State of Louisiana

Coastal Protection and Restoration Authority of Louisiana

Monitoring Plan

for

Caminada Headland Back Barrier Marsh Restoration (BA-0171)

State Project Number BA-0171
Priority Project List 23

November 2016
Revised March 2024
Lafourche Parish

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The Coastal Protection and Restoration Authority (CPRA) of Louisiana and the United States Environmental Protection Agency (EPA) agree to carry out the terms of this Monitoring Plan of the accepted, completed project features in accordance with grant no. 00F90301 dated on August 26th, 2014 with amendments dated Oct 21st, 2014, January 7th, 2015, May 28th, 2015 and October 27th, 2016. The MOA for O&M and Monitoring, and inspections activities for the BA-0171 project was signed on 14 March 2024.

The project features covered by this plan are inclusive of and are identified as the Caminada Headland Back Barrier Marsh Restoration (BA-0171). The intention of the provisions of this Monitoring Plan is to monitor the project using standardized data collection techniques and to analyze that data and any available data from other programs to determine whether the project is achieving the anticipated benefits. Reports will be generated and recommendations made to adaptively manage the project.

Construction of the Caminada Headland Back Barrier Marsh Restoration (BA-0171) is authorized by Section 303(a) of Title III Public Law 101-646, the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) enacted on November 29, 1990 as amended. The Caminada Headland Back Barrier Marsh Restoration (BA-0171) was approved on the 23th Priority Project List.

1. PROJECT DESCRIPTION, PURPOSE, GOALS, and FEATURES

Description

The Caminada Back Barrier Marsh Creation Project (BA-0171) consists of marsh creation and nourishment project features situated along the Caminada-Moreau Headland in Lafourche and Jefferson Parish, LA within the CWPPRA Planning Region 2. Specifically, the project is located in the area south of Louisiana Highway 1 between Belle Pass and Caminada Pass, and stretches from the area in and around Bay Champagne to the west of Elmer's Island along the headland and directly north of the Caminada Headland Beach and Dune project (BA-0045) (Figure 1).

According to the marsh type survey (Sasser *et al*. 2014), the project area is 19 percent shore, 26 percent saline marsh and 55 percent water. Field observations indicate saline marsh dominated by black mangrove (*Avicennia germinans*) and smooth cordgrass (*Spartina alterniflora*). The project area is entirely classified as saline marsh. No submerged aquatic vegetation has been observed in the project area or in nearby marshes (Osowski, 2016).

Wildlife that utilizes estuarine marshes includes wading birds (herons, egrets, ibises, and roseate spoonbills), rails, migratory waterfowl (green-winged teal, blue-winged teal, mottled duck, gadwall, American widgeon, and lesser scaup), raptors, and songbirds. Brackish marshes with submerged aquatic vegetation often support large numbers of puddle ducks, (dabbling ducks such as mallards and pintails). Shorebirds utilizing estuarine marshes include killdeer, American avocet, black-necked stilt, American oystercatcher, common snipe, and various species of sandpipers. Seabirds supported by those habitats include white pelican, brown pelican, black skimmer, herring gull,

laughing gull, and several species of terns. Other nongame birds such as boat-tailed grackle, red-winged blackbird, seaside sparrow, olivaceous cormorant, northern harrier, belted kingfisher, and sedge wren also utilize estuarine marshes (Osowski, 2016).

According to both United States Fish and Wildlife Service (USFWS) and Louisiana Department of Wildlife and Fisheries (LDWF), bird nesting colonies may occur in the project area. Estuarine marsh mammals include swamp rabbit, nutria, muskrat, mink, river otter, raccoon, white-tailed deer, and coyote. Reptiles are limited primarily to the American alligator in intermediate and brackish marshes, and the diamond-backed terrapin and gulf salt marsh snake in brackish and saline marshes. Juvenile sea turtles may occasionally utilize bays and saline marsh ponds adjacent to the Gulf (Osowski, 2016).

The West Indian manatee, red knot, piping plover, and two species of sea turtles (loggerhead sea turtle and endangered Kemp's ridley turtle) are federally listed threatened and endangered species that may occur within the project area (Osowski, 2016). In addition, a critically imperiled to rare species, Wilson's plover, could occur within the project area.

In conjunction with Caminada Headland Beach and Dune Increments I and II (BA-0045 and BA-0143, respectively), the BA-0171 will help restore the geomorphic form and function of the barrier shoreline. Restoration of these shorelines and coastal marshes via the aforementioned projects would enhance critical habitat, restore geomorphic form and function, and advance the long-term sustainability of the Caminada-Moreau Headland.

Although there are no CRMS sites hydrologically connected within the project area, CRMS0164 and CRMS0292 are located within a 5.5 mile radius of the approximate project center (Figure 1). Data collected from the surrounding CRMS sites includes continuous hydrographic metrics, discrete hydrographic metrics, bi-annual accretion, surface elevation (RSET), and yearly vegetation. These nearby CRMS sites may provide important reference sites for evaluation of the project goals. Data from CRMS0292 was used to determine the marsh creation elevation for the project areas. Future marsh surveys and water levels at CRMS0292 and other CRMS sites shall be utilized to see if the created marsh platform is following expected settlement curves.

Purpose:

The purpose of the proposed project is to create and nourish approximately 900 acres of emergent marsh by dredging sediment from an offshore borrow area and depositing that material in shallow open-water areas (Taylor 2016).

As defined in the 95% Design Report (Taylor 2016), the primary goals of the Caminada Back Barrier Marsh Creation Project are to:

1) Create and/or nourish approximately 900 acres of back barrier marsh by pumping sediment into the marsh fill area from an offshore borrow area.
2) Create a marsh platform upon which the beach and dune can migrate, reducing the likelihood of breaching, improving the longevity of the barrier shoreline, and protecting wetlands and infrastructure to the north and west.

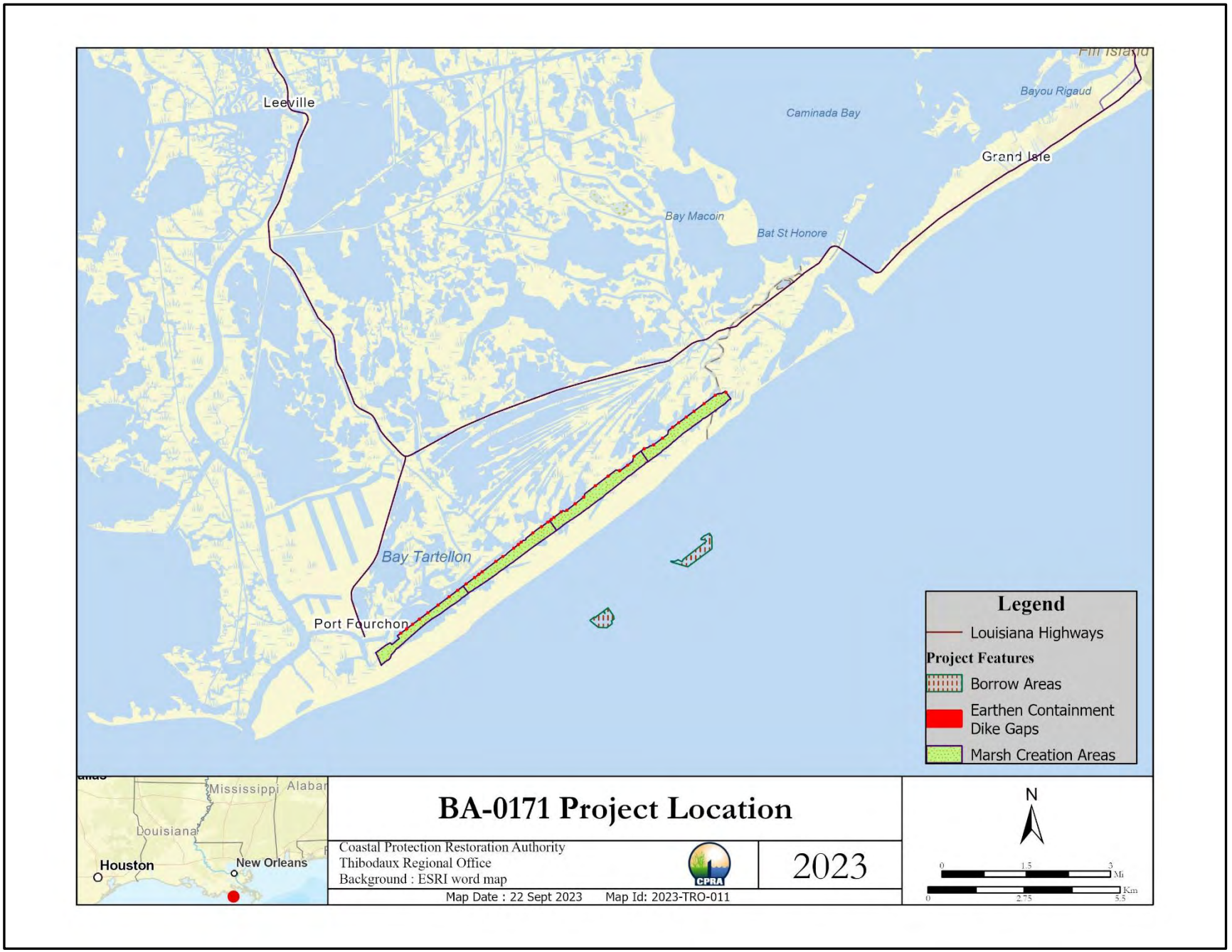

Figure 1. Location of the Caminada Back Barrier Marsh Creation Project (BA-0171).

Specific Goals of the project are:

1) Create and/or nourish approximately 900 acres of back barrier marsh habitat using sediments pumped from an offshore borrow areas in the Gulf of Mexico.
2) Create a platform upon which the beach and dune can migrate, reducing the likelihood of breaching, improving the longevity of the barrier shoreline, and protecting wetlands and infrastructure to the north.
3) The project is expected to result in approximately 329 net acres over the 20-year project life.

Features:

The estimated acres for the Caminada Back Barrier Marsh Creation project of the four increment/fill (Marsh Creation) areas are:

Increment/Fill Area 1: 197.4 acres
Increment/Fill Area 2: 232.8 acres
Increment/Fill Area 3: 273.8 acres
Increment/Fill Area 4: 238.5 acres
Total March Creation Areas (MCA): 942.5 acres

Earthen containment dikes were created to a +3.0 ft NAVD88 using in-situ material. The containment dikes were gapped following dewatering of the marsh creation fill areas by the construction contractor. No additional gapping is expected; however, the containment dikes will be monitored by O&M to determine if additional gapping and/or if additional dredging of the bottom elevation of the gap(s) is needed.

The borrow area had a pre-construction bathymetric survey, as well as a post-construction bathymetric survey to document the affects of dredging. The borrow areas are located approximately 1.6 miles offshore and are shown in Figure 2.

Table 1. As-Built Borrow Quantities

Borrow Area	Volume (cy)	Area (Ac.)
Southwest	991,579	190.0
Northwest	1,461,534	136.4
Total Borrow Area	2,453,113	326.4

The project has a twenty (20) year economic life with notable dates of:

Construction Start: **June 2020**
End of Construction Phase: **October 1, 2023**
Beginning of Monitoring Phase: **October 2, 2023**
Estimated End of Project Life: **October 2043**

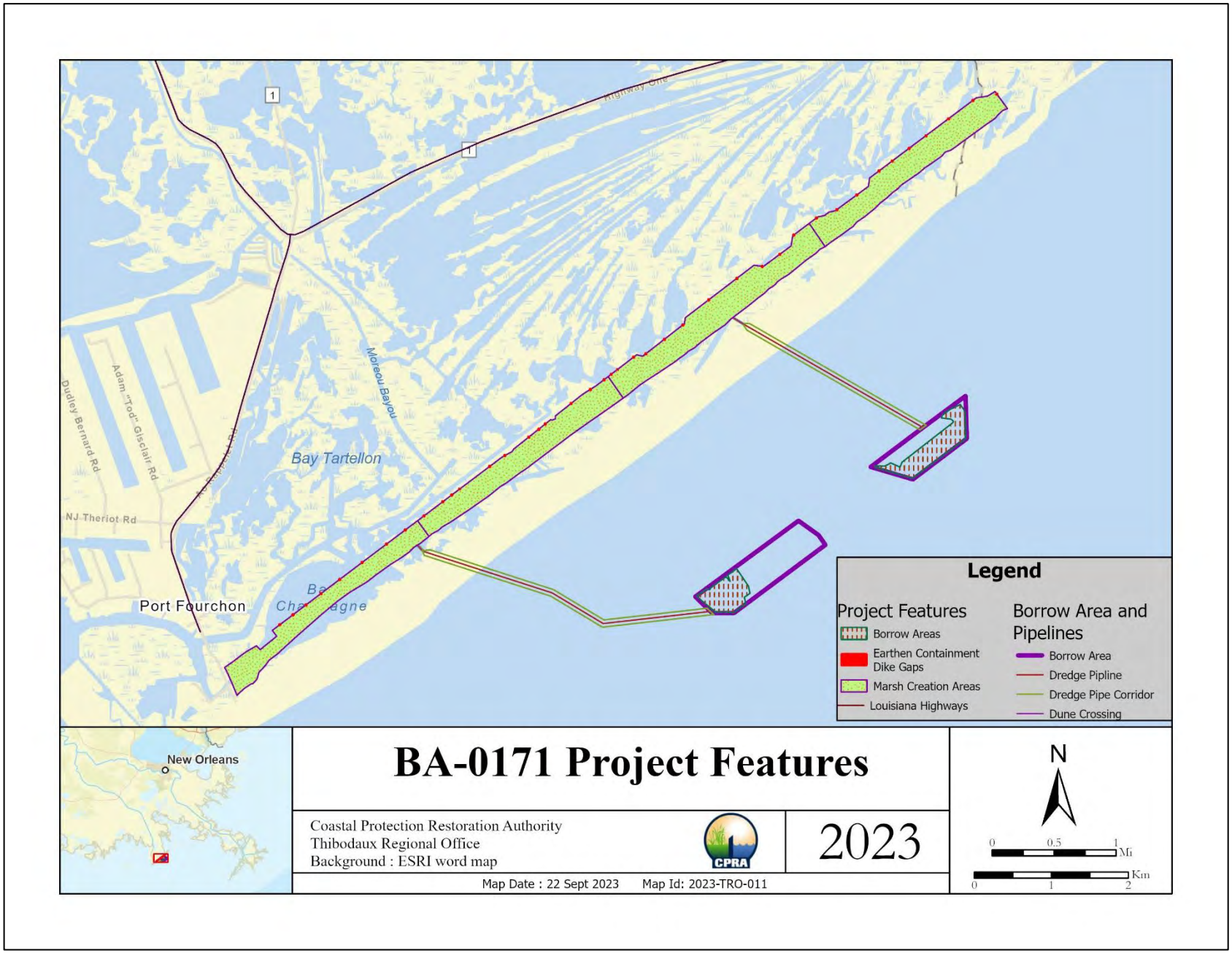

Figure 2. Project features for the Caminada Headland Back Barrier Marsh Restoration (BA-0171) project.

2. ITEMS REQUIRING MONITORING

In conjunction with data collected from the Coast-wide Reference Monitoring System (CRMS), Barrier Island Comprehensive Monitoring Program (BICM), and the BA-0171 project specific data collection, the data analysis shall provide insight to the success of the project.

The Coast-wide Reference Monitoring System (CRMS) - *Wetlands* is a network of approximately 392 monitoring sites distributed throughout the coastal zone of Louisiana. Hydrographic, vertical accretion, elevation change, vegetation, soils, and aerial photography data are collected at each CRMS site. Although there are no CRMS sites located within the project boundaries (Figure 2), data from the surrounding CRMS sites (CRMS0292 and CRMS0164) may be used to help characterize conditions surrounding the project area.

The Barrier Island Comprehensive Monitoring Program (BICM) was initiated in 2002 to provide a comprehensive approach to barrier shoreline monitoring similar to CRMS-*Wetlands* (Troutman et al. 2003). The decided advantage of BICM over project specific monitoring is that it provides long term data on all of Louisiana's barrier shorelines and is not limited to areas with constructed projects. As a result, a greater amount of long-term data is available to evaluate constructed projects, to facilitate planning and design of future barrier island projects in numerous other programs (CWPPRA, LCA, WRDA, CIAP), to assist with O&M activities, and to determine storm impacts. Because data are collected for the entire barrier island system concurrently and with identical methodologies, these data are more consistent, accurate, and comprehensive than previous barrier island data collection efforts.

The objectives of BICM are to:

1. Determine the elevation, longevity, and conservation mass of the barrier islands.
2. Determine major habitat types and the distribution and quantity of each habitat over time on the barrier islands.
3. Determine geotechnical properties of sediments on the barrier islands.
4. Relate available data on environmental forces that affect the ecology and morphology of the barrier islands to other BICM data sets.
5. Determine species composition and diversity of vegetation within major habitat types on the barrier islands.

The following monitoring strategies will provide the information necessary to evaluate the specific project goals**.**

A. **Aerial Photography and Habitat Mapping**: To document the change in habitat within the project area, habitat mapping data will be obtained from digital imagery (Z/I Imaging digital mapping camera) with a minimal of 1-meter resolution. The photography will be geo-rectified using standard operating procedures described in Folse et al. (2023), and habitat ratios will be determined using the BICM classification (Enwright et al. 2020). Habitat mapping analysis will be adjusted to coincide with the

CRMS coast-wide aerial photography tentatively scheduled for collection during post-construction project years 1, 5, 8, 11 and 17 (calendar years 2023, 2027, 2030, 2033 and 2039), or adjusted to coincide with the coast-wide flights scheduled for every 3 years (2024, 2027, 2030…). Scheduled habitat mapping analysis will be adjusted to coincide with the CRMS coastwide aerial photography. Five habitat mapping analysis will be funded by the BA-0171 project monitoring budget while the acquisition of the imagery will be funded through the CRMS coast-wide aerial photography. An "as-built" aerial image of the project area was acquired in spring 2023 paid through construction funds.

B. **Surveys**: To document the change in the elevation of the marsh creation areas, four surveys will be conducted at years 5, 8, 11, and 17 (calendar years 2027, 2030, 2033 and 2039) in addition to the as-built surveys. Scheduling of the surveys may be adjusted to coincide with OM&M events or land/water analysis. All post-construction surveys will be funded by the BA-0171 Monitoring budget.

   To estimate elevation and volume changes in the project areas over time, ground surveys will be employed. This elevation data will be used to measure elevation and sediment volume for the created marsh areas. Topographic surveys will be performed at 500ft intervals along as-built survey transects in the marsh creation area in accordance with the current Guide to Minimum Standards. These survey transects will follow the same lines as the design survey and pre/post construction surveys. BICM bathymetry transects will be mapped onto the emergent portion of the project and a suggested survey interval will be determined by interval of the existing survey transects merging with BICM bathymetry transects. The use of BICM LiDAR data shall also be included to determine elevation changes.

C. **Vegetative Sampling:** Vegetation sampling will be conducted and will follow the Braun-Blanquet methodology (Folse et al. 2023). The stations will consist of randomly selected replicate 2m x 2m plots located along the survey transects divided amongst the creation area. Sampling will occur in project years 2, 5, 11 and 17 (calendar years 2024, 2027, 2033 and 2039) or adjusted to coincide with other sampling events. The vegetative sampling will be funded by the BA-0171 Monitoring budget.

D. **Benthic Surveys**: Benthic surveys were proposed in the draft Monitoring Plan; however, based on a consultation with USFWS dated September 28, 2016, USFWS would use benthic recolonization rates from the Winter Shorebird and Benthic Surveys – Caminada Headland reports for BA-0045 and BA-0143 as a estimation of what would occur on the BA-171 site. The benthic survey reports are stored in the CIMS library located through the CPRA website : https://cims.coastal.louisiana.gov/

E. **Reports:** Monitoring reports will be produced during the years following multiple monitoring variables are collected. The reports are anticipated to be produced during project years of 4, 7, 13, and 19 (calendar years 2026, 2029, 2035, and 2041). A final monitoring project closeout report will be produced during the final years of project

life (2040-2042). The actual years when reports are produced may vary due to data availability and data analysis.

3. MONITORING BUDGET

The cost associated with project-specific monitoring variables outlined in Section 2 of this plan for the twenty (20) year project life is $2,429,475. Funding for monitoring the monitoring budget was approved by the CWPPRA Task Force in February 2018 (Appendix 1) in conjunction with the Phase II construction funding. The OM&M MOA was approved and signed on 14 March 2024.

Upon completion of the BA-0171 construction, CPRA Monitoring section and EPA, agreed to follow a modified monitoring budget and monitoring schedule as stated in this document. The agreed upon budget is in Appendix 2 of this monitoring plan for ***$1,380,997.00*** *(non-inflated)*.

4. RESPONSIBILITIES

A. CPRA will:

1. Coordinate and oversee all scientific data collection.

2. Ensure that all data goes through quality control procedures and is entered into the public database.

3. Analyze the data and report on the status of the project after data collection events. Should the data indicate that the project is not meeting the goals and objectives, adaptive management recommendations will be made to improve the response.

4. Review the monitoring plan and budget annually with the EPA to determine that the data being collected adequately evaluates the project.

B. EPA will:

1. Review the monitoring plan and budget annually with the CPRA to determine that the data being collected adequately evaluates the project.

2. Review and provide feedback of data results and reports for adaptive management decisions associated with the project.

References

Enwright, N.M., SooHoo, W.M., Dugas, J.L., Conzelmann, C.P., Laurenzano, C., Lee, D.M., Mouton, K., and Stelly, S.J., 2020, Louisiana Barrier Island Comprehensive Monitoring Program—Mapping habitats in beach, dune, and intertidal environments along the Louisiana Gulf of Mexico shoreline, 2008 and 2015–16: U.S. Geological Survey Open-File Report 2020–1030, 57 pp., https://doi.org/10.3133/ofr20201030.

Folse, T. M., Thomas E. McGinnis, Leigh A. Sharp, Jonathan L. West, Melissa K. Hymel, John P. Troutman, Dona Weifenbach, William M. Boshart, Laurie B. Rodrigue, Danielle C. Richardi, W. Bernard Wood, C. Mike Miller, Elizabeth M. Robinson, Angelina M. Freeman, Camille L. Stagg, Brady R. Couvillion, and Holly J. Beck. 2023. A Standard Operating Procedures Manual for the Coastwide Reference Monitoring System-Wetlands and the System-Wide Assessment and Monitoring Program: Methods for Site Establishment, Data Collection, and Quality Assurance/Quality Control. Louisiana Coastal Protection and Restoration Authority. Baton Rouge, LA. 255 pp. https://cims.coastal.louisiana.gov/RecordDetail.aspx?Root=0&sid=25156

Osowski, S., 2016. Final Project Information Sheet for Wetland Value Assessment (WVA) for Caminada Headland Back Barrier Marsh Restoration (BA-0171). U.S. Environmental Protection Agency.18pp.

Sasser, C.E., Visser, J.M., Mouton, Edmond, Linscombe, Jeb, and Hartley, S.B., 2014, Vegetation types in coastal Louisiana in 2013: U.S. Geological Survey Scientific Investigations Map 3290, 1 sheet, scale 1:550,000, <http://dx.doi.org/10.3133/sim3290>.

Taylor, A.M., S.M Hayes, R Bennett, A. Chavarrie, 2016. BA-0171 Caminada headland Back Barrier Marsh Creation Project, 95% Design Report. Coastal protection and Restoration Authority. 45pp.

Troutman, J.P., D.M. Lee, S. Khalil, B.S. Carter, K.S. Gray, and L.A. Reynolds. 2003. Draft Barrier Island Comprehensive Monitoring Program. Louisiana Department of Natural Resources Coastal Restoration Division Biological Monitoring Section.

Attachment 1

Task Force approved Project Monitoring Budget, February 2018

						Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Monitoring Items (State costs placed in separate "monitoring" acct)																									
BA-193 Monitoring Management (1 week CPRA)	Yearly	1	7500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500
BA-171 Monitoring Management (1 week CPRA)	Yearly	1	7500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500
BA-0193 Task Management, SOS, FieldTrips/Inspection	Hours	1	150	13,500	9,000	13,500		13,500							13,500								13,500		
BA-0171 Task Management, SOS, FieldTrips/Inspection	Hours	1	150	13,500	9,000	13,500		13,500							13,500								13,500		
BA-193 Vegetative Sampling	Each	1	15600	15,600		15,600		15,600							15,600								15,600		
BA-171 Vegetative Sampling	Each	1	15600	15,600		15,600		15,600							15,600								15,600		
BA-193 Elevation Survey	Each	1	132000			132,000		26,400							26,400								26,400		
BA-171 Elevation Survey	Each	1	217796			217,796		26,400							26,400								26,400		
BA-0193 OM&M Report	Each	1	36000			36,000		36,000							36,000								36,000		
BA-0171 OM&M Report	Each	1	36000			36,000		36,000							36,000								36,000		
BA-0193 Habitat Mapping and Land/Water Analysis	Varies	1	6000	124,000		24,000		24,000							12,000								12,000		
BA-0171 Habitat Mapping and Land/Water Analysis	Varies	1	6000	124,000		24,000		24,000							12,000								12,000		
BA-193 Benthic Surveys	Each	1	25000	25,000	25,000	25,000																			
BA-171 Benthic Surveys	Each	1	25000	25,000	25,000	25,000																			
	Subtotal (5)			**371,200**	**83,000**	**592,996**	**15,000**	**246,000**	**15,000**	**15,000**	**15,000**	**15,000**	**222,000**	**15,000**	**15,000**	**15,000**	**15,000**	**15,000**	**15,000**	**15,000**	**222,000**	**15,000**	**15,000**

Attachment 2

CPRA and EPA agreed upon Project Monitoring Budget, July 2023

Caminada Back Barrier (BA-0171)

CWPPRA

11-Jul-23

Monitoring Budget Development: FY24 Non-inflated

Years are Calendar Years

		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	
Monitoring Item	**Cost**																					**Monitoring Item Total**
Contractor &/or CPRA Equipment, Travel Costs (Non-IDC)																						
Elevation Survey	$ 100,000.00					$ 100,000.00						$ 100,000.00						$ 100,000.00				**$ 300,000.00**
Habitat Mapping Analysis	$ 15,000.00	$ 15,000.00				$ 15,000.00			$ 15,000.00			$ 15,000.00						$ 15,000.00				**$ 75,000.00**
Contractor &/or CPRA Equipment, Travel Sub-Total		*$ 15,000.00*	*$ -*	*$ -*	*$ -*	*$ 115,000.00*	*$ -*	*$ -*	*$ 15,000.00*	*$ -*	*$ -*	*$ 115,000.00*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 115,000.00*	*$ -*	*$ -*	*$ -*	*$ 375,000.00*
CPRA Personnel Costs																						
Task Management: Elevation Survey (60 hrs)	$ 3,651.60		$ 3,651.60									$ 3,651.60							$ 3,651.60			$ 10,954.80
Task Management: Habitat Mapping Analysis	$ 2,434.40	$ 2,434.40				$ 2,434.40			$ 2,434.40			$ 2,434.40						$ 2,434.40				$ 12,172.00
Vegetation (4 day)	$ 46,451.86		$ 46,451.86			$ 46,451.86						$ 46,451.86						$ 46,451.86				$ 185,807.45
Report (360 hrs)	$ 14,606.40				$ 14,606.40															$ 14,606.40		$ 29,212.80
Report (120 hrs)	$ 7,303.20							$ 7,303.20						$ 7,303.20								$ 14,606.40
Project Administration (40 hrs)	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 2,434.40	$ 48,688.00
CPRA Personnel Sub-Total		*$ 4,868.80*	*$ 52,537.86*	*$ 2,434.40*	*$ 17,040.80*	*$ 51,320.66*	*$ 2,434.40*	*$ 9,737.60*	*$ 4,868.80*	*$ 2,434.40*	*$ 2,434.40*	*$ 54,972.26*	*$ 2,434.40*	*$ 9,737.60*	*$ 2,434.40*	*$ 2,434.40*	*$ 2,434.40*	*$ 51,320.66*	*$ 6,086.00*	*$ 17,040.80*	*$ 2,434.40*	$ 301,441.44
CPRA IDC (FY24; 233.73%)	*2.3373*	*$ 11,379.85*	*$ 122,796.74*	*$ 5,689.92*	*$ 39,829.46*	*$ 119,951.78*	*$ 5,689.92*	*$ 22,759.69*	*$ 11,379.85*	*$ 5,689.92*	*$ 5,689.92*	*$ 128,486.66*	*$ 5,689.92*	*$ 22,759.69*	*$ 5,689.92*	*$ 5,689.92*	*$ 5,689.92*	*$ 119,951.78*	*$ 14,224.81*	*$ 39,829.46*	*$ 5,689.92*	$ 704,559.00
CPRA Total		*$ 16,248.65*	*$ 175,334.60*	*$ 8,124.32*	*$ 56,870.26*	*$ 171,272.44*	*$ 8,124.32*	*$ 32,497.29*	*$ 16,248.65*	*$ 8,124.32*	*$ 8,124.32*	*$ 183,458.92*	*$ 8,124.32*	*$ 32,497.29*	*$ 8,124.32*	*$ 8,124.32*	*$ 8,124.32*	*$ 171,272.44*	*$ 20,310.81*	*$ 56,870.26*	*$ 8,124.32*	*$ 1,006,000.00*
Yearly Total		$ 31,249.00	$ 175,335.00	$ 8,124.00	$ 56,870.00	$ 286,272.00	$ 8,124.00	$ 32,497.00	$ 31,249.00	$ 8,124.00	$ 8,124.00	$ 298,459.00	$ 8,124.00	$ 32,497.00	$ 8,124.00	$ 8,124.00	$ 8,124.00	$ 286,272.00	$ 20,311.00	$ 56,870.00	$ 8,124.00	
Running Total		**$ 31,249.00**	$ 206,584.00	$ 214,708.00	$ 271,578.00	$ 557,850.00	$ 565,974.00	$ 598,471.00	$ 629,720.00	$ 637,844.00	$ 645,968.00	$ 944,427.00	$ 952,551.00	$ 985,048.00	$ 993,172.00	$ 1,001,296.00	$ 1,009,420.00	$ 1,295,692.00	$ 1,316,003.00	$ 1,372,873.00	$ 1,380,997.00	**$ 1,380,997.00**