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Department of Natural Resources
Coastal Restoration Division and
Coastal Engineering Division

2005 Operations, Maintenance, and Monitoring Report

for

BRADY CANAL HYDROLOGIC RESTORATION

State Project Number TE-28
Priority Project List 3

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Terrebonne Parish

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2005 Operations, Maintenance, and Monitoring Report
for
Brady Canal Hydrologic Restoration (TE-28)

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I. Introduction

The Brady Canal Hydrologic Restoration Project consists of 7,653-ac (3,097-ha) located in the Terrebonne Basin, within the Bayou Penchant-Lake Penchant watershed. The project is bounded by Bayou Penchant, Brady Canal, and Little Carencro Bayou to the north, Bayou de Cade and Turtle Bayou to the south, Superior Canal to the east, and Little Carencro Bayou and Voss Canal to the west (Figure 1).

The project area is bisected by the Mauvais Bois Ridge, which results in different hydrologic regimes to the north and south of the ridge. The northern section of the project area still receives freshwater and sediments provided through overbank flow from Bayou Penchant, Little Carencro Bayou, and Brady Canal. The Mauvais Bois Ridge forms a barrier to reduce the outflow of freshwater. Freshwater and sediment retention has diminished in the southern portion of the project area due to unimpeded throughflow and tidal exchange combined with a decrease in freshwater and sediment.

Land loss data show that during the period from 1932 to 1990, about 1,818 ac (736 ha) of land was converted to open water in the Brady Canal Hydrologic Restoration project area. Approximately 52% of the loss occurred over a 16-year period between 1958 and 1974. The average loss between 1932 and 1958 was approximately 18 ac (7.3 ha) per year, while the average loss of 31 ac (12.5 ha) per year occurred between 1983 to 1990.

The increase of land loss in the project area was a result of major changes: (1) the hydrology of the Penchant Basin, both natural and human induced, was altered; (2) the natural levee ridge of Bayou de Cade had eroded below marsh elevation along the southern end of the project area; (3) higher-salinity waters from the south began infiltrating the lower saline environment; (4) the tidal exchange at the southern end of the project area began to increase; and (5) there was a reduction in freshwater and sediment retention.

The original project proposal involved the installation and maintenance of canal plugs along with the repair, construction, and maintenance of levees, several different types of weirs, rock plugs, earthen and/or rock and earthen embankments, as well as the construction and maintenance of stabilized channel cross-sections. The structures are designed to reduce adverse tidal effects in the project area as well as to better utilize available freshwater and sediment.

A subsequent project authorized under the sixth Project Priority List, the Penchant Basin Plan (TE-34), encompasses the entire Penchant Basin Project which includes the Brady Canal Hydrologic Restoration Project. Due to ongoing development of the Penchant Basin Plan, two construction features originally planned to be included under the Brady Canal project were never constructed. These features included the northernmost structure located along Bayou Penchant and the overflow banks along Brady Canal in the northern section of the project.

Construction of the Brady Canal Hydrologic Restoration Project began in August 1999 and was completed on July 10, 2000. During this period, the following features were constructed: three fixed crest weirs with variable crest section(s) (Figure 1, sites 14, 21, and 23), a fixed crest weir with barge bay (Figure 1, site 6), a fixed crest weir (Figure 1, site 24), two rock armored channel liners (Figure 1, sites 10 and 20), a rock plug (Figure 1, site 7), and three different embankment types (rock armored earthen embankment, rock dike, and earthen embankment).

Due to budget constraints, breaches along Bayou de Cade between Jug Lake and Turtle Bayou were not closed during construction of the Brady Canal Hydrologic Restoration Project. However, in August of 2003, the Louisiana Department of Natural Resources (LDNR) completed the closure of these breaches through their operation, maintenance and rehabilitation program. Rock rip-rap was used to repair the breaches along Bayou Decade. Under the same construction contract, smaller breaches located along Turtle Bayou and Superior Canal were repaired with either earthen material or rock rip-rap.

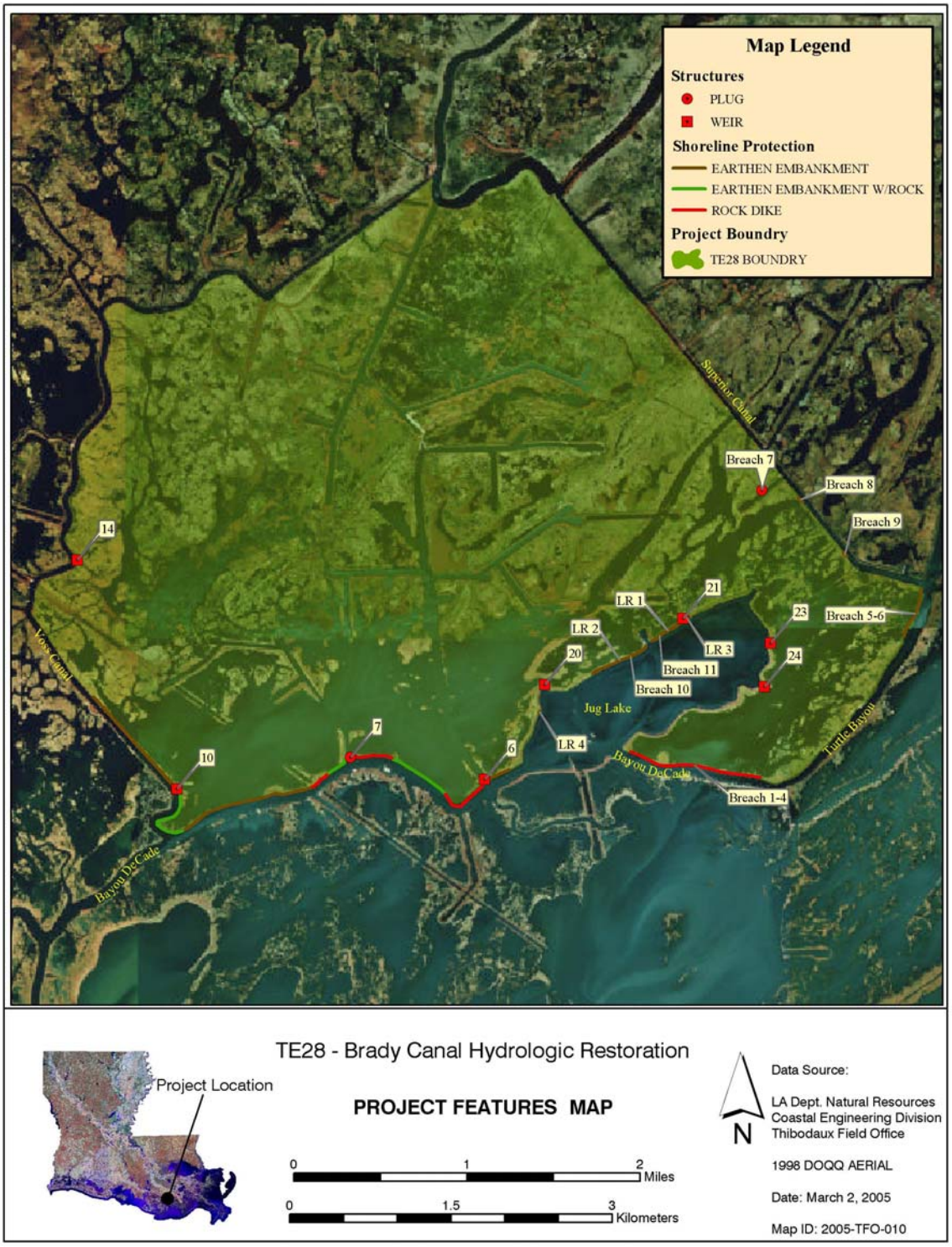


Figure 1. Brady Canal Hydrologic Restoration (TE-28) project features map.

II. Maintenance Activity

a. Project Feature Inspection Procedures

The purpose of the 2005 Annual Inspection of the Brady Canal Hydrologic Restoration Project (TE-28) is to evaluate the constructed project features, to identify any deficiencies, and to prepare a report detailing the condition of project features and recommended corrective actions, if needed. Should it be determined that corrective actions are needed, LDNR shall provide, within the inspection report, a detailed cost estimate for engineering, design, supervision, inspection, construction, and contingencies, and an assessment of the urgency of such repairs (LDNR-Coastal Restoration Division and Pyburn and Odom, Inc. 2002).

An inspection of the Brady Canal Hydrologic Restoration Project (TE-28) was held on February 17, 2005, under partly cloudy skies and mild temperatures. In attendance were Brian Babin and Todd Folse from LDNR, Dale Garber and Mike Trusclair representing Natural Resources Conservation Service (NRCS), Evance Adams with Burlington Resources, and Lloyd Triche and Archie Domangue with Apache Corporation. All parties met at the Falgout Canal Marina in Theriot, La. The annual inspection began at approximately 9:00 a.m. on the southeast side of the project area near Turtle Bayou and ended at 1:00 p.m. on the northeast end of the project area at the intersection of Bayou Penchant and Brady Canal.

The field inspection consisted of a visual inspection of the project features. Staff gauge readings and existing temporary benchmarks were used to determine approximate elevations of water, rock weirs, earthen embankments, steel bulkhead structures, and other project features. Photographs were taken and inspection notes were completed in the field to record measurements and deficiencies. Photographs are compiled in Appendix A, a three-year budge projection is presented in Appendix B, and inspection notes documenting the inspection are shown in Appendix C.

b. Inspection Results

<u>Structure No. 6 – Fixed Crest Weir with Barge Bay</u>

Overall, Structure No. 6 appeared to be in very good condition, with minor deficiencies noted. The pipe guard rails located above the fixed crest sheet pile section on the west side of the structure was slightly bent (Appendix A, Photo 53) and several galvanized pile covers on the timber piles supporting the navigation lights were missing. Navigational aids, warning signs, and timber pile clusters were in good condition with no noticeable physical damage or corrosion found. Navigation lights were repaired in October 2004. However, following the field inspection in March 2005, reports from several sources revealed that two of the four navigation lights were not functioning. These two navigation lights were removed by LDNR personnel on

April 14, 2005, and delivered to Automatic Power, Inc. of Larose for repairs. The lights were repaired and reinstalled on April 21, 2005. Minor erosion was also noted along the riprap revetment section on the east side of the structure. The documented deficiencies mentioned above are considered minor repairs and no emergency corrective actions are recommended. However, these deficiencies should be included in the next scheduled maintenance cycle.

Structure No. 7 – Rock Plug

The rock plug appeared to be in very good condition with no obvious signs of settlement along the length of the structure. The timber piles and warning signs adjacent to the structure were also in good condition (Appendix A, Photo 59). No maintenance or corrective actions are recommended.

Structure No.10 – Stabilization Rock Armored Channel Liner

The physical condition of Structure No.10 appeared to be very good with no signs of settlement along the portion of the rock armor above the waterline (Appendix A, Photos 68 and 69). The condition of the rock armor along the channel bottom is difficult to determine without further investigation. At some point in the future, a centerline profile may be needed to properly assess the rock-lined channel submerged below the waterline. Timber piles supports and signage were in very good condition. No deficiencies were discovered which would require immediate repairs or maintenance.

Structure No. 14 – Fixed Crest Weir with Variable Crest Section

Upon a visual inspection of Structure No. 14, we found that there was moderate erosion of the earthen embankment tie-ins on both sides of the structure (Appendix A, Photo 72). While the erosion of the earthen embankment continues to worsen over time, we believe that the quantity of material directly behind the sheetpile wall will provide the necessary protection from breaching for the time being. However, it is recommended that the earthen embankment be refurbished during the next maintenance cycle. The steel structure, timber pile supports, and signage appear to be in very good condition with no obvious defects or structural damage.

Structure No. 20 – Stabilization Rock Armored Channel Liner

Structure No. 20 appeared to be in good condition with no signs of settlement along the portion of the rock armor above the waterline (Appendix A, Photo 48). Similar to Structure No. 6, the condition of the rock armor along the channel bottom is difficult to determine without further investigation. At some point, a centerline profile may be needed to properly assess the condition of the rock-lined channel below the water

surface. Timber piles, supports, and signage were also in good condition. No immediate repairs are necessary at this time.

Structure No. 21 – Fixed Crest Weir with Three Variable Crest Sections

The variable crest weir structure was in good condition with no physical or structural damage noted (Appendix A, Photo 38). However, we did observe large cut banks along the earthen embankment tie-ins on both sides of the structure, with more pronounced erosion on the north side. While no breaching was evident, we consider the erosion along the earthen embankment to be moderate to severe. It is recommended that the earthen embankment be refurbished under the next maintenance cycle to prevent the potential for breaching.

Structure No. 23 – Fixed Crest Weir with Two Variable Crest Sections

The variable crest weir structure appeared to be in good condition with no physical or structural damage noted (Appendix A, Photos 30 and 37). As in the case of Structure No. 21, we did observe significant erosion of the earthen embankments on both sides of the structure. The top of the steel bulkhead on the north side of the structure was exposed from apparent water flow around the structure during extremely high tides. It is recommended that the earthen embankment adjacent to the water control structure be refurbished during the next maintenance cycle. From the existing temporary benchmark located on the structure, it was determined that the water elevation at the time of the inspection was 1.2 ft (0.4 m) NAVD88. All signs and timber supports were in good condition.

Structure No. 24 – Fixed Crest Weir

Upon visual inspection of Structure No. 24, it was determined that the structure itself was in good condition with no signs of structural damage (Appendix A, Photos 25 and 26). We did observe that the paint along the guardrail appeared to be chipping. Since the underlying material is galvanized, as in the case of all water control structure on this project, the affects of corrosion resulting from deterioration of the paint is unlikely. Moderate erosion was also noted along the earthen embankment on both sides of the structure with the most severe case being on the south side. It is recommended that the earthen embankment be refurbished on the next maintenance cycle. All signs and supports were in good condition.

Earthen Embankments

The inspection of earthen embankments consisted of a visual inspection of the breach repair project completed in 2003, levee refurbishment along the west bank of Jug Lake, and an inspection of existing earthen embankment and overflow banks making

up the boundary of the Brady Canal project. Below are the results of the earthen embankment inspections:

2003 Brady Canal Breach Repair Project

Breach 7 – Breach 7 consisted of a large opening in the earthen embankment along an existing oilfield canal off of Superior Canal. Due to the depth and width of the opening in the levee, rock rip-rap was used to close the breach in lieu of dredged material (Appendix A, Photo 3). The rock riprap plug appeared to be holding up well with no noticeable settlement. It was estimated from water level reading from a staff gauge at the intersection of Turtle Bayou and Bayou de Cade (water level: 0.0 ft) that the rock plug was presently at an elevation of +3.5 ft (+1.1m) NAVD 88. No maintenance was required at this site.

Breach 8 – Breach 8 consisted of a 200-ft- (60.9-m-) wide low-lying area along Superior Canal adjacent to an existing pipeline right-of-way. The low areas of the embankment were repaired using dredge material from Superior Canal (Appendix A, Photo 10). The earthen embankment in this area appeared to be in good condition with thick vegetation present. No maintenance was required at this site.

Breach 9 – Breach 9 is located along Superior Canal near the bend and consisted of a 250-ft (76.2-m) section of earthen embankment which had settled significantly. This section of levee was also repaired using dredge material from Superior Canal (Appendix A, Photo 12). The earthen embankment in this area appeared to be in very good condition with no noticeable erosion or settlement since refurbishment in 2003. No maintenance was required.

Breaches 5 and 6 – Breaches 5 and 6 consisted of a low area along the earthen embankment along Turtle Bayou from the mouth of Superior Canal 1500 ft (457.2 m) southward. The earthen embankment was refurbished using dredge material from Turtle Bayou (Appendix A, Photos 13 and 16). The earthen embankment repairs appear to be in good condition with the exception of small cut banks along the face of the levee. No maintenance is required.

Breaches 1 throug 4 - Breaches 1 through 4 consisted of a low-lying bank along Bayou de Cade with large openings in the levee exposing the interior marsh (Appendix A, Photo 22). Due to the elevation of the existing bank line and exposure to significant wave action, a rock dike was constructed along the length of Bayou de Cade from Turtle Bayou to Jug Lake. At the time of the inspection, the rock dike was in fair condition with several low areas along the

length of the structure. We feel that the rock dike is not settling and the low areas are due to the fact that the design elevation of the rock dike was not achieved during construction. The rock dike appeared to be in fair condition and no maintenance will be required.

Levee Refurbishment Project along Jug Lake

As a result of past inspections with representatives of LDNR, NRCS, and the landowners, it was obvious that the existing levee along the west bank of Jug Lake was deteriorating at an alarming rate and would require immediate repairs. The landowner, Apache Corporation, agreed to contract the maintenance work using in-kind service credits authorized in the Brady Canal Cost Share Agreement. Berry Brothers General Contractors performed the repairs (Appendix A, Photo 46). At the time of the inspection, the levee refurbishment appeared to be in good condition with thick vegetative cover. We did note significant cut banks along the front face of the levee. Due to extensive wave action in Jug Lake, this was expected. We feel that the refurbished earthen section is stabilized and no maintenance is required.

Existing Earthen Embankments and Overflow Banks

During the visual inspection of all earthen embankments and overflow banks which make up the boundary of the Brady Canal Hydrologic Restoration Project, we identified several locations which are considered to be low and at a high risk of potential breaching. We also inspected two small breaches previously identified along Little Carencro Bayou (Appendix A, Photo 71) and two large breaches along Brady Canal and Bayou Penchant near the Apache camp site (Appendix A, Photo 75). The large breaches near the Apache camp are between 50 ft (15.2 m) and 75 ft (22.9 m) wide with high volumes of water bypassing the existing water control structure. It is recommended that these breaches be repaired.

Rock Armored Embankments

Rock armored embankments along the north bank of Bayou de Cade and Voss Canal appear to be in good condition. However, the rock dike, without earthen embankments, along Voss Canal appeared to be experiencing moderate settling. We will continue to monitor this area in the future.

c. In-Kind Service Credits

Under Article II of the Brady Canal Cost Share Agreement, the landowners, Burlington Resources and Apache Corporation were granted in-kind service credits to repair existing earthen embankments within the project area. Below is a description of work and cost associated with the maintenance performed by Burlington and Apache:

In-Kind Service Credits - Burlington Resources: In February 2003, Burlington Resources was granted in-kind service credits for the repair of two large breaches along Little Carencro Bayou resulting from Hurricane Lili. The maintenance project consisted of the repair of a 133-ft (40.5-m) and 268- ft (81.7-m) breach in the existing overflow bank along Little Carencro Bayou. The maintenance project was completed on March, 15, 2003.

In-Kind Service Credits - Apache Corporation: On September 3, 2003, Apache Corporation requested in-kind service credits for the removal of an existing dilapidated water control structure and refurbishment of approximately 3,100 linear ft (944.9 m) of earthen embankment along the west bank of Jug Lake estimated to cost approximately $35,000. Apache completed approximately 5,050 linear ft (1539.2 m) of levee refurbishment and removed the existing structure along Jug Lake on October 31, 2003. Shaw Coastal, Inc. was tasked through LDNR to perform an as-built survey of the refurbished levee. This work was completed in November 2003.

In-Kind Service Credits - Apache Corporation: As a result of Hurricane Lili, existing levee embankments along Turtle Bayou, Superior Canal, and the west bank of Jug Lake were breached. Apache repaired these breached locations and were granted in-kind credits as reimbursement.

Brady Canal Breach Repair Project – LDNR: As a result of the 2002 Annual Inspection, a plan of action was prepared to repair deficiencies discovered during the inspection. LDNR tasked Pyburn & Odom, MCA to perform surveying, engineering and design and project oversight services to complete the maintenance project. This maintenance project included the installation of approximately 9,667 tons of broken stone riprap, 2,325 linear ft (708.7 m) of earthen breach repair, and replacement of a timber pile on dolphin at structure no.6. Construction of the breach repair project was completed on August 13, 2003. A map showing the locations which were repaired under this construction contract are located in Babin (2004).

d. Maintenance Recommendations

As a result of the 2005 Annual Inspection, both immediate and problematic levels of recommended maintenance were identified that will require corrective actions. The

problematic deficiencies include moderate to severe erosion along the earthen embankment tie-ins adjacent to structures 6, 14, 21, 23, and 24. While no breaching was evident at the time of the inspection, these locations are at high risk of breaching and should be refurbished. Areas which will require immediate maintenance included two large breaches located near the intersection of Brady Canal and Bayou Penchant near the Apache Camp and several small breaches located along Little Carencro Bayou. Below is an estimated project budget outlining the cost for refurbishment of earthen embankments adjacent to the structures mention above and recommended repairs of existing breaches along Brady Canal, Bayou Penchant and Little Carencro Bayou:

Maintenance Project – Estimated Project Budget

Mobilization:	$ 7,500	
Embankment Construction: (1,600 lft @ $20/lft)	$32,000	
Total Construction:	$39,500	
Contingency: ($39,500 x 25%)		$49,375
Engineering & Design:		$31,012
Surveying: (3 days @ 1,500/day)	$ 4,500	
E&D: ($49,375 x 20%)	$ 9,875	
Construction Oversight: (15 days @ $780/day)	$11,700	
Administration: ($49,375 x 10%)	$ 4,937	
Total Estimated Project Budget:		**$80,387**

III. Operation Activity

a. Operation Plan

The Operation, Maintenance, and Rehabilitation Plan for the Brady Canal Hydrologic Restoration Project (TE-28) was jointly prepared and approved by the Louisiana Department of Natural Resources (LDNR), the Natural Resources Conservation Service (NRCS), Apache Corporation (formerly Laterre Co. Ltd.), and Burlington

Resources. The intention of the Operation, Maintenance, and Rehabilitation Plan for the Brady Canal Hydrologic Restoration Project (TE-28) is to maintain the constructed project features in a condition that will generally provide the anticipated benefits on which the project was based on (LDNR and Pyburn and Odom, Inc. 2002). A cost share agreement was implemented and executed on June 17, 1998, between the government agencies and landowners involved, outlining the responsibilities and obligations of each party. The Brady Canal Project has a 20-year economic life which began in July 2000 at completion of the construction phase of the project. As a result of periodic field inspections since the completion of the project, several maintenance projects were identified and completed under the guidelines of the cost share agreement and O&M Plan. Below is a summary of completed maintenance projects undertaken since July 2000:

b. Actual Operations

Within the Brady Canal project, structures no. 14, 21, and 23 are variable crest weirs and require active operations. The basic philosophy for operation of these project structures is to allow fresh water from the north to move into the project area and block southerly water fluctuations by keeping these structures as high as possible. During emergency and storm events, the stop logs in the variable crest weir structures should be removed to allow water out of the project area. Generally, during the fall (September 1) of each year, all stop logs shall be placed at a maximum elevation and during the spring (March 15) of each year, lower or remove stop logs to the natural channel bottom. This operation schedule may change once the Penchant Basin Project comes on-line and cuts in the southern portion of the project are repaired. Therefore, the operation of the variable crest weir structures shall be observed and revised as needed.

The Brady Canal project area is divided into Conservation Treatment Unit (CTU) #1, CTU #2 and CTU #3. Operation plans and procedures for CTU #1 are designed to stabilize water fluctuations. Operation plans and procedures for CTU #2 and CTU #3 are designed to expose mud flats for seed germination and planting. Once vegetative plantings are established, operation and procedures for CTU #3 are designed to gradually increase water levels to maintain and enhance vegetative growth. Below is a description of the Operation and Water Management Schedule and Special Safety Provisions regarding operations of water control structures within the Brady Canal Project:

<u>Operation and Water Management Schedule</u>

CTU #1 Structure No. 14: Fall (September 1) of each year, set structures to maximum elevation. Spring (March 15) of each year, lower or remove stop logs to natural channel bottom.

CTU #3 Structures No. 21 and No. 23: Fall (September 1) of each year, set structures to maximum elevation. Spring (March 15) of each year, lower or remove stop logs to natural channel bottom.

In accordance with the Operation and Water Management Schedule above, structures 14, 21, and 23 were adjusted twice a year (March and September) beginning in April 2002. Details of each operation period are documented in an Operations Report which can be obtained from LDNR – Thibodaux Field Office.

Safety Provisions

Storms: Immediately following heavy rain storms or storm tidal surges, all weirs shall be opened, to provide normal gravity drainage for the area as well as to protect the integrity of the levee system surrounding the project area.

IV. Monitoring Activity

a. Monitoring Goals

The objective of the Brady Canal Hydrologic Restoration Project is two-fold: (1) to maintain and enhance existing marshes in the project area by reducing the rate of tidal exchange, and (2) to improve the retention of introduced freshwater and sediment.

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

1. Decrease the rate of marsh loss.
2. Maintain or increase the abundance of plant species typical of a freshwater and intermediate marsh.
3. Decrease variability in water level within the project area.
4. Decrease variability in salinities in the southern portion of the project.
5. Increase vertical accretion within the project area.
6. Increase the frequency of occurrence of submerged aquatic vegetation (SAV) within the project area.

b. Monitoring Elements

Habitat Mapping

To document vegetated and non-vegetated areas, color infrared aerial photography (1:12,000 scale with ground controls) will be obtained. The photography will be photointerpreted, scanned, mosaicked, georectified, and analyzed by National Wetlands Research Center (NWRC) personnel according to the standard operating procedure described in Steyer et al. (1995, revised 2000). The photography was

obtained in 1998 (pre-construction) and in 2002 (post-construction), and will be obtained in 2008 and 2017 (post-construction).

Salinity

To monitor salinities one continuous recorder is located in each CTU and reference area (Figure 2). One additional recorder is located outside the project area on Bayou Penchant where Brady Canal begins near a water control structure. Discrete salinities are measured monthly at five sites within each CTU and reference area. Salinity data has been collected from 1996 to 2000 (pre-construction) and from 2000 to 2004 (post-construction), and will continue. Hourly and discrete salinity data was discontinued in the reference areas except for station TE28-07R in April 2004, due to the implementation of CRMS-*Wetlands*.

Water Level

To monitor water level variability, one continuous recorder is located within each CTU and one recorder is located in each reference area (Figure 2). One additional recorder is located outside the project area on Bayou Penchant near a water control structure. Mean daily water level variability and duration and frequency of flooding will be compared between pre-construction and post-construction and also between project and reference areas. Water level data was collected from 1997-2000 (pre-construction) and 2000-2004 (post-construction), and will continue. Hourly water level data was discontinued in the reference areas except for station TE28-07R in April 2004 due to the implementation of CRMS-*Wetlands*.

Emergent Vegetation

Species richness and relative abundance are evaluated in the project and reference areas using the Braun-Blanquet method (Mueller-Dombois and Ellenberg 1974). Five stations were chosen within each CTU and reference area and replicate samples are collected at each station. Relative abundance will be documented in permanent plots to allow revisiting over time. Sites were sampled once in 1996 (pre-construction), in 1999 (as-built), and in 2002 (post-construction)m and will be sampled in 2006, 2009, 2012, and 2015 (post-construction). Emergent vegetation data was not collected in 2004 due to the implementation of CRMS-*Wetlands*. Once the CRMS-*Wetlands* stations have been established in the vicinity of the project area, the emergent vegetation stations within the project area will be visited and data will be collected. However, those stations in the reference areas will not be visited. Data from the surrounding CRMS-*Wetlands* stations will be used as reference sites.

Accretion

Vertical accretion is determined in triplicate at each of the five representative stations within each CTU and reference area using techniques described in Steyer et al. (1995, revised 2000). The location of vertical accretion sites corresponds with the location of vegetation sampling sites. Sites were sampled in 1997/1998 (pre-construction), and in 2000/2001 (post-construction), and will be sampled in 2006, 2009, 2012, and 2015 (post-construction). Accretion data was not collected in 2004 due to the implementation of CRMS-*Wetlands*. Once the CRMS-*Wetlands* stations have been established in the vicinity of the project area, the accretion stations will be established and data will be collected. However, those stations in the reference areas will not be visited. Data from the surrounding CRMS-*Wetlands* stations will be used as reference sites.

Marsh Mat Movement

To monitor marsh mat movement, one continuous recorder is located within CTU #2 and one recorder located in the paired reference area #2 (Figure 2). Mean daily water level variability and duration and frequency of flooding of floating marshes are determined for pre-construction vs. post-construction comparisons and also project vs. reference comparisons. Marsh mat movement data was collected from 1998 to 2000 (pre-construction) and 2000 to 2004 (post-construction), and will continue for the recorder located in CTU #2. However, the recorder in reference area #2 was deployed in 1998 and collected data until February 2002

Submerged Aquatic Vegetation (SAV)

The frequency of occurrence of SAV was compared between project and reference areas. Within the project (by CTU) and reference areas, 5 ponds were sampled during the fall (October or November) in 1996 and 1999 (pre-construction) and in 2002 (post-construction) and will be sampled in 2006, 2012, and 2015 (post-construction). Methods described in Nyman and Chabreck (1996) will be used to determine the frequency of occurrence of SAV. Within each pond sampled, the presence/absence of SAV is determined at a minimum of 20 random points. Frequency of occurrence is determined for each pond from the number of points at which SAV occurred and the total number of points sampled. When SAV occurs at a point, the species occurring will be listed.

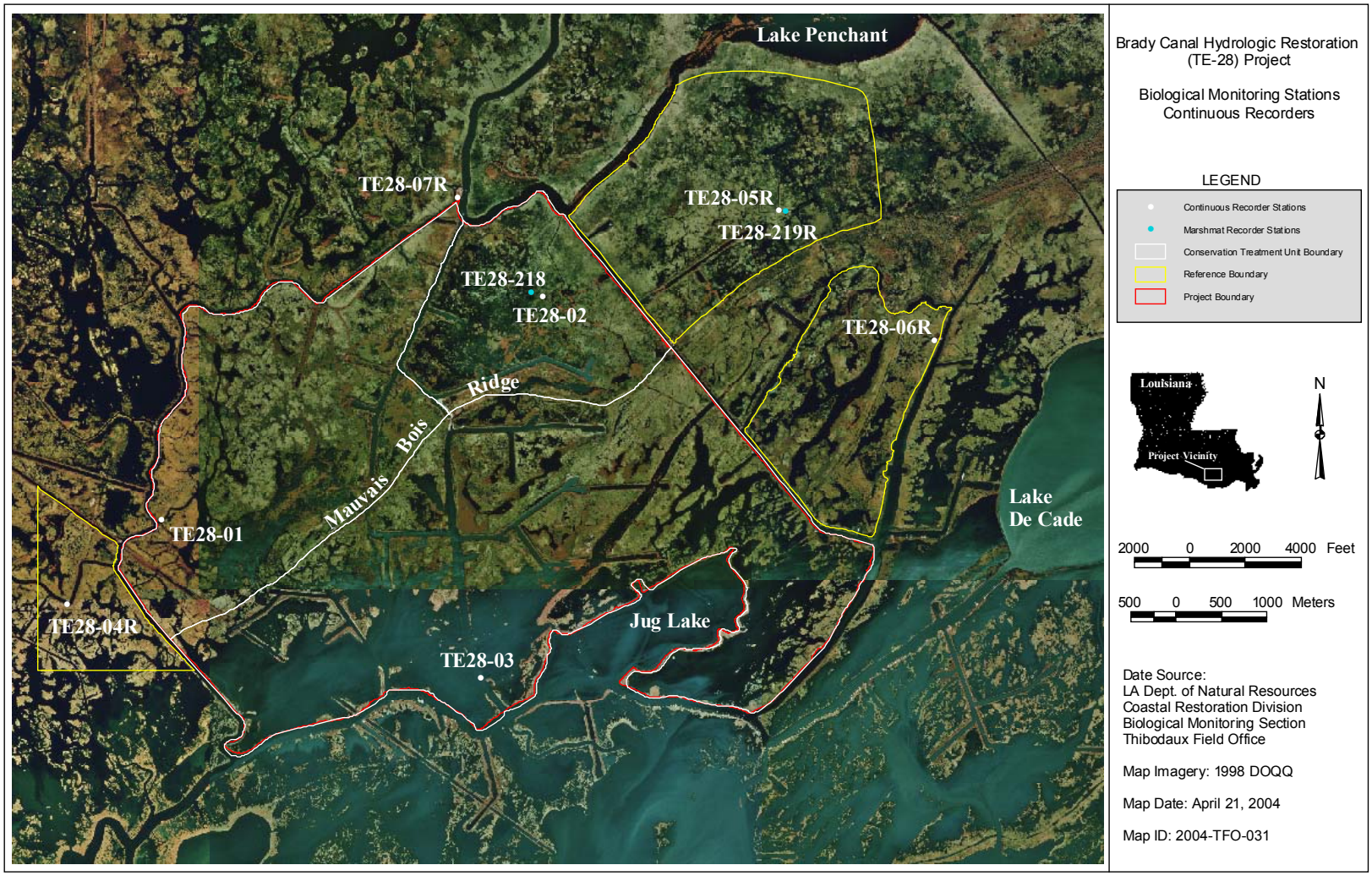


Figure 2: Location of continuous salinity and water level recorders in the Brady Canal Hydrologic Restoration (TE-28) project.

IV. Monitoring Activity (continued)

c. Preliminary Monitoring Results and Discussion

A comprehensive analysis of monitoring variables except habitat mapping is presented in the 2004 Operations, Maintenance, and Monitoring Report (Folse and Babin 2007). The report can be obtained through the department's web site at dnr.louisiana.gov. This report provides information concerning the habitat mapping analysis from 1998 and 2002 along with the presentation of the water level and salinity data collected in 2004.

Habitat Mapping

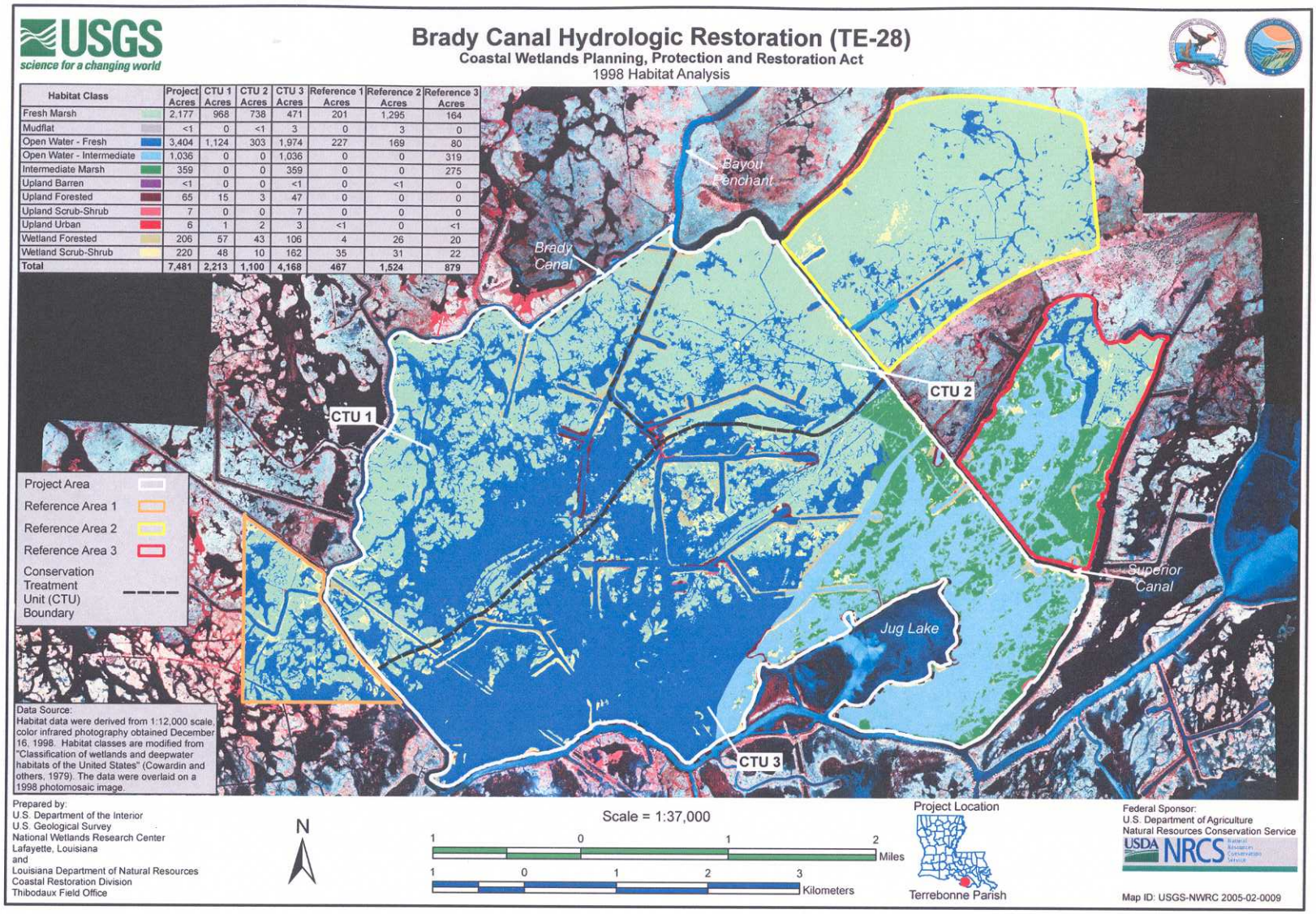
Habitat analysis of the project and reference areas was completed by USGS/NWRC in Lafayette for the 1998 and 2002 photography, and draft hard copies of maps were produced and sent to the Louisiana Department of Natural Resources, Coastal Restoration Division, Thibodaux Field Office (LDNR/CRD/TFO) for review. LDNR/CRD/TFO examined the salinity data (1998 and 2002) and the emergent vegetation data (1999 and 2002) to enhance the characterization of the categories used by the USGS/NWRC and to verify their delineation. Comments were sent back to NWRC and incorporated into final drafts. Figures 3 and 4 are the habitat maps with tables showing the breakdown of each habitat class and the amount of acres in each CTU and reference (REF) area. Table 1 provides the acreage change from the 1998 to the 2002 habitat mapping delineation. Figure 5 illustrates the total amount of land and water in the project and reference areas in 1998 and 2002 by adding all land and water categories from the habitat mapping tables within figures 3 and 4.

Table 1: Acreage loss (-) / gain from 1998 to 2002 using habitat mapping.

Habitat Class	Project Acres	CTU 1 Acres	CTU 2 Acres	CTU 3 Acres	Reference Acres	REF 1 Acres	REF 2 Acres	REF 3 Acres
Open Water	-13	-33	38	-15	10	8	18	-10
Fresh Marsh	-217	-36	-48	-133	-89	-5	19	-65
Intermediate Marsh	87	0	0	87	82	0	0	82
Wooded Wetland[1]	173	84	14	75	-2	-3	7	-6
Upland[2]	-29	-15	-3	-11	1	0	0	0
Mudflat	0	0	0	0	-3	0	-3	0

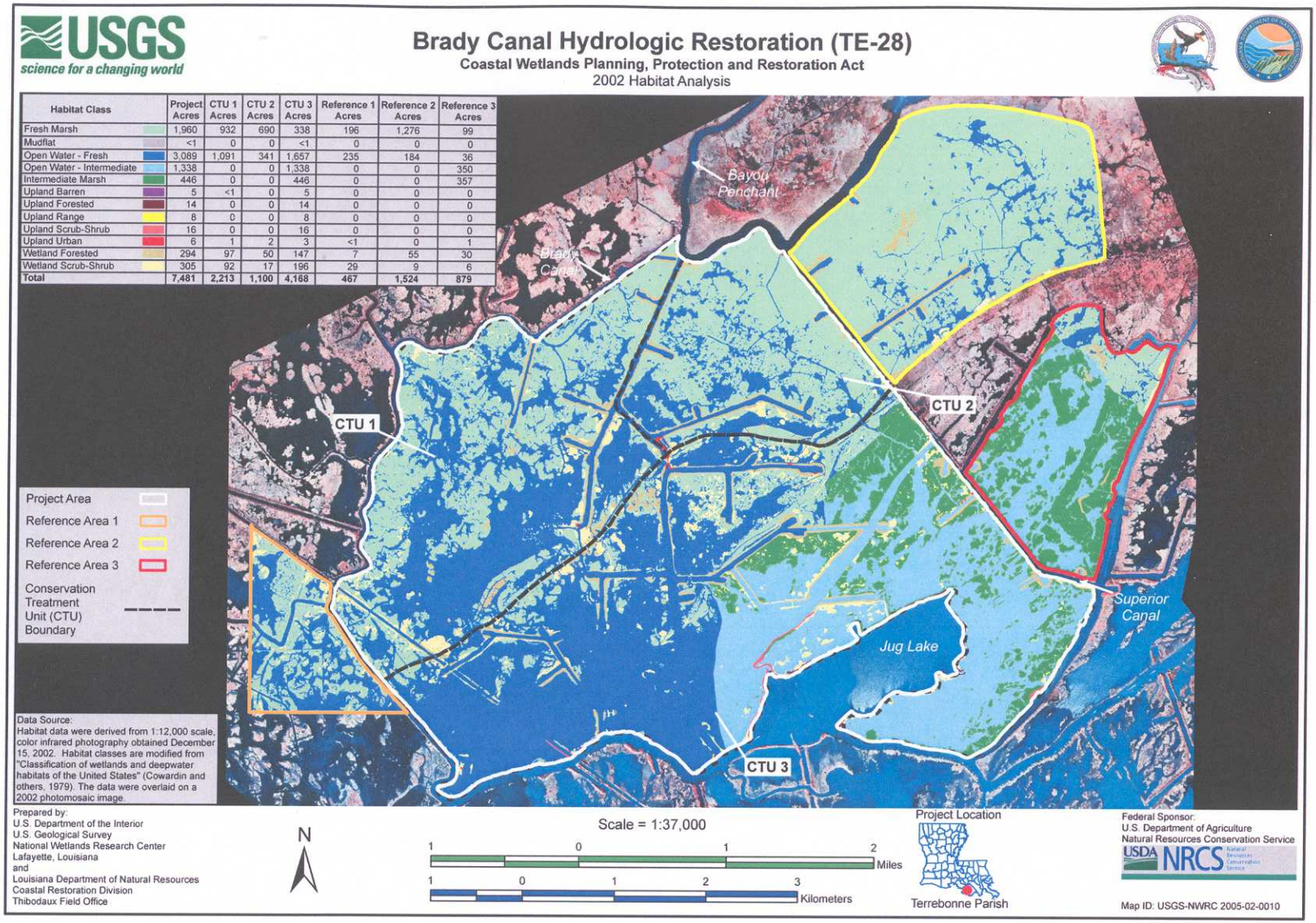
Wooded Wetland[1] includes Wetland Forest and Wetland Scrub-Shrub

Upland[2] includes Upland Barren, Upland Forested, Upland Scrub-Shrub, and Upland Urban



Habitat Class	Project Acres	CTU 1 Acres	CTU 2 Acres	CTU 3 Acres	Reference 1 Acres	Reference 2 Acres	Reference 3 Acres
Fresh Marsh	2,177	968	738	471	201	1,295	164
Mudflat	<1	0	<1	3	0	3	0
Open Water - Fresh	3,404	1,124	303	1,974	227	169	80
Open Water - Intermediate	1,036	0	0	1,036	0	0	319
Intermediate Marsh	359	0	0	359	0	0	275
Upland Barren	<1	0	0	<1	0	<1	0
Upland Forested	65	15	3	47	0	0	0
Upland Scrub-Shrub	7	0	0	7	0	0	0
Upland Urban	6	1	2	3	<1	0	<1
Wetland Forested	206	57	43	106	4	26	20
Wetland Scrub-Shrub	220	48	10	162	35	31	22
Total	**7,481**	**2,213**	**1,100**	**4,168**	**467**	**1,524**	**879**

Figure 3: 1998 Habitat mapping data, Brady Canal Hydrologic Restoration Project.



Habitat Class	Project Acres	CTU 1 Acres	CTU 2 Acres	CTU 3 Acres	Reference 1 Acres	Reference 2 Acres	Reference 3 Acres
Fresh Marsh	1,960	932	690	338	196	1,276	99
Mudflat	<1	0	0	<1	0	0	0
Open Water - Fresh	3,089	1,091	341	1,657	235	184	36
Open Water - Intermediate	1,338	0	0	1,338	0	0	350
Intermediate Marsh	446	0	0	446	0	0	357
Upland Barren	5	<1	0	5	0	0	0
Upland Forested	14	0	0	14	0	0	0
Upland Range	8	0	0	8	0	0	0
Upland Scrub-Shrub	16	0	0	16	0	0	0
Upland Urban	6	1	2	3	<1	0	1
Wetland Forested	294	97	50	147	7	55	30
Wetland Scrub-Shrub	305	92	17	196	29	9	6
Total	**7,481**	**2,213**	**1,100**	**4,168**	**467**	**1,524**	**879**

Figure 4: 2002 Habitat mapping, Brady Canal Hydrologic Restoration Project.

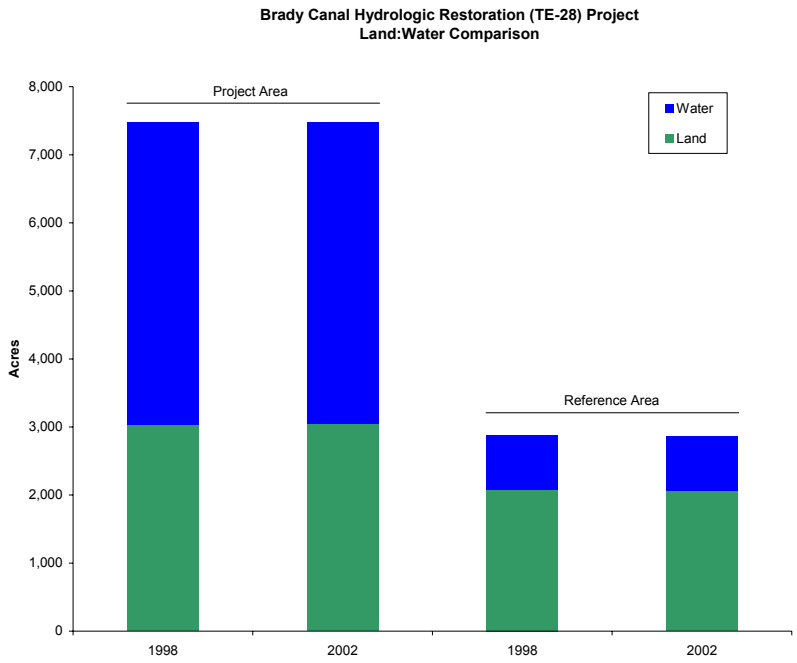


Figure 5: Total acres of land and water in the project and reference areas for 1998 and 2002, Brady Canal Hydrologic Restoration Project.

Salinity and Water Level

Hourly water level and salinity data were collected at all seven stations during 2004; however, stations TE28-04R, 05R, and 06R were deactivated on April 1, 2004, due to the implementation of CRMS-*Wetlands*. Figures 6-12 illustrate the water levels and salinity concentrations collected at each site.

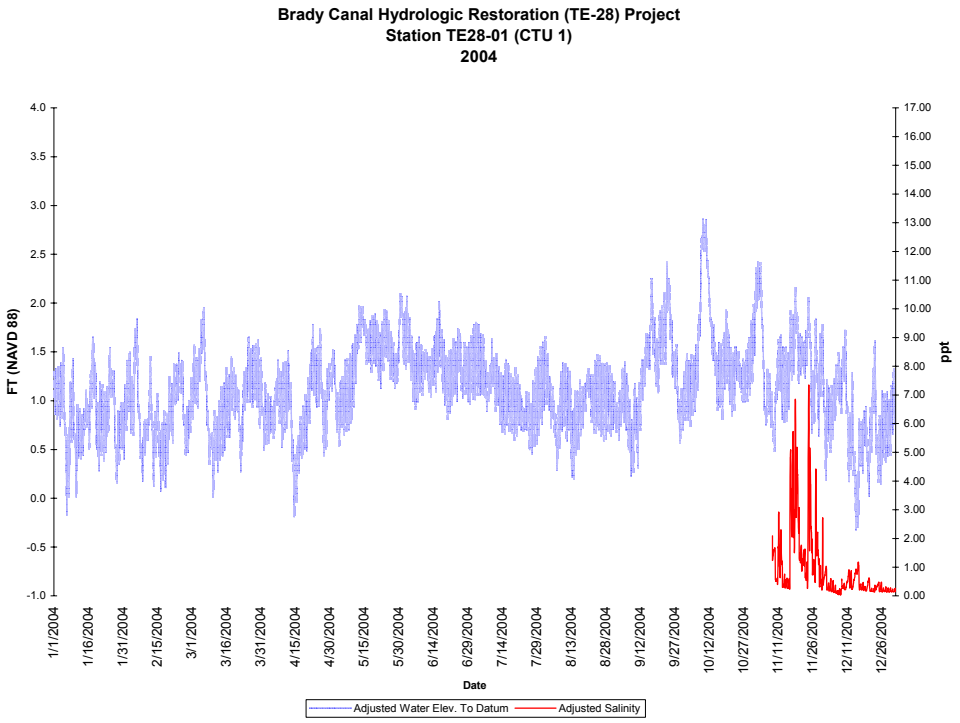


Figure 6: Water level and salinity data collected at station TE28-01 during 2004. The salinity data that is missing is attributed to a mat of decaying water hyacinth that has skewed the data.

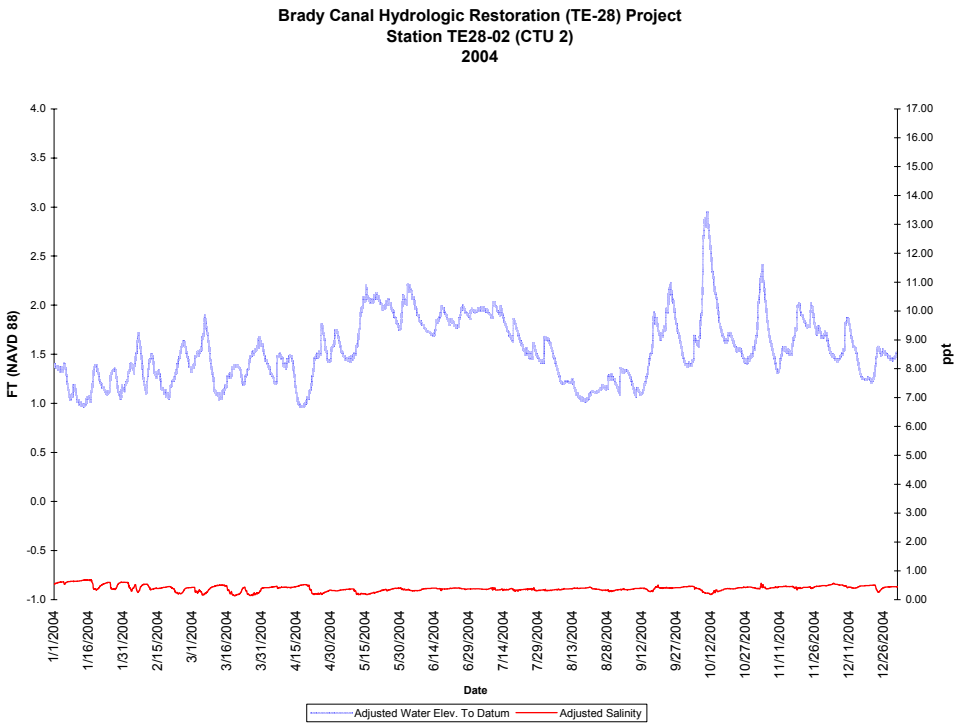


Figure 7: Water level and salinity data collected at station TE28-02 during 2004.

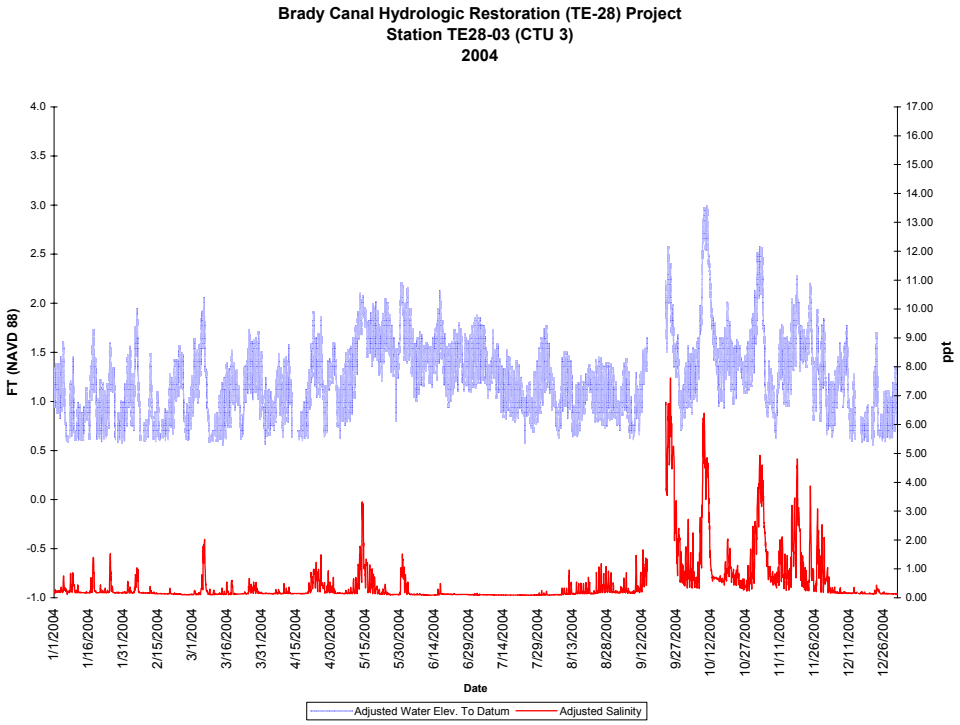


Figure 8: Water level and salinity data collected at TE28-03 during 2004.

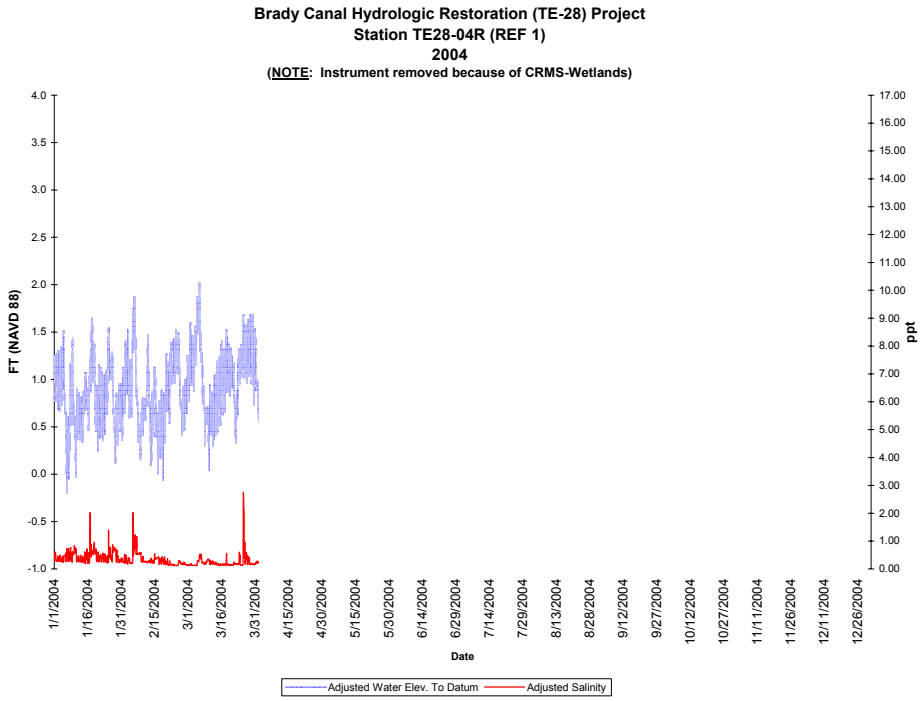


Figure 9: Water level and salinity data collected at TE28-04R during 2004.

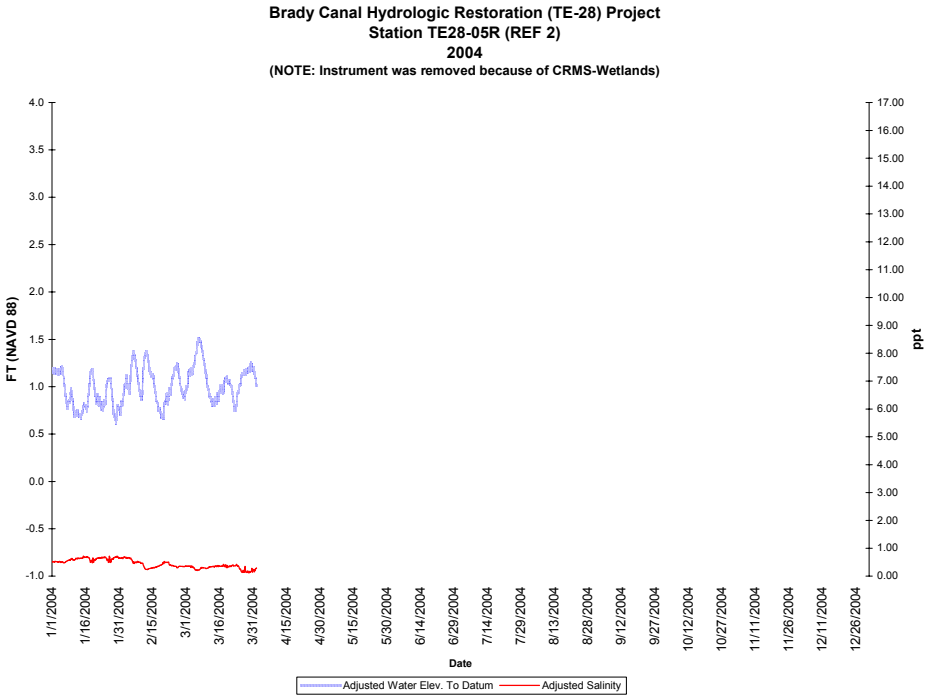


Figure 10: Water level and salinity data collected at station TE28-05R during 2004.

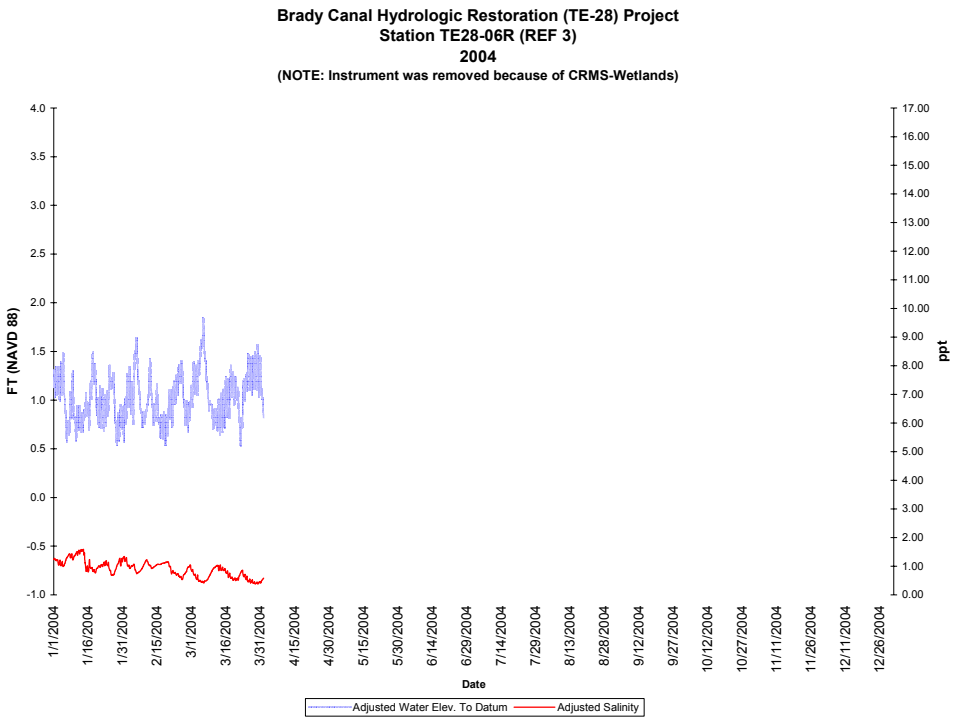


Figure 11: Water level and salinity data collected at TE28-06R during 2004.

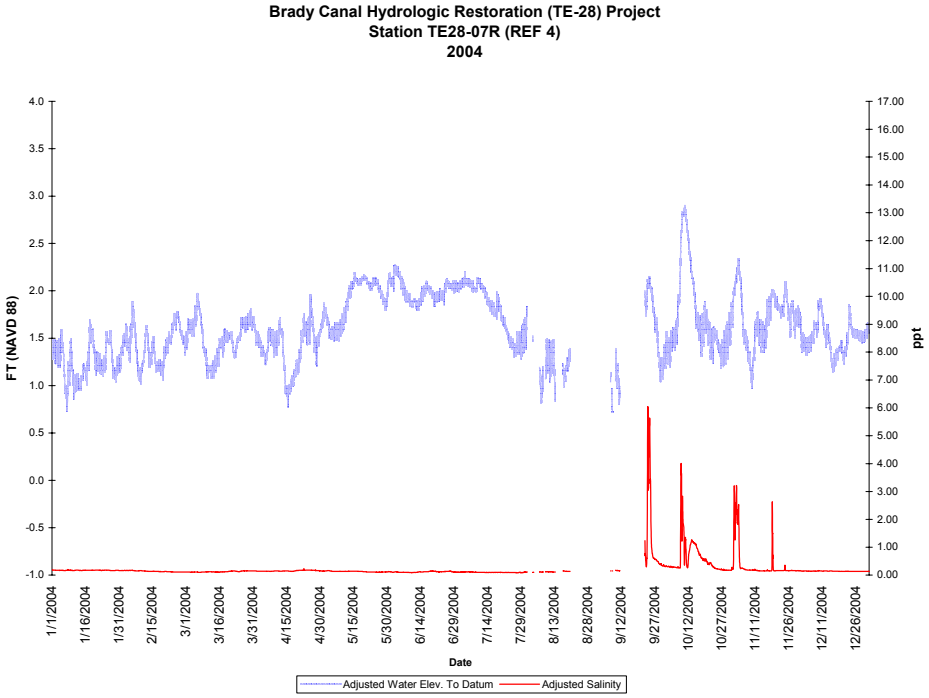


Figure 12: Water level and salinity data collected at station TE28-07R during 2004.

Marsh Mat Movement

Hourly water level, marsh surface, and salinity data are collected using a continuous recorder that is suspended below the marsh mat in the fluid ooze layer, which is above the firm substrate layer. Water level data are converted to ft NAVD88 using data from an hourly continuous recorder in the adjacent marsh channel. Figure 13 illustrates the salinity concentration below the marsh mat surface and show the water level and marsh mat surface fluctuation.

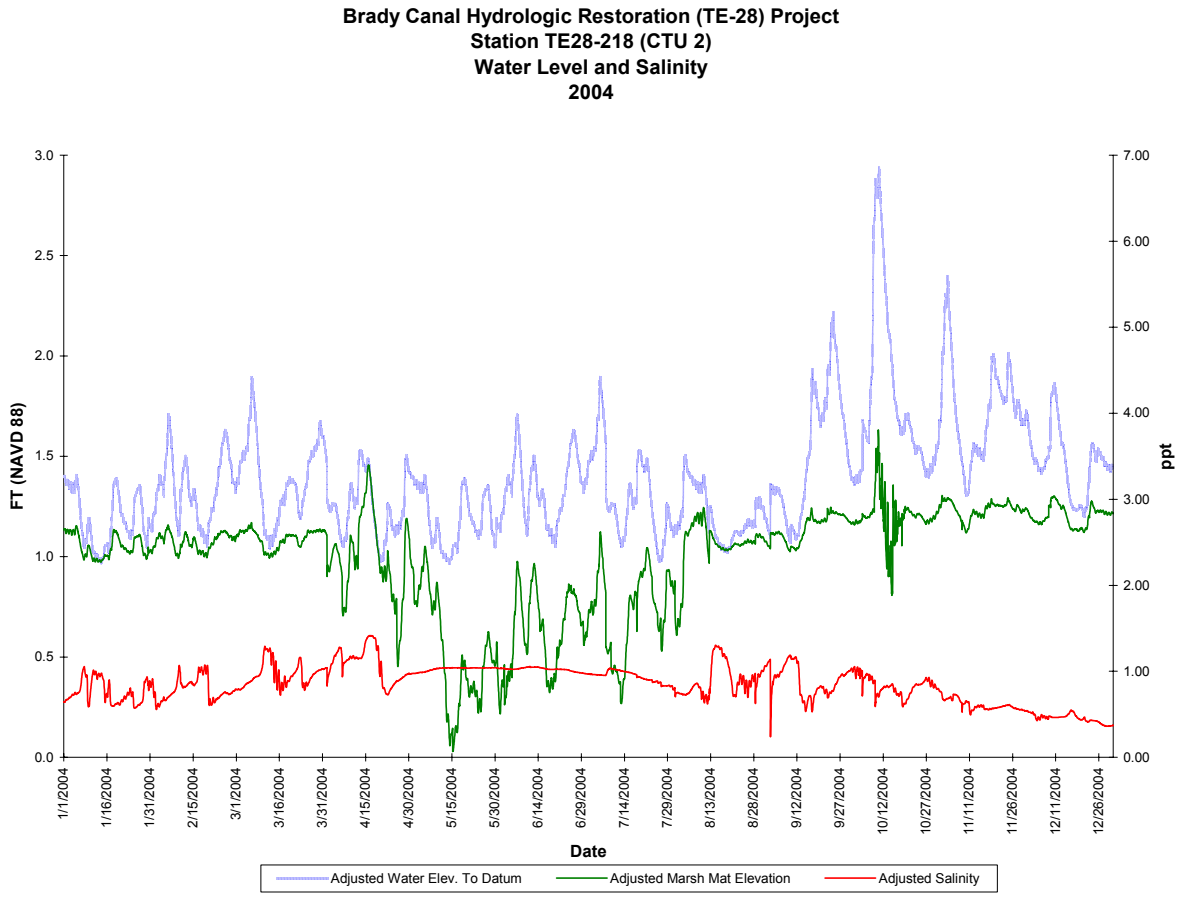


Figure 13: Salinity, water level, and marsh surface data collected at station TE28-218 during 2004.

V. Conclusions

a. Project Effectiveness

A comprehensive analysis of the monitoring data was completed in 2004 and presented in the 2004 Operations, Maintenance, and Monitoring Report (Folse and Babin 2004). Monitoring data was presented in figures 3-12 showing various variables that were collected during 2004. Since all the monitoring variables were not collected in 2004, a detailed analysis was not performed.

b. Recommended Improvements

As a result of the 2005 Annual Inspection, both immediate and problematic levels of recommended improvements were identified that will require corrective actions in the 2205/2006 maintenance cycle. The problematic deficiencies include moderate to severe erosion along the earthen embankment tie-ins adjacent to Structure 6, 14, 21, 23, and 24. While no breaching was evident at the time of the inspection, these locations are at high risk of breaching and should be refurbished. Areas which will require immediate maintenance included two large breaches located near the intersection of Brady Canal and Bayou Penchant near the Apache Camp and several small breaches located along Little Carencro Bayou. The overall estimated project budget for repairing both the immediate and problematic deficiencies mentioned above is $80,387. A detailed cost breakdown of the project budget is shown in Section II.c., "Maintenance Recommendations."

Field inspections should include an evaluation of the earthen levees and marsh channels from within the project and not just the exterior. Earthen levees along Bayou Decade, Voss Canal, and Jug Lake should be inspected from inside the project area since these levees are impacted by large, shallow water bodies. Marsh channels should be examined for hydrologic connectivity to the weirs. Specifically, the marsh channel between the large, shallow pond in CTU 1 and Structure No. 14 appears to have reduced its carrying capacity by filling in with sediment and organic matter and the width of the channel has changed since Hurricane Lili in 2002.

Channel depths adjacent to the water control structures should be investigated to determine if the structures are raising the elevation of the channel bottoms and affecting the hydrographic connectivity.

c. Lessons Learned

Hydrologic restoration projects should include investigative measures to determine if changes within the project area have affected the function and purpose of the project features, i.e. water control structures. Oftentimes, channels may change as a result of the construction of a water control structure or the placement of levees or other

features that alter the hydrology of a system. Consequently, procedures should be prepared in advance of the project to investigate changes within the project as it affects the hydrologic changes.

VI. References

Babin, B. 2004. 2004 Annual inspection report for Brady Canal hydrologic restoration project, Louisiana Department of Natural Resources, Coastal Engineering Division, Baton Rouge.

Folse, T. and B. Babin. 2007. 2004 Operations, maintenance, and monitoring report for Brady Canal hydrologic restoration (TE-28), Louisiana Department of Natural Resources, Coastal Restoration Division and Coastal Engineering Division, Thibodaux, Louisiana. 38 pp.

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Mueller-Dombois, D. and H. Ellenberg. 1974. Aims and Methods of Vegetation Ecology. John Wiley and Sons, New York. 547 pp.

Nyman, J.A., and R.H. Chabreck. 1996. Some effects of 30 years of weir management on coastal marsh aquatic vegetation implications to waterfowl management. Gulf of Mexico Science. 1:16-25.

Steyer, G.D., R.C. Raynie, D.L. Steller, D. Fuller and E. Swenson. 1995. Quality management plan for Coastal Wetlands Planning, Protection, and Restoration Act monitoring program. Open-file series no. 95-01. Baton Rouge: Louisiana Department of Natural Resources, CRD.

APPENDIX A

INSPECTION PHOTOS

Breach 7 – Existing Breach repair under 2003 Maintenance Project located at the end of an oil field location canal west of Superior Canal. (Photo 2, looking west)

Breach 7 – Existing breach repair under 2003 Maintenance Project located at the end of an oil field location canal west of Superior Canal (Photo 3, looking east)

Breach 8 – Earthen embankment refurbishment along Superior Canal completed under the 2003 Maintenance Project (Photo 10, looking south)

Breach 9 – Earthen embankment refurbished along Superior Canal completed under the 2003 Maintenance Project (Photo 12, looking west)

Breach 5&6 – Levee refurbishment along Turtle Bayou beginning near Superior Canal and commencing 1,500’ southward completed under the 2003 Maintenance Project. (Photo 13, looking west)

Photo of vegetation and small tree growth along breach 5 & 6 located along Turtle Bayou (Photo 16, looking southeast)

Location of breach repaired by Apache Corporation along the west bank of Turtle Bayou (Photo 21, looking west)

Breach 1 thru 4 – rock dike constructed under the 2003 Maintenance Project to shore up an existing earthen embankment along Bayou Decade between Jug Lake and Turtle Bayou which was breached in several locations (Photo 22, looking north)

Structure No.24 – fixed crest weir structure located along the east bank of Jug lake (Photo 25 – looking east)

Structure No.24 – south bank tie-in of the fixed crest weir structure looking southeast (Photo 26).

Structure No.23 – Fixed crest weir structure with two (2) variable crest weir sections located along the north shoreline of Jug Lake (Photo 30, looking northeast)

Structure No.23 – earthen embankment tie-in on the north side of the structure were erosion around the sheet pile wall is evident (Photo 37, looking east)

Structure No.21 – fixed crest weir structure with three (3) variable crest sections located along the northwest bank of Jug Lake. (Photo 38, looking west)

Earthen embankment along the west bank of Jug Lake refurbished by the Apache Corporation in 2003 with in-kin service credits. (Photo 46, looking west)

Structure No.20 – north side of rock riprap lined channel across Bayou Loutre entering the west bank of Jug Lake. (Photo 48, looking west)

Structure No.20 – south side of riprap lined channel section across Bayou Loutre entering Jug Lake (Photo 49, looking west)

Structure No.6 – steel sheet pile wall on the west side of the structure located along Bayou Decade south of Bayou Loutre. Slight damage to guard rail and timber piling (Photo 53, looking west)

Earthen embankment with rock revetment located along the north bank of Bayou Decade. (Photo 55, looking northwest)

Structure No.7 – rock riprap plug located along the north bank of Bayou Decade south of Bay Long. (Photo 59, looking north)

Shoreline Protection – earthen embankment with rock revetment located along Voss Canal south of Structure No.10. (Photo 67. looking north)

Structure No.10 – south bank tie-in of rock riprap lined channel entering Bay Long from Voss Canal (Photo 68, looking east)

Structure No.10 – north bank tie-in of rock riprap lined channel located at the entrance to Bay Long from Voss Canal. (Photo 69, looking east)

Small breach located along Carencro Bayou south of Structure No. 14 near an existing power line. (Photo 71, looking east)

Structure No.14 – fixed crest weir structure with a single variable crest section located along the east bank of Carencro Bayou just south of the “Better Livin” camp (Photo 72, looking east)

Large breach located along the south bank of Brady Canal southwest of the Apache camp. Breach connects to a second breach located along Bayou Penchant. (Photo 75, looking southeast)

APPENDIX B

THREE YEAR BUDGET PROJECTIONS

BRADY CANAL / TE28 / PPL3

Three-Year Operations & Maintenance Budgets 07/01/2005 - 06/30/08

Project Manager	O & M Manager	Federal Sponsor	Prepared By
	Babin	*NRCS*	*Babin*

	2005/2006	2006/2007	2007/2008
Maintenance Inspection	$ 5,000.00	$ 5,000.00	$ 5,000.00
Structure Operation	$ 12,000.00	$ 12,000.00	$ 12,000.00
Administration	$ 3,000.00	$ 3,000.00	$ 3,000.00
Maintenance/Rehabilitation			

05/06 Description: Routine Levee Maintenance

E&D	$ 19,312.00		
Construction	$ 49,375.00		
Construction Oversight	$ 11,700.00		
Sub Total - Maint. And Rehab.	$ 80,387.00		

06/07 Description: Routine Levee Maintenance and Navigation Light Repairs

E&D		$ 5,000.00	
Construction		$ 24,000.00	
Construction Oversight		$ 3,000.00	
	Sub Total - Maint. And Rehab.	$ 32,000.00	

07/08 Description: Routine Levee Maintenance

E&D			$ 5,000.00
Construction			$ 20,000.00
Construction Oversight			$ 3,000.00
		Sub Total - Maint. And Rehab.	$ 28,000.00

	2004/2005	2005/2006	2006/2007
Total O&M Budgets	**$ 100,387.00**	**$ 52,000.00**	**$ 48,000.00**
Unexpended O&M Funds			**$453,639**
Remaining O&M Budget Projected			**$200,387**

OPERATIONS & MAINTENANCE BUDGET WORKSHEET

Project: <u>TE-28 Brady Canal Hydrologic Restoration</u>

FY 05/06 –

Administration		$ 3,000
O&M Inspection & Report		$ 5,000
Operation:		$ 12,000
Maintenance:		$ 80,387
E&D:	$ 19,312	
Construction:	$ 49,375	
Construction Oversight:	$ 11,700	

Operation and Maintenance Assumptions:

Structure Operations: 3 – structures are operated twice annually for a total of $6,000 per operation. (2)($6,000) = $12,000

Maintenance:

As a result of the 2005 Annual Inspection, recommendations were made for the repair of two (2) large breaches located near the intersection of Brady Canal and Bayou Penchant and several small breaches located along Little Carencro Bayou as well as levee refurbishment of low areas adjacent to structures 6, 14, 21, 23 & 23. (See detailed cost breakdown in Section II of the 2005 Annual Inspection Report).

FY 06/07 –

Administration		$ 3,000
O&M Inspection & Report		$ 5,000
Operation:		$ 12,000
Maintenance:		$ 32,000
E&D:	$ 5,000	
Construction:	$ 20,000	
Navigation Light Repairs:	$ 4,000	
Construction Oversight:	$ 3,000	

Operation and Maintenance Assumptions:

Structure Operations: 3 – structures are operated twice annually for a total of $6,000 per operation. (2)($6,000) = $12,000
Maintenance:
It is anticipated that miscellaneous earthen breaches will have to be repaired during the fiscal year. The cost above is based on in-kind service credits to the landowner for repair of breaches. From past experience with the maintenance of navigation lights, the service interval is approximately two (2) years at an estimated cost of $4,000.

FY 07/08 –

Administration		$ 3,000
O&M Inspection & Report		$ 5,000
Operation:		$ 12,000
Maintenance:		$ 28,000
E&D:	$ 5,000	
Construction:	$ 20,000	
Construction Oversight:	$ 3,000	

Operation and Maintenance Assumptions:

Structure Operations: 3 – structures are operated twice annually for a total of $6,000 per operation. (2)($6,000) = $12,000
Maintenance:
It is anticipated that miscellaneous earthen breaches will have to be repaired during the fiscal year. The cost above is based on in-kind service credits to the landowner for repair of breaches.

APPENDIX C

FIELD INSPECTION REPORTS

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 17, 2005

Structure No. Site 6

Inspector(s): B. Babin, T. Folse, D. Garber, M. Trosclair, E. Adams L. Triche and A. Domangue

Structure Description: Fixed Crest Weir w/ Barge Bay

Water Level: N/A

Type of Inspection: Annual

Weather Conditions: P. Cloudy and Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Good	pipe rail slightly bent		52 thru 54	**Observations:**
Earthen Wingwalls	Good				Pipe rail along the top of the bulkhead channel cap on the west side of the structure was slightly bent.
Stop Logs Bays timbers, locks hoist etc.					Several galvanized pile caps covering the timber piles were missing or delapidated.
Handrails					Stainless steel cable raps on the southwest timber dolphin appears to be loose.
Grating Hardware etc.					Minor erosion was noted along the rock revetment on the east side of the structure.
Timber Piles	Good				
Timber Wales					
Galv. Pile Caps	Fair	several caps missing			
Cables	Fair	loose on the southwest dolphin			
Signage /Supports	Good				**Structure Description:** 244 linear ft. steel sheetpile fixed crest weir structure with a 70 ft. wide barge bay crossing an oilfield canal on the north side of Bayou Decade west of Jug Lake.
Rock Embankment					The mudline of the 70 ft. wide barge bay is set at an elevation of -0.5 ft. The fixed crest section is set at elevation +0.5 ft. NAVD. The steel sheetpile sections tie into the existing earthen embankment which is constructed to an elevation of +4.0 ft. NAVD.
Eathern Embankment					on each side of the structure. Two (2) batter dolphin piles with navigational aids are located on each side of the structure. Navigational aids include solar powered navigation lights with battery backup and aluminum warning signs attached to batter piles.
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 17, 2005

Structure No. Site 7

Inspector(s): B. Babin, T. Folse, D, Garber, M. Trosclair, E. Adams, L. Triche and A. Domangue

Structure Description: Rock Plug

Water Level : N/A

Type of Inspection: Annual

Weather Conditions: P. Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A			59	**Observation:** Structure 7 appeared to be in very good condition. No signs of settlement along the structure.
Earthen Wingwalls	N/A				
Stop Logs Bays timbers, locks hoist etc.	N/A				
Handrails Grating Hardware etc.	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Cables	N/A				
Signage /Supports	Very Good				
Rock Embankment	Very Good				**Structure Description:** 415 linear ft. rock riprap plug (approximately 6,000 tons of riprap installed) across as oil field access canal on the north side of Bayou Decade wet of Site 6. The top of the riprap plug is was constructed to an elevation of +4.0' NAVD which corresponds to the earthen embankment on each side to the structure. Aluminum warning signs are located in front of the structure along Bayou Decade.
Eathern Embankment	N/A				
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 17, 2005

Structure No. Site 10

Inspector(s): B. Babin, T. Folse, D. Garber, M. Trosclair, E. Adams L. Triche and A. Domangue

Structure Description: Rock Armored Channel Lining

Water Level: N/A

Type of Inspection: Annual

Weather Conditions: P. Cloudy/ Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A			68 & 69	The rock lined channel section appeared to be in good condition with no settlement of the weir section on each side. Earthen tie also looked to be in good condition.
Earthen Wingwalls	N/A				It is unclear, from a visual inspection, whether the section below the water surface is settling or not. A profile survey may be required in the future to assess this portion of the structure.
Stop Logs Bays timbers, locks hoist etc.	N/A				
Handrails Grating Hardware etc.	N/A				
Timber Piles	Good				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Cables	N/A				
Signage /Supports	N/A				
Rock Embankment	Good				**Structure Description:** 275 ft. x 45 ft. wide rock riprap channel liner three (3) feet minimum thickness lining the opening of a interior channel located on the west end of Bay Long intersecting Voss Canal. Aluminum warning signs attached to timber piles are located on both sides of the structure.
Eathern Embankment	N/A				
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 17, 2005

Structure No. Site 14

Inspector(s): B. Babin, T. Folse, D. Garber, M. Trosclair, E. Adams L. Triche and A. Domangue

Structure Description: Fixed Crest Weir w/ Adjustable Stoplogs

Approx. Water Level:

Type of Inspection: Annual

Weather Conditions: P. Cloudy/ Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Good	None	minor paint chipping	72, 73, 74	Slight erosion was noted on the earthen bank tie-ins on both sides of the structure. No breaching around the structure was occurring. The structure itself was in good condition with minor flaking of paint on the handrails of the structure.
Earthen Wingwalls	Fair	moderate erosion			Large cut banks were also noted along the earthen embankments adjacent to the structure.
Stop Logs Bays timbers, locks hoist etc.	Good				Stop logs were in place at the time of the inspection. Logs are scheduled to be removed in mid March.
Handrails Grating Hardware etc.	Good				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	Good				
Cables	N/A				
Signage /Supports	Good				**Structure Description:** 82 linear ft. steel pile fixed crest weir with a six (6) ft. wide variable crest weir structure. This structure consist of 36 ft. fixed crest weir structure (18 ft. on each side of the stop log bay) set at an elevation of 1.0 ft. BML. The six (6) ft. wide variable crest section contains 10 - 4" x 6" stop logs, steel channel guides, locking channels and locks, steel grating walkways, handrails, etc. Aluminum warning signs are located adjacent to structure.
Rock Embankment	N/A				
Eathern Embankment	significant cut banks				
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 17, 2005

Structure No. Site 20

Inspector(s): B. Babin, T. Folse, D. Garber, M. Trosclair, E. Adams L. Triche and A. Domangue

Structure Description: Rock Armored Channel Liner

Water Level: N/A

Type of Inspection: Annual

Weather Conditions: P. Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #
Steel Bulkhead / Caps	N/A	None	N/A	44 & 48
Earthen Wingwalls	N/A			
Stop Logs Bays timbers, locks hoist etc.	N/A			
Handrails Grating Hardware etc.	N/A			
Timber Piles	Good			
Timber Wales	N/A			
Galv. Pile Caps	Good			
Cables	N/A			
Signage /Supports	Good			
Rock Embankment	Good			
Eathern Embankment	N/A			
Rock Armored Earthen Embankment	N/A			

Observations and Remarks

Observation:

Rock riprap channel liner appeared to be in very good condition with no noticeable settlement along the weir bank sections. It is not known from a visual inspection whether the rock lined section below the water is experiencing settlement or not.

Structure Description:

180 ft. x 48 ft. wide loose rock riprap channel lining placed 3 ft. minimum thickness, lining the opening of the canal at the northwest corner of Jug Lake connecting the interior marsh. Aluminum waring signs supported by timber piles are located on both sides of the structure.

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 17, 2005

Structure No. Site 21

Inspector(s): B. Babin, T. Folse, D. Garber, M. Trosclair, E. Adams L. Triche and A. Domangue

Structure Description: Fixed Crest Weir w/ Adjustable Stoplogs

Approx. Water Level : 1.2' NAVD (measurement at structure 23)

Type of Inspection: Annual

Weather Conditions: Partly Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #
Steel Bulkhead / Caps	Good	Paint chipping	None	38, 40, 41
Earthen Wingwalls	Fair	significant erosion		
Stop Logs Bays timbers, locks hoist etc.	Good			
Handrails Grating Hardware etc.	Good	Paint chipping		
Timber Piles	Good			
Timber Wales	Good			
Galv. Pile Caps	Good			
Cables				
Signage /Supports	Good			
Rock Embankment	N/A			
Eathern Embankment	N/A			
Rock Armored Earthen Embankment	N/A			

Observations and Remarks

Observation:

The variable crest weir structure appeared to be in good condition. Stop logs were in-place at the time of the inspection. Scheduled operation in mid March.

Large cut banks noted along the earthen embankment on each side of the structure. Otherwise, the earthen tie-ins on each side of the structure are in fair condition.

Slight erosion observed on the north side of the structure at tie-in.

Paint along the steel bulkhead channel cap is chipping. No corrosion noted.

Structure Description:

100 linear ft. steel sheet pile fixed crest weir with three (3) - 6 ft. wide variable crest sections. Each variable crest sections contains 10 stop logs each measuring 4" x 6" timbers. The variable crest sections can be adjusted from 1.0 ft. BML to 5.0 ft. BML. The sheet pile structure ties into a 15 ft. wide earthen embankment section on each side of the structure. Aluminum warning signs attached to round timber piles are located on each side in front of the structure.

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 17, 2005

Structure No. Site 23

Inspector(s): B. Babin, T. Folse, D. Garber, M. Trosclair, E. Adams L. Triche and A. Domangue

Structure Description: Fixed Crest Weir w/ Adjustable Stoplogs

Approx. Water Level : 1.2' NAVD

Type of Inspection: Annual

Weather Conditions: Partly Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Good	Paint chipping	None	30, 33, 34, 37	**Observation:** The variable crest weir structure appeared to be in good condition. Stop logs were in-place at the time of the inspection. Scheduled operation in mid March. Earten embankment tie-in on the north side of the structure is eroding away exposing the end of the steel bulkhead. Approximately 15' to 20' of material remain on the back side of the wingwall. Continue to monitor condition of earthen wingwall.
Earthen Wingwalls	Fair	severe erosion	N/A		
Stop Logs Bays timbers, locks hoist etc.	Good				
Handrails Grating Hardware etc.	Good				Paint along the steel bulkhead channel cap is chipping. No corrosion noted.
Timber Piles	Good				
Timber Wales	Good				
Galv. Pile Caps	Good				
Cables					
Signage /Supports	Good				**Structure Description:** 100 linear ft. steel sheet pile fixed crest weir with two (2) - 6 ft. wide variable crest sections. Each variable crest sections contains 10 stop logs each measuring 4" x 6" timbers. The variable crest sections can be adjusted from 1.0 ft. BML to 5.0 ft. BML. The sheet pile structure ties into a 15 ft. wide earthen embankment section on each side of the structure. Aluminum warning signs attached to round timber piles are located on each side in front of the structure.
Rock Embankment	N/A				
Eathern Embankment	N/A				
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 17, 2005

Structure No. Site 24

Inspector(s): B. Babin, T. Folse, D. Garber, M. Trosclair, E. Adams, L. Triche and A. Domangue

Structure Description: Fixed Crest Weir

Water Level: +1.2' NAVD (est. at structure 23)

Type of Inspection: Annual

Weather Conditions: Partly Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Good	Paint chipping	None	25, 26, 29	
Earthen Wingwalls	Fair	moderate erosion			Fixed crest weir structure appeared to be in good condition with some erosion noted along the earthen wingwalls on each side of the structure. However, there was no breaching around the structure.
Stop Logs Bays timbers, locks hoist etc.	N/A				
Handrails Grating Hardware etc.	Good				We also noticed that the paint covering the galvanized gaurdrails and steel bulkhead channel cap was chipping.
Timber Piles	Good				
Timber Wales	N/A				
Galv. Pile Caps	Good				
Cables	N/A				
Signage /Supports	Good				
Rock Embankment	N/A				**Structure Description:** 140 ft. steel pile fixed crest weir located adjacent to the southeast corner of Jug Lake. The structure consists of a fixed crest steel sheet pile weir with 60' section set at +4.0'. elev., 30' section set at +1.5' elev., and 50' section set at -03' elev. On either side of the structure is a 15 linear ft. wide earthen wingwall sections construction to +4.0'. NAVD88 to tie into the existing earthen embankments. Aluminum warning signs are set at either side of the 50 linear ft. sections of sheet piling and are supported by timber piles.
Eathern Embankment	N/A				
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 17, 2005

Structure No.

Inspector(s): B. Babin, T. Folse, D. Garber, M. Trosclair, E. Adams L. Triche and A. Domangue

Structure Description: Rock Armored Embankments

Water Level:

Type of Inspection: Annual

Weather Conditions: P. Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Rock Plug Breach 7	Good	None	N/A	2,3,4	Rock Plug located at the end of existing location canal west of Superior Canal was in good condition. Rock dike does not appear to have settled at all since construction completion in 2003. Exising tranasse behind structure was closed with water hyacinth.
Rock Dike Breach 1 thru 4	Good	None	N/A	22,23,24	Rock dike along Bayou Decade between Jug Lake and Turtle Bayou is in good condition with no noticeable settlement or breaching of the structure. Vegetation along the structure appear to be flurishing in several locations.
Rock Dike Rock Revetment	Good	None	N/A	51, 55, 56 61, 62	Rock dike and earthen embankments with rock revetment sections along Bayou Decade west of Jug Lake appear to holding up well with no signs of settlement or breaching. However, the earten embankment section between Jug Lake and Structure No.6 is very low and may require maintenance in the near future.
Rock Revetment	Fair	None	N/A	65,66,67	Rock revetment section located at the intersection of Bayou Decade and Voss Canal was in fair condition with a low area noted at the beginning of the revetment section. This area contains very little earthen material with a small volume of rock remaining. Monitor this area on future site visits.

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 17, 2005

Structure No.

Inspector(s): B. Babin, T. Folse, D. Garber, M. Trosclair, E. Adams L. Triche and A. Domangue

Structure Description: Earthen Embankments

Water Level Inside: N/A Outside: N/A

Type of Inspection: Annual

Weather Conditions: Partly Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Earthen Embankment	Good	slight cut bank	N/A	10	Breach 8 - levee refurbishment along Superior Canal appeared to be in good condition with a slight cut bank noticed along the front face to the embankment. Levee width and elevation was good and vegetation was thick and plentiful.
Earten Embankment	Good	slight cut bank	N/A	12	Breach 9 - a visual inspection of the levee refurbishment along Superior Canal revealed that the earten embankment was in good condition with adequate width and elevation A slight cut bank was noted along the face of the levee. Vegetation was plentiful.
Earthen Embankment	Good	slight cut bank	N/A	13, 14, 16 & 19	Breach 5 & 6 - levee refurbishment along Turtle Bayou from Superior Canal south a distance of 1500' appeared to be in very good condition. The levee with was constructed wider than the design width and appears to be holding up well. Vegetation appeared to be thick but dormant at the time of the inspection.
Earthen Embankment	Poor	Low Area	N/A	21	Low area which could potentially breach in near future was noted in the inspection The low area is located along Turtle Bayou south of Breach 5&6 and north of Bayou Decade. Low area has been repaired by the landowner.
Earthen Embankment	Fair	large cut banks	N/A	45 & 46	Earthen bank refubishement along the west bank of Jug Lake appeared to be in good condition with large cut banks noted along the face of the levee. Although large cut banks exists, the levee width and elevation does not appear to be compromised.
Earthen Embankment	Good	isolated large cut banks	N/A	63 & 64	Earthen embankment sections located along Bayou Decade appear to be holding up well considering the past storm events affecting the area. The elevation and width of these levees are in good shape with thick vegetation present. We did notice several locations with significant cut banks as shown in Photo 64.

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 17, 2005

Structure No.

Inspector(s): B. Babin, T. Folse, D. Garber, M. Trosclair, E. Adams
L. Triche and A. Domangue

Structure Description: Earthen Embankments

Water Level Inside: N/A Outside: N/A

Type of Inspection: Annual

Weather Conditions: Partly Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Earthen Embankment	Poor	significant erosion	N/A	not available	Significant erosion and large cut banks were noted along the east bank of Voss Canal to the pipeline crossing near the rock plug installed by pipeline company. Continue to monitor this location and possible refurbishment on future maintenance Project.
Earthen Embankment	Poor	small breach	N/A	70 & 71	Small breach noted in last inspection report was also inspected and determine to be in the same condition as a year ago. Breach is located at the intersection of Carencro Bayou and Little Carencro Bayou near an existing powerline ROW. Breach shall be repaired on future maintenance project.
Earthen Embankment	poor	large breach		75&77	A large breach was discovered along Brady Canal and Bayou Penchant near the Apache camp site on the northeast side of the project area. Repairs will be required to close breaches.