Coastal Protection and
Restoration Authority of Louisiana

State of Louisiana
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2013 Operations, Maintenance, and Monitoring Report

for

Mississippi River Sediment Delivery System–Bayou Dupont (BA-39)

State Project Number BA-39
Priority Project List 12

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Jefferson and Plaquemines Parishes

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Operations, Maintenance, and Monitoring Report
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Preface

The 2013 Operations, Maintenance, and Monitoring (OM&M) Report for Mississippi River Sediment Delivery System–Bayou Dupont (BA-39) includes monitoring data collected from January 2010–December 2012 and details from the most recent monitoring inspection, which was conducted May 2, 2013. This is the first OM&M report for BA-39; however, the O&M plan, project completion report, and other documents pertaining to BA-39 can be accessed through the Coastal Protection and Restoration Authority's (CPRA) library, which is available through CPRA's website at *http://coastal.louisiana.gov/*.

I. Introduction

Mississippi River Sediment Delivery System–Bayou Dupont (BA-39) is funded through the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA), with the United States Environmental Protection Agency (USEPA) as the federal sponsor. This project was included on the 12th CWPPRA priority project list (PPL 12). The BA-39 marsh creation project used sediment hydraulically dredged from the Mississippi River to build a marsh platform in an area that lies within a rapidly eroding and subsiding section of the Barataria Landbridge. Now converted to mostly open water, the degraded condition of marsh in this region is due to a combination of factors including subsidence, lack of riverine sediment input (Baumann et al. 1984), and the alteration of hydrology resulting from the dredging of oil and gas canals (Sasser et al. 1986). Monitoring of this project is particularly important because it is the first time a CWPPRA project has used sediment dredged from the Mississippi River to create marsh.

The BA-39 project area is located on the west bank of the Mississippi River in Jefferson and Plaquemines Parishes, approximately 3.7 miles northwest of the town of Myrtle Grove, LA (Figure 1). The project area is bordered on the east by the Plaquemines Parish flood protection levee, to the north by Cheniere Traverse Bayou, and to the west and south by pipeline canals. The BA-39 project area is nested within another CWPPRA project: Naomi Outfall Management (BA-03c). Information on this siphon diversion project that is sponsored by the National Resource Conservation Service can be found on CPRA's website through the library document referencing system.

Construction of BA-39 began in April 2009, with sediment delivery into the project area starting a few months later on November 11, 2009. The final day of sediment delivery was December 25, 2009, and project construction was officially completed on May 10, 2010. Sediment was pumped to approximately +2.0′ ± 0.3′ NAVD88 into both of the marsh creation cells (ABMB Engineers, Inc. 2011). This elevation is higher than the target elevation for the marsh due to the predicted rapid settlement of the dredged material that occurs during the first few years post-construction. A targeted marsh elevation of +1.3′ NAVD88 was chosen based on observations of local, natural *Spartina patens* (saltmeadow cordgrass) marsh. This elevation should provide the flooding conditions best-suited for sustaining healthy marsh vegetation in the project area (Thompson 2007).

The perimeter of the BA-39 marsh platform was planted with approximately 5,000 *Paspalum vaginatum* (Brazoria seashore paspalum) plugs and 21,000 *Spartina alterniflora* (Vermilion smooth cordgrass) plugs between May 4, 2010 and June 3, 2010 (Faust 2010). Both species are used to stabilize soils for dredge fill marsh creation projects (Fine and Thomassie 2000a, 2000b).

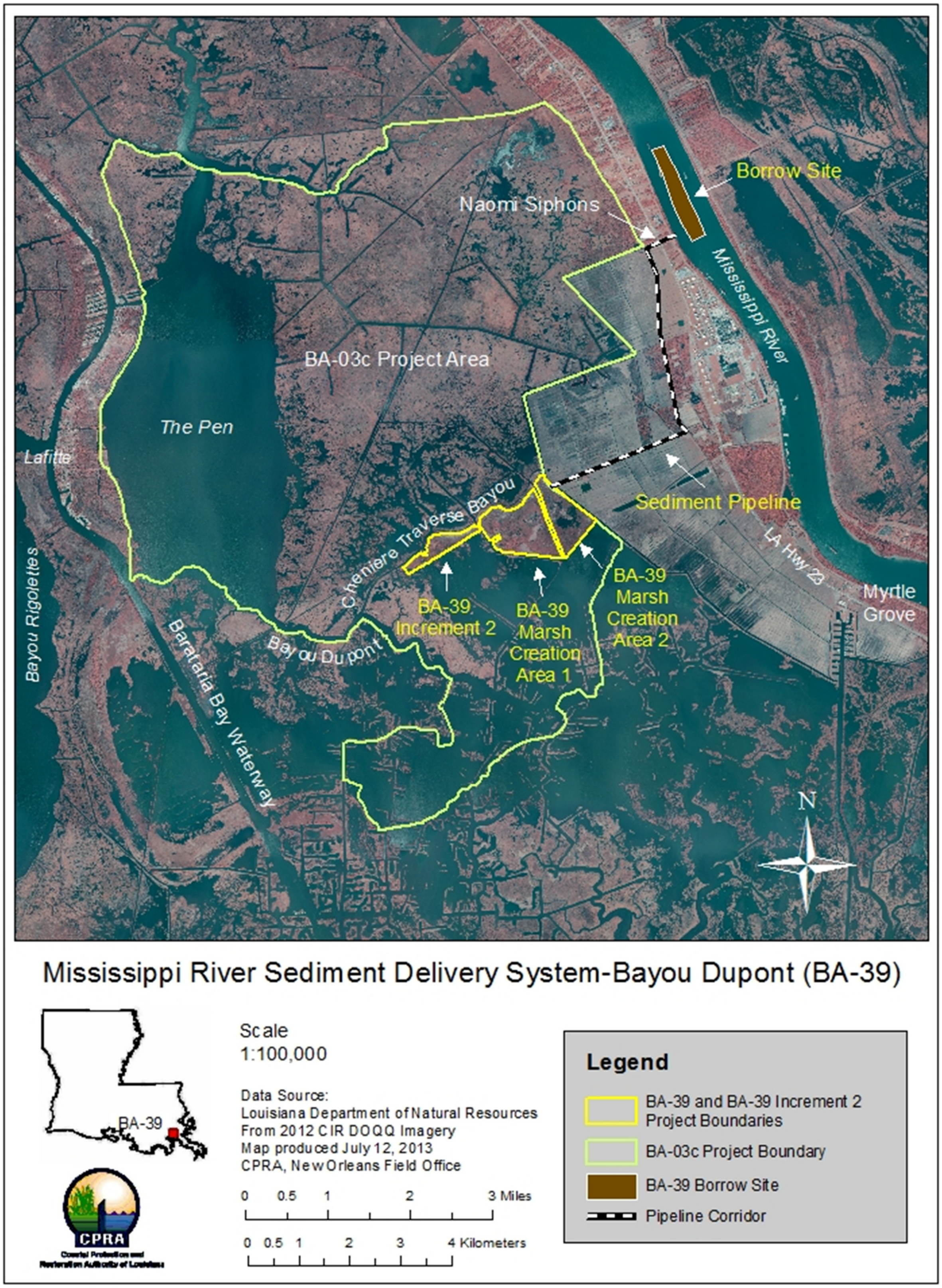

Figure 1. Location of Mississippi River Sediment Delivery System–Bayou Dupont (BA-39) and BA-39 Increment 2 project areas.

BA-39 Project Features

The as-built principal project features of the Mississippi River Sediment Delivery System–Bayou Dupont project (BA-39) include the following:

- Approximately 484 acres of marsh fill (Marsh Creation Area 1 and Marsh Creation Area 2)
- Approximately 25,935 linear feet of containment dikes
- One 95 linear foot, 48 inch diameter casing that was left in place as a crossing under the New Orleans & Gulf Coast Railroad for future use
- One 194 linear foot, 48 inch diameter casing that was left in place under Highway 23 for future use

During construction, the sediment fill area of BA-39 was expanded to the west through the addition of Increment 2 (Figure 1). Increment 2 was sponsored by the National Oceanographic and Atmospheric Administration (NOAA) and was funded by the American Recovery and Reinvestment Act (ARRA) through a grant administered by NOAA. Additional funding was provided through the CWPPRA grant administered by USEPA. Increment 2 data are analyzed separately in this report because monitoring was conducted on a limited basis, with the final monitoring event occurring in 2011.

BA-39 Increment 2 Project Features

The as-built principal project features of the Mississippi River Sediment Delivery System–Bayou Dupont project (BA-39) Increment 2 include the following:

- Increment 2: approximately 84 acres of marsh fill
- Increment 2: approximately 6241 linear feet of containment dikes

II. Maintenance Activity

a. Project Feature Inspection Procedures

The purpose of the annual inspection of the Mississippi River Sediment Delivery System–Bayou Dupont project (BA-39) is to evaluate the constructed project features and to prepare an inspection report detailing the condition of project features and recommended corrective actions needed. The inspection procedure consists of a site visit with a visual inspection of the project features. Should it be determined that corrective actions are needed, CPRA shall provide in the inspection report a detailed cost estimate for engineering, design, supervision, inspection, and construction contingencies, and an assessment of the urgency of such repairs. The annual inspection report also contains a summary of maintenance projects and an estimated projected budget for the upcoming three years for operation, maintenance and rehabilitation.

An inspection of BA-39 was conducted on May 2, 2013 by Peter Hopkins, Danielle Richardi, and Erin Plitsch of CPRA. There was a light wind and partly cloudy skies during the inspection. Photographs from this inspection are included in Appendix A. The three-year projected operation, maintenance and monitoring budget is included in Appendix B, and the field inspection notes are included in Appendix C.

b. Inspection Results

Marsh Creation Areas

The containment dikes and fill areas appeared to be holding up well. The fill areas have varying degrees of vegetation and no further vegetative plantings are planned at this time. The gaps appear to be allowing tidal exchange in their immediate areas. Although not considered to be project features, the two landowner-maintained crossings between fill areas have been severely damaged by Hurricane Isaac and are no longer serviceable, and approximately 1,000 feet of the relic canal on the south side of Marsh Creation Area 1 has partially silted in.

Railroad and Highway Crossings

The casings under the New Orleans & Gulf Coast Railroad and Highway 23 are underground and are not visible for inspection.

c. Maintenance Recommendations

Mississippi River Sediment Delivery System–Bayou Dupont (BA-39) is performing as intended. No additional vegetative plantings are planned at this time.

Immediate Repairs

No immediate repairs are necessary at this time.

Programmed Maintenance

Continue to monitor the condition of the fill area and crossings of the highway and railroad.

III. Operation Activity

a. Operation Plan

There are no operations associated with BA-39.

b. Actual Operations

There are no operations associated with BA-39.

IV. Monitoring Activity

a. Monitoring Goals

The goals of BA-39 are to restore/create approximately 372 acres and nourish approximately 99 acres of emergent marsh in an area that was mostly open water (USEPA, LDNR 2007).

The introduction and placement of sediments through the use of dedicated dredging is consistent with the Louisiana's Comprehensive Master Plan for a Sustainable Coast, specifically, the Barataria Marsh Creation Component (CPRA 2012).

b. Monitoring Elements

Monitoring includes three BA-39 project-specific monitoring sites (BA39-01, BA39-02, and BA39-03) where data are collected to measure project success as based on project goals (Figure 2). Data collected from these sites are compared to data from nearby Coast-wide Reference Monitoring System-*Wetlands* (CRMS-*Wetlands*) stations and BA-03c project-specific stations to compare characteristics between the created marsh and local, natural marsh (Figure 3). Monitoring for Increment 2 is analyzed separately in this report because it was conducted on a limited basis, with the final monitoring event occurring in 2011.

Land-Water Analysis

Land-water analysis of aerial photography is used in conjunction with topographic surveys of the project area to evaluate the project's success of creating a sustainable marsh platform. Land to water ratios in the project area are determined using CRMS aerial photography (Z/I Imaging digital mapping camera) with 1-meter resolution. The photography is georectified using standard operating procedures described in Steyer et al. (2000). The initial aerial photography was collected on November 14, 2012 and the final photography is tentatively scheduled for fall 2017, dependent on the scheduling of CRMS coastwide flights.

Elevation (Topographic Surveys)

Data from topographic surveys are being compared over time to determine if the dredged material is settling at the predicted rate to reach the target marsh elevation of +1.3′ NAVD88 at year 10. Post-construction topographic surveys were conducted in 2011 and will be conducted again in 2013 and 2015. These surveys are performed along the same transects as the as-built survey in 2010. Transects are spaced at intervals of 500 feet and points are taken approximately every 50 feet along the transects.

Vegetation

Vegetation data are used to assess how well the platform is being colonized by marsh vegetation and to compare the vegetation in the created marsh to that of local, natural marsh. Surveys of marsh vegetation are conducted at each of the three BA-39 project-specific monitoring sites following CRMS methodology (Folse et al. 2012). The sites contain ten 2 m x 2 m vegetation stations located along a 288 m diagonal transect within a 200 m x 200 m square. Examples of data collected at the stations include species composition, total percent cover, percent cover of each species and vegetation layer, average height of the dominant species and each vegetation layer, and the depth of water on the marsh surface. Vegetation sampling was conducted in 2010 and 2011 and is scheduled again for 2015, 2018 and 2021. Vegetation was also surveyed at six 2 m x 2 m stations in Increment 2 in 2010 and 2011 using funds provided through the ARRA grant. Although monitoring will not be continued at these stations, data from these surveys will be summarized in this report.

Soil Properties

Soil data are used to monitor changes in soil properties over time and to compare soil properties in the created marsh to those in local, natural marsh. Soil cores were collected and analyzed from each of the three BA-39 project-specific monitoring sites in 2010 and will be collected again in 2014 and 2019 following CRMS methodology (Folse et al. 2012). Soil properties analyzed include percent organic matter, bulk density, soil pH, salinity (EC), moisture, and wet/dry volume. This report will discuss percent organic matter and bulk density.

Rod Surface Elevation Table (RSET)

A Rod Surface Elevation Table (RSET) is used at each of the three BA-39 project-specific monitoring sites to measure precise changes in marsh surface elevation over time relative to a fixed datum (NAVD88). RSET data have been collected and analyzed bi-annually in the spring and fall since 2011 and will continue to be collected through 2020 following CRMS methodology (Folse et al. 2012).

Accretion

Vertical accretion data are analyzed in conjunction with RSET data to provide rates of shallow subsidence at each site. Vertical accretion above a feldspar marker horizon has been measured at each of the three BA-39 project-specific monitoring sites (concurrently with RSET data collection) biannually in the spring and fall since 2011 and will continue to be measured through 2020 following CRMS methodology (Folse et al. 2012).

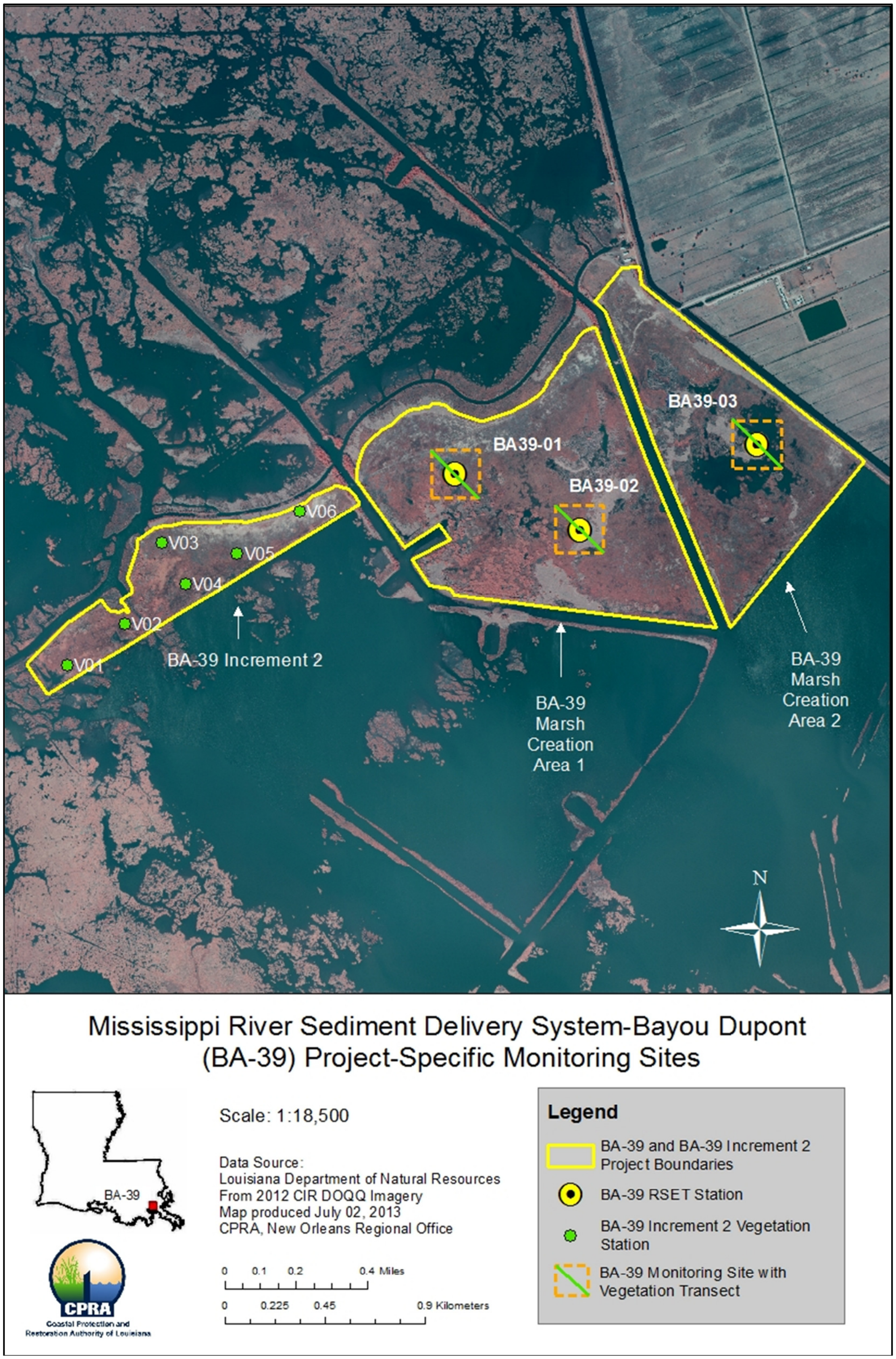

Figure 2. Location of BA-39 and BA-39 Increment 2 project-specific monitoring sites and stations.

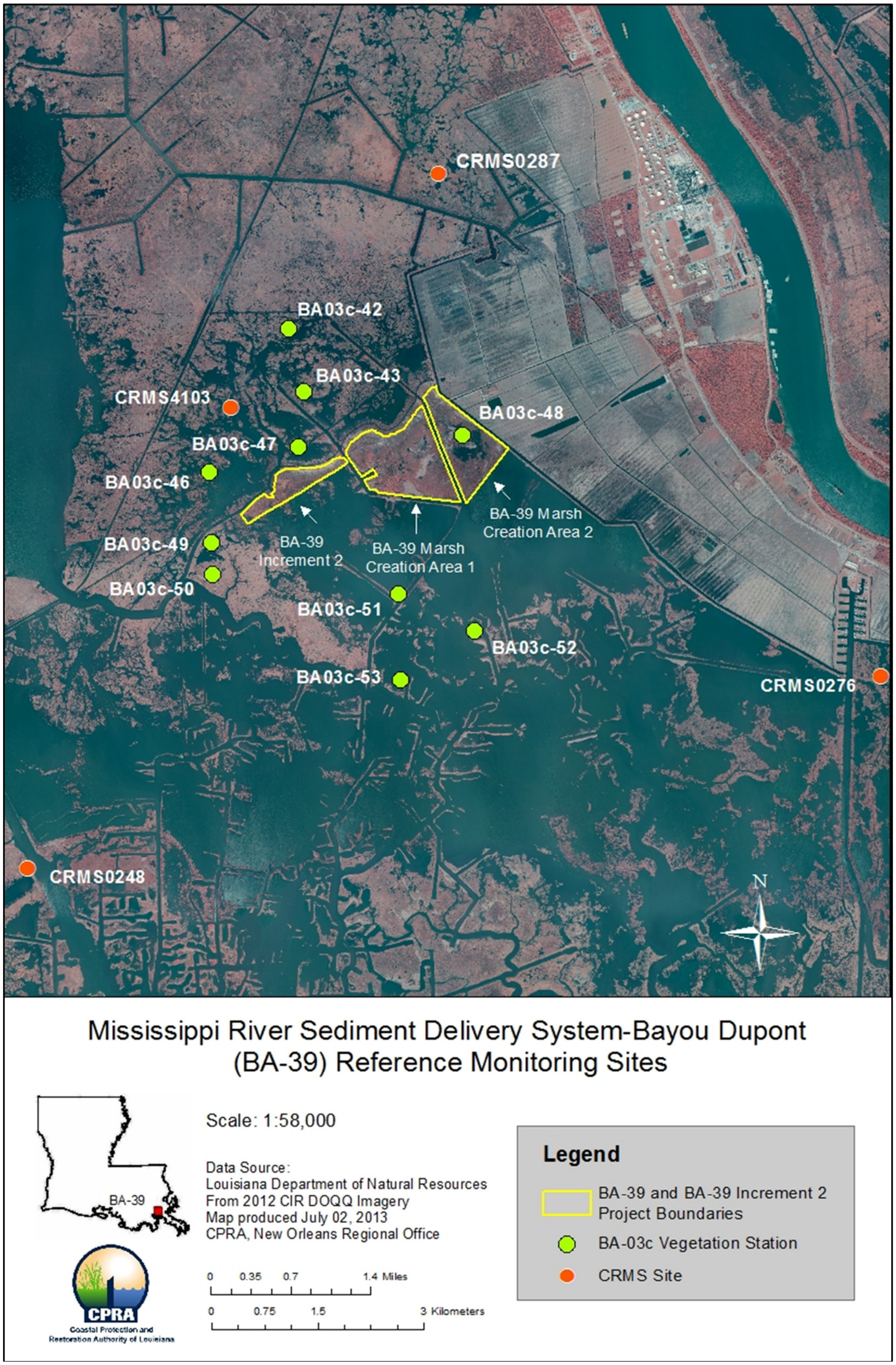

Figure 3. Location of CRMS sites and BA-03c project-specific stations being used as reference stations for BA-39.

c. Monitoring Results and Discussion

i. Land-Water Analysis

Land-water analysis is a useful tool to measure the amount of land that has been created with a marsh restoration project and to track the sustainability of that land over the project's life. A limit of this analysis is that land habitat types such as emergent marsh, scrub-shrub and bare ground are not differentiated from one another. Fortunately, vegetation analyses provide important information that can be used in conjunction with land-water analyses to help define the predominant habitat types and record changes in vegetative cover and species.

The goals of BA-39 are to restore/create 372 acres and nourish approximately 99 acres of emergent marsh in an area that was mostly open water (USEPA, LDNR 2007). The goals for BA-39 do not pertain to Increment 2 and land-water analysis was not conducted for this area. Nourishment refers to the light application of dredged sediment on top of the pre-existing marsh in the project area. Rather than filling directly over the marsh, sediment is typically filled around it and allowed to flow over the surface to the as-built elevation, thereby supplementing the marsh with new sediment and nutrients.

Pre-construction Google Earth imagery from October 11, 2007 clearly shows that open water was the primary habitat type in the BA-39 project area, with a small amount of marsh present in Marsh Creation Area (MCA) 1, MCA 2 and Increment 2 (Figure 4). The first post-construction aerial photography for BA-39 was flown on November 14, 2012 as part of the CRMS aerial photography flights. Analysis of this imagery indicates that there were 458 acres of land in the project area and 37 acres of water (Figure 5). A comparison of the total acres of land from the land-water analysis (458 acres) to the total acres of land listed in the project goals (471 acres), demonstrates that the goals have been nearly met; however, a direct comparison is difficult due to an additional 24 acres that are included in the land-water analysis. These acres are most likely acres that were designated as "agricultural other" in the project area and were not used in the wetland value assessment (USEPA, LDNR 2007) or in the determination of project goals.

The 37 acres of water are primarily due to ponding that is occurring in areas of slightly lower elevation. The area of ponding in MCA 2 is centralized and has been a feature of the project area since construction. The landowner has reported that it is providing habitat for waterfowl, although a formal waterfowl survey has not been conducted. Two upcoming monitoring events, a topographic survey in 2015 and a land-water analysis in 2017, will provide important data on how this area is responding over time and on whether it is being colonized with emergent marsh vegetation.

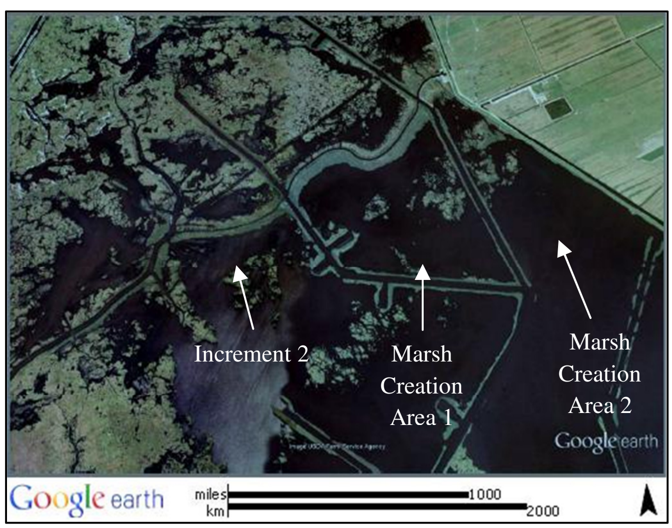

Figure 4. Google Earth aerial imagery of the BA-39 project area acquired pre-construction on 10/11/2007 shows the majority of the project area was open water, with some remnant marsh.

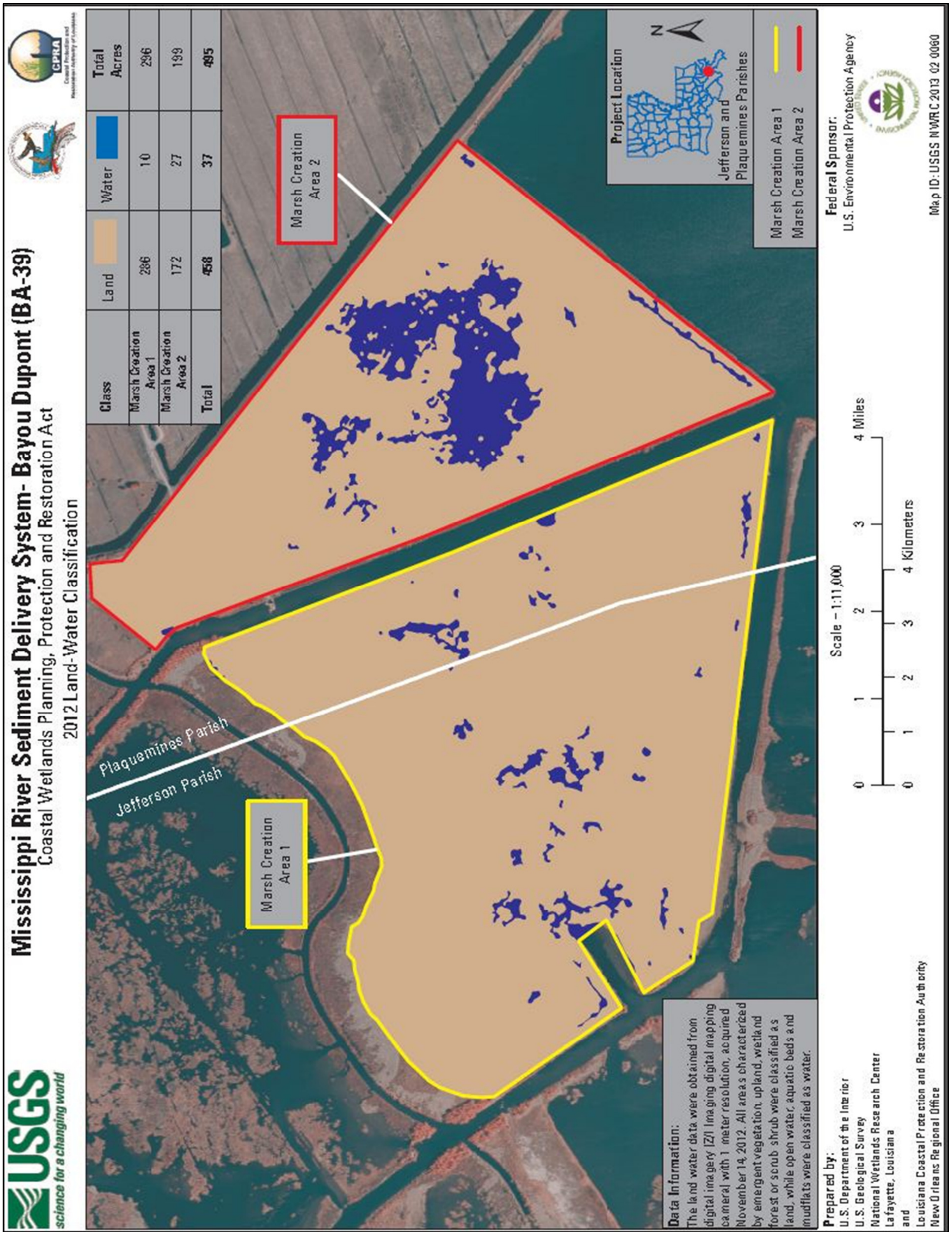

Figure 5. Land-water classification of the BA-39 project area for aerial photography acquired on November 14, 2012.

ii. Elevation (Topographic Surveys)

Topographic surveys of the BA-39 and Increment 2 project areas were conducted after the final day of sediment delivery (as-built survey, January 2010–April 2010) and again approximately two years later (October 2011– January 2012). Topographic contour maps were generated from the survey data using AutoCAD Civil 3D 2013 to estimate surface elevation and settlement of the project areas. AutoCAD interpolates between survey points to create a surface elevation grid; therefore, the maps are a useful tool for assessing elevation and settlement, but they are only as accurate as the robustness of the dataset. The elevation survey transects for BA-39 are spaced 500 feet apart and points are taken approximately every 50 feet along each transect. The contractor did not complete the survey for all transect lines during the 2011–2012 survey due to water in the project area; therefore, the elevation of these areas is subject to a high level of interpolation and should be viewed with less accuracy than the rest of the dataset (Figure 6). Also, additional cross sectional surveys of the project area perimeter (pre-existing spoil banks, project containment dikes, and levee) were conducted for the 2010 survey, as requested by CPRA.

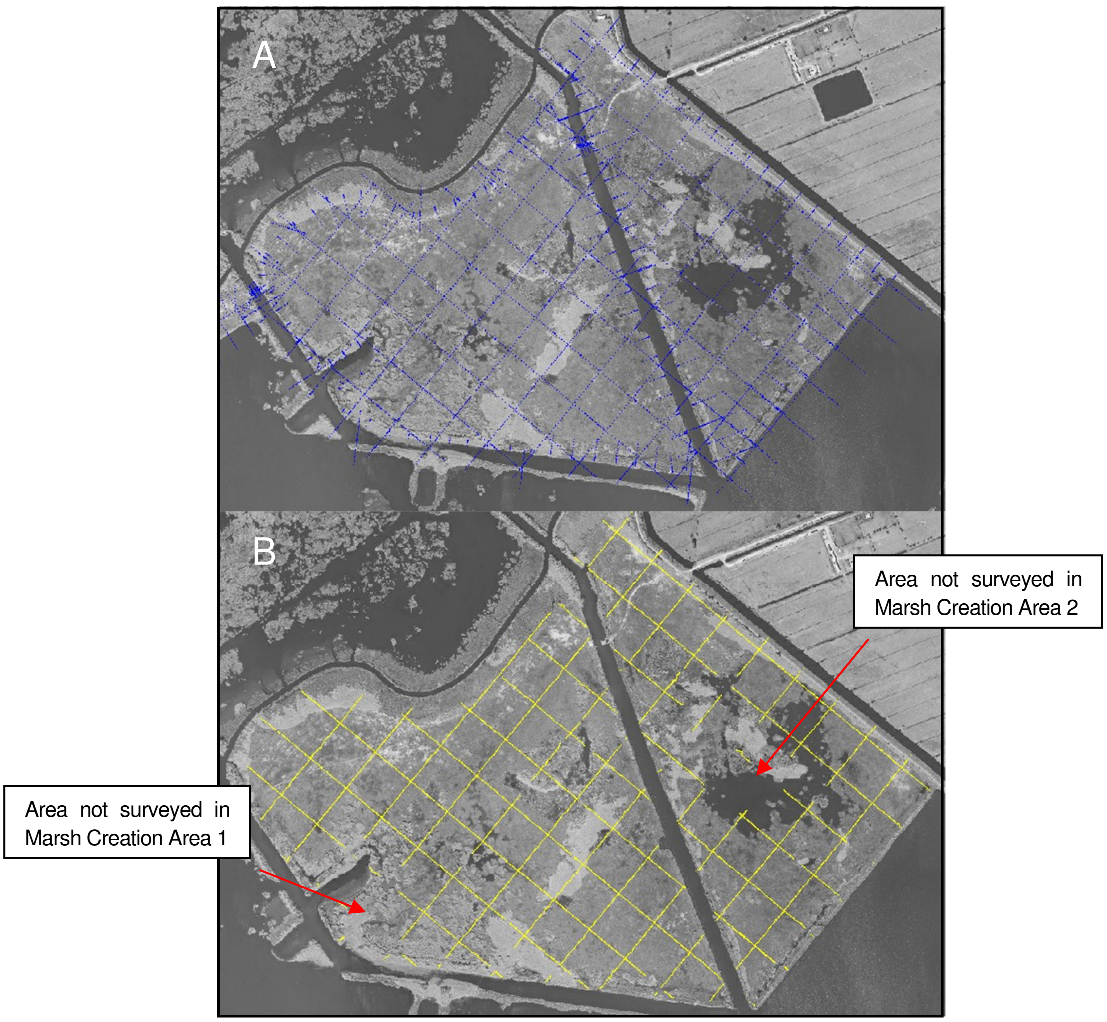

Figure 6. Completed transect lines for the 2010 BA-39 topographic survey **(A)** and the 2011–2012 BA-39 topographic survey **(B)**.

Based on the predicted settlement of the BA-39 marsh fill, an as-built elevation of +2.0′ NAVD88 was chosen to provide an initial constructed marsh elevation that would settle into the intertidal zone and support emergent marsh vegetation through most of the project's 20-year CWPPRA life-span (Thompson 2007) (Figure 7). A target marsh elevation of +1.3′ NAVD88 was chosen based on observations of the elevation of nearby *Spartina patens* (saltmeadow cordgrass) marsh. *Spartina patens* is found in intermediate to brackish marshes and is the dominant species in the surrounding natural marsh. According to the predicted settlement for BA-39, the target marsh elevation of +1.3′ NAVD88 should be reached near year 10, with settlement to +1.2′ NAVD88 near year 20 (Thompson 2007) (Figure 7).

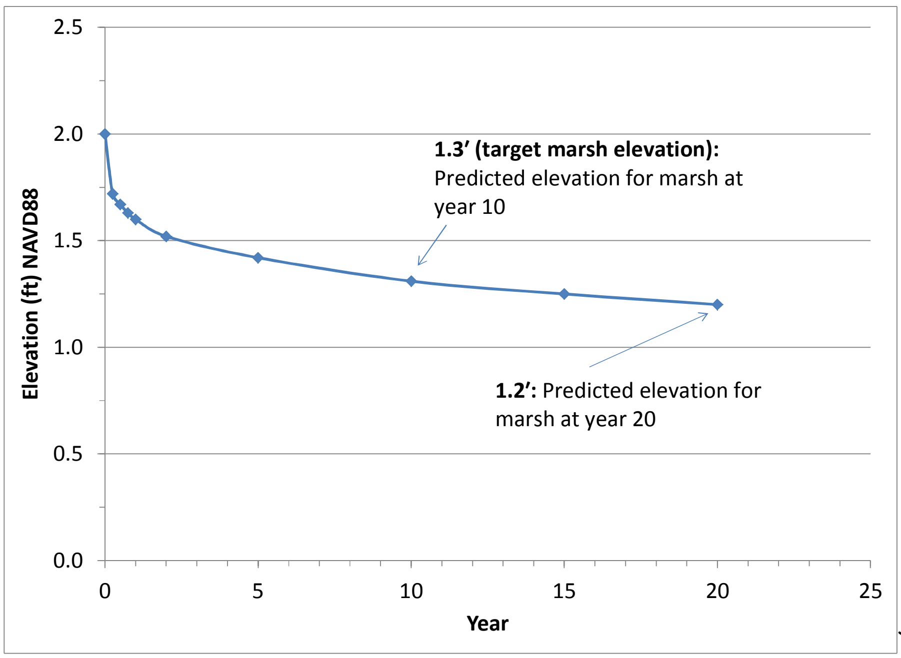

Figure 7. Predicted twenty-year settlement curve for BA-39 based on a constructed marsh fill elevation of +2.0′ NAVD88.

The as-built topographic survey data collected January 2010–April 2010 indicate that the majority of BA-39 Marsh Creation Area (MCA) 1, MCA 2, and Increment 2 were filled to an elevation between +2.0′–2.5′ NAVD88, with 66%, 68%, and 76% of the respective cells falling within the stated elevation range (Figures 8, 9). The targeted as-built elevation of +2.0′ NAVD88 had a construction specification that permitted a ± 0.3′ range of error. If the percent of the project area is expanded to include the area between +1.5′–2.5′ NAVD88, accounting for the ± 0.3 range of error, approximately 87% of MCA 1, 78% of MCA 2 and 86% of Increment 2 were filled to the targeted elevation. Since the elevation ranges on the contour maps are divided into 0.5′ increments rather than 0.3′ increments, the estimated percent of the project area at the targeted as-built elevation is likely a slight overestimation. Most of the remaining project area for MCA 1, MCA 2 and Increment 2 was filled slightly higher to an elevation between +2.5′–3.0′ NAVD88. The surveyed area around the project perimeter that is greater than +3.0′ NAVD88 represents the pre-existing spoil banks and levees, and the containment dikes that were constructed to contain the dredged marsh fill (Figure 8, 9).

The second topographic survey for BA-39 and Increment 2 was conducted October 2011–January 2012. The majority of the survey was completed in October and November 2011, with the survey of the containment dikes extending into January 2012. The predicted settlement at year 1 was to +1.6′ NAVD88 and at year 2 was to +1.5′ NAVD88. Since the second survey was conducted slightly less than two-years after construction, the elevation should be between these two values (but closer to +1.5′ NAVD88) with an as-built elevation assumption of +2.0′ ± 0.3′ NAVD88. The survey data indicate that the largest percentage of each marsh creation area settled to an elevation between +1.5′–2.0′ NAVD88 as predicted, with 49% of MCA 1, 47% of MCA 2, and 50% of Increment 2 falling within this range (Figure 10, 11). However, much of the project area was still at a higher elevation between +2.0′–2.5′ NAVD88 for this survey, with 29% of MCA 1, 25% of MCA 2, and 40% of Increment 2 classified within this range. As previously mentioned, sections of the survey area, in particular in the central region of MCA 2 in 2011 (Figure 6) and the southwestern end of Increment 2 (Figure 11), were not surveyed due to water on the marsh surface.

Contour maps were created to delineate the project area based on the amount of settlement that occurred between surveys along each transect line. The majority of the project area settled 0.0′–0.5′ between surveys, with 57% of MCA 1, 46% of MCA 2 and 64% of Increment 2 settling within this range. The second highest percentage of the project area settled between 0.5′–1.0′, with 31% of MCA 1, 43% of MCA 2, and 27% of Increment 2 settling within this range (Figure 12). Areas of higher settlement (0.5′–1.0′) in MCA 1 are somewhat randomly distributed throughout the project area; however, in MCA 2, higher settlement appears concentrated in the central project area that was largely classified as water for the 2012 land-water analysis. Elevation transects were incomplete for this area in 2011 due to standing water; therefore, the 2011 data used for the settlement analysis is highly interpolated. In Increment 2, higher settlement between 0.5′–1.0′ occurred primarily in the southern half of the project area within approximately 350′–400′ of the southeast containment dike (Figure 13).

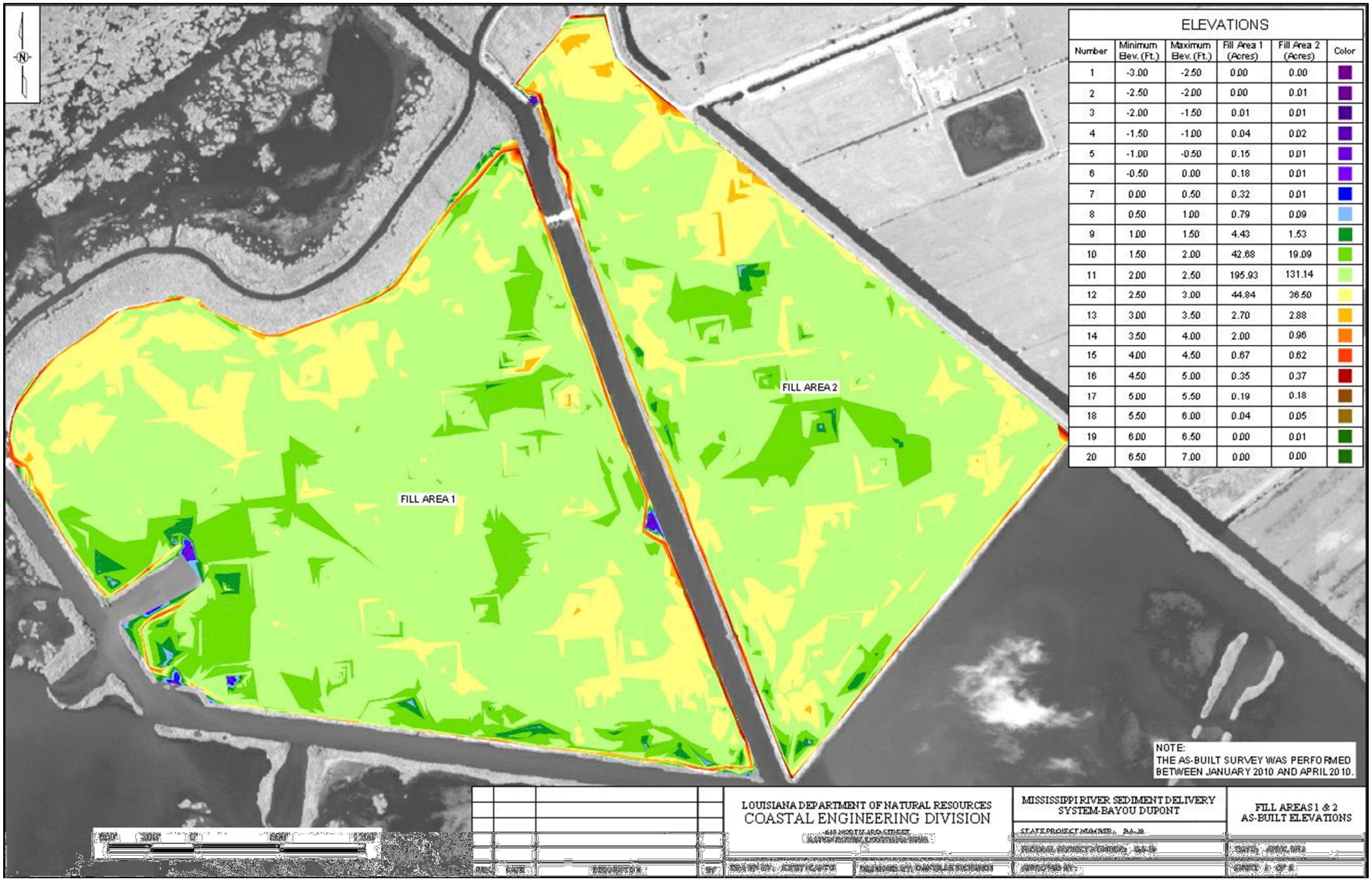

Figure 8. As-built elevation for BA-39 Fill Area 1 (MCA 1) and Fill Area 2 (MCA 2) as surveyed between January 2010 and April 2010.

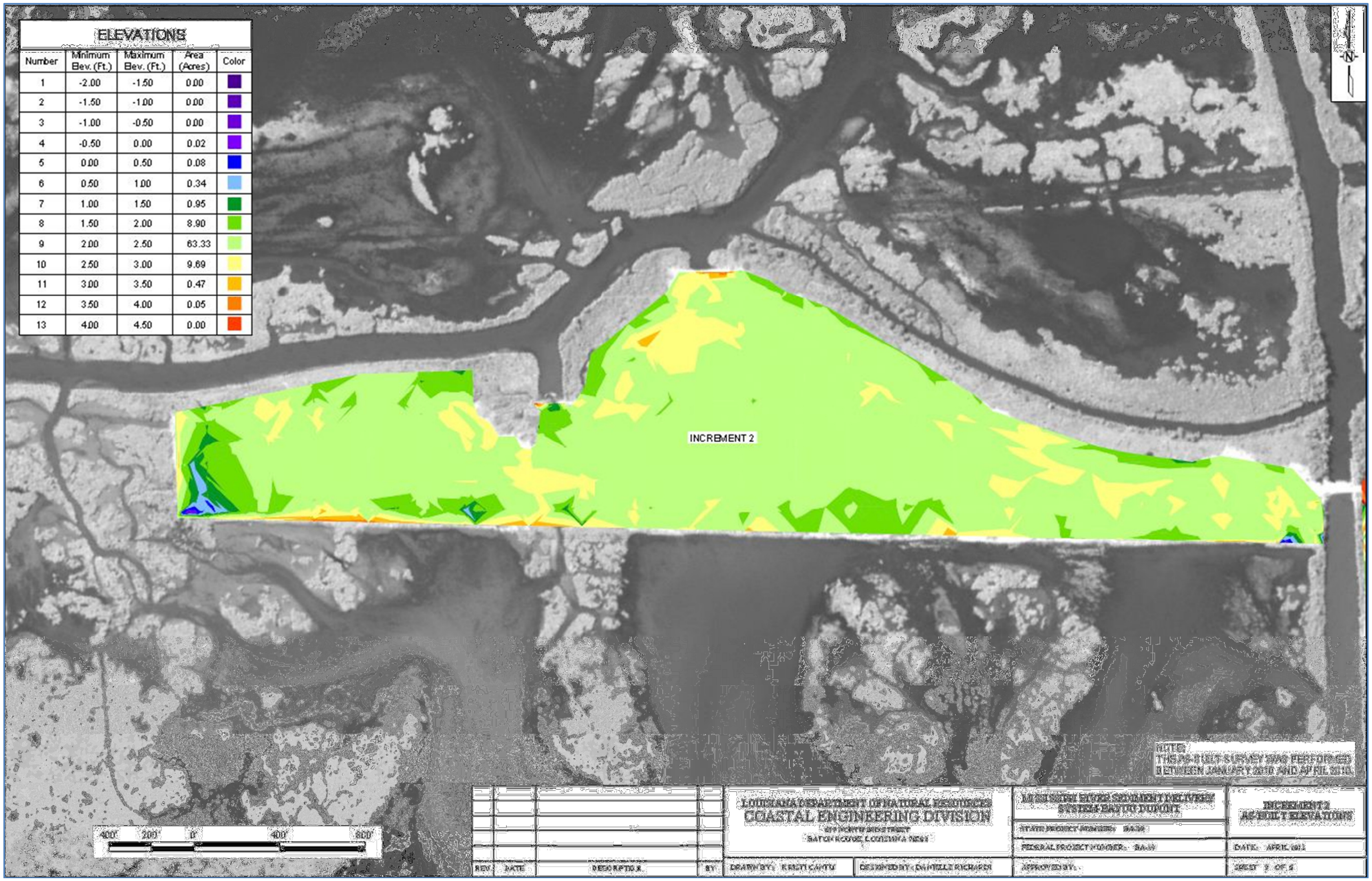

Figure 9. As-built elevation for BA-39 Increment 2 as surveyed between January 2010 and April 2010.

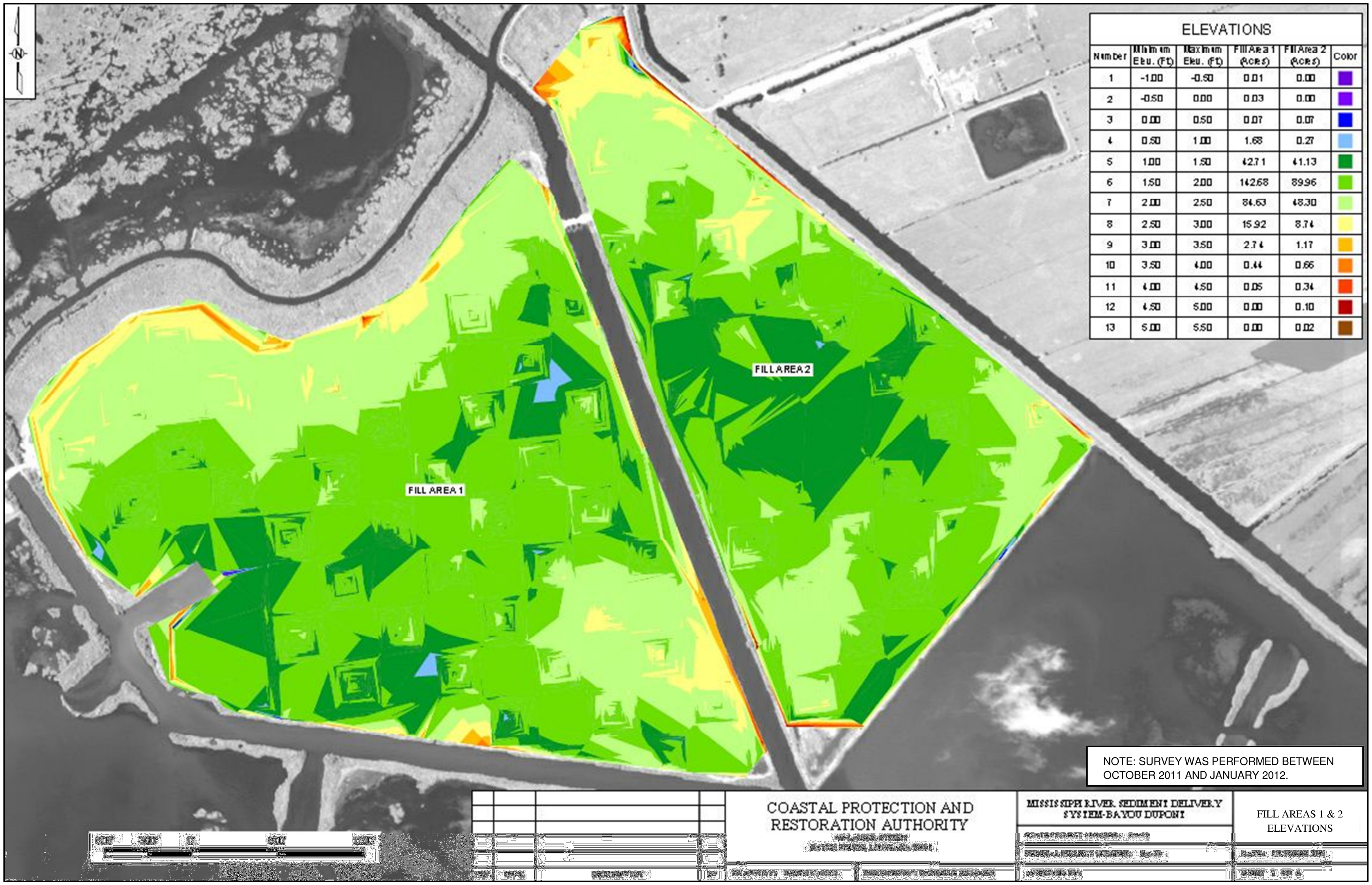

Figure 10. Elevation for BA-39 Fill Area 1 (MCA 1) and Fill Area 2 (MCA 2) as surveyed between October 2011 and January 2012.

Figure 11. Elevation for BA-39 Increment 2 as surveyed between October 2011 and January 2012.

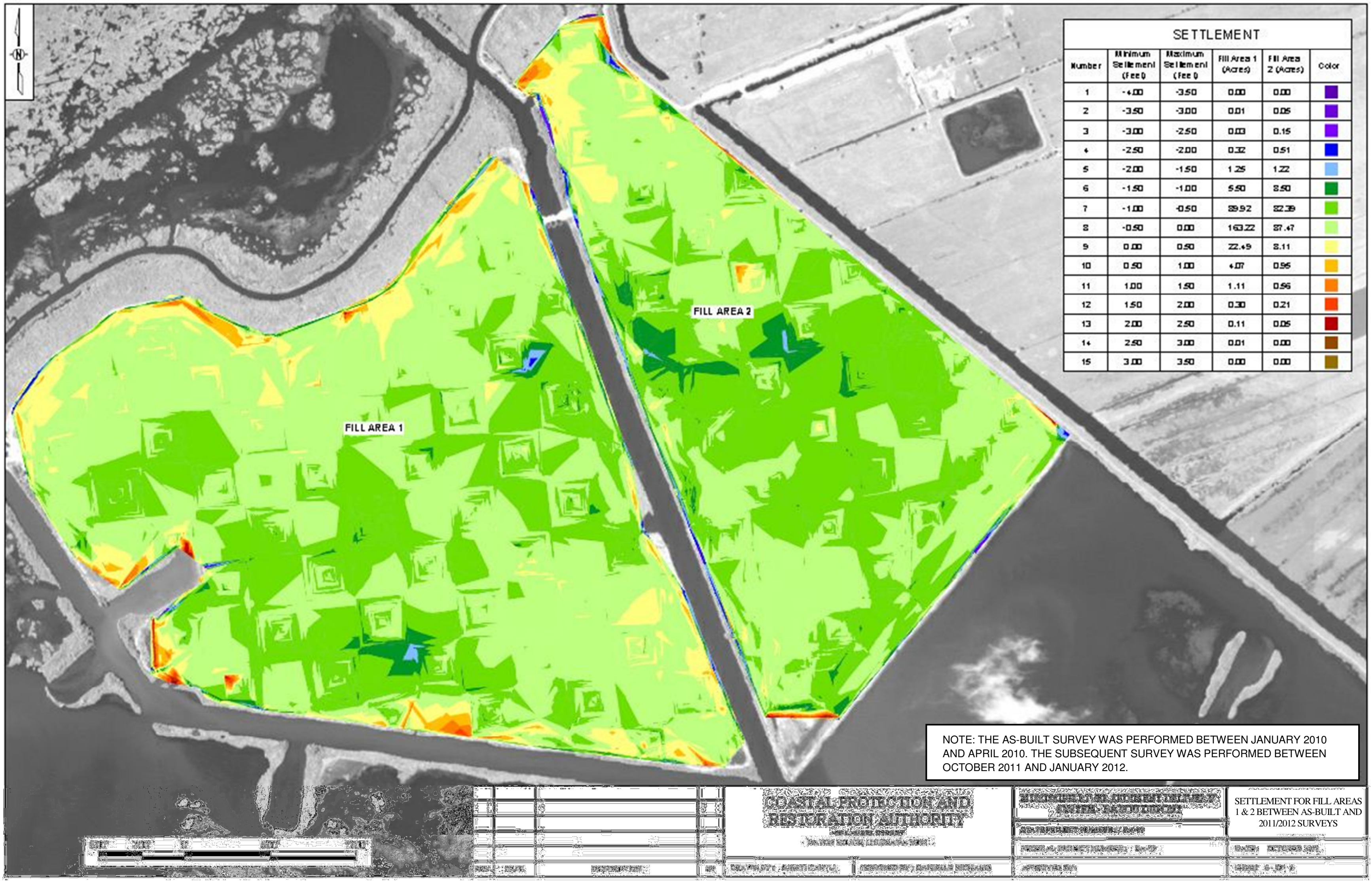

Figure 12. Settlement of BA-39 Fill Area 1 (MCA 1) and Fill Area 2 (MCA 2) between the as-built (2010) and 2011/2012 elevation surveys.

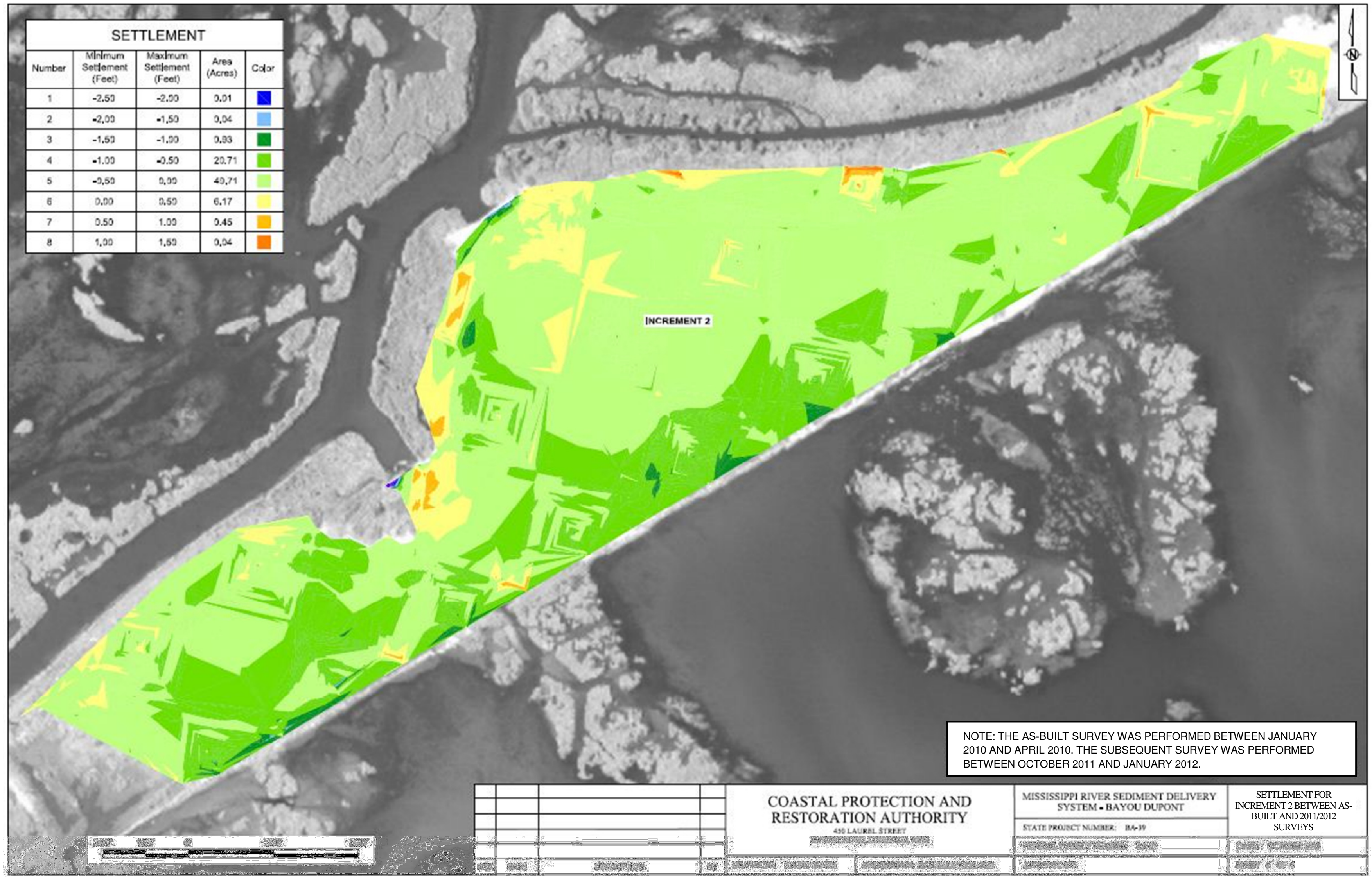

Figure 13. Settlement of BA-39 Increment 2 between the as-built (2010) and 2011/2012 elevation surveys.

iii. Vegetation

With any marsh creation project, it can take several years for the establishment of a vegetative community that resembles the community of the natural surrounding marsh. This is especially true when creating a marsh platform that is composed of a different sediment type and is built to an initial elevation that is different than that of the surrounding marsh. In addition to the sediment characteristics and the elevation of the platform, the developing marsh community will be influenced by the hydrology in the marsh, the extent of the plantings in the project area, and the availability and composition of a nearby seedbank. Vegetation monitoring of the BA-39 project is focused on examining how the species cover and composition in the project area change over time, and on how the marsh community in the project area compares to that of the surrounding natural marsh.

Total Percent Cover

Total percent cover is a single estimation of vegetative cover that is visually assessed at each station and ranges from 0% –100%. The mean total percent cover for vegetation in the BA-39 and Increment 2 project areas was compared between years using a paired two sample t-test ($\alpha = 0.05$). The total cover increased significantly at each BA-39 site between 2010 and 2011, with the site average increasing from 40% in 2010 to 64% in 2011 (Figure 14). The mean total percent cover also increased between years in Increment 2, from 42% in 2010 to 53% in 2011, but the increase was not significant ($p = 0.1567$) (Figure 14). The low percent cover for vegetation in 2010 is largely due to the short duration between the end of project construction and the survey—the 2010 survey was conducted just five months after the project was constructed, allowing little time for colonization and growth of vegetation. It should also be noted that the location of vegetation stations in Increment 2 does not follow the CRMS protocol for station establishment; rather than the standard 10 stations along a 288 m diagonal transect at each CRMS site, there are six stations spaced throughout the project area (Figure 2).

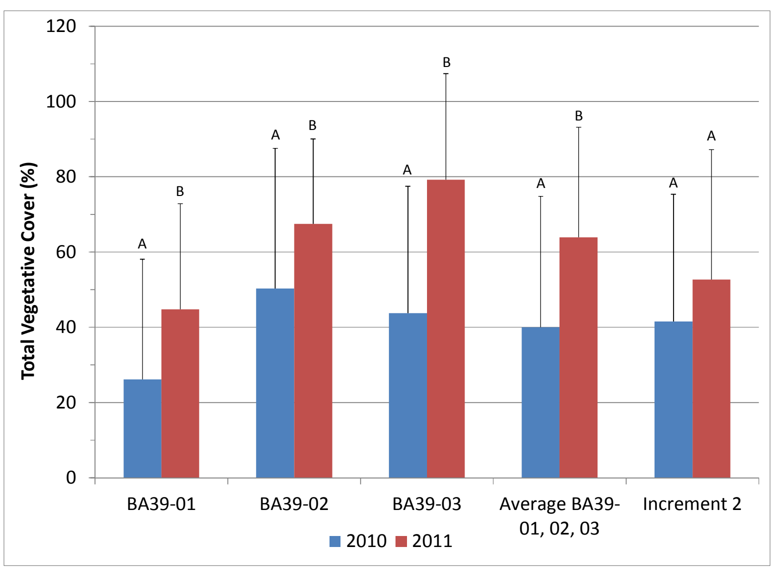

Figure 14. Mean total percent cover (+ SD) for vegetation at BA-39 sites (10 stations per site) and at Increment 2 stations (6 total stations) in 2010 and 2011. Significant differences in mean total vegetative cover between years are indicated by different letters ($\alpha = 0.05$).

Individual Species Percent Cover

Individual species percent cover is the visual estimation of the percent cover for each species of vegetation at a station. Because the covers for species can overlap due to different heights and growth forms, the sum of the individual species covers at a station can exceed 100%. *Paspalum vaginatum* (seashore paspalum) had the highest mean percent cover in the BA-39 project area in 2010 and 2011, with 13.4% and 19.3% cover, respectively (Figure 15). Five thousand plugs of this species were planted along sections of the project perimeter May 2010–June 2010 (Faust 2010), but none were planted in the surveyed area. The 'Brazoria' cultivar that was chosen for this project grows well in a range of soils and is characterized by its ability to rapidly colonize and stabilize bare soils with salinity up to 10 ppt (Fine and Thomassie 2000a). These characteristics resemble the conditions at BA-39 and the prevalence of this species likely indicates that the 'Brazoria' plants are spreading through the project area. *Distichlis spicata* (saltgrass) and *Typha latifolia* (broad-leaved cattail) had the second (8.6%) and third (7.6%) highest percent covers, respectively, when averaged between years. Both species increased in cover between 2010 and 2011, with *D. spicata* increasing from 2.1% to 15.2% and *T. latifolia* increasing from 5.7% to 9.5% (Figure 15).

Twenty-one thousand plugs of *Spartina alterniflora* 'Vermilion' (smooth cordgrass) were also planted in the BA-39 project area May 2010–June 2010 (Faust 2010). Like *P. vaginatum*, this species was not planted at any vegetation stations. Despite the larger number of plugs that were planted for *S. alterniflora*, the cover of this species was lower than that for *P. vaginatum*, with no cover in 2010 and only 1.5% mean cover in 2011 (Appendix D, Table 1). The 'Vermilion' cultivar is described as growing within a salinity range of 8−33 ppt and being an effective species for stabilizing sediments in dredge fill projects. It grows best in mineral soils with water depths ranging from 1−18 inches. (Fine and Thomassie 2000b).

The three dominant species in the BA-39 project area were not recorded in Increment 2 in 2010 or 2011. The species with the greatest percent cover in Increment 2 when averaged between years were *Bacopa monnieri* (herb of grace, 11.5%), *Paspalum distichum* (knotgrass, 8.6%) and *Eleocharis sp*. (spikerush, 7.7%) (Figure 16). The most noticeable increase in cover between years was seen for the sedge *Schoenoplectus americanus* (chairmaker's bulrush). This species was only recorded at one of the six stations in Increment 2, but the increase in cover at that one station, from 1% in 2010 to 90% in 2011, was pronounced.

The early marsh community composing BA-39 and Increment 2 differed greatly from the community growing in the nearby natural marsh. CRMS4103 is located approximately 1.6 miles northwest of the center of BA-39 Marsh Creation Area 1 and is the closest CRMS site to the project area (Figure 3). The intermediate marsh community at CRMS4103 has been dominated by *Spartina patens* (saltmeadow cordgrass), which averaged 33.5% cover between years and ranged from a high of 69% mean cover in 2008, to a low of 15.9% mean cover in 2010. The vines *Ipomoea sagittata* (saltmarsh morning glory) and *Vigna luteola* (hairypod cowpea) have also been consistent significant components of the marsh community, averaging 14.1% and 12.0% cover between years, respectively (Figure 17).

The BA-39 project area is located within the project boundary for the CWPPRA project Naomi Outfall Management (BA-03c), which has ten vegetation stations situated within an approximate two-mile radius of BA-39 (Figure 3). The most recent vegetation survey for this project was conducted in 2009, with prior surveys following a similar protocol being done on a three-year interval since 1997. The dominant species at these stations between years has also been *S. patens*, with an average percent cover between years of 49.9%. This species has exhibited a trending decline from a mean high of 75.0% cover in 1997, to a mean low of 30.6% cover in 2009 (Figure 18). Like CMRS4103, the next two dominant species when averaged between years were *I. sagittata* (7.3%) and *V. luteola* (6.8%). One BA-03c vegetation station (BA03c-48) was located within the BA-39 project area and was surveyed a final time in 2006 prior to BA-39 construction (Figure 3). The dominant species each year at this station was *S. patens*, with an average 69.8% percent cover between years, ranging from a high of 90% cover in 1997, to a low of 35% cover in 2003.

Floristic Quality Index

While a determination of the percent cover of individual species provides data on the relative dominance of plants in the project area, it fails to provide an assessment of the quality of the marsh habitat. For example, a high percent cover of the vine *Vigna luteola* could indicate a stressed community, since this vine can literally choke out other species. The Floristic Quality Index (FQI) is useful in characterizing the quality and stability of the marsh. The calculation of the FQI was developed by Swink and Wilhelm (1979), but has been modified by Cretini et al. (2011) to more effectively describe the coastal community in Louisiana. The FQI is calculated using the percent cover for each species and a value that is assigned to each species based on how indicative it is of a stable community. This value is called the coefficient of conservatism (CC) and ranges from 0 to 10, with 0 being a species of lowest value (e.g. invasive species) and 10 being a species that is characteristic of a vigorous coastal wetland (e.g. *Spartina alterniflora*). A station with a high FQI score represents a community that has a low percentage of invasive and disturbance species and is dominated by species that are found in a stable marsh community.

The ideal FQI range for marshes in an inactive deltaic plain in Louisiana is > 80 (Cretini et al. 2011). The FQI for BA-39 was only 20.4 in 2010, but the survey was conducted just five months after project completion. The FQI nearly doubled to 39.2 in 2011, indicating a positive trajectory for the vegetative community (Figure 15). The low FQI values are due not only to low vegetative cover, especially in 2010, but also to the prevalence of *Distichlis spicata* (CC = 2 in fresh/intermediate marshes) and *Typha latifolia* (CC = 2), as well as other less abundant species that also have low CC scores. When present in brackish and saline marshes, *D. spicata* is a natural component of a stable vegetative community, but when it grows in a fresher marsh environment it is considered a disturbance species. The marsh habitat at BA-39 is categorized as intermediate based on the species composition, and as a part of this fresher community, *D. spicata* is most likely occurring as a disturbance species. *Typha latifolia* can tolerate a range of salinities, but is generally characterized as a freshwater species and is always found growing in or near water (Appendix A, photo 6). This species can grow aggressively and prevent the establishment of a diverse marsh community (Stevens and Hoag 2000).

The FQI for Increment 2 was also low, but increased from 17.4 in 2010 to 27.3 in 2011 (Figure 16). While the sum of the species covers did not increase significantly between years, the mean cover of *Schoenoplectus americanus* (chairmaker's bulrush), a species with a high CC score of 8, increased from 0% in 2010 to 15% in 2011 and largely explains the higher FQI. It should be noted that the increase in *S. americanus* was seen at just one of the six stations in Increment 2, representing a relatively isolated occurrence.

The FQI for natural marsh in the proximity of the BA-39 project area was higher than that for BA-39, but is still considered lower than ideal. The FQI for CRMS4103 has been somewhat variable, ranging from a high of 67.4 in 2008, to a low of 45.9 in 2012 (Figure 17). The years with higher FQI scores benefitted from a high sum of species covers, as well as a larger contribution to the total cover from high CC score species such as *S. patens* (CC = 9) and *I. sagittata* (CC = 8). The mean FQI for the BA-03c stations surrounding the project area was relatively stable between 1997 and 2009, ranging from 60.1 to 67.3, despite large fluctuations between years in the sum of the species covers (Figure 18). The percent cover of *S. patens* has played a strong role in the FQI value for these stations, as it did for CRMS4103.

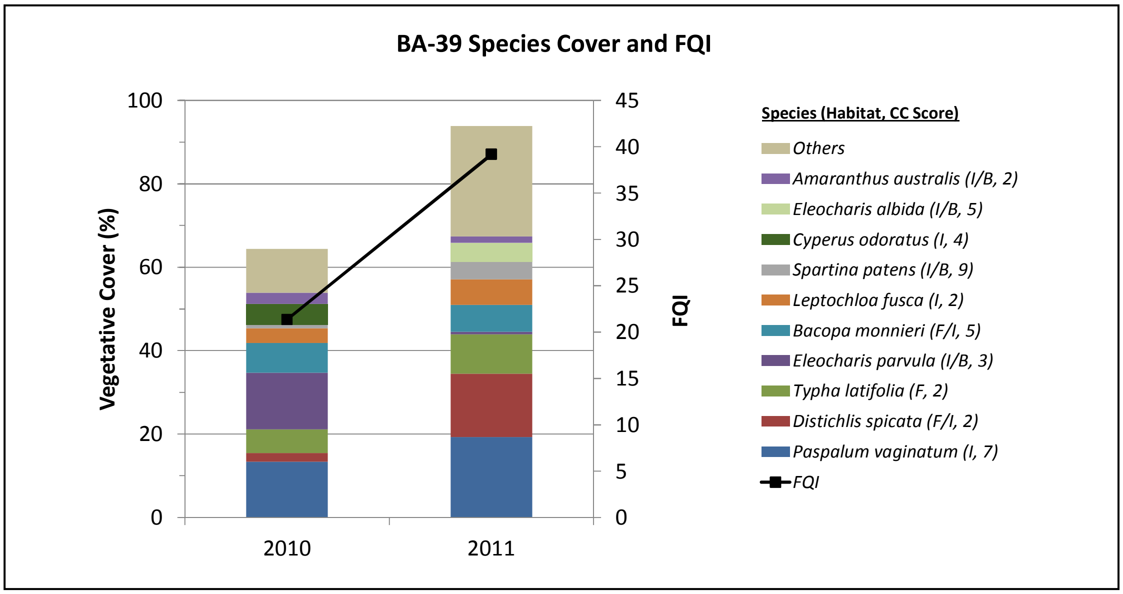

Figure 15. Annual percent cover of species and FQI score for BA-39. The marsh habitat where the species typically grows and its CC score are listed after the species name. F = freshwater, I = intermediate, B = brackish, S = saltwater. The complete species list is included in Appendix D, Table 1.

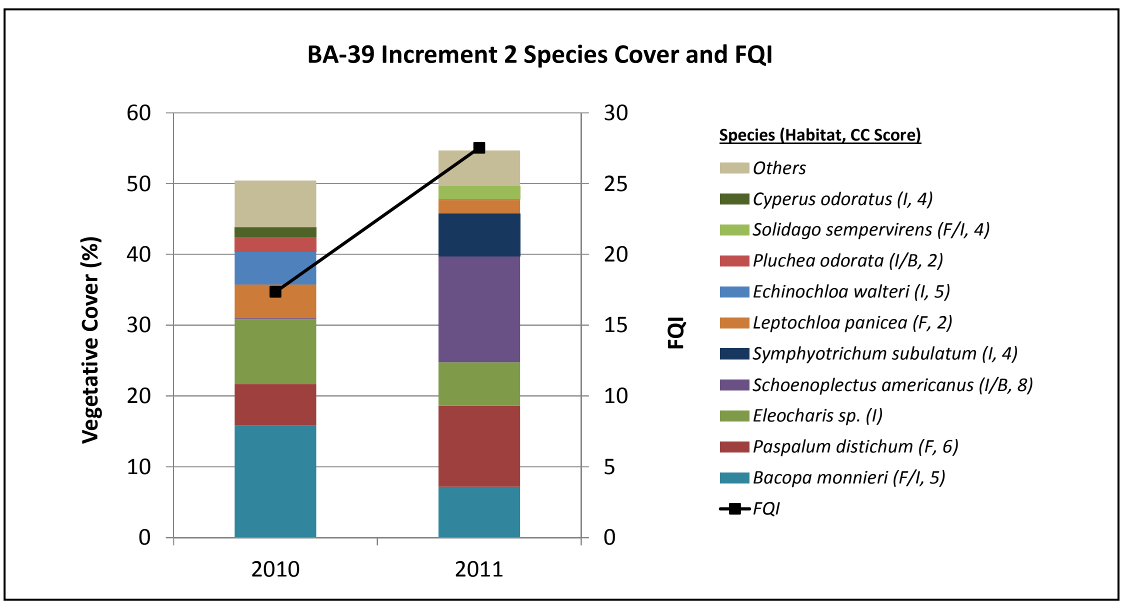

Figure 16. Annual percent cover of species and FQI score for Increment 2. The marsh habitat where the species typically grows and its CC score are listed after the species name. F = freshwater, I = intermediate, B = brackish, S = saltwater. The complete species list is included in Appendix D, Table 2.

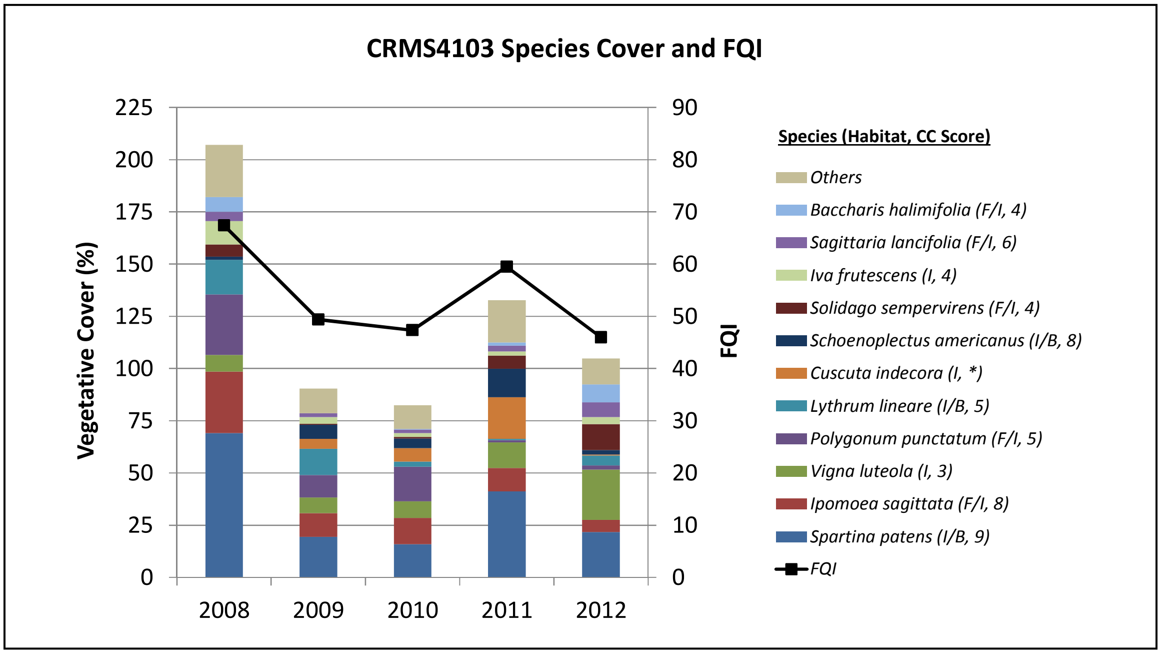

Figure 17. Annual percent cover of species and FQI score for CRMS4103. The marsh habitat where the species typically grows and its CC score are listed after the species name. F = freshwater, I = intermediate, B = brackish, S = saltwater. * *Cuscuta indecora* (bigseed alfalfa dodder) is a non-rooted parasitic plant and is not included in the FQI calculation.

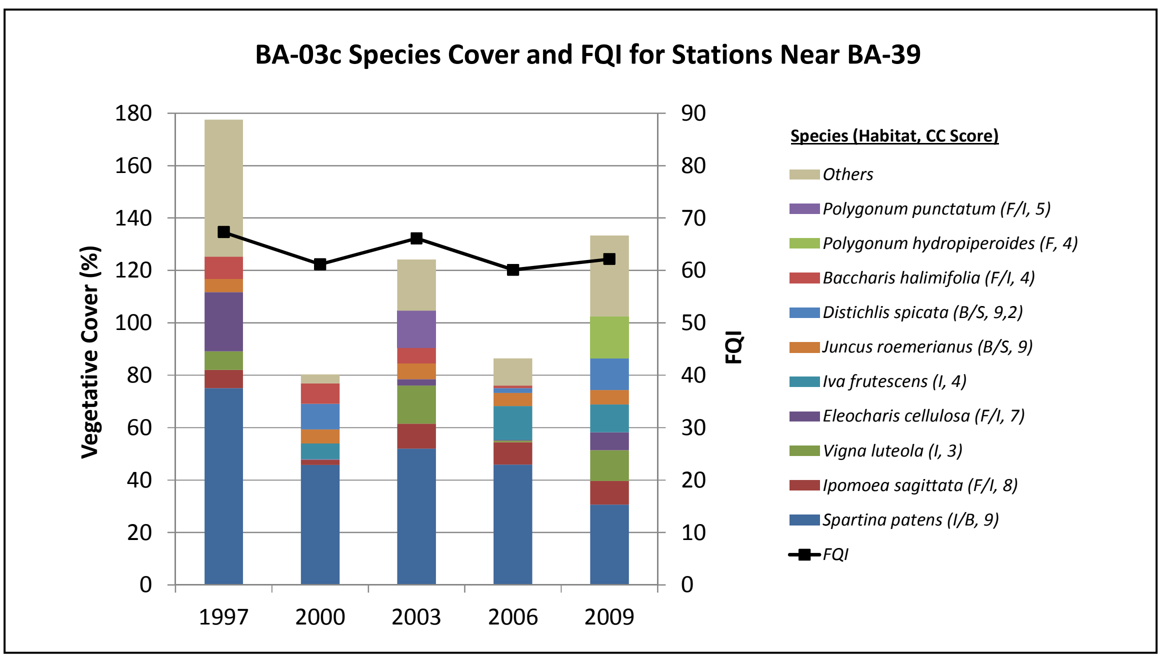

Figure 18. Annual percent cover of species and FQI score for project-specific BA-03c stations (Figure 3). The marsh habitat where the species typically grows and its CC score are listed after the species name. F = freshwater, I = intermediate, B = brackish, S = saltwater.

Species Distribution

By combining vegetation cover data with species distribution data, a more complete picture is generated of the vegetative community. Together, these data can help determine if a species' distribution is patchy, or if it is occurring more widely throughout the project area. For example, because Increment 2 has only six vegetation stations, changes in cover for a species at just one station (i.e. *Schoenoplectus americanus* in 2011) can create the appearance of an overall species trend in the project area, when in actuality it may be limited to the area within one 4 m^2 station.

Paspalum vaginatum, the species with the highest mean percent cover in BA-39, was also the species with the widest distribution, occurring at an average of 53% of the stations between years (Table 1). However, despite having the second and third highest percent covers, *Distichlis spicata* and *Typha latifolia* were less evenly distributed in the project area, occurring at an average of 32% and 18% of stations between years, respectively. The patchiness for *T. latifolia* may be attributed to its restriction to the region of the project area that receives more frequent inundation (Appendix A, photo 6). *Amaranthus australis* (southern amaranth) and *Bacopa monnieri* were the most widely distributed species after *P. vaginatum*, occurring at an average of 38% and 37% of stations between years.

Three species had large fluctuations in their distributions between years: *Eleocharis parvula* (dwarf spikerush) was present at 57% of stations in 2010, but only 13% of stations in 2011, and *Cyperus odoratus* (fragrant flatsedge) was found at 43% of stations in 2010, but wasn't recorded at any stations in 2011. *Symphyotrichum divaricatum* (southern annual saltmarsh aster) was not recorded in 2010, but was seen at 40% of stations in 2011 (Table 1). Higher fluctuation in the distribution of species is expected in areas of disturbance, such as newly created marsh. As the marsh community stabilizes and transitions from disturbance species towards a species assemblage that is more typical of a mature intermediate/brackish marsh, these fluctuations should decline. The overall number of species recorded in the project area increased between years from 30 species in 2010 to 40 species in 2011 (Table 1).

In Increment 2, *Leptochloa panicea* (mucronate sprangletop) was the most widely distributed species between years, occurring at an average of 67% of stations, followed by *Paspalum distichum* and *Echinochloa walteri* (coast cockspur grass), at 58% and 42% of stations, respectively (Table 2). *Bacopa monnieri* had the highest mean percent cover in Increment 2, but was only the fifth highest in distribution, being found at 33% of stations each year. Despite not being surveyed in 2010, *Symphyotrichum subulatum* (eastern annual saltmarsh aster) was found in 67% of stations in 2011, meaning its emergence in the project area was widespread and not due to an isolated patch. The number of species recorded in Increment 2 was nearly stable between years, increasing only slightly from 17 species in 2010, to 18 species in 2011 (Table 2).

Table 1. Percent of BA-39 project-specific vegetation stations where each species occurred for the 2010 and 2011 vegetation surveys. *Habitat* is the marsh habitat where the species is most commonly found. F = freshwater, I = intermediate, B = brackish, S = saltwater. * Table 1 includes the 15 species with the highest mean percent occurrence at stations between years. The complete list of species is included in Appendix D.

Scientific Name	Common Name	Percent of Stations			Habitat
		2010 (N = 30)	2011 (N = 30)	Average	
Paspalum vaginatum	seashore paspalum	50	57	53.3	I
Amaranthus australis	southern amaranth	30	47	38.3	I/B
Bacopa monnieri	herb of grace	27	47	36.7	F/I
Leptochloa fusca	Malabar sprangletop	33	37	35.0	I
Eleocharis parvula	dwarf spikerush	57	13	35.0	I/B
Distichlis spicata	saltgrass	20	43	31.7	F/I/B/S
Echinochloa walteri	coast cockspur grass	30	17	23.3	I
Lythrum lineare	wand lythrum	17	27	21.7	I/B
Pluchea odorata	sweetscent	13	30	21.7	I/B
Cyperus odoratus	fragrant flatsedge	43	.	21.7	I
Symphyotrichum divaricatum	southern annual saltmarsh aster	.	40	20.0	F
Typha latifolia	broadleaf cattail	10	27	18.3	F
Ammannia latifolia	pink redstem	7	27	16.7	F/I
Eleocharis albida	white spikerush	.	27	13.3	I/B
Solidago sempervirens	seaside goldenrod	3	23	13.3	F/I
Total Number of Species*		**30**	**40**		

Table 2. Percent of BA-39 Increment 2 project-specific vegetation stations where each species occurred for the 2010 and 2011 vegetation surveys. *Habitat* is the marsh habitat where the species is most commonly found. F = freshwater, I = intermediate, B = brackish, S = saltwater. * Table 2 includes the 15 species with the highest mean percent occurrence at stations between years. The complete list of species is included in Appendix D.

Scientific Name	Common Name	Percent of Stations			Habitat
		2010 (N = 6)	2011 (N = 6)	Average	
Leptochloa panicea	mucronate sprangletop	67	67	67	F
Paspalum distichum	knotgrass	33	83	58	F
Echinochloa walteri	coast cockspur grass	67	17	42	I
Symphyotrichum subulatum	eastern annual saltmarsh aster	.	67	33	I
Bacopa monnieri	herb of grace	33	33	33	F/I
Eleocharis sp.	spikerush	33	33	33	I
Amaranthus cannabinus	tidalmarsh amaranth	33	17	25	I/B
Lythrum lineare	wand lythrum	33	17	25	I/B
Portulaca oleracea	little hogweed	33	17	25	F
Solidago sempervirens	seaside goldenrod	.	50	25	F/I
Cyperus compressus	poorland flatsedge	17	17	17	F
Echinochloa colona	jungle rice	17	17	17	F
Schoenoplectus americanus	chairmaker's bulrush	17	17	17	I/B
Ammannia latifolia	pink redstem	33	.	17	F/I
Cyperus odoratus	fragrant flatsedge	33	.	17	I
Total Number of Species*		**17**	**18**		

Vegetation Summary

The marsh in BA-39 and Increment 2 does not currently resemble the natural marsh in the area; however, it is expected that it will take several years for the community to transition from aggressive, disturbance species typical of a pioneer community to species that are representative of a more stable marsh. Vegetation data from 2010 and 2011 indicate that total percent cover and FQI are increasing in the project area. It should be acknowledged that only two years of consecutive vegetation data have been collected and future surveys are necessary before significant trends in the community can be assessed. Based on the local salinity (Figure 19) and the naturally occurring dominant species in the area, the project area could likely see an increase in the intermediate/brackish species *Spartina patens* as the marsh platform continues to settle and hydrologic exchange increases. The target marsh elevation (+1.3′ NAVD88) was based on the elevation of local, natural *S. patens* marsh.

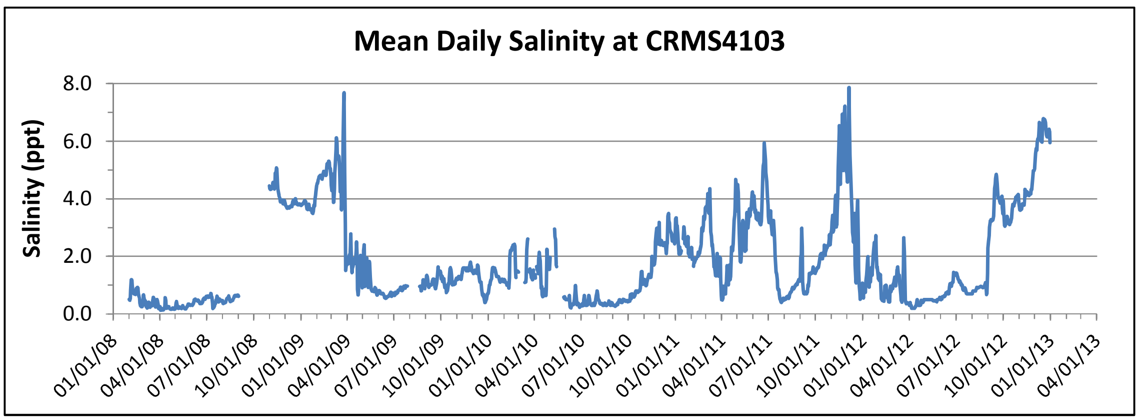

Figure 19. Mean daily salinity at CRMS4103 between 02/01/2008–12/31/2012. CRMS4103 is located approximately 1.6 miles northwest of the center of BA-39 Marsh Creation Area 1 and is the CRMS site closest to the BA-39 project area (Figure 3).

iv. Soil Properties

Soil cores were collected in September 2010 from the three BA-39 project-specific monitoring sites. Each soil core is taken from the surface down to 24 inches deep, with three replicate cores collected at each site. The cores are sliced every four inches into a total of six sections and soil properties are analyzed for each four-inch increment (i.e. 0″–4″ deep, 4″–8″ deep…) (Folse et al 2012). Soil characteristics were compared between sites and depths using ANOVA in Proc GLM, $\alpha = 0.05$ (SAS Institute Inc., Cary, NC, version 9.1).

The mean percent organic matter (% OM) of the cores collected from BA-39 was 1.62 ± 1.68% SD, with the mean % OM at individual sites and depths ranging from 0.46% – 5.42% (Figure 20). The mean % OM was not significantly different between depths; however, it was significantly different between sites ($P < 0.01$). The organic matter content is significantly higher for site BA39-02 due to one sample core that may have been taken in an area of remnant marsh. Core 3 sampled at BA39-02 had relatively high organic matter content at each depth, ranging from a high of 15.10% between 16″–20″ depth, to a low of 4.59% between 4″–8″ depth. Comments on the data collection sheet described this core as "clay, well-consolidated," whereas the other cores were generally described as being sandy and unconsolidated. If the data for core 3 are removed from the analysis, the mean % OM between sites is not significantly different and declines to 0.63 ± 0.22% SD, with the mean % OM at individual sites and depths ranging from 0.46% to 1.33% (Figure 20).

The % OM of soil cores collected from CRMS sites near the BA-39 project (Figure 3) was significantly higher ($P < 0.0001$) than that of the project area (Figure 20). The % OM decreased among the sites along a north to south gradient, with CRMS0287, the most northern site, having the highest mean % OM (84.50 ± 3.05% SD) and CRMS0248, the most southern site, having the lowest (28.67 ± 3.95% SD). The mean % OM at CRMS4103, the site closest to the project area, was 62.78 ± 2.75% SD and may represent an approximation of the % OM of the remnant marsh in the project area prior to project construction. The sediment that was dredged from the Mississippi River to create the marsh platform for BA-39 was sandy with very low organic content. Organic material accumulates in marsh sediment largely due to the growth and subsequent death and decomposition of vegetation; therefore, it is expected that the organic content of the sediment at BA-39 will increase with the life of the project.

The mean bulk density for the BA-39 stations was 1.28 ± 0.18 g/cm^3 SD, with the mean bulk density at individual sites and depths ranging from 0.92–1.57 g/cm^3 (Figure 21). Bulk density was not significantly different between depths; however, it was significantly different between site BA39-01 and BA39-02 ($P < 0.01$). Again, core 3 at site BA39-02 is responsible for the difference, with the mean bulk density being lower than that of the other cores collected at the site. The lower bulk density for core 3 again points to the potential of remnant marsh in the sample. If the data for core 3 are removed from the analysis, the mean bulk density between sites is not significantly different and increases to 1.35 ± 0.13 g/cm^3 SD, with the mean bulk density at individual sites and depths ranging from 1.07 – 1.57 g/cm^3 (Figure 21).

The bulk density of the sediment cores collected in the BA-39 project area was significantly higher ($P < 0.0001$) than the bulk density of cores collected at the surrounding CRMS stations (Figure 21). Sandy sediment with low organic content, such as that dredged from the river and used to construct BA-39, tends to have less pore space between grains and as a result, typically has a higher bulk density (USDA NRCS 2008). The bulk density of the soil collected from the CRMS sites increased along a north to south gradient, with CRMS0287, the most northern site, having the lowest mean bulk density (0.06 ± 0.01 g/cm^3 SD) and CRMS0248, the most southern site, having the highest (0.26 ± 0.07 g/cm^3 SD). The mean bulk density at CRMS4103 was 0.11 ± 0.01 g/cm^3 SD and due to the close proximity to BA-39, may represent an approximation of the bulk density of the remnant marsh in the project area prior to project construction (Figure 21).

The organic content can be expected to increase in the project area, along with a decrease in bulk density, as the marsh continues to increase in vegetative productivity. A post-Hurricane Isaac inspection of the project area on September 27, 2012 revealed a considerable amount of wrack that had been brought into the project area, although it remained primarily around the project perimeter. A new thin layer of sediment also appeared to have been introduced to the project area from the flooding that occurred during the storm. High water events may serve as a primary vector of both organic and inorganic external inputs to the project area until the platform settles into the intertidal zone.

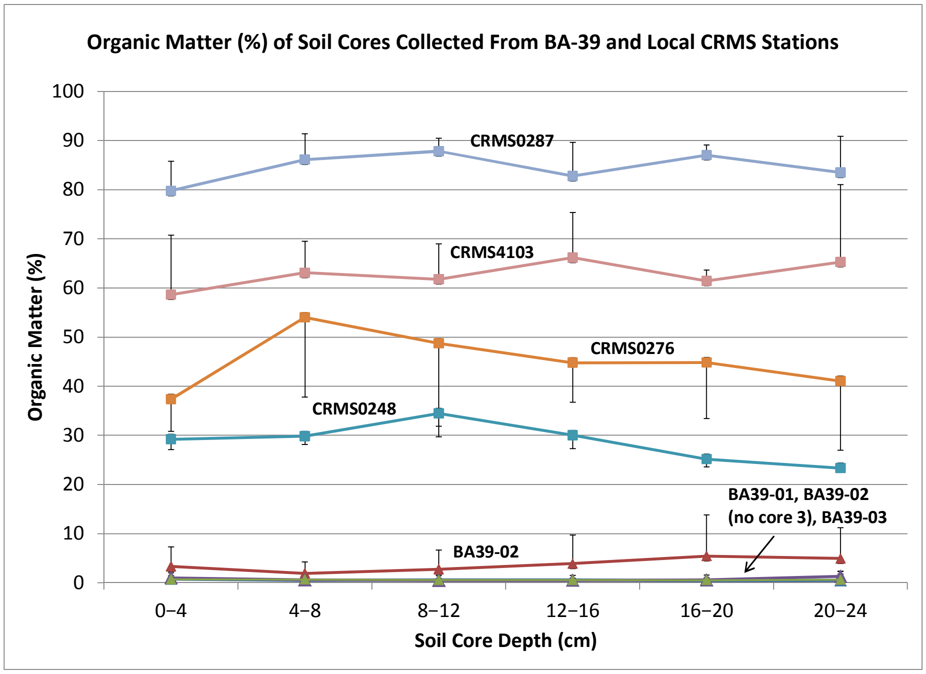

Figure 20. Mean percent organic matter by weight of soil cores collected from BA-39 and surrounding CRMS stations. The BA-39 cores were collected in 2010; the CRMS site cores were collected in 2007/2008. The bars represent standard deviation and are included as either + or – to avoid overlap between sites.

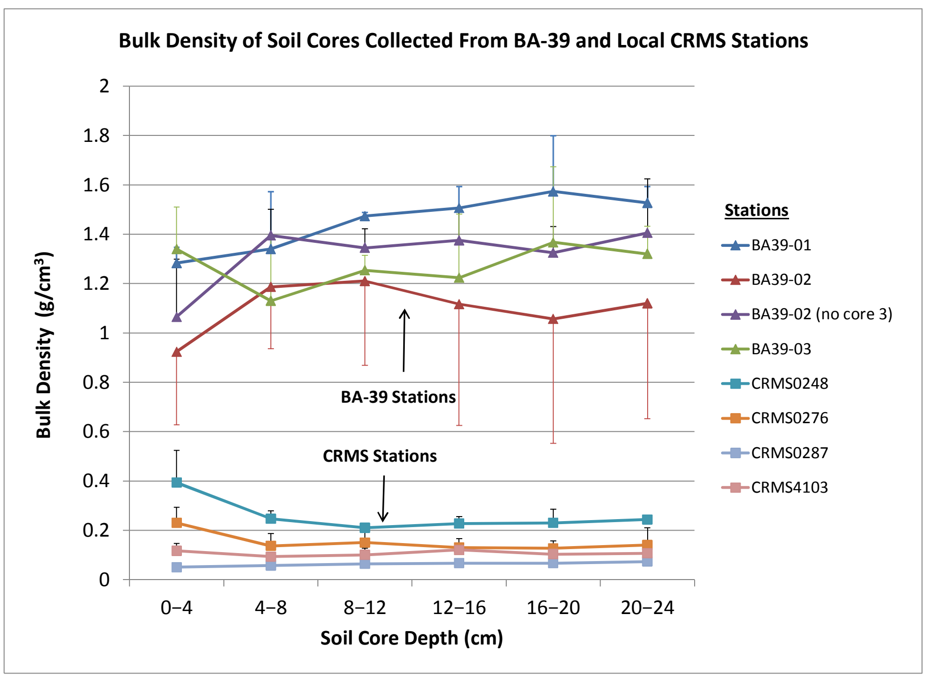

Figure 21. Mean bulk density of soil cores collected from BA-39 and surrounding CRMS stations. The BA-39 cores were collected in 2010; the CRMS site cores were collected in 2007/2008. The bars represent standard deviation and are included as either + or – to avoid overlap between sites.

v. Rod Surface Elevation Table (RSET)/Accretion

Data collected from rod surface elevation tables (RSETs) and vertical accretion plots will not be reported until five years of bi-annual data have been attained. The accurate determination of marsh elevation requires a five-year period of data collection to account for temporal variation and a consistent comparison to the water- level record (Cahoon et al. 2006). These data will be reported in the next BA-39 OM&M report.

V. Conclusions

a. Project Effectiveness

The goals of BA-39 are to restore/create approximately 372 acres and nourish approximately 99 acres of emergent marsh in an area that was mostly open water (USEPA, LDNR 2007). The 2012 land-water analysis for BA-39 classified 458 acres as land and 37 acres as water. A comparison of the total acres of land listed in the project goals (471 acres) to the acres of land from the land-water analysis (458 acres) demonstrates that the goals have nearly been met. Without a habitat analysis, it is difficult to ascertain how much of this land is marsh habitat, but vegetation surveys have shown that the marsh platform has increased in vegetative cover between years. As the marsh elevation continues to settle towards the target elevation of +1.3′ NAVD88, it is expected that hydrologic exchange will increase and the vegetation will transition to a marsh community that is more composed of naturally occurring intermediate/brackish species, such as the locally dominant *Spartina patens*.

b. Recommended Improvements

Discussions between USEPA and CPRA have addressed the possibility of increasing hydrologic flow into and out of the project area through the creation of additional gaps and channels. The retention of water in Marsh Creation Area 2 could potentially be alleviated through the construction of a channel, or additional sediment could be added to the area to raise the elevation to that of the surrounding marsh. However, due to the early age of the project, the situation is being monitored and no actions are being recommended at this time. Annual inspections have recorded active water flow out of the project area and natural channels are likely still being excavated. As monitoring continues for BA-39, a more substantial assessment of project effectiveness will be attained and as a result, recommended improvements will be more clearly defined.

Because it can take several years for the conditions in a created marsh to begin to resemble the conditions in natural marsh, it is recommended that monitoring be extended through the end of the CWPPRA 20-year project life. A final land-water analysis and elevation survey near year 20 would provide important data on the sustainability of the marsh. Supplementing the land-water analysis with a habitat analysis would be beneficial in addressing the goals of restoring/creating emergent marsh. A final sediment analysis, also at the end of the project’s life span, would indicate how the characteristics of sediment dredged from the Mississippi River have changed and whether they are beginning to more closely resemble the characteristics of natural marsh sediment. It is also recommended that one or two additional vegetation surveys are conducted past year 11 to monitor how the community is responding to changing elevation, hydrology, and sediment characteristics in the marsh.

c. Lessons Learned

Although only three years have passed since project construction, some preliminary observations can be made.

1) The relatively high percent cover for *Paspalum vaginatum* 'Brazoria' in the project area indicates that this species was a suitable choice for planting. Its ability to rapidly colonize bare ground may make it a wise choice for planting future marsh creation projects with similar environmental conditions.

2) Ponding due to interior lower platform elevation in Marsh Creation Area 2 may hinder the full attainment of project goals. However, based on observations of the landowner, these areas are providing important habitat for waterfowl.

3) Increased hydrologic connectivity may benefit the project area in regards to the development of intermediate/brackish marsh. It is early in the project's life span and a need for greater connectivity may resolve itself over time if gaps and channels expand and the marsh elevation settles into the intertidal zone.

The overall impression of the BA-39 project is one of success, with increasing marsh vegetation and an elevation that is continuing to settle towards the target marsh elevation of +1.3′ NAVD88. The development of a robust vegetative community takes years and monitoring data indicate that this marsh creation project is on the right trajectory.

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Appendix A

Inspection Photographs for Mississippi River Sediment Delivery System–Bayou Dupont (BA-39)

Photo 1. BA-39 Marsh Creation Area 1 containment dike gap

Photo 2. BA-39 Marsh Creation Area 1

Photo 3. BA-39 Marsh Creation Area 1 looking east toward canal

Photo 4. BA-39 Marsh Creation Area 2 containment dike gap

Photo 5. BA-39 Marsh Creation Area 2 looking west from back levee

Photo 6. BA-39 Marsh Creation Area 2 looking south from back levee. *Typha latifolia* is growing is an area that is inundated with water.

Photo 7. South containment dike for BA-39 Marsh Creation Area 2 at junction with canal looking northeast

Photo 8. BA-39 Increment 2 project area containing both created and remnant marsh (evident by cypress tree)

Appendix B

Three-Year Budget Projection for Mississippi River Sediment Delivery System–

Bayou Dupont (BA-39)

Mississippi River Sediment Delivery System - Bayou Dupont BA-39
Federal Sponsor: EPA
Construction Completed : 2010
PPL 12

Current Approved O&M Budget	Year 0 FY11	Year - 1 FY12	Year - 2 FY13	Year - 3 FY14	Year - 4 FY15	Year - 5 FY16	Year - 6 FY17	Year - 7 FY18	Year - 8 FY19	Year - 9 FY20	Year - 10 FY21	Year - 11 FY22	Year - 12 FY23	Year - 13 FY24	Year - 14 FY25	Year - 15 FY26	Year - 16 FY27	Year - 17 FY28	Year - 18 FY29	Year - 19 FY30	Project Life Budget	Currently Funded
State O&M	$6,809	$3,197	$5,612	$3,326	$5,267	$3,726	$3,529	$3,600	$4,442	$3,900	$3,777	$4,152	$3,930	$4,008	$4,089	$4,170	$4,254	$4,339	$4,426	$4,514	$85,067	$85,067
Corps Admin	$785	$801	$817	$834	$850	$867	$885	$902	$921	$939	$958	$977	$996	$1,016	$1,037	$1,057	$1,079	$1,100	$1,122	$1,145	$19,088	$19,088
Federal S&A	$6,809	$3,197	$5,612	$3,326	$5,267	$3,726	$3,529	$3,600	$4,442	$3,900	$3,777	$4,152	$3,930	$4,008	$4,089	$4,170	$4,254	$4,339	$4,426	$4,514	$85,067	$85,067
Total O&M	$14,403	$7,195	$12,041	$7,486	$11,384	$8,319	$7,943	$8,102	$9,805	$8,739	$8,512	$9,281	$8,856	$9,032	$9,215	$9,397	$9,587	$9,778	$9,974	$10,173	$189,222	$189,222
Engineering Monitoring																						
Aerial Photography			$14,167						$15,957												$30,124	$30,124
Survey - Project Area and Settlement Plates	$52,325		$54,495		$56,700																$163,520	$163,520
Survey - Borrow Area	$41,860																				$41,860	$41,860
Geotechncial Instrumentation for Monitoring Hydraulically Dredged Fill Material	$37,608																				$37,608	$37,608
Monitoring Site Installation, Construction, and Survey O&M	$36,628																				$36,628	$36,628
Vegetation	$7,849		$8,174			$8,674			$9,205			$9,769									$43,671	$43,671
Soil Samples	$4,252				$4,602					$5,086											$13,940	$13,940
RSET	$1,125	$1,149	$1,172	$1,195	$1,219	$1,243	$1,268	$1,294	$1,319	$1,346											$12,330	$12,330
Total Engineering Monitoring	$181,647	$1,149	$78,008	$1,195	$62,521	$9,917	$1,268	$1,294	$26,481	$6,432	$0	$9,769	$0	$0	$0	$0	$0	$0	$0	$0	$379,681	$379,681
Total OM&M	$196,050	$8,344	$90,049	$8,681	$73,905	$18,236	$9,211	$9,396	$36,286	$15,171	$8,512	$19,050	$8,856	$9,032	$9,215	$9,397	$9,587	$9,778	$9,974	$10,173	$568,903	$568,903
STATE Task Force Approved O&M Funding			$15,618																			
FEDERAL Task Force Approved O&M Funding			$15,618																			
COE Task Force Approved O&M Funding			$4,087																			
ENGR MONIT State Current Project-Life Budget			$260,804																			
TOTAL Task Force Approved O&M Funding			$296,127																			
Projected OM&M Expenditures																					Remaining Project Life	
Maintenance Inspection	$6,809	$3,197	$5,612	$3,326	$5,267	$3,726	$3,529	$3,600	$4,442	$3,900	$3,777	$4,152	$3,930	$4,008	$4,089	$4,170	$4,254	$4,339	$4,426	$4,514	$85,067	$85,067
Federal S&A	$6,809	$3,197	$5,612	$3,326	$5,267	$3,726	$3,529	$3,600	$4,442	$3,900	$3,777	$4,152	$3,930	$4,008	$4,089	$4,170	$4,254	$4,339	$4,426	$4,514	$85,067	$85,067
Engineering Monitoring																						
Aerial Photography			$14,169						$15,957												$30,126	$30,126
Survey - Project Area and Settlement Plates	$52,325		$54,495		$56,638																$163,458	$163,458
Survey - Borrow Area	$41,860																				$41,860	$41,860
Geotechncial Instrumentation for Monitoring Hydraulically Dredged Fill Material	$37,608																				$37,608	$37,608
Monitoring Site Installation, Construction, and Survey O&M	$36,628																				$36,628	$36,628
Vegetation	$7,849		$8,174			$8,674			$9,205			$9,769									$43,671	$43,671
Soil Samples	$4,252				$4,602					$5,086											$13,940	$13,940
RSET	$1,125	$1,149	$1,172	$1,195	$1,219	$1,243	$1,268	$1,294	$1,319	$1,346											$12,330	$12,330
																					$0	$0
Total	$195,265	$7,543	$89,234	$7,847	$72,993	$17,369	$8,326	$8,494	$35,365	$14,232	$7,554	$18,073	$7,860	$8,016	$8,178	$8,340	$8,508	$8,678	$8,852	$9,028	$549,755	$549,755

Appendix C

Field Inspection Notes for Mississippi River Sediment Delivery System–Bayou Dupont

(BA-39)

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **BA-39 Mississippi River Sediment Delivery System - Bayou Dupont**

Date of Inspection: 5/2/2013 Time: 9:30 am

Structure No. N/A

Inspector(s): Hopkins, Richardi, Plitsch

Structure Description: N/A

Water Level Inside: 1.5' Staff Gage Outside: N/A

Type of Inspection: Annual

Weather Conditions: Partly Cloudy, Light Wind

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Containment dikes	Good	None	N/A	1 - 3	
Marsh Creation Areas	Good	None	N/A	4	
Highway Casing					Casing not visible, buried.
Railroad Casing					Casing not visible, buried.

Appendix D

Vegetation Tables for Mississippi River Sediment Delivery System–Bayou Dupont

(BA-39)

Table 1. Percent cover and percent occurrence of each species at vegetation stations in the BA-39 project area. N = number of stations surveyed. *Habitat* is the marsh habitat where the species is most commonly found. F = freshwater, I = intermediate, B = brackish, S = saltwater.

Scientific Name	Common Name	BA-39 2010 (N = 30)		BA-39 2011 (N = 30)		Habitat
		% Cover	% of Stations	% Cover	% of Stations	
Alternanthera philoxeroides	alligatorweed	0.2	3	0.9	10	F/I
Amaranthus australis	southern amaranth	2.7	30	1.5	47	I/B
Ammannia latifolia	pink redstem	0.2	7	0.5	27	F/I
Baccharis halimifolia	eastern baccharis	.	.	0.6	10	F/I
Bacopa monnieri	herb of grace	7.1	27	6.5	47	F/I
Batis maritima	turtleweed	.	.	< 0.1	3	S
Cynodon dactylon	Bermudagrass	.	.	3.0	7	F
Cyperus filicinus	fern flatsedge	.	.	0.1	7	F/I
Cyperus haspan	haspan flatsedge	0.3	3	.	.	F
Cyperus odoratus	fragrant flatsedge	5.0	43	.	.	I
Distichlis spicata	saltgrass	2.1	20	15.2	43	F/I/B/S
Echinochloa sp.	cockspur grass	.	.	< 0.1	3	F/I
Echinochloa walteri	coast cockspur grass	2.4	30	1.2	17	I
Eleocharis albida	white spikerush	.	.	4.5	27	I/B
Eleocharis baldwinii	Baldwin's spikerush	0.7	3	2.4	10	F
Eleocharis cellulosa	Gulf Coast spikerush	0.3	10	1.0	13	F/I
Eleocharis macrostachya	pale spikerush	0.5	7	2.2	13	I
Eleocharis parvula	dwarf spikerush	13.6	57	0.6	13	I/B
Ipomoea sagittata	saltmarsh morning-glory	0.2	7	< 0.1	3	F/I
Iva annua	annual marsh elder	.	.	< 0.1	3	F
Iva frutescens	Jesuit's bark	0.1	3	0.5	10	I
Leptochloa fusca	Malabar sprangletop	3.6	33	6.1	37	I
Lythrum lineare	wand lythrum	0.9	17	3.0	27	I/B
Mollugo verticillata	green carpetweed	0.2	3	0.3	10	F
Panicum dichotomiflorum	fall panicgrass	.	.	1.7	17	F/I
Paspalum vaginatum	seashore paspalum	13.4	50	19.3	57	I
Pluchea odorata	sweetscent	1.4	13	2.2	30	I/B
Polygonum lapathifolium	curlytop knotweed	0.6	13	0.1	3	F
Polygonum punctatum	dotted smartweed	0.2	3	0.1	3	F/I
Portulaca oleracea	little hogweed	0.1	3	.	.	F
Sagittaria lancifolia	bulltongue arrowhead	.	.	0.1	7	F/I
Schoenoplectus americanus	chairmaker's bulrush	.	.	0.3	3	I/B
Schoenoplectus californicus	California bulrush	< 0.1	3	.	.	I
Schoenoplectus tabernaemontani	softstem bulrush	0.7	3	0.1	3	I/B
Sesbania drummondii	poisonbean	.	.	0.1	3	F
Sesbania herbacea	bigpod sesbania	.	.	0.1	3	I
Solidago sempervirens	seaside goldenrod	0.1	3	1.1	23	F/I
Spartina alterniflora	smooth cordgrass	.	.	1.5	3	S
Spartina patens	saltmeadow cordgrass	0.8	3	4.2	23	I/B
Symphyotrichum divaricatum	southern annual saltmarsh aster	.	.	1.9	40	F
Symphyotrichum sp.	aster	.	.	0.5	13	F
Symphyotrichum tenuifolium	perennial saltmarsh aster	0.1	3	.	.	I/B
Typha domingensis	southern cattail	.	.	0.8	7	I
Typha latifolia	broadleaf cattail	5.7	10	9.5	27	F
Typha sp.	cattail	0.2	3	.	.	F/I
Vigna luteola	hairypod cowpea	1.2	10	0.1	7	I
Total Number of Species		**30**		**40**		

Table 2. Percent cover and percent occurrence of each species at vegetation stations in the BA-39 Increment 2 project area. N = number of stations surveyed. *Habitat* is the marsh habitat where the species is most commonly found. F = freshwater, I = intermediate, B = brackish, S = saltwater.

Scientific Name	Common Name	Increment 2, 2010 (N = 6)		Increment 2, 2011 (N = 6)		Habitat
		% Cover	% of Stations	% Cover	% of Stations	
Amaranthus cannabinus	tidalmarsh amaranth	1.2	33	0.3	17	I/B
Ammannia latifolia	pink redstem	0.4	33	.	.	F/I
Bacopa monnieri	herb of grace	15.8	33	7.2	33	F/I
Cyperus compressus	poorland flatsedge	1.2	17	0.3	17	F
Cyperus odoratus	fragrant flatsedge	1.3	33	.	.	I
Echinochloa colona	jungle rice	0.7	17	0.3	17	F
Echinochloa walteri	coast cockspur grass	4.6	67	0.1	17	I
Eclipta prostrata	false daisy	1.2	17	.	.	F
Eleocharis cellulosa	Gulf Coast spikerush	.	.	0.1	17	F/I
Eleocharis sp.	spikerush	9.2	33	6.2	33	I
Ipomoea sagittata	saltmarsh morning-glory	.	.	0.2	17	F/I
Iva frutescens	Jesuit's bark	.	.	1.2	33	I
Leptochloa fusca	Malabar sprangletop	0.8	17	.	.	I
Leptochloa panicea	mucronate sprangletop	4.8	67	1.9	67	F
Lythrum lineare	wand lythrum	0.8	33	0.3	17	I/B
Panicum repens	torpedo grass	.	.	1.2	17	I
Paspalum distichum	knotgrass	5.8	33	11.4	83	F
Pluchea odorata	sweetscent	2.2	33	.	.	I/B
Polygonum hydropiperoides	swamp smartweed	0.2	33	.	.	F
Portulaca oleracea	little hogweed	0.3	33	0.2	17	F
Schoenoplectus americanus	chairmaker's bulrush	0.2	17	15.0	17	I/B
Solidago sempervirens	seaside goldenrod	.	.	1.9	50	F/I
Symphyotrichum subulatum	eastern annual saltmarsh aster	.	.	6.0	67	I
Typha latifolia	broadleaf cattail	.	.	0.9	33	F
Total Number of Species		**17**		**18**		