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Department of Natural Resources
Coastal Restoration Division and
Coastal Engineering Division

2004 Operations, Maintenance and Monitoring Report

for

North Lake Mechant Landbridge Restoration

State Project Number TE-44
Priority Project List 9

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Terrebonne Parish

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(TE-44)

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I. Introduction

The North Lake Mechant Landbridge Restoration project, Construction Unit 1 (CU1), is located in Terrebonne Parish, south of Bayou Decade and north of Lake Mechant. The project area encompasses approximately 7,572 acres (3,064 ha) of predominantly open water (>70%) and marsh, of which most is classified as intermediate (Belhadjali, 2002).

The land bridge, consisting of the Small Bayou la Pointe natural levees and the north shore of Lake Mechant, helps to protect the low-salinity marshes north of Lake Mechant from marine processes of the lake. The steep salinity gradient in the project area and the Penchant Basin area to the north demonstrates the important hydrologic function performed by this land bridge. The Brady Canal Hydrologic Restoration Project (TE-28) in the Penchant Basin, was implemented in 1999 to restore and maintain the salinity gradient of freshwater, intermediate and brackish marshes.

Continued deterioration of the marsh within the project area, both from interior marsh loss and shoreline erosion along Lakes Mechant and Pagie, threatens the integrity of the landbridge. The landbridge separates the intermediate and fresh marshes to the north, from the marine and tidally dominated system of the lake. At the present shoreline erosion rate of 7.5 feet/year (2.29 m/yr) (Paille and Segura 2000), it is projected that a 500 -1,000 foot (152-305 m) section of Lake Mechant shoreline will be breached, thus compromising the hydrologic and ecologic integrity of the area. Additionally, the east Lake Pagie shoreline is eroding at a rate of 3.3 to 3.8 feet/year (1.00 - 1.16 m/yr) (Paille and Segura 2000)

The principal project features include:

Vegetation plantings consist of *Spartina alterniflora* Loisel cv. Vermilion (smooth cordgrass). The *S. alterniflora* were planted along 44,307 feet (13,505 m) of the northern shoreline of Lake Mechant and the eastern shoreline of Lake Pagie (figure 1). A total of approximately 10,000 trade gallons and 20,000 plugs were used. The gallon containers have a minimum of six live and actively growing stems per container, and the plugs were multi-stemmed with bare root material.

The plantings included two rows of *Spartina alterniflora* plugs followed by one row of gallon containers (figure 2). There was some deviation to this scheme to conform to the topography. The *S. alterniflora* were planted five feet on center. No Nutria Exclusion Devices (N.E.D.) were used for this project.

Construction Unit 2 (CU2) will consist of dredge material placement on the interior marsh, earthen plugs, armored earthen plugs, and weir repairs (figure 1). Vegetation destroyed during CU2 will be replanted as needed. CU2 is scheduled to begin construction during the summer of 2004.

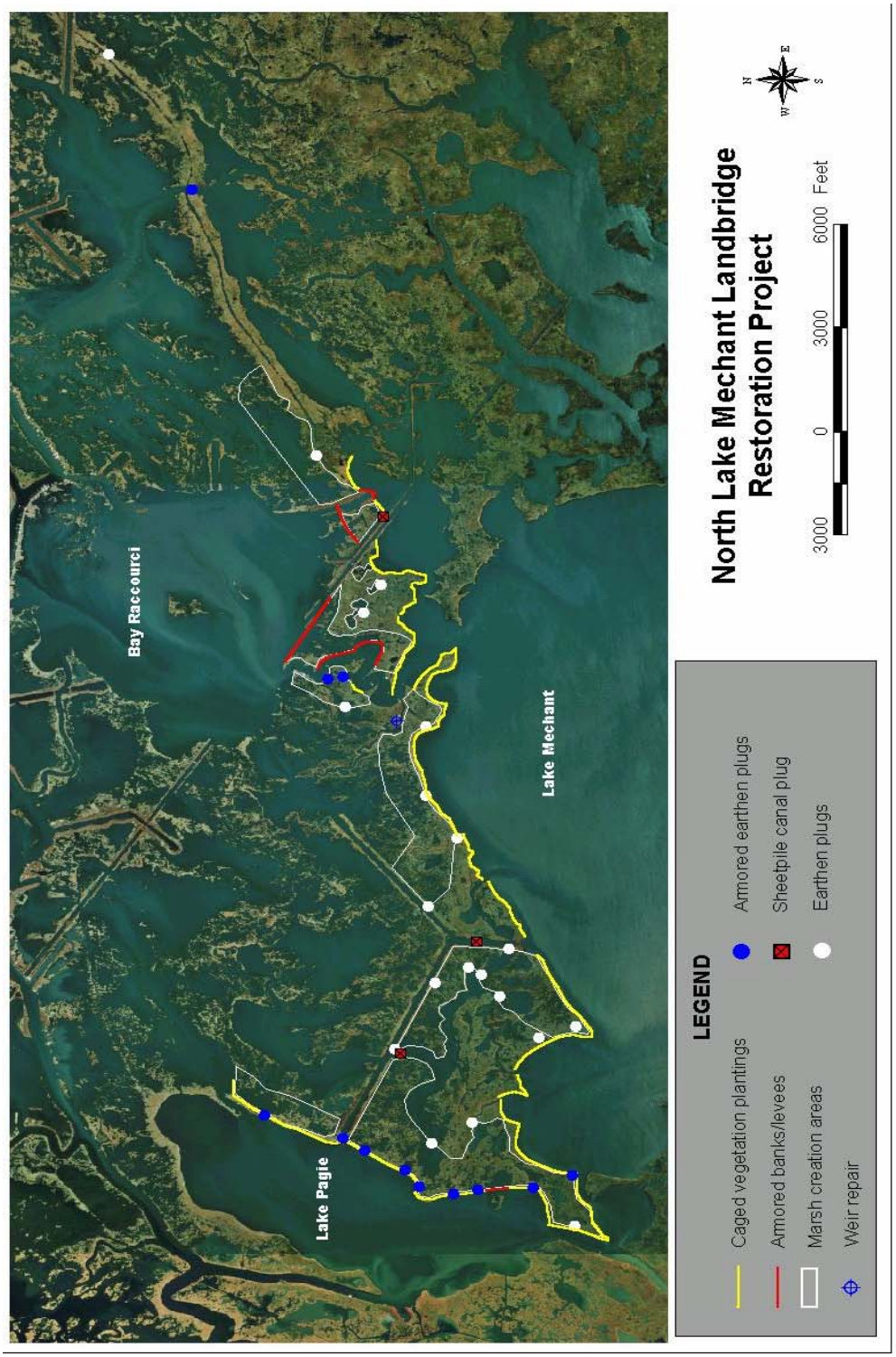

Figure 1. North Lake Mechant Landbridge Restoration (TE-44) project boundary and features design.

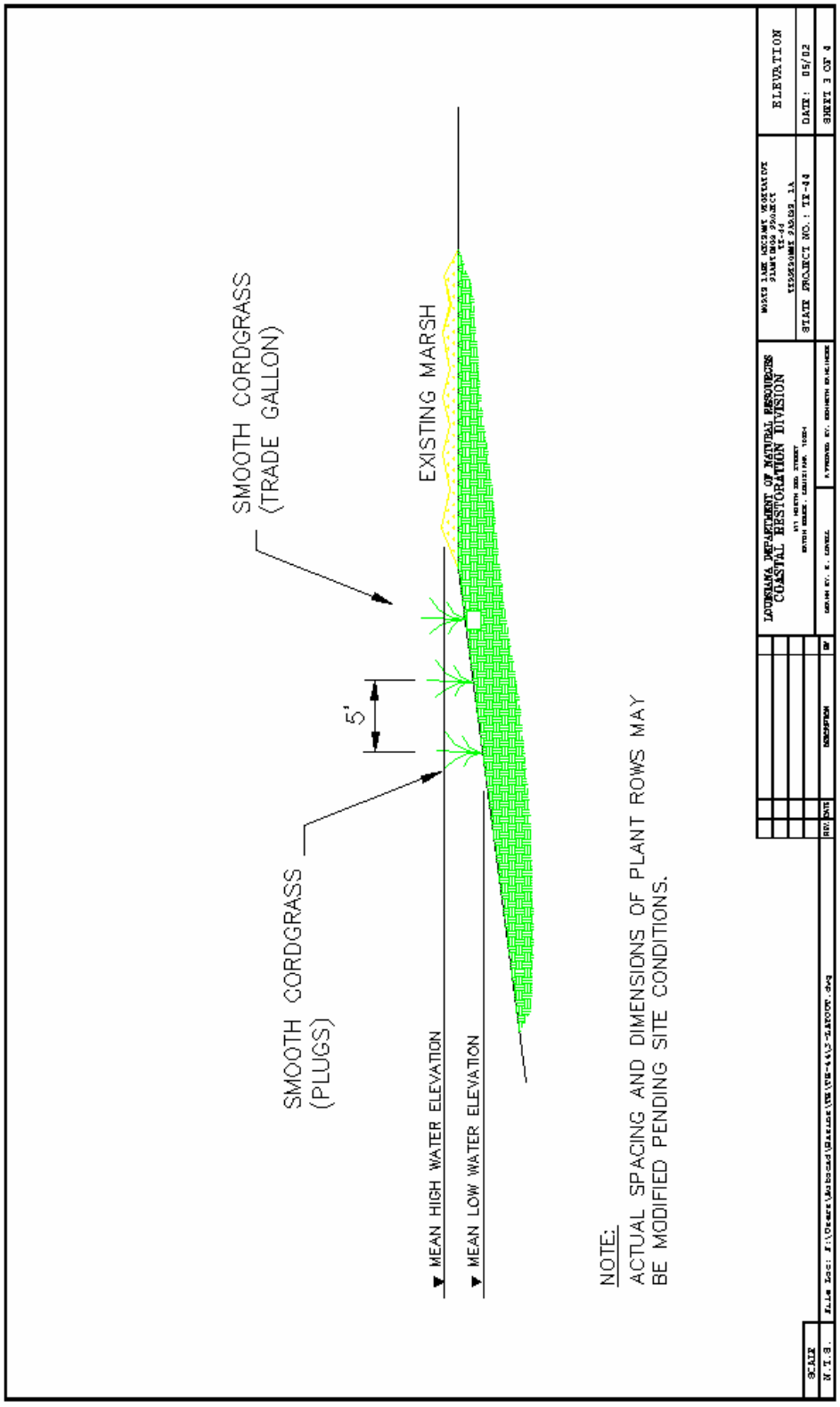

Figure 2. Planting schematic

II. Maintenance Activity

To date, CU2 of the North Lake Mechant Landbridge Restoration Project has not been constructed and no maintenance performed.

III. Operation Activity

No operation activity associated with this project.

IV. Monitoring Activity

a. Monitoring Goals

1. Determine the effectiveness of vegetation plantings in reducing the rate of erosion as compared to historical rates of erosion.

2. Determine the survival success of the vegetation plantings.

b. Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

Aerial Photography and Land/Water Analysis

Near vertical, color infrared (CIR) aerial photography was collected by U.S. Geologic Survey/National Wetlands Research Center (USGS/NWRC) in 2002 to evaluate changes in land and water areas. These data will be compared with future photography to evaluate changes during post-construction time periods.

Shoreline Change

Controlled GPS will be used to document marsh edge position using techniques described in Steyer et al. (1995). The shoreline will be divided into 400 foot (122 m) segments along the shoreline of Lake Mechant and Lake Pagie. GPS readings will be taken within each of ten randomly selected 400 foot (122 m) segments immediately post construction and then in years 2004, 2007, 2010, 2015, 2020. Historical rates of erosion will be obtained and compared to erosion rates within the sample segments after project implementation. Reference sites adjacent to the project area will be monitored and compared to historical erosion rates.

Vegetation

Species composition and relative abundance will be evaluated using techniques described in Steyer et al. (1995). A modified Braun-Blanquet method (Mueller-Dombois and Ellenberg 1974) will be utilized. Vegetation will be sampled in ten randomly selected plots within each of the ten randomly selected 400 foot (122 m) segments referenced in the previous section (figure 3).

Vegetation species composition and relative abundance will be evaluated in the fall following

construction in 2003 and then in years 2004, 2007, and 2010. Each sampling station will be marked with a corner pole to allow revisiting over time. Controlled GPS will also be used to document each sampling station.

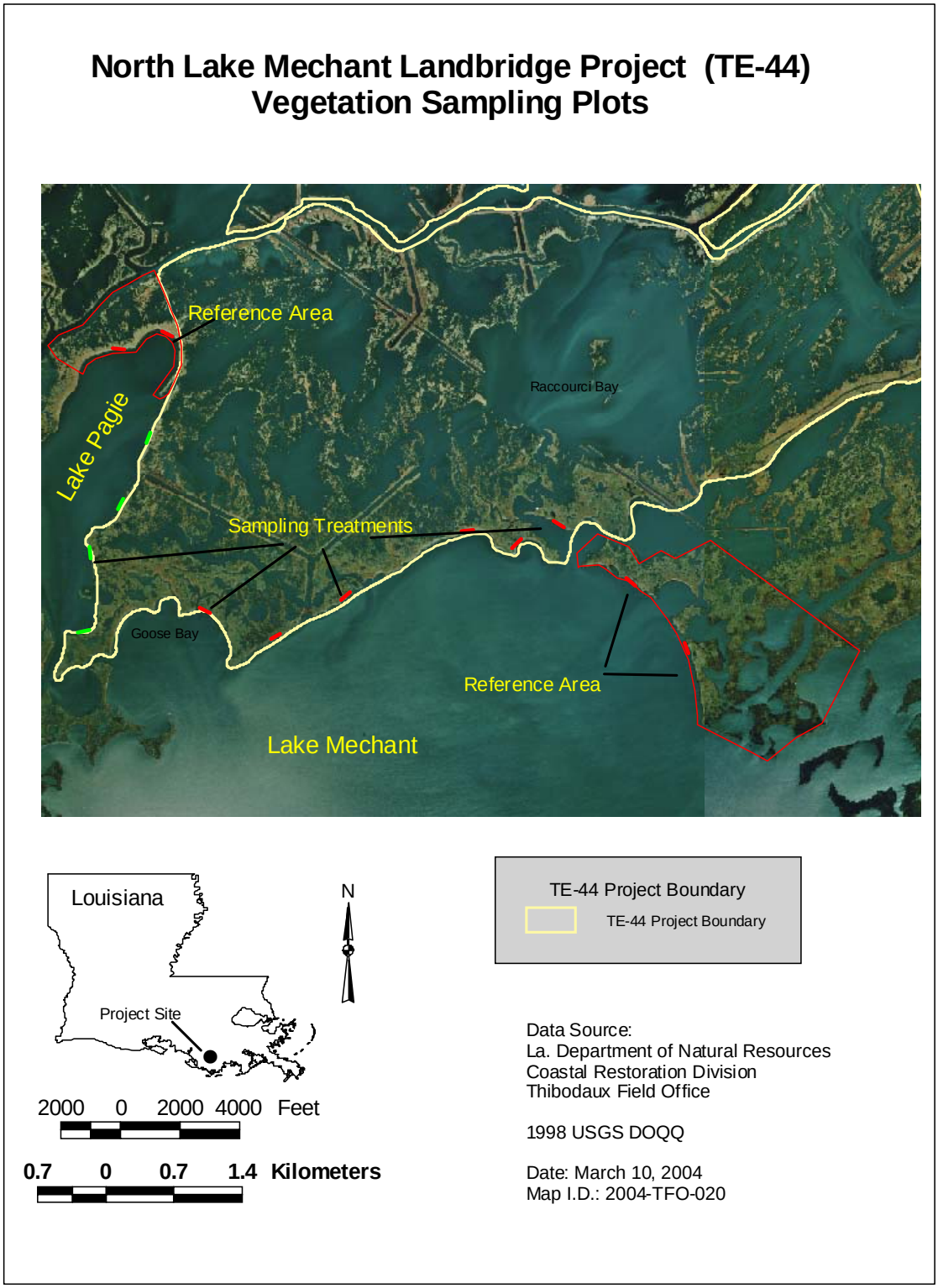

Figure 3. Vegetation sampling plots and project boundary.

c. Preliminary Monitoring Results and Discussion

Aerial Photography and Land/Water Analysis

Initial land/water analysis (figure 4) indicated that the project area contained 18.4% land while the reference areas averaged 37.8% land. Future comparisons will allow inferences on land loss and project effectiveness.

Vegetation

Vegetation surveys were conducted in June, 2003 (N=100 plots) immediately post-construction. *Spartina alteriflora* (smooth cordgrass) was the most commonly occurring species although only amounted to 4% cover (table 1). Bare ground (water) was still dominant as expected this early after planting (figure 5). This was expected since *Spartina alterniflora* was the planted species and was planted in the sub-tidal zone. Far more important at this time was the survival of the planted species. Percent survival of planted *Spartina alterniflora* (smooth cordgrass) was 64.75% overall. Condition of the planted material was noted. There had been a prolonged period of high tidal activity before and since planting. It appeared that many of the plants along Lake Pagie had been completely submerged for an extended time and this may have contributed to the mortality of the plants (figure 6). The shoreline along Lake Pagie in the project area is not a gradual slope from supratidal to subtidal. There is a two to three foot drop off along the marsh edge (figure 7). The vegetation was planted in the water where depths were observed from two to three feet. The soils of the Lake Pagie shoreline are loose, unconsolidated and highly organic.

Vegetation mortality along the north shore of Lake Mechant, seemed to have suffered from vigorous wave action. Some planting rows were completely missing. The north shoreline of Lake Mechant consists of a wide tidal mudflat of consolidated soils. Prevailing winds during the summer are from the south. Lake Mechant is a very shallow lake and rough conditions can be generated by moderate wind speeds of 15 -20 miles per hour.

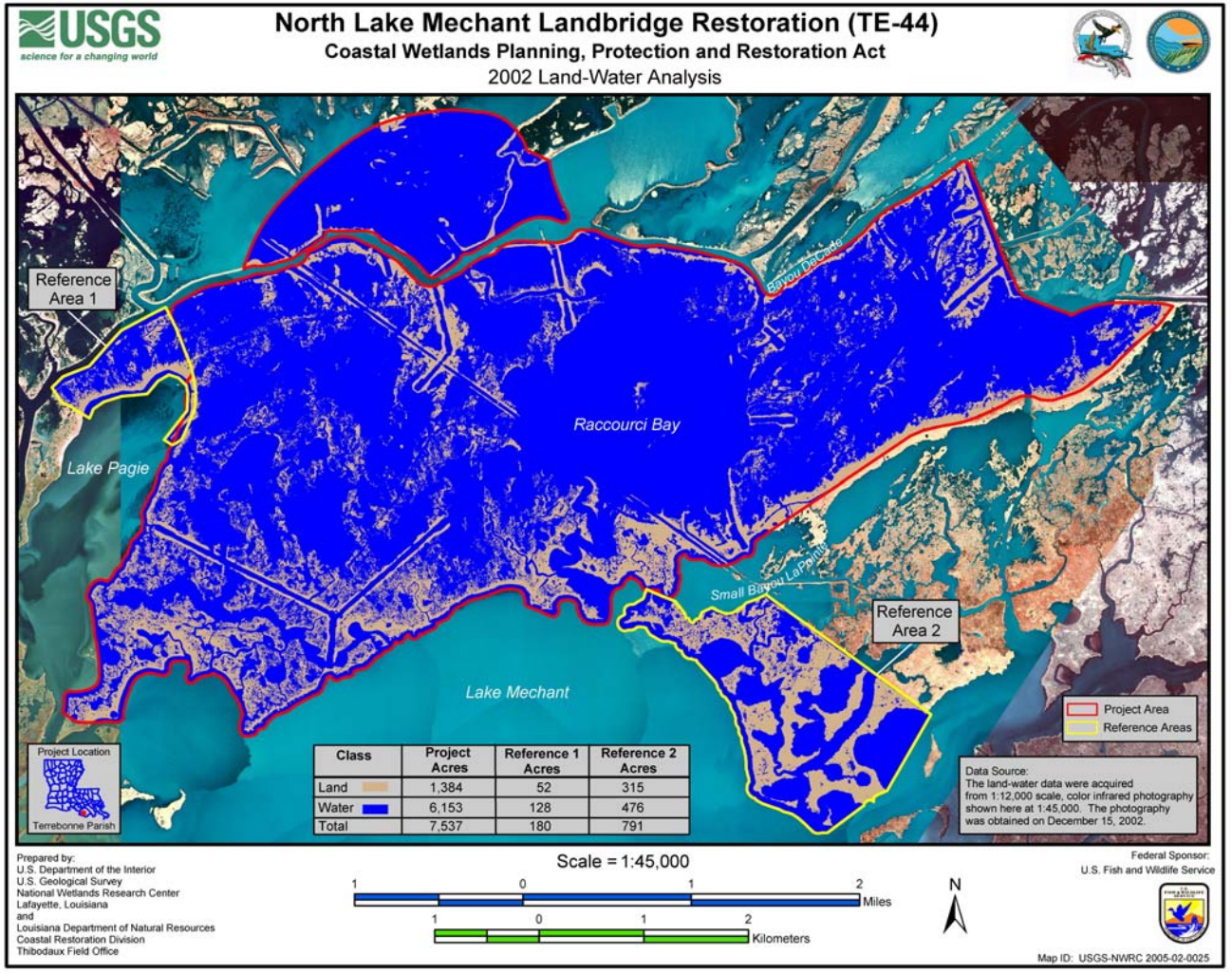

Figure 4. Land/water analysis of the pre-construction (December 15, 2002) CIR aerial photography.

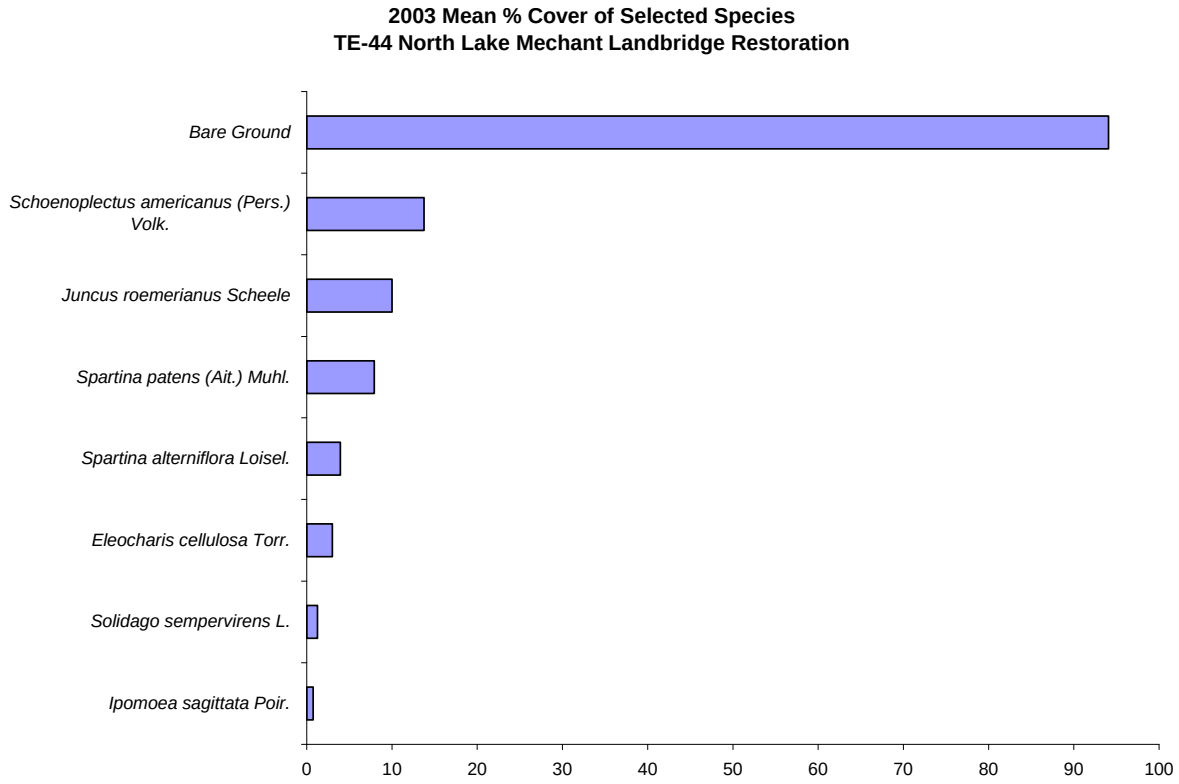

Figure 5. Mean % cover of species in all 4-m^2 plots within the TE-44 project area during June, 2003 (N=100 plots). Vegetation was sampled using the modified Braun-Blanquet method.

Table 1. The percentage of the total number of vegetation plots where each species occurred and the mean percent cover of species within plots where they occurred during the 2003 (N=100 plots) vegetation sampling. Sampling was conducted using the modified Braun-Blanquet method.

Scientific Name	Occurance of Total Plots (%)	Mean % Cover in Plots where Species Occurred
	2003	2003
Bare Ground	98	94
Eleocharis cellulosa Torr.	1	3
Ipomoea sagittata Poir.	2	1
Juncus roemerianus Scheele	1	10
Schoenoplectus americanus (Pers.) Volk.	4	14
Solidago sempervirens L.	2	1
Spartina alterniflora Loisel.	82	4
Spartina patens (Ait.) Muhl.	27	8

Figure 6. Planted rows of *Spartina alterniflora* along the eastern shore of Lake Pagie.

Figure 7. Marsh edge showing drop off and planted vegetation along Lake Pagie.

Shoreline Change

Controlled GPS was used to document marsh edge position using techniques described in Steyer et al. (1995). The shoreline of Lake Pagie and Lake Mechant within the project area were divided into 400 foot (122 m) segments along the shoreline of Lake Mechant and Lake Pagie. GPS readings were taken within each of the ten randomly selected 400 foot (122 m) segments immediately post construction and coincided with the vegetation sampling segments (figure 8). Historical rates of erosion will be obtained and compared to erosion rates within the sample segments after project implementation. Reference sites adjacent to the project area will be monitored and compared to historical erosion rates.

No comparative analysis was done on this first set of data (Year 0). Year 1 data collected in 2004 will be compared to year 0 data and historical rates.

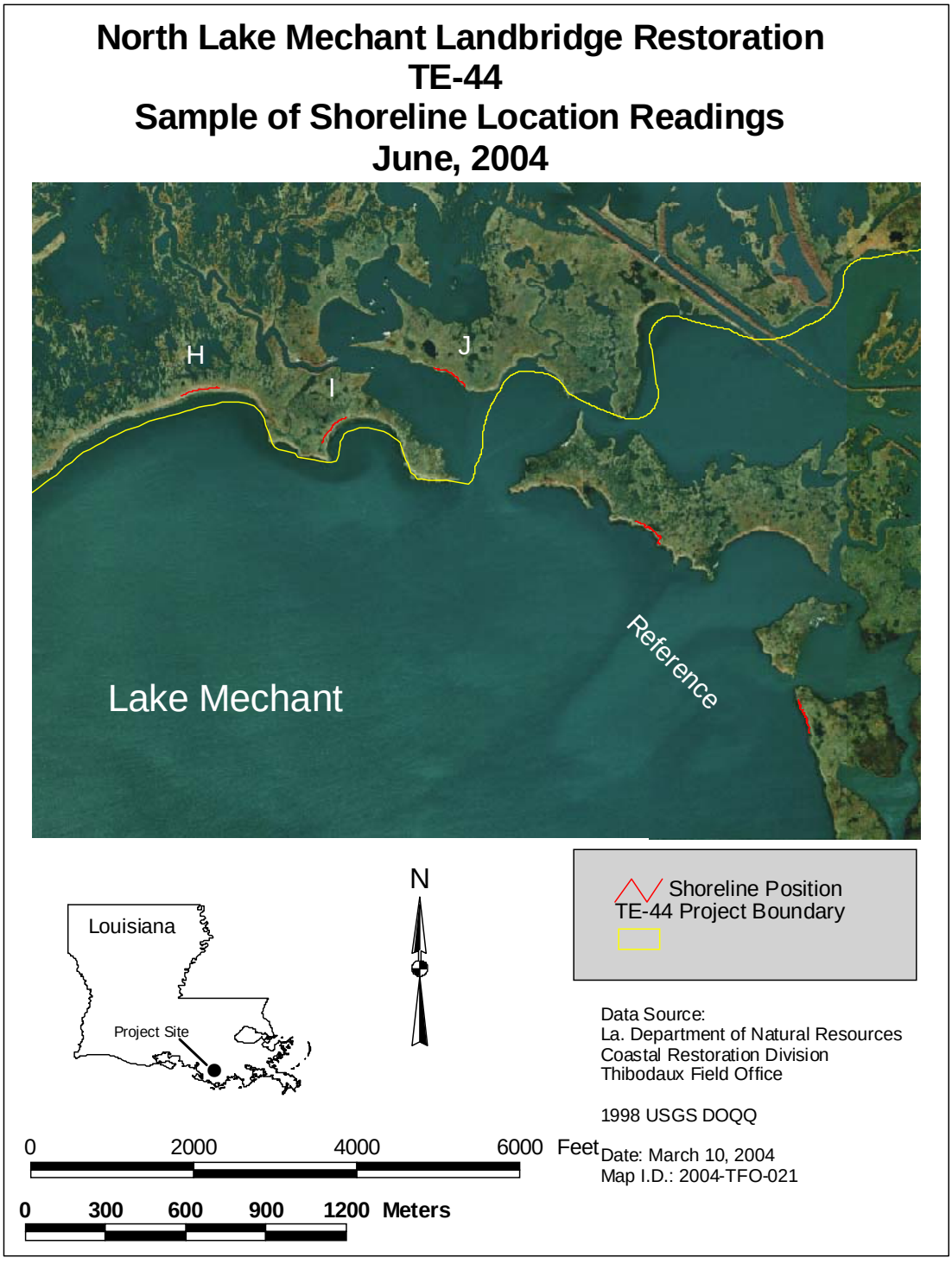

Figure 8. Shoreline segments measured with differential GPS in Year 0. This will serve as a baseline to measure shoreline changes over time.

V. Conclusions

a. Project Effectiveness

Project effectiveness is as of yet undetermined.

b. Recommended Improvements

It is recommended that supplemental planting be done in the future since the initial planting experienced only 65% survival immediately following planting. The project design calls for supplemental planting after CU2 construction is completed to replace vegetation damaged by dredge material placement on the interior marsh. This should also be considered as regular maintenance when periods of high mortality reduce the planted vegetation. In our opinion, the significant mortality was due to unusually high water immediately after planting and poor soil conditions. High water occurs frequently after tropical storm events and during summer when southerly winds push water levels two feet and higher above normal tides. Plants tolerant to being submerged for long periods of times should be considered. It was also observed that the *Spartina alterniflora* (smooth cordgrass) did considerably better in the more compact soils along the shoreline of Lake Mechant. The soils of Lake Pagie have a much higher organic composition and are much more unconsolidated.

c. Lessons Learned

Vegetation selected for planting should be matched with environmental conditions at the site to maximize survival. In addition, supplemental planting should be included in project design, as was the case in this project, to account for plant mortality in the initial post-planting period. Project effectiveness and lessons learned will become apparent with subsequent monitoring events.

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