



**Coastal Protection and Restoration
Authority of Louisiana**

**Office of Coastal Protection and
Restoration**

**2008/2009 Annual Inspection
Report**

for

**EAST MUD LAKE MARSH
MANAGEMENT PROJECT
(CS-20)**

State Project Number CS-20
Priority Project List 2

October 20, 2008
Cameron Parish

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I. Introduction

The East Mud Lake Marsh Management project area consists of 8,054 acres (3,222 ha) located in the Calcasieu/Sabine Basin in Cameron Parish, Louisiana. The project is bounded by the southern Apache Louisiana Minerals, Inc. Company property line to the south, La. Hwy. 27 to the west, the Sabine National Wildlife Refuge north of Magnolia Road, and an existing step levee and property line near Oyster Bayou to the south. (See Appendix A).

The East Mud Lake Marsh Management Project was authorized by Section 303(a) of Title III Public Law 101-646, the Coastal Wetlands Planning Protection and Restoration Act (CWPPRA) enacted on November 29, 1990 as amended and approved on the third Priority Project List. The Mud Lake Project has a twenty –year (20 year) economic life, which began in April 1996.

II. Inspection Purpose and Procedures

The purpose of the annual inspection of the East Mud Lake Marsh Management Project (CS-20) is to evaluate the constructed project features to identify any deficiencies and prepare a report detailing the condition of project features and recommended corrective actions needed. Should it be determined that corrective actions are needed, OCPR shall provide, in the report, a detailed cost estimate for engineering, design, supervision, inspection, and construction contingencies, and an assessment of the urgency of such repairs (O&M Plan, 2004). 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 Mud Lake Project are outlined in Section IV.

In 2003, the CWPPRA Task Force determined, due to the fact that OCPR was responsible for the operation and maintenance phase of the vast majority of CWPPRA projects, that OCPR would be the responsible party for all Post Storm/Hurricane Assessments. After Hurricane Ike, every project appeared to have been impacted by the storms; therefore, OCPR determined that all projects should be assessed for damages (Broussard, 2006). With concurrence from the federal sponsor, OCPR has decided to use the information obtained during this post hurricane assessment in this Annual Maintenance Inspection.

An inspection of the East Mud Lake Marsh Management Project (CS-20) was held on October 20, 2008 under sunny skies and mild temperatures. In attendance were Stan Aucoin, Darrell Pontiff, Patrick Landry, and Tommy McGinnis from OCPR, Dale Garber representing NRCS, and Scott Rosteet representing Apache Louisiana Minerals, Inc. The annual inspection began at approximately 10:00 a.m. at Structure #6 and ended at Structure #13 at approximately 12:45 p.m.

The field inspection included a complete visual inspection of most of the project features. Conditions of features not inspected on this visit were verified by Mr. Scott Rosteet of Apache Louisiana Minerals, Inc. Staff gauge readings where available were used to determine approximate elevations of water, rock weirs, earthen embankments, steel bulkhead structures and other project 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).

III. Project Description and History

The East Mud Lake Marsh Management Project (CS-20) was completed in April 1996 and involved the installation and maintenance of six variable crest culverts with flap gates, three variable crest culverts with slots, one gated culvert, five culverts with flap gates, one variable crest box structure, two earthen plugs, approximately 5,000 linear feet of shoreline repair on E. Mud Lake, and approximately 40,600 linear feet of levee repair along part of the project area boundary (the step canal). These structures are designed to assist drainage, stabilize salinity and water levels and allow ingress and egress of fisheries species. The principle project features of the East Mud Lake Marsh Management Project include the following:

- ES-6- 2- 36" x 40' corrugated aluminum pipe (10 gauge), with 10' aluminum variable crest weir inlet on the south side. The weir inlet has 2- 4" vertical slots, each with a 3" x 6" x 6' vertical timber stop log. The weir inlet has a total of 52- 3" x 6" x 4'-7" timber stop logs. ES-#6 replaces an existing structure.
- ES-7- 2- 36" x 40' corrugated aluminum pipe (10 gauge), with 10' aluminum variable crest weir inlet on the south side . The weir inlet has 2- 4" vertical slots, each with a 3" x 6" x 6' vertical timber stop log. The weir inlet has a total of 52- 3" x 6" x 4'-7" timber stop logs. ES-#7 replaces an existing structure.
- ES-8- 2 -36" x 40' corrugated aluminum pipe (10 gauge), with 10' aluminum variable crest weir inlet on the south side. The weir inlet has 2- 4" vertical slots, each with a 3" x 6" x 6' vertical timber stop log. The weir inlet has a total of 52- 3" x 6" x 4'-7" timber stop logs. ES-#8 replaces an existing structure.
- ES-9a- 1- 36" x 25' corrugated aluminum pipe (10 gauge), with 10' aluminum variable crest weir inlet on the south side and aluminum flap gate on the north side. The weir inlet has a total of 26- 3" x 6" x 4'-11" timber stop logs. ES-# 9A replaces an existing structure.
- ES-9b- 1- 48" x 30' corrugated aluminum pipe (8 gauge), with aluminum canal gate on the south side and aluminum flap gate on the north side. ES-# 9B replaces an existing structure.
- ES-5- 1 - 36" x 35' corrugated aluminum pipe (10 gauge), with 10' aluminum variable crest weir inlet on the south side. The weir inlet has a total of 26 -3" x 6" x 4'-11" timber stop logs. ES-#5 replaces an existing structure.
- ES-11- 1 -36" x 35' corrugated aluminum pipe (10 gauge), with 10' aluminum variable crest weir inlet on the south side and aluminum flap gate on the north side. The weir inlet has a total of 26- 3" x 6" x 4'-11" timber stop logs. ES-# 11 replaces an existing structure

- ES-4 - 5 - 36" corrugated aluminum pipe with aluminum variable crest weir on the west side and aluminum flap gate on the east side. ES-#4 is an existing structure installed by FINA.
- ES-3- 1 - 36" corrugated aluminum pipe with aluminum variable crest weir on the north side and aluminum flap gate on the south side. ES-#3 is an existing structure installed by FINA.
- ES-1- 1 - 36" x 40' corrugated aluminum pipe (10 gauge), with 10' aluminum variable crest weir inlet on the north side and aluminum flap gate on the south side. The weir inlet has a total of 26- 3" x 6" x 4'-11" timber stop logs. ES-#1 is a new structure.
- ES-17- 1 - 65' sheetpile structure with one (1) 7' wide variable crest weir/boat bay. The weir has a total of 12- 4" x 6" x 6'-11" timber stop logs. ES-#17 is a new structure.
- ES-13- 1 - 160' steel sheetpile bulkhead with two (2) 7' wide variable crest weirs and two (2) 7' aluminum flap gates. The weir inlet has a total of 26- 4" x 6" x 6'-11" timber stop logs. ES-#13 is a new structure.
- ES-14-15- approximately 5,000 linear feet of earthen embankment constructed along the Mud Lake Shoreline.
- ES-16- earthen plug
- ES-19- 1 - 24" x 30' corrugated aluminum pipe (12 gauge), with aluminum flap gate on the west side. ES-#19 replaces an existing structure.
- ES-20- 1 - 24" x 30' corrugated aluminum pipe (12 gauge), with aluminum flap gate on the west side. ES-#19 replaces an existing structure.
- ES-21- 1 - 24" x 30' corrugated aluminum pipe (12 gauge), with aluminum flap gate on the west side. ES-#19 replaces an existing structure.
- ES-22- 1 - 24" x 30' corrugated aluminum pipe (12 gauge), with aluminum flap gate on the west side. ES-#19 replaces an existing structure.
- ES-29- 1 - 24" x 30' corrugated aluminum pipe (12 gauge), with aluminum flap gate on the west side. ES-#19 replaces an existing structure.
- ES-29a- earthen plug

40,600 linear ft. – levee refurbishment along the Step Canal

The Calcasieu Ship Channel is 1 mi (1.6 km) east of the project area and provides an avenue for high salinity water (4–32 ppt) and rapid water movement into the East Mud Lake project area via West Cove, Oyster Bayou, and Mud Bayou. These connections facilitate increases in turbidity and scouring within the project area. The construction of La. Hwy 27 in 1936 reduced the input of freshwater from the west (USDA-SCS 1994). In the 1950's, portions of the project area were impounded by construction of Magnolia Road and a levee system on the north, east, and south (figure 1). Analysis of aerial photos of the project area indicates a marsh loss rate of 76 ac/yr (30.4 ha/yr) from 1953 to 1983 (USDA-SCS 1992). Excluding Mud Lake, the land to open water ratio deteriorated from 99:1 in 1953 to 70:30 by 1983.

Another problem in the project area is flooding of the marsh for prolonged time periods. Construction of La. Hwy. 27 to the west and La. Hwy. 82 to the south have decreased avenues for drainage from the western and southern areas of the project. This has lead to prolonged periods of high water levels and "ponding," which has resulted in the deterioration of the

vegetation (USDA-SCS 1994). Subsidence and sea level rise have also exacerbated the problem, resulting in a relative water level increase of 0.25 in/yr (0.64 cm/yr) from 1942 to 1988 (Penland et al. 1989). The East Mud Lake project addresses these problems by increasing the total number of drainage outlets for the area.

The project area has been divided into two hydrologically separate Conservation Treatment Units (CTUs) that are managed independently (figure 1). CTU 1 contains Mud Lake and is managed passively. Structures and features in CTU 1 consist of vegetative plantings, earthen plugs, culverts with flap gates and variable-crest culverts. The variable-crest culverts at stations 6, 7, and 8 are set at 6 in (15 cm) below marsh level with vertical slots open except when salinities exceed 15 ppt. The variable-crest culvert at station 13 is set at 6 in (15 cm) below marsh level (BML) with flap gates locked open except when salinities exceed 7 ppt.

CTU 2 is actively managed and has drawdown capabilities in order to encourage shallow water areas to revert to emergent vegetation. Two drawdown events were planned for the first five years of the project. Structures and features present in CTU 2 consist of vegetative plantings, variable crest culverts with flap gates, a gated culvert, and a variable-crest box structure (figure 1). Phase I emphasizes curtailing marsh erosion and reclaiming emergent marsh by implementing a partial drawdown from February 15-July 15. All flap gates at variable-crest culverts 1, 3, 4, 5, 9a, and 11 are allowed to operate with all stop logs removed. Stoplogs are set at 12 in (30.48 cm) above marsh level (AML) on the variable crest box structure at station 17. The screw gate at station 9 is opened and the flap gate allowed to operate.

Phase II, the maintenance phase, emphasizes stabilization of salinity and water levels while ensuring ingress and egress of fisheries species. During this phase of operation, flap gates at stations 3, 4, 5, 9a, 9b, and 11 are locked open. Stoplogs are set at 6 in (15 cm) below marsh level at stations 1, 3, 4, 9a, and 11 while at station 5, one bay is set at 6 in (15 cm) BML and one bay at 12 in (30.48 cm) BML. The screw gate at station 9b is opened and all stop logs removed from station 17. To protect marsh vegetation during periods of high salinity, the ingress gates are closed when salinity inside the project area exceeds 15 ppt at stations 3 or 5.

Vegetation plantings were installed through a cooperative effort by the Louisiana Department of Natural Resources (LDNR), Soil and Water Conservation District, and Natural Resource Conservation Service (NRCS) from June 5 through July 8, 1995. A total of 7,200 *Spartina alterniflora* (smooth cord grass) trade gallons were planted along the step levee in CTU 2 (figure 2). The cut bank configuration of most of the Mud Lake shoreline limited plantings to 480 plants in areas adjacent to structures 17, 13, and the earthen plug west of structure 17 in CTU 1.

Construction was completed May 1, 1996. The project objectives are to prevent wetland degradation by reducing vegetative stress, thereby improving the abundance of emergent and submergent vegetation and to stabilize the shoreline of Mud Lake through vegetative plantings. Specific goals are to (1) decrease the rate of marsh loss, (2) increase vegetative cover along the shoreline of East Mud Lake, (3) increase percent cover of emergent vegetation in shallow open-water areas, (4) increase abundance of vegetation in presently

vegetated portions of the project area, (5) reduce water-level fluctuations to within 6 in (15 cm) BML to 2 in (5.08 cm) AML and salinity levels to 15 ppt or less, (6) decrease the duration and frequency of flooding over emergent marsh, (7) decrease the mean salinity in CTU 2, and (8) increase vertical accretion in CTU 2. Maintaining fisheries abundance is not a specific goal as addressed in the project documentation. However, because of concerns regarding potential fishery impacts, it has been included in the monitoring plan.

The area east of CTU 2, south of Oyster Bayou and Mud Bayou (reference area 1), was selected as the best reference area for the evaluation of the water level, salinity, and fisheries monitoring elements. The area north of Magnolia Road (reference area 2) is a suitable reference area for the evaluation of the vegetative, accretion, water-level, salinity, fisheries, and soil monitoring elements. The project area and both reference areas are classified as brackish marsh (Chabreck and Linscombe 1988) and contain mainly organic Bancker and Creole soils with ridges of Mermentau soils (USDA-NRCS 1995). All are directly influenced hydrologically by the CSC and are dominated by *Spartina patens* (marsh hay cord grass).

IV. Summary of Past Operation and Maintenance Projects

General Maintenance: Below is a summary of completed maintenance projects and operation tasks performed since April 1996, the construction completion date of the East Mud Lake Marsh Management Project (CS-20).

December-1999 LDNR: This maintenance project included the installation of approximately 600 tons of stone riprap around Structure #4, aluminum fabrication and installation of flap gate lifting devices and a stop log channel repair at Structure #4, approximately 950 linear feet of earthen levee repair, and placement of approximately 100 tons of stone riprap at Structures 6, 7, 8, 9a & 9b. Construction was completed in December 1999. The costs associated with the engineering, design and construction of the East Mud Lake Maintenance Project are as follows:

Construction:	\$113,848.21
Engineering & Design:	\$ In house
Construction Oversight/As built surveys:	<u>\$ 11,902.28</u>

TOTAL CONSTRUCTION COST: \$125,750.49

(Does not include costs associated with in-house design.)

Structure Operations: In accordance with the operation schedule outlined in the Operation and Maintenance Plan, structures were manipulated as required by Apache personnel. A contract between LDNR and Apache Louisiana Minerals, Inc. for operation of the structures has been executed effective April 2007.

V. Inspection Results

ES-6 – 2-36" culverts with stop logs, and a 4" fish slot

The overall condition of Structure No. 6 appears to be very good and does not appear to have suffered any damage from Hurricane Ike. Water level gauges weren't available near the structure. Water was flowing out of the project at the time of the inspection. The timber piles, stop logs, grating, etc. are in good condition, however the metal pile caps are rusting out. Rock placed around the outlet side of the structure has held up well and stabilized the shoreline. Erosion is occurring on the bank line adjacent to the inlet side of the structure. The ends of the outlet pipes are clogged with marsh and other debris. The padlocks on the stop log locking devices have rusted and cannot be operated. As a result of the inspection of Structure No. 6, OCPR and NRCS agree that approximately 114 tons of stone needs to be added on the cut bank lines adjacent to the access roadway, replace padlocks, replace lock pins, replace metal pile caps, and clean out ends of both outfall pipes of marsh debris. (Photos: Appendix B, Photo 1).

ES-7 – 2-36" culverts with stop logs, and a 4" fish slot

Structure No. 7 appears to be in very good condition and does not appear to have suffered any damage from Hurricane Ike. Water level gage on the outside was slightly above +2.0 NAVD88. (Note: these staff gages were recently replaced through the CRMS program). Both ends of this structure are clogged with marsh debris and have silted up. Erosion is occurring on the bank line adjacent to the inlet side of the structure. The padlocks on the stop log locking devices have rusted and cannot be operated. As a result of the inspection of Structure No. 7, OCPR and NRCS agree that approximately 66 tons of stone needs to be added on the cut bank lines adjacent to the access roadway, replace padlocks, replace lock pins, replace metal pile caps, check elevation of staff gages on inlet and outlet side of the structure, and clean out ends of both outfall pipes of marsh debris. (Photos: Appendix B, Photo 2).

ES-8 – 2-36" culverts with stop logs, and a 4" fish slot

Structure No. 8 appears to be in very good condition and does not appear to have suffered any damage from Hurricane Ike. Water level gauges were unavailable. Both ends of this structure are clogged with marsh debris and have silted up. It appears very little flow is going through the pipes due to washover of the access road rock material into the water. Erosion is occurring on the bank line adjacent to the inlet side of the structure. The padlocks on the stop log locking devices have rusted and cannot be operated. OCPR and NRCS agree that this structure requires clean out of the ends of outlet pipes, placement of approximately 66 tons of rock along cut bank lines adjacent to the structure, replace padlocks, replace lock pins, and replace metal pile caps. (Photos: Appendix B, Photo 3).

ES-9a – 1- 36" culvert w/ stop logs & flap gate

Structure No. 9a is in good condition and does not appear to have suffered any damage from Hurricane Ike. The staff gage on the outside was +2.0 NAVD88. (Note: these staff gages were recently replaced through the CRMS program). Both ends of this structure are clogged with marsh debris and have silted up. The handle on the outlet pipe flapgate has been broken off. The metal pile caps on the pilings have rusted out. The padlocks on the stop log locking devices have rusted and cannot be operated. OCPR and NRCS agree that this structure requires replacement of the metal pile caps, clean out of the ends of outlet pipes, check elevation of staff gages inside and out, replace padlocks, replace lock pins and repair of the flapgate handle. (Photos: Appendix B, Photo 4).

ES-9b – 1- 48" culvert w/ sluice gate and flap gate

Structure No. 9b is in good condition and does not appear to have suffered any damage from Hurricane Ike. Both ends of this structure are clogged with marsh debris and have silted up. The staff gage on the outside was +2.0 NAVD88. (Note: these staff gages were recently replaced through the CRMS program). Water was flowing into the project area. The handle on the outlet pipe flapgate has been broken off. The gear box on the sluice gate is showing signs of rust and the stem cover is missing. Apache personnel have reported that it, so far, is not a problem; however it will probably need to be addressed. Metal pile cap covers have rusted out. The seat flange on the flap gate is broken and has come apart from the pipe barrel. OCPR and NRCS agree that this structure is in operable condition and maintenance will be required to refurbish the gear box and replace stem cover, replace seat flange on flap gate, clean out of the ends of outlet pipes, replace padlocks, replace metal pile caps and repair flapgate handle. (Photos: Appendix B, Photo 4).

ES-11 – 1- 36" culvert w/ stop logs & flap gate

The structure is in good condition and does not appear to have suffered any damage from Hurricane Ike. Water level on the outside staff gage was +1.9 NAVD88 and the gage on the inside was +1.9 NAVD88. (Note: these staff gages were recently replaced through the CRMS program). There is some erosion of the bank on both the inlet and discharge sides of the structure. Approximately 228 tons of man size rip rap will be required to reinforce the bank around the structure. The bank line near the outlet flap gate has eroded and the boardwalk is not accessible. The metal pile cap covers have rusted out. The padlocks on the stop log locking devices have rusted and cannot be operated. OCPR and NRCS agree that maintenance work is required to add rip rap on both sides of the structure, extend wooden boardwalk, replace metal pile caps, replace padlocks, replaced lock pins and check elevations of replace staff gages inside and out. (Photos: Appendix B, Photo 5).

ES-5 – 1- 36" culvert w/ stop logs & flap gate

The structure itself is in good condition and does not appear to have suffered any damage from Hurricane Ike. Erosion was noted along the bank on both the inlet and discharge sides of the structure. Approximately 342 tons of rock will be needed to reinforce the bank around this

structure. The boardwalk at the outlet pipe flap gate is missing. The metal pile cap covers have rusted out. The padlocks on the stop log locking devices have rusted and cannot be operated. OCPR and NRCS agree that maintenance work is required to add rip rap, replace metal pile caps, replace padlocks, replace lock pins, replace wooden boardwalk, and check elevation of staff gages inside and out. (Photos: Appendix B, Photo 6).

ES-4 – 5- 48" culverts w/ stop logs & flap gates

This structure is a pre-existing structure that was incorporated into the CS-20 Project. It is in disrepair and needs to be replaced. A new structure was let out for bids on February 10, 2005, however it was over budget and the bid was rejected. This structure will be replaced with a structure similar to ES-13, and the existing structure will be abandoned in place. Staff gauge readings were not available. (Photos: Appendix B, Photo 8).

ES-3 – 1- 36" culvert w/ stop logs & flap gates

This is also a pre-existing structure that was incorporated into the CS-20 Project. The wooden walkways on the outside and the inside of the structure are missing. The structure is silted up with marsh debris. The bank, however, is showing signs of some erosion and will require approximately 209 tons of man-size rip rap for reinforcement. Additional erosion has occurred due to Hurricane Ike. Water level on the outside staff gage was +1.9 NAVD88 and the gage on the inside was +2.05 NAVD88. (Note: these staff gages were recently replaced through the CRMS program). Water was flowing out to the exterior marsh. The padlocks on the stop log locking devices have rusted and cannot be operated. OCPR and NRCS agree that maintenance work is required to add rip rap, clean out debris, replace both walkways, replace padlocks, replace lock pins and check elevation of staff gages inside and out. (Photos: Appendix B, Photo 9).

ES-1 – 1- 36" culvert w/ stop logs & flap gates

Vandals have stolen all of the grating on the inlet side of the structure. The structure is silted up with marsh debris. The bank, however, is showing signs of some erosion and will require approximately 470 tons of man-size rip rap for reinforcement. Water level on the gage on the inside was +1.9 NAVD88. (Note: these staff gages were recently replaced through the CRMS program). Water was flowing out to the exterior marsh. The padlocks on the stop log locking devices have rusted and cannot be operated. The metal pile cap covers have rusted out. The wooden boardwalk needs to be extended. OCPR and NRCS agree that maintenance work is required to add rip rap, clean out debris, extend the boardwalk, replace metal pile caps, replace grating, replace lock pins, replace padlocks, and check elevation of staff gages inside and out. (Photo: Appendix B, Photo 10).

ES-17 – variable crest weir w/ boat bay

The sheet pile cap is severely rusted out on both sides of the structure. The locking tabs on the landing side of the stop log slots are missing. The warning sign is missing. The padlocks on the stop log locking devices have rusted and cannot be operated. The metal pile cap covers

are rusted out. Water level on the outside staff gage was +1.0 NAVD88 and the gage on the lake side was +1.0 NAVD88. (Note: these staff gages were recently replaced through the CRMS program). Erosion is also occurring on each end of the sheet pile wall. OCPR and NRCS agree that maintenance work is required to replace sign and pile cap on sheet pile wall, check elevation of staff gages, replace metal pile cap covers, replace padlocks, and replace locking tabs, however due to budget constraints will not be undertaken with the proposed maintenance event of 2009. Consideration is also being given to replacing the entire sheet pile wall in the future. (Photos: Appendix B, Photo 11).

ES-13 – sheet pile bulkhead w/ 2 variable crested weirs & flap gates

The warning sign is missing. Staff gages outside and inside were not readable. The structure is silted up with marsh debris. The padlocks on the stop log locking devices have rusted and cannot be operated. The metal pile cap covers have rusted out. The sheet pile cap on top of the sheet pile wall is severely rusted. Water was flowing into the interior marsh at the time of the inspection. OCPR and NRCS agree that maintenance is required to replace the warning sign, replace the metal pile cap covers, replace staff gages inside and out, clean out marsh debris, replace padlocks, replace locking pins, and replace sheet pile cap on both sides of structure. (Photos: Appendix B, Photo 12).

ES-19, 20, 21, 22, & 29 – 24” culverts w/ flap gates

These structures were not directly inspected on this inspection as agreed jointly by OCPR and NRCS personnel. According to Mr. Rosteet, they are in working order and functioning as designed. OCPR and NRCS agree that no maintenance is required at this time.

ES-29a – earthen plug

Due to logistics, this plug also was not directly inspected on this trip. According to Mr. Rosteet, it is stable and functioning as designed. OCPR and NRCS agree that no maintenance is required at this time.

ES-14 - 15 – 5,000 linear feet of earthen embankment on E. Mud Lake

See ES-29a comments.

40,600 linear feet of Levee Refurbishment along the Step Canal

The inspection of the earthen levee consisted of a visual inspection of the entire length of levee along the Step Canal. In addition to the erosion noted above, the storm surge has eroded portions of the levee in various locations. In addition the storm surge has placed large amounts of marsh and other debris into the east-west sections of the Step Canal. In these areas of the canal, the water depth was very shallow. The north-south sections appear to be relatively free of any obstructions. OCPR and NRCS agree that maintenance is required to repair the levees and remove trash from the canal. (Photos: Appendix B, Photo 7).

VI. Conclusions and Recommendations

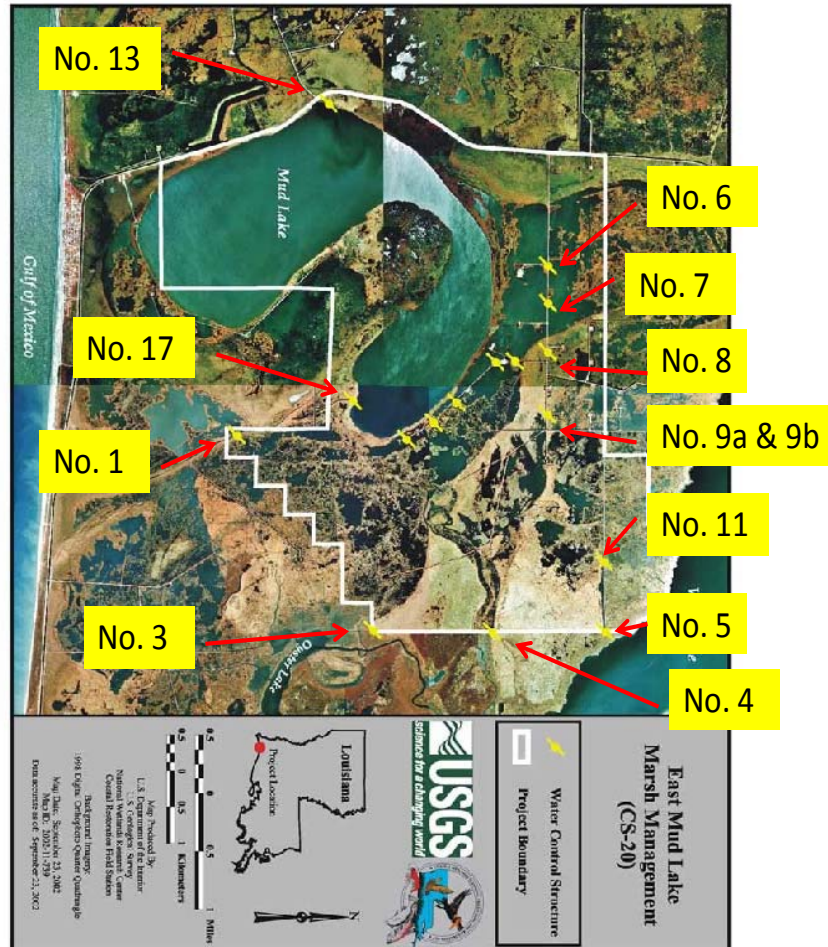
Overall, the East Mud Lake Marsh Management Project is in fair condition and functioning as designed however maintenance repairs are needed as listed below. This project was primarily damaged from Hurricane Rita, but did sustain some additional erosion due to Hurricane Ike. Plans and specifications are being prepared for replacement of structure ES-4 and to address maintenance of the other structures in Fiscal 2009/2010.

- ES-6 – rock rip rap for bank erosion, replace padlocks and metal pile caps, clean out culverts.
- ES-7 – rock rip rap for bank erosion, replace padlocks and metal pile caps, check elevation of staff gages, replace missing inside staff gage, clean out culverts.
- ES-8 – rock rip rap for bank erosion, replace padlocks and metal pile caps.
- ES-9a – replace metal pile caps, clean out culvert, check elevation of staff gages, replace missing inside staff gage, replace padlocks and repair flapgate handle.
- ES-9b – refurbish gear box and replace stem cover, replace seat flange on flapgate, clean out culvert, replace padlocks and metal pile cap covers, repair flapgate handle.
- ES-11 – rock rip rap for bank erosion, extend boardwalk, replace metal pile cap covers and padlocks, check elevation of staff gages.
- ES-5 – rock rip rap for bank erosion, replace metal pile cap covers, replace padlocks, replace boardwalk, and inside and outside staff gages.
- ES-4 – replace structure, abandon existing structure in place.
- ES-3 – rock rip rap for bank erosion, clean out culvert, replace boardwalks, replace padlocks and check elevation of staff gages.
- ES-1 – rock rip rap for bank erosion, extend boardwalk, replace metal pile cap covers and padlocks, check elevation of staff gages, replace outside staff gage.
- ES-13 – replace warning sign, replace metal pile cap covers, replace staff gages, clean out debris, replace padlocks, replace metal pile cap on sheet pile wall.
- Levee/Step canal – repair levees and remove trash/debris and silt from canal.

Appendix A

Project Features Map

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20



Appendix B

Photographs



Photo No.1 Structure No. 6



Photo No. 2 Structure No. 7



Photo No. 3, Structure No. 8



Photo No. 4, Structure No. 9a & 9b

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Photo No. 5, Structure No. 11



Photo No. 6, Structure No. 5



Photo No. 7, Typical levee erosion on eastern levee along Step Canal



Photo No. 8, Structure No. 4



Photo No. 9, Structure No. 3, view showing additional erosion



Photo No. 10, Structure No.1



Photo No. 11, Structure No. 17



Photo No. 12, Structure No. 13

Appendix C

Three Year Budget Projection

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

E. MUD LAKE/ CS-20 / PPL 2
Three-Year Operations & Maintenance Budgets 07/01/2009 - 06/30/2012

<u>Project Manager</u>	<u>O & M Manager</u>	<u>Federal Sponsor</u>	<u>Prepared By</u>
Pat Landry	Pat Landry	NRCS	Pat Landry

	2009/2010	2010/2011	2011/2012
Maintenance Inspection	\$ 5,737.00	\$ 5,909.00	\$ 6,086.00
Structure Operation	\$ 6,500.00	\$ 6,500.00	\$ 6,500.00
Administration	\$ 30,000.00		\$ -

Maintenance/Rehabilitation

09/10 Description: Replace Structure No.4 and perform maintenance on 10 other structures.

Note: The construction cost includes \$263,120 for Additive Alternate Bid for Structures No. 6, 7, 8, 9A, 9B, & 13.

E&D	\$ 47,457.00
Construction	\$ 1,537,902.00
Construction Oversight	\$ 121,890.00
Sub Total - Maint. And Rehab.	\$ 1,707,249.00

10/11 Description:

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

11/12 Description:

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

	2009/2010	2010/2011	2011/2012
Total O&M Budgets	\$ 1,749,486.00	\$ 12,409.00	\$ 12,586.00

O & M Budget (3 yr Total)	\$ 1,774,481.00
Unexpended O & M Budget	\$ 1,438,004.00
Remaining O & M Budget (Projected)	\$ (336,477.00)

Note: FEMA has approved reimbursement of \$147,666.00 for Hurricane RITA damages.

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

OPERATION AND MAINTENANCE BUDGET WORKSHEET

E. MUD LAKE / PROJECT NO. CS-20 / PPL NO. 2

DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	ESTIMATED TOTAL
O&M Inspection and Report	EACH	1	\$5,737.00	\$5,737.00
General Structure Maintenance	LUMP	1	\$0.00	\$0.00
Engineering and Design	LUMP	1	\$47,457.00	\$47,457.00
Operations Contract	LUMP	1	\$6,500.00	\$6,500.00
Construction Oversight	LUMP	1	\$121,890.00	\$121,890.00

ADMINISTRATION

OCPR / CRD Admin.	LUMP	1	\$25,000.00	\$25,000.00
FEDERAL SPONSOR Admin.	LUMP	1	\$5,000.00	\$5,000.00
SURVEY Admin.	LUMP	0	\$0.00	\$0.00
OTHER				\$0.00
TOTAL ADMINISTRATION COSTS:				\$30,000.00

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:	Maintenance work on structures, replace Structure No. 4, repair Hurricane RITA damages, clean out Step Canal.				
	Rip Rap	LIN FT	TON / FT	TONS	UNIT PRICE
	Rock Armor at 1, 3, 5, 11	0	0.0	1,207	\$150.00
	Rock Armor at 6, 7, 8	0	0.0	288	\$71.00
		0	0.0	0	\$0.00
	Filter Cloth / Geogrid Fabric	SQ YD	0		\$0.00
	Navigation Aid	EACH	0		\$0.00
	Signage	EACH	0		\$0.00
	General Excavation / Fill	CU YD	0		\$0.00
	Dredging	CU YD	0		\$0.00
	Sheet Piles (Lin Ft or Sq Yds)		0		\$0.00
	Timber Piles (each or lump sum)		0		\$0.00
	Timber Members (each or lump sum)		0		\$0.00
	Hardware	LUMP	1		\$0.00
	Materials	LUMP	1		\$0.00
	Mob / Demob	LUMP	1		\$110,000.00
	Contingency	LUMP	1		\$159,834.00
	General Structure Maintenance	LUMP	1		\$226,000.00
	Replace Structure No. 4	LUMP	1		\$734,570.00
	Levee Repair	CU YD	13,250		\$8.00
	Clean Wrack & Debris	LUMP	0		\$0.00
TOTAL CONSTRUCTION COSTS:					\$1,537,902.00

TOTAL OPERATIONS AND MAINTENANCE BUDGET:

\$1,749,486.00

Appendix D

Field Inspection Form

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: CS-20 E. Mud Lake

Date of Inspection: October 20, 2008 Time: 12:10pm

Structure No. 1

Inspector(s): Stan Aucoin, Pat Landry, Darrell Pontiff, Tommy McGinnis (OCPR)
Scott Rosteet (ALMI), Dale Garber (NRCS)

Structure Description: Culvert w/stop logs and Flap

Water Level Inside: +1.9 Outside:
Weather Conditions: Sunny and mild

Type of Inspection: Annual

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	Fair			10	Replace all sections of grating that are missing.
Stop Logs	Good				
Hardware	Poor		Yes	10	Corrosion on padlocks, need to be replaced.
Timber Piles	Good				
Timber Walkway	Poor				Need to extend walkway.
Timber Wales	Good				
Galv. Pile Caps	Poor		Yes	10	Need to be replaced.
Cables	Good				
Signage / Supports	Good				
Staff Gages	Good				Need to check elevation of staff gage inside and replace outside gage.
Rip Rap (fill)	N/A				
Earthen Embankment	Poor			10	Rock armor needed both sides of structure.

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?

Yes

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: CS-20 E. Mud Lake

Date of Inspection: October 20, 2008 Time: 11:45 am

Structure No. 3:

Inspector(s): Stan Aucoin, Pat Landry, Darrell Pontiff, Tommy McGinnis (OCPR)
Scott Rosteet (ALMI), Dale Garber (NRCS)

Structure Description: Culvert w/stoplogs and Flapgate

Water Level Inside: +2.00 Outside: +1.9

Type of Inspection: Annual

Weather Conditions: Sunny and mild

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	Good				
Stop Logs	Good				
Hardware	Poor		Yes	9	Corrosion on padlocks, need to be replaced.
Timber Piles/ Walkway	Poor				Walkways on the inside and outside of the structure are missing.
Timber Wales	Good				
Galv. Pile Caps	Poor		Yes	9	Need to be replaced.
Cables	Good				
Signage / Supports	Fair				
Staff Gages	Good				Check elevation of staff gage on inside and outside of the structure.
Rip Rap (fill)	N/A				
Earthen Embankment	Fair	Yes		9	Rock armor needed both sides of structure
Channel	Poor			9	Inlet side of the structure is silted up with marsh debris.

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?

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: CS-20 E. Mud Lake

Date of Inspection: October 20, 2008 Time: 11:35 am

Structure No. 4:

Inspector(s): Stan Aucoin, Pat Landry, Darrell Pontiff, Tommy McGinnis (OCPR)
Scott Rosteet (ALMI), Dale Garber (NRCS)

Structure Description: Culverts w/stoplogs and Flapgate

Water Level Inside: Outside:
Weather Conditions: Sunny and mild

Type of Inspection: Annual

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A			8	GENERAL NOTE: Due to severe settlement of the overall structure, it is beyond repair and needs to be abandoned in place, and a new structure built along side.
Steel Grating	Poor				
Stop Logs	Fair				
Hardware	Fair				
Timber Piles	Poor				
Timber Wales	Poor				
Galv. Pile Caps	Good				
Cables	N/A				
Signage / Supports	Good				
Rip Rap (fill)	Fair				
Earthen Embankment	Fair	Yes			

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?

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: CS-20 E. Mud Lake

Date of Inspection: October 20, 2008 Time: 11:20 am

Structure No. 5

Inspector(s): Stan Aucoin, Pat Landry, Darrell Pontiff, Tommy McGinnis (OCPR)
Scott Rosteet (ALMI), Dale Garber (NRCS)

Structure Description: Culvert w/stoplog and Flapgate

Water Level Inside: Outside:
Weather Conditions: Sunny and mild

Type of Inspection: Annual

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	Good				
Stop Logs	Good				
Hardware	Poor		Yes	6	Corrosion on padlocks, need to be replaced.
Timber Piles	Good				
Timber Walkway	Poor				Replace missing boardwalk.
Timber Wales	Good				
Galv. Pile Caps	Poor		Yes	6	Need to be replaced.
Cables	Good				
Signage / Supports	Good				
Staff Gages	Poor				Replace staff gages.
Rip Rap (fill)	N/A				
Earthen Embankment	Fair	Yes			Rock armor needed on both sides of structure.

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?

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: CS-20 E. Mud Lake

Date of Inspection: October 20, 2008 Time: 10:00 am

Structure No. 6

Inspector(s): Stan Aucoin, Pat Landry, Darrell Pontiff, Tommy McGinnis (OCPR)
Scott Rosteet (ALMI), Dale Garber (NRCS)

Structure Description: Culvert w/stoplog and Flapgate

Water Level Inside: Outside:
Weather Conditions: Sunny and mild

Type of Inspection: Annual

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	Good				
Stop Logs	Good				
Hardware	Poor		Yes	1	Corrosion on padlocks, need to be replaced.
Timber Piles	Good				
Timber Wales	Good				
Galv. Pile Caps	Poor		Yes	1	Need to be replaced.
Cables	Good				
Signage / Supports	Fair				General Note: There are no staff gages at this structure.
Outlet Pipes	Fair				The ends of both outlet pipes are clogged with marsh debris.
Earthen Embankment	Fair			1	Rock armor needed on bank line adjacent to inlet structure.

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?

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: CS-20 E. Mud Lake

Date of Inspection: October 20, 2008 Time: 10:15 am

Structure No. 7

Inspector(s): Stan Aucoin, Pat Landry, Darrell Pontiff, Tommy McGinnis (OCPR)
Scott Rosteet (ALMI), Dale Garber (NRCS)

Structure Description: Culvert w/stoplog and Flapgate

Water Level Inside: Outside: +2.0

Type of Inspection: Annual

Weather Conditions: Sunny and mild

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	Good				
Stop Logs	Good				
Hardware	Poor		Yes	2	Corrosion on padlocks, need to be replaced.
Timber Piles	Good				
Timber Wales	Good				
Galv. Pile Caps	Poor		Yes	2	Need to be replaced.
Cables	Good				
Signage / Supports	Good				
Staff Gages	Fair				Need to check elevation of staff gage outside and replace staff gage inside.
Inlet/Outlet Pipe	Fair				Inlet and outlet pipes are clogged with marsh debris.
Earthen Embankment	Fair			2	Rock armor needed on bank line adjacent to inlet structure.

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?

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: CS-20 E. Mud Lake

Date of Inspection: October 20, 2008 Time: 10:25 am

Structure No. 8

Inspector(s): Stan Aucoin, Pat Landry, Darrell Pontiff, Tommy McGinnis (OCPR)
Scott Rosteet (ALMI), Dale Garber (NRCS)

Structure Description: Culvert w/stoplog and Flapgate

Water Level Inside: Outside:
Weather Conditions: Sunny and mild

Type of Inspection: Annual

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	Good				
Stop Logs	Good				
Hardware	Poor		Yes	3	Corrosion on padlocks, need to be replaced.
Timber Piles	Good				
Timber Wales	Good				
Galv. Pile Caps	Poor		Yes	3	Need to be replaced.
Cables	Good				
Signage / Supports / Staff Gages	Good				Note: There are no staff gages inside and outside of this structure.
Inlet/Outlet Pipe	Fair				
Earthen Embankment	Fair			3	Rock armor needed along bank line adjacent to inlet structure.

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?

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: CS-20 E. Mud Lake

Date of Inspection: October 20, 2008 Time: 10:35 am

Structure No. 9A & 9B

Inspector(s): Stan Aucoin, Pat Landry, Darrell Pontiff, Tommy McGinnis (OCPR)
Scott Rosteet (ALMI), Dale Garber (NRCS)

Structure Description: Culvert w/stoplog and Flap, Sluice Gate with Flap

Water Level Inside: Outside: +2.0
Weather Conditions: Sunny and mild

Type of Inspection: Annual

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	Good				
Stop Logs	Good				
Hardware Sluice Gate	Fair Poor		Yes Yes	4	Corrosion on padlocks, handles on outlet pipe flap gates are broken. Gear box corroded and needs to be refurbished, stem cover missing, needs to be replaced.
Timber Piles	Good				
Timber Wales	Good				
Galv. Pile Caps	Poor		Yes	4	Need to be replaced.
Cables	Good				
Signage / Supports	Good				
Staff Gages	Good				Check elevation of staff gage outside and replace inside gage.
Rip Rap (fill)	Good				
Earthen Embankment	Good				

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?

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: CS-20 E. Mud Lake

Date of Inspection: October 20, 2008 Time: 11:10 am

Structure No. 11

Inspector(s): Stan Aucoin, Pat Landry, Darrell Pontiff, Tommy McGinnis (OCPR)
Scott Rosteet (ALMI), Dale Garber (NRCS)

Structure Description: Culvert w/stoplog and Flapgate

Water Level Inside: +1.9 Outside: +1.9

Type of Inspection: Annual

Weather Conditions: Sunny and mild

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	Good				
Stop Logs	Good				
Hardware	Poor		Yes		Corrosion on padlocks, need to be replaced.
Timber Piles	Good				
Timber Walkway	Poor				Wooden boardwalk needs to be extended.
Timber Wales	Good				
Galv. Pile Caps	Good				
Cables	Good				
Signage / Supports	Fair				
Staff Gages	Good				Check elevation of staff gages inside and out.
Rip Rap (fill)	N/A				
Earthen Embankment	Fair	Yes		5	Rock armor needed on both sides of the structure.

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?

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: CS-20 E. Mud Lake

Date of Inspection: October 20, 2008 Time: 12:45 pm

Structure No. 13

Inspector(s): Stan Aucoin, Pat Landry, Darrell Pontiff, Tommy McGinnis (OCPR)
Scott Rosteet (ALMI), Dale Garber (NRCS)

Structure Description: VCW with Flap

Water Level Inside: Outside:
Weather Conditions: Sunny and Mild

Type of Inspection: Annual

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Poor		Yes	12	Some rusting of pile cap is present, needs to be replaced.
Steel Grating	Good				
Stop Logs	Good				
Hardware	Poor		Yes		Padlocks corroded, need to be replaced.
Timber Piles	Good				
Timber Wales	Good				
Galv. Pile Caps	Poor				Need to be replaced.
Cables					
Signage / Supports	Poor			12	Warning sign is missing, needs to be replaced.
Staff Gage	Poor			12	Staff gages need to be replaced inside and out.
Rip Rap (fill)	N/A				
Earthen Embankment	Good				

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?

Annual Inspection Report
EAST MUD LAKE MARSH MANAGEMENT
State Project No. CS-20

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: CS-20 E. Mud Lake

Date of Inspection: October 20, 2008 Time: 12:20 pm

Structure No. 17

Inspector(s): Stan Aucoin, Pat Landry, Darrell Pontiff, Tommy McGinnis (OCPR)
Scott Rosteet (ALMI), Dale Garber (NRCS)

Structure Description: VCW with Boat Bay

Water Level Inside: Outside:

Type of Inspection: Annual

Weather Conditions: Sunny and mild

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Poor		Yes	11	Steel sheet pile and cap show signs of corrosion. Pile cap needs to be replaced.
Steel Grating	Good				
Stop Logs	Fair			11	The locking tabs on the stop log slots are missing.
Hardware	Poor		Yes	11	Padlocks corroded and need to be replaced.
Timber Piles	Good				
Timber Wales	Good				
Galv. Pile Caps	Poor			11	Need to be replaced.
Cables	Good				
Signage / Supports	Poor			11	Warning sign is missing.
Staff Gages	Good			11	Check elevation of staff gages.
Rip Rap (fill)	N/A				
Earthen Embankment	Good				

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 E

Locations to be Monitored