State of Louisiana
Department of Natural Resources
Coastal Restoration Division

Monitoring Plan

for

Cheniere Au Tigre Sediment Trapping Demonstration

State Project Number TV-16
Priority Project List 6

August 2003
Vermilion Parish

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LDNR/Coastal Restoration and Management

MONITORING PLAN

PROJECT NO. TV-16 (PTV-5) CHENIERE AU TIGRE SHORELINE DEMO

ORIGINAL DATE: May 08, 2001
REVISED DATE: August 14, 2003

Preface

Pursuant to a CWPPRA Task Force decision on August 14, 2003 to adopt the Coastwide Reference Monitoring System (CRMS-*Wetlands*) for CWPPRA, updates were made to this Monitoring Plan to merge it with CRMS to provide more useful information for modeling efforts and future project planning while maintaining the monitoring mandates of the Breaux Act. The implementation plan included review of monitoring efforts on currently constructed projects for opportunities to 1) determine if current monitoring stations could be replaced by CRMS stations, 2) determine if monitoring could be reduced to evaluate only the primary objectives of each project and 3) determine whether monitoring should be reduced or stopped because project success had been demonstrated or unresolved issues compromised our ability to actually evaluate project effectiveness. As a the result of a joint meeting with DNR, USGS, and the federal sponsor, the recommendations for this Monitoring Plan were to maintain this project Monitoring Plan in its current form. Consequently, no changes were made to this Monitoring Plan.

Project Description

The Cheniere au Tigre shoreline demonstration project is a shoreline protection project from the 6th priority list of the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA). The project area is located along the shoreline of the Gulf of Mexico, approximately 15 mi (24 km) south of Intracoastal City, Louisiana, in Vermilion parish (figure 1). The proposed project design involves the construction of up to ten rock rip-rap breakwater segments, each 200 ft (61 m) long, with a 120 ft (36 m) gap between segments. Breakwater segments will be constructed parallel to the shoreline at a distance of 200 ft (61 m) offshore. Settled elevation of the rock segments will be 3.5 ft (1 m) (North American Vertical Datum [NAVD] of 1988). The project design utilized results from a previous breakwater project employed at nearby Holly Beach, Louisiana (Underwood et al. 1999). Specifically, the current project will use longer breakwaters with smaller gaps between breakwaters, set at a distance as much as 300 ft closer to the shore than those constructed for the Holly Beach project, in order to further reduce wave energies and allow sufficient sediment availability for the westernmost areas of the project. The actual number of breakwater segments constructed will be dependent on the costs of the rock rip-rap and construction, resulting in a maximum total project distance parallel to the shoreline of 3,080 ft (939 m). In the case that construction costs prohibit the maximum project distance, construction will proceed, with a minimum of 4-5 breakwaters, from the eastern boundary of the project area, allowing an adequate buffer distance from an oyster lease present to the east of the project area.

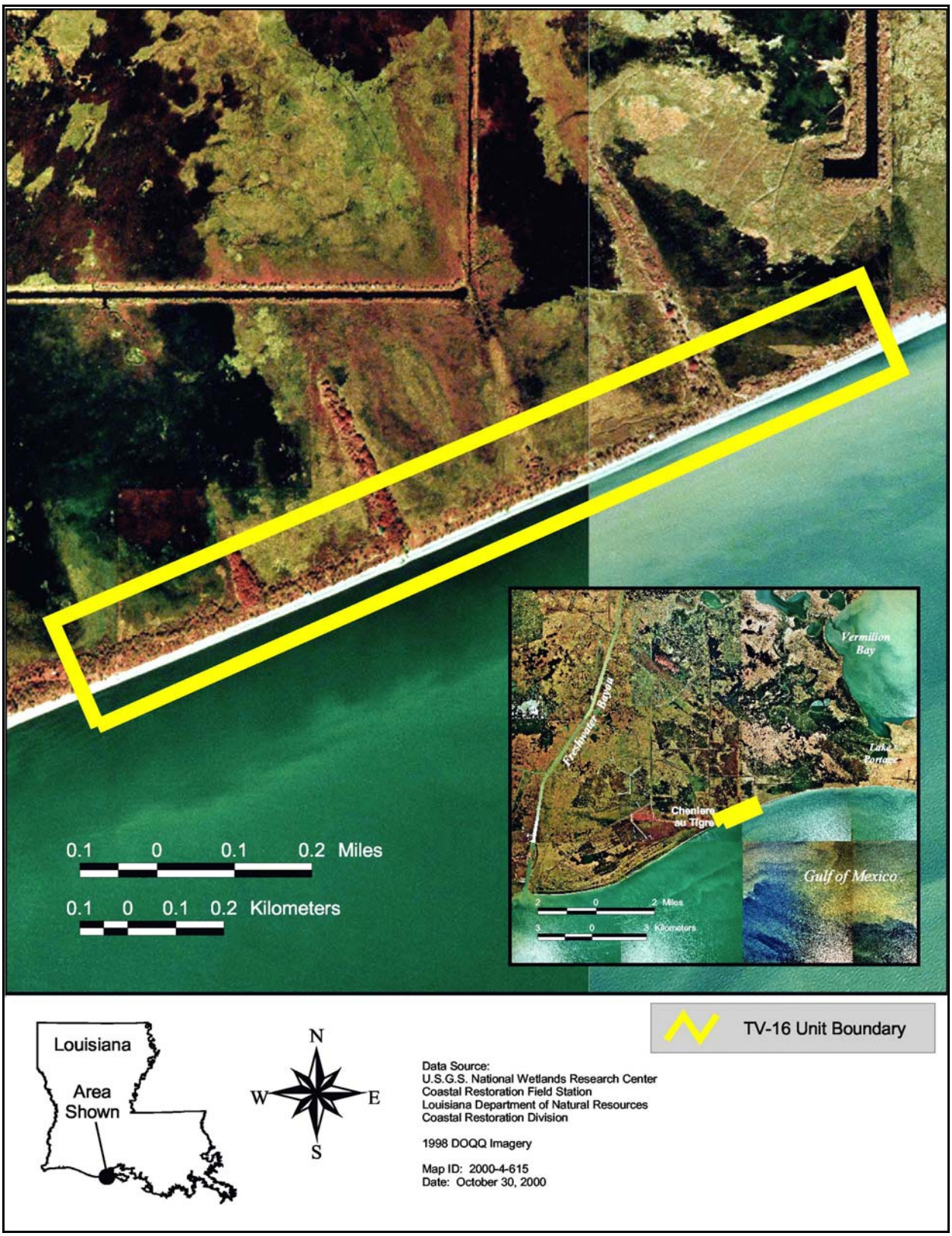

Figure 1. Cheniere au Tigre project location.

The Cheniere au Tigre project is located on the chenier plain of southwestern Louisiana, which developed during the past 5,000 years through westward littoral transport of Mississippi River delta sediments, in combination with deposition of local fluvial sediments (Howe et al. 1935; Van Lopik and McIntire 1957; Byrne et al. 1959; DeLaune et al. 1983). The development of cheniers coincided with eastward shifts in the course of the Mississippi River (Byrne et al. 1959; Gould and McFarlan 1959; DeLaune et al. 1983). These cheniers are recessional beach ridges, comprised of sand and shell fragments, which parallel the current shoreline.

The dominant soils present in and around the project area are the Mermentau clay and coastal beach (U. S. Department of Agriculture, Natural Resources Conservation Service 1996). The Mermentau clay is a level, poorly drained saline soil, with high shrink-swell potential, which occurs on low ridges of coastal brackish marshes. It is frequently flooded by shallow water during the highest normal tides and by deep water during infrequent extreme tides associated with storms. The coastal beach soil is a gently sloping intertidal soil, comprised of sand and shell fragments, that is usually absent of vegetation.

A humid, subtropical climate with a distinct maritime nature is present in the vicinity of the project area. Southerly winds from the Gulf of Mexico serve to moderate summer heat and infrequent polar air masses in winter. Precipitation is typically abundant in all seasons as total annual precipitation averages 59 in (149.9 cm). The heaviest precipitation normally occurs during the period between April and September. Mean summer and winter temperatures are 81°F (27°C) and 52°F (11°C), respectively.

The project area is comprised of approximately 103 acres (41.7 ha), occurring as 38 acres (15.4 ha) of open water, 44 acres (17.8 ha) of brackish marsh, 4 acres (1.6 ha) of coastal beach, 12 acres (4.9 ha) of upland scrub/shrub habitat, and 5 acres of upland forest (2.0 ha). Vegetation in the brackish marshes is dominated by *Spartina patens* (marshhay cordgrass), *Ranunculus* spp. (buttercup), *Iva frutescens* (marshelder), *Eleocharis* spp. (spikesedge), *Distichlis spicata* (saltgrass), *Rumex* spp. (dock), and *Sesbania* spp. (poisonbean). Vegetation occurring adjacent to the shoreline is characterized by *Ambrosia* spp. (giant ragweed), *Acacia smallii* (sweet acacia), *Geranium carolinianum* (wild geranium), *Galium* spp. (bedstraw), and *Opuntia compressa* (prickly pear cactus).

Wetland loss in the project area has occurred as conversion of beach and brackish marsh to open water. Loss of nearly 26 acres (10.5 ha) occurred between 1956 and 1990, as loss of 8 acres (3.2 ha) of coastal beach, 6 acres (2.4 ha) of brackish marsh, and 12 acres (4.9 ha) of scrub/shrub habitat (U.S. Department of Agriculture, Natural Resources Conservation Service 1998). Shoreline retreat in this area between 1956 and 1969 was measured to be 26.6 ft/yr (8.1 m/yr) (Louisiana State University Center for Wetland Resources 1978). Another shoreline change study by Byrnes et al. (1995) found the mean shoreline retreat rate for the chenier plain from Cheniere au Tigre to Southwest Pass to be 9.5 ft/yr (2.9 m/yr) during the period from 1883-1994. This loss has resulted primarily from erosional scouring from the same littoral currents which can also contribute to sediment accretion. These littoral currents from the Atchafalaya River and Wax Lake Outlet to the east, cause sediment accretion during periods of slow littoral currents and scouring as current

velocity increases from storms and other anthropogenic factors. One such factor is the removal of reef shell from Southwest Pass near Marsh Island, which caused an increase in current velocity.

The construction of the proposed rock breakwaters will serve to protect the current shoreline of Cheniere au Tigre and prevent further wave-induced erosion. Additionally, the reduced current velocity near the shoreline of the project area will allow sediment from the Atchafalaya River and Wax Lake Outlet to be deposited around and behind the structures, thus creating habitat area to benefit important wetland species. Segmented breakwaters have shown promising preliminary results in similar shoreline protection projects at Raccoon Island (Armbruster 1999) and Holly Beach (Underwood et al. 1999).

Segmented breakwaters at Holly Beach protect 7.3 mi (11.7 km) of shoreline in the Louisiana chenier plain. For this project, 85 segmented breakwaters 150-174 ft (46-53 m) in length with 300 ft (91 m) gaps were constructed in water depths of 4-6 ft (1.2-1.8 m). Beach profiles conducted between 1990 and 1994 indicated extensive sediment aggradation. However, beach profile analyses conducted after the summer and winter of 1995 indicate that more than half of the accumulated sediment was removed due to Tropical Storms Dean and Opal (Byrnes and McBride 1995). Thus, the Cheniere au Tigre project will allow the evaluation of the use of segmented breakwaters to protect an area of shoreline, influenced by the active Atchafalaya River delta, in the chenier plain.

Project Objective

1. To protect the beaches and interior brackish marshes of Cheniere au Tigre through the use of segmented breakwaters.

Specific Goal

The following goal will contribute to the evaluation of the above objective:

1. Protect the acreage of the interior brackish marshes by reducing the rate of beach erosion.

Updrift/Downdrift Effects

Monitoring of areas adjacent to either side of the project area will be conducted to assess possible impacts due to project construction. These updrift and downdrift areas will be analyzed for shoreline movement, sediment accretion, and the presence of erosional "shadows" due to changes in sediment availability and transport caused by project features (Underwood et al. 1999).

Monitoring Limitations

Although conventional forms of measuring rates of shoreline erosion, such as surveying, are preferred due to their increased precision, erosion rates can also be detected through the analysis of aerial photography. For this project, budgetary constraints have dictated the use of aerial photography in the measurement of shoreline retreat. Limitations in the project budget have also precluded measurement of sediment accumulation in the project area.

The use of aerial photography to monitor shoreline change is limited in the ability to detect small changes in shoreline position due to the additive nature of errors associated with image resolution and rectification, as well as errors associated with interpretation of shoreline position. These individual errors can be combined using the root mean square approach to determine the overall detection limit of the shoreline comparison method used (Byrnes et al. 1995). In this case, the analysis of aerial photography can detect changes in shoreline position greater than 1.5 m (4.5ft) during the study period. Thus, monitoring efforts are limited in that smaller project effects may go undetected.

Monitoring Elements

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

1. Aerial Photography — To measure land and water areas and to document long term shoreline changes, color-infrared aerial photography (1:6,000 scale) will be acquired by the USGS National Wetlands Research Center (NWRC) updrift, downdrift, and in the project area. The photography will be georectified by NWRC personnel using NWRC standard operating procedures (Steyer et al. 1995, revised 2000). The photography will be obtained prior to project construction in 2000 and post-construction in 2005. Additional photography may be obtained in response to storm events.

Data Evaluation

Comparison of the pre- and post-construction data sets of shoreline position will be documented and presented in the project final comprehensive report.

Note: Available ecological data, including both descriptive and quantitative data, will be evaluated in concert with the analysis of aerial photography, to aid in determination of overall project success. This includes ancillary data collected in the monitoring project but not used directly in analysis of aerial photography, as well as data available from other sources (USACE, USFWS, DNR, LSU, etc.).

Notes

1)	Implementation Schedule:	Start Construction End Construction	July 2001 September 2001
2)	NRCS Point of Contact:	Marty Floyd	(318) 473-7693
3)	DNR Project Manager: DNR Monitoring Manager:	Clay Menard Troy Barrilleaux	(337) 482-0683 (337) 482-0657

4) The five-year monitoring plan development and implementation budget for this demonstration project is $145,000. However, the total funds allocated to monitoring are $65,000, while remaining funds will be applied to constructions costs for the project. A close-out comprehensive report will be available in 2006 following analysis of post-construction aerial photography. This report will describe the status and effectiveness of the project.

5) The DNR engineering section will propose to monitor the breakwaters with an "as- built" survey and construction completion cross-sectional survey, which will serve as additional monitoring data documenting shoreline change for the project. Reports based on these data will provide information on the status and effectiveness of the project.

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