



**Coastal Protection and Restoration
Authority of Louisiana
Office of Coastal Protection and
Restoration**

**2008 Operations, Maintenance,
and Monitoring Report**

for

**Four-Mile Canal Terracing and
Sediment Trapping**

State Project Number TV-18
Priority Project List 9

July 2008
Vermilion Parish

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2008 Operations, Maintenance, and Monitoring Report
For
Four-Mile Canal Terracing and Sediment Trapping (TV-18)

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I. Introduction

The Four Mile Canal Terracing and Sediment Trapping (TV-18) project is from the 9th priority list of the Coastal Wetlands Planning, Protection, and Restoration Act. The project is located approximately 4 miles (6.44 km) south of Intracoastal City in Vermilion Parish, Louisiana, and includes Little White Lake and the portion of Little Vermilion Bay immediately west of Four-Mile Canal also known as the Vermilion River Cutoff (Figure 1). The total project area comprises approximately 2,269 acres (918.56 ha) of intermediate marsh and open water. There are approximately 160 acres (64.93 ha) of land and 2,109 acres (853.63 ha) of open water from the 1993 land loss data. The 1988/90 habitat data classifies the area as having 62 acres (25.09 ha) of intermediate marsh, 53 acres (21.45 ha) of brackish marsh, 5 acres (2.02 ha) of unavailable data and 1,823 acres (737.34 ha) of open water (United States Geological Survey/National Wetlands Research Center [USGS/NWRC] 1988/90).

Soils around the project area are Clovelly and Lafitte muck with two patches of Udifluvents. Clovelly and Lafitte series are poorly drained organic soils that formed in herbaceous plant material over clayey alluvium. Udifluvents are sandy to clayey soils that were hydraulically excavated during the construction and maintenance of navigable waterways. Udifluvents are of medium fertility with water and air moving at a very slow to moderate rate. Many areas are very intermittently submerged and occur as small to large lakes (United States Department of Agriculture [USDA 1996]). Soil boring samples collected and analyzed by HNTB of Baton Rouge in one to four feet of water encountered two to five feet of very soft clay over two to eight feet of organic clay. This area was entirely a brackish marsh from 1949 through 1968 (O'Neil 1949, Chabreck et al. 1968). By 1978 through 1988 the marsh around the northern shore of Little White Lake and Four-Mile Canal was classified as an intermediate marsh (Chabreck and Linscombe 1978, 1988). The most recent classification in 1997 finds the project area surrounded by intermediate marsh (Chabreck and Linscombe 1997).

Emergent vegetation observed on the shore around Little White Lake consists of *Phragmites australis* (common reed), *Zizaniopsis mileacea* (giant cutgrass), *Spartina alterniflora* (smooth cordgrass), *Hymenocallis caroliniana* (Carolina spiderlily), *Triadica sebifera* (tallowtree), and *Sesbania drummondii* (poisonbean). In 1998, Foret found the vegetation community to include *Spartina patens* (saltmeadow cordgrass), *Cladium mariscus ssp. jamaicense* (Jamaica sawgrass), and *Schoenoplectus robustus* (sturdy bulrush). Vegetation in the open water portion of the project area were scattered stands of *Myriophyllum spicatum* (spike watermilfoil), *Ceratophyllum demersum* (coon's tail) and *Najas guadalupensis* (southern waternymph) (United States Department of Commerce/National Oceanic and Atmospheric Administration/National Marine Fisheries Service 2000).

The Flood Control Act of 18 August 1941 enacted by the United States Congress provided for improvements in the Vermilion River. Vermilion River Cutoff, an 8 ft by 80 ft (2.44 m by 24.38 m) channel from the -8 foot contour in the Vermilion Bay to the Gulf Intracoastal Waterway (GIWW) was constructed for improving navigation from Lafayette, LA to the -8 foot (-2.44 m) contour in Vermilion Bay and to improve flood control from Port Barre, LA to the Vermilion Bay via Bayou Teche, Bayou Fusilier and Vermilion River. The materials excavated to build the canal were deposited in spoil banks along the canal. This prevented the

river waters from nourishing the adjacent marsh (USACE 1993; HNTB 2002). The main cause of marsh loss in this area is believed to be shoreline erosion. From the 1978 Louisiana Department of Transportation and Development (LDOTD) inventory and assessment of shoreline erosion in coastal Louisiana, the Abbeville 15 Quadrangle, which is Vermilion Bay near Onion Bayou, documents an erosion rate of 1.6 ft/yr (0.5 m/yr). Adjacent to that in the Cheniere Au Tigre & Abbeville 15 quadrangle, which is Vermilion Bay (Mud Point to Lake Cleodis), the erosion rate is 2.6 ft/yr [0.8 m/yr] (Adams et al. 1978). Shoreline change, specifically in the project area, calculated by USGS was 2.86 ft/yr (0.87 m/yr) and island area change was 0.64 acres/yr (0.26 ha/yr [2003]). A combination of wave and wake erosion continues to deteriorate this area, which is relatively unprotected and affected by storm events emerging from Vermilion Bay. This erosion prevents sub-aerial marsh development from sediments introduced to the area by the GIWW through the Vermilion River and Four-Mile Canal (LDNR 1999).

The project goals include:

- 1 Create 70 acres (28.3 ha) of earthen terraces within the project area immediately after construction.
- 2 Reduce shoreline erosion rates by 50% (reduce from 8 ft/yr to 4 ft/yr) over the 20 year project life.
- 3 As a result of goals 1 and 2, achieve a 9% (approximately 17 acres [6.9 ha]) net increase in marsh habitat by the end of the 20 year project.
- 4 Increase submerged aquatic vegetation (SAV) coverage from 0% to 25% of the project area by the end of the 20 year project life.
- 5 Increase fisheries utilization of the project area.

The construction of terraces in Little White Lake and Vermilion Bay will buffer existing marsh against shoreline erosion by reducing wave and wake energy. Marsh will immediately be created by planting *S. alterniflora* along the crowns and slopes of the constructed terraces. Additionally, new marsh will be created as freshwater and suspended sediments introduced from Four Mile Canal and the Vermilion River are dispersed through the project area via conveyance channels, and trapped in the shallow open water adjacent to the terraces. In doing so, terraces may indirectly reduce water-column turbidity within the project area. This, in conjunction with decreased wave and wake energy, will create habitat suitable for the colonization by submerged aquatic vegetation (SAV). Fisheries habitat may be enhanced by the marsh edge created by the terraces and the propagation of SAV. Conveyance channels may also promote the exchange of organisms and organic material within and through the project area. Data obtained from a USGS gauge at Cypremort Point from 1990 to 1999 indicate the average annual high water elevation in Little Vermilion Bay is +4.24 ft (+1.29 m) NAVD88 and average annual low water elevation is -1.63 ft (-0.50 m) NAVD88. Approximate marsh elevation in the area is 1.5 ft (0.46 m) NAVD88.

Approximately 40,300 linear ft (12,283.4 m) of terraces in the eastern portion of Little Vermilion Bay area adjacent to Four Mile Canal (Figure 2) and 28,150 linear ft (8,580.12 m) in the Little White Lake area (Figure 3). The terraces are arranged in either a linear or “fish-net” orientation in the open water areas. Terraces in the Little Vermilion Bay area will be built to + 5.0 ft (+1.52 m) NAVD88 with a 20 ft crown and 4:1 ft (1.21:0.31 m) side slopes. Terraces in the Little White Lake area will also be built to + 5.0 ft (+1.52 m) NAVD88, but

will have a 15 ft (4.57 m) crown with 4:1 ft (1.21:0.31 m) side slopes (Figure 4). Post consolidation elevation of all terraces is expected to be between 2 and 3 ft NAVD88 (0.61 and 0.91 m) The borrow or floatation channel will be located on the land side of all terraces and will be at a maximum depth of 10 ft below the current water bottom. In order to minimize erosive energies, the terrace slopes and crowns will be planted with *Spartina alterniflora* (smooth cordgrass). Construction was completed in May, 2004.

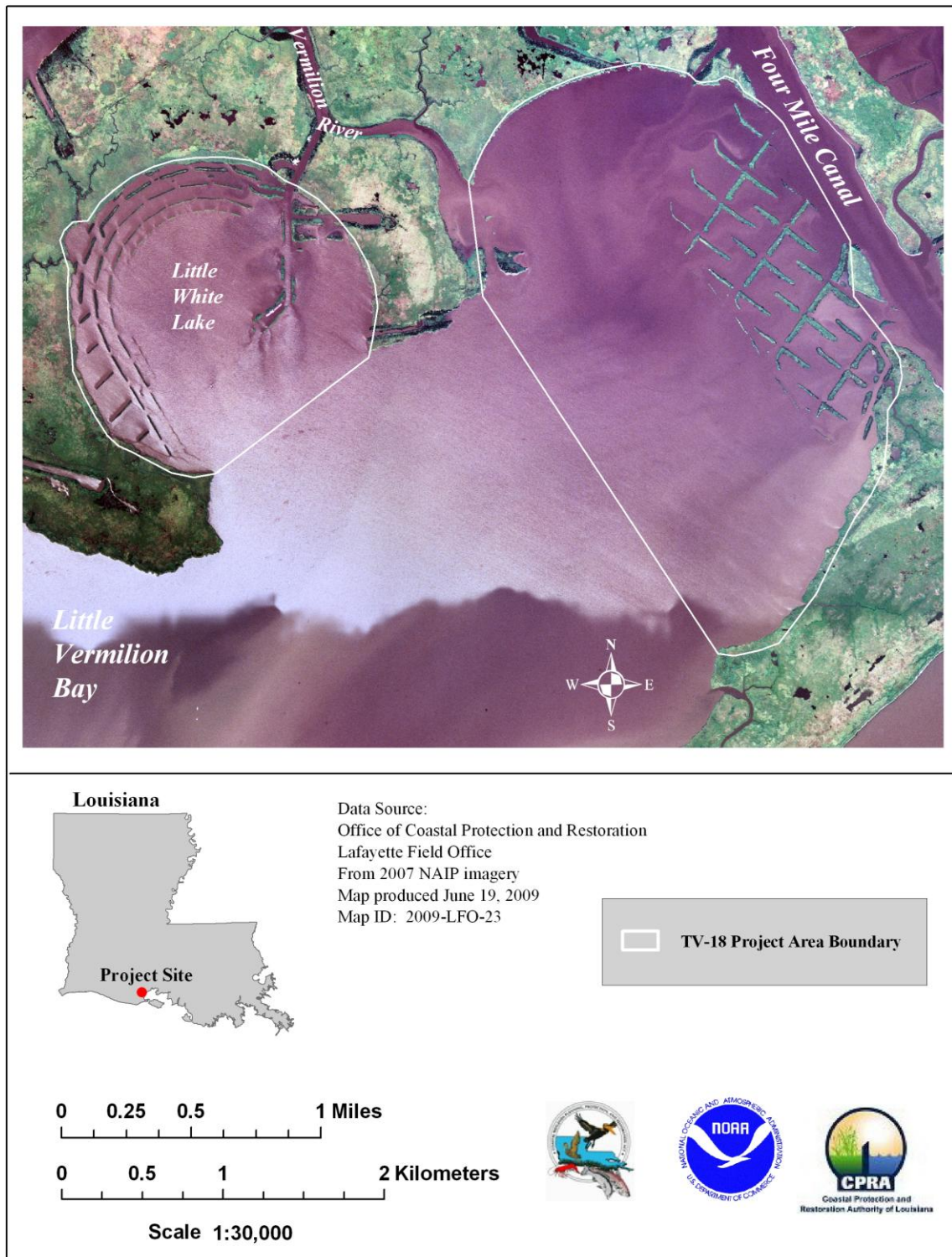


Figure 1. Four-Mile Canal Terracing and Sediment Trapping (T/V-18) project area showing boundary and proposed terrace locations.

II. Maintenance Activity

a. Project Feature Inspection Procedures

The purpose of the annual inspection of the Four Mile Canal Terracing and Sediment Trapping Project (TV-18) is to evaluate the constructed project features to identify any deficiencies and prepare a report detailing the condition of project features and recommended corrective actions needed. Should it be determined that corrective actions are needed, OCPR shall provide, in the report, a detailed cost estimate for engineering, design, supervision, inspection, and construction contingencies, and an assessment of the urgency of such repairs (O&M Plan, 2005). The annual inspection report also contains a summary of maintenance projects which were completed since completion of constructed project features and an estimated projected budget for the upcoming three (3) years for operation, maintenance and rehabilitation. The three (3) year projected operation and maintenance budget is shown in Appendix C.

An inspection of the Four Mile Canal Terracing and Sediment Trapping Project (TV-18) was held on June 6, 2008 under clear skies and hot temperatures. In attendance were Stan Aucoin from OCPR and John Foret of NOAA Fisheries. Parties met at the Lafayette Field Office of CED and traveled to Intracoastal City in Vermilion Parish, LA. The annual inspection began at the site of the terraces constructed in Little White Lake.

The field inspection included a complete visual inspection of the entire project site. Staff gauge readings were used to determine approximate elevations of water and earthen terraces. Photographs were taken at each project feature (see Appendix B) and Field Inspection notes were completed in the field to record measurements and deficiencies (see Appendix D).

b. Inspection Results

Site 1—Earthen terraces

The interior terraces in both Little White Lake and the ones off of the Vermilion River Cut-Off are in excellent condition. Terraces nearest the Vermilion River Cut-Off and on the southwestern rim of this area of the project are eroding but are still functional. Submerged aquatic vegetation is becoming established between the terraces. The two exterior rows of terraces in Little White Lake have eroded significantly. Vegetation is still evident on what is left of some of the terraces. No maintenance needed at this time. (Photos: Appendix B, Photo 1-4)

Site 2—Vegetation plantings

Vegetation has spread throughout the terraces. A staff gauge needs to be installed in the vicinity of the Little White Lake terraces. No other maintenance needed at this time.

c. Maintenance Recommendations



i. Immediate/Emergency repairs

None

ii. Programmatic/Routine Repairs

None

d. Maintenance History

General Maintenance: Below is a summary of completed maintenance projects and operation tasks performed since May 2004, the construction completion date of the Four Mile Canal Terracing and Sediment Trapping Project.

There has been no required maintenance on this project.

III. Operation Activity

a. Operation Plan

There are no water control structures associated with this project, therefore no Structural Operation Plan is required.

b. Actual Operations

There are no water control structures associated with this project, therefore no Structural Operation Plan is required.

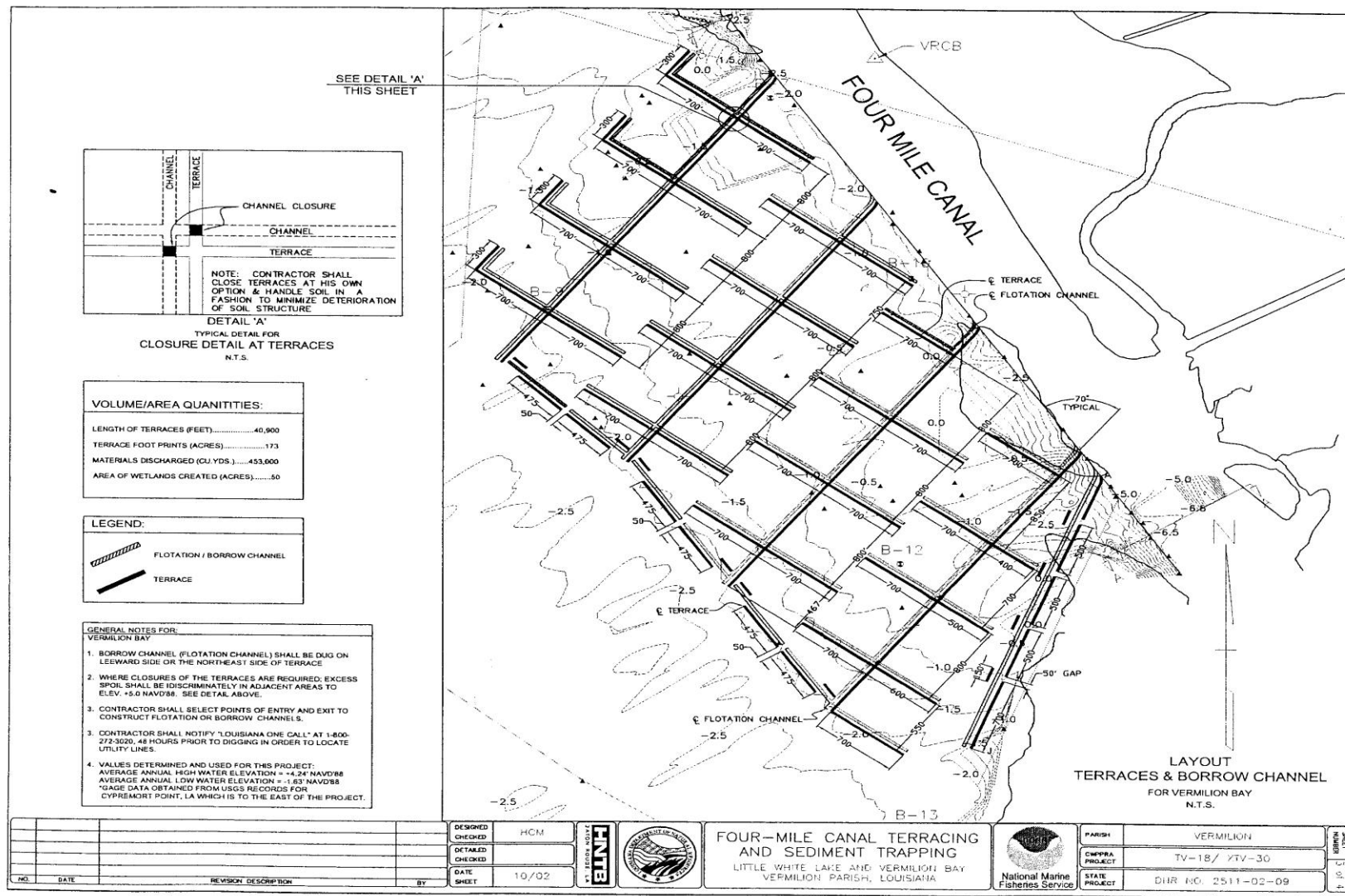


Figure 2. Proposed schematic for Four-Mile Canal Terracing and Sediment Trapping (T/V-18) for terraces in the eastern section of Little Vermilion Bay (HNTB 2002).

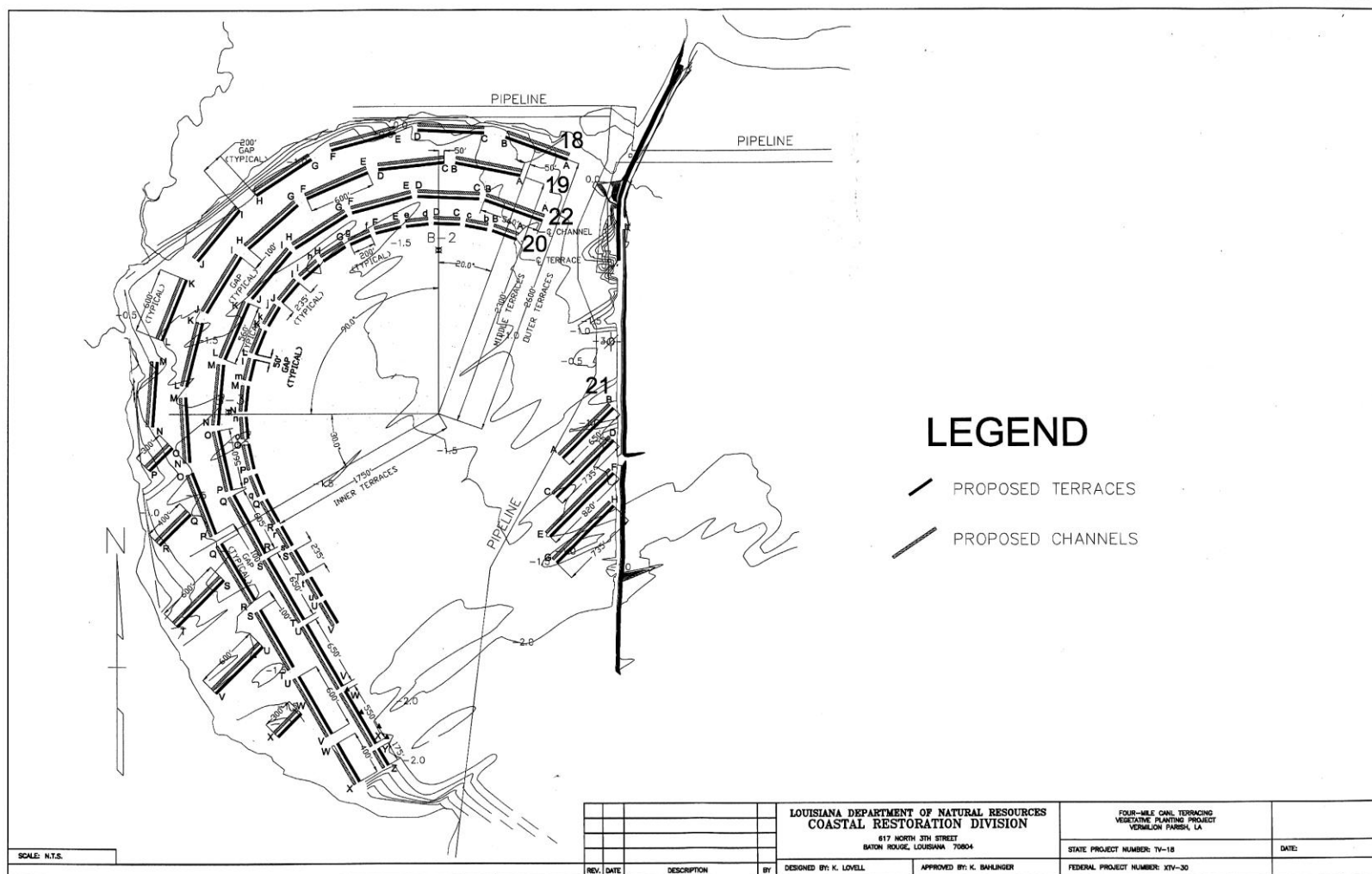


Figure 3. Proposed schematic for Four-Mile Canal Terracing and Sediment Trapping (T/V-18) for terraces in the western section of Little White Lake (HNTB 2002).

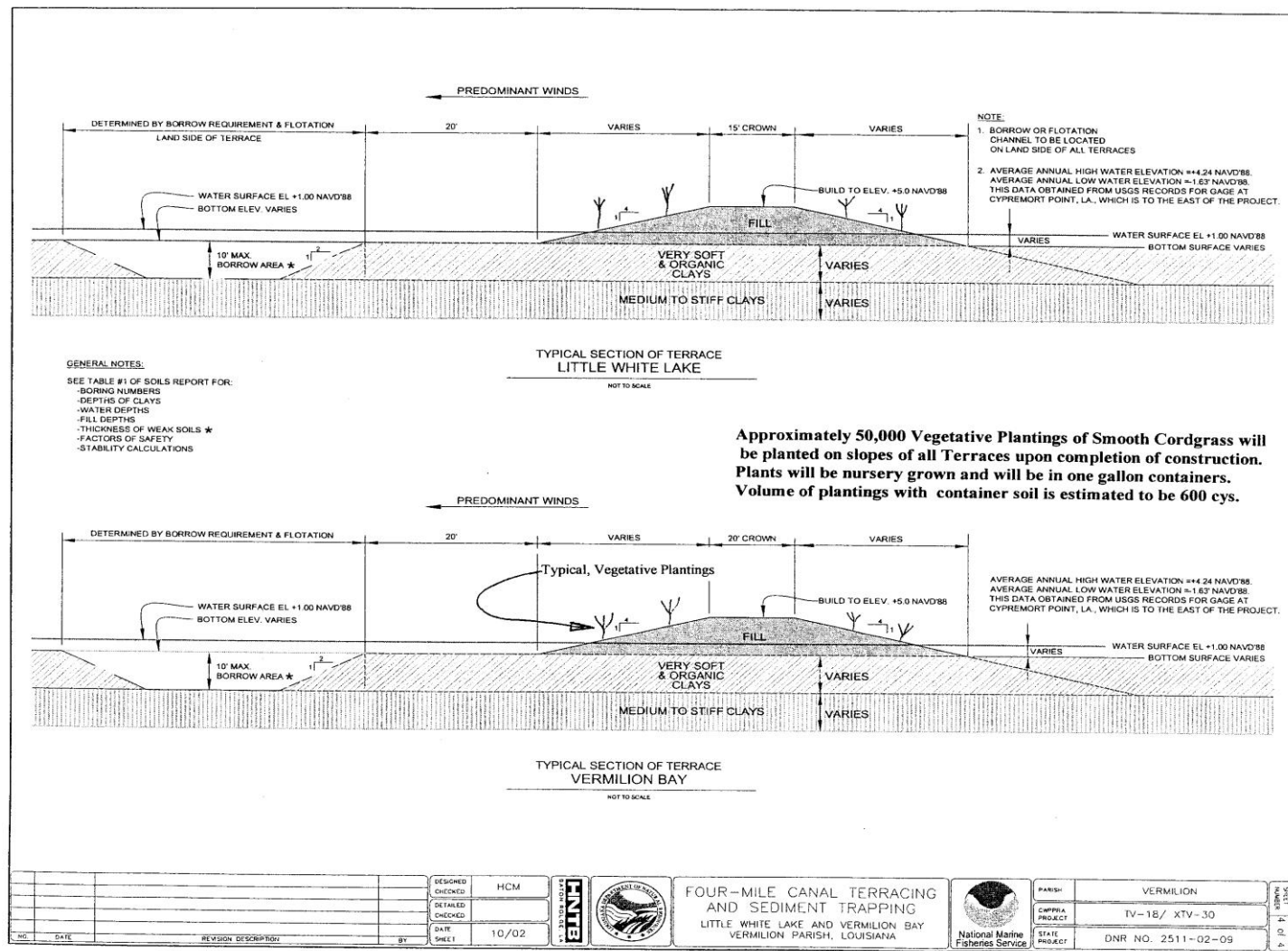


Figure 4. Typical layout and cross section of proposed terraces to be constructed in Little Vermilion Bay and Little White Lake for the Four-Mile Canal Terracing and Sediment Trapping (TV-18) project (HNTB 2002).

IV. Monitoring Activity

a. Monitoring Goals

The objectives of the Four-Mile Canal Terracing and Sediment Trapping project are to reduce shoreline erosion rates and increase marsh habitat, SAV and fisheries utilization, and to increase freshwater and sediment flow from Four-Mile Canal into the project area by constructing conveyance channels adjacent to earthen terraces.

The following goals will contribute to the evaluation of the above objectives:

Specific Monitoring Goals:

- 1 Evaluate the rate of erosion along the shoreline of the project area (Little White Lake and adjacent Little Vermilion Bay).
- 2 Evaluate establishment of emergent vegetation on planted terraces.
- 3 Evaluate sediment deposition within the project area.
- 4 Evaluate land/water ratios with respect to initial and secondary land gains.

b. Monitoring Elements

Shoreline Survey

To document shoreline movement, differential GPS will be used to map the shoreline in Little Vermilion Bay and Little White Lake. Differential GPS will be used as described in Steyer et al. (1995). Differentially corrected GPS data sets were obtained 2004 (as built terraces), and will be obtained post-construction in years 2010, and 2017. GPS data will be taken during the spring of each monitoring year to minimize errors associated with taking data at different times of the year, not accounting for seasonal changes that might occur to the shoreline.

Terrace Vegetation

The condition of the natural emergent and planted vegetation on the terraces over the life of the project will be monitored using a stratified sampling scheme on 16 of the total planted terraces using a modified Braun-Blanquet sampling method as outlined in Steyer et al. (1995). Transect lines and plots were established across selected terraces to include both high and low energy environments. Three sampling plots were established on randomly selected transect lines which will include a plot on both slopes and 1 plot on the crown. At each station, percent cover, dominant plant height, and species composition were documented in a 4 m² sample area. Each plot was marked with 2 corner poles to allow for revisiting the sites over time. Vegetation was evaluated at the sampling sites in the spring of 2004 (as built), and postconstruction in the spring of 2007, and will be evaluated in 2010, and 2016.

Bathymetry/Topography

Sediment deposition was monitored along existing transects used in bathymetry map creation. Twenty eight (28) transects encompassing an array of terrace and channel formations were

selected for development of elevation profiles. Elevation of the water bottom sediments was determined along each transect in a similar fashion to that in the initial survey. Surveys were conducted by a professional engineering firm in 2003 (immediately post-construction, funded by construction), and will be replicated in 2010, and 2017. Survey years may change to gather additional information earlier in the project life based on potential effectiveness of the project.

Digital Color Infrared Video Imagery

To document land to open-water ratios and marsh loss/gain rates in the project area, color infrared video imagery (1:12,000) was obtained in the summer of 2004 (as built), and will be obtained postconstruction in 2007, and 2010. Imagery were delineated to classify all land in the project area as either (1) preexisting wetlands, (2) vegetated and non-vegetated terraces, and (3) non-terrace, newly developed wetlands (i.e., those that develop in open water areas between the terraces or adjacent to the preexisting perimeter levees).

CRMS Supplemental

In addition to the project specific monitoring elements listed above, a variety of other data is collected at CRMS-*Wetlands* stations which can be used as supporting or contextual information. Data types collected at CRMS sites include hydrologic from continuous recorder (mentioned above), vegetative, physical soil characteristics, discrete porewater, surface elevation, and land:water analysis of 1 km² area encompassing the station. For this report, data from sites within the project area is compared to data from sites outside the project area in a traditional project versus reference manner. In the future, data collected from the CRMS network over a sufficient amount of time to develop valid trends will be used to develop integrated data indices at different spatial scales (local, basin, coastal) to which we can compare project performance.

Soil cores were collected one time (within a year of site establishment) to describe soil properties (bulk density and percent organic matter). Three, 4" (10.16-cm) diameter cores were collected to a depth of 24 cm and divided into 6, 4-cm sections at the site. The soil was processed by the Department of Agronomy and Environmental Management at Louisiana State University.

To determine plant species, percent cover and the quality of the species, a species cover and floristic quality index (FQI) was utilized which qualifies cover values combined with quality classifications so that invasive species and those indicative of disturbance or destabilization get lower scores than those that indicate stable marshes.

Soil surface elevation change utilizing a combination of sediment elevation tables (RSET) and vertical accretion from feldspar horizon markers are being measured twice per year at each site. This data will be used to describe general components of elevation change and establish accretion/subsidence rates. The RSET will be surveyed to a known elevation datum (ft, NAVD88) so it can be directly compared to other elevation variables such as water level. There are no CRMS stations located in the project area; however a reference station location was chosen based on tidally influenced marsh in the Acadiana Bays complex. The CRMS station referencing the project area is 552.

c. Preliminary Monitoring Results and Discussion

Shoreline Position

The first DGPS shoreline survey was performed on June 2, 2004 and results of that survey are overlaid onto 2004 Digital Orthophoto Quarter Quadrangle (DOQQ) images (Figure 5). Loss and gain interpretations will be performed after the second and third survey scheduled for June 2010 and June 2017.

Terrace Vegetation

Terrace vegetation was monitored on July 27 and 28 of 2004 and July 18 and 19 of 2007 (Figures 6 and 7). Mean percent cover of vegetation from the 2004 sampling to the 2007 sampling in the 33 plots located on the Little White Lake (LWL) terraces increased from 12.3 % to 38.1 %. Mean percent cover of the vegetation on the Vermilion Bay (VB) terraces remained the same from 71.6 % to 70 % (Figures 8a and 8b). There is significant difference in cover between the two terrace areas but not between years (Figure 9). In LWL, the terraces located on the northeast lake rim were protected by the terrace rows in front of them and showed a higher number of species. The outer most terrace row was subjected to more wave energies and experienced the lowest number of species and high rates of erosion. In VB, terraces located behind an existing island and in the innermost terrace field had the highest number of species while the first set of terrace rows opened to VB experienced the most erosion and low species numbers.

Floristic quality of the vegetation in both the LWL terrace area and the VB terrace area increased from 2004 sampling period to the 2007 sampling period (Figures 10a-10b). The dominant species in the LWL area was the planted species, *Spartina alterniflora*, for both sampling years. Other species represented low cover value for both sampling periods. On the VB terrace area *Echinochloa walteri* was the dominant species for 2004 and was replaced by *S. alterniflora* in 2007. Percent cover, although higher than the LWL area, decreased slightly along with species richness from 2004 to 2007. However, the species that were not present in 2007 were lower quality, annual disturbance species.

Bathymetry/Topography

Preliminary bathymetry surveys were completed in 2003 and differences will be calculated after the second survey scheduled for June 2010 (Figure 11).

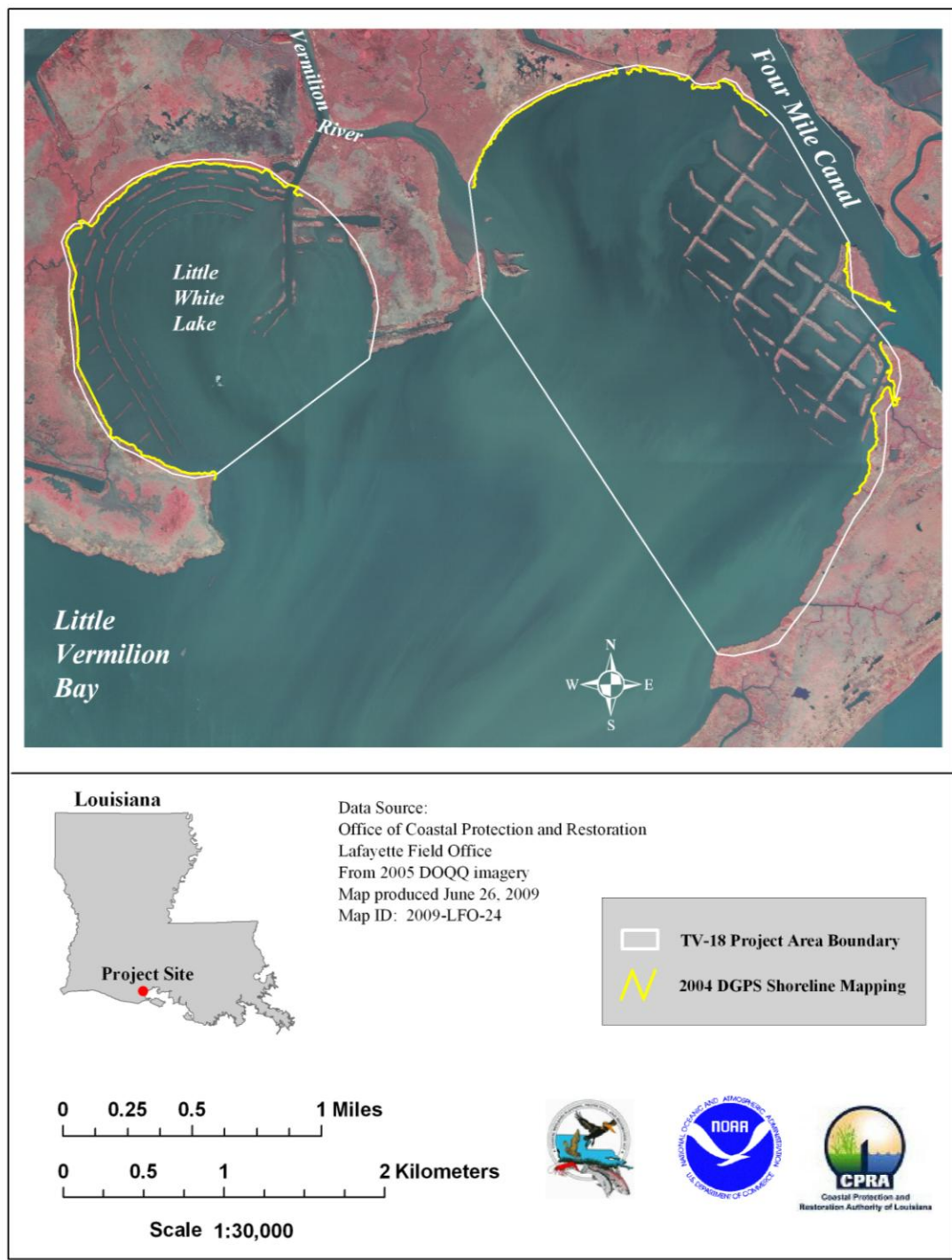


Figure 5. Four-Mile Canal Terracing and Sediment Trapping DGPS shoreline mapping for 2004.

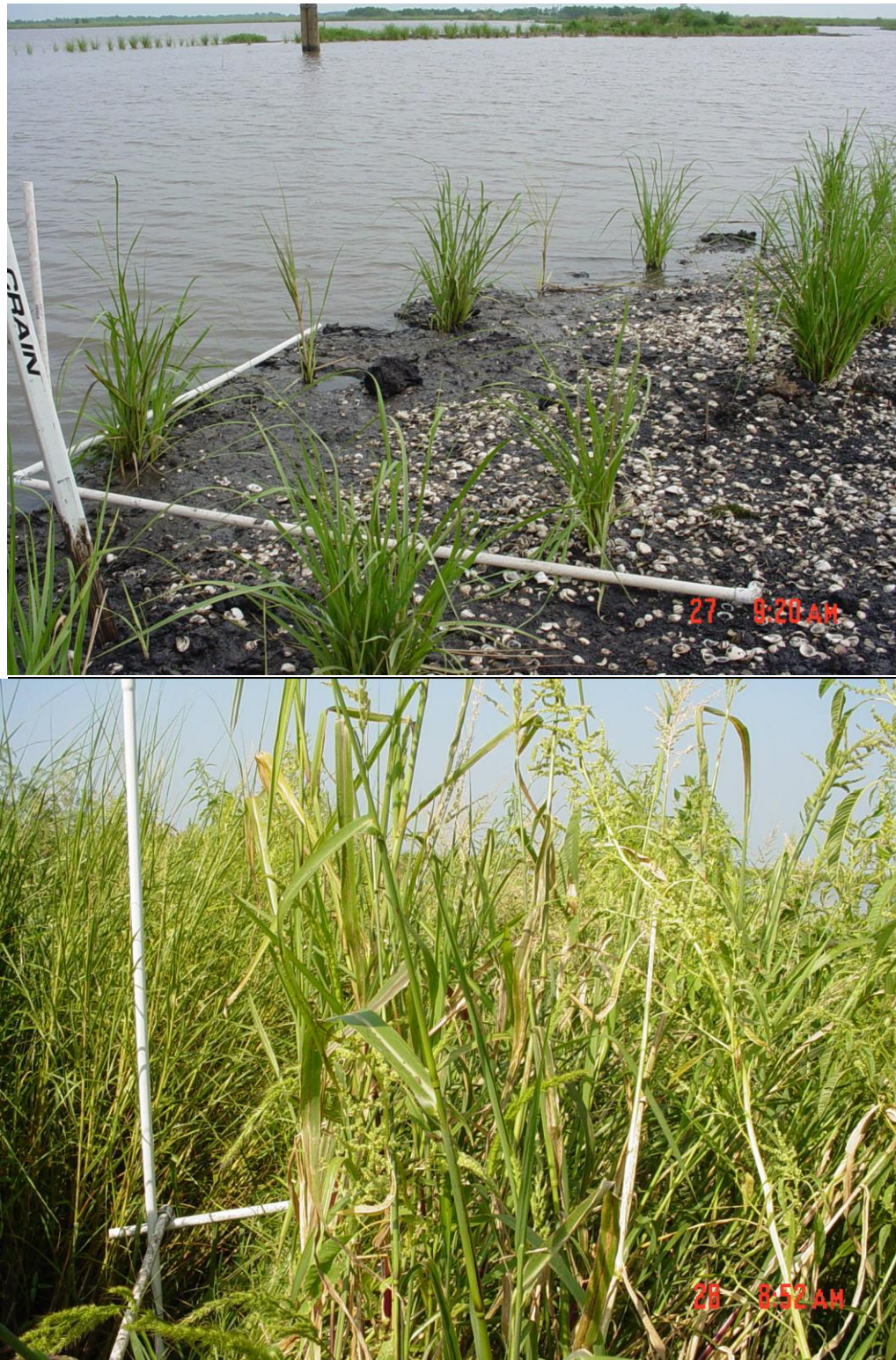


Figure 6. Vegetation sampling plot of terrace located in Little White Lake (upper) and Vermilion Bay (lower) areas taken July 27, 2004 and July 28, 2004, respectively.



Figure 7. Vegetation sampling plot of terrace located in Little White Lake (upper) and Vermilion Bay (lower) areas taken July 19, 2007.

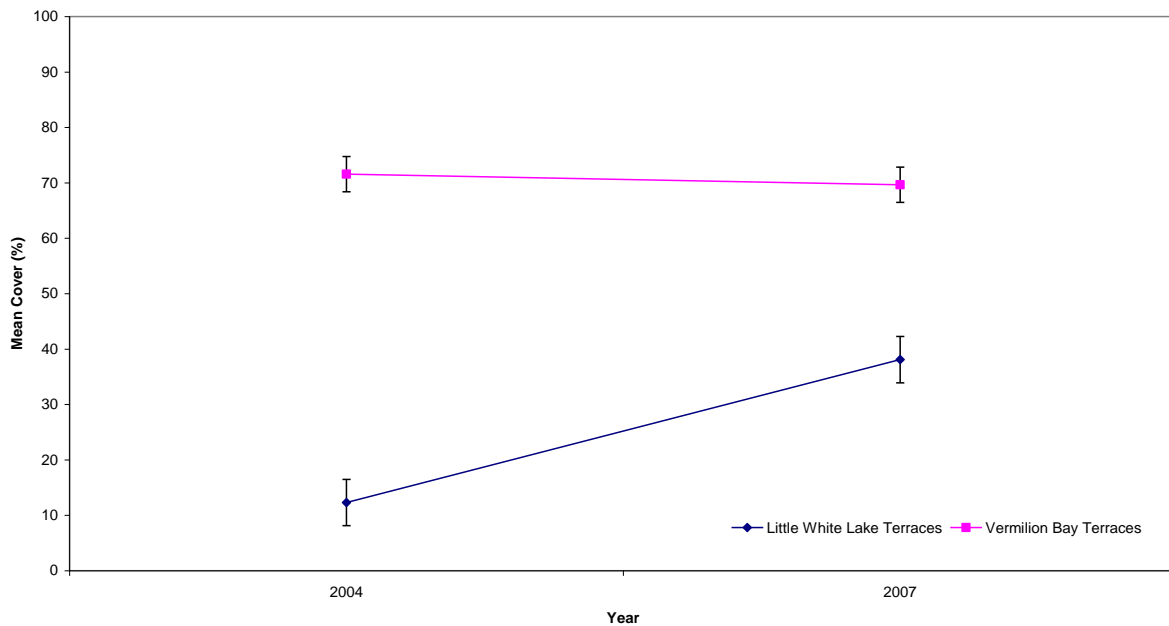


Figure 8a. Mean percent cover of vegetation on the Little White Lake terraces and the Vermilion Bay terraces from 2004 to 2007.

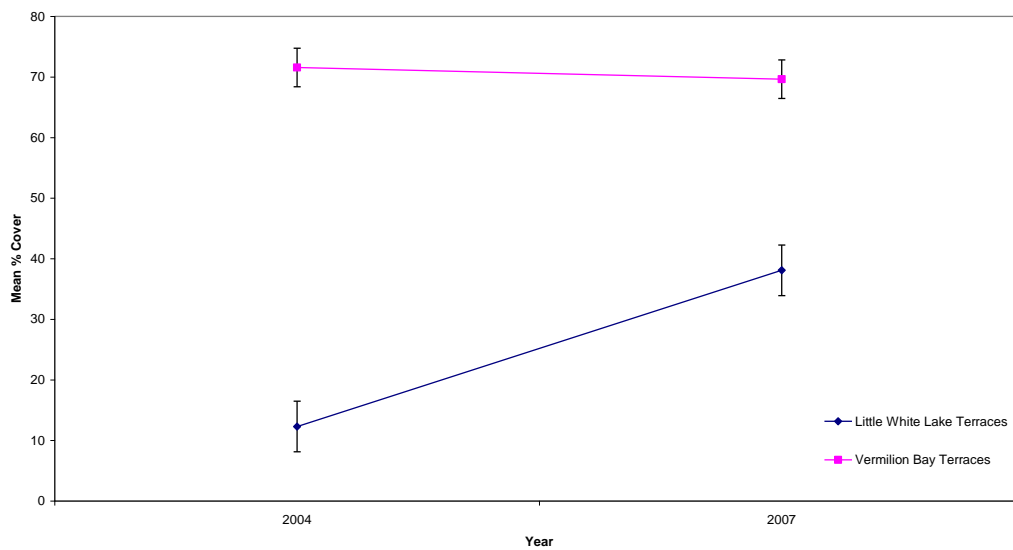


Figure 8b. Mean percent cover from 2004 to 2007 of vegetation species in located in Little White Lake and Vermilion Bay areas.

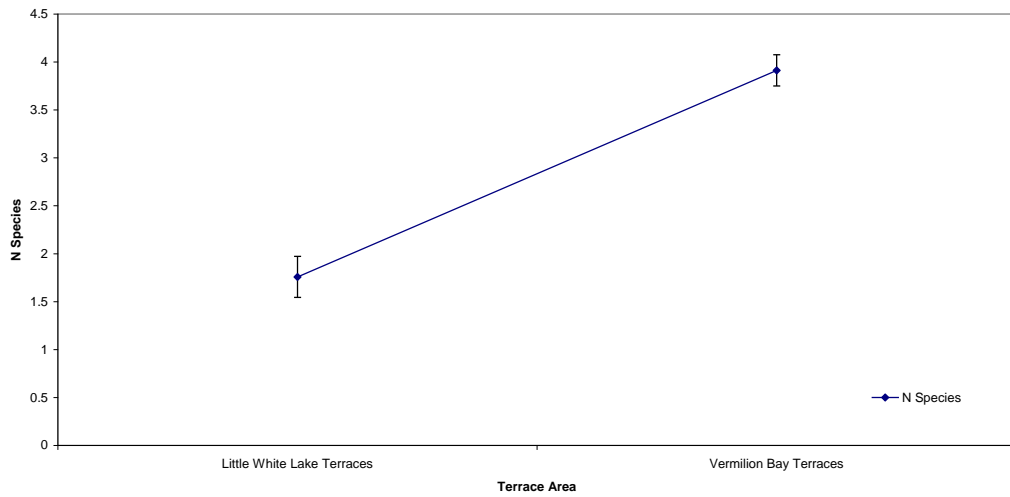


Figure 9. Comparison of vegetation in Little White Lake terrace area to the Vermilion Bay terrace area from two sampling periods in 2004 and 2007.

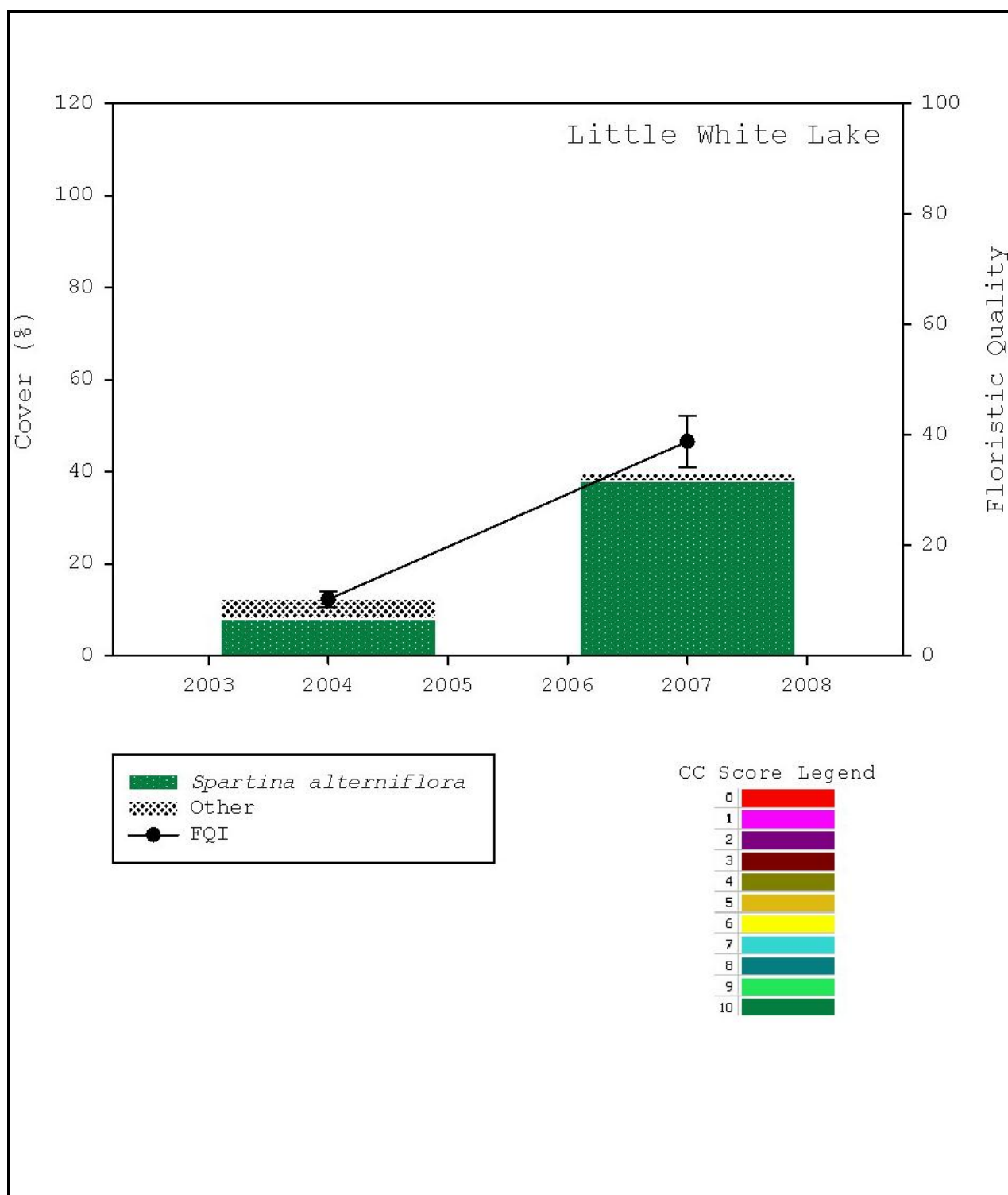


Figure 10a. Percent coverage of species and floristic quality index of vegetation data collected on the Little White Lake terrace area. Values are means of 33 stations within the site; therefore, the sum of % coverage of individual species can be greater than 100 %.

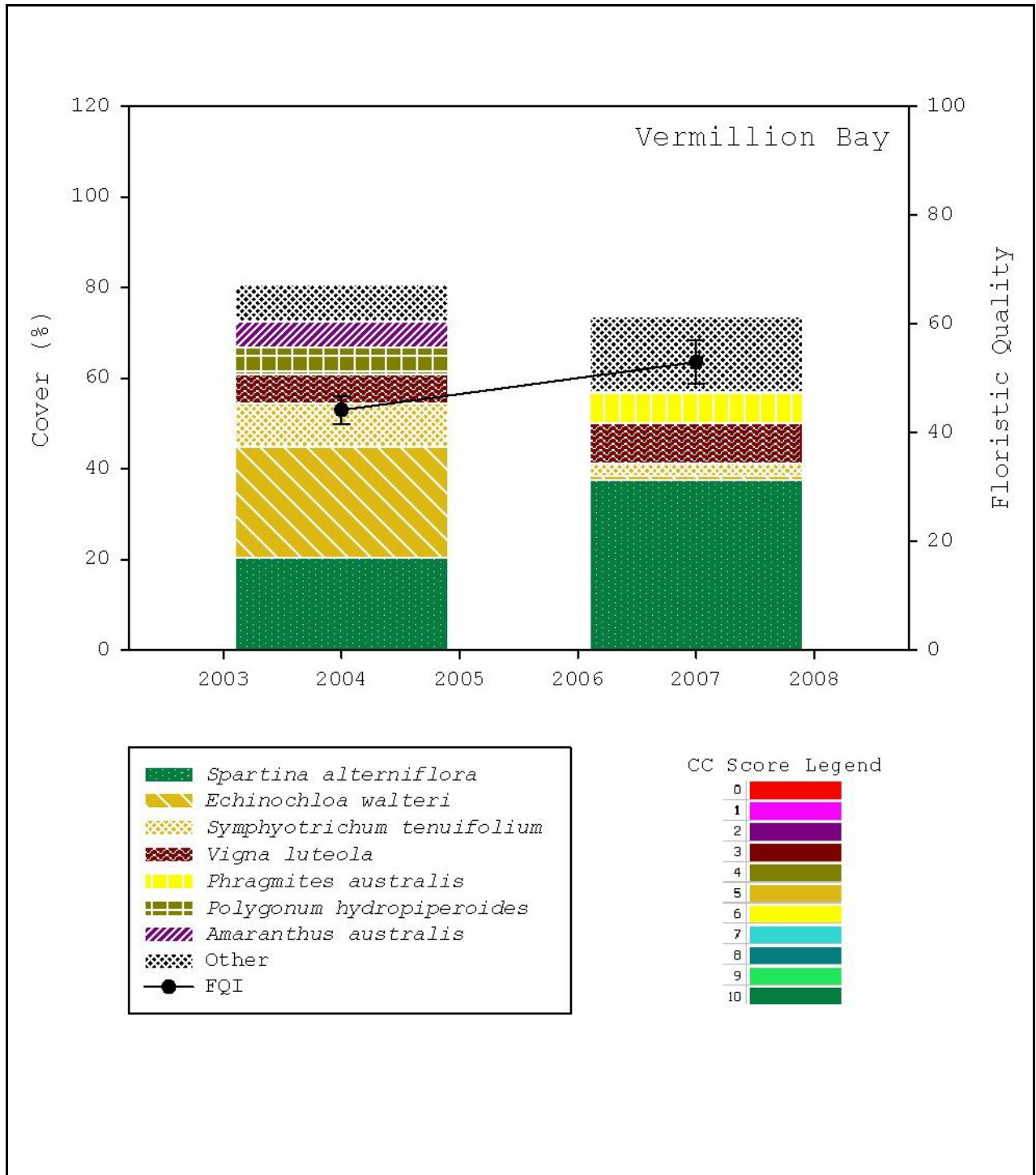


Figure 10b. Percent coverage of species and floristic quality index of vegetation data collected on the Vermillion Bay terrace area. Values are means of 57 stations within the site; therefore, the sum of % coverage of individual species can be greater than 100 %.

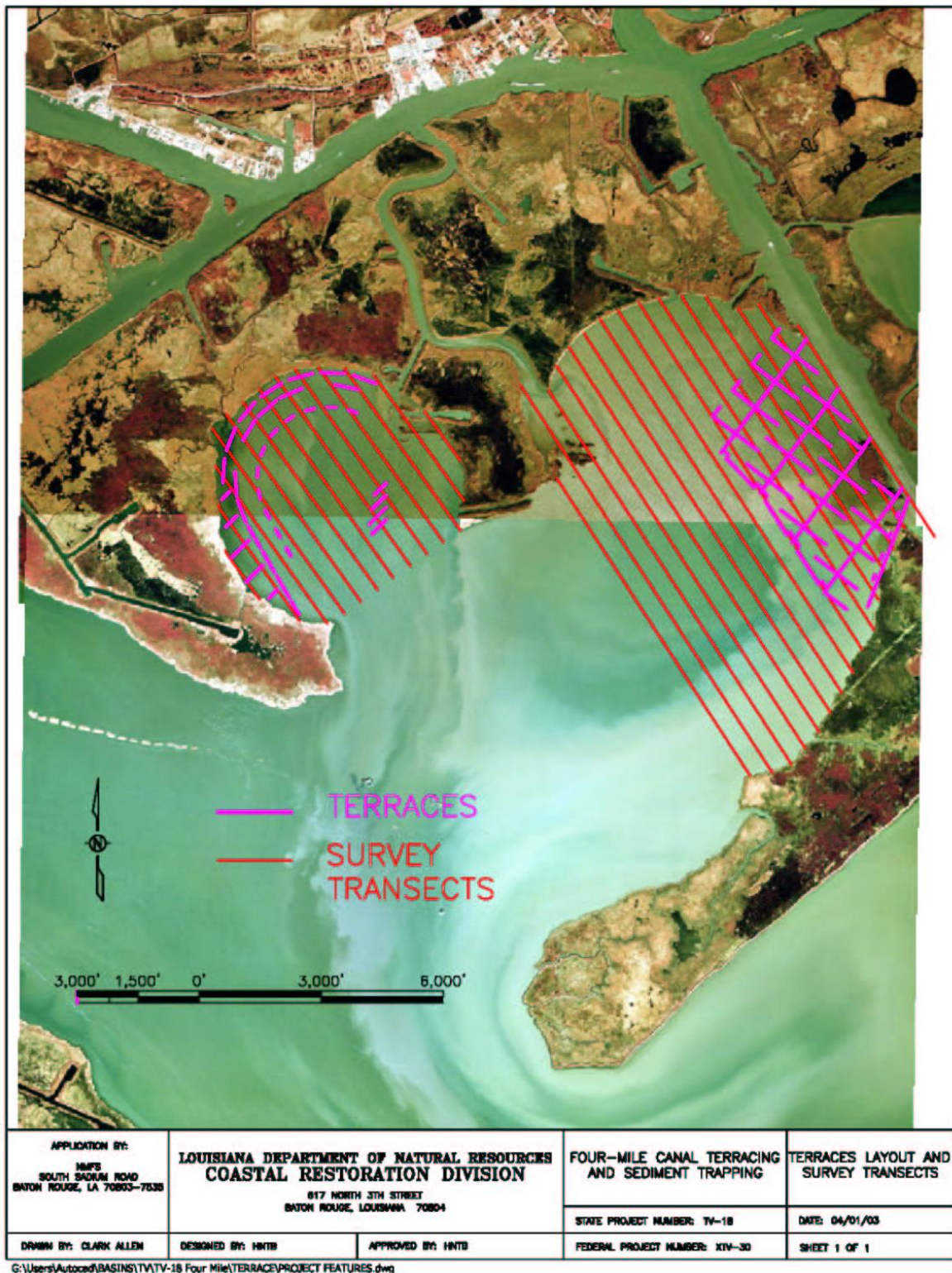


Figure 11. Layout for terraces and survey transects for Four-Mile Canal Terracing and Sediment Trapping (T/V-18).

Digital Color Infrared Video Imagery:

Analysis of digital color infrared video taken in 2004, Z-1 imaging for 2005 and color infrared aerial photography for 2007 for the entire project area are presented in Figures 12a-12c. Total project area is 2,270 acres. The White project Lake area consists of 643 acres and the Vermilion Bay project area consists of 1,456 acres. Land area increased slightly from 2004 to 2007 in both the Little White Lake terrace area and the Vermilion Bay terrace area. Slight land losses were due to erosion of the outer terraces exposed to wave action. Slight gains were located in protected areas where sediment was trapped.

The terrace area increased a net of 8 acres of 11% of the terrace area constructed, which does not include previously existing land that increased potentially as a result of the terraces providing a buffer. Some land gains shown in the 2004 imagery were absent in the 2005 imagery, which may reflect real changes, the error range of such analysis, or a combination of these. Also, while significant erosion has occurred along the high energy environment along Four Mile canal, the land/water analysis shows that those sediments are not simply re-deposited within the project, but additional sediment is being accumulated.

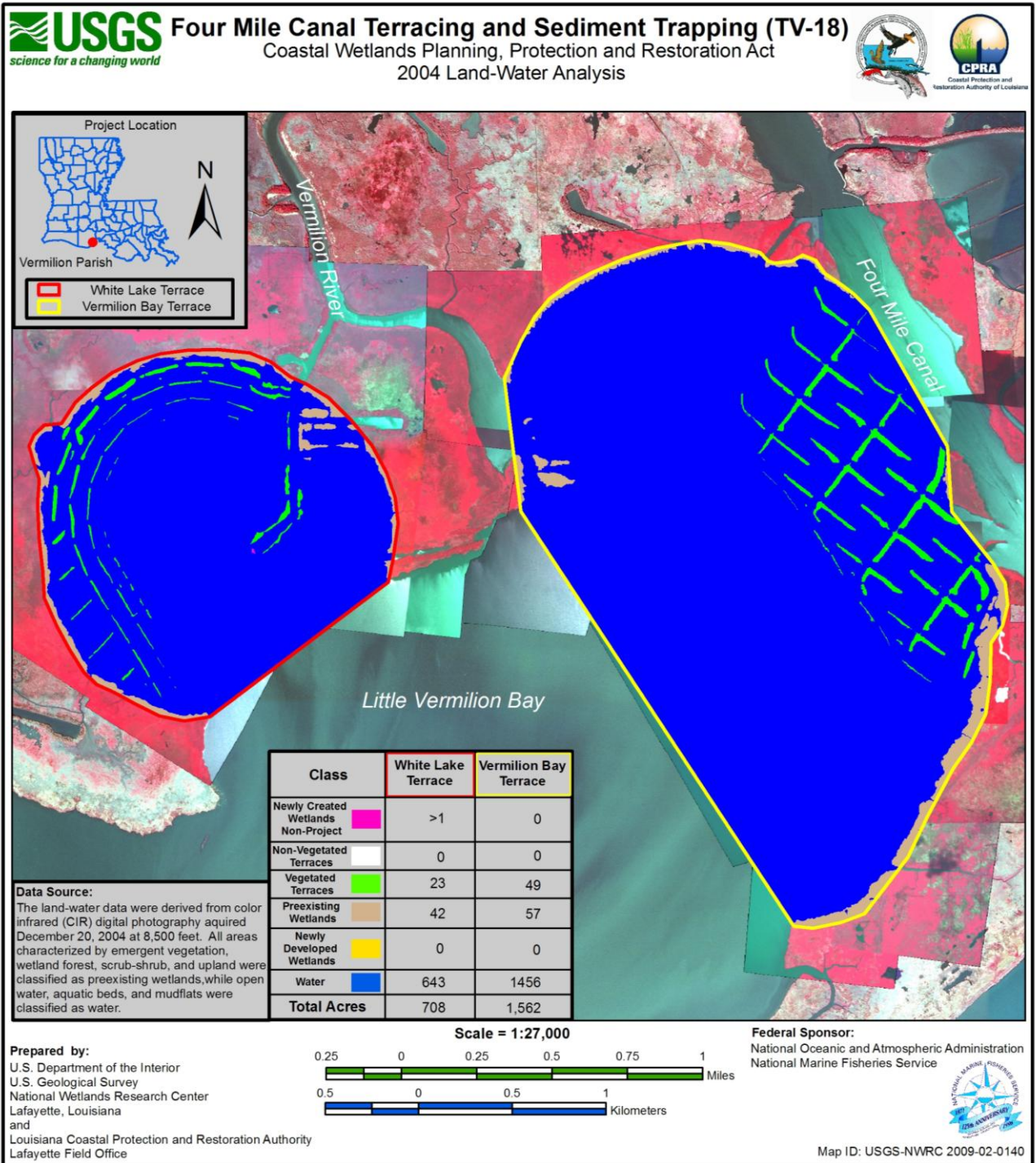


Figure 12a. Four-Mile Canal Terracing and Sediment Trapping (TV-18) 2004 land water analysis.

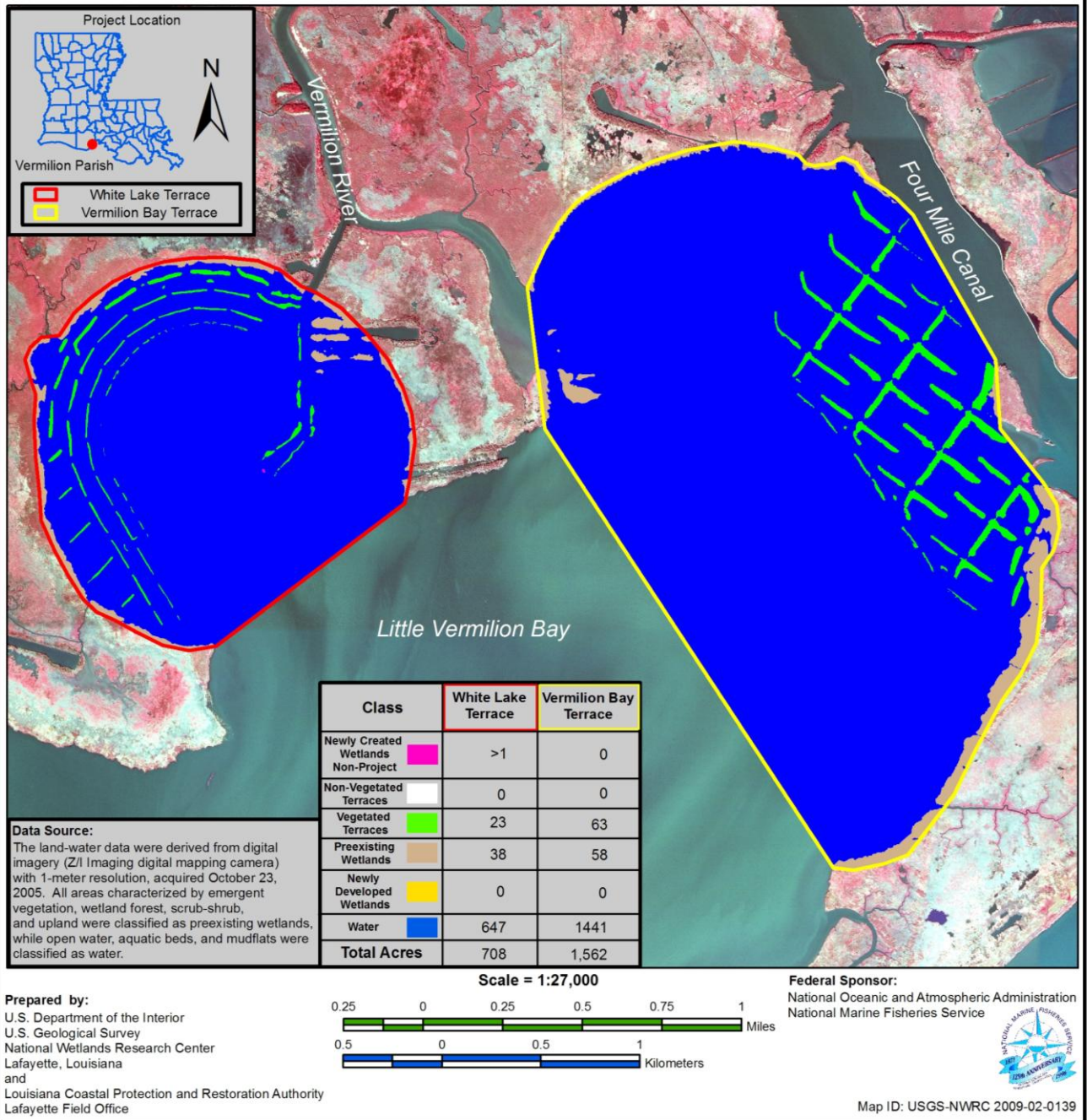


Figure 12b. Four-Mile Canal Terracing and Sediment Trapping (TV-18) 2005 land water analysis.

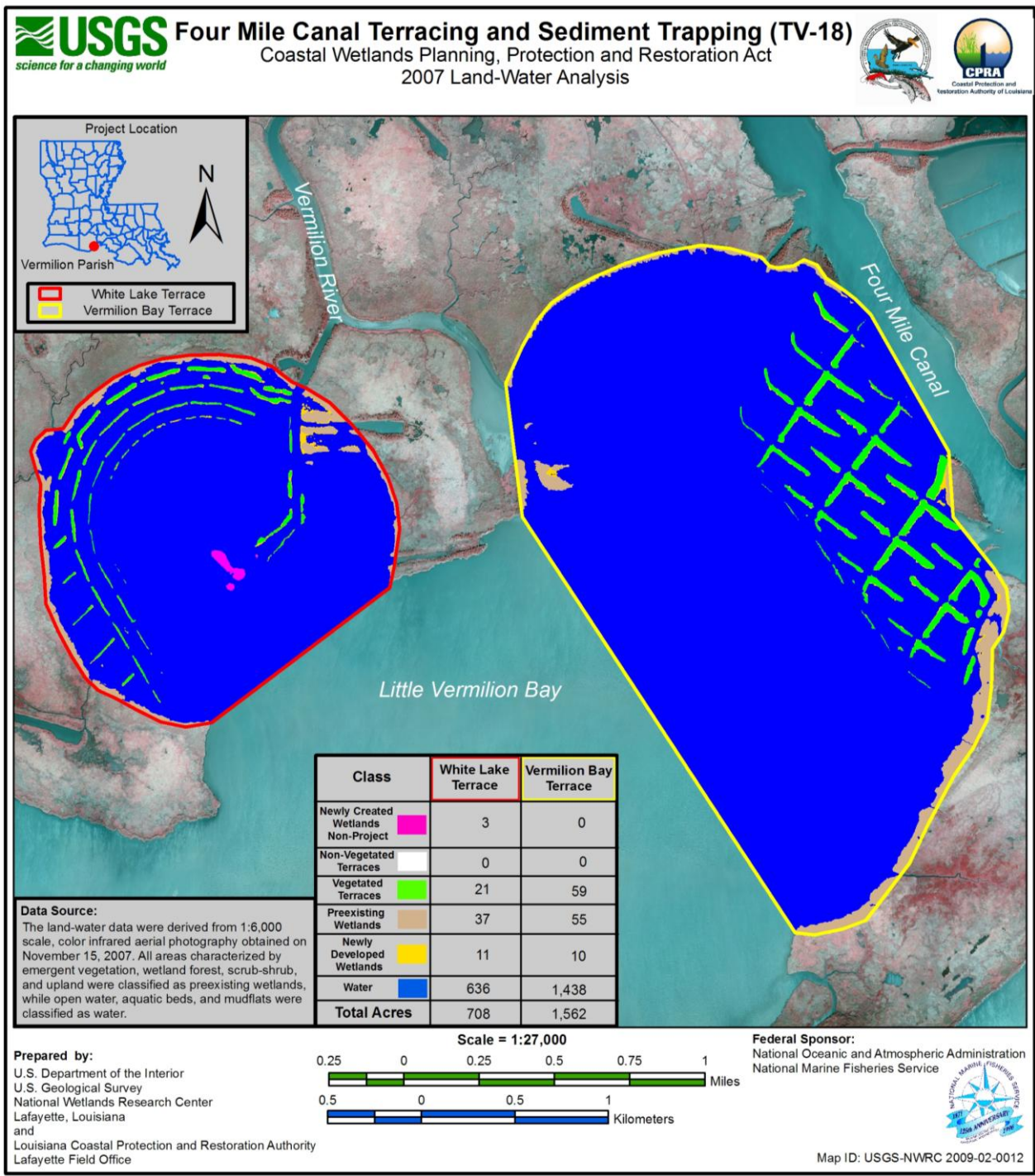


Figure 12c. 2007 Land Water analysis for Four Mile Canal Terracing and Sediment Trapping (TV-18).

V. Conclusions

a. Project Effectiveness

The Four Mile Canal Terracing and Sediment Trapping Project is in very good condition and functioning as intended.

Terraces in the highest energy environment areas have eroded and in some areas are completely gone. The planted vegetation has colonized most of the terraces in Vermilion Bay and a lower percentage of the terraces in Little White Lake. Overall, the project has created functional marshland and is expected to maintain the integrity of the marsh it has been protecting.

b. Recommended Improvements

In order to evaluate earthen terrace settlement and any vertical accretion between the terraces, a structural assessment survey performed by a licensed engineering/ land surveying firm is recommended within the first 5 years of construction. The date of assessment survey should be agreed upon by the state and federal sponsor at the annual maintenance inspection.

Staff gauges should be installed at convenient locations when other survey work in the area is required.

c. Lessons Learned

Terraces created in high energy environments such as the ones located adjacent to the Four-Mile Canal may benefit from a hard structure, fence, or breakwater to minimize the erosive effects from boat wake traffic.

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Appendix A

(Inspection Photographs)



Photo 1—terraces along Vermilion River Cut-Off



Photo 2—terraces in Little Vermilion Bay



Photo 3—terraces in Little White Lake



Photo 4—terraces in Little White Lake

Appendix B

(Three Year Budget Projection)

FOUR MILE CANAL/ TV18 / PPL 9
Three-Year Operations & Maintenance Budgets 07/01/2008 - 06/30/2011

<u>Project Manager</u>	<u>O & M Manager</u>	<u>Federal Sponsor</u>	<u>Prepared By</u>
Pat Landry	Stan Aucoin	NMFS	Stan Aucoin

	2008/2009	2009/2010	2010/2011
Maintenance Inspection	\$ 5,570.00	\$ 5,737.00	\$ 5,909.00
Structure Operation			
Administration		\$ -	\$ -
Maintenance/Rehabilitation			

08/09 Description: Add staff gage.

E&D	\$7,500.00
Construction	
Construction Oversight	
Sub Total - Maint. And Rehab.	\$ 7,500.00

09/10 Description:

E&D	\$ -
Construction	\$ -
Construction Oversight	\$ -
Sub Total - Maint. And Rehab.	\$ -

10/11 Description:

E&D	\$ -
Construction	\$ -
Construction Oversight	\$ -
Sub Total - Maint. And Rehab.	\$ -

	2008/2009	2009/2010	2010/2011
Total O&M Budgets	\$ 13,070.00	\$ 5,737.00	\$ 5,909.00

O & M Budget (3 yr Total)	\$ 24,716.00
Unexpended O & M Budget	\$ 19,894.83
Remaining O & M Budget (Projected)	\$ (4,821.17)

OPERATION AND MAINTENANCE BUDGET 07/01/2008-06/30/2009
FOUR MILE CANAL TERRACING AND SEDIMENT TRAPPING/TV-18/PPL9

DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	ESTIMATED TOTAL
O&M Inspection and Report	EACH	1	\$5,570.00	\$5,570.00
General Structure Maintenance	LUMP	1	\$0.00	\$0.00
Engineering and Design	LUMP	1	\$0.00	\$0.00
Operations Contract	LUMP	1	\$0.00	\$0.00
Construction Oversight	LUMP	1	\$0.00	\$0.00

ADMINISTRATION

LDNR / CRD Admin.	LUMP	0	\$0.00	\$0.00
FEDERAL SPONSER Admin.	LUMP	0	\$0.00	\$0.00
SURVEY Admin.	LUMP	0	\$2,000.00	\$0.00
OTHER				\$0.00
TOTAL ADMINISTRATION COSTS:				\$0.00

MAINTENANCE / CONSTRUCTION

SURVEY

SURVEY DESCRIPTION:	Add staff gage.			
Secondary Monument	EACH	0	\$0.00	\$0.00
Staff Gauge / Recorders	EACH	1	\$7,500.00	\$7,500.00
Marsh Elevation / Topography	LUMP	0	\$0.00	\$0.00
TBM Installation	EACH	0	\$0.00	\$0.00
OTHER				\$0.00
TOTAL SURVEY COSTS:				\$7,500.00

GEOTECHNICAL

GEOTECH DESCRIPTION:				
Borings	EACH	0	\$0.00	\$0.00
OTHER				\$0.00
TOTAL GEOTECHNICAL COSTS:				\$0.00

CONSTRUCTION

CONSTRUCTION DESCRIPTION:					
Rip Rap	LIN FT	TON / FT	TONS	UNIT PRICE	
	0	0.0	0	\$0.00	\$0.00
	0	0.0	0	\$0.00	\$0.00
	0	0.0	0	\$0.00	\$0.00
Filter Cloth / Geogrid Fabric	SQ YD	0	\$0.00	\$0.00	\$0.00
Navigation Aid	EACH	0	\$0.00	\$0.00	\$0.00
Signage	EACH	0	\$0.00	\$0.00	\$0.00
General Excavation / Fill	CU YD	0	\$0.00	\$0.00	\$0.00
Dredging	CU YD	0	\$0.00	\$0.00	\$0.00
Sheet Piles (Lin Ft or Sq Yds)		0	\$0.00	\$0.00	\$0.00
Timber Piles (each or lump sum)		0	\$0.00	\$0.00	\$0.00
Timber Members (each or lump sum)		0	\$0.00	\$0.00	\$0.00
Hardware	LUMP	1	\$0.00	\$0.00	\$0.00
Materials	LUMP	1	\$0.00	\$0.00	\$0.00
Mob / Demob	LUMP	1	\$0.00	\$0.00	\$0.00
Contingency	LUMP	1	\$0.00	\$0.00	\$0.00
General Structure Maintenance	LUMP	1	\$0.00	\$0.00	\$0.00
OTHER			\$0.00	\$0.00	\$0.00
OTHER			\$0.00	\$0.00	\$0.00
OTHER			\$0.00	\$0.00	\$0.00
TOTAL CONSTRUCTION COSTS:					\$0.00

TOTAL OPERATIONS AND MAINTENANCE BUDGET: **\$13,070.00**

OPERATION AND MAINTENANCE BUDGET 07/01/2009-06/30/2010
FOUR MILE CANAL TERRACING AND SEDIMENT TRAPPING/TV-18/PPL9

DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	ESTIMATED TOTAL
O&M Inspection and Report	EACH	1	\$5,737.00	\$5,737.00
General Structure Maintenance	LUMP	1	\$0.00	\$0.00
Engineering and Design	LUMP	1	\$0.00	\$0.00
Operations Contract	LUMP	1	\$0.00	\$0.00
Construction Oversight	LUMP	1	\$0.00	\$0.00

ADMINISTRATION

LDNR / CRD Admin.	LUMP	0	\$0.00	\$0.00
FEDERAL SPONSER Admin.	LUMP	0	\$0.00	\$0.00
SURVEY Admin.	LUMP	0	\$0.00	\$0.00
OTHER				\$0.00
TOTAL ADMINISTRATION COSTS:				\$0.00

MAINTENANCE / CONSTRUCTION

SURVEY

SURVEY DESCRIPTION:					
Secondary Monument	EACH	0	\$0.00	\$0.00	
Staff Gauge / Recorders	EACH	0	\$0.00	\$0.00	
Marsh Elevation / Topography	LUMP	0	\$0.00	\$0.00	
TBM Installation	EACH	0	\$0.00	\$0.00	
OTHER					\$0.00
TOTAL SURVEY COSTS:					\$0.00

GEOTECHNICAL

GEOTECH DESCRIPTION:					
Borings	EACH	0	\$0.00	\$0.00	
OTHER					\$0.00
TOTAL GEOTECHNICAL COSTS:					\$0.00

CONSTRUCTION

CONSTRUCTION DESCRIPTION:					
Rip Rap	LIN FT	TON / FT	TONS	UNIT PRICE	
	0	0.0	0	\$0.00	\$0.00
	0	0.0	0	\$0.00	\$0.00
	0	0.0	0	\$0.00	\$0.00
Filter Cloth / Geogrid Fabric	SQ YD	0		\$0.00	\$0.00
Navigation Aid	EACH	0		\$0.00	\$0.00
Signage	EACH	0		\$0.00	\$0.00
General Excavation / Fill	CU YD	0		\$0.00	\$0.00
Dredging	CU YD	0		\$0.00	\$0.00
Sheet Piles (Lin Ft or Sq Yds)		0		\$0.00	\$0.00
Timber Piles (each or lump sum)		0		\$0.00	\$0.00
Timber Members (each or lump sum)		0		\$0.00	\$0.00
Hardware	LUMP	1		\$0.00	\$0.00
Materials	LUMP	1		\$0.00	\$0.00
Mob / Demob	LUMP	1		\$0.00	\$0.00
Contingency	LUMP	1		\$0.00	\$0.00
General Structure Maintenance	LUMP	1		\$0.00	\$0.00
OTHER				\$0.00	\$0.00
OTHER				\$0.00	\$0.00
OTHER				\$0.00	\$0.00
TOTAL CONSTRUCTION COSTS:					\$0.00

TOTAL OPERATIONS AND MAINTENANCE BUDGET: **\$5,737.00**

OPERATION AND MAINTENANCE BUDGET 07/01/2010-06/30/2011
FOUR MILE CANAL TERRACING AND SEDIMENT TRAPPING/TV-18/PPL9

DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	ESTIMATED TOTAL
O&M Inspection and Report	EACH	1	\$5,909.00	\$5,909.00
General Structure Maintenance	LUMP	1	\$0.00	\$0.00
Engineering and Design	LUMP	1	\$0.00	\$0.00
Operations Contract	LUMP	1	\$0.00	\$0.00
Construction Oversight	LUMP	1	\$0.00	\$0.00

ADMINISTRATION

LDNR / CRD Admin.	LUMP	1	\$0.00	\$0.00
FEDERAL SPONSER Admin.	LUMP	1	\$0.00	\$0.00
SURVEY Admin.	LUMP	1	\$0.00	\$0.00
OTHER				\$0.00
TOTAL ADMINISTRATION COSTS:				\$0.00

MAINTENANCE / CONSTRUCTION

SURVEY

SURVEY DESCRIPTION:					
	Secondary Monument	EACH	0	\$0.00	\$0.00
	Staff Gauge / Recorders	EACH	0	\$0.00	\$0.00
	Marsh Elevation / Topography	LUMP	0	\$0.00	\$0.00
	TBM Installation	EACH	0	\$0.00	\$0.00
	OTHER				\$0.00
	TOTAL SURVEY COSTS:				\$0.00

GEOTECHNICAL

GEOTECH DESCRIPTION:					
	Borings	EACH	0	\$0.00	\$0.00
	OTHER				\$0.00
	TOTAL GEOTECHNICAL COSTS:				\$0.00

CONSTRUCTION

CONSTRUCTION DESCRIPTION:					
Rip Rap	LIN FT	TON / FT	TONS	UNIT PRICE	
	0	0.0	0	\$0.00	\$0.00
	0	0.0	0	\$0.00	\$0.00
	0	0.0	0	\$0.00	\$0.00
Filter Cloth / Geogrid Fabric	SQ YD	0		\$0.00	\$0.00
Navigation Aid	EACH	0		\$0.00	\$0.00
Signage	EACH	0		\$0.00	\$0.00
General Excavation / Fill	CU YD	0		\$0.00	\$0.00
Dredging	CU YD	0		\$0.00	\$0.00
Sheet Piles (Lin Ft or Sq Yds)		0		\$0.00	\$0.00
Timber Piles (each or lump sum)		0		\$0.00	\$0.00
Timber Members (each or lump sum)		0		\$0.00	\$0.00
Hardware	LUMP	1		\$0.00	\$0.00
Materials	LUMP	1		\$0.00	\$0.00
Mob / Demob	LUMP	1		\$0.00	\$0.00
Contingency	LUMP	1		\$0.00	\$0.00
General Structure Maintenance	LUMP	1		\$0.00	\$0.00
OTHER				\$0.00	\$0.00
OTHER				\$0.00	\$0.00
OTHER				\$0.00	\$0.00
TOTAL CONSTRUCTION COSTS:					\$0.00

TOTAL OPERATIONS AND MAINTENANCE BUDGET: **\$5,909.00**

Appendix C

(Field Inspection Notes)

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-18 Four Mile Canal

Date of Inspection: June 6, 2008 Time:

Structure No. N/A

Inspector(s): Stan Aucoin (OCPR)

John Foret (NMFS)

Structure Description: Terracing and Sediment Trapping

Water Level NAVD

Type of Inspection: Annual

Weather Conditions: Sunny and warm

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	Good				
Signage / Supports	N/A				
Rip Rap (fill)	N/A				
Eathern Embankment Terraces	Good			1, 2, 3 & 4	Expected erosion on sacrificial terraces. Significant erosion on terraces adjacent to Vermilion River Cut Off.

What are the conditions of the existing levees?
 Are there any noticable breaches?
 Settlement of rock plugs and rock weirs?
 Position of stoplogs at the time of the inspection?
 Are there any signs of vandalism?