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

2005 Operations, Maintenance, and Monitoring Report

for

WEST POINTE A LA HACHE SIPHON CONSTRUCTION

State Project Number BA-04
State Funded Project

June 2005
Plaquemines Parish

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West Pointe a la Hache Siphon Construction (BA-04)

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Preface

The Operations, Maintenance, and Monitoring (OM&M) Report format is a streamlined approach which combines the Operations and Maintenance annual project inspection information with the Monitoring data and analyses on a project-specific basis. This report for 2005 includes monitoring data collected through December 2004, and annual Maintenance Inspections through June 2004.

I. Introduction

In 1992, the state-funded West Pointe a la Hache siphon construction (BA-04) project was built to re-introduce (or divert) freshwater from the Mississippi River into the adjacent marshes through a set of eight siphons (Figure 1) which discharge into an outflow pond which empties through four distribution channels. The freshwater re-introduction was intended to replace some of the ecological functions supported by periodic over-bank flooding that occurred prior to the placement of the flood-control levee system.

The West Pointe a la Hache project area lies within the Barataria Basin in Plaquemines Parish, Louisiana. The area is bordered by Lake Judge Perez to the northwest, Bayou Grand Cheniere to the south, Socola Canal to the southeast, and the Mississippi River back protection levee to the north (Figure 2). The project comprises an area of approximately 16,297 acres (6,519 ha) of open water and brackish marsh.

The objective of the West Pointe a la Hache project was to protect the area from continued degradation by introducing freshwater from the Mississippi River. In doing so, the project sought to obtain the benefit of sediment and nutrients introduced into the project area. Specific goals were: (1) to reduce and stabilize mean salinity; (2) improve the growing conditions and increase the relative abundance of the target plant species *Spartina patens*; and (3) increase marsh to open-water ratio.

The principal project features include:

- A set of 8 separate siphons, each consisting of a steel pipe 6 ft (1.8 m) in diameter and 2600 ft (792.5 m) in length, which cross over the west levee of the Mississippi River at West Pointe a la Hache, Louisiana (see Figure 1).

II. Maintenance Activity

a. Project Feature Inspection Procedures

The siphons were last inspected on June 5, 2002. The 2002 Annual Inspection Report contained photographs along with a summary of maintenance notes (Cook 2002).

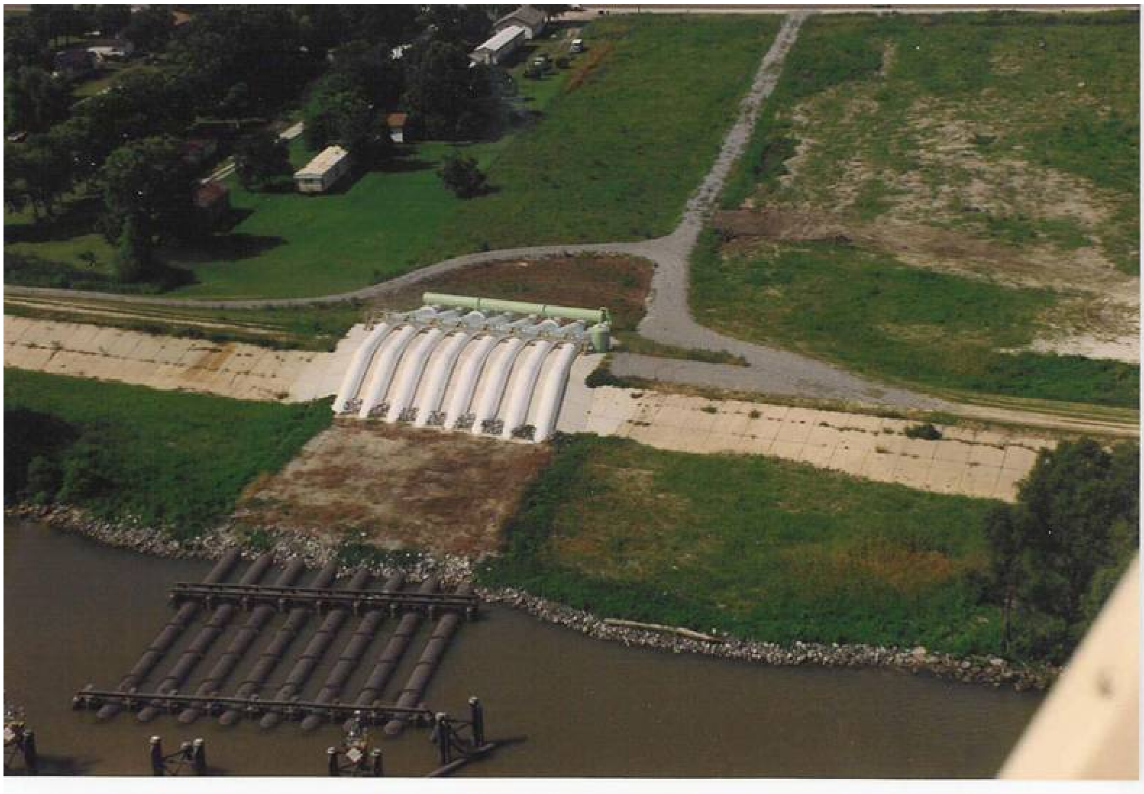

Figure 1. West Pointe a la Hache siphons (BA-04) constructed in 1992 and funded by the state of Louisiana. Mississippi River water was siphoned from the river intakes, discharged into a ponding area, and distributed through four channels into the surrounding marshes.

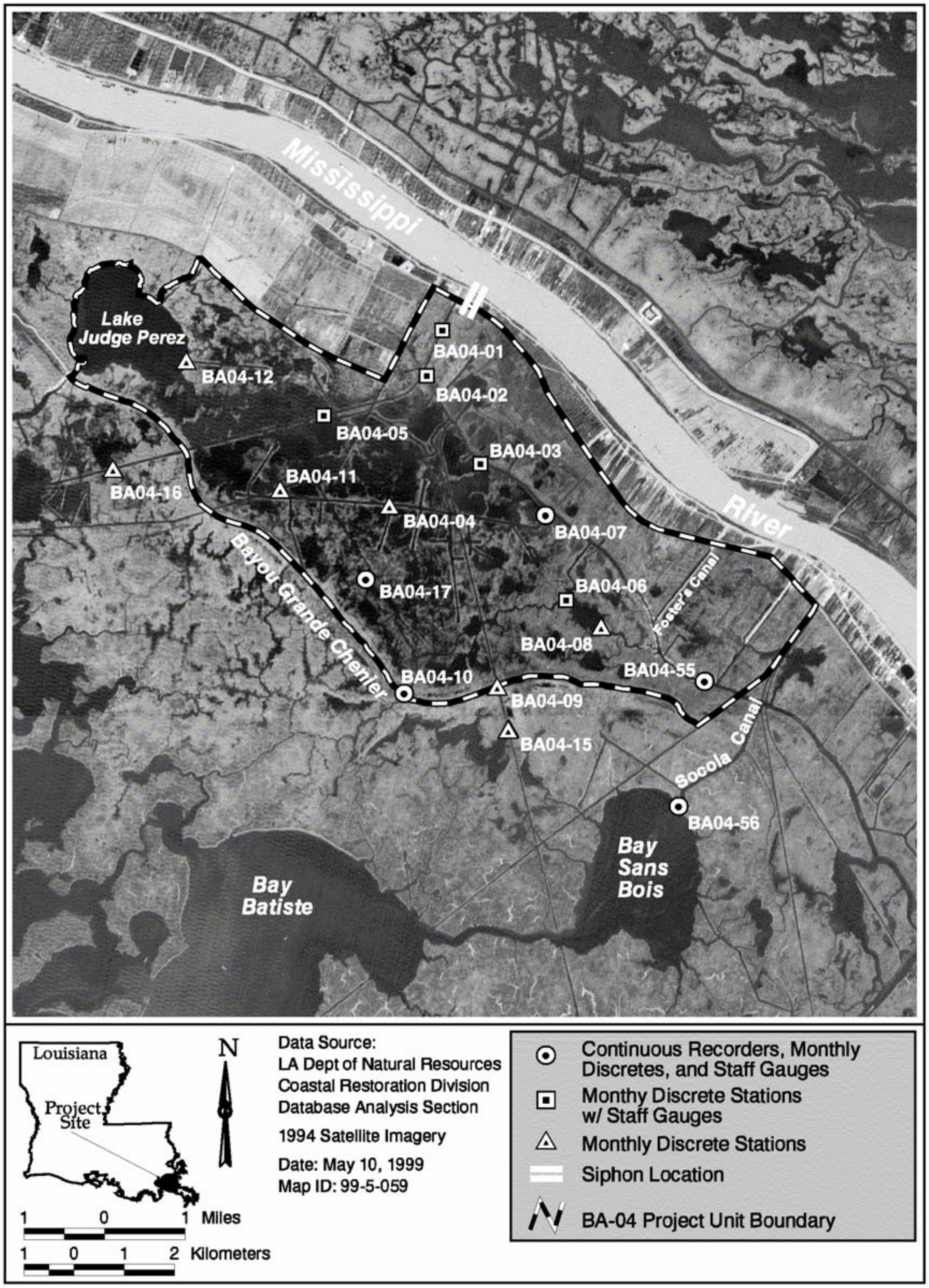

Figure 2. The West Pointe a la Hache (BA-04) project boundary, and stations. Staff gauges were located at stations 1, 2, 3, 5, 6, 7, 10, 17, 55, and 56.

b. Inspection Results

The project was in good structural condition; however, some work was required, as shown in the following table. Most of the anticipated work was related to improving the priming and instrumentation systems. If an improved priming system was available, the siphons would now be operating on an intermediate basis. An increasing in siphon sediment input, if feasible at all, would take detailed analysis.

c. Maintenance Recommendations

No.	Type of Work Recommended	Cost Estimate	Status
1	Repair bitumastic sealers	$ 3,000	Not initiated *
2	Repair or install new staff gauge on river and recalibrate.	$ 5,000	Not initiated *
3	Inspect and service navigation lighting system.	$ 2,000[1]	Not initiated *
4	Install security fencing and additional signs.	$20,000	Not initiated *
5	Engineering study: Improved priming system and improved instrumentation.	$20,000[2]	Study completed. Review by LDNR has been completed. Copy of report has been sent to Natural Resources Conservation Service.
6	Implementation of improved priming system and improved instrumentation.	$ 354,000[3]	On hold. More information is needed. This is in the conceptual state.
7	Engineering study: Inputting more sediment. This would require detailed analysis & review by top LDNR and Plaquemines management.	Need more information	Not initiated

*An agreement is needed between LDNR and Plaquemines Parish before the repairs can be accomplished.
[1] Need for lighting will first be verified.
[2] West Pointe a la Hache share. Naomi will also be charged $20,000.
[3] Estimate by Perrin Carter, Inc.

Another recommendation was that LDNR personnel meet with Plaquemines administrative personnel regarding the above recommendations.

i. Immediate/ Emergency Repairs

No immediate repairs are necessary at this time.

ii. Programmatic/ Routine Repairs

No programmatic repairs are necessary at this time.

III. Operation Activity

a. Operation Plan

Siphon Operation

Daily siphon discharge from 1993 to 2004 was calculated from the head differential between the river and the immediate outfall area plus the number of siphon pipes in operation. Water elevation data were obtained from the Mississippi River gauge readings at West Pointe a la Hache, Louisiana, and the immediate outfall area staff gauge (BA04-01). Operation data, which contained both the date and number of siphon pipes in operation, were obtained from Plaquemines Parish Government (PPG).

b. Actual Operations

Siphon Discharge

The siphons were capable of a maximum discharge of 2144 ft^3s^{-1} (60.7 m^3s^{-1}) with the optimum river stage and full, faultless operations. However, through 2004, the structure was only in operation 74% of the time and averaged 919 ft^3s^{-1} when fully operational (i.e., all eight pipes in operation) and 693 ft^3s^{-1} (26.0 m^3s^{-1}) over the entire period, including times of no flow (Figure 3). In addition, siphon flow varied each year due to not only limited operations, but as a result of seasonal low river stages and droughts. At a water level below 1.5 feet (0.46 m) NAVD88 on the Mississippi River gauge in West Pointe a la Hache, Louisiana, the siphons begin to lose prime and are rendered inoperable. Additional obstacles to operations were: marine fisheries, tropical storms, oil spills, maintenance problems, and staffing limitations within PPG.

IV. Monitoring Activity

This is a comprehensive report and includes all data collected from the pre-construction period and post-construction period through December 2004.

a. Monitoring Goals

The objective of the project is to protect the area from continued degradation by introducing freshwater from the Mississippi River, increasing the inflow of sediment and nutrients into the project area.

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

1. Reduce mean project area salinity.
2. Improve growing conditions for and increase relative abundance of target plant species *Spartina patens*.
3. Increase marsh to open-water ratio.

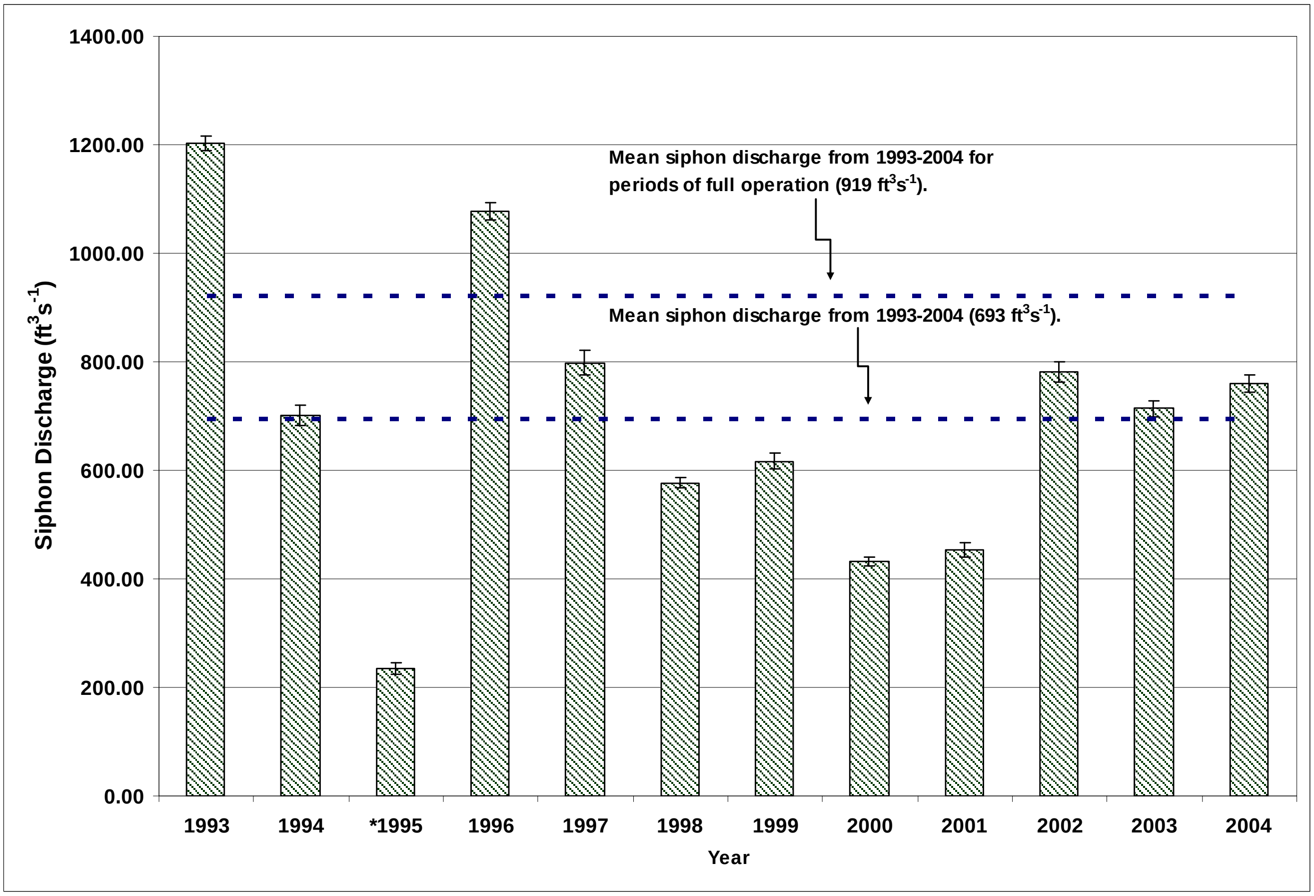

Figure 3. BA-04 yearly mean (±SE) siphon discharge, 1993-2004. Dotted lines represent mean discharge during period when siphons were in full operation and the overall average for 1993-2004. Daily siphon discharge data was estimated from the Mississippi River gauge at West Pointe a la Hache, Louisiana, the immediate staff gauge in the outfall area, and the number of siphons in operation. *Siphons were not operational for nine months during 1995.

b. Monitoring Elements

Salinity

Salinity was monitored hourly at five continuous recorder stations from 1993 to December 2004 (see Figure 2). Discrete salinity was monitored monthly at 17 stations from 1992 to 2004. Data were used to characterize the spatial and temporal variation in salinity throughout the project area. Salinity data will continue to be collected through 2012.

Vegetation

Species composition and relative abundance of emergent vegetation were quantified using techniques described in Steyer et al. (1995). Twenty-one stations were monitored visually in 1992 (pre-construction) and in 1995 (post-construction). Thirty-six 4-m^2 plots were monitored for years 1997, 2001, and 2003, and will continue in 2006 and 2009.

Habitat Mapping

In order to document vegetated and non-vegetated areas, color-infrared aerial photography (1:12,000 scale with ground controls) was obtained following procedures outlined in Steyer et al. (1995). Photography was obtained in 1991 (pre-construction) and 1999 (post-construction) and will be collected in 2009 and 2017.

c. Preliminary Monitoring Results and Discussion

Salinity

Mean daily salinity measured at the continuous recorders was lower during periods when all siphons were in major or minor operation vs. no-flow. This is an indication that the siphons are capable of reducing salinity in the project area (Figure 4). Further evidence from discrete salinity monitoring indicated that salinity levels were higher in the project area during 1995 when the siphons were not operating and weather patterns were normal during that year (Figure 5). In addition, mean monthly discrete salinity readings indicated that stations in the northern and western sections of the project area were similar to one another and salinity in both areas was lower than in the southern project area. This suggests that the effects of the diversion on salinity decreases with distance from the siphons. Salinity during these periods was influenced by factors other than siphon operation, particularly normal seasonal variability within the Barataria Basin (Swenson and Swarzenski 1995; Wiseman et. al. 1990). For example, salinity is generally lowest throughout the Barataria Basin during the spring, which corresponds to the period of highest flow for the Mississippi River. Siphon flow is a function of river stage; thus the ability to control salinity during drought or normal low river stages (e.g., late summer and fall) was limited. Two periods when salinity increased were 1995 and 1999. During 1995 siphons were closed 9 out of the 12 months, thus salinity levels were higher that year. Drought conditions persisted from September 1999 through December 2000, thus mean yearly salinity levels in the project area increased greatly while siphon operation decreased substantially due to low river stage (see Figure 5).

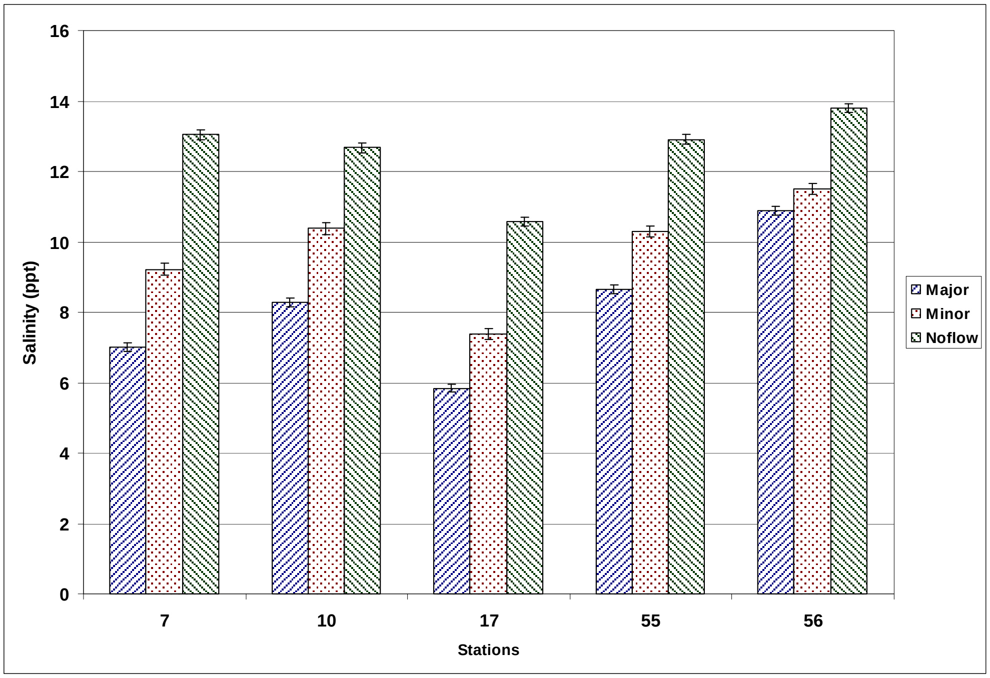

Figure 4. BA-04 mean (±SE) salinity for the period 1999-2004 for three operational categories at continuous recorder stations (major discharge >1,072 ft^3s^{-1} [30.36 m^3s^{-1}]; minor discharge > 0 <1,072 ft^3s^{-1}; no flow =0 ft^3s^{-1}).

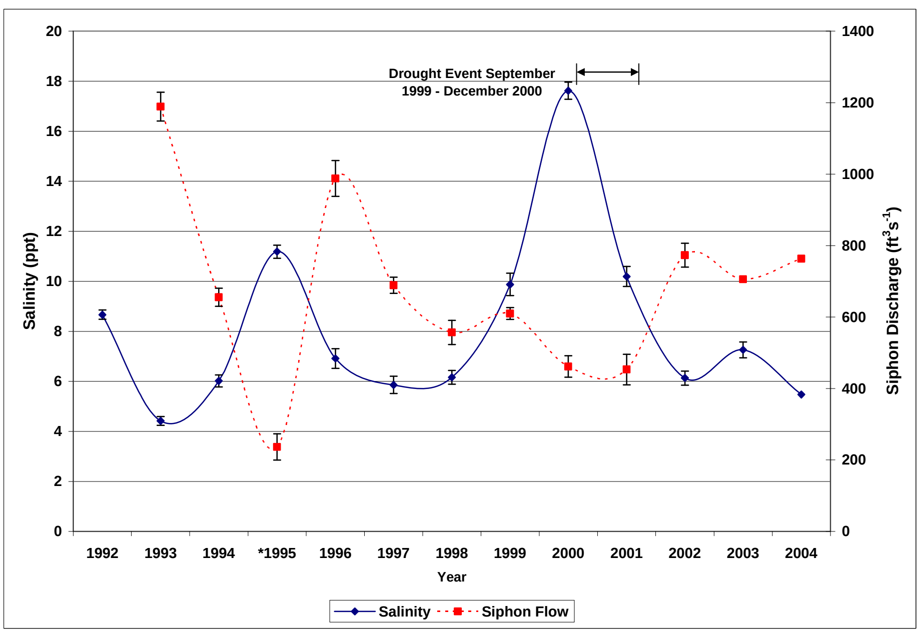

Figure 5. BA-04 West Pointe a la Hache project yearly mean (±SE) salinity and siphon discharge. Salinity was measured at 17 discrete monthly hydrologic stations from 1992 to 2004. *Siphons were not operational for nine months during 1995 and operated at a minimum in 2000.

Water Elevation

Water level from monthly staff gauge readings collected during siphon operation was significantly higher ($P<0.05$) at the monitoring station nearest the outfall structure (station 1) than at the remaining stations. The mean water level at station 1 during major flow conditions

(>1,072 ft^3s^{-1} [30.36 m^3s^{-1}]) was 1.1 ft (0.34 m) higher than mean water level measured during no-flow conditions. However, increased water surface elevations dissipated with distance from the discharge area (Boshart 2003).

Vegetation

Different methodologies, times of year, and different sites were used for the 1992 and 1995 surveys, than were used for the 1997, 2001, and 2003 surveys. For example, stations during 1992 and 1995 consisted of 20 sampling sites and were visually surveyed as opposed to 36 Blaun-Blanquet 4-m^2 sites used in 1997, 2001, and 2003. Therefore, vegetation sample data were not statistically compared. Vegetation data within the project area suggested a freshening between 1992 and 1997 (Evers and Sasser 2002). Between 1997 and 2001 vegetation type at many sites remained the same; however, some sites (farthest from the siphon) became more saline and other sites (closest to the siphon) became fresher. Drought conditions from 1999 to 2000 were most likely the cause for some sites reverting to more saline vegetation types (Evers and Sasser 2002). For the 1997, 2001, and 2003 surveys, *Distichlis spicata*, *Spartina alterniflora*, *Spartina patens, Polygonum punctatum*, and *Vigna luteola* remained the dominant species in both percent cover and frequency of occurrence (Figure 6 and Table 1). Stations located in the southern part of the project area were less diverse than those stations located closer to the diversion. This is an indication that areas farthest from the diversion site are influenced less by the diversion waters. The southern stations consisted mainly of *S. alterniflora*, *S. patens*, and *D. spicata.* Vegetation community types, based on Visser et al. 1998, were characterized as oligohaline mix for stations north and nearest to the diversion, mesohaline mix for stations west and southwest, and polyhaline oystergrass for the southernmost stations (Boshart 2003).

Habitat Mapping

Historical loss rates for the project area taken from the Pointe a la Hache Quadrangle were as follows: 0.18%/yr through 1932-1956, 0.54%/yr through 1956-1974, 1.10%/yr through 1974-1983, and 1.29%/yr through 1983-1990. The West Pointe a la Hache project area lost 460.4 acres (184.2 ha) of land between 1991 and 1999 (Figures 7 and 8). This represents a loss of 7.2% of land present in 1991, or 1.03% per year. The siphon area lost a total of 21.2 acres (8.5 ha), constituting a loss of 10.7% of land or 1.46% per year. Although the project continues to lose land, rates of loss are lower than recent historical rates, except in the siphon area. Land loss comparisons were made between January 1999, when siphons were running at a mean of 1,248 ft^3s^{-1} (35.34 m^3s^{-1}), and November 1991, when there were no siphons or distributary channels yet constructed. Therefore, higher land loss rates calculated for the siphon area may have been due to elevated water levels in adjacent areas during siphon operation. In addition, direct loss of land from construction of distrubutary channels likely affected rates as well.

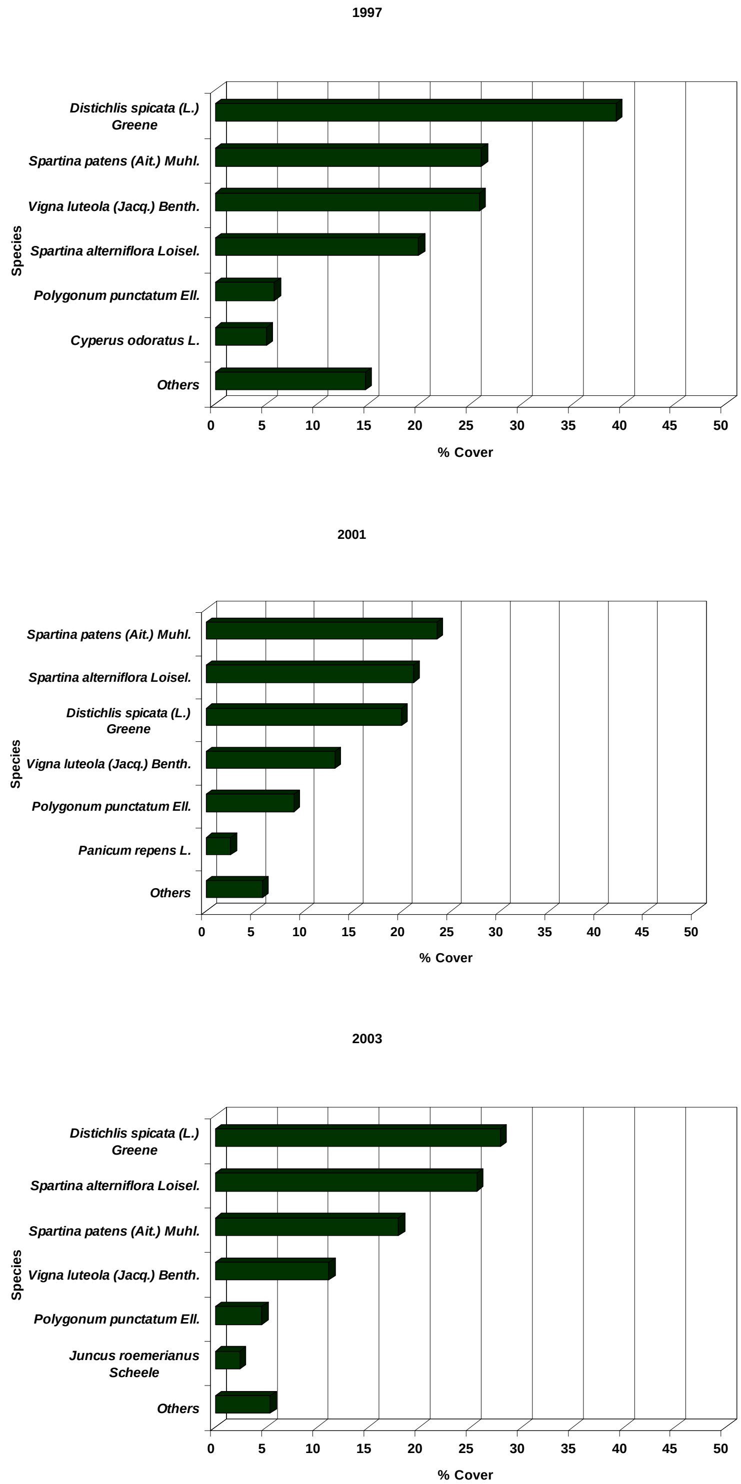

Figure 6. Mean percent cover of dominant vegetative species across all 4-m^2 plots during 1997, 2001, and 2003 vegetation surveys in the BA-04 West Point a la Hache project area.

Table 1. The total number of species observed and percentage of vegetation plots each species occurs in the West Pointe a la Hache Project (BA-04).

Scientific Name	Common Name	Occurrence (%) 1997	2001	2003
Alternanthera philoxeroides (Mart.) Gris	Alligatorweed	3.85	2.94	2.94
Amaranthus australis (Gray) Sauer	Southern amaranth	.	8.82	.
Amaranthus L.	Pigweed	.	.	11.76
Ammannia coccinea Rottb.	Valley redstem	.	.	2.94
Ammannia latifolia L.	Pink redstem	.	.	2.94
Baccharis halimifolia L.	Eastern baccharis	.	2.94	.
Colocasia esculenta (L.) Schott	Coco yam	.	2.94	2.94
Cynanchum angustifolium Pers.	Gulf coast swallow-wort	.	.	2.94
Cyperus L.	Flatsedge	.	.	2.94
Cyperus odoratus L.	Fragrant flatsedge	19.23	8.82	8.82
Distichlis spicata (L.) Greene	Seashore saltgrass	69.23	67.65	70.59
Echinochloa walteri (Pursh) Heller	Coast cockspur	3.85	.	5.88
Eleocharis cellulosa Torr.	Gulf coast spikerush	.	.	2.94
Ipomoea L.	Morning-glory	.	.	2.94
Ipomoea sagittata Poir.	Saltmarsh morning-glory	11.54	5.88	5.88
Iva frutescens L.	Bigleaf sumpweed	.	2.94	2.94
Juncus effusus L.	Common rush	.	8.82	.
Juncus roemerianus Scheele	Needlegrass rush	3.85	.	5.88
Kosteletzkya virginica (L.) K. Presl ex	Virginia saltmarsh mallow	3.85	.	.
Lythrum lineare L.	Wand lythrum	7.69	.	8.82
Panicum L.	Panicgrass	.	.	2.94
Panicum hemitomon J.A. Schultes	Maidencane	.	2.94	.
Panicum repens L.	Torpedograss	.	5.88	.
Paspalum distichum L.	Knotgrass	11.54	.	.
Paspalum L.	Crowngrass	3.85	.	.
Pluchea odorata (L.) Cass.	Sweetscent	3.85	.	.
Polygonum punctatum Ell.	Dotted smartweed	15.38	23.53	20.59
Schoenoplectus robustus (Pursh) M.T. Str	Sturdy bulrush	3.85	.	5.88
Setaria magna Griseb.	Giant bristlegrass	.	2.94	.
Solidago L.	Goldenrod	.	.	5.88
Solidago sempervirens L.	Seaside goldenrod	.	2.94	.
Sorghum halepense (L.) Pers.	Johnsongrass	.	11.76	2.94
Spartina alterniflora Loisel.	Smooth cordgrass	53.85	47.06	50.00
Spartina patens (Ait.) Muhl.	Marshay cordgrass	46.15	52.94	41.18
Symphyotrichum subulatum (Michx.) Nesom	Eastern annual saltmarsh aster	7.69	.	.
Symphyotrichum tenuifolium (L.) Nesom	Perennial saltmarsh aster	11.54	8.82	2.94
Toxicodendron radicans (L.) Kuntze	Eastern poison ivy	3.85	.	.
Vigna luteola (Jacq.) Benth.	Hairypod cowpea	46.15	47.06	44.12
Vitis L.	Grape	11.54	.	.
Number of species		20	19	25

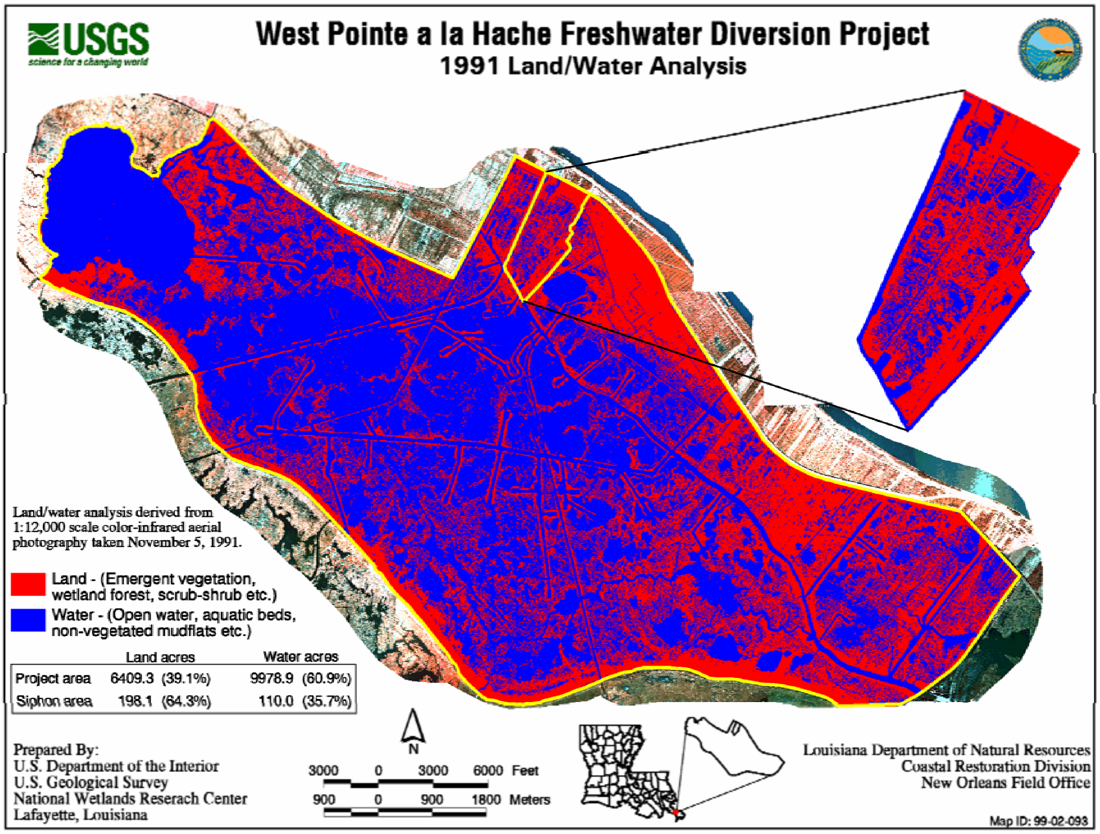

Figure 7. West Pointe a la Hache project area classification of 1991 data. GIS land/water analysis figures for project and siphon area (inset) before construction.

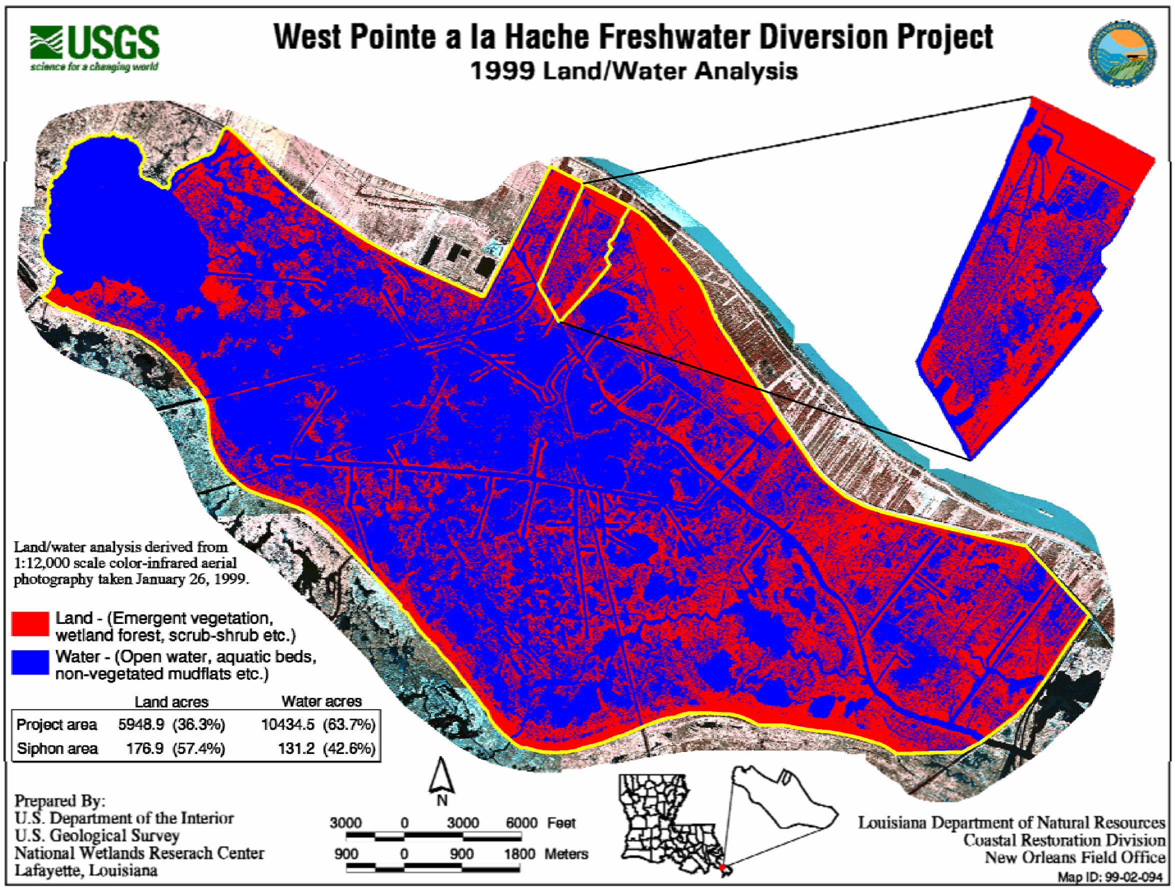

Figure 8. West Pointe a la Hache project area classification of 1999 data. GIS land/water analysis figures for project and siphon area (inset) after construction.

V. Conclusions

a. Project Effectiveness

The first goal of the project, the reduction of salinity, was partially met. Salinity levels were reduced at data collection sites during periods of major and minor flow compared to no-flow conditions. Results from hydrologic modeling of the West Pointe a la Hache Outfall Management Project (BA-04c) indicated that salinity reduction was possible in the magnitude of 5 to 10 ppt during siphon discharge periods (Fenstermaker and Associates 2004). A second goal of the project, to improve growing conditions for and increase the relative abundance of *S. patens,* was not met. Survey results showed that the percent cover of *S. patens* decreased marginally in the project area from 1997 through 2003. It was recommended (Evers and Sasser 2002) that looking at change in the overall plant community (i.e., vegetation types) instead of change in a single species (i.e., *S. patens*) better reflected the effects of diverting freshwater into the coastal marsh. Their results indicated that the vegetation community types became fresher over the period 1992-1997. Drought conditions affected the vegetation community during 1997-2001 as indicated by a reversion to higher-salinity vegetation at some stations in 2001. A third goal, increasing marsh to open water, has not been attained. Aerial photography analysis indicated that land loss was still occurring in the project area from the period 1991 through 1999. However, land loss has decreased in relation to the historical loss rates.

b. Recommended Improvements

At this time, an automated priming system is recommended to enable the siphons to promptly resume operation once the river stage is at an appropriate level. In, addition, flow meters or gauges are recommended to accurately record siphon discharge.

c. Lessons Learned

The monitoring of this project increased the learning curve (lessons learned) for wetland projects of this type. Lessons learned include the following: (1) project goals should have been quantified as much as possible to aid evaluation of project effectiveness; (2) a range of flow (i.e., quantifiable) should have been used in modeling, instead of just determining “with” or “without” flow; (3) outfall management should have been considered from the beginning planning stages; (4) hydrodynamic and salinity transport numerical modeling should have been considered to assess the impact of the proposed project features, and determined if the proposed project features would help achieve the primary goals of the project; and (5) a reference area should have been included during the project planning or developmental stages of this project, but this can be addressed in the future with the Coastwide Reference Monitoring System-*Wetlands* (CRMS *Wetlands*).

VI. References

Boshart, W. 2003. BA-04 West Pointe a la Hache siphon construction summary data and graphics. Louisiana Department of Natural Resources, Coastal Restoration Division, Baton Rouge, La. 51 pp.

Cook, V. 2002, 2002 Annual inspection report. BA-04 West Pointe a la Hache siphon construction project. Louisiana Department of Natural Resources, Field Engineering Section, Baton Rouge, La.

Evers, D. E., and C. E. Sasser. 2002. CWPPRA Adaptive management review BA-04 (West Pointe a la Hache) vegetation. Unpublished report prepared for the Louisiana Department of Natural Resources/Coastal Restoration Division, Coastal Ecology Institute, Baton Rouge, La.

Fenstermaker and Associates. 2004. Hydrodynamic modeling of the West Pointe a la Hache outfall management project (BA-04c). Unpublished report prepared for the Louisiana Department of Natural Resources and the Natural Resources Conservation Service, Baton Rouge, La. 139 pp.

Steyer, G. D., R. C. Raynie, D. L. Steller, D. Fuller, and E. Swenson. 1995. Quality management plan for the Coastal Wetlands Planning, Protection, and Restoration Act monitoring program. Open-file series no. 95-01 (revised June 2000). Louisiana Department of Natural Resources, Coastal Restoration Division, Baton Rouge. 97 pp.

Swenson, E. M., and C. M. Swarzenski. 1995. Water levels and salinity in the Barataria-Terrebonne Estuarine System . In D. J. Reed, ed. Status and Historical Trends of Hydrologic Modification, Reduction in Sediment Availability, and Habitat Loss/Modification in the Barataria and Terrebonne Estuarine System. BTNEP Publ. No. 20, Barataria-Terrebonne National Estuary Program, Thibodaux, La. 338 pp.

Visser, J. M., C. E. Sasser, R. H. Chabreck, and R. G. Linscombe. 1998. Marsh vegetation types of the Mississippi River Deltaic Plain, USA. Estuaries 21:818-828.

Wiseman, W. J., E. M. Swenson, and F. J. Kelly. 1990. Control of estuarine salinities by coastal ocean salinity. In Residual Currents and Long-Term Transport, ed. R. T. Cheng, 184-93. Coastal and Estuarine Studies, Vol. 38. New York: Springer- Verlag.