



**State of Louisiana  
Department of Natural Resources  
Coastal Restoration Division and  
Coastal Engineering Division**

**2004 Operations, Maintenance,  
and Monitoring Report**

for

**Vermilion River Cutoff**

State Project Number TV-03  
Priority Project List 2

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Vermilion Parish

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## **I. Introduction**

The Vermilion River Cutoff Project area consists of approximately 194.2 acres (78.6 ha) of brackish marsh and open water, located in Vermilion Parish, Louisiana. The Vermilion River Cutoff, near Intracoastal City, La., was constructed in 1947 to connect the Vermilion River and the Gulf Intracoastal Waterway (GIWW) with Vermilion Bay for navigational purposes. A large section of the west bank of the Vermilion River Cutoff has eroded as a result of both bay-side wave action and boat wakes within the cutoff. Erosion of the west bank of the Vermilion River Cutoff, estimated at 23.3 ft/yr (7.1 m/yr) from comparisons of 1955–1985 aerial photography, has occurred to the extent that the land bridge between the cutoff and Vermilion Bay, to the west, is breached in several places. Erosion rates from 1948 to 1972 for Vermilion Bay near Onion Bayou as estimated by the Louisiana Department of Transportation and Development was 1.6 ft/yr (0.5 m/yr). The shoreline retreat from 1948 to 1972 for Vermilion Bay (Mud Point to Lake Cleodis) as estimated by the Louisiana Department of Transportation and Development was 2.6 ft/yr (0.8 m/yr). Erosion on the east bank threatens to breach the land bridge between the cutoff and Onion Lake.

The project as described in the Priority List 1 Report was a 6,200-foot rock-armored structure on the western side of the Vermilion River Cutoff. About 350 feet westward of the rock there was a 4,300-foot brush fence designed to break waves and trap sediment. The goal of the project was to protect the area in front of Onion Lake from erosion.

In 1992, due to continued erosion and degradation of the western side of the canal, the Corps proposed and the state agreed to move the project to the east side of the cut. It was also proposed that a sediment fence be built on the western side of the Cut at a future time and that three “headlands” on the west side be armored.

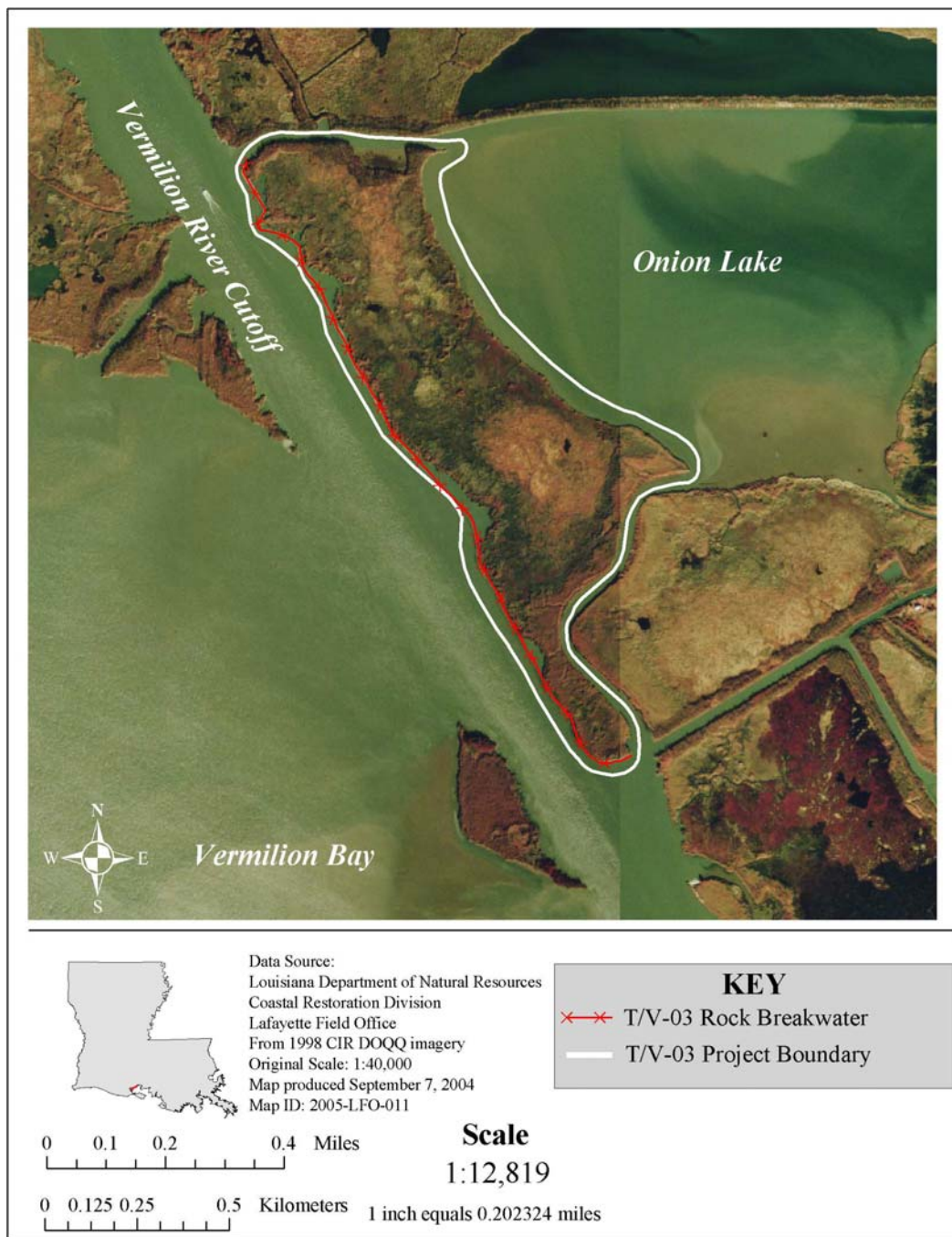
The December 1993 Environmental Assessment described 8,900 feet of rock dike from the small bayou/canal that enters the Cut south of the managed portion of Onion Lake to where Onion Bayou enters the Cut for the second time. This included two small islands on the 1972 quad map. It also described armoring three points on the western shore: both points of the large island opposite the place Onion Bayou first enters the Cut and the northern point of land.

The 27 March 1995 construction Plans recommended rock armor on land areas from the small bayou/canal that enters the Cut south of the managed portion of Onion Lake to where Onion Bayou enters the Cut for the second time: a total of 7,125 feet of rock. Also, on the west side of the Cut, both points of the large island opposite the place Onion Bayou first enters the cut and the northern point of land were to have corner erosion protection. This was to consist of 25 feet of rock on either side of each point.



During construction, there was unexpected settlement of the first portions of the rock dike that was constructed. The design of the project was reduced in cross-section by USACE and LDNR project managers. Also, the dike was run straight across three coves and 915 feet of the dike at the southern end was eliminated. In addition, armoring of three points on the west side of the cut was not performed because of budget and material limitations.





**Figure 1.** Vermilion River Cutoff (TV-03) project area map showing location of rock breakwater.



## **II. Maintenance Activity**

### **a. Project Feature Inspection Procedures**

The purpose of the annual inspection of the Vermilion River Cut-Off Project (TV-03) 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, LDNR 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.

An inspection of the Vermilion River Cut-Off Project (TV-03) was held on March 29, 2004 under cloudy skies and mild temperatures. In attendance was Stan Aucoin, Dewey Billodeau, Mel Guidry, and Pat Landry from LDNR, Brad Sticker representing NRCS (for other inspections), and John Foret of NOAA Fisheries (for other inspections). Representatives from the USACE were invited but were unable to attend. All parties met at the Lafayette Field Office of CED and traveled to Intracoastal City in Vermilion Parish, LA. The annual inspection began at approximately 12:50 p.m. at the northern end of the rock dike on the Vermilion River Cut-Off.

The field inspection included a complete visual inspection of the entire project site. Staff gauge readings and existing temporary benchmarks were used to determine approximate elevations of water and rock weirs. Photographs were taken at each project feature and Field Inspection notes were completed in the field to record measurements and deficiencies.

### **b. Inspection Results**

#### **Site 1—Foresshore rock dike**

The dike is in need of repair. Approximately 5,000 linear feet of the 6,200 linear foot total is 1-2 feet below constructed elevation. The dike is, however, still functional. Based on previous year's inspections, preliminary engineering has been initiated to begin repairs. Aucoin & Associates will be the consultant.

## **II. Maintenance Activity (continued)**

### **c. Maintenance Recommendations**

#### **i. Immediate/ Emergency Repairs**

Construction to begin in Spring 2005 to raise dike back to approximate original construction elevation in areas as required.

#### **ii. Programmatic/ Routine Repairs**

None.



### **III. Operation Activity**

#### **a. Operation Plan**

There are no active operations associated with this project.

#### **b. Actual Operations**

There are no active operations associated with this project.



## **IV. Monitoring Activity**

### **a. Monitoring Goals**

The objectives of the Vermilion River Cutoff project are:

1. Maintain and protect approximately 67 ac (27 ha) of brackish marsh along the eastern side of the Vermilion River Cutoff that will contribute to protecting the integrity of several thousand acres of the Onion Lake wetland complex.
2. Prevent the Vermilion River Cutoff from widening into adjacent marshes.

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

1. Decrease the rate of shoreline erosion along the east bank of the Vermilion River Cutoff adjacent to Onion Lake through the use of a rock breakwater.

### **b. Monitoring Elements**

#### **Aerial Photography:**

To document vegetated and non-vegetated areas, near vertical color-infrared aerial photography (1:12,000 scale with ground controls) was obtained in 1993 (pre-construction) and post-construction in 2002. The original photographs were checked for flight accuracy, color correctness, and clarity and were subsequently archived. Aerial photographs were scanned, mosaicked, and georectified by USGS/NWRC personnel according to standard operating procedures. Additional post-construction photography is scheduled for 2011.

#### **Shoreline Change:**

Shoreline movement was documented using Differential Global Positioning System (DGPS) in 1995, 1999, and 2002. DGPS is scheduled for 2006, 2011, and 2015 to provide a template for mapping shoreline changes and movement over time. Shoreline positions for 1999 were compared to historical data sets available in digitized format for 1993.

Shoreline markers were established at the vegetated marsh edge along the original shoreline adjacent to the breakwater post-construction in 1998 and direct measurements were taken from the settlement plate to the vegetated marsh edge. Measurements were also collected in 2000 and 2002 post-construction.



#### **IV. Monitoring Activity (continued)**

##### **c. Preliminary Monitoring Results and Discussion**

###### **Aerial Photography:**

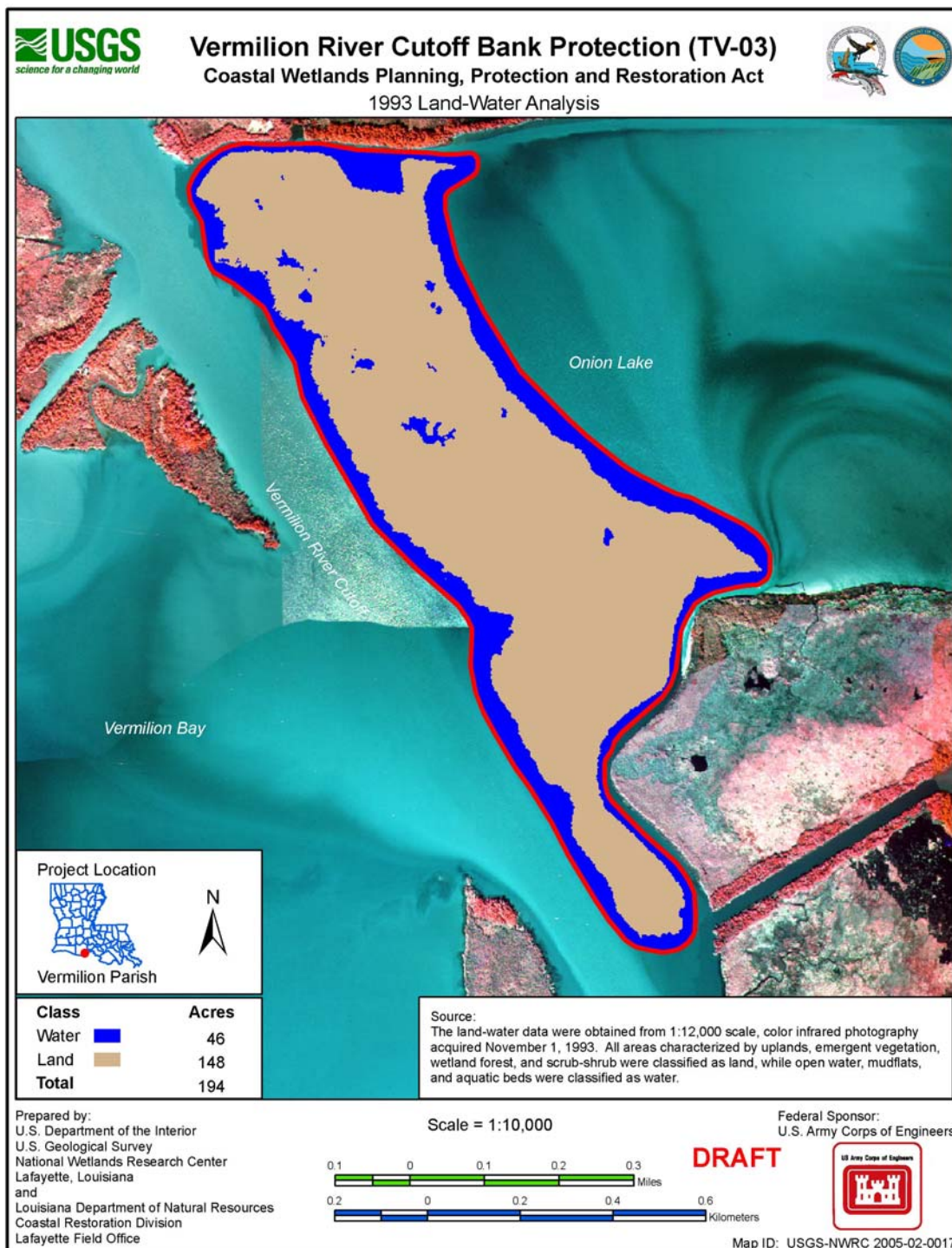
The original boundary for the project area in 1993 did not include the entire area where the shoreline structure was constructed. The official boundary for the project area was adjusted to encompass the rock dike to better evaluate the project area over time. Comparison of the 1993 land to water analysis to the analysis for 2002 shows an increase in land by one acre (figures 2 and 3). Part of this increase may be due to the terraces that were constructed by a private land owner in Onion Lake.

###### **Shoreline Change:**

Shoreline change analysis from 1993 to 1999 indicates an increase of open water in the project area. Aerial photography taken in 1993 was used as a baseline for shoreline position instead of the actual DGPS shoreline positions captured in 1995. This was three years prior to construction of the Vermilion River Cutoff (TV-03) project in February 1996, which increases the probability of error in interpreting when this loss actually occurred (figure 3). The data used for the 1999 shoreline position was from DGPS acquired by LDNR personnel. It is not known how much of the loss occurred from 1993 to the completion of project construction in February 1996. Analysis of baseline DGPS taken in 1995 and compared to 1999, and 2002 DGPS has not been completed (figures 4-5). There was some question of compatibility of the 1995 DGPS data set with the subsequent DGPS surveys that still needs to be addressed.

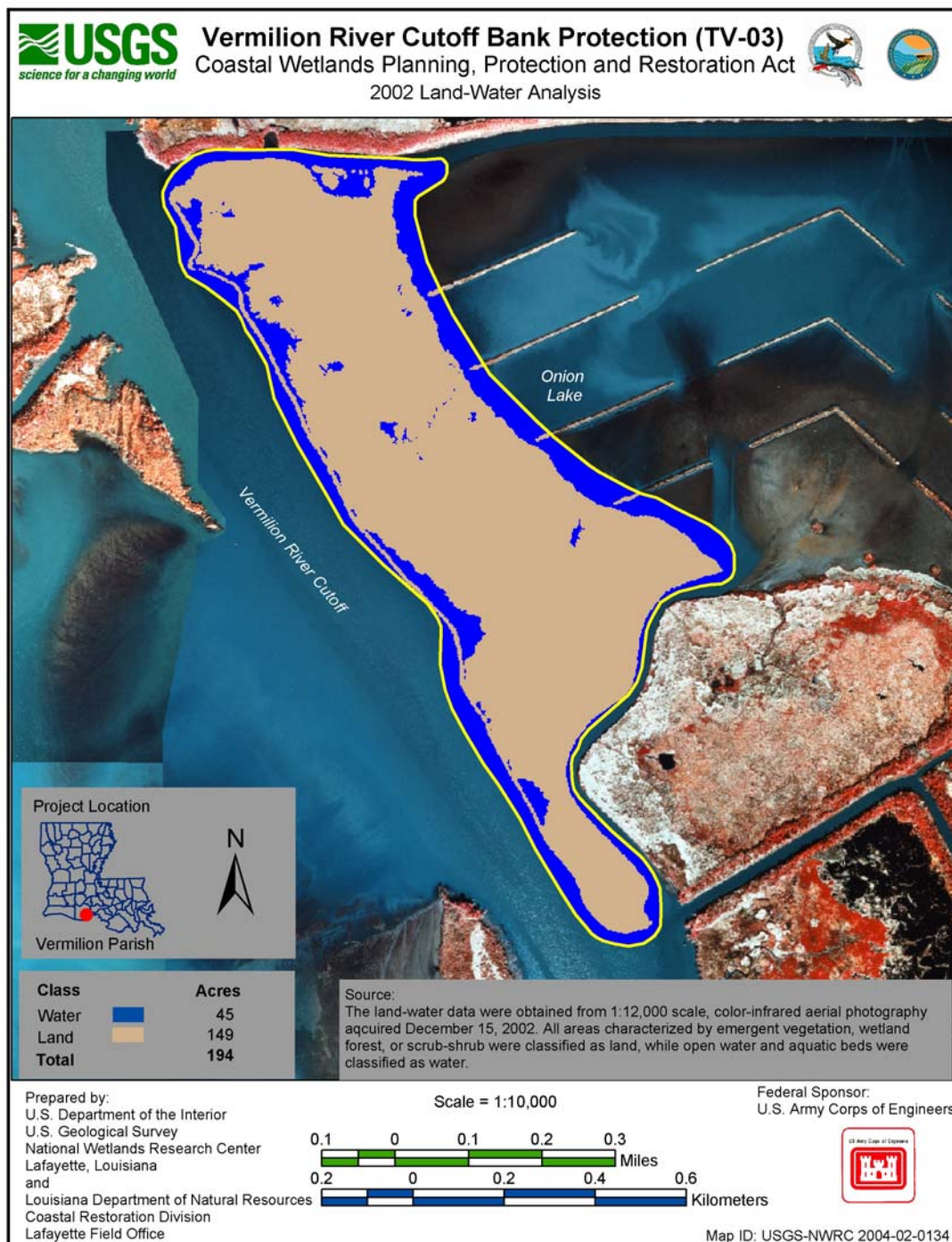
Direct shoreline measurements taken from each settlement plate (figure 6) to the vegetated edge of the marsh behind the rock breakwater in the project area indicate progradation at three of the five sites. Only one site, at settlement plate 1006, experienced a loss of approximately 0.77 ft/yr (0.23 m/yr). Settlement plate 1005 showed a gain of 2.56 ft/yr (0.78m/yr) and settlement plate 1007 remained unchanged (table 1, figure 7). The data from these measurements indicate the shoreline behind the rock breakwater on the three northern most settlement plates is prograding (figures 8-10). The loss of shoreline behind nearest settlement plate 1006 may be attributed to the sinking elevation of the rock breakwater at or below 2 ft NAVD88.





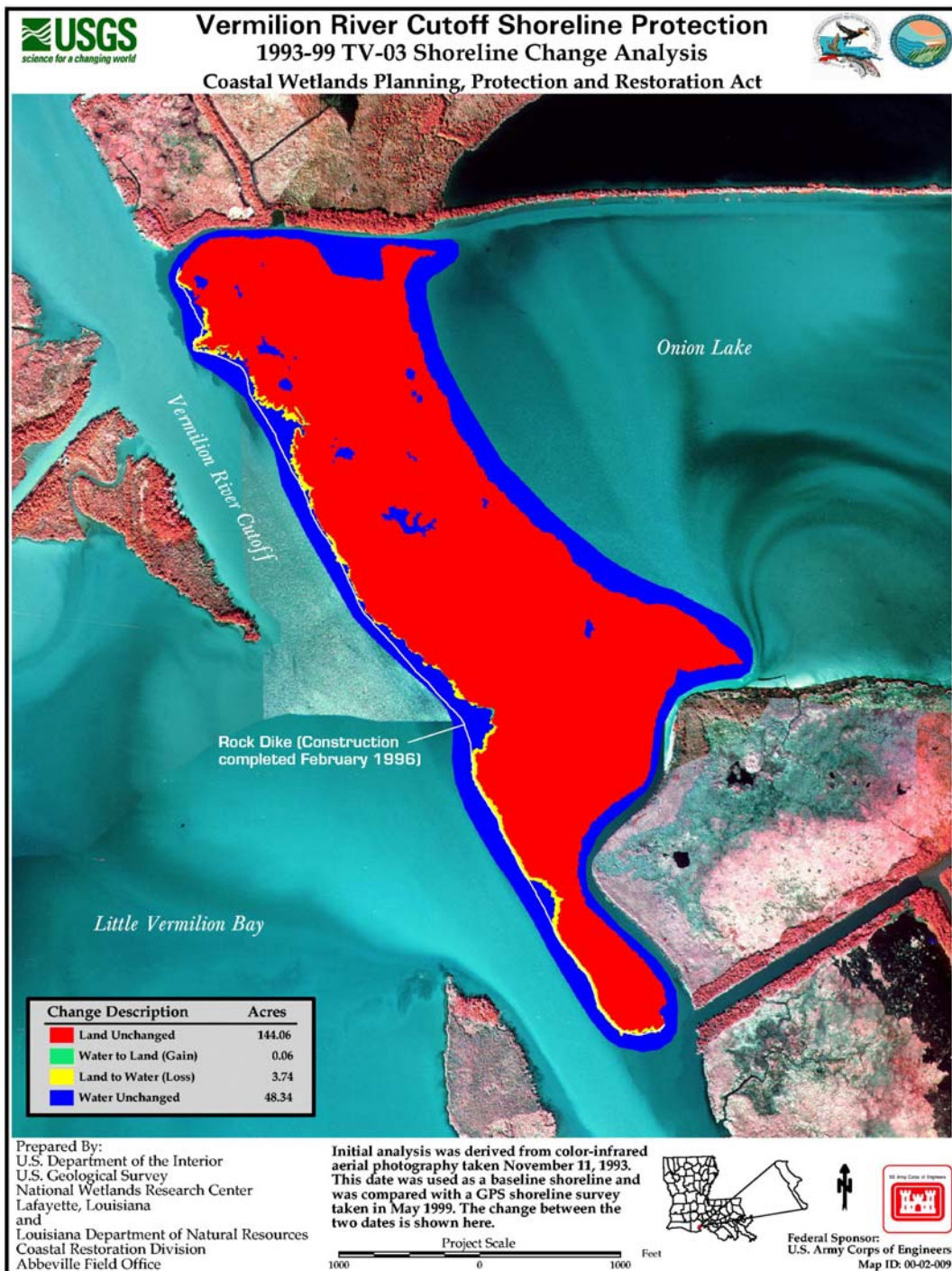
**Figure 2.** Pre-construction Land to Water analysis for Vermilion River Cutoff (TV-03) project area for 1993.





**Figure 3.** Land to water analysis for Vermilion River Cutoff (TV-03) project area in 2002.





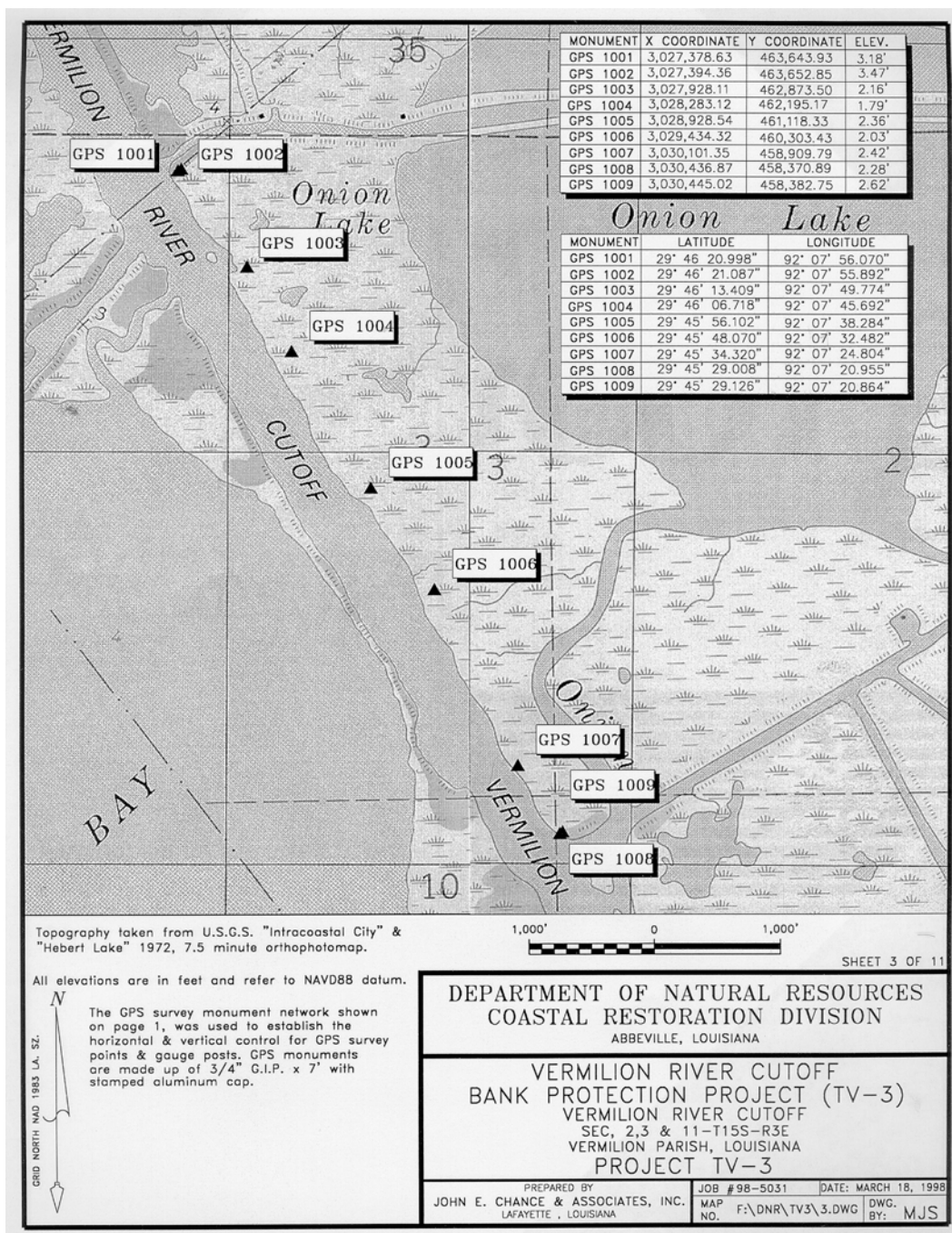
**Figure 4.** Shoreline change analysis for Vermilion River Cutoff (TV-03) project from 1993 to 1999.





**Figure 5.** Location of shoreline surveys for 1999 and September 2001 of Vermilion River Cutoff (TV-03) project and surrounding shoreline.





**Figure 6.** Cross section of Vermilion River Cutoff Shoreline Protection project showing settlement plate locations.



**Table 1.** Shoreline changes at the settlement plates along the east bank of the Vermilion River Cutoff behind the project rock breakwater for the period beginning February 25, 1998, February 1, 2000 and July 9, 2002.

Settlement Plate	Distance ft (m) February 25, 1998	Distance ft (m) February 1, 2000	1998-2000 Change in Distance ft (m)	Distance ft (m) July 9, 2002	1998-2002 Change in Distance ft (m)	Shoreline Change Rate ft/yr (m/yr)
1003	63.40 (19.32)	63.40 (19.32)	0.00	50.1 (15.27)	13.3 (4.05)	2.27 (0.69)
1004	40.85 (12.45)	40.85 (12.45)	0.00	36.85 (11.23)	4 (1.22)	0.68 (0.21)
1005	70.60 (21.52)	65.15 (19.86)	5.45 (1.66)	55.60 (16.95)	15 (4.57)	2.56 (0.78)
1006	23.35 (7.12)	23.35 (7.12)	0.00	27.85 (8.49)	-4.5 (-1.37)	-0.77 (0.23)
1007	13.90 (4.24)	11.95 (3.64)	1.95 (0.59)	13.90 (4.24)	0.00	*

\* No change

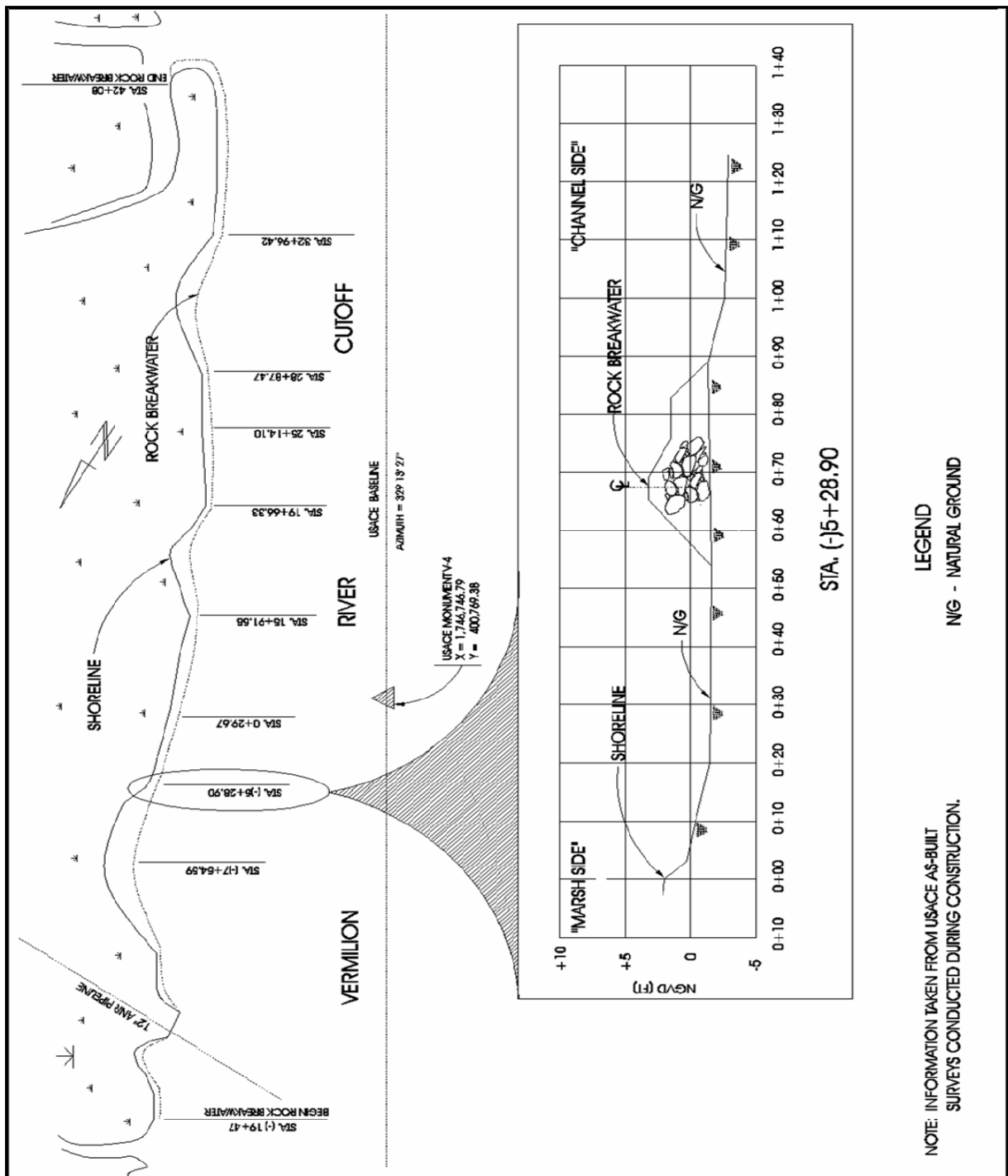




**Figure 7.** Photograph of rock breakwater and vegetation growth at settlement plate 1005 (upper) and water overtopping rock breakwater at settlement plate 1006, July 2002 (lower).



**Figure 8.** Aerial photograph of Vermilion River Cutoff (TV-03) shoreline protection project showing the Onion Lake complex on the right side of the rock breakwater, February 2000.



**Figure 9.** Plan and cross section showing location and elevation profile of station (-)5+28.90 in as-built survey (data from USACE 1996).

## Conclusions

### a. Project Effectiveness

The shoreline behind the foreshore rock dike prograded at 2 of 5 sites 2 years post-construction and at 3 of 5 sites 4 years post-construction. Interpretations from the land to water analysis are inconclusive due to the uncertainty of land loss prior to actual construction of the project in late 1995 and the addition of the terraces that have increased the land to water acreage in the 2002 aerial photography, however, small interior ponds appear to have partially filled in.

### b. Recommended Improvements

A maintenance construction contract is currently being developed to address an area of the foreshore dike that has deteriorated below acceptable standards. Construction is scheduled for Spring 2005.

### c. Lessons Learned

Interpreting land loss and shoreline position should be performed using only data of the same type. Data acquired from DGPS should only be compared to other DGPS data sets. Substitution of aerial photography for baseline shoreline position introduces error in interpretation.

Early project boundary locations for this project were produced in a manner that is not consistent with newly developed projects. Analysis of earlier projects, such as Vermilion River Cutoff, may benefit from revising the project boundaries to accommodate newly developed data analysis programs.

