



**State of Louisiana**

**Coastal Protection and Restoration  
Authority (CPRA)**

## **2014 Operations, Maintenance, and Monitoring Report**

for

### **Marsh Island Hydrologic Restoration**

State Project Number TV-14  
Priority Project List 6

June 2014  
Iberia Parish

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Table of Contents

I. Introduction.....	1
II. Maintenance Activity.....	4
a. Project Feature Inspection Procedures .....	4
b. Inspection Results .....	4
c. Maintenance Recommendations .....	6
i. Immediate/Emergency .....	6
ii. Programmatic/Routine.....	6
d. Maintenance History .....	7
III. Operation Activity.....	8
a. Operation Plan.....	8
b. Actual operations .....	8
IV. Monitoring Activity .....	8
a. Monitoring Goals .....	9
b. Monitoring Elements .....	9
c. Monitoring Results and Discussion .....	13
Aerial Photography .....	13
Shoreline Position .....	18
Water Level.....	20
Submerged Aquatic Vegetation .....	21
V. Conclusions.....	24
a. Project Effectiveness .....	24
b. Recommended Improvements.....	24
c. Lessons Learned .....	24
VI. Literature Cited.....	25
VII. Appendices .....	27
a. Appendix A (Inspection Photographs).....	27
b. Appendix B (Three Year Budget Projection).....	38
c. Appendix C (Field Inspection Notes).....	43
d. Appendix D (Constructed Project Features Map).....	53



## Preface

This report includes monitoring data collected through December 2013, and annual Maintenance Inspections through May 2014.

The 2014 report is the 5<sup>th</sup> report in a series of reports. For additional information on lessons learned, recommendations and project effectiveness please refer to previous OM&M reports (2004, 2005, 2007 and 2011) and annual O&M inspection reports (2005-2013) on the CPRA web site (<http://lacoast.gov/new/Projects/Info.aspx?num=TV-14>).

## I. Introduction

The Marsh Island Hydrologic Restoration Project was proposed on the 6<sup>th</sup> priority list of the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) and is co-sponsored by the United States Army Corps of Engineers (USACE) and the Coastal Protection and Restoration Authority (CPRA). The project is located in Iberia Parish approximately six miles south of Cypremort Point. The project area encompasses approximately 7,310 acres (2,958 ha) of wetlands on the northeast tip of Marsh Island east of Bayou Blanc (Figure 1). It comprises 4,290 acres (1,736 ha) of brackish marsh and 3,020 acres (1,222 ha) of open water, based on the Louisiana Department of Natural Resource's GIS data for 2004 (LDNR 2004). Common plant species found in the project area include *Juncus roemerianus* (needlegrass rush), *Spartina patens* (saltmeadow cordgrass), *Schoenoplectus maritimus* (cosmopolitan bulrush), *Schoenoplectus americanus* (chairmaker's bulrush), *Spartina alterniflora* (saltmarsh cordgrass), and *Vigna luteola* (hairypod cowpea) (United States Department of Agriculture, Natural Resources Conservation Service 2002, Chabreck and Linscombe 1988).

Between 1930 and the present, the hydrology of Marsh Island has changed due to tidal influenced erosion, subsidence, and oil and gas exploration (Orton 1959, SCS 1978). Several oil field canals were constructed to facilitate oil and gas exploration in the project area during the 1950's. Recent deterioration and subsidence of the spoil banks deposited in the 1950's have resulted in cuts in the spoil banks that have become conduits for rapid tidal exchanges between the surrounding bays and the interior marshes. These rapid exchanges have resulted in tidal scouring and the loss of marsh vegetation through erosion and subsidence. Lake Sand and a number of interior lakes also supported a significant amount of submerged aquatic vegetation (SAV). Today these lakes are almost devoid of SAV, presumably due to the effects of increased tidal exchange and increased turbidity. Erosion has also lead to the deterioration of the northeast end of Marsh Island and the north rim of Lake Sand, leaving exposed a highly organic brackish marsh.

During the life of the 20 year project, 408 acres (168 ha) of wetlands will be protected (USACE 1994). The project consists of the construction of 9 closures in oil and gas canals at the northeast end of Marsh Island and free-standing rock breakwaters to isolate Lake Sand from Vermilion Bay and to provide shoreline protection to the northeastern shoreline of Marsh

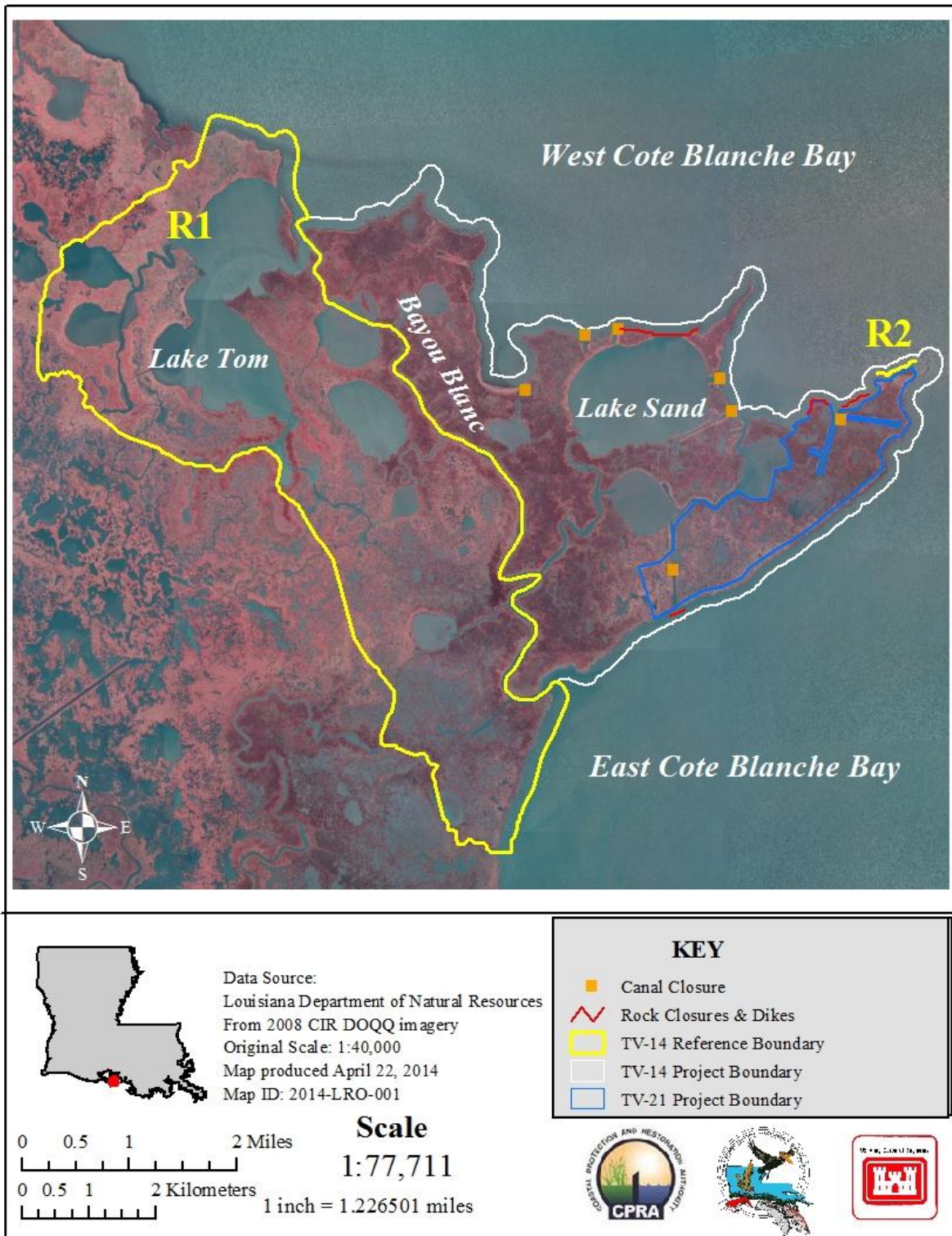


Island (Figure 1). Project construction began on July 25, 2001 with the construction of approximately 4,000 linear feet (1291 m) of rock breakwater to protect the north shoreline of Lake Sand. A total of seven canals were plugged with rock armor while one was plugged with an earthen closure only. An additional closure, constructed of painted steel sheetpile and rock armor, was constructed at the mouth of an oil exploration canal on the eastern end of the project area. Construction of the \$2.9 million project was completed on December 12, 2001.

Hurricane Rita struck the coast of southwestern Louisiana on September 24, 2005 with a maximum storm surge of 10 ft (3.1 m) in the TV-14 project area (FEMA 2006). USGS calculated the amount of land that changed to water resulting from the storm to be 98 square miles in southwestern Louisiana, 5 square miles in the Teche/Vermilion basin (Barras 2006).

Hurricane Ike struck near Galveston, Texas on September 13, 2008. A maximum storm surge of 7 - 8 ft (2.1 – 2.4 m) NAVD 88 was reported near the TV-14 project area (East et al. 2008).

The East Marsh Island Marsh Creation Project (TV-21) was constructed within the TV-14 project area in September 2010 (Figure 1). The project consisted of the addition of sediment hydraulically dredged from East Cote Blanche Bay to create 362 acres (146.5 ha) of contained marsh and 797 acres of un-contained/nourished marsh. The primary purpose of the project is to restore emergent marsh habitat that was lost due to Hurricane damage. The TV-21 project provides a synergistic effect with the TV-14 project.



**Figure 1.** Marsh Island Hydrologic Restoration (TV-14) project boundary and features.





## **II. Maintenance Activity**

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

The purpose of the annual inspection of the Marsh Island Hydrologic Restoration Project (TV-14) 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, CPRA 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. 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. A summary of past operation and maintenance projects completed since completion of the Marsh Island Hydrologic Restoration Project are outlined in Section IV.

An inspection of the Marsh Island Hydrologic Restoration Project (TV-14) was held on June 19, 2014 under partly cloudy skies and warm temperatures. In attendance were Darrell Pontiff, Dion Broussard, and Mark Mouledous representing CPRA; Cassidy Lejeune and Tyson Crouch representing LDWF. Representatives for the USACE were not able to attend. The annual inspection began at approximately 10:15 a.m. at Structure No. 9 and ended at Structure No. 1 at approximately 11:30 a.m.

The field inspection included a complete visual inspection of most of the project features. Staff gage readings and existing temporary benchmarks where available were used to determine approximate elevations of water, embankments and weir features. 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**

#### **Closure No. 1**

The erosion problems and Hurricane Rita damages have been repaired through the recent maintenance project that was completed in February 2009. The dike was capped and bank paving installed on both ends of the closure. This site is in good condition since this work was performed. (Photos: Appendix A, Photo 1 & 2).

#### **Closure No. 2**

The dike was capped and bank paving installed as noted above and is in good condition since the work was performed. (Photos: Appendix A, Photo 3).



### **Closure No. 3**

The rock closure dike appears in good condition and was extended on the western end along with installing bank paving during the recent maintenance event. Also, it was observed (and confirmed with aerial photography post Hurricane RITA) that a large open water area has developed within the marsh near the western terminus of Closure No. 3 and that the bankline between that point and the eastern end of Closure No. 2 has eroded very severely and such that the “landbridge” between Vermilion Bay on the north of Marsh Island and the northwestern portion of Lake Sand proper is now narrow and may become subject to breaching thus allowing an undesirable water connection between the two bodies of water. CPRA and COE agree that this area is in poor condition and should be considered for maintenance. It is recommended that an additional reach of shoreline protection dike be constructed, an estimated 1,500 to 1,800 linear feet, to connect the western end of Closure No. 3 to the eastern end of Closure No. 2. The estimated cost for rock dike and flotation is approximately \$1,250,000. (Photos: Appendix A, Photos 4 & 5).

### **Closure No. 4**

The Lake Sand Dike closure as originally constructed and recently repaired for Hurricane Rita damages, appears in good condition. The dike was capped in those areas where it was below elevation +3.0 as well as extended on the eastern end with bank paving. Dike has maintained elevation in capped areas. There is some settlement on the eastern end of the dike. (Photos: Appendix A, Photo 6).

### **Closure No. 5**

The steel sheet pile, rock riprap wingwalls, and stone bank/marsh paving placed as part of the Hurricane LILI repair project is in good condition and were apparently very effective in preventing additional damage by the erosive action of Hurricane RITA. The staff gage was re-set as part of the recent maintenance event. The overbank marsh areas paved to make same “hard” and paid for with O & M funding needs to be continually evaluated for its effectiveness. There is a breach on the southern end of the bank paving where water is passing through. Additionally, a small area of broken land/marsh exists between closures 5 and 6. If left unattended, an undesirable water connection between Vermilion Bay and Lake Sand will occur. It is recommended that an additional reach of shoreline protection dike be constructed, an estimated 1,500 to 1,800 linear feet, to connect the southern end of Closure No. 5 to the northern end of Closure No. 6. The estimated cost for rock dike and flotation is approximately \$1,250,000. (Photos: Appendix A, Photos 7-9).

### **Closure No. 6**





The breach on the southern end of the dike that had occurred prior to Hurricane Rita and subsequently worsened as a result of the tidal surge has been repaired as part of the recent maintenance event. The dike was extended on the northern end and bank paving was installed on both ends of the closure. With high tides, water is migrating around the southern end of the closure where bank paving was introduced to mitigate this problem in the past. A trenasse has formed and could lead to further damage to the marsh. (Photos: Appendix A, Photos 10 & 11).

### **Closure No. 7**

This closure site is in good condition and spoil material from the dredging of the north-south canal in 2008 was placed along the eastern end of the rock dike in an effort to stabilize this section of shore. In addition dredge spoil material was pumped behind the rock dike as part of this same access dredging and a small area of marsh creation was formed which is now starting to vegetate. There is some settlement along two (2) 150 foot lengths of the rock dike. (Photos: Appendix A, Photo 12).

### **Closure No. 8**

There is a breach on the southern end of the closure. A maintenance event on the adjacent TV-21 project will require the closure to be partially removed for access. At the conclusion of the TV-21 maintenance event, the contractor will replace the closure and add additional rock to repair the breach. (Photos: Appendix A, Photos 13 & 14).

### **Closure No. 9**

The rock riprap shoreline protection dike constructed on the south shoreline of Marsh Island was noted to now sit out further into the waters of the Gulf as discussed in the last inspection. Conditions were such that the feature was functioning well and that sediment had accreted and a growth of marsh vegetation had extended over the new fill. This rock shoreline feature will still function as a breakwater and extend the life of the earthen pipeline closure to the north. The recent construction of the TV-21 East Marsh Island Marsh Creation project has helped to reinforce the breach that had occurred on the southeast corner of the pipeline canal since the last inspection. The pipeline canal north of the rock breakwater was filled in with sediment from the marsh creation project and construction of containment dikes have now closed off the breach at the shoreline. No maintenance will be necessary at closure No. 9 as a result of the work performed through the TV-21 project. (Photos: Appendix A, Photo 15).

## **c. Maintenance Recommendations**

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

- A large open water area has developed within the marsh near the western terminus of Closure No. 3 and that the bankline between that point and the eastern end of Closure No. 2 has



eroded very severely and such that the “landbridge” between Vermilion Bay on the north of Marsh Island and the northwestern portion of Lake Sand proper is now narrow and may become subject to breaching thus allowing an undesirable water connection between the two bodies of water. It is recommended that an additional reach of shoreline protection dike be constructed, an estimated 1,500 to 1,800 linear feet, to connect the western end of Closure No. 3 to the eastern end of Closure No.2.

- There is a breach on the southern end of the bank paving at Closure No. 5 as well as a section of broken marsh between Closures No. 5 and No. 6 which is allowing exchange to occur between Vermilion Bay and Lake Sand. It is recommended that an additional reach of shoreline protection dike be constructed, an estimated 1,500 to 1,800 linear feet, to connect the southern end of Closure No. 5 to the northern end of Closure No. 6.
- There is a breach on the southern end of the rock plug at Closure No. 8 which will be addressed in conjunction with a maintenance event currently underway for TV-21.

## ii. Programmatic/ Routine Repairs

None

## d. Maintenance History

**General Maintenance** : Below is a summary of completed maintenance projects and operation tasks performed since December 2001, the construction completion date of the Marsh Island Hydrologic Restoration Project (TV-14).

**2005 Maintenance Project–Grillot, Inc. (Through lease agreement with Bertucci Contracting Corp.)** This maintenance project included the placement of paving stone (18” thick) spread out around the wingwalls of the plug at Lake Sand Canal No. 5 Closure to “harden” the area while still allowing flow in extreme tidal events to pass around the structure without washing away the existing bank. Also included was the extension of the rock dike on the southern end of Canal No. 5. Approximately 4,000 tons of 1000# stone was placed on Lake Sand Closure No. 4 to reconstruct the rock dike where stone was displaced. This maintenance project was a result of damages that occurred during Hurricane Lili in 2002. The costs associated with the engineering, design and construction of the Marsh Island Maintenance Project are as follows:

Construction (FEMA)	\$267,059.11*
Construction (CWPPRA)	\$ 64,092.00



E & D, construction oversight, as-builts	\$ 30,262.00
<b>TOTAL CONSTRUCTION COST:</b>	<b>\$361,413.11</b>

\* This cost was reimbursed by FEMA

**2008 Repair of Closure No. 8 Breach** – This repair work included placing spoil material on the southern end of the rock plug from the dredging of the north-south access canal adjacent to this closure. The work was performed by Renaissance Petroleum Co. as part of their CUP application for a new oil and gas well on the east end of Marsh Island. Additional dredge material was also placed along the entire reach of the west levee of the proposed TV-21 project as well as on the northern end of Closure No. 8 towards the bay connecting to an existing rock dike. Hydraulic dredge material was also pumped behind Structure No. 7 to create marsh behind the rock dike. In addition, spoil material from the bucket dredge operation was placed on the west side of the north-south access canal to bridge a small area of marsh that connects to Structure No. 7. This work was completed in November 2008 and was performed at no cost to CWPPRA and OCPR.

**2009 Maintenance Project – Antill Pipeline Construction** - This maintenance project included placing 175 tons of 130# rock at Closure No. 1, 370 tons of 130# rock at Closure No. 2, 2,270 tons of 130# rock at Closure No. 4, and 570 tons of 130 # rock at Closure No. 6. Bank paving (using 30# rock) was placed at the ends of all of the closures as part of this project which was completed in February 2009. This maintenance project was a result of damages sustained from Hurricane Rita in 2005 and other required routine maintenance. The costs associated with the engineering, design and construction of the Marsh Island Maintenance Project are as follows:

Construction (FEMA)	\$113,083.30
Construction (CWPPRA)	\$358,041.70
E & D, construction oversight, as-builts	\$ 44,627.14
<b>Project Total</b>	<b>\$515,752.14</b>

### 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 required structural operations.

#### **IV. Monitoring Activity**

As mandated in the monitoring plan, the four continuous recorders were removed at the end of 2006. Pursuant to a CWPPRA Task Force decision on August 14, 2003 to adopt the Coastwide Reference Monitoring System-*Wetlands* (CRMS-*Wetlands*) for CWPPRA, updates were made to the TV-14 Monitoring Plan to merge it with CRMS-*Wetlands* and provide more useful information for modeling efforts and future project planning while maintaining the monitoring mandates of the Breaux Act. There are no CRMS-*Wetlands* sites inside the TV-14 project area, however, there are 9 sites located on Marsh Island.

##### **a. Monitoring Goals**

The objective of the Marsh Island Hydrologic Restoration Project is to restore more natural hydrologic conditions in the project area resulting in the protection of the existing marsh.

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

1. Reduce water level variability in the project area.
2. Decrease the rate of marsh loss in the project area.
3. Reduce erosion rate of the northeast shoreline of Marsh Island.
4. Increase the occurrence of submerged aquatic vegetation in Lake Sand and in shallow open water within the project area.

##### **b. Monitoring Elements**

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

Near-vertical color-infrared aerial photography (1:12,000 scale) was used to measure vegetated and non-vegetated areas for the project and reference areas. The photography was obtained in 2000 prior to project construction and post-construction in years 2004 and 2009. Additional photography will be acquired in 2016. The original photography was checked for flight accuracy, color correctness, and clarity and was subsequently archived. Aerial photography was scanned, mosaicked, and georectified by USGS/NWRC personnel according to standard operating procedures (Steyer et al. 1995, revised 2000) (Figure 2).



Percent land trends were calculated using Landsat Thematic Mapper (TM) data for 1985 – 2010. Linear regressions were calculated for the period of record. The variability in percent land data points around the slope illustrate the influence of various sources of environmental variance or classification error. Positive slopes indicate increasing percent land or historical land gain and negative slopes indicate decreasing percent land or historical land loss (Couvillion et al., 2011).

### **Shoreline Change:**

To document shoreline movement along the northeast shoreline of Marsh Island, a differential GPS (DGPS) survey of unobstructed sections of shoreline was conducted at the vegetative edge of the bank to document the position of the shoreline in pre-construction year 1999 and post-construction in 2003, 2009, and 2012. A subsequent survey will be conducted in 2019. A similar survey was conducted concurrently along a 2,000 ft (609.6 m) section of reference area 2 (R2). DGPS shoreline positions were mapped.

### **Water Level:**

Water level variability was monitored hourly at two continuous data recorders deployed in the project area and two continuous data recorders deployed in reference area 1 (R1) (Figure 5). Staff gages adjacent to the continuous recorders were surveyed to correlate water levels NAVD88. Hourly water level data was collected at these stations for five years following project construction, from October 1999 to December 2006.

Water level is monitored hourly at station TV21CR02 within the project area and selected reference site CRMS0523, within R1. Water level data were used to document water level variability in the southern part of the TV-14 project area and the reference area.

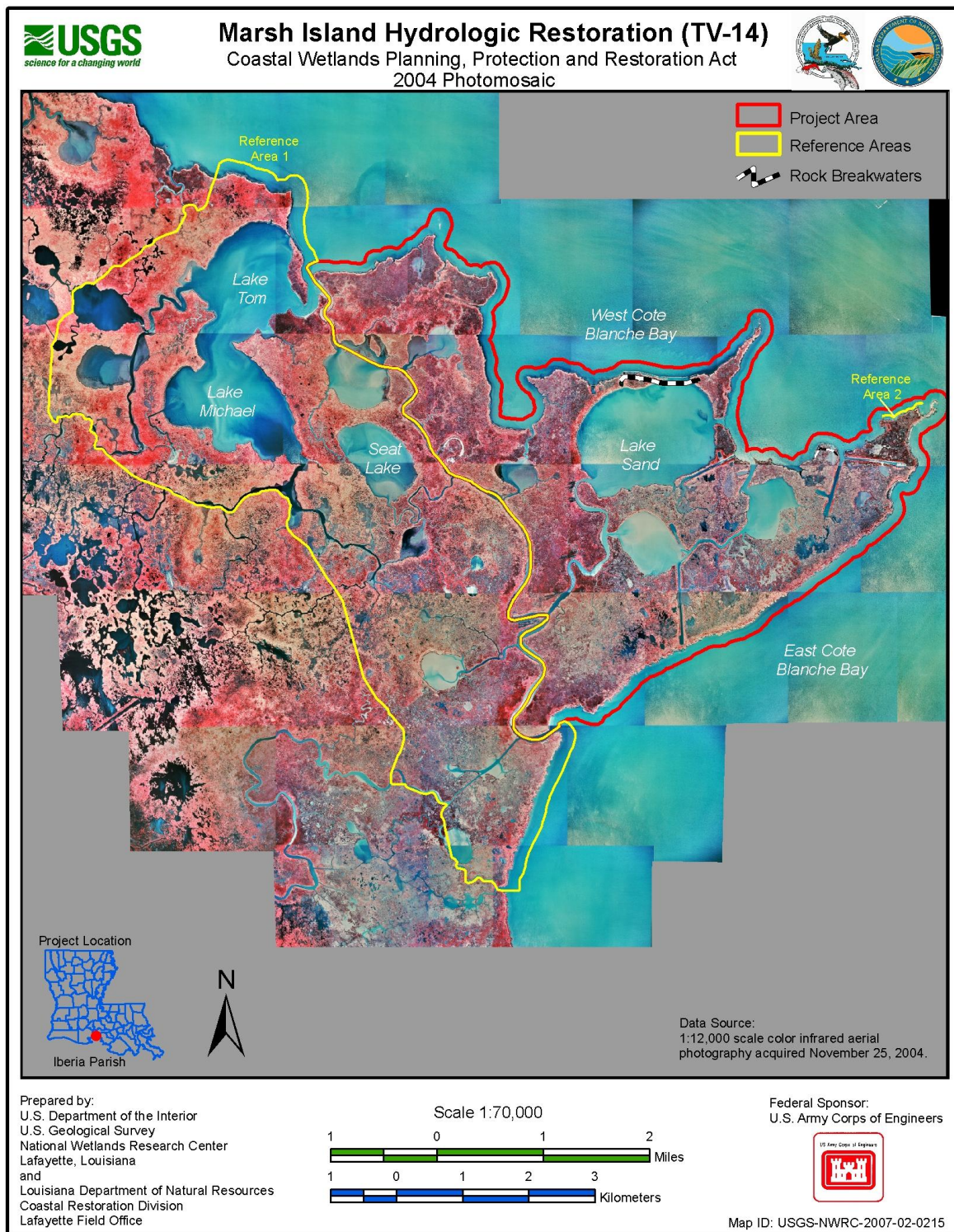
### **Submerged Aquatic Vegetation (SAV):**

SAV was monitored using the rake method (Chabreck and Hoffpauir 1962). Restoration of the Lake Sand shoreline is expected to influence SAV primarily in Lake Sand, while canal plugs and spoil bank repair work is expected to influence SAV primarily in other shallow open water areas. Separate tests were therefore used to evaluate SAV in Lake Sand and SAV in shallow open water areas. The frequency of occurrence of SAV in Lake Sand was compared to the frequency of occurrence of SAV in Lake Tom found in R1. Three parallel transects were established and separated by a distance approximately equal to one-fourth the pond width (Figure 5). Each transect is composed of a minimum of twenty-five equally spaced sampling stations. At each station, aquatic vegetation was sampled by dragging a garden rake on the pond bottom for one second. The presence of vegetation was recorded to determine the frequency of aquatic plant occurrence (frequency = number of occurrences/25 x 100). When vegetation was present, the species present were recorded in order to determine the frequencies of individual species (Nyman and Chabreck 1996). In shallow open water areas, three small ponds in the project area were compared to three small ponds in R1. Two parallel transects, separated by a distance approximately equal to one-third the pond width were established in each pond and investigated using similar sampling techniques as discussed above. Ancillary salinity data, collected with continuous data recorders and monthly discrete





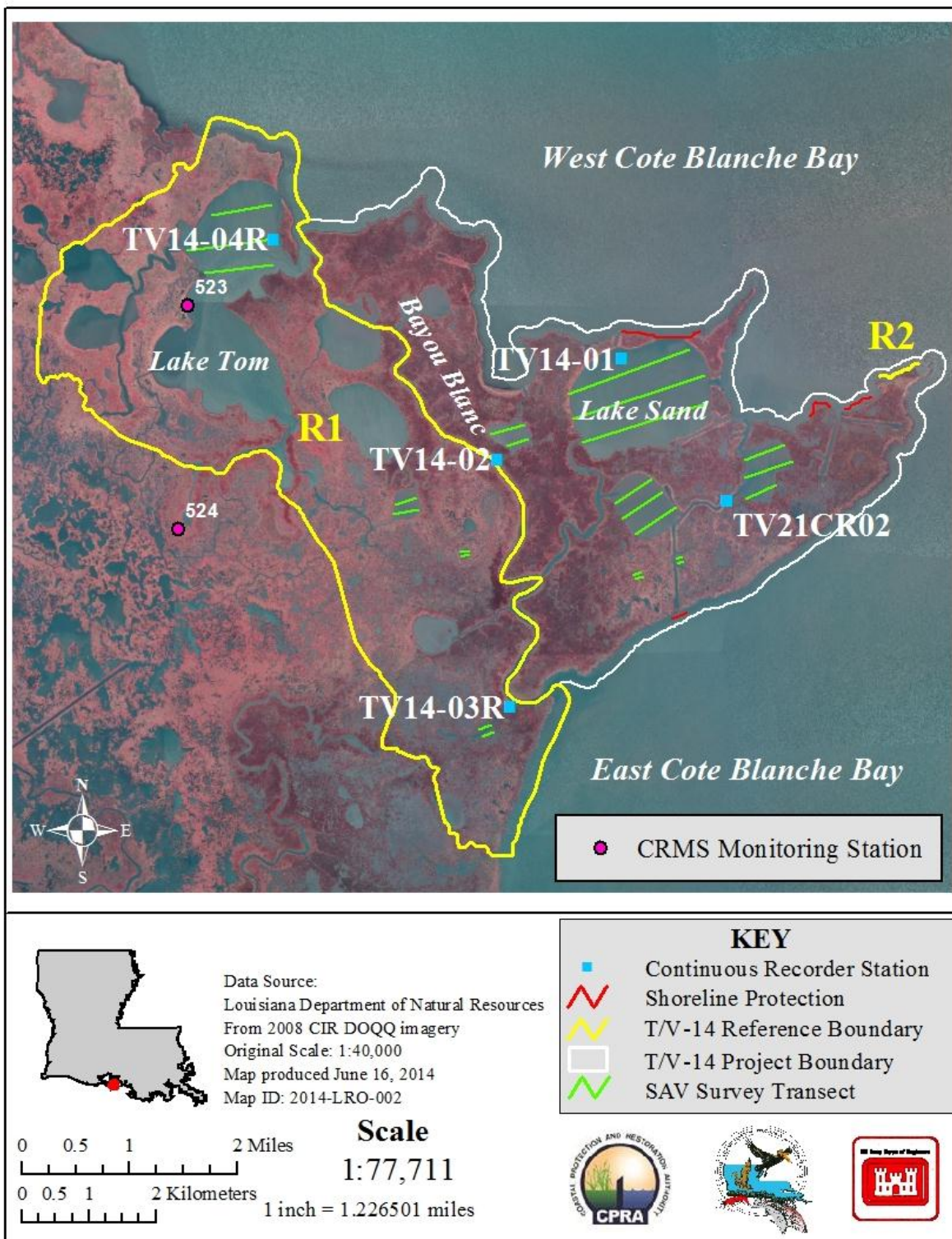
samples, will be evaluated in concert with the statistical analysis to aid in the interpretation of SAV data. SAV was monitored in the fall preceding construction in 1999 and in post-construction years 2002, 2004, 2006, 2009, 2012, 2013 and will be surveyed in 2016.





**Figure 2.** Photomosaic of the 2004 color-infrared aerial photography for the TV-14 project and reference areas from aerial photography taken November 25, 2004.





**Figure 5.** Continuous hydrographic monitoring stations and SAV monitoring survey transects for the TV-14 project and reference areas.

#### IV. Monitoring Activity (continued)

##### c. Monitoring Results and Discussion

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

Pre-construction classification (2000) indicated 69.8% land and 30.2% water within the project area and 64.4% land and 35.6% water within R1 (Table 1, Figure 6). Post-construction classification of land area and open water, collected in November 2004, indicated 58.6% land and 41.4% water in the project area and 58.3% land and 41.7% water within R1 (Table 1, Figure 7). However, due to a correction of the project and R1 boundaries resulting in a change in acreage for both areas, the pre- and post-construction classifications are not directly comparable. The project and R1 boundaries were updated to correct inaccuracies due to the low-resolution satellite imagery used to create the boundaries during project planning. Because of the low resolution, some parts of the project and R1 were excluded. For both areas, the boundaries were expanded to include these areas as well as some open water surrounding the project area and R1. As a result, the first comparison of land and water area is being made using the 2009 data. The photography flown on December 20, 2009 indicated 56.3% land and 43.7% water within the project area and 56.2% land and 43.8% water within R1 (Figure 8). These values indicate a loss of approximately 2% land in both the project area and reference areas for the period 2004-2009 (Table 1).

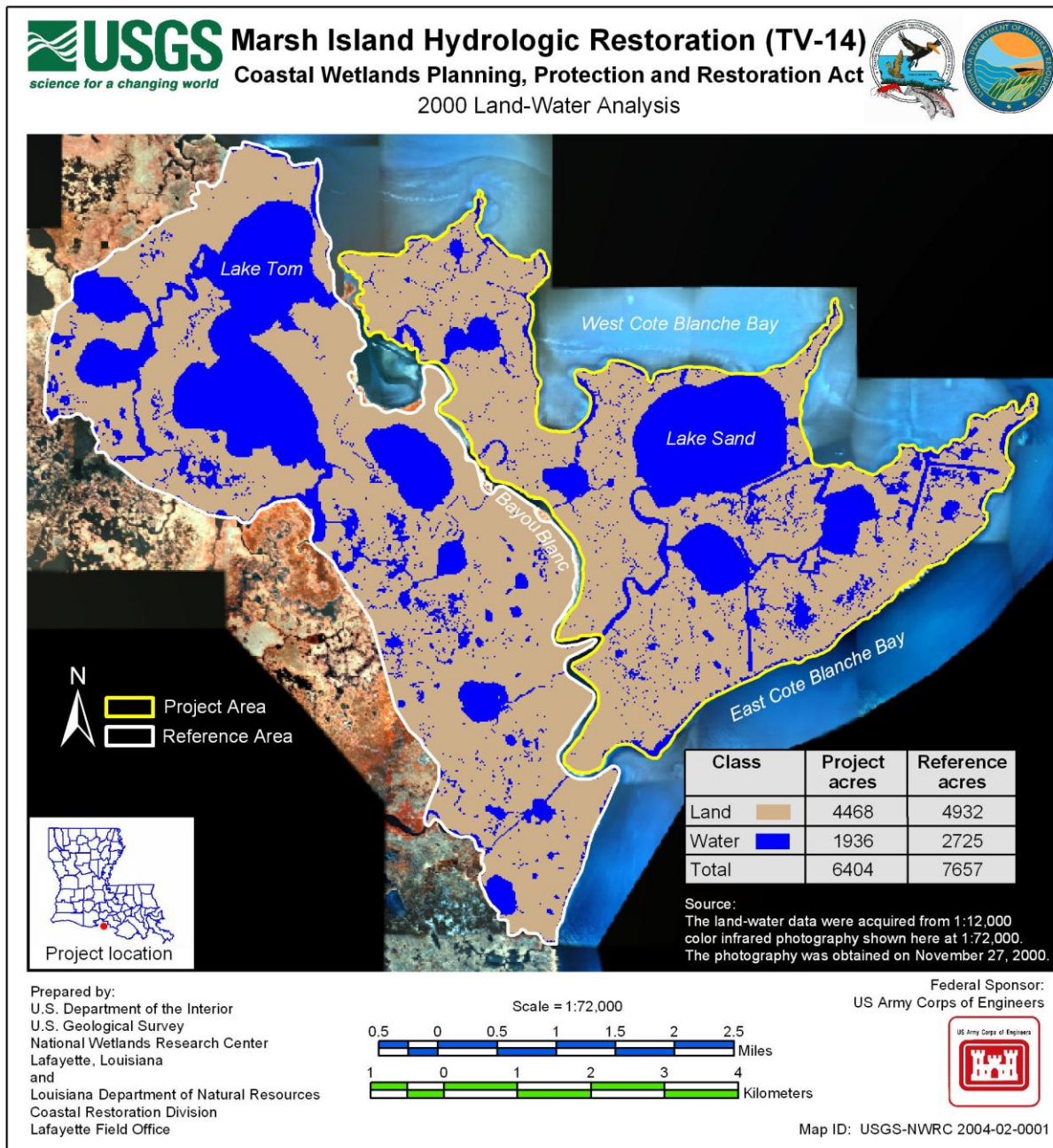
The general land trend within the project area prior to construction was negative (-0.35%/yr; 25.59 ac/yr) from 1985 to 2001 (Figure 9). Incorporating the 2001 to 2010 data, which includes the post-construction satellite imagery, shows an almost equal loss trend to the pre-construction data (-0.38% /yr; 27.78 ac/yr). Using post-construction data only, however, causes the loss trend to become slightly greater (-0.63%/yr; 46.05 ac/yr). The 2010 imagery was taken while the TV-21 project was still new and the sediments hadn't settled. Thus, these areas of fresh spoil were interpreted as water by the Landsat Thematic Mapper. Therefore, the 2010 imagery was excluded from this analysis. Future imagery analyses should show a reduction in the project area's loss rate.

**Table 1.** Land and water area percentages and percent change for the project and R1 reference areas 2000-2009.

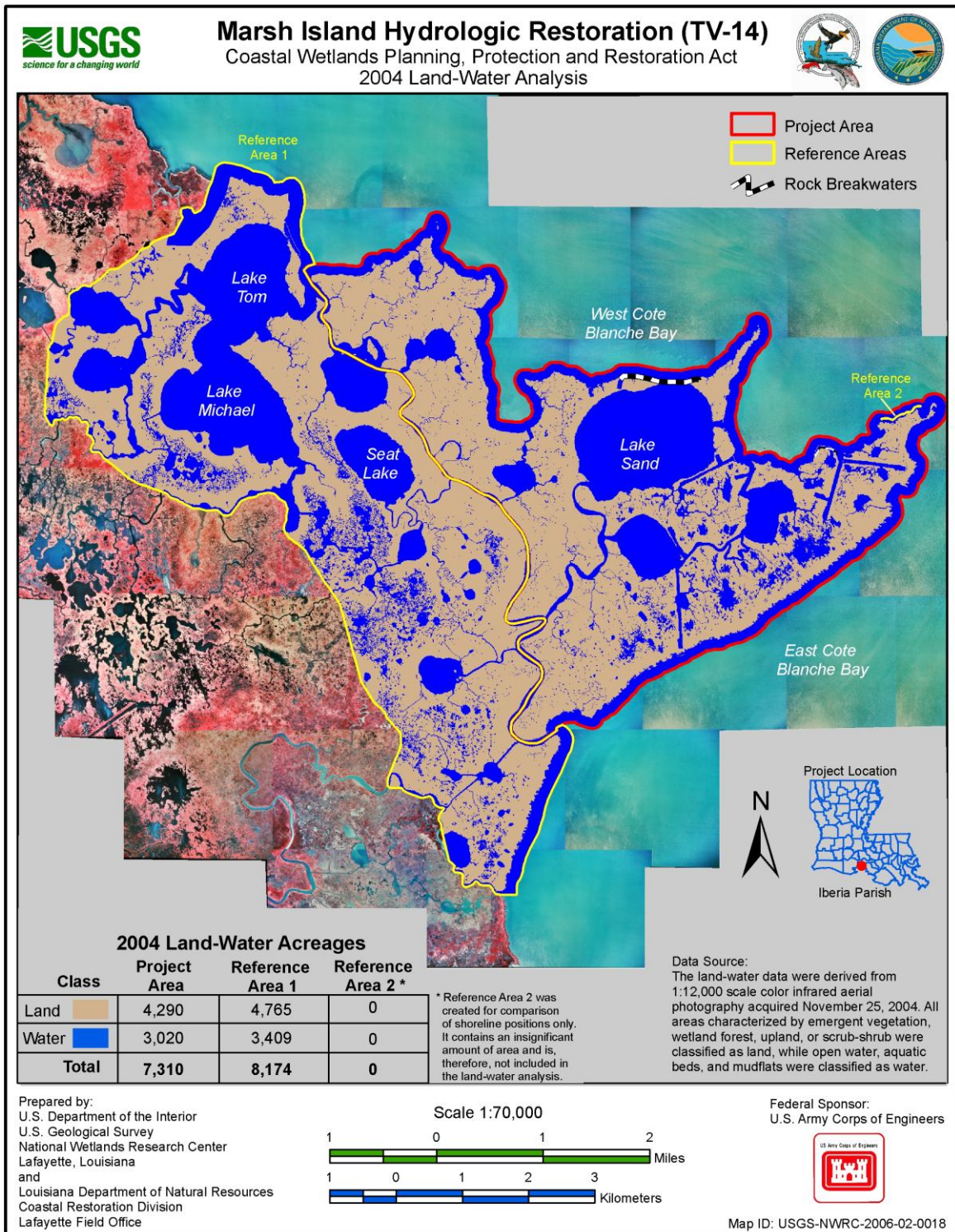
Date/Area	% Land	% Water	%Change Land 2004-2009
2000 Project	69.8	30.2	N/A
2000 Reference	64.4	35.6	N/A
2004 Project	58.6	41.1	N/A
2004 Reference	58.3	41.7	N/A
2009 Project	56.3	43.7	-2.3
2009 Reference	56.2	43.8	-2.1





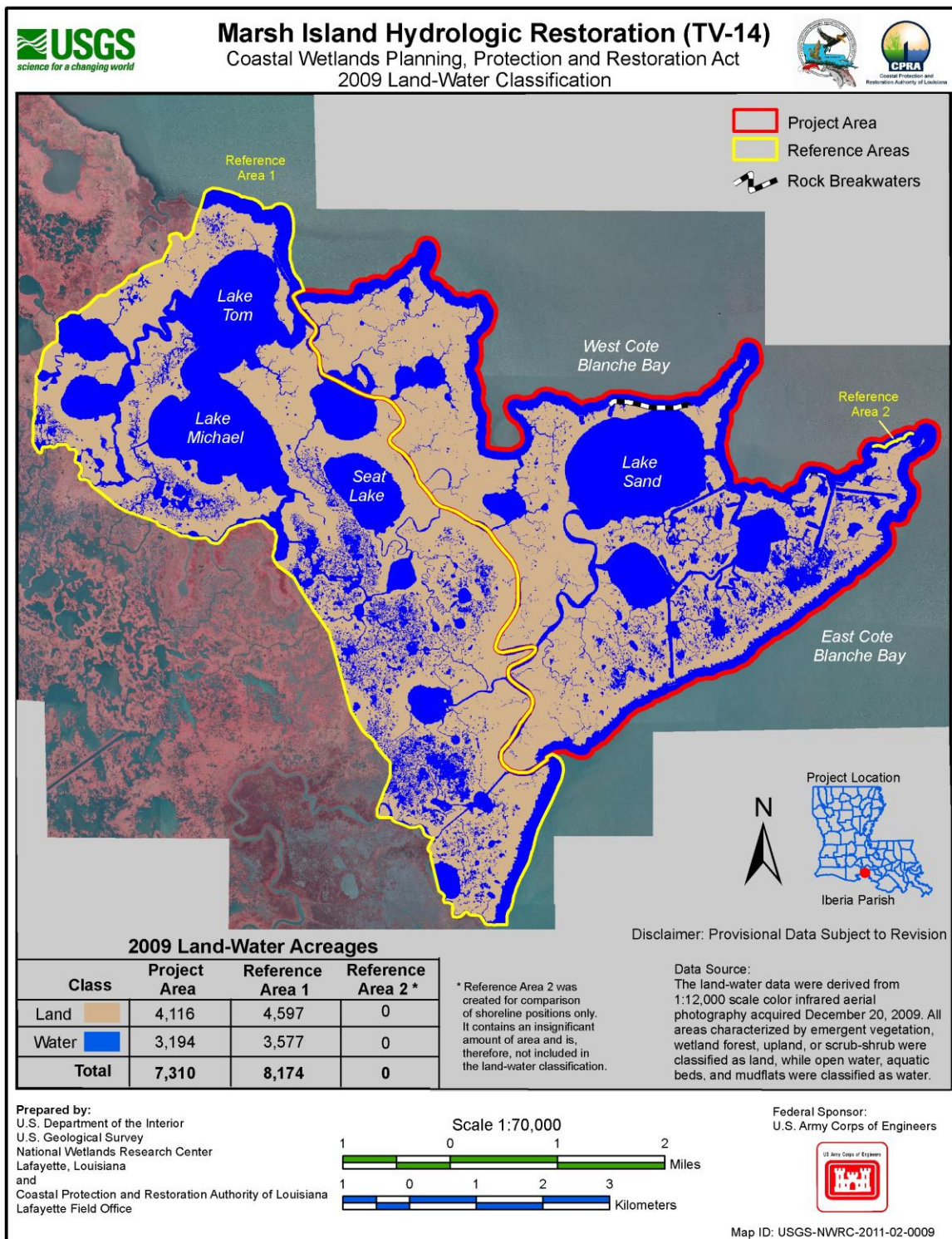


**Figure 6.** Results of the 2000 Land:Water GIS image classification for the TV-14 project and reference areas from aerial photography taken November 27, 2000.



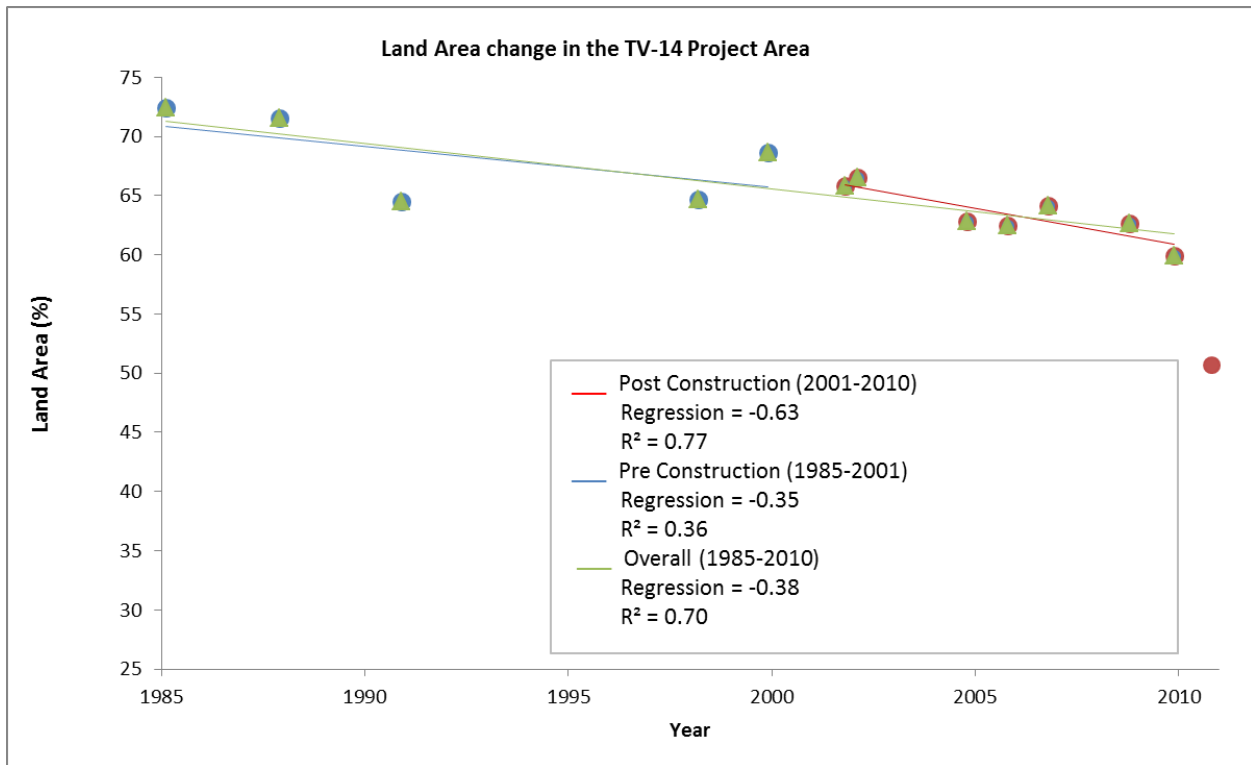
**Figure 7.** Results of the 2004 Land:Water GIS image classification for the TV-14 project and reference areas from aerial photography taken November 25, 2004.





**Figure 8.** Results of the 2009 Land:Water GIS image classification for the TV-14 project and reference areas from aerial photography taken December 20, 2009.





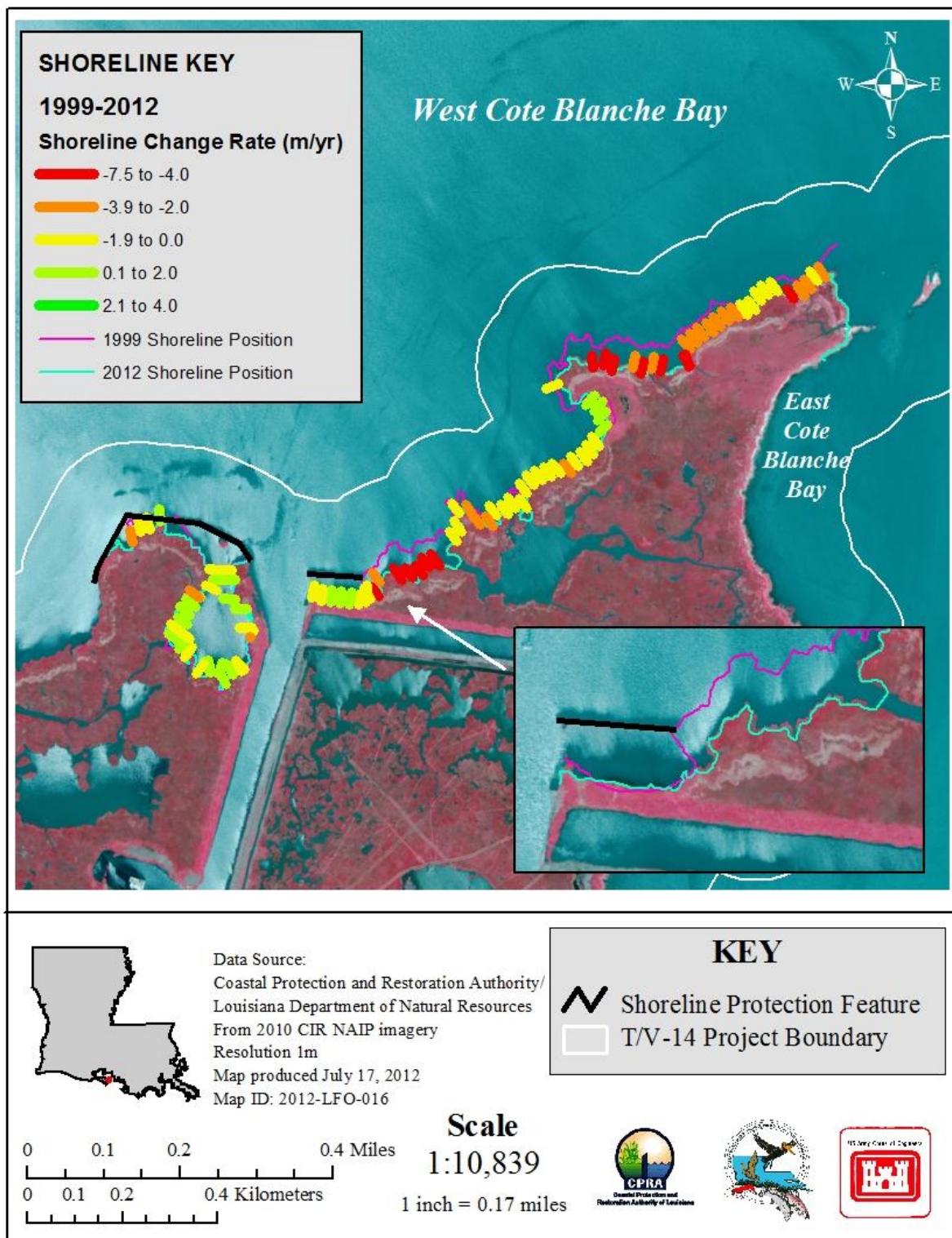
**Figure 9.** Project scale percent land change for TV-14. Percent land values are displayed for all cloud free TM images available from 1984-2010. The green line depicts the percent land trend for the entire period of record. The blue and red lines depict the pre- and post-construction percent land trends, respectively. Percent land calculated as percent land of total project area. See Couvillion et al. 2011.

**Shoreline Position:**

Comparison of the 2003 dataset to the preconstruction (1999) data indicated a gain of 1.08 m/yr in the protected section of the shoreline and a loss of -0.62 m/yr in the unprotected section. Comparing the 2009 survey (post-Hurricanes Rita and Ike) to the 2003 survey indicated a loss of -0.77 m/yr in the protected area and -3.58 m/yr in the unprotected area. The post-Hurricane recovery period (comparing 2009-2012) showed a gain of 0.99 m/yr in the protected section while the unprotected section saw a loss of -2.68 m/yr. Overall loss from 1999 to 2012 was -0.18 m/yr in the protected section and -2.50 m/yr in the unprotected section (Figure 10).

Time Period	Protected Section		Unprotected Section	
	Mean Shoreline Change (m/yr)	SE (+/-)	Mean Shoreline Change (m/yr)	SE (+/-)
1999-2003	1.08	0.54	-0.62	0.59
2003-2009	-0.77	.20	-3.58	0.37
2009-2012	0.99	0.69	-2.68	0.24
1999-2012	-0.18	0.12	-2.50	0.24





**Figure 10.** Marsh Island Hydrologic Restoration (TV-14) shoreline change 1999-2012.

### **Water Level:**

Relative water level data for the pre-and post-construction time periods were analyzed from the following datasets:

<b>Station</b>	<b>Data collection period</b>
TV14-01	10/12/1999 – 12/31/2006
TV14-02*	10/12/1999 – 3/14/2002
TV14-23	3/14/2002 – 12/31/2006
TV14-03R	10/12/1999 – 12/31/2006
TV14-04R	10/12/1999 – 12/31/2006
TV21CR02	2/14/2012 – 12/31/13
CRMS0523	2/14/2012 – 12/31/13

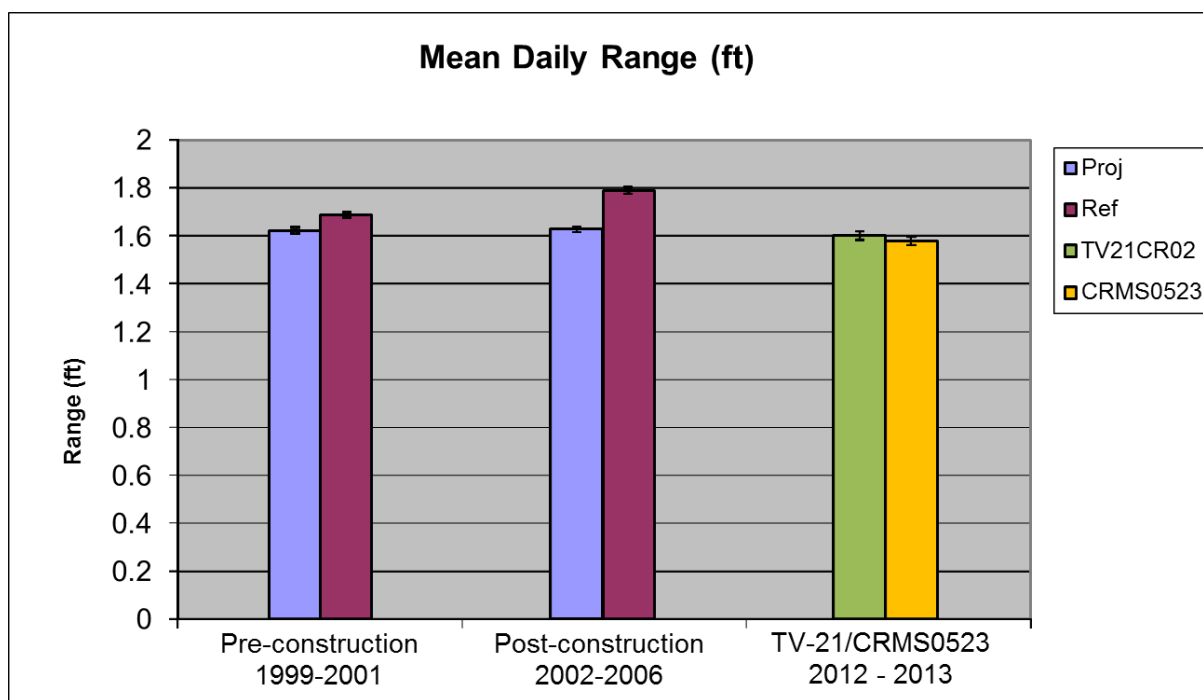
\*The continuous recorder at TV14-02 was removed because of access problems following project construction. The replacement station, TV14-23 was installed closer to Bayou Blanc, a more accessible location.

The difference in project area and R1 water level range (variability) was significantly higher post-construction than pre-construction ( $p < 0.0001$ ) (R1 had a water level range 0.16' higher than the project area post-construction and 0.06' higher preconstruction). Water level variability in the project area was found to be significantly less than that in R1, for both the pre- and post-construction periods (Figure 11). Water level variability appeared to increase following project construction in R1 and the project appears to have been successful at preventing a similar increase in the project area. It is not known what factors contributed to the increase in water level variability in R1 following project construction. However, it is not likely to be due to any effects of the project but rather variations in weather and tides. There was less variability in the project area before construction but ranges in the reference area increased relative to the project area post-construction. Thus, the project appears to have reduced water level variability as designed.

Visser (2007) determined that there was a significant decrease in flood stress based on two TV-14 project gages in an analysis of hydrologic data on CWPPRA Hydrologic Restoration projects. Because the flooding stress was so small in the TV-14 project area, Visser determined that this was not biologically significant. Flooding stress was calculated by multiplying the stress level from flood events of different durations by the percentage of time that the stress level occurred and the percentage of plant productivity.

Water level variability at TV21CR02 was not significantly different from CRMS0523 during 2012 – 2013, indicating the project has not had an effect on variability within the southern part of the project area. This is not surprising considering the TV-21 recorder is situated within a canal that has open access to West Cote Blanche Bay, unlike the TV-14 recorders that were situated in the northern part of the project area behind the canal closures.

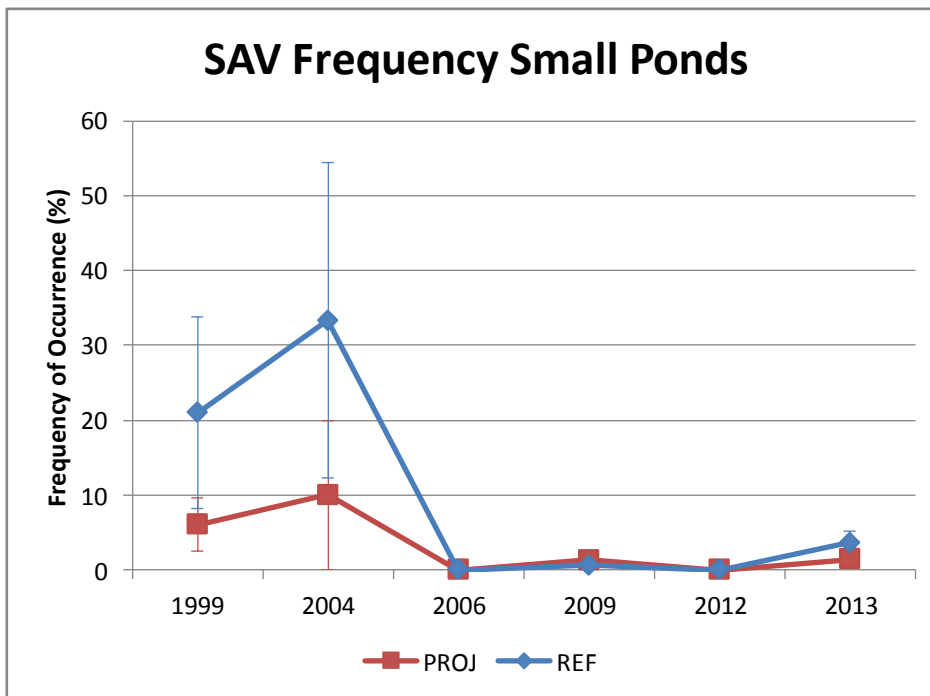
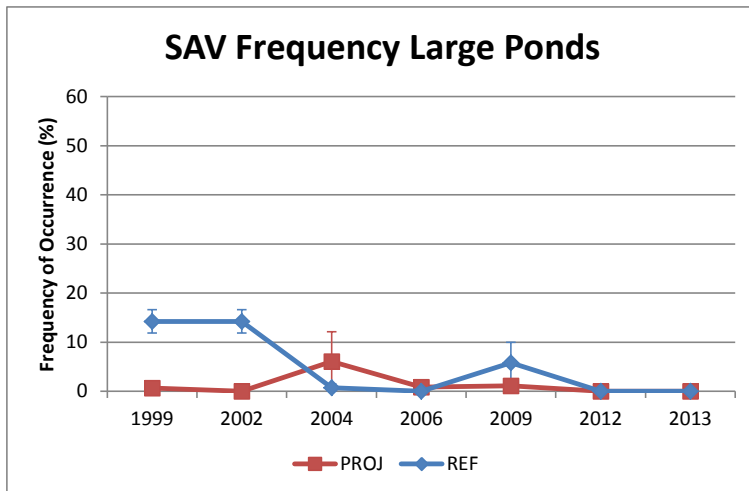




**Figure 11.** Mean daily water level range (variability)  $\pm$  standard error during the pre- and post-construction periods for the project and R1 stations as well as the 2012-2013 monitoring period at stations TV21CR02 and CRMS0523.

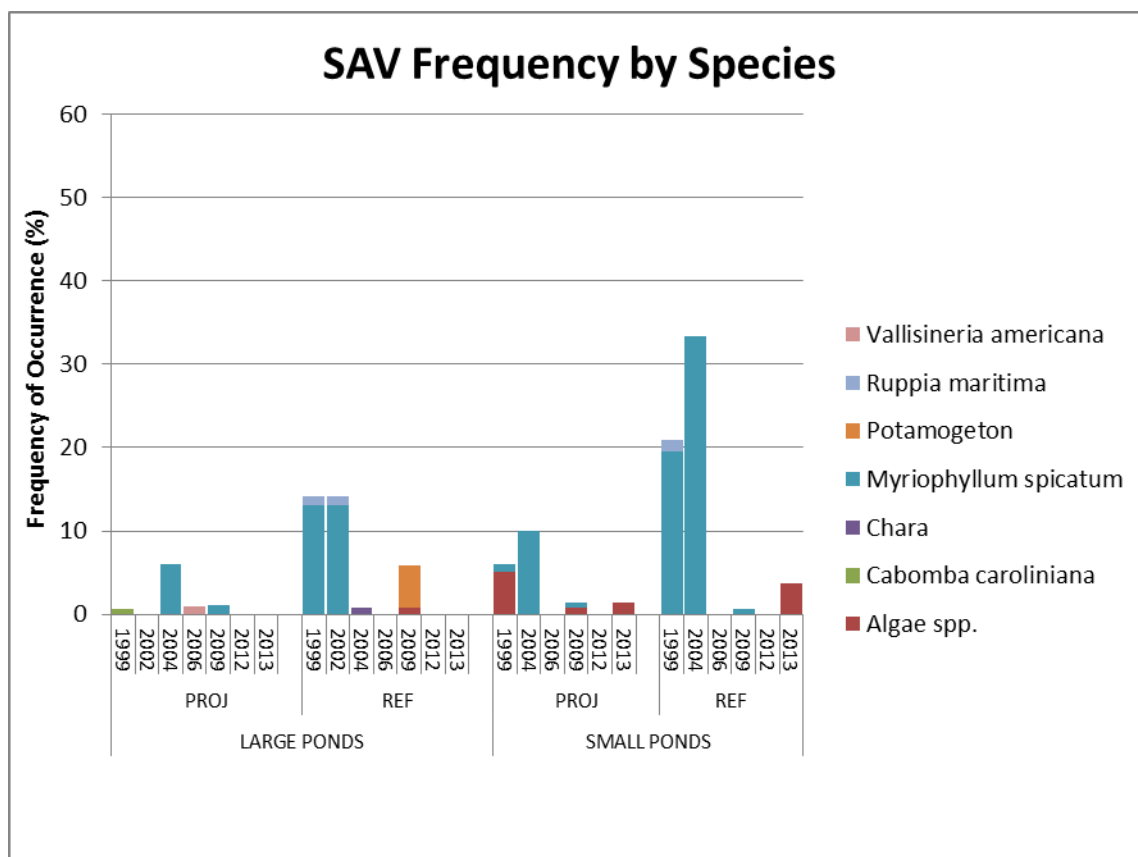
### **Submerged Aquatic Vegetation (SAV):**

SAV was analyzed separately for large and small ponds (Lake Sand vs. Lake Tom and small ponds in the project area vs. small ponds in R1). Analysis of Variance was conducted on frequency of occurrence data for areas (project and reference), years, and interaction between the two. For large ponds, there was a significant area year interaction that may be a project effect (Figure 12). SAV abundance had been higher in the reference area than the project area and a reverse occurred. There was no significant difference in SAV abundance in small ponds (overall or among any of the terms). SAV cover was low in both areas particularly after the hurricanes. The greatest abundance of SAV was in the reference ponds in 1999, 2002, and 2004 where *Myriophyllum spicatum* dominated (Figure 13). Other species were occasionally present including *Vallisneria americana* in the large project pond in 2006 and *Potamogeton* in the large reference pond in 2009 but none were abundant. No SAV were found in 2012 and only trace amounts of Algae were found in the small ponds on the 2013 survey. The absence of SAV could be due to the shallow pond depth, as the ponds could become mudflats at low tides as well as the effects of wind, which could cause high turbidity. This turbidity could reduce light levels in the pond, inhibiting SAV growth. The absence of SAV could also be related to yearly variations caused by climate.



**Figure 12.** Submerged aquatic vegetation abundance calculated separately for small and large ponds. Mean  $\pm$  SE.





**Figure 13.** Submerged aquatic vegetation abundance by species for both the project and R1.

## V. Conclusions

### a. Project Effectiveness

The project has been effective at reducing water level variability within the northern portion of the project area as compared to an ecologically similar reference area (R1). Water level variability did not increase in the project area as it did in R1 post-construction. SAV occurrence was beginning to improve in the project area prior to Hurricanes Rita and Ike but it has been virtually absent in both areas since the storms.

The goal to reduce the erosion rate of the northeast shoreline was partially met. In areas that received protection from a rock dike, erosion rates were much lower than those that were unprotected. The protected areas showed erosion during Hurricanes Rita and Ike, but have been prograding since.

Land to water ratios in the project and reference area R1 decreased slightly from 2004 to 2009. This is supported by the land change analysis which showed this trend continuing through 2010. Future analyses should show a reduction in the marsh loss rate due to the construction of the TV-21 project.

### b. Recommended Improvements

Overall, the Marsh Island Hydrologic Restoration Project is in good condition with most features still functioning as designed after repair. However, as noted above, there are a few areas of concern that if left unattended, could lead to more serious problems occurring. CPRA and the COE agree that a maintenance event is necessary. There is not enough money in the project budget to accommodate the estimated cost of the maintenance event. Discussion of the proposed maintenance event is ongoing.

### c. Lessons Learned

The steel sheet pile, rock riprap wingwalls, and stone bank paving installed at each end of Closure No. 5 after Hurricane Lili proved to be successful in preventing erosion during the Hurricane Rita storm surge event. This application will be applied to other closure sites for bank stabilization and protection.



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## **APPENDIX A**

### **(Inspection Photographs)**





**Photo No. 1**, Eastern End of Closure No. 1



**Photo No. 2**, Western End of Closure No. 1





**Photo No. 3, Closure No. 2**



**Photo No. 4, Closure No. 3**



**Photo No. 5, Thin strip of land between Closures 2 & 3**



**Photo No. 6, Closure No. 4**



**Photo No. 7, Closure No. 5**



**Photo No. 8, Southern End of Closure No. 5**





**Photo No. 9**, Broken land/marsh between Closures 5 & 6



**Photo No. 10**, Northern End of Closure No. 6



**Photo No. 11,** Southern End of Closure No. 6



**Photo No. 12,** Closure No. 7



**Photo No. 13, Closure No. 8**



**Photo No. 14, Breach at Closure No. 8**





**Photo No. 15**, Closure No. 9

**APPENDIX B**  
**(Three Year Budget Projection)**



**MARSH ISLAND/ TV-14 / PPL 6**  
**Three-Year Operations & Maintenance Budgets 07/01/2014 - 06/30/2017**

<u>Project Manager</u>	<u>O &amp; M Manager</u>	<u>Federal Sponsor</u>	<u>Prepared By</u>
Pat Landry	Dion Broussard	COE	Dion Broussard

	2014/2015 (-13)	2015/2016 (-14)	2016/2017 (-15)
<b>Maintenance Inspection</b>	\$ 6,651.00	\$ 6,851.00	\$ 7,057.00
<b>Structure Operation</b>			
<b>State Administration</b>	\$ -		\$ -
<b>Federal Administration</b>	\$ -		\$ -
<b>Maintenance/Rehabilitation</b>			

14/15 Description:

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

15/16 Description :

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

16/17 Description:

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

	2014/2015 (-13)	2015/2016 (-14)	2016/2017 (-15)
<b>Total O&amp;M Budgets</b>	\$ 6,651.00	\$ 6,851.00	\$ 7,057.00

<b>O &amp; M Budget (3 yr Total)</b>	<b>\$ 20,559.00</b>
<b>Unexpended O &amp; M Budget</b>	<b>\$ 491,807.00</b>
<b>Remaining O &amp; M Budget (Projected)</b>	<b>\$ 471,248.00</b>



**OPERATION AND MAINTENANCE BUDGET WORKSHEET**  
MARSH ISLAND HYDROLOGIC RESTORATION / PROJECT NO. TV-14 / PPL NO. 6/ 2014/2015

DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	ESTIMATED TOTAL
O&M Inspection and Report	EACH	1	\$6,651.00	\$6,651.00
General Structure Maintenance	LUMP	0	\$0.00	\$0.00
Engineering and Design	LUMP	0	\$0.00	\$0.00
Operations Contract	LUMP	0	\$0.00	\$0.00
Construction Oversight	LUMP	0	\$0.00	\$0.00

**ADMINISTRATION**

CPRA Admin.	LUMP	0	\$0.00	\$0.00
FEDERAL SPONSOR 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	SQ YD	TON / FT	TONS	UNIT PRICE	
	Rock Dike	0	0.0	0	\$0.00	\$0.00
	Bank Paving	0	0.0	0	\$0.00	\$0.00
	Articulated Concrete Mats	2000	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	0	\$0.00	\$0.00
	Materials		LUMP	0	\$0.00	\$0.00
	Mob / Demob		LUMP	0	\$0.00	\$0.00
	Contingency (25%)		LUMP	0	\$0.00	\$0.00
	Access and Flotation		LUMP	0	\$0.00	\$0.00
	Vegetative Plantings		LUMP	0	\$0.00	\$0.00
	Timber Mat Removal		LUMP	0	\$0.00	\$0.00
	Construction Layout		LUMP	0	\$0.00	\$0.00
TOTAL CONSTRUCTION COSTS:						\$0.00

**TOTAL OPERATIONS AND MAINTENANCE BUDGET:**

**\$6,651.00**



**OPERATION AND MAINTENANCE BUDGET WORKSHEET**  
MARSH ISLAND HYDROLOGIC RESTORATION / PROJECT NO. TV-14 / PPL NO. 6/ 2015/2016

DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	ESTIMATED TOTAL
O&M Inspection and Report	EACH	1	\$6,851.00	\$6,851.00
General Structure Maintenance	LUMP	0	\$0.00	\$0.00
Engineering and Design	LUMP	0	\$0.00	\$0.00
Operations Contract	LUMP	0	\$0.00	\$0.00
Construction Oversight	LUMP	0	\$0.00	\$0.00

**ADMINISTRATION**

CPRA Admin.	LUMP	0	\$0.00	\$0.00
FEDERAL SPONSOR Admin.	LUMP	0	\$0.00	\$0.00
SURVEY Admin.	LUMP	0	\$0.00	\$0.00
OTHER				\$0.00
<b>TOTAL ADMINISTRATION COSTS:</b>				<b>\$0.00</b>

**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	SQ YD	TON / FT	TONS	UNIT PRICE	
	Rock Dike	0	0.0	0	\$0.00	\$0.00
	Bank Paving	0	0.0	0	\$0.00	\$0.00
	Articulated Concrete Mats	2000	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	0	\$0.00	\$0.00
	Materials		LUMP	0	\$0.00	\$0.00
	Mob / Demob		LUMP	0	\$0.00	\$0.00
	Contingency (25%)		LUMP	0	\$0.00	\$0.00
	Access and Flotation		LUMP	0	\$0.00	\$0.00
	Vegetative Plantings		LUMP	0	\$0.00	\$0.00
	Timber Mat Removal		LUMP	0	\$0.00	\$0.00
	Construction Layout		LUMP	0	\$0.00	\$0.00
	TOTAL CONSTRUCTION COSTS:					\$0.00

**TOTAL OPERATIONS AND MAINTENANCE BUDGET:** \$6,851.00





**OPERATION AND MAINTENANCE BUDGET WORKSHEET**  
**MARSH ISLAND HYDROLOGIC RESTORATION / PROJECT NO. TV-14 / PPL NO. 6/ 2016/2017**

DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	ESTIMATED TOTAL
O&M Inspection and Report	EACH	1	\$7,057.00	\$7,057.00
General Structure Maintenance	LUMP	0	\$0.00	\$0.00
Engineering and Design	LUMP	0	\$0.00	\$0.00
Operations Contract	LUMP	0	\$0.00	\$0.00
Construction Oversight	LUMP	0	\$0.00	\$0.00

**ADMINISTRATION**

CPRA Admin.	LUMP	0	\$0.00	\$0.00
FEDERAL SPONSOR 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	SQ YD	TON / FT	TONS	UNIT PRICE	
	Rock Dike	0	0.0	0	\$0.00	\$0.00
	Bank Paving	0	0.0	0	\$0.00	\$0.00
	Articulated Concrete Mats	2000	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	0	\$0.00	\$0.00
	Materials		LUMP	0	\$0.00	\$0.00
	Mob / Demob		LUMP	0	\$0.00	\$0.00
	Contingency (25%)		LUMP	0	\$0.00	\$0.00
	Access and Flotation		LUMP	0	\$0.00	\$0.00
	Vegetative Plantings		LUMP	0	\$0.00	\$0.00
	Timber Mat Removal		LUMP	0	\$0.00	\$0.00
	Construction Layout		LUMP	0	\$0.00	\$0.00
TOTAL CONSTRUCTION COSTS:						\$0.00

**TOTAL OPERATIONS AND MAINTENANCE BUDGET:**

**\$7,057.00**



## **APPENDIX C**

### **(Field Inspection Notes)**



### MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-14 Marsh Island Hydrologic Restoration

Date of Inspection: June 19, 2014    Time: 11:30 AM

Structure No. 1

Inspector(s): Darrell Pontiff, Dion Broussard, Mark Mouledous (CPRA)  
 Tyson Crouch, Cassidy Lejeune (LDWF)  
 (USACE) Not present

Structure Description: Rock Plug

Type of Inspection: Annual

Water Level      Inside: \_\_\_\_\_      Outside: \_\_\_\_\_  
 Weather Conditions: Clear 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				
Cables	N/A				
Signage / Supports	N/A				
Rip Rap (fill)	Good			1,2	The site is in good condition.
Earthen Embankment	N/A				

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



# **MAINTENANCE INSPECTION REPORT CHECK SHEET**

Project No. / Name: TV-14 Marsh Island Hydrologic Restoration

Date of Inspection: June 19, 2014    Time: 11:30 AM

Structure No. 2

Inspector(s): Darrell Pontiff, Dion Broussard, Mark Mouledous (CPRA)  
Tyson Crouch, Cassidy Lejeune (LDWF)  
(USACE) Not present

Structure Description: Rock Plug

Type of Inspection: Annual

Water Level      Inside: \_\_\_\_\_      Outside: \_\_\_\_\_  
Weather Conditions: Clear 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				
Cables	N/A				
Signage / Supports	N/A				
Rip Rap (fill)	Good			3	The site is in good condition.
Earthen Embankment	N/A				

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



### MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-14 Marsh Island Hydrologic Restoration

Date of Inspection: June 19, 2014 Time: 11:30 AM

Structure No. 3

Inspector(s): Darrell Pontiff, Dion Broussard, Mark Mouledous (CPRA)

Structure Description: Rock Plug

Tyson Crouch, Cassidy Lejeune (LDWF)

(USACE) Not present

Type of Inspection: Annual

Water Level Inside: \_\_\_\_\_ Outside: \_\_\_\_\_

Weather Conditions: Clear 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				
Cables	N/A				
Signage / Supports	N/A				
Rip Rap (fill)	Good			4,5	Thin strip of land on the eastern side of the closure is cause for concern.
Earthen Embankment	N/A				

What are the conditions of the existing levees?

Are there any noticeable breaches?

Settlement of rock plugs and rock weirs?

Position of stoplogs at the time of the inspection?

Are there any signs of vandalism?





### MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-14 Marsh Island Hydrologic Restoration

Date of Inspection: June 19, 2014 Time: 11:15 AM

Structure No. 4

Inspector(s): Darrell Pontiff, Dion Broussard, Mark Mouledous (CPRA)  
Tyson Crouch, Cassidy Lejeune (LDWF)  
(USACE) Not present

Structure Description: Rock Plug

Type of Inspection: Annual

Water Level Inside: \_\_\_\_\_ Outside: \_\_\_\_\_  
Weather Conditions: Clear 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				
Cables	N/A				
Signage / Supports	N/A				
Rip Rap (fill)	Good			6	Settlement on eastern end of the dike.
Earthen Embankment	N/A				

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



### MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-14 Marsh Island Hydrologic Restoration

Date of Inspection: June 19, 2014 Time: 11:15 AM

Structure No. 5

Inspector(s): Darrell Pontiff, Dion Broussard, Mark Mouledous (CPRA)  
Tyson Crouch, Cassidy Lejeune (LDWF)  
(USACE) Not present

Structure Description: Steel Sheet Pile with Rip Rap

Type of Inspection: Annual

Water Level Inside: \_\_\_\_\_ Outside: \_\_\_\_\_  
Weather Conditions: Clear and Warm

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Good			7	
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Cables	N/A				
Signage / Supports	N/A				
Rip Rap (fill)	Good			8,9	There is a small area of broken land/marsh in between closures 5 & 6.
Earthen Embankment	N/A				

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



### MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-14 Marsh Island Hydrologic Restoration

Date of Inspection: June 19, 2014 Time: 11:15 AM

Structure No. 6

Inspector(s): Darrell Pontiff, Dion Broussard, Mark Mouledous (CPRA)  
Tyson Crouch, Cassidy Lejeune (LDWF)  
(USACE) Not present

Structure Description: Rock Plug

Type of Inspection: Annual

Water Level Inside: \_\_\_\_\_ Outside: \_\_\_\_\_  
Weather Conditions: Clear 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				
Cables	N/A				
Signage / Supports	N/A				
Rock Dike	Good			10,11	Water is cutting around southern end of structure.
Earthen Embankment	N/A				

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



# **MAINTENANCE INSPECTION REPORT CHECK SHEET**

Project No. / Name:TV-14 Marsh Island Hydrologic Restoration

Date of Inspection: June 19, 2014 Time: 11:15 AM

Structure No. 7

Inspector(s): Darrell Pontiff, Dion Broussard, Mark Mouledous (CPRA)  
Tyson Crouch, Cassidy Lejeune (LDWF)  
(USACE) Not present

Structure Description: Rock Dike

Type of Inspection: Annual

Water Level Inside:\_\_\_\_\_ Outside: \_\_\_\_\_  
Weather Conditions: Clear 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				
Cables	N/A				
Signage /Supports	N/A				
Rock Dike	Good			12	The site is in good condition.
Earthen Embankment	N/A				

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



### MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-14 Marsh Island Hydrologic Restoration

Date of Inspection: June 19, 2014 Time: 11:00 AM

Structure No. 8

Inspector(s): Darrell Pontiff, Dion Broussard, Mark Mouledous (CPRA)  
Tyson Crouch, Cassidy Lejeune (LDWF)  
(USACE) Not present

Structure Description: Rock Plug

Type of Inspection: Annual

Water Level Inside: \_\_\_\_\_ Outside: \_\_\_\_\_  
Weather Conditions: Clear 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				
Cables	N/A				
Signage / Supports	N/A				
Rock Plug	Good			13,14	Breach on southern end of closure will be repaired in conjunction with TV-21 maintenance event.
Earthen Embankment	N/A				

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





### MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-14 Marsh Island Hydrologic Restoration

Date of Inspection: June 19, 2014 Time: 11:00 AM

Structure No. 9

Inspector(s): Darrell Pontiff, Dion Broussard, Mark Mouledous (CPRA)  
Tyson Crouch, Cassidy Lejeune (LDWF)  
(USACE) Not present

Structure Description: Rock Plug

Type of Inspection: Annual

Water Level Inside: \_\_\_\_\_ Outside: \_\_\_\_\_  
Weather Conditions: Clear 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				
Cables	N/A				
Signage / Supports	N/A				
Rock Dike	Fair			15	Dike is settling in some areas. Breach is closed and shoreline looks good since the TV-21 project.
Earthen Embankment	N/A				

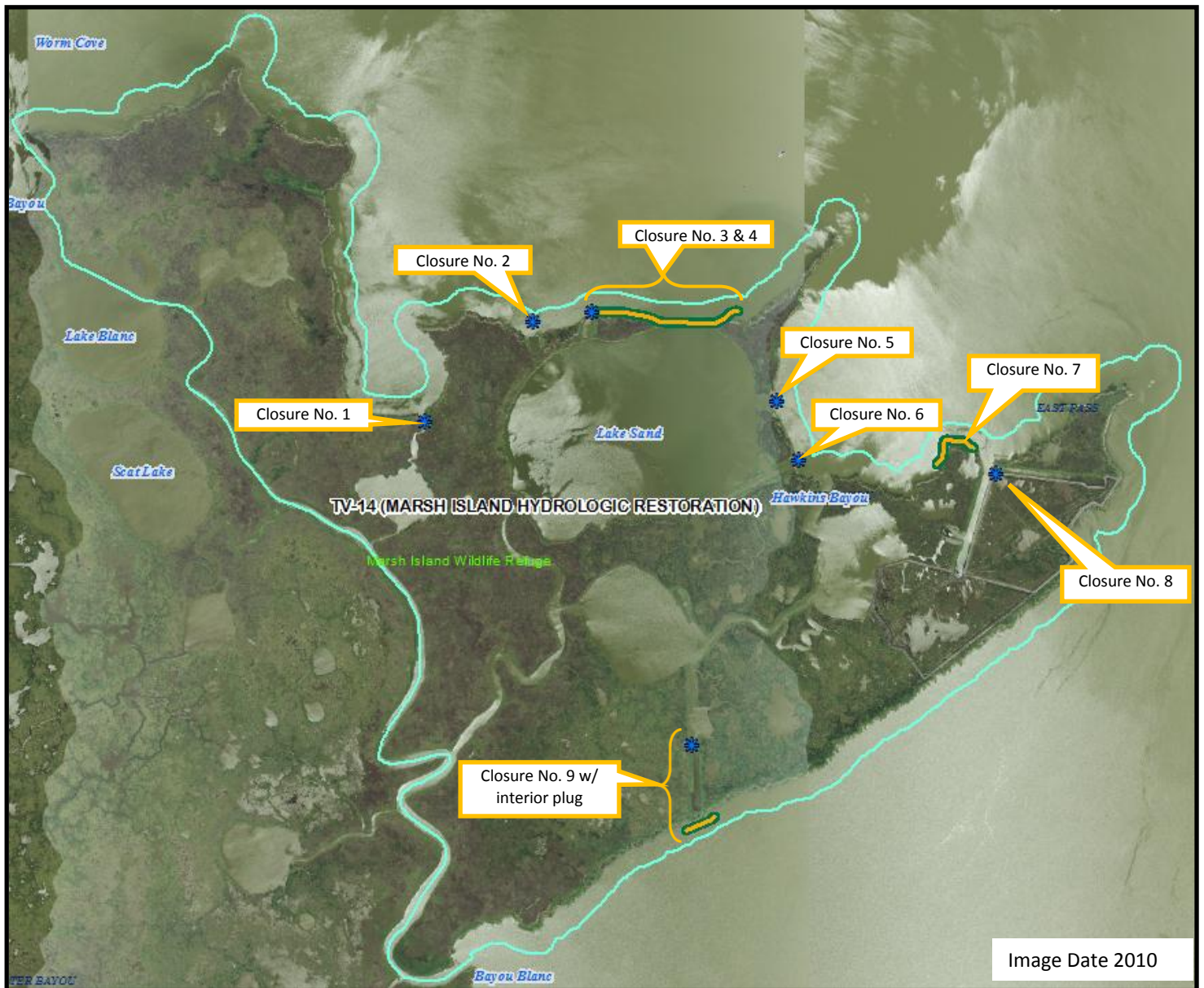
What are the conditions of the existing levees?  
Are there any noticeable breaches?  
Settlement of rock plugs and rock weirs?  
Position of stoplogs at the time of the inspection?  
Are there any signs of vandalism?



## **APPENDIX D**

### **(Constructed Project Features Map)**





## TV-14 Marsh Island Hydrologic Restoration

Project Completion Date December 2001

