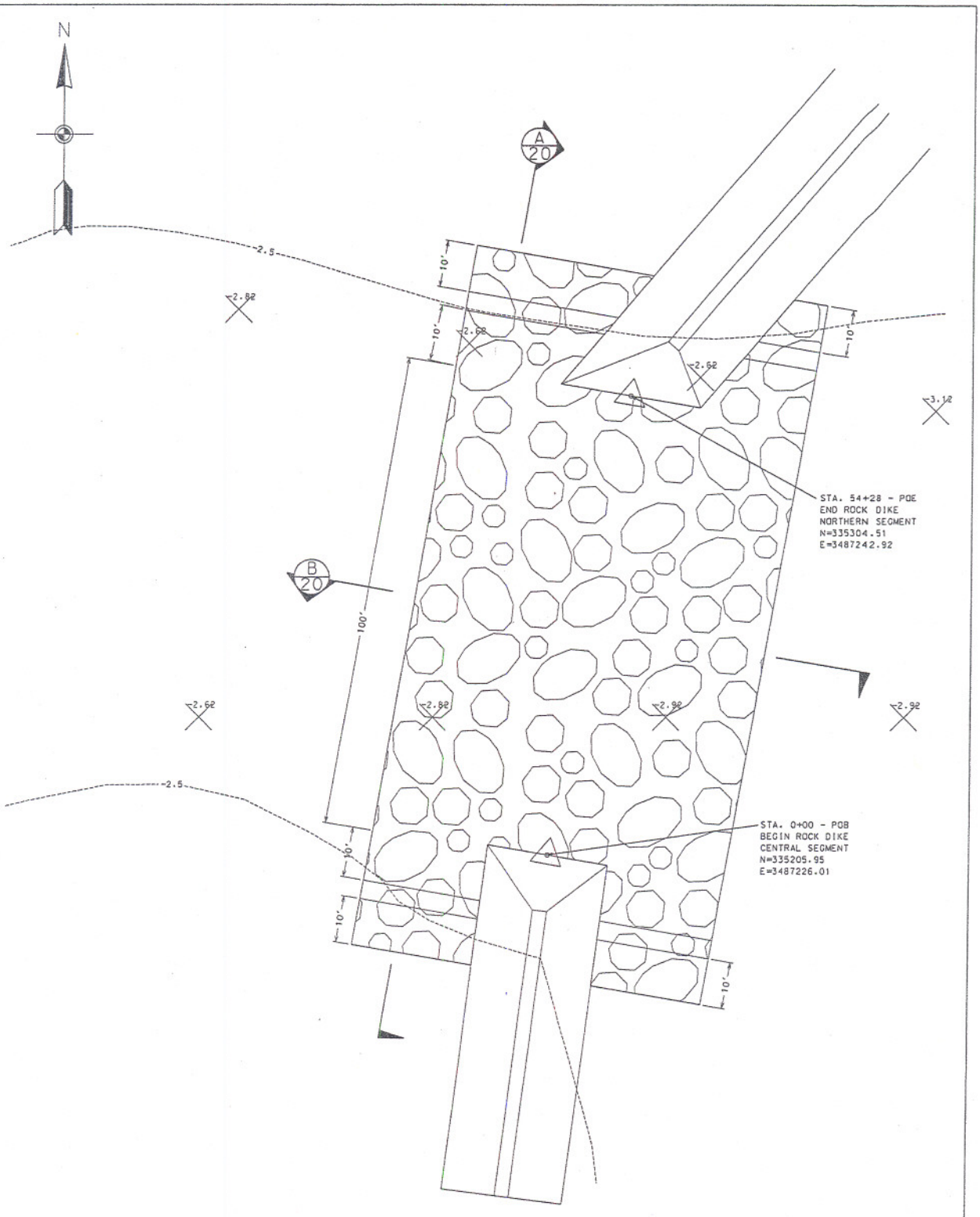

PLAN VIEW - CHOKE DOWN SECTION
(SCALE AS SHOWN)

10 0 10 20 30 40
SCALE IN FEET

PRELIMINARY

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Natural Resources Conservation Service
United States Department of Agriculture

CHOKE DOWN DETAILS
TE-46 - WEST LAKE BOUDREAUX
CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA

		Date
Designed	R. FAULKNER	08/05
Drawn	A.J. GREMILLION	08/05
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Approved		

File Name: LA-346
Drawing Name: LA346019.dgn
Sheet 19 of 53

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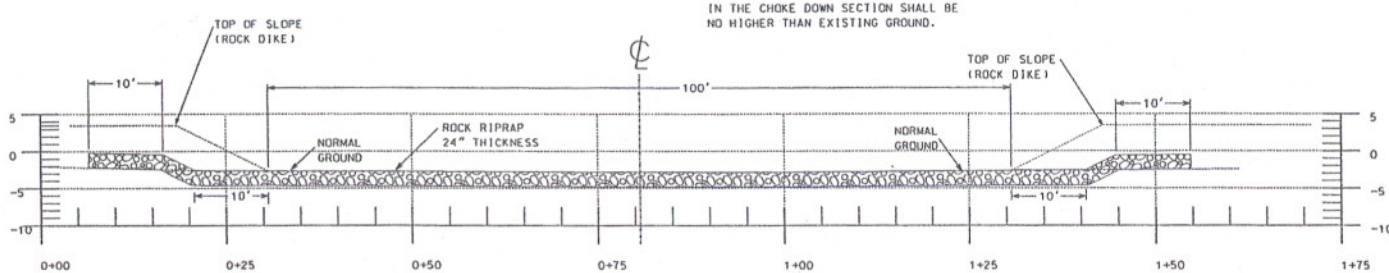
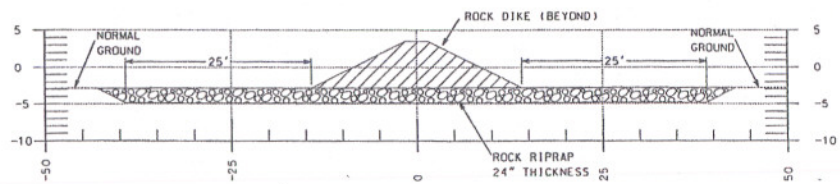
NOTE.
THE ELEVATION OF THE TOP OF THE ROCK IN THE CHOKE DOWN SECTION SHALL BE NO HIGHER THAN EXISTING GROUND.



CHOKE DOWN SECTION (A) (19)
(SCALE AS SHOWN)

NOTE.
THE ELEVATION OF THE TOP OF THE ROCK IN THE CHOKE DOWN SECTION SHALL BE NO HIGHER THAN EXISTING GROUND.



CHOKE DOWN SECTION (B) (19)
(SCALE AS SHOWN)

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CHOKE DOWN DETAILS
TE-46 - WEST LAKE BOUDREAUX
CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA

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Natural Resources Conservation Service
United States Department of Agriculture

File Name
LA-346

Drawing Name
LA346020.dgn

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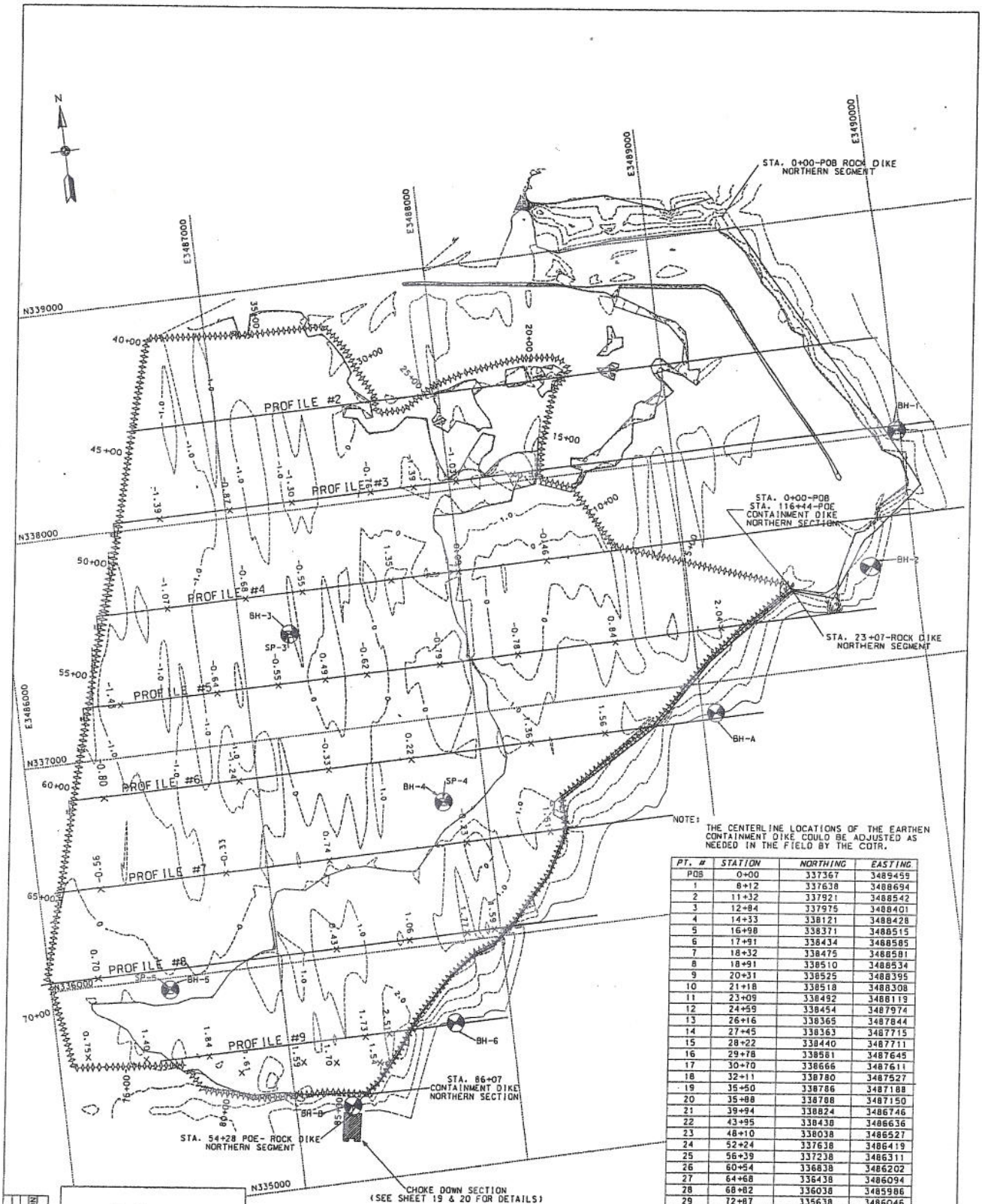

NOTE:
THE CENTERLINE LOCATIONS OF THE EARTHEN CONTAINMENT DIKE COULD BE ADJUSTED AS NEEDED IN THE FIELD BY THE CQTR.

PT. #	STATION	NORTHING	EASTING
POB	0+00	337367	3489459
1	8+12	337638	3488694
2	11+32	337921	3488542
3	12+84	337975	3488401
4	14+33	338121	3488428
5	16+98	338371	3488515
6	17+91	338434	3488585
7	18+32	338475	3488581
8	18+91	338510	3488534
9	20+31	338525	3488395
10	21+18	338518	3488308
11	23+09	338492	3488119
12	24+59	338454	3487974
13	26+16	338365	3487844
14	27+45	338363	3487715
15	28+22	338440	3487711
16	29+78	338581	3487645
17	30+70	338666	3487611
18	32+11	338780	3487527
19	35+50	338786	3487188
20	35+88	338708	3487150
21	39+94	338824	3486746
22	43+95	338438	3486636
23	48+10	338038	3486527
24	52+24	337638	3486419
25	56+39	337238	3486311
26	60+54	336838	3486202
27	64+68	336438	3486094
28	68+82	336038	3485986
29	72+87	335638	3486046
30	77+72	335589	3486528
31	78+86	335489	3486586
32	81+49	335418	3486838
33	84+52	335408	3487141
34	86+07	335377	3487294
POE	116+44	337367	3489459

NOTE:
THERE ARE NO CENTERLINE LOCATIONS OF THE EARTHEN CONTAINMENT FROM STA. 86+07 TO STA. 116+44. THIS REACH OF THE CONTAINMENT DIKE PARRELLS THE ROCK DIKE. THE ALIGNMENT OF THE ROCK DIKE WILL BE DETERMINED AT THE TIME OF CONSTRUCTION.

PRELIMINARY

THIS DOCUMENT SHALL NOT BE USED FOR CONSTRUCTION, BIDDING, RECORDATION, CONVEYANCE, SALES, OR AS THE BASIS FOR THE ISSUANCE OF A PERMIT

NO.	DATE	REVISIONS APPROVED	TITLE

WEST LAKE BOUDREAUX - MARSH CREATION
NORTHERN SECTION - PLAN VIEW

200 0 200 400 600 800
SCALE IN FEET

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

PLAN VIEW-NORTHERN MARSH CREATION AREA
TE-46 - WEST LAKE BOUDREAUX
CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA

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Sheet 21 of 59
File Name LA-346
Drawing Name LA346021.dgn
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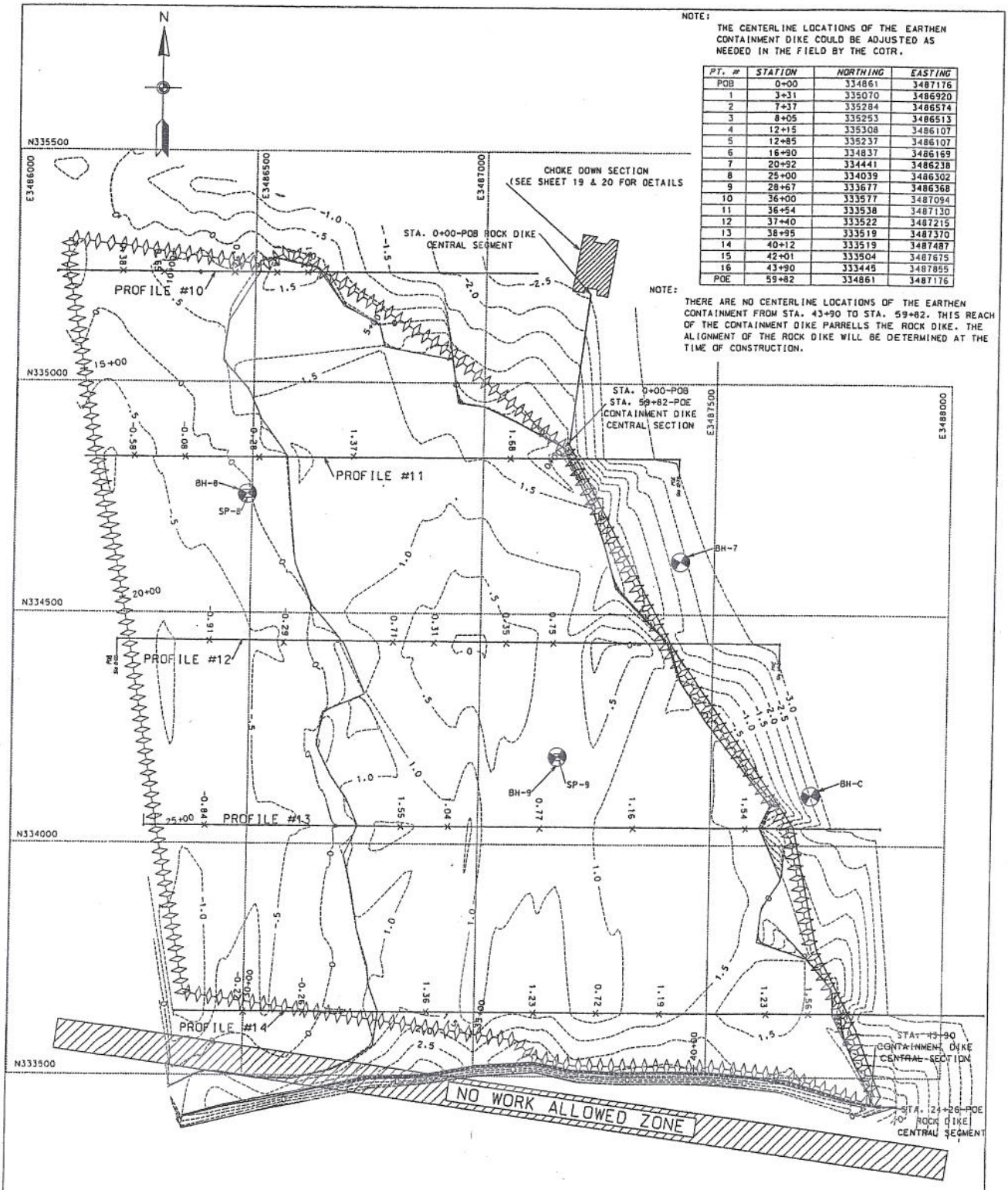

NOTE:
THE CENTERLINE LOCATIONS OF THE EARTHEN CONTAINMENT DIKE COULD BE ADJUSTED AS NEEDED IN THE FIELD BY THE COTR.

PT. #	STATION	NORTHING	EASTING
POB	0+00	334861	3487176
1	3+31	335070	3486920
2	7+37	335284	3486574
3	8+05	335253	3486513
4	12+15	335308	3486107
5	12+85	335237	3486107
6	16+90	334837	3486169
7	20+92	334441	3486238
8	25+00	334039	3486302
9	28+67	333677	3486368
10	36+00	333577	3487094
11	36+54	333538	3487130
12	37+40	333522	3487215
13	38+95	333519	3487370
14	40+12	333519	3487487
15	42+01	333504	3487675
16	43+90	333445	3487855
POE	59+82	334861	3487176

NOTE:
THERE ARE NO CENTERLINE LOCATIONS OF THE EARTHEN CONTAINMENT FROM STA. 43+90 TO STA. 59+82. THIS REACH OF THE CONTAINMENT DIKE PARRELLS THE ROCK DIKE. THE ALIGNMENT OF THE ROCK DIKE WILL BE DETERMINED AT THE TIME OF CONSTRUCTION.

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NO	DATE	REVISIONS APPROVED	TITLE

WEST LAKE BOUDREAUX - MARSH CREATION
CENTRAL SECTION - PLAN VIEW

100 0 100 200 300 400
SCALE IN FEET

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Natural Resources Conservation Service
United States Department of Agriculture

PLAN VIEW-CENTRAL MARSH CREATION AREA
TE-46 - WEST LAKE BOUDREAUX
CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA

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Sheet 28 of 59
Drawing Name: LA346028.dgn
File Name: LA-346

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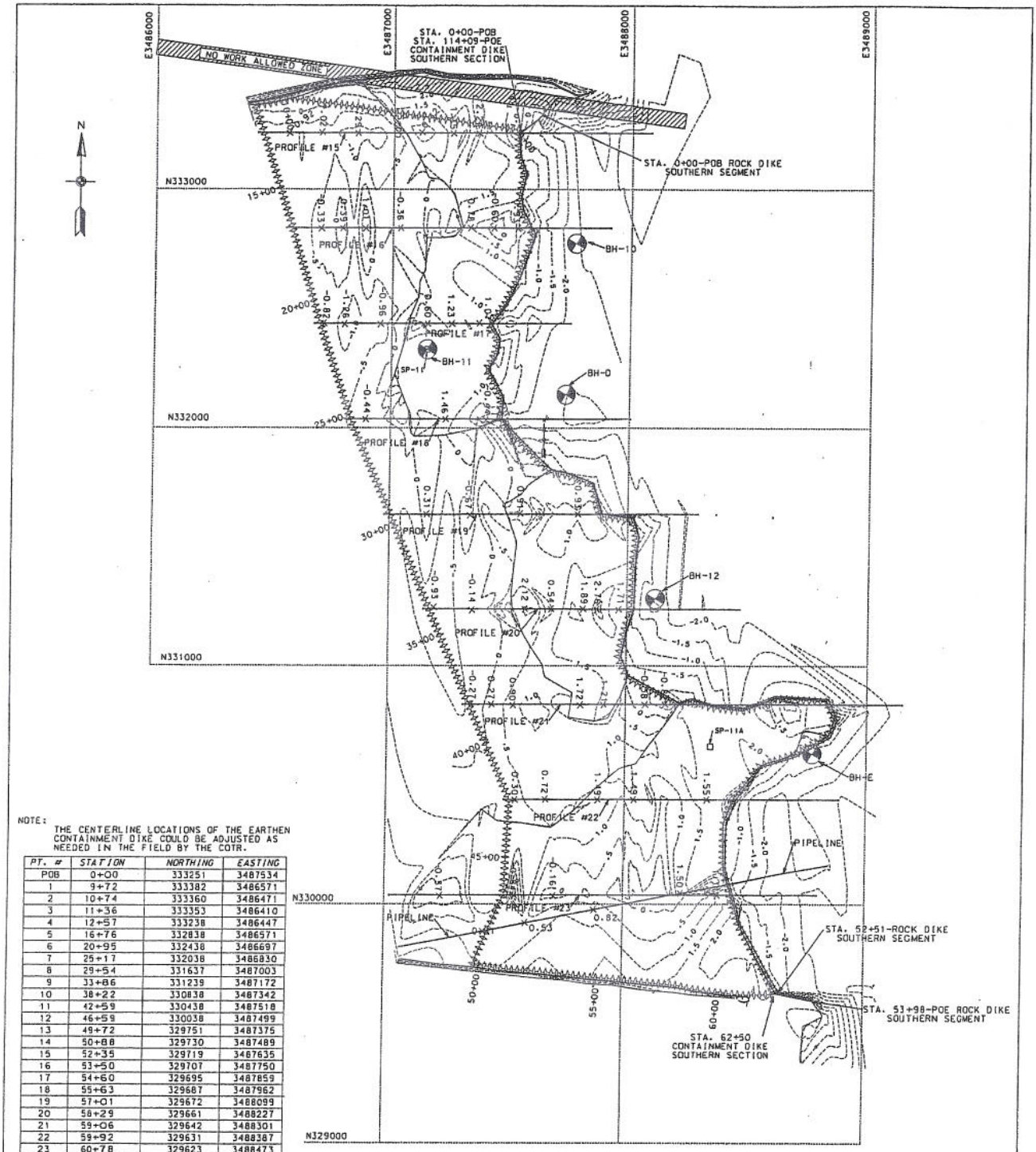

NOTE:
THE CENTERLINE LOCATIONS OF THE EARTHEN CONTAINMENT DIKE COULD BE ADJUSTED AS NEEDED IN THE FIELD BY THE COTR.

PT. #	STATION	NORTHING	EASTING
POB	0+00	333251	3487534
1	9+72	333382	3486571
2	10+74	333360	3486471
3	11+36	333353	3486410
4	12+57	333238	3486447
5	16+76	332838	3486571
6	20+95	332438	3486697
7	25+17	332038	3486830
8	29+54	331637	3487003
9	33+86	331239	3487172
10	38+22	330838	3487342
11	42+59	330438	3487518
12	46+59	330038	3487499
13	49+72	329751	3487375
14	50+88	329730	3487489
15	52+35	329719	3487635
16	53+50	329707	3487750
17	54+60	329695	3487859
18	55+63	329687	3487962
19	57+01	329672	3488099
20	58+29	329661	3488227
21	59+06	329642	3488301
22	59+92	329631	3488387
23	60+78	329623	3488473
24	61+32	329619	3488527
25	62+50	329624	3488644
POE	114+09	333251	3487534

NOTE:
THERE ARE NO CENTERLINE LOCATIONS OF THE EARTHEN CONTAINMENT FROM STA. 62+50 TO STA. 114+09. THIS REACH OF THE CONTAINMENT DIKE PARRELLS THE ROCK DIKE. THE ALIGNMENT OF THE ROCK DIKE WILL BE DETERMINED AT THE TIME OF CONSTRUCTION.

NO.	DATE	REVISIONS	APPROVED	TITLE

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WEST LAKE BOUDREAUX - MARSH CREATION
SOUTHERN SECTION - PLAN VIEW

200 0 200 400 600 800
SCALE IN FEET

Sheet 32 of 59
Drawing Name LA346032.dgn
File Name LA-346

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United States Department of Agriculture

PLAN VIEW-SOUTHERN MARSH CREATION AREA
TE-46 - WEST LAKE BOUDREAUX
CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA

		Date
Designed	R. FAULKNER	01/05
Drawn	A.J. CREMILLION	01/05
Checked		
Approved		

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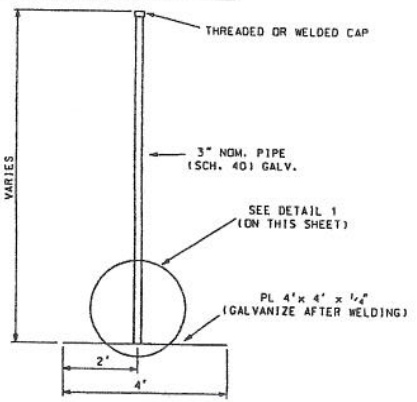
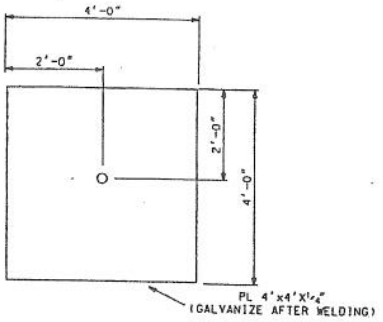
NOTE:
IF THREADED CAP IS USED, COLD GALVINIZE THREADS AFTER INSTALLATION.



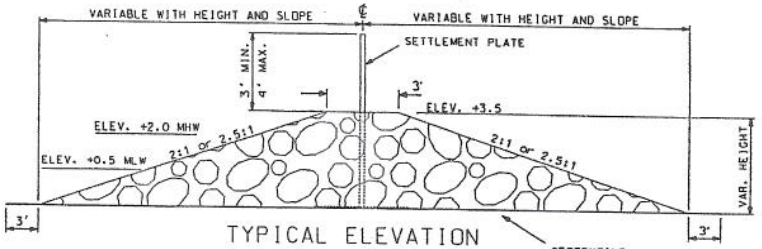
ELEVATION VIEW



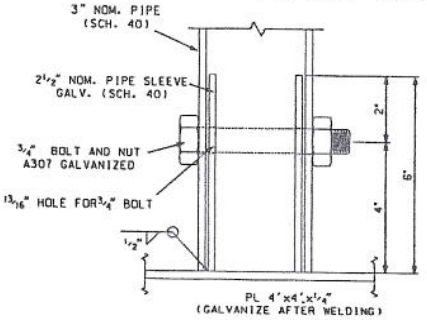
PLAN VIEW

NOTE:
THE SETTLEMENT PLATE ELEVATION SHALL BE DETERMINED BEFORE PLACING ROCK AND AT END OF CONSTRUCTION.

SETTLEMENT PLATE DETAILS
(NOT TO SCALE)

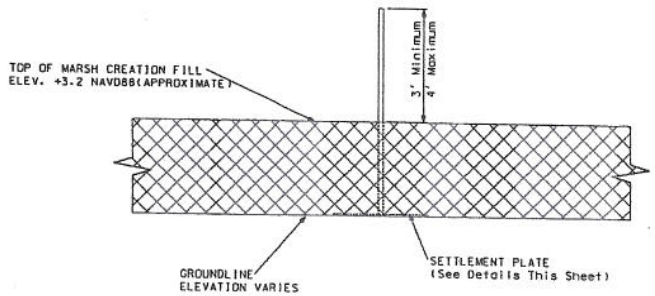


TYPICAL ELEVATION



DETAIL 1 - 6"PIPE SLEEVE
(NOT TO SCALE)

APPLIES TO SETTLEMENT PLATES 3.4.5.8.9.11 & 11A



SETTLEMENT PLATE DETAILS WITHIN MARSH CREATION
(NOT TO SCALE)

CREATION AREA SETTLEMENT PLATES

AREA	SP-#	NORTHING	EASTING
NORTHERN	SP-3	337454	3487216
NORTHERN	SP-4	336627	3487809
NORTHERN	SP-5	335948	3486507
CENTRAL	SP-8	334758	3486490
CENTRAL	SP-9	334190	3487170
SOUTHERN	SP-11	332329	3487152
SOUTHERN	SP-11A	330660	3488353

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REVISIONS

NO.	DATE	APPROVED	TITLE

DESIGNED R. FAULKNER 01/05
DRAWN A.J. GREMILLION 01/05
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APPROVED

SETTLEMENT PLATE DETAILS
TE-46 - WEST LAKE BOUDREAUX CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA

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FILE NAME LA-346
DRAWING NAME LA346039.dgn
SHEET 39 of 59

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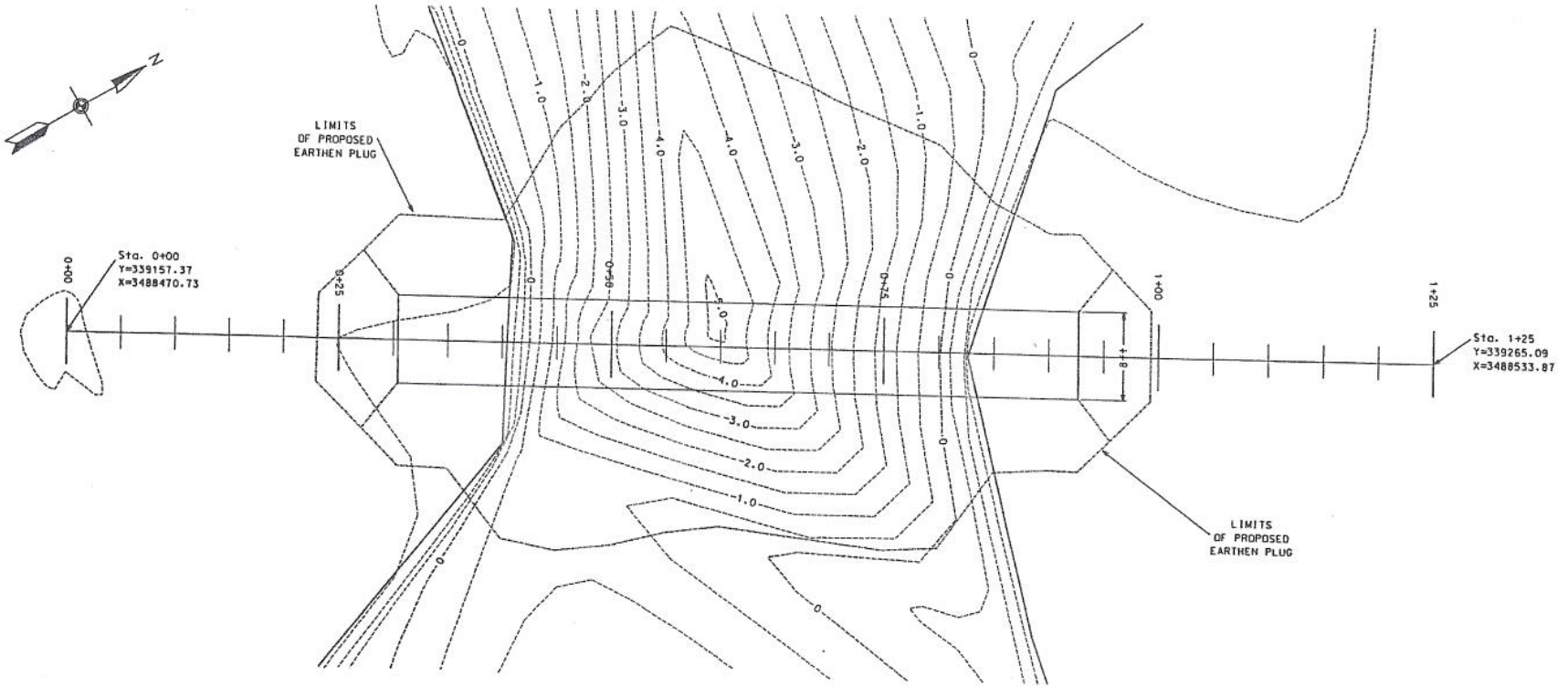
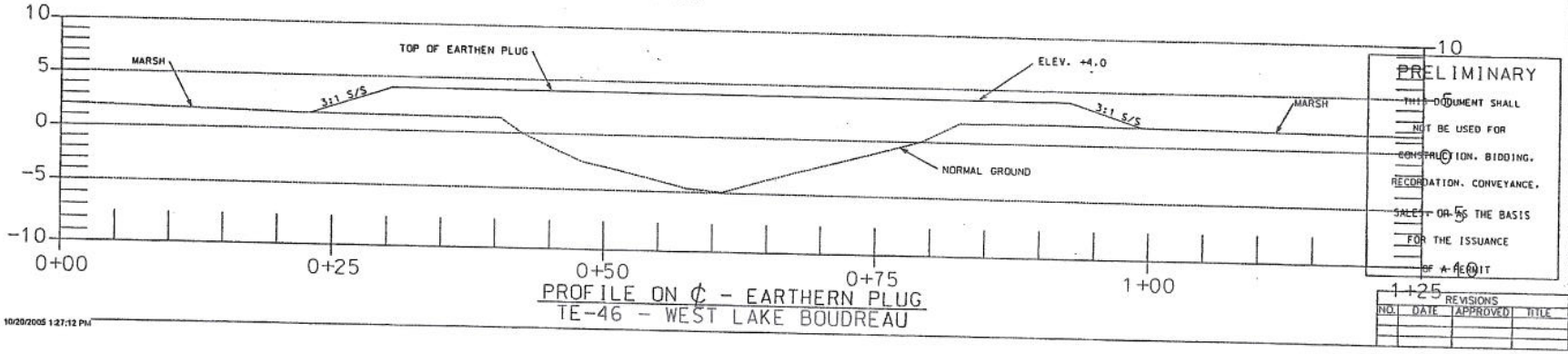


PLAN - EARTHEN PLUG
TE-46 - WEST LAKE BOUDREAU

SCALE IN FEET
5 0 5 10 15 20



PROFILE ON ℄ - EARTHERN PLUG
TE-46 - WEST LAKE BOUDREAU

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REVISIONS			
NO.	DATE	APPROVED	TITLE

PLAN & PROFILE-EARTHEN PLUG.
TE-46 - WEST LAKE BOUDREAUX
CONSTRUCTION UNIT NO. 1
TERREBONNE PARISH, LOUISIANA

		Date
Designed	R. FAULKNER	01/05
Drawn	A.J. GREMILLION	01/05
Checked		
Approved		

NRCS
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United States Department of Agriculture

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