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2017 Coastal Master Plan

Appendix A: Project Definition

Report: Final

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Coastal Protection and Restoration Authority

This document was prepared in support of the 2017 Coastal Master Plan being prepared by the Coastal Protection and Restoration Authority (CPRA). CPRA was established by the Louisiana Legislature in response to Hurricanes Katrina and Rita through Act 8 of the First Extraordinary Session of 2005. Act 8 of the First Extraordinary Session of 2005 expanded the membership, duties, and responsibilities of CPRA and charged the new authority to develop and implement a comprehensive coastal protection plan, consisting of a master plan (revised every five years) and annual plans. CPRA's mandate is to develop, implement, and enforce a comprehensive coastal protection and restoration master plan.

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Executive Summary

As coastal Louisiana faces increasing threats from flooding and sea level rise, there is a great need to advance our scientific understanding of the coast and how coastal Louisiana will need to adapt to future conditions. The Coastal Protection and Restoration Authority (CPRA) is undertaking this challenge through five year updates of Louisiana's Comprehensive Master Plan for a Sustainable Coast. The 2017 Coastal Master Plan builds on past progress and establishes a clear vision for the future. It carries the 2007 and 2012 plans forward by improving the methods used to ensure projects are completed as efficiently and effectively as possible.

This document summarizes the process by which CPRA developed the list of candidate projects to evaluate for consideration in the 2017 Coastal Master Plan. Following development of the candidate projects list, specific project details were required to define project features affecting the landscape in the coastal system, as well as the economic analysis and prioritization of projects. This was accomplished by the development of specific attributes for each type of candidate project to provide physical and monetary parameters needed by the Integrated Compartment Model (ICM), the Coastal Louisiana Risk Assessment (CLARA) model, and the Planning Tool. This document presents the principal project attribute assumptions for each project type.

In addition, fact sheets describing each restoration and risk reduction project evaluated for the master plan are provided as an attachment to this document as well as parish fact sheets that detail the potential impacts of future without action and future with implementation of the master plan at the parish level.

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List of Abbreviations

ASCE	American Society of Civil Engineers
BH	Barrier Island/Headland
BS	Bank Stabilization
cfs	cubic feet per second
CLARA	Coastal Louisiana Risk Assessment
CPRA	Coastal Protection and Restoration Authority
CWPPRA	Coastal Wetlands Planning, Protection and Restoration Act
DEM	Digital Elevation Model
DI	Diversion
FEMA	Federal Emergency Management Agency
FMV	Fair Market Value
FWOA	Future Without Action
GIS	Geographic Information System
GIWW	Gulf Intracoastal Waterway
HP	Structural Protection
HR	Hydrologic Restoration
HSDRRS	Hurricane and Storm Damage Risk Reduction System
ICM	Integrated Compartment Model
LCA	Louisiana Coastal Area
LGM	Larose to Golden Meadow
MC	Marsh Creation
MRGO	Mississippi River Gulf Outlet
MRL	Mississippi River Levee
MR&T	Mississippi River and Tributaries
NAVD88	North American Vertical Datum of 1988

NDV	Non-Depreciated Values
NOV	New Orleans to Venice
NRDA	Natural Resource Damage Assessment
NS	Nonstructural Risk Reduction
O&M	Operations and Maintenance
OR	Oyster Barrier Reef
P/E&D	Planning/Engineering and Design
RC	Ridge Restoration
SP	Shoreline Protection
USACE	U.S. Army Corps of Engineers
UTM	Universal Transverse Mercator

1.0 Introduction

1.1 Developing a List of Projects

As coastal Louisiana faces increasing threats from flooding and sea level rise, there is a great need to advance our scientific understanding of the coast and how coastal Louisiana will need to adapt to future conditions. The Coastal Protection and Restoration Authority (CPRA) is undertaking this challenge through five year updates of Louisiana's Comprehensive Master Plan for a Sustainable Coast.

The 2017 Coastal Master Plan builds on past progress and establishes a clear vision for the future. It carries the 2007 and 2012 plans forward by improving the methods used to ensure projects are completed as efficiently and effectively as possible.

This document describes the process by which CPRA developed the list of candidate projects and the associated attributes required to evaluate each project for consideration in the 2017 Coastal Master Plan.

1.1.1 Refinement of 2012 Coastal Master Plan Projects

Projects or increments of projects included in the 2012 Coastal Master Plan that have been constructed or had funding for construction as of January 1, 2015, were not part of the list of candidate projects for 2017. They instead were included as part of future without action (FWOA).[1] A list of all projects included in FWOA can be found in Attachment A1. In total, 19 projects included in the 2012 Coastal Master Plan met this criterion (Table 1).

Table 1: 2012 Projects (or Project Increments*) Moved to FWOA.

Project ID	Project Name	FWOA Project (or Project Increments)
001.CO.01	South Lake Lery Marsh Creation	South Lake Lery Shoreline and Marsh Restoration (BS-0016)
001.HR.01	Amite River Diversion Canal	Hydrologic Restoration of the Amite River Diversion (PO-0142)
001.SP.01*	Manchac Landbridge Shoreline Protection	Lake Pontchartrain Shoreline Protection (PO-0052)
002.BH.04*	Barataria Pass to Sandy Point Barrier Island Restoration	Shell Island West (BA-0111)

[1]Projects considered part of FWOA are either projects that have been constructed and will continue to have an effect on the landscape into the future or projects for which funding has been procured. FWOA projects will not compete for the potential future funding. The FWOA condition is the baseline against which candidate projects were evaluated.

Project ID	Project Name	FWOA Project (or Project Increments)
002.BH.05*	Belle Pass to Caminada Pass Barrier Island Restoration	Caminada Headland Beach and Dune Restoration (BA-0143)
002.CO.01	Grand Liard Marsh/Ridge Restoration	Grand Liard Marsh and Ridge Restoration (BA-0068)
002.HP.07*	Lafitte Ring Levee	Rosethorne Tidal Protection (BA-0075-2)
002.HP.08	Maintain West Bank Levees	West Bank and Vicinity (BA-0066)
002.MC.05e*	Large-Scale Barataria Marsh Creation – Component E	Mississippi River Sediment Delivery System (BA-0039); Long Distance Mississippi River Sediment Pipeline (BA-0043-EB); Bayou Dupont Marsh and Ridge Restoration (BA-0048)
03a.BH.03*	Isles Dernieres Barrier Island Restoration	Caillou Lake Headlands (TE-0100)
03a.DI.01*	Bayou Lafourche Diversion	Mississippi River Water Reintroduction into Bayou Lafourche (BA-0161)
03a.HP.02b*	Morganza to the Gulf	Morganza to the Gulf (TE-0064)
03a.HR.10	HNC Lock Hydrologic Restoration	Houma Navigation Canal Lock Complex (TE-0113)
03b.CO.01	North Lost Lake Marsh Creation	Lost Lake Marsh Creation and Hydrologic Restoration (TE-0072)
004.BS.01*	Grand Lake Bank Stabilization	Grand Lake Shoreline Protection (ME-0021-EB)
004.HR.18	Mermentau Basin Hydrologic Restoration (East of Calcasieu Lake)	West Big Burn Bridge Restoration (ME-0026)
004.MC.01*	South Grand Chenier Marsh Creation	South Grand Chenier Marsh Creation Project (ME-0020)
004.MC.04*	Mud Lake Marsh Creation	Oyster Bayou Marsh Creation and Terracing (CS-0059)
004.SP.08[2]	Calcasieu – Sabine Shoreline Protection – Component A	Cameron Parish Shoreline (CS-0033)

[2] Project identified as Calcasieu – Sabine Shoreline Protection – Component A (004.BS.04a) in the 2012 Coastal Master Plan.

Eighteen 2012 Coastal Master Plan projects were not included in the list of candidate projects based on new information gained since the 2012 Coastal Master Plan was developed (Table 2):

- The Bayou Sale Ridge Restoration (03b.RC.01), West Cote Blanche Bay Oyster Reef Restoration (03b.OR.02), and East Cote Blanche Bay Oyster Reef Restoration (03b.OR.03) projects were removed due to constructability issues/concerns.
- The Gulf Intracoastal Waterway Bank Stabilization (Freshwater Bayou to Calcasieu Ship Channel; 004.BS.03) and Calcasieu Ship Channel Bank Stabilization (Gulf to Calcasieu Lake; 004.BS.06) projects were removed due to CPRA's policy that bank line stabilization on federally navigable waterways is a federal responsibility, and thus no state dollars would be allocated to such projects. While the state will continue to support these projects and push for federal funding, they will not be modeled or compete for master plan funding.
- Berwick to Wax Lake (03b.HP.11) was removed based on analysis completed through the South Central Coastal Louisiana Flood Protection study, in which it was concluded that the elevations of the existing project are sufficient to provide 100-year protection over the next 50 years.
- Chacahoula Basin Hydrologic Restoration (03a.HR.04) was removed because existing hydraulic connectivity at the structure locations exceeds what was proposed for the project.
- Terrebonne Gulf Intracoastal Waterway Marsh Creation (03b.MC.05) was removed based on information gained through the Increase Atchafalaya to Terrebonne (TE-0110) study, which found that sufficient sediment is not available in the Gulf Intracoastal Waterway (GIWW) to construct the project. Beneficial use of any material dredged from the GIWW for the TE-0110 project will be further explored during engineering and design.
- Hackberry Ridge Restoration (004.RC.04) was removed because existing elevations are equal to or greater than those proposed for the project.
- Little Pecan Bayou Sill (004.HR.07), Sabine Pass Hydrologic Restoration (004.HR.08), Tom's Bayou Hydrologic Restoration (004.HR.12), Deep Lake Hydrologic Restoration (004.HR.13), Alkali Ditch Hydrologic Restoration (004.HR.14), Oyster Bayou Hydrologic Restoration (004.HR.17), Mermentau Basin Hydrologic Restoration: South of Grand Lake (004.HR.19), Mermentau Basin Hydrologic Restoration: South of White Lake (004.HR.20), and East Calcasieu Lake Hydrologic Restoration (004.HR.22) were not included in the National Ecosystem Restoration Tentatively Selected Plan for the Southwest Coastal Louisiana Study (USACE, 2015) and have been removed.

Table 2: 2012 Projects Removed from 2017 Consideration.

Project ID	Project Name	Reason for Removal
03a.HR.04	Chacahoula Basin Hydrologic Restoration	Existing hydraulic connectivity exceeds what was proposed for the project
03b.HP.11	Berwick to Wax Lake	Results of South Central Coastal Louisiana Flood Protection study
03b.MC.05	Terrebonne GIWW Marsh Creation	Results of Increase Atchafalaya to Terrebonne feasibility study

Project ID	Project Name	Reason for Removal
03b.RC.01	Bayou Sale Ridge Restoration	Constructability issues/concerns
03b.OR.02	West Cote Blanche Bay Oyster Reef Restoration	Constructability issues/concerns
03b.OR.03	East Cote Blanche Bay Oyster Reef Restoration	Constructability issues/concerns
004.BS.03	GIWW Bank Stabilization (Freshwater Bayou to Calcasieu Ship Channel)	CPRA policy that bank line stabilization on federally navigable waterways is a federal responsibility
004.BS.06	Calcasieu Ship Channel Bank Stabilization (Gulf to Calcasieu Lake)	CPRA policy that bank line stabilization on federally navigable waterways is a federal responsibility
004.HR.07	Little Pecan Bayou Sill	Results of Southwest Coastal Louisiana Study
004.HR.08	Sabine Pass Hydrologic Restoration	Results of Southwest Coastal Louisiana Study
004.HR.12	Tom's Bayou Hydrologic Restoration	Results of Southwest Coastal Louisiana Study
004.HR.13	Deep Lake Hydrologic Restoration	Results of Southwest Coastal Louisiana Study
004.HR.14	Alkali Ditch Hydrologic Restoration	Results of Southwest Coastal Louisiana Feasibility Study
004.HR.17	Oyster Bayou Hydrologic Restoration	Results of Southwest Coastal Louisiana Feasibility Study
004.HR.19	Mermentau Basin Hydrologic Restoration (South of Grand Lake)	Results of Southwest Coastal Louisiana Feasibility Study
004.HR.20	Mermentau Basin Hydrologic Restoration (South of White Lake)	Results of Southwest Coastal Louisiana Feasibility Study
004.HR.22	East Calcasieu Lake Hydrologic Restoration	Results of Southwest Coastal Louisiana Feasibility Study
004.RC.04	Hackberry Ridge Restoration	Existing elevations equal to or greater than proposed project elevations

Fourteen projects were modified based on availability of new information (Table 3):

- The West Shore Lake Pontchartrain (001.HP.05)[3] alignment was modified based on the U.S. Army Corps of Engineers (USACE) West Shore Lake Pontchartrain Study (2014).
- The Upper Breton Diversion 250,000 cubic feet per second (cfs) (001.DI.17) project location was modified based on the results of recent modeling analysis from ongoing Mississippi River studies.
- The Mid-Breton Sound Diversion (001.DI.23) capacity was increased to 35,000 cfs to be consistent with the results of recent modeling analysis from ongoing Mississippi River studies.
- Alignments for four Structural Protection projects were modified based on additional modeling and analysis completed through the South Central Coastal Louisiana Flood Protection Study
    - Morgan City Back Levee (03b.HP.10)
    - Franklin and Vicinity Hurricane Protection (03b.HP.12)
    - St. Mary/Iberia Upland Levee (03b.HP.14)
    - Abbeville and Vicinity (004.HP.15)
- The Morganza to the Gulf (03a.HP.02b) alignment was updated based on the new alignment identified in the USACE Post Authorization Change Report for Morganza to the Gulf (USACE, 2013a).
- Central Terrebonne Hydrologic Restoration (03a.HR.02) was modified based on Coastal Wetlands Planning Protection and Restoration Act (CWPPRA) Phase I analysis (Natural Resources Conservation Service, 2014).
- The Belle Pass to Golden Meadow (03a.MC.07) project area was modified based on input from Lafourche Parish.
- The Bayou Chene Floodgate(03b.HP.13) project was modified based on input from the St. Mary Levee District and from USACE, who supplied a revised understanding on the channel's authorized dimensions.
- Calcasieu Ship Channel Salinity Control Measures (004.HR.06) project features were updated based on the Calcasieu Ship Channel Salinity Control Measures Project Planning and Feasibility Decision Report (CPRA, 2015a).
- In addition, due to the ongoing work with the River Reintroduction into Maurepas Swamp (PO-0029) project and the existing Louisiana Coastal Area (LCA) Small Diversion at Convent/Blind River (PO-0068) project, the 2012 Coastal Master Plan West Maurepas Diversion (5,000 cfs; 001.DI.29) project was separated into East Maurepas Diversion (2,000 cfs; 001.DI.21) and West Maurepas Diversion (3,000 cfs; 001.DI.29).
- The Amelia Levee Improvements (03b.HP.08) project was modified to include an enlarged gate cross section to ensure that if built in tandem with the Convey Atchafalaya to Terrebonne diversion (03b.DI.04), sufficient flow area and gate size existed to mitigate flow velocity concerns of the navigation industry. Additionally, cost for a pump station was

[3] Project identified as Greater New Orleans LaPlace Extension (001.HP.05) in the 2012 Coastal Master Plan.

included to ensure backwater storm water runoff in Lake Palourde could be controlled because the new alignment would block natural drainage patterns when closed across Bayou Boeuf.

Table 3: 2012 Projects with Revised Features.

Project ID	Project Name	Reason for Revision
001.HP.05	West Shore Lake Pontchartrain	New alignment identified in USACE West Shore Lake Pontchartrain Study
001.DI.17	Upper Breton Diversion	Results of recent modeling analysis conducted for the Mississippi River
001.DI.23	Mid-Breton Sound Diversion	Results of recent modeling analysis conducted for the Mississippi River
001.DI.29	West Maurepas Diversion	Separation of 001.DI.29 into two projects based on new information gained since 2012
03a.HP.02b	Morganza to the Gulf	New alignment identified in USACE Post Authorization Report for Morganza to the Gulf
03a.HR.02	Central Terrebonne Hydrologic Restoration	Revised project features based on CWPPRA Phase I analysis
03a.MC.07	Belle Pass to Golden Meadow	Parish input
03b.HP.08	Amelia Levee Improvements	Navigational industry and local input
03b.HP.10	Morgan City Back Levee	Results of South Central Coastal Louisiana Flood Protection study (previously 03b.HP.14 in 2012 Coastal Master Plan)
03b.HP.12	Franklin and Vicinity	Results of South Central Coastal Louisiana Flood Protection study
03b.HP.13	Bayou Chene Floodgate	Results of St. Mary Levee District Preliminary Report and USACE's channel authorization document
03b.HP.14	St. Mary/Iberia Upland Levee	Results of South Central Coastal Louisiana Flood Protection Study
004.HP.15	Abbeville and Vicinity	Results of South Central Coastal Louisiana Flood Protection study (previously 004.HP.04 in 2012 Coastal Master Plan)

Project ID	Project Name	Reason for Revision
004.HR.06	Calcasieu Ship Channel Salinity Control Measures	Results of Calcasieu Ship Channel Salinity Control Measures Project Planning and Feasibility Decision Report

In total, 80 restoration and risk reduction projects included in the 2012 Coastal Master Plan were evaluated as part of the 2017 Coastal Master Plan (Figure 1).

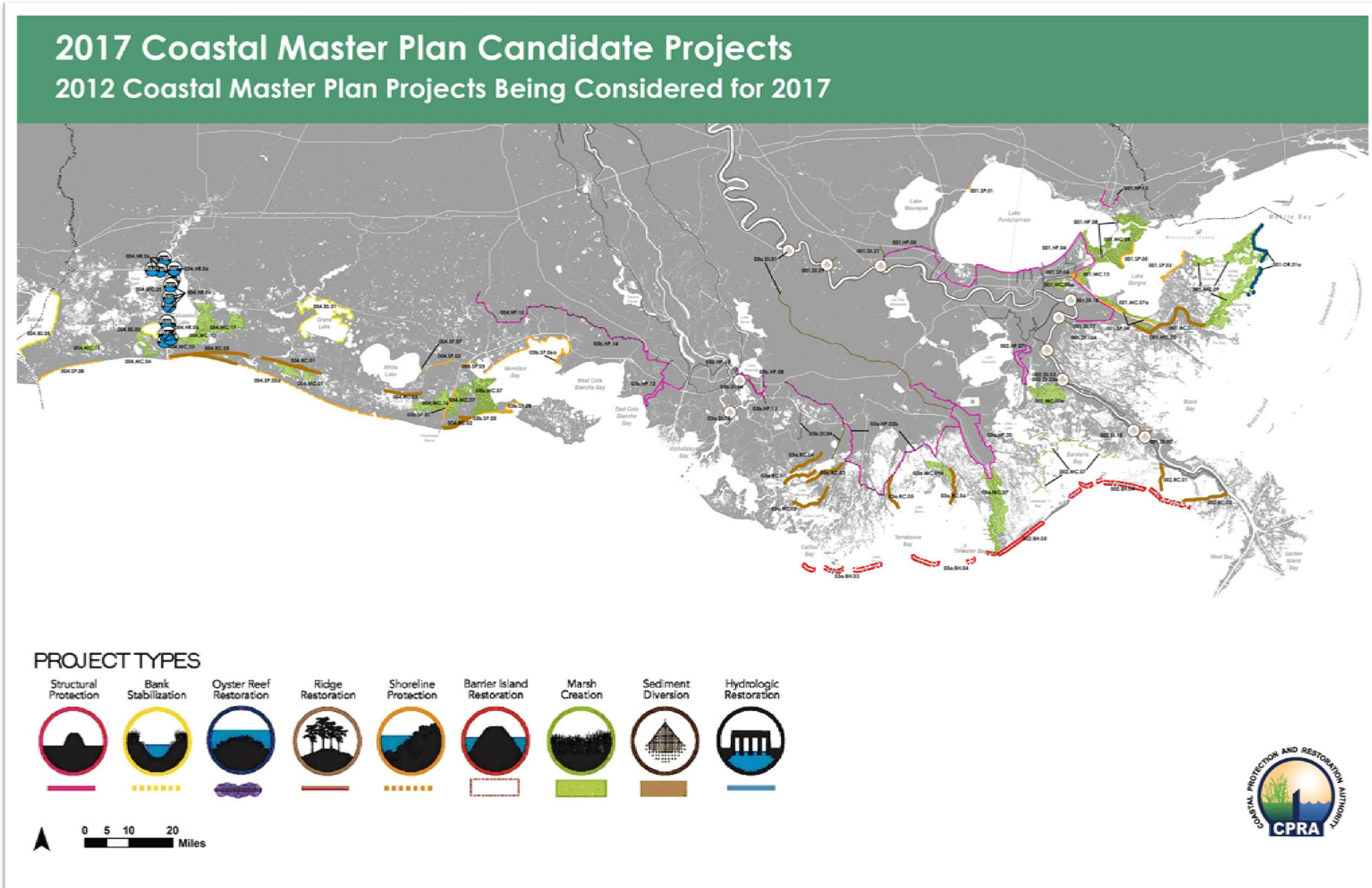

Figure 1: 2012 Coastal Master Plan Projects Being Considered for 2017.

1.1.2 2017 New Project Development Program

Over the course of two solicitation periods totaling 140 days, CPRA accepted proposals for new projects to be considered in the 2017 Coastal Master Plan. New projects could be proposed by any source, including academia, parishes, elected officials, agencies, non-governmental organizations, landowners, business/industry, and the general public. New projects could be proposed that build and/or sustain land, provide significant flood risk reduction, address radical shifts in the coastal landscape, or confront future uncertainty challenges. Each project submission was screened using the following criteria:

- **Size Threshold**: For marsh creation project concepts, a minimum size threshold of 500 acres (i.e., the expected area of project effect on the coastal landscape) was required for a project to be considered for inclusion in the 2017 Coastal Master Plan analysis. Like the 2012 Coastal Master Plan, the 2017 Coastal Master Plan involves a large-scale, regional approach to coastal risk reduction and restoration. The core of the master plan's analysis is an interconnected suite of predictive models that estimate restoration and risk reduction effects of candidate projects on various aspects of the coastal system. These models were developed for a system-wide, planning-scale analysis and, consequently, in some cases, are unable to capture the effects of small-scale, localized projects in the coastal system.
- **Geographic Area**: The 2012 Coastal Master Plan screened out certain types of project concepts in some locations (e.g., marsh creation in the lower Atchafalaya or Wax Lake Deltas) because natural processes in those locations could be expected to produce similar results and investment in restoration projects in these areas would be unnecessary. Based on the current state of the Louisiana coast, the 2017 Coastal Master Plan likewise screened out projects where natural processes are already producing the desired effects.
- **Adequate Information**: Project concepts need to be described in sufficient detail so they can be evaluated using the master plan models. Adequate information typically includes specific geospatial location data (for all project concepts), elevations (for risk reduction projects), and, where applicable, information on proposed operational regimes (for restoration projects).
- **Consistency with Master Plan Objectives and Principles**: Project concepts need to clearly contribute to and be consistent with the objectives and principles of the master plan (http://coastal.la.gov/a-common-vision/2012-coastal-master-plan/) to be considered for inclusion. Projects that did not meet these criteria were eliminated from consideration. Furthermore, as stated in the master plan principles, the state will strive to use sediment from renewable sources, such as the Mississippi River, or from outside the coastal system, such as the Gulf of Mexico, for marsh creation and barrier headland/island projects.
- **Duplicative Effects**: Many project concepts have overlapping scopes, goals, and physical locations. New projects must be significantly different than any project analyzed through the 2012 Coastal Master Plan process, including those that were not selected for inclusion in the final plan.

Overall, CPRA received 155 project ideas from 42 project sponsors. Using the screening criteria above, 50 submissions were considered for inclusion in the 2017 Coastal Master Plan. From these submissions, projects were accepted in full, combined with other submittals, or modified to better reflect CPRA project, resulting in 50 projects submitted through the NPDP process being analyzed for the 2017 Coastal Master Plan (Table 4).

Table 4: 2017 Coastal Master Plan New Project Development Program Submissions.

Project Title	**Project Type**	**Decision**[4]	**Screening Criteria**[5]
Adams Bay Headland Restoration	RC; MC	Partial	
AGMAC Marsh Creation Project from Beneficial Use of Dredged Material	MC	Partial	
Armoring of the Tidal Levee in Delacroix Island, St. Bernard Parish	HP	No	4
Avoca Island Diversion	HR	N/A	
Barataria/Terrebonne Basin Marsh Terracing Program	OT	No	4
Bay Denesse Outfall Management	OT	No	4
Bayou Aux Chenes Ridge Restoration	RC; MC	Partial	
Bayou Cane Marsh Creation	MC	Yes	
Bayou Decade Marsh Creation	MC	No	5

[4] **Decision**: For each submittal, a decision was made on whether the project would be evaluated as part of the 2017 Coastal Master Plan. The decision options are described below.

N/A: Refers to Hydrologic Restoration or Oyster Reef projects that meet master plan goals and objectives but, at the coast wide scale, their effects cannot be captured for effective comparison with other solutions or Nonstructural Risk Reduction projects which are being developed separately.
No: Submittal will not be modeled. The reason for the decision is provided in the Screening Criteria column.
Partial: Refers to submittals that were partially accepted (i.e., multiple project types were submitted but only one project type was accepted), or projects that were modified to better correspond with master plan principles and objectives.
Subsumed: Refers to projects that overlapped another 2017 submittal. Projects (or parts of projects) listed as subsumed were ultimately approved for consideration.
Yes: Project will be evaluated.

[5] **Screening Criteria**: Criteria for which projects were screened out of consideration:

1. Size threshold
2. Geographic area
3. Adequate information
4. Consistency with master plan objectives and principles
5. Duplicative effects

Project Title	Project Type	Decision[4]	Screening Criteria[5]
Bayou Dularge Marsh Creation	MC; SP	No	5
Bayou Eau Noir Ridge Restoration	RC; MC	Partial	
Bayou La Loutre Ridge Restoration Project	RC	No	5
Bayou Lacombe Marsh Creation	MC	Yes	
Bayou Lafourche East Bank	MC	No	5
Bayou L'Ours Restoration	HR; MC	No	4
Bayou Penchant Marsh Creation	MC	No	5
Bayou Sauveur Marsh Creation Land Bridge	MC	Subsumed	
Bayou Terre aux Boeufs Ridge Restoration Project	RC	Yes	
Bayou Terrebonne Freshwater Diversion into Grand Montegut and PAC/DU Wetlands	HR	N/A	
Bayou Terrebonne to Isle St. Jean Charles Land Bridge	MC	No	5
Bell Island Marsh Creation	MC	No	4
Belle Pass to Golden Meadow Marsh Creation	MC	Subsumed	
Big Branch Marsh Restoration	MC	Subsumed	
Biloxi Marsh Creation	MC	No	5
Biloxi Marsh Subtidal and Fringe Oyster Reefs	OR	Partial	
Bully Camp Marsh Creation	MC	No	5
Caernarvon Freshwater Distribution – East	HR	No	4
Caillou Lake – Lake Mechant Marsh Creation	MC	No	5
Calcasieu Lake East and West Fringe Oyster Reefs	OR	N/A	
Calcasieu Lake West Bank	MC	Yes	

Project Title	Project Type	Decision[4]	Screening Criteria[5]
Cameron Meadows Marsh Creation, Phase II	MC	Subsumed	
Cameron Parish Comprehensive Plan	HR; MC; RC; SP	Partial	
Carlisle Ridge Restoration	RC; MC	Partial	
Channel Restrictions at Bayou Dupont, Harvey Cut, Bayou Perot, and Barataria Waterway	HR	N/A	
Controllable Coastline Creation via Positive Displacement Sediment Pumping	MC	No	4
Cote Blanche Freshwater and Sediment Introduction and Shoreline Protection Project	HR; SP	N/A	
Design and Construction of Braithwaite to White Ditch back levee	HP	No	5
Design and Construction of Fort Jackson to Venice back levee (HSDRRS NOV-08)	HP	Yes	
Design and Construction of Oakville to La Reussite back levee (HSDRRS NOV-NFL-04a) and MRL Oakville to La Reussite (MRL-WB-179)	HP	Yes	
Design and Construction of Phoenix to Bohemia back levee (HSDRRS NOV - 01)	HP	No	5
Design and Construction of St. Jude to City Price back levee (NOV-05a) and MRL St. Jude to City Price (NOV 09)	HP	Yes	
Drum Island Marsh Creation	MC	No	4
Dulac - Cocodrie Marsh Creation	MC	No	5
East Bank Land Bridge (Alternative A) Marsh Creation	MC	Subsumed	
East Bank Land Bridge (Alternative B) Marsh Creation	MC	Yes	
East Bank Land Bridge (Alternative C) Marsh Creation	MC	Subsumed	

Project Title	Project Type	Decision[4]	Screening Criteria[5]
East Bank Land Bridge (Alternative D) Marsh Creation	MC	Subsumed	
East Bank Oyster Barrier Reef	OR	N/A	
East Golden Meadow Marsh Creation	MC	No	5
East Maurepas Swamp Diversion Project	DI	Yes	
East St. Tammany Storm Surge Structural Protection Project	OT	No	4
Eastern Lake Borgne Shoreline Protection	SP	No	5
Eloi Bay Subtidal and Fringe Oyster Reefs	OR	N/A	
Expansion of Large-Scale Barataria Marsh Creation Component E (002.MC.05e)	MC	Yes	
Faciane Canal Marsh Creation	MC	Yes	
Falgout Canal Marsh Creation	MC	Subsumed	
Fifi Island Restoration Project	MC; SP	Partial	
Freshwater Diversion from GIWW down Grand Bayou in Lafourche Parish	HR	Subsumed	
Fritchie North Marsh Creation	MC	Yes	
Geologic Framework Preservation Through Innovative Reef Building	OR	N/A	
Golden Meadow - Montegut Marsh Creation	MC	No	5
Grand Bayou Freshwater Enhancement	HR; MC	Subsumed	
Grand Bayou Freshwater Reintroduction	HR; MC	Partial	
Grand Bayou Ridge Restoration	RC; MC	Partial	
Grand Chenier Subtidal Oyster Reefs	OR	N/A	
Grand Lake Shoreline Marsh Creation	MC	Subsumed	
Gulf future coalition non-structural adaptation and community resiliency	OT	N/A	
Guste Island Marsh Creation	MC	Yes	

Project Title	Project Type	Decision[4]	Screening Criteria[5]
HNC - Lake Mechant Marsh Creation	MC	No	5
Iron Banks Marsh Creation	MC	No	4
Jesuit Bend Marsh Creation Site	MC	No	4
LaBranche Wetlands Freshwater and Sediment Diversion Project	HR	Yes	
LaBranche Wetlands Shoreline Protection	SP	Partial	
Lake Hermitage Shoreline Protection	SP	Yes	
Lake Hermitage South Marsh Creation	MC	No	5
Lake Salvador Shoreline Protection	SP	Yes	
Large Scale Barataria – Barataria Bay Rim Marsh Creation	MC	Partial	
Leeville Area Bank Stabilization along the Southeast and Southwest Canals	BS	Yes	
Leeville Ridge Restoration and Marsh Creation	RC	No	3
Marsh Creation Through Beneficial Use of Dredged Material from Baptiste Collette Bayou Navigation Channel Deepening	MC	No	2
Marsh Creation via Atchafalaya Long Distance Sediment Pipeline	DI; MC	Partial	
Mermentau Marsh Restoration	SP; OT	No	5
Mid Breton Marsh Creation Land Bridge	MC	No	5
Mid-Barataria Oyster Breakwater and Brood Stock Sanctuary - Pilot Project	OR	N/A	
Mississippi River Long Distance Sediment Pipeline - West of Barataria Waterway	MC; RC	No	4
MRGO Shoreline Protection	SP	No	5
MSR East Bank	MC	No	5
MSR West Bank South	MC	No	5

Project Title	**Project Type**	**Decision**[4]	**Screening Criteria**[5]
New Orleans East Land Bridge Marsh Creation	MC	Subsumed	
North East Tangipahoa Shoreline Protection	SP	Yes	
North Goose Point Marsh Restoration	MC	Subsumed	
North Lake Boudreaux Marsh Creation and Shoreline Protection Project	MC; SP	Partial	
North Lost Lake Marsh Creation and Hydrologic Restoration Project	MC; HR	No	5
North Terrebonne Bay Marsh Creation	MC	No	5
Overbank Spillway(s) into Upper Barataria Coastal Forests	OT	No	5
Overbank Spillway(s) into Upper Pontchartrain Coastal Forest	OT	No	5
Oysterville Project	OR	N/A	
Pass-A-Loutre Hydrologic Restoration and Marsh Creation Project	HR; MC	No	2
Pelto Bay to Point Au Fer Subtidal and Fringe Oyster Reefs	OR	N/A	
Point a la Hache Marsh Creation (Central)	MC	Yes	
Point a la Hache Marsh Creation (North)	MC	Yes	
Point a la Hache Marsh Creation (South)	MC	Yes	
Pointe a la Hache Ridge Restoration	RC; MC	No	5
Proposal for the Use of Harvested Water Hyacinth in Burlap "Geomembranes" for Creation of Silt Barriers in Louisiana Wetlands	OT	No	4
Protecting our marsh restoration projects and natural marshes through feral hog removal	OT	No	4
Protecting our marsh restoration projects and natural marshes through invasive plant species control	OT	No	4

Project Title	Project Type	Decision[4]	Screening Criteria[5]
Red Pass Ridge Restoration	RC; MC	Partial	
Restoration of Chandeleur Barrier Island Complex	BI	No	5
Ridge Restoration Modification Project	RC	No	4
Sabine Marsh Creation Browns Lake Area	MC	No	1;5
SCA Gulf Restoration Corps Marsh Creation Project	MC	No	2
Sediment and Freshwater Diversions Using Very Large Spillways and Above Ground Reservoirs	DI	No	4
Sediment Diversion Efficiency Along the Atchafalaya and Mississippi Rivers	HR	N/A	
Sediment Enhancement and Management of the Caernarvon Diversion	DI; MC; HR	No	4
Shoreline Protection along Lake Salvador (south side of Couba Island)	SP	Yes	
Shoreline Protection along the Gulf and Bay Shoreline from Oyster Bayou to Grand Pass des Illettes	SP	No	5
Shoreline Protection at Lost Lake – Southern Rim	SP	Yes	
Shoreline Protection East Marsh Island	SP	Yes	
Shoreline Protection in East Cote Blanche Bay, West Cote Blanche, and Vermilion Bay	SP	No	5
Small Bayou LaPointe Marsh Creation	MC	Subsumed	
South Avoca Island Freshwater Diversion (5,000 cfs)	DI	No	5
South East Tangipahoa Shoreline Protection	SP	No	5
South Lake Salvador Landbridge Restoration	MC; SP	Partial	

Project Title	Project Type	Decision[4]	Screening Criteria[5]
South Sabine Refuge Pool 3 Marsh Restoration	MC	Subsumed	
Southeast LaBranche Wetland Creation and Nourishment Project	MC	No	5
Southeast Marsh Island Restoration Project	MC	Yes	
Southwest Barataria Subtidal and Fringe Oyster Reefs	OR	N/A	
Southwest Pecan Island Marsh Restoration	MC	No	5
Spanish Lake Shoreline Marsh Creation	MC	Yes	
St. Bernard Bioengineered Reef Zones	OR	N/A	
St. Tammany Parish Elevation	OT	N/A	
Strategic Stabilization Barrier	SP	Partial	
Sulphur Mine Land Bridge Restoration Project	MC	No	5
Sunrise Point Marsh Creation	MC	Yes	
Telegraph Point/Pelican Island Marsh Creation	MC	No	4
Terrebonne Bay Rim Subtidal and Fringe Oyster Reef Restoration	OR	N/A	
Third Delta Conveyance Channel	DI	No	5
Tiger Ridge/Maple Knoll Area Marsh Creation	MC	Yes	
Triple Pass Island Marsh Creation	MC	No	4
Twin Pipeline Canal Marsh Creation and Ridge Restoration	RC; MC	No	4;5
Twin Pipelines Land Bridge	MC	No	5
Uhlan Bay Marsh Creation	MC	Yes	
Vermilion Bay Marsh Creation	MC; SP	Partial	
Wax Lake Outlet Enrichment Project	DI; MC	No	2

Project Title	**Project Type**	**Decision[4]**	**Screening Criteria[5]**
West Bank Barrier Island Expansion	BI	No	5
West Bank Oyster Barrier Reef	OR	N/A	
West Belle Pass Marsh Creation	MC	No	1;5
West Brown Lake Marsh Restoration	MC	Yes	
West Cameron Restoration Proposal	HR; MC	Subsumed	
West Lac Des Allemands Shoreline Protection Project Phase II	SP	Yes	
West Point a la Hache and Naomi Siphon Enhancement	HR	No	4
West St. Tammany Shoreline Protection	SP	Yes	
Western Sabine Refuge Marsh Restoration	MC	Yes	
White Lake Marsh Creation	MC; SP	Yes	
Wild Horse Ridge Protection Project	BS; MC	No	5

Legend:

BS – Bank Stabilization
DI – Freshwater/Sediment Diversion
HR – Hydrologic Restoration
OR – Oyster Barrier Reef
RC – Ridge Restoration
BH – Barrier Island/Headland Restoration
HP – Structural Protection
MC – Marsh Creation
OT – Other
SP – Shoreline Protection

In addition to the New Project Development Program, CPRA considered CWPPRA project nominees from PPL 19-24 (117 projects) and projects submitted under the Natural Resource Damage Assessment (NRDA) process in response to the Deepwater Horizon and other oil spills (501 projects). CWPPRA and NRDA projects were screened using the same criteria described above. From this screening, seven projects were identified for consideration in the 2017 Coastal Master Plan.

As a result of new information from ongoing Mississippi River studies, Union Freshwater Diversion (001.DI.102), Ama Sediment Diversion (001.DI.101), and Upper Breton Diversion (001.DI.103) were proposed and added to the list of candidate projects, totaling 60 new projects being considered in 2017 (Figure 2; Table 5).

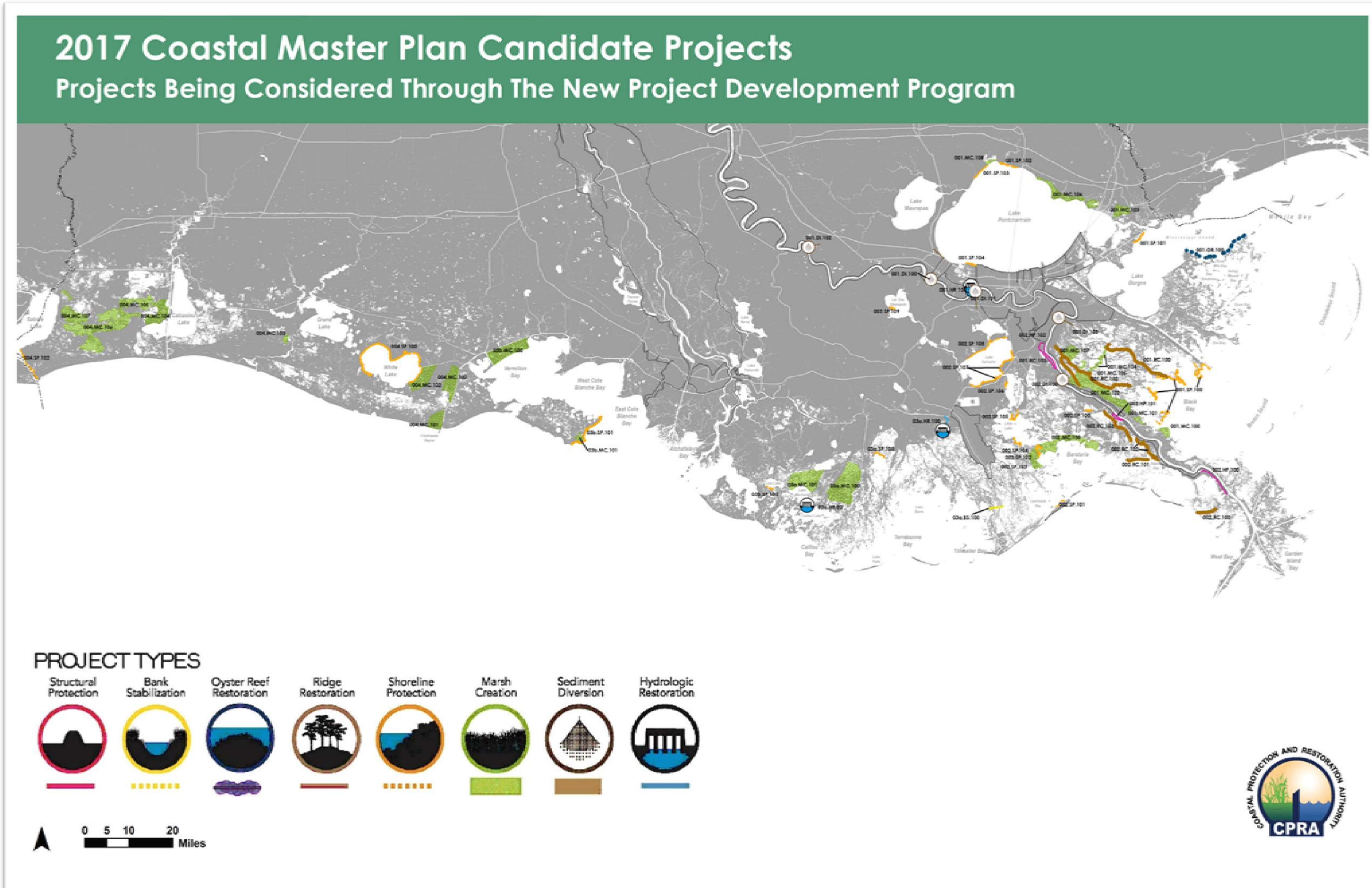

Figure 2: Projects Being Considered through the New Project Development Program (includes CWPPRA, NRDA, and CPRA projects).

Table 5: New Projects Being Considered Based on New Project Development Program (includes CWPPRA, NRDA, and CPRA projects).

Project ID	Project Name	Parish
001.DI.100	Manchac Landbridge Diversion	St. Charles; St. John
001.DI.101	Ama Sediment Diversion	St. Charles
001.DI.102	Union Freshwater Diversion	Ascension
001.DI.103	Upper Breton Diversion (75,000 cfs)	Plaquemines
001.HR.100	LaBranche Hydrologic Restoration	St. Charles
001.MC.100	Sunrise Point Marsh Creation	Plaquemines
001.MC.101	Uhlan Bay Marsh Creation	Plaquemines
001.MC.102	Pointe a la Hache Marsh Creation	Plaquemines
001.MC.103	Fritchie North Marsh Creation	St. Tammany
001.MC.104	East Bank Land Bridge Marsh Creation	Plaquemines
001.MC.105	Spanish Lake Marsh Creation	Plaquemines
001.MC.106	St. Tammany Marsh Creation	St. Tammany
001.MC.107	Tiger Ridge/Maple Knoll Marsh Creation	Plaquemines
001.MC.108	Guste Island Marsh Creation	St. Tammany
001.OR.100	North Biloxi Marsh Oyster Reef	St. Bernard
001.RC.100	Bayou Terre aux Boeufs Ridge Restoration	St. Bernard
001.RC.102	Bayou Aux Chenes Ridge Restoration	Plaquemines
001.RC.103	Carlisle Ridge Restoration	Plaquemines
001.SP.100	Breton Sound Shoreline Protection	St. Bernard; Plaquemines
001.SP.101	Unknown Pass to Rigolets Shoreline Protection	Orleans
001.SP.102	North Lake Pontchartrain Shoreline Protection	St. Tammany
001.SP.103	Northeast Lake Pontchartrain Shoreline Protection	St. Tammany; Tangipahoa

Project ID	Project Name	Parish
001.SP.104	LaBranche Wetlands Shoreline Protection	St. Charles
002.HP.100	Fort Jackson to Venice	Plaquemines
002.HP.101	St. Jude to City Price	Plaquemines
002.HP.102	Oakville to La Reussite	Plaquemines
002.MC.100	North Barataria Bay Marsh Creation	Plaquemines; Jefferson; Lafourche
002.RC.100	Red Pass Ridge Restoration	Plaquemines
002.RC.101	Adams Bay Ridge Restoration	Plaquemines
002.RC.102	Bayou Eau Noire Ridge Restoration	Plaquemines
002.RC.103	Grand Bayou Ridge Restoration	Plaquemines
002.SP.100	Lake Hermitage Shoreline Protection	Plaquemines
002.SP.101	Fifi Island Shoreline Protection	Jefferson
002.SP.102	East Snail Bay Shoreline Protection	Lafourche
002.SP.103	West Snail Bay Shoreline Protection	Lafourche
002.SP.104	South Little Lake Shoreline Protection	Lafourche
002.SP.105	North Little Lake Shoreline Protection	Lafourche
002.SP.106	Bayou Perot Shoreline Protection	Lafourche
002.SP.107	South Lake Salvador Shoreline Protection	Jefferson; Lafourche
002.SP.108	Lake Salvador Shoreline Protection	St. Charles
002.SP.109	Lac Des Allemands Shoreline Protection	St. John
03a.BS.100	Leeville Bank Stabilization	Lafourche
03a.HR.100	Grand Bayou Hydrologic Restoration	Lafourche
03a.MC.100	South Terrebonne Marsh Creation	Terrebonne
03a.MC.101	North Lake Mechant Marsh Creation	Terrebonne

Project ID	Project Name	Parish
03a.SP.100	North Lake Boudreaux Shoreline Protection	Terrebonne
03b.MC.100	Vermilion Bay Marsh Creation	Vermilion
03b.MC.101	Southeast Marsh Island Marsh Creation	Iberia
03b.SP.100	Lost Lake Shoreline Protection	Terrebonne
03b.SP.101	Southeast Marsh Island Shoreline Protection	Iberia
004.MC.100	Freshwater Bayou North Marsh Creation	Vermilion
004.MC.101	Freshwater Bayou South Marsh Creation	Vermilion
004.MC.102	White Lake Marsh Creation	Vermilion
004.MC.103	Little Chenier Marsh Creation	Cameron
004.MC.104	Calcasieu Lake West Bank Marsh Creation	Cameron
004.MC.105	West Brown Lake Marsh Creation	Cameron
004.MC.106	Cameron Meadows and Vicinity Marsh Creation	Cameron
004.MC.107	West Sabine Refuge Marsh Creation	Cameron
004.SP.100	White Lake Shoreline Protection	Cameron, Vermilion
004.SP.102	Sabine Pass Shoreline Protection	Cameron

1.1.3 Programmatic Measures for Oyster Reef and Hydrologic Restoration

Artificial or bioengineered oyster reef projects, in which reefs are created using shell or engineered products to provide substrate for oyster recruitment, have become an increasingly popular restoration technique over the last decade. Rather than management or enhancement of the oyster fishery, the primary goal of these projects is coastal restoration. They can provide a number of benefits including protecting shorelines, creating habitat for other fauna, reducing saltwater exchange, and reducing fetch in open water. In areas suitable for oyster recruitment and growth, these reefs could serve as an alternative to traditional methods for shoreline protection. So far, in limited applications, promising results have been seen, although their overall effectiveness is still being evaluated through several projects in Louisiana.[6]

The biggest drivers of marsh health in coastal Louisiana are salinity and water level. Hydrologic restoration, as a technique for improving marsh health, seeks to restore natural hydrologic patterns by conveying fresh water to areas that have been isolated by man-made features, relieving unnatural impoundments, or preventing the intrusion of salt water. Hydrologic restoration can range in scale from large-scale freshwater diversions and locks to spoil bank gapping and culverts for drainage.

CPRA often receives project submissions for local hydrologic control structures, oyster reef restoration/living shoreline, and conservation partnerships and has historically supported these efforts as evidenced through our Coastal Forest Conservation Initiative and other ongoing projects (e.g., Ducks Unlimited and North American Wetlands Conservation Act projects).

While these types of projects often satisfy the objective of creating or maintaining land, the effects of projects such as local flap-gated culverts for salinity control or small scale living shoreline projects cannot be accurately captured in our current models and are largely not recommended in the 2017 Coastal Master Plan. However, hydrologic restoration and oyster reef/living shoreline projects are considered by CPRA to be consistent with the 2017 Coastal Master Plan, and the merit of and investment in these projects will continue to be strategically evaluated on a case by case basis.

1.1.4 Identify Candidate Projects from 2012 for Reconsideration

Based on feedback from the 2017 Coastal Master Plan's Framework Development Team as well as other stakeholders, CPRA was asked to reconsider a select number of projects that were evaluated for the 2012 Coastal Master Plan but not included in the final plan. CPRA developed a set of criteria to determine which projects could justifiably be reconsidered.

Because the 2012 Coastal Master Plan was based on an unprecedented technical analysis, including the reliance on predictive models and the Planning Tool, CPRA proposed that projects not in the 2012 Coastal Master Plan but selected by the Planning Tool based on modeled benefits under the $50 billion, Max Land, 50/50 Restoration/Protection funding split be reconsidered for analysis. This category of projects was proposed because these projects were the next highest performers based on the two primary 2012 Coastal Master Plan decision drivers, risk reduction and/or land building.

In addition, CPRA further proposed reconsidering projects not in the 2012 Coastal Master Plan but selected by the Planning Tool using model output under the $50 billion, Max Land, 60/40 Restoration/ Protection funding split. This category of projects was proposed because these projects were the next highest performers if an extra $5 billion was allocated toward restoration projects.

The list of projects in these two categories was then reviewed on a project-by-project basis to determine if there were any projects that overlapped or were duplicative with projects already being considered for 2017, if any projects were no longer feasible from an implementation

[6] Living Shoreline Protection Demonstration Project (PO-148); Terrebonne Bay Shore Protection Demonstration (TE-45); Bio-Engineered Oyster Reef Demonstration (LA-08).

perspective, or if there were any projects removed from the 2012 Coastal Master Plan based on project-specific feedback. This resulted in five additional projects that were reconsidered.

In addition to reconsidering high-performing projects, CPRA proposed reconsidering projects evaluated as part of the 2012 Coastal Master Plan that were either on critical landscape areas identified in the 2009 Louisiana Coastal Protection and Restoration Report (USACE, 2009) or on the critical landforms included in the decision criteria used as part of the decision-making process for the 2012 Coastal Master Plan but not included in the final plan. Based on this step, one 2012 project increment, Lower Barataria Marsh Creation – Component A (002.MC.04a), was reconsidered.

Lastly, CPRA established the Project Development and Implementation Program to work with local entities to develop new project alternatives for consideration. As such, CPRA has worked with the Lafourche Basin Levee District to develop alternate alignments to 002.HP.06 (Upper Barataria Risk Reduction) since that project was modeled and not selected as part of the 2012 Coastal Master Plan. The project alignment has been developed and is included in the list of 2017 candidate projects. In total, CPRA reconsidered eight candidate projects from the 2012 Coastal Master Plan (Table 6) along with all projects selected in the 2012 Coastal Master Plan (Table 7).

Table 6: Candidate Projects from 2012 for Reconsideration.

Project ID	Project Name	Reason for Reconsideration
001.MC.06a	Breton Marsh Creation – Component A	Max Land 50/50 next highest performer
001.MC.17	Eastern Lake Borgne Marsh Creation	Max Land 50/50 next highest performer
001.DI.21	East Maurepas Diversion	See Notes Below[7]
002.HP.06	Upper Barataria Risk Reduction	Alternate alignment identified through the Project Development and Implementation Program
002.MC.04a	Lower Barataria Marsh Creation – Component A	Located on critical landform
002.MC.08	North Caminada Marsh Creation	Max Land 50/50 next highest performer
03b.MC.03	Marsh Island Marsh Creation	Max Land 60/40 next highest performer

[7] Due to the ongoing work with the River Reintroduction into Maurepas Swamp (PO-0029) project and the existing LCA Small Diversion at Convent/Blind River (PO-0068) project, the 2012 Coastal Master Plans' West Maurepas Diversion (5,000 cfs; 001.DI.29) project has been separated into East Maurepas Diversion (2,000 cfs; 001.DI.21) and West Maurepas Diversion (3,000 cfs; 001.DI.29).

Project ID	Project Name	Reason for Reconsideration
03b.MC.09	Point Au Fer Island Marsh Creation	Max Land 50/50 next highest performer

Table 7: 2012 Coastal Master Plan Projects Being Considered.[8]

Project ID	Project Name	Parish
001.DI.02	Lower Breton Diversion (50,000 cfs)	Plaquemines
001.DI.17	Upper Breton Diversion (250,000 cfs)	Plaquemines
001.DI.18	Central Wetlands Diversion (5,000 cfs)	St. Bernard
001.DI.23	Mid-Breton Sound Diversion (35,000 cfs)	Plaquemines
001.DI.29	West Maurepas Diversion (3,000 cfs)	St. James
001.HP.04	Greater New Orleans High Level	Orleans; St. Bernard; Jefferson; St. Charles; Plaquemines
001.HP.05	West Shore Lake Pontchartrain	St. Charles; St. John; St. James
001.HP.08	Lake Pontchartrain Barrier	Orleans; St. Tammany
001.HP.13	Slidell Ring Levees	St. Tammany
001.MC.02	Hopedale Marsh Creation	St. Bernard
001.MC.05	New Orleans East Landbridge Restoration	Orleans; St. Tammany
001.MC.07a	Lake Borgne Marsh Creation - Component A	St. Bernard
001.MC.08a	Central Wetlands Marsh Creation - Component A	Orleans; St. Bernard
001.MC.09	Biloxi Marsh Creation	St. Bernard
001.MC.13	Golden Triangle Marsh Creation	Orleans; St. Bernard
001.OR.01a	Biloxi Marsh Oyster Reef	St. Bernard

[8] Lake Charles Protection (004.HP.06p) is being considered programmatically. CPRA will continue to coordinate with this community to identify the flood risk reduction measures that best address current and future flooding risks. CPRA will continue to explore options to provide sustainable, constructible restoration of Terrebonne Bay rim through Terrebonne Bay Rim Marsh Creation Study (03a.MC.09p).

Project ID	**Project Name**	**Parish**
001.RC.01	Bayou LaLoutre Ridge Restoration	St. Bernard
001.SP.01	Manchac Landbridge Shoreline Protection	Tangipahoa
001.SP.03	Eastern Lake Borgne Shoreline Protection	St. Bernard
001.SP.04	MRGO Shoreline Protection	Orleans; St. Bernard
001.SP.05	East New Orleans Landbridge Shoreline Protection (previously 001.CO.03 in 2012 Coastal Master Plan)	Orleans
002.BH.04	Barataria Pass to Sandy Point Barrier Island Restoration	Plaquemines; Jefferson
002.BH.05	Belle Pass to Caminada Pass Barrier Island Restoration	Lafourche; Jefferson
002.DI.03	Mid-Barataria Diversion (75,000 cfs)	Plaquemines
002.DI.03a	Mid-Barataria Diversion (250,000 cfs)	Plaquemines
002.DI.15	Lower Barataria Diversion (50,000 cfs)	Plaquemines
002.HP.07	Lafitte Ring Levee	Jefferson
002.MC.05e	Large-Scale Barataria Marsh Creation – Component E	Plaquemines; Jefferson
002.MC.07	Barataria Bay Rim Marsh Creation	Plaquemines; Jefferson; Lafourche
002.RC.01	Bayou Long Ridge Restoration	Plaquemines
002.RC.02	Spanish Pass Ridge Restoration	Plaquemines
03a.BH.03	Isles Dernieres Barrier Island Restoration	Terrebonne
03a.BH.04	Timbalier Islands Barrier Island Restoration	Lafourche; Terrebonne
03a.DI.01	Bayou Lafourche Diversion (1,000 cfs)	Ascension, Assumption, Lafourche
03a.DI.05	Atchafalaya River Diversion (30,000 cfs)	Terrebonne
03a.HP.02b	Morganza to the Gulf	Lafourche; Terrebonne
03a.HP.20	Larose to Golden Meadow	Lafourche

Project ID	Project Name	Parish
03a.HR.02	Central Terrebonne Hydrologic Restoration	Terrebonne
03a.MC.07	Belle Pass-Golden Meadow Marsh Creation	Lafourche
03a.MC.09b	North Terrebonne Bay Marsh Creation – Component B	Terrebonne
03a.RC.01	Bayou Decade Ridge Restoration	Terrebonne
03a.RC.02	Bayou Dularge Ridge Restoration	Terrebonne
03a.RC.03	Small Bayou LaPointe Ridge Restoration	Terrebonne
03a.RC.04	Mauvais Bois Ridge Restoration	Terrebonne
03a.RC.05	Bayou Terrebonne Ridge Restoration	Terrebonne
03a.RC.06	Bayou Pointe Aux Chenes Ridge Restoration	Terrebonne
03b.DI.04	Increase Atchafalaya Flow to Terrebonne (18,000 cfs)	Assumption, St. Mary; Terrebonne
03b.HP.08	Amelia Levee Improvements (3E)	Assumption; St. Mary
03b.HP.10	Morgan City Back Levee	St. Mary
03b.HP.12	Franklin and Vicinity	St. Mary
03b.HP.13	Bayou Chene Floodgate	St. Mary; Terrebonne
03b.HP.14	St. Mary/Iberia Upland Levee	St. Mary; Iberia
03b.MC.07	East Rainey Marsh Creation	Vermilion
03b.SP.01	Freshwater Bayou Shoreline Protection (Belle Isle Canal to Lock)	Vermilion
03b.SP.05	Gulf Shoreline Protection (Freshwater Bayou to Southwest Pass)	Vermilion
03b.SP.06a	Vermilion Bay and West Cote Blanche Bay Shoreline Protection	Vermilion; Iberia
03b.SP.08	Southwest Pass Shoreline Protection (West Side)	Vermilion

Project ID	Project Name	Parish
004.BS.01	Grand Lake Bank Stabilization	Cameron
004.BS.02	West Cove Bank Stabilization	Cameron
004.BS.05	Sabine Lake Bank Stabilization	Cameron
004.HP.15	Abbeville and Vicinity (previously 004.HP.04 in 2012 Coastal Master Plan)	Iberia; Vermilion
004.HR.06	Calcasieu Ship Channel Salinity Control Measures	Calcasieu; Cameron
004.MC.01	South Grand Chenier Marsh Creation	Cameron
004.MC.04	Mud Lake Marsh Creation	Cameron
004.MC.07	West Rainey Marsh Creation	Vermilion
004.MC.10	Southeast Calcasieu Lake Marsh Creation	Cameron
004.MC.13	Cameron Meadows Marsh Creation	Cameron
004.MC.16	East Pecan Island Marsh Creation	Vermilion
004.MC.19	East Calcasieu Lake Marsh Creation	Cameron
004.MC.23	Calcasieu Ship Channel Marsh Creation	Cameron
004.MC.25	Kelso Bayou Marsh Creation	Cameron
004.RC.01	Grand Chenier Ridge Restoration	Cameron
004.RC.02	Cheniere au Tigre Ridge Restoration	Vermilion
004.RC.03	Pecan Island Ridge Restoration	Vermilion
004.RC.05	Front Ridge Restoration	Cameron
004.SP.02	Schooner Bayou Canal Shoreline Protection	Vermilion
004.SP.03	Freshwater Bayou Canal Shoreline Protection	Vermilion
004.SP.05a	Gulf Shoreline Protection (Calcasieu River to Rockefeller)	Cameron; Vermilion

Project ID	Project Name	Parish
004.SP.07	Northeast White Lake Shoreline Protection	Vermilion
004.SP.08	Calcasieu-Sabine Shoreline Protection-Component A	Cameron

1.1.5 Project Variations Examined

As a result of local stakeholder feedback and interim reconnaissance and feasibility studies completed since the 2012 Coastal Master Plan, several variants of previously examined 2012 Coastal Master Plan projects were analyzed, as described in the following bullets.

- **Larose to Golden Meadow-enhanced (03a.HP.101):** based on preliminary data from the Larose to Golden Meadow Federal Feasibility study currently being undertaken by USACE, CPRA elected to analyze versions of levee improvements for the Larose to Golden Meadow (LGM) system that incorporated basic improvements to the existing levee cross section (03a.HP.20) and enhanced improvements (03a.HP.101), which incorporate wave and stability berms into the alignment.
- **Morganza to the Gulf-basic inducements study (03a.HP.103):** based on preliminary data from the Larose to Golden Meadow Federal Feasibility Study currently being undertaken by USACE, CPRA elected to analyze versions of levee improvements for the LGM and Morganza to the Gulf (Morganza) systems which account for known surge inducement seen by the western reaches of the LGM system if the federal Morganza system is implemented. This alternative sums the implementation cost of the federal Morganza system with the cost of improving the basic LGM alignment (reaches A-West, B-North, B-South, and C-South) to withstand any surge inducements caused by the Morganza system's implementation.
- **Morganza to the Gulf-enhanced inducements study (03a.HP.102):** based on preliminary data from the Larose to Golden Meadow Federal Feasibility Study currently being undertaken by USACE, CPRA elected to analyze versions of levee improvements for the LGM and Morganza systems which account for known surge inducement seen by the western reaches of the LGM system if the federal Morganza system is implemented. This alternative sums the implementation cost of the federal Morganza system with the cost of improving the enhanced cross-section version of the LGM alignment (reaches A-West, B-North, B-South, and C-South) to withstand any surge inducements caused by the Morganza system's implementation.
- **Mid-Breton Sound Diversion (001.DI.104):** is a variation of 001.DI.23 with a difference in operating regime in that 001.DI.104 has a minimum flow of 5,000 cfs when Mississippi River flows are less than 200,000 cfs, while 001.DI.23 does not operate when Mississippi River flows are less than 200,000 cfs. This project was examined to test the sensitivity of modeling runs to basin salinity variations driven by the Mississippi River's hydrograph and different rates of sea level rise in the various environmental scenarios analyzed.
- **Mid-Barataria Diversion (002.DI.100)**: is a variation of 002.DI.03 with a difference in operating regime in that 002.DI.100 increases maximum flowrate over time from 35,000 cfs to 75,000 cfs. This project allows flow beyond the 75,000 cfs capacity to pass through the diversion based

on available head in the Mississippi River. This project was examined to determine how land building and other project outcomes may vary in response to changes in diversion operations.

- **Mid-Barataria Diversion (002.DI.101)**: is a variation of 002.DI.100 with a difference in operating regime in that 002.DI.101has an initial maximum flowrate of 75,000 cfs when the Mississippi River is flowing at 1.2 Million cfs. This flowrate is capped regardless of the behavior of the river. This project was examined to determine how land building and other project outcomes may vary in response to changes in diversion operations.
- **Mid-Barataria Diversion (002.DI.102):** is a variation of 002.DI.101 with a difference in operating regime in that 002.DI.102 has a minimum flow of 5,000 cfs when Mississippi River flows are less than 200,000 cfs, while 002.DI.101 does not operate when Mississippi River flows are less than 200,000 cfs. This project was examined to test the sensitivity of modeling runs to basin salinity variations driven by the Mississippi River's hydrograph and different rates of sea level rise in the various environmental scenarios analyzed.

1.2 The Project List

Through the processes described above and variants developed during 2017, 209 candidate projects have been identified for consideration in the 2017 Coastal Master Plan: 80 from the 2012 Coastal Master Plan, 60 through the New Project Development Program, eight being reconsidered from 2012, seven project variants discussed in Section 1.1.5, and 54 Nonstructural Risk Reduction projects which are discussed in Section 1.2.3. Figure 3 represents all projects being considered in the 2017 Coastal Master Plan.

1.2.1 Restoration Projects

Restoration projects are those projects whose features restore degraded components of Louisiana's coastal ecosystem by re-establishing natural processes or through mechanical means such as the placement of dredged material. Restoration projects are grouped into the following eight general categories:

- Bank Stabilization (four projects)
- Barrier Island/Headland Restoration (four projects)
- Diversions (20 projects)
- Hydrologic Restoration (four projects)
- Marsh Creation (48 projects)
- Oyster Barrier Reefs (two projects)
- Ridge Restoration (20 projects)
- Shoreline Protection (33 projects)

Additional information about the restoration projects evaluated in the 2017 Coastal Master Plan is presented in Sections 3.1 through 3.8. Table 8 provides a list of the 135 restoration projects evaluated for the 2017 Coastal Master Plan.

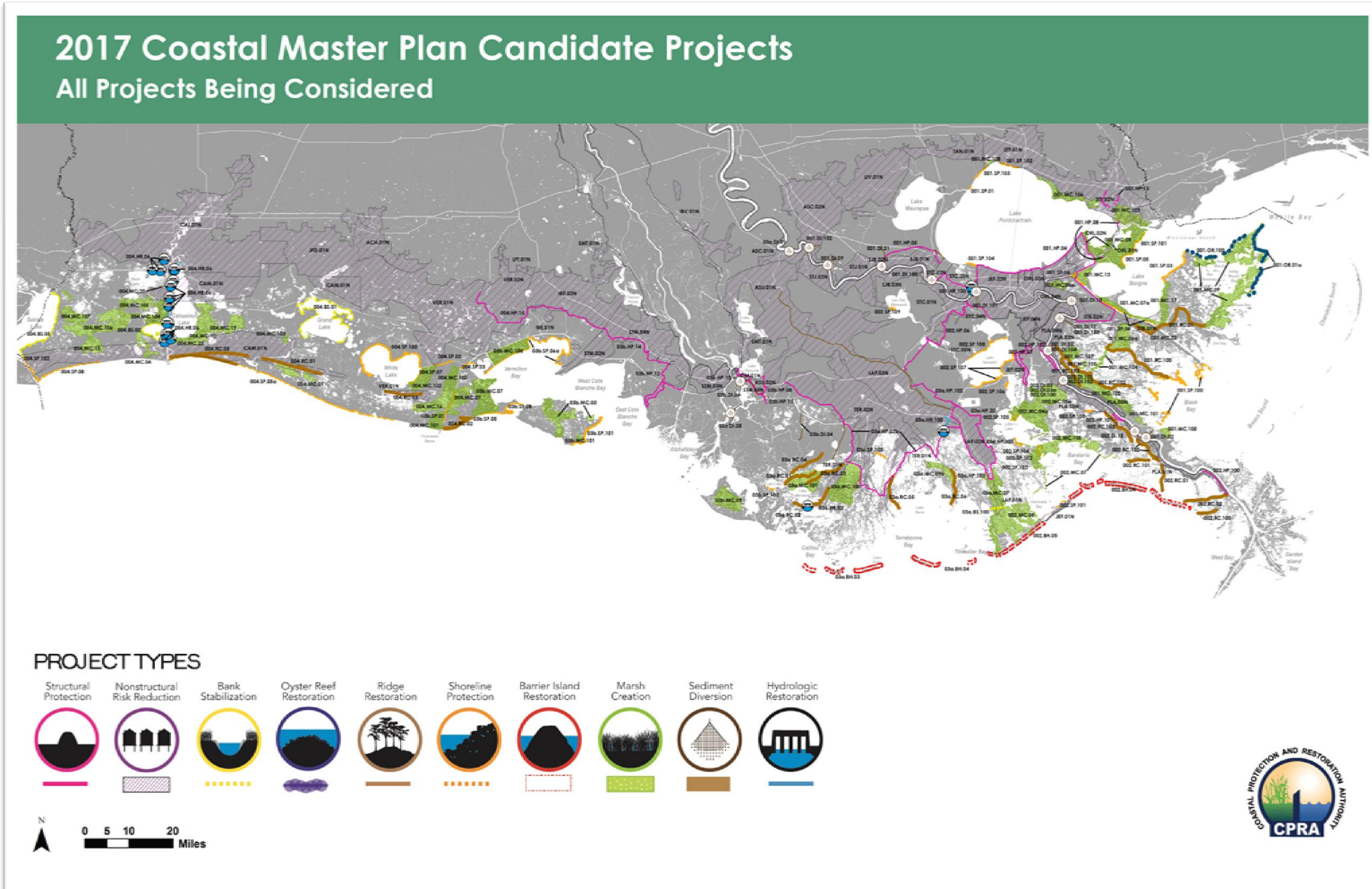

Figure 3: All Projects Being Considered.

Table 8: Restoration Projects Being Considered in the 2017 Coastal Master Plan.

Project ID	Project Type	Name	Description	Parish
001.DI.02	Diversion	Lower Breton Diversion (50,000 cfs)	Sediment diversion of 50,000 cfs into Lower Breton Sound to build and maintain land (modeled at 50,000 cfs for river flows at 1,000,000 cfs; variable flows above 200,000 cfs calculated using a linear function up to 1,000,000 cfs; and open with variable flow rate (larger than 50,000 cfs, estimated using linear extrapolation) for river flow above 1,000,000 cfs. No operation below 200,000 cfs).	Plaquemines
001.DI.100	Diversion	Manchac Landbridge Diversion	A structure in the existing western spillway guide levee to divert 2,000 cfs thereby increasing freshwater exchange with adjacent wetlands.	St. Charles; St. John
001.DI.101	Diversion	Ama Sediment Diversion	Sediment diversion into Upper Barataria near Ama to provide sediment for emergent marsh creation and freshwater to maintain existing wetlands, 50,000 cfs capacity (modeled at 50,0000 cfs when Mississippi River flow equals 1,000,000 cfs; open with a variable flow rate calculated using a linear function from zero to 50,000 cfs for river flow between 200,000 cfs and 1,000,000 cfs, diverts exactly 50,000 cfs when Mississippi River flow is 1,000,000 cfs; and open with variable flow rate (larger than 50,000 cfs, estimated using linear extrapolation) for river flow above 1,000,000 cfs. No operation below 200,000 cfs).	St. Charles

Project ID	Project Type	Name	Description	Parish
001.DI.102	Diversion	Union Freshwater Diversion	Diversion into West Maurepas swamp near Burnside to provide sediment for emergent marsh creation and freshwater and fine sediment to maintain existing wetlands, 25,000 cfs capacity (modeled at 25,000 cfs when Mississippi River flow equals 400,000 cfs; closed when river flow is below 200,000 cfs or above 600,000 cfs; a variable flow rate calculated using a linear function from zero to 25,000 cfs for river flow between 200,000 cfs and 400,000 cfs and held constant at 25,000 cfs for river flow between 400,000 cfs and 600,000 cfs).	Ascension
001.DI.103	Diversion	Upper Breton Diversion	Sediment diversion into Upper Breton Sound near Caernarvon to build and maintain land, 75,000 cfs capacity (open with a variable flow rate calculated using a linear function from zero to 75,000 cfs for river flow between 200,000 cfs and 1,000,000 cfs; diverts exactly 75,000 cfs when Mississippi River flow is 1,000,000 cfs; and open with variable flow rate (larger than 75,000 cfs, estimated using linear extrapolation) for river flow above 1,000,000 cfs. No operation below 200,000 cfs).	Plaquemines
001.DI.104	Diversion	Mid-Breton Sound Diversion (35,000 cfs)	Sediment diversion into Mid-Breton Sound in the vicinity of White's Ditch to build and maintain land, 35,000 cfs capacity (modeled at 35,000 cfs when the Mississippi River flow equals 1,000,000 cfs; flow rate calculated using a linear function for river flow from 200,000 cfs to 1,000,000 cfs; flows variable above 1,000,000 cfs; 5,000 cfs minimum flow below 200,000 cfs).	Plaquemines

Project ID	Project Type	Name	Description	Parish
001.DI.17	Diversion	Upper Breton Diversion (250,000 cfs)	Sediment diversion into Upper Breton Sound near Caernarvon to build and maintain land, 250,000 cfs capacity (modeled with a variable flow rate calculated using a linear function from zero to 250,000 cfs for river flow between 200,000 cfs and 1,000,000 cfs; diverts exactly 250,000 cfs when Mississippi River flow is 1,000,000 cfs; and open with variable flow rate (larger than 250,000 cfs, estimated using linear extrapolation) for river flow above 1,000,000 cfs).	Plaquemines
001.DI.18	Diversion	Central Wetlands Diversion (5,000 cfs)	Diversion into Central Wetlands near Violet to provide sediment for emergent marsh creation and freshwater to maintain existing wetlands, 5,000 cfs capacity (modeled at a constant flow of 5,000 cfs, independent of the Mississippi River flow).	St. Bernard
001.DI.21	Diversion	East Maurepas Diversion (2,000 cfs)	Diversion into East Maurepas near Hope Canal to provide sediment for emergent marsh creation and freshwater and fine sediment to maintain existing wetlands, 2,000 cfs capacity (modeled at a constant flow of 2,000 cfs, independent of the Mississippi River flow).	St. John
001.DI.23	Diversion	Mid-Breton Sound Diversion (35,000 cfs)	Sediment diversion into Mid-Breton Sound near Woodlawn to build and maintain land, 35,000 cfs capacity (when Mississippi River flow equals 1,000,000 cfs; and open with variable flow rate (larger than 35,000 cfs, estimated using linear extrapolation) for river flow above 1,000,000 cfs. No operation below 200,000 cfs).	Plaquemines

Project ID	Project Type	Name	Description	Parish
001.DI.29	Diversion	West Maurepas Diversion (3,000 cfs)	Diversion into West Maurepas near Romeville to provide sediment for emergent marsh creation and freshwater and fine sediment to sustain existing wetlands, 3,000 cfs capacity (modeled at 3,000 cfs, independent of the Mississippi River flow).	St. James
001.HR.100	Hydrologic Restoration	LaBranche Hydrologic Restoration	Construction of a 750 cfs hybrid pump-siphon structure, intake structure, and an approximately 1 mile long conveyance system to LaBranche wetlands via the Mississippi River to restore the historically fresh to intermediate marshes. Features also include a conveyance channel roadway and railroad crossings.	St. Charles
001.MC.02	Marsh Creation	Hopedale Marsh Creation	Creation of approximately 1,800 acres of marsh in northern Breton Sound near Hopedale to create new wetland habitat and restore degraded marsh.	St. Bernard
001.MC.05	Marsh Creation	New Orleans East Landbridge Restoration	Creation of approximately 29,800 acres of marsh in the New Orleans East Landbridge to create new wetland habitat and restore degraded marsh.	Orleans; St. Tammany
001.MC.06a	Marsh Creation	Breton Marsh Creation-Component A	Creation of approximately 11,800 acres of marsh in the Breton Marsh east of Delacroix Island to create new wetland habitat and restore degraded marsh.	St. Bernard
001.MC.07a	Marsh Creation	Lake Borgne Marsh Creation-Component A	Creation of approximately 6,100 acres of marsh along the south shoreline of Lake Borgne near Proctors Point to create new wetland habitat and restore degraded marsh.	St. Bernard

Project ID	Project Type	Name	Description	Parish
001.MC.08a	Marsh Creation	Central Wetlands Marsh Creation-Component A	Creation of approximately 3,000 acres of marsh in Central Wetlands near Bayou Bienvenue to create new wetland habitat and restore degraded marsh.	Orleans; St. Bernard
001.MC.09	Marsh Creation	Biloxi Marsh Creation	Creation of approximately 37,200 acres of marsh in the eastern portion of Biloxi Marsh from Oyster Bay to Drum Bay to create new wetland habitat and restore degraded marsh.	St. Bernard
001.MC.100	Marsh Creation	Sunrise Point Marsh Creation	Creation of approximately 1,200 acres of marsh on east bank of Plaquemines Parish around Auguste Bay to create new wetland habitat and restore degraded marsh.	Plaquemines
001.MC.101	Marsh Creation	Uhlan Bay Marsh Creation	Creation of approximately 800 acres of marsh on the east bank of Plaquemines Parish around Uhlan Bay to create new wetland habitat and restore degraded marsh.	Plaquemines
001.MC.102	Marsh Creation	Pointe a la Hache Marsh Creation	Creation of approximately 20,000 acres of marsh on the east bank of Plaquemines Parish near Pointe a la Hache to create new wetland habitat and restore degraded marsh.	Plaquemines
001.MC.103	Marsh Creation	Fritchie North Marsh Creation	Creation of approximately 4,300 acres of marsh in St. Tammany Parish along the eastern Lake Pontchartrain shoreline to create new wetland habitat and restore degraded marsh.	St. Tammany
001.MC.104	Marsh Creation	East Bank Land Bridge Marsh Creation	Creation of approximately 2,300 acres of marsh in Plaquemines Parish between Grand Lake and Lake Lery to create new wetland habitat and restore degraded marsh.	Plaquemines

Project ID	Project Type	Name	Description	Parish
001.MC.105	Marsh Creation	Spanish Lake Marsh Creation	Creation of approximately 800 acres of marsh in Plaquemines Parish along the eastern shore of Spanish Lake to create new wetland habitat and restore degraded marsh.	Plaquemines
001.MC.106	Marsh Creation	St. Tammany Marsh Creation	Creation of approximately 5,900 acres of marsh in St. Tammany Parish along the northern shore of Lake Pontchartrain to create new wetland habitat and restore degraded marsh.	St. Tammany
001.MC.107	Marsh Creation	Tiger Ridge/Maple Knoll Marsh Creation	Creation of approximately 4,000 acres of marsh in Plaquemines Parish near Tiger Ridge to create new wetland habitat and restore degraded marsh.	Plaquemines
001.MC.108	Marsh Creation	Guste Island Marsh Creation	Creation of approximately 700 acres of marsh in St. Tammany Parish along the northwest Lake Pontchartrain shoreline to create new wetland habitat and restore degraded marsh.	St. Tammany
001.MC.13	Marsh Creation	Golden Triangle Marsh Creation	Creation of approximately 4,100 acres of marsh in Golden Triangle Marsh between the MRGO and GIWW to create new wetland habitat and restore degraded marsh.	Orleans; St. Bernard
001.MC.17	Marsh Creation	Eastern Lake Borgne Marsh Creation	Creation of approximately 7,000 acres of marsh in Biloxi Marsh on eastern shore of Lake Borgne near Bayou La Loutre to create new wetland habitat and restore degraded marsh.	St. Bernard
001.OR.01a	Oyster Barrier Reef	Biloxi Marsh Oyster Barrier Reef-Component A	Creation of approximately 104,400 feet of oyster barrier reef to a design elevation of 2 feet NAVD88 along the eastern shore of Biloxi Marsh to provide oyster habitat, reduce wave erosion, and prevent further marsh degradation.	St. Bernard

Project ID	Project Type	Name	Description	Parish
001.OR.100	Oyster Barrier Reef	North Biloxi Marsh Oyster Reef	Creation of approximately 66,200 feet of oyster barrier reef to a design elevation of 2 feet NAVD88 along the northern shore of Biloxi Marsh to provide oyster habitat, reduce wave erosion, and prevent further marsh degradation.	St. Bernard
001.RC.01	Ridge Restoration	Bayou LaLoutre Ridge Restoration	Restoration of approximately 108,900 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation to approximately 210 acres along Bayou LaLoutre.	St. Bernard
001.RC.100	Ridge Restoration	Bayou Terre aux Ridge Restoration	Restoration of approximately 91,200 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation to approximately 180 acres along Bayou Terre aux Boeufs.	St. Bernard
001.RC.102	Ridge Restoration	Bayou Aux Chenes Ridge Restoration	Restoration of approximately 113,200 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation to approximately 220 acres along Bayou Aux Chenes.	Plaquemines
001.RC.103	Ridge Restoration	Carlisle Ridge Restoration	Restoration of approximately 38,200 feet of a natural land bridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation to approximately 80 acres near Carlisle.	Plaquemines

Project ID	Project Type	Name	Description	Parish
001.SP.01	Shoreline Protection	Manchac Landbridge Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 5,500 feet of the west side of Lake Pontchartrain north of Pass Manchac near Stinking Bayou to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Tangipahoa
001.SP.03	Shoreline Protection	Eastern Lake Borgne Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 54,400 feet of the eastern shore of Lake Borgne to preserve shoreline integrity and reduce wetland degradation from wave erosion.	St. Bernard
001.SP.04	Shoreline Protection	MRGO Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 71,500 feet of the north bank of the Mississippi River Gulf Outlet to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Orleans; St. Bernard
001.SP.05	Shoreline Protection	East New Orleans Landbridge Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 35,900 feet of the east side of the New Orleans Landbridge near Alligator Bend to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Orleans
001.SP.100	Shoreline Protection	Breton Sound Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 217,300 feet of the west side of Breton Sound from the Mississippi River Gulf Outlet to California Bay to preserve shoreline integrity and reduce wetland degradation from wave erosion.	St. Bernard; Plaquemines

Project ID	**Project Type**	**Name**	**Description**	**Parish**
001.SP.101	Shoreline Protection	Unknown Pass to Rigolets Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 2,000 feet of the east side of the New Orleans Landbridge from Unknown Pass to the Rigolets to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Orleans
001.SP.102	Shoreline Protection	North Lake Pontchartrain Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 23,300 feet of the north side of the Lake Pontchartrain shoreline to preserve shoreline integrity and reduce wetland degradation from wave erosion.	St. Tammany
001.SP.103	Shoreline Protection	Northeast Lake Pontchartrain Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 18,200 feet of the western shore of Lake Pontchartrain east of the Tangipahoa River to preserve shoreline integrity and reduce wetland degradation from wave erosion.	St. Tammany; Tangipahoa
001.SP.104	Shoreline Protection	LaBranche Wetlands Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 11,100 feet of the southern shore of Lake Pontchartrain near the LaBranche wetlands to preserve shoreline integrity and reduce wetland degradation from wave erosion.	St. Charles
002.BH.04	Barrier Island/ Headland Restoration	Barataria Pass to Sandy Point Barrier Island Restoration	Restoration of 13,800 acres of Barataria Bay barrier islands between Barataria Pass and Sandy Point to provide dune, beach, and back barrier marsh habitat. The project provides storm surge and wave attenuation for 134,100 linear ft. of shoreline in the Barataria Basin.	Plaquemines; Jefferson

Project ID	Project Type	Name	Description	Parish
002.BH.05	Barrier Island/ Headland Restoration	Belle Pass to Caminada Pass Barrier Island Restoration	Restoration of 6,900 acres of Barataria Bay barrier islands between Belle Pass and Caminada Pass to provide dune, beach, and back barrier marsh habitat. The project provides storm surge and wave attenuation for 82,900 linear ft. of shoreline in the Barataria Basin.	Lafourche; Jefferson
002.DI.03	Diversion	Mid-Barataria Diversion (75,000 cfs)	Sediment diversion of 75,000 cfs into Mid-Barataria in the vicinity of Myrtle Grove to build and maintain land (modeled at 75,000 cfs for river flows of 1,000,000 cfs; variable flows from 200,000 cfs to 1,000,000 cfs calculated using a linear function; and open with variable flow rate (larger than 75,000 cfs, estimated using linear extrapolation) for river flow above 1,000,000 cfs. No operation below 200,000 cfs.	Plaquemines
002.DI.03a	Diversion	Mid-Barataria Diversion (250,000 cfs)	Sediment diversion of 250,000 cfs into Mid-Barataria in the vicinity of Myrtle Grove to build and maintain land (open with a variable flow rate calculated using a linear function from zero to 250,000 cfs for river flow between 200,000 cfs and 1,000,000 cfs; diverts exactly 250,000 cfs when Mississippi River flow is 1,000,000 cfs; and open with variable flow rate (larger than 250,000 cfs, estimated using linear extrapolation) for river flow above 1,000,000 cfs. No operation below 200,000 cfs.	Plaquemines

Project ID	Project Type	Name	Description	Parish
002.DI.15	Diversion	Lower Barataria Diversion (50,000 cfs)	Sediment diversion of 50,000 cfs into Lower Barataria in the vicinity of Port Sulphur to build and maintain land (open with a variable flow rate calculated using a linear function from zero to 50,000 cfs for river flow between 200,000 cfs and 1,000,000 cfs; diverts exactly 50,000 cfs when Mississippi River flow is 1,000,000 cfs; and open with variable flow rate (larger than 50,000 cfs, estimated using linear extrapolation) for river flow above 1,000,000 cfs. No operation below 200,000 cfs.	Plaquemines
002.DI.100	Diversion	Mid-Barataria Diversion (75,000 cfs)	Sediment diversion of 35,000 to 75,000 cfs into Mid-Barataria in the vicinity of Myrtle Grove to build and maintain land. (Modeled at 35,000 cfs for years 9 through 20 and 75,000 cfs for years 21 through 50 for river flows at 1,000,000 cfs; open with a variable flow rate calculated using a linear function from zero to capacity between 200,000 and 1,000,000 cfs and above 1,000,000; no operation below 200,000 cfs).	Plaquemines
002.DI.101	Diversion	Mid-Barataria Diversion (75,000 cfs)	Sediment diversion into Mid-Barataria to build and maintain land, 75,000 cfs capacity (modeled with no flow under 200,000 cfs. Variable flows to capacity when the Mississippi River flows are between 200,000 and 1,250,000 cfs. The project diverts exactly 75,000 cfs when the Mississippi River flows at 1,250,000 cfs).	Plaquemines

Project ID	Project Type	Name	Description	Parish
002.DI.102	Diversion	Mid-Barataria Diversion (75,000 cfs)	Sediment diversion into Mid-Barataria near Myrtle Grove to build and maintain land, 75,000 cfs (modeled at 5,000 cfs for Mississippi River flows below 200,000 cfs; variable flows to capacity between 200,000 and 1,250,000 cfs calculated using a linear function; diverts exactly 75,000 cfs when flows at 1,250,000 cfs).	Plaquemines
002.MC.04a	Marsh Creation	Lower Barataria Marsh Creation-Component A	Creation of approximately 19,300 acres of marsh in Jefferson Parish on east shore of Little Lake and Turtle Bay to create new wetland habitat and restore degraded marsh.	Jefferson
002.MC.05e	Marsh Creation	Large-Scale Barataria Marsh Creation-Component E	Creation of approximately 12,400 acres of marsh in the Barataria Basin south of the Pen to the Barataria Landbridge to create new wetland habitat and restore degraded marsh.	Plaquemines; Jefferson
002.MC.07	Marsh Creation	Barataria Bay Rim Marsh Creation	Creation of approximately 1,200 acres of marsh along northern rim of Barataria Bay to create new wetland habitat and restore degraded marsh.	Plaquemines; Jefferson; Lafourche
002.MC.08	Marsh Creation	North Caminada Marsh Creation	Creation of approximately 16,600 acres of marsh north of Elmers Island between Caminada Bay and Bayou Lafourche to create new wetland habitat and restore degraded marsh.	Lafourche
002.MC.100	Marsh Creation	North Barataria Bay Marsh Creation	Creation of approximately 13,900 acres of marsh surrounding Barataria Bay shoreline to create new wetland habitat and restore degraded marsh.	Plaquemines; Jefferson; Lafourche

Project ID	**Project Type**	**Name**	**Description**	**Parish**
002.RC.01	Ridge Restoration	Bayou Long Ridge Restoration	Restoration of approximately 27,000 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation to approximately 50 acres along Bayou Long/Bayou Fontanelle.	Plaquemines
002.RC.02	Ridge Restoration	Spanish Pass Ridge Restoration	Restoration of approximately 46,300 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation to approximately 90 acres west of Venice along banks of Spanish Pass.	Plaquemines
002.RC.100	Ridge Restoration	Red Pass Ridge Restoration	Restoration of approximately 23,000 feet of historic ridge southwest of Venice to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation to approximately 50 acres along banks of Red Pass.	Plaquemines
002.RC.101	Ridge Restoration	Adams Bay Ridge Restoration	Restoration of approximately 31,600 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation to approximately 60 acres along Adams Bay.	Plaquemines
002.RC.102	Ridge Restoration	Bayou Eau Noire Ridge Restoration	Restoration of approximately 34,800 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation to approximately 70 acres along Bayou Eau Noire.	Plaquemines

Project ID	Project Type	Name	Description	Parish
002.RC.103	Ridge Restoration	Grand Bayou Ridge Restoration	Restoration of approximately 48,100 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation to approximately 90 acres along Grand Bayou.	Plaquemines
002.SP.100	Shoreline Protection	Lake Hermitage Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 6,500 feet around southern shore of Lake Hermitage to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Plaquemines
002.SP.101	Shoreline Protection	Fifi Island Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 10,500 feet of the northeastern shore and southwestern shore of Fifi Island to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Jefferson
002.SP.102	Shoreline Protection	East Snail Bay Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 7,300 feet of the northeastern shore of Snail Bay south of Little Lake to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Lafourche
002.SP.103	Shoreline Protection	West Snail Bay Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 16,600 feet of the western shoreline of Snail Bay south of Little Lake to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Lafourche

Project ID	Project Type	Name	Description	Parish
002.SP.104	Shoreline Protection	South Little Lake Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 17,100 feet of the southern shore of Little Lake west of Coffee Bay to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Lafourche
002.SP.105	Shoreline Protection	North Little Lake Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 25,700 feet of the eastern shore of Little Lake and west shore of Turtle Bay into the Harvey Cutoff to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Lafourche
002.SP.106	Shoreline Protection	Bayou Perot Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 5,900 feet of the western shore of Bayou Perot to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Lafourche
002.SP.107	Shoreline Protection	South Lake Salvador Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 82,300 feet of the southern shore of Lake Salvador from Catahoula Bay to the northeast of Bayou Villars to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Jefferson; Lafourche

Project ID	Project Type	Name	Description	Parish
002.SP.108	Shoreline Protection	Lake Salvador Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 50,200 feet of the northern shore of Lake Salvador from Baie du Cabanage to Bayou Bardeaux to preserve shoreline integrity and reduce wetland degradation from wave erosion.	St. Charles
002.SP.109	Shoreline Protection	Lac Des Allemands Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 5,800 feet of west shore of Lac Des Allemands from Fausse Pointe to Pointe aux Herbes to preserve shoreline integrity and reduce wetland degradation from wave erosion.	St. John
004.BS.01	Bank Stabilization	Grand Lake Bank Stabilization	Bank stabilization through earthen fill placement, high performance turf reinforcement mat, and vegetative plantings to a design elevation of 4 feet NAVD88 around approximately 298,800 feet of perimeter shoreline at Grand Lake.	Cameron
004.BS.02	Bank Stabilization	West Cove Bank Stabilization	Bank stabilization through earthen fill placement, high performance turf reinforcement mat, and vegetative plantings to a design elevation of 4 feet NAVD88 around approximately 97,900 feet of perimeter shoreline at West Cove of Calcasieu Lake.	Cameron
004.BS.05	Bank Stabilization	Sabine Lake Bank Stabilization	Bank stabilization through earthen fill placement, high performance turf reinforcement mat, and vegetative plantings to a design elevation of 4 feet NAVD88 along approximately 128,200 feet of perimeter shoreline at Sabine Lake.	Cameron

Project ID	Project Type	Name	Description	Parish
004.HR.06	Hydrologic Restoration	Calcasieu Ship Channel Salinity Control Measures	Construction of Sill and Wall structures in West Pass, East Pass, Lake Wall, Long Point Lake, Nine Mile Cut, Dugas Cut 1, Dugas Cut 2, Texaco Cut, Turner's Bay, Salt Ditch, Drainage Canal, and Choupique Bayou to prevent saltwater intrusion from the Calcasieu Ship Channel.	Calcasieu; Cameron
004.MC.01	Marsh Creation	South Grand Chenier Marsh Creation	Creation of approximately 6,700 acres of marsh south of Highway LA 82 near Grand Chenier to create new wetland habitat and restore degraded marsh.	Cameron
004.MC.04	Marsh Creation	Mud Lake Marsh Creation	Creation of approximately 5,100 acres of marsh at Mud Lake south of West Cove, Calcasieu Lake to create new wetland habitat and restore degraded marsh.	Cameron
004.MC.07	Marsh Creation	West Rainey Marsh Creation	Creation of approximately 7,600 acres of marsh at Rainey Marsh near the southeast bank of the Freshwater Bayou Canal to create new wetland habitat and restore degraded marsh.	Vermilion
004.MC.10	Marsh Creation	Southeast Calcasieu Lake Marsh Creation	Creation of approximately 7,700 acres of marsh southeast of Calcasieu Lake to create new wetland habitat and restore degraded marsh.	Cameron
004.MC.100	Marsh Creation	Freshwater Bayou North Marsh Creation	Creation of approximately 4,800 acres of marsh in Vermilion Parish west of Freshwater Bayou to create new wetland habitat and restore degraded marsh.	Vermilion
004.MC.101	Marsh Creation	Freshwater Bayou South Marsh Creation	Creation of approximately 5,800 acres of marsh in Vermilion Parish west of Freshwater Bayou to create new wetland habitat and restore degraded marsh.	Vermilion

Project ID	Project Type	Name	Description	Parish
004.MC.102	Marsh Creation	White Lake Marsh Creation	Creation of approximately 10,100 acres of marsh in Vermilion Parish east of White Lake to create new wetland habitat and restore degraded marsh.	Vermilion
004.MC.103	Marsh Creation	Little Chenier Marsh Creation	Creation of approximately 1,000 acres of marsh in Cameron Parish south of Grand Lake to create new wetland habitat and restore degraded marsh.	Cameron
004.MC.104	Marsh Creation	Calcasieu Lake West Bank Marsh Creation	Creation of approximately 8,100 acres of marsh in Cameron Parish west of Calcasieu Lake to create new wetland habitat and restore degraded marsh.	Cameron
004.MC.105	Marsh Creation	West Brown Lake Marsh Creation	Creation of approximately 13,100 acres of marsh in Cameron Parish south of Black Lake to create new wetland habitat and restore degraded marsh.	Cameron
004.MC.106	Marsh Creation	Cameron Meadows and Vicinity Marsh Creation	Creation of approximately 27,800 acres of marsh near Cameron Meadows and Sabine National Wildlife Refuge to create new wetland habitat and restore degraded marsh.	Cameron
004.MC.107	Marsh Creation	West Sabine Refuge Marsh Creation	Creation of approximately 9,100 acres of marsh east of Sabine Lake to create new wetland habitat and restore degraded marsh.	Cameron
004.MC.13	Marsh Creation	Cameron Meadows Marsh Creation	Creation of approximately 3,600 acres of marsh at Cameron Meadows north of Johnsons Bayou to create new wetland habitat and restore degraded marsh.	Cameron
004.MC.16	Marsh Creation	East Pecan Island Marsh Creation	Creation of approximately 10,100 acres of marsh between Pecan Island and the west bank of the Freshwater Bayou Canal to create new wetland habitat and restore degraded marsh.	Vermilion

Project ID	Project Type	Name	Description	Parish
004.MC.19	Marsh Creation	East Calcasieu Lake Marsh Creation	Creation of approximately 17,700 acres of marsh in the eastern Cameron-Creole watershed to create new wetland habitat and restore degraded marsh.	Cameron
004.MC.23	Marsh Creation	Calcasieu Ship Channel Marsh Creation	Creation of approximately 2,500 acres of marsh south of Calcasieu Lake near Cameron to create new wetland habitat and restore degraded marsh.	Cameron
004.MC.25	Marsh Creation	Kelso Bayou Marsh Creation	Creation of approximately 300 acres of marsh at Kelso Bayou immediately west of Calcasieu Ship Channel to create new wetland habitat and restore degraded marsh.	Cameron
004.RC.01	Ridge Restoration	Grand Chenier Ridge Restoration	Restoration of approximately 86,300 feet of the Grand Chenier Ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation for approximately 170 acres.	Cameron
004.RC.02	Ridge Restoration	Cheniere au Tigre Ridge Restoration	Restoration of approximately 77,800 feet of Bill Ridge and Cheniere au Tigre to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation for approximately 130 acres.	Vermilion
004.RC.03	Ridge Restoration	Pecan Island Ridge Restoration	Restoration of approximately 43,800 feet of Pecan Island Ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation for approximately 80 acres.	Vermilion

Project ID	Project Type	Name	Description	Parish
004.RC.05	Ridge Restoration	Front Ridge Restoration	Restoration of approximately 147,000 feet of Front Ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation for approximately 290 acres.	Cameron
004.SP.02	Shoreline Protection	Schooner Bayou Canal Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 17,900 feet of the south bank of Schooner Bayou Canal from Highway 82 to North Prong to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Vermilion
004.SP.03	Shoreline Protection	Freshwater Bayou Canal Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 7,500 feet of the south bank of Freshwater Bayou Canal at Little Vermilion Bay to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Vermilion
004.SP.05a	Shoreline Protection	Gulf Shoreline Protection (Calcasieu River to Rockefeller)	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along critical areas of the Gulf shoreline between Calcasieu River and Freshwater Bayou to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Cameron; Vermilion
004.SP.07	Shoreline Protection	Northeast White Lake Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 3,200 feet of the east side of White Lake near Schooner Bayou Canal to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Vermilion

Project ID	Project Type	Name	Description	Parish
004.SP.08	Shoreline Protection	Calcasieu-Sabine Shoreline Protection-Component A	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 75,400 feet of the Gulf shoreline east of Sabine River to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Cameron
004.SP.100	Shoreline Protection	White Lake Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 178,200 feet of White Lake shoreline to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Cameron, Vermilion
004.SP.102	Shoreline Protection	Sabine Pass Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 41,900 feet of the east bank of Sabine Pass from the Gulf to Sabine Lake to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Cameron
03a.BH.03	Barrier Island/ Headland Restoration	Isles Dernieres Barrier Island Restoration	Restoration of 7,400 acres the Isles Dernieres barrier islands to provide dune, beach, and back barrier marsh habitat. The project provides storm surge and wave attenuation for 86,000 linear ft. of shoreline in the Terrebonne Basin.	Terrebonne
03a.BH.04	Barrier Island/ Headland Restoration	Timbalier Islands Barrier Island Restoration	Restoration of 4,500 acres of the Timbalier barrier islands to provide dune, beach, and back barrier marsh habitat. The project provides storm surge and wave attenuation for 57,000 linear ft. of shoreline in the Terrebonne Basin.	Lafourche; Terrebonne

Project ID	Project Type	Name	Description	Parish
03a.BS.100	Bank Stabilization	Leeville Bank Stabilization	Bank stabilization through earthen fill placement and articulated concrete block mat to a design elevation of 4 feet NAVD88 along approximately 28,400 feet along the northern and southern banks the Southeast and Southwest Canals south of Leeville.	Lafourche
03a.DI.01	Diversion	Bayou Lafourche Diversion (1,000 cfs)	Diversion of the Mississippi River into Bayou Lafourche to increase freshwater flow down Bayou Lafourche with 1,000 cfs capacity (modeled with continuous operation at 1,000 cfs, independent of Mississippi River flow).	Ascension, Assumption, Lafourche
03a.DI.05	Diversion	Atchafalaya River Diversion (30,000 cfs)	Sediment diversion off of the Atchafalaya river to benefit the Penchant basin and southwest Terrebonne marshes with 30,000 cfs capacity (modeled at 26% of the Atchafalaya River flow upstream of the confluence with Bayou Shaffer).	Terrebonne
03a.HR.02	Hydrologic Restoration	Central Terrebonne Hydrologic Restoration	Construction of a rock plug in Grand Pass with a 150’ X 15’ navigable section to prevent saltwater intrusion from Caillou Lake into Lake Mechant.	Terrebonne
03a.HR.100	Hydrologic Restoration	Grand Bayou Hydrologic Restoration	Dredging of Margaret's Bayou and Grand Bayou in conjunction with the construction of a fixed crest structure at Grand Bayou and the installation of 5 48" flap-gated culverts on the western bank of Grand Bayou.	Lafourche
03a.MC.07	Marsh Creation	Belle Pass-Golden Meadow Marsh Creation	Creation of approximately 24,800 acres of marsh from Belle Pass to Golden Meadow to create new wetland habitat and restore degraded marsh.	Lafourche

Project ID	Project Type	Name	Description	Parish
03a.MC.09b	Marsh Creation	North Terrebonne Bay Marsh Creation-Component B	Creation of approximately 4,700 acres of marsh south of Montegut between Bayou St. Jean Charles and Bayou Pointe Aux Chenes to create new wetland habitat and restore degraded marsh.	Terrebonne
03a.MC.100	Marsh Creation	South Terrebonne Marsh Creation	Creation of approximately 25,200 acres of marsh south of Dulac between Bayou Dularge and Houma Navigation Canal to create new wetland habitat and restore degraded marsh.	Terrebonne
03a.MC.101	Marsh Creation	North Lake Mechant Marsh Creation	Creation of approximately 13,200 acres of marsh between Lake de Cade and Lake Mechant to create new wetland habitat and restore degraded marsh.	Terrebonne
03a.RC.01	Ridge Restoration	Bayou Decade Ridge Restoration	Restoration of approximately 42,600 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation for approximately 80 acres along Bayou Decade.	Terrebonne
03a.RC.02	Ridge Restoration	Bayou Dularge Ridge Restoration	Restoration of approximately 53,200 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation for approximately 100 acres along Bayou Dularge.	Terrebonne
03a.RC.03	Ridge Restoration	Small Bayou LaPointe Ridge Restoration	Restoration of approximately 49,000 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation for approximately 100 acres along Small Bayou LaPointe.	Terrebonne

Project ID	Project Type	Name	Description	Parish
03a.RC.04	Ridge Restoration	Mauvais Bois Ridge Restoration	Restoration of approximately 43,400 feet of historic ridge to an elevation of 5 feet NAVD88 at Mauvais Bois to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation for approximately 90 acres.	Terrebonne
03a.RC.05	Ridge Restoration	Bayou Terrebonne Ridge Restoration	Restoration of approximately 40,700 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation for approximately 80 acres along the southern portions of Bayou Terrebonne.	Terrebonne
03a.RC.06	Ridge Restoration	Bayou Pointe Aux Chenes Ridge Restoration	Restoration of approximately 43,600 feet of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation for approximately 90 acres along the southern portions of Bayou Pointe Aux Chenes.	Terrebonne
03a.SP.100	Shoreline Protection	North Lake Boudreaux Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 15,400 feet of the northern shore of Lake Boudreaux east of Hog Point to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Terrebonne
03b.DI.04	Diversion	Increase Atchafalaya Flow to Terrebonne	Dredging of the GIWW and construction of a bypass structure at the Bayou Boeuf Lock from the Atchafalaya River to Terrebonne marshes with 20,000 cfs capacity.	Assumption, St. Mary; Terrebonne

Project ID	Project Type	Name	Description	Parish
03b.MC.03	Marsh Creation	Marsh Island Marsh Creation	Creation of approximately 11,500 acres of marsh on Marsh Island to create new wetland habitat and restore degraded marsh.	Iberia
03b.MC.07	Marsh Creation	East Rainey Marsh Creation	Creation of approximately 20,500 acres of marsh in the eastern portion of Rainey Marsh to create new wetland habitat and restore degraded marsh.	Vermilion
03b.MC.09	Marsh Creation	Point Au Fer Island Marsh Creation	Creation of approximately 13,400 acres of marsh on Point Au Fer Island to create new wetland habitat and restore degraded marsh.	Terrebonne
03b.MC.100	Marsh Creation	Vermilion Bay Marsh Creation	Creation of approximately 14,800 acres of marsh along Vermilion Bay to create new wetland habitat and restore degraded marsh.	Vermilion
03b.MC.101	Marsh Creation	Southeast Marsh Island Marsh Creation	Creation of approximately 1,100 acres of marsh on eastern tip of Marsh Island to create new wetland habitat and restore degraded marsh.	Iberia
03b.SP.01	Shoreline Protection	Freshwater Bayou Shoreline Protection (Belle Isle Canal to Lock)	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 36,000 feet of the east bank of Freshwater Bayou Canal from Belle Isle Canal to Freshwater Bayou Lock to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Vermilion
03b.SP.05	Shoreline Protection	Gulf Shoreline Protection (Freshwater Bayou to Southwest Pass)	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 79,800 feet of Gulf shoreline from Freshwater Bayou to Southwest Pass (near Marsh Island) to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Vermilion

Project ID	Project Type	Name	Description	Parish
03b.SP.06a	Shoreline Protection	Vermilion Bay and West Cote Blanche Bay Shoreline Protection (Critical Areas)	Shoreline protection through rock breakwaters of critical areas designed to an elevation of 3.5 feet NAVD88 along the east shoreline of Vermilion Bay to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Vermilion; Iberia
03b.SP.08	Shoreline Protection	Southwest Pass Shoreline Protection (West Side)	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 34,400 feet of the west shoreline along Southwest Pass immediately west of Marsh Island to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Vermilion
03b.SP.100	Shoreline Protection	Lost Lake Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 10,600 feet of the southern shore of Lost Lake from Rice Bayou to Lost Lake Pass to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Terrebonne
03b.SP.101	Shoreline Protection	Southeast Marsh Island Shoreline Protection	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along approximately 65,900 feet along the eastern shoreline of Marsh Island to preserve shoreline integrity and reduce wetland degradation from wave erosion.	Iberia

1.2.2 Structural Protection Projects

Structural Protection projects reduce hurricane flood risk in coastal communities by acting as a physical barrier against storm surge. The 20 Structural Protection projects evaluated in the 2017 Coastal Master Plan include one or more of the following basic components:

- **Earthen Levee:** The principal component of each Structural Protection project is the earthen levee. These structures consist of pyramidal banks of compacted earth that provide a barrier against storm surge for coastal communities or assets. Levees can either be linear or ring levees. Ring levees form a closed risk reduction system that encircles a protected area (referred to as a polder). Linear levees create a closed system by tying into other linear levees or by extending inland to high ground. Based on local geotechnical and hydraulic conditions, some levee templates include stability berms on the protected side and wave berms on the flood side of levees. CPRA's Louisiana Flood Protection Design Guidelines (July 2015b) were used when applicable to inform levee geometry selections when not made explicit in a source report or document.

- **Concrete T-wall:** T-walls are typically located at points along an earthen levee that have a high potential for erosion or insufficient space for the wide slopes of an earthen levee.
- **Floodgate:** Floodgates are needed where levees or T-walls cross a road or railroad or where they intersect waterways.
- **Ring Pumps (Internal to Levees):** Pumps are needed in enclosed risk reduction systems to allow water that enters a polder to be pumped out.

Additional information about the Structural Protection projects evaluated in the master plan is presented in Section 3.9. Table 9 presents the 20 Structural Protection projects evaluated in the 2017 Coastal Master Plan.

Table 9: Structural Protection Projects Evaluated in the 2017 Coastal Master Plan.

Project ID	Project Name	Description	Parish
001.HP.04	Greater New Orleans High Level	Hurricane protection levee around the Greater New Orleans area from Verret to the Bonnet Carre Spillway (elevation 15 to 35 feet)	Orleans; St. Bernard; Jefferson; St. Charles; Plaquemines
001.HP.05	Greater New Orleans LaPlace Extension	Hurricane protection levee in the LaPlace area (elevation 13.5 feet)	St. Charles; St. John; St. James
001.HP.08	Lake Pontchartrain Barrier	Planning and design of hurricane protection barriers across the passes at Chef Menteur and The Rigolets (elevation 2.0 feet)	Orleans; St. Tammany
001.HP.13	Slidell Ring Levee	Hurricane protection levee around Slidell (elevation 16.0 feet)	St. Tammany
002.HP.06	Upper Barataria Risk Reduction-Hwy 90 Alignment	Hurricane protection levee along Highway 90 between the West Bank and Larose (elevation 15.5 feet)	St. Charles; Lafourche; Jefferson
002.HP.07	Lafitte Ring Levee	Hurricane protection levee around Lafitte (elevation 16.0 feet)	Jefferson
002.HP.100	Fort Jackson to Venice	Hurricane protection levee between Fort Jackson and Venice (elevation 18.0 feet)	Plaquemines

Project ID	Project Name	Description	Parish
002.HP.101	St. Jude to City Price	Hurricane protection levee between St. Jude and City Price (elevation 17.0 to 22.0 feet)	Plaquemines
002.HP.102	Oakville to La Reussite	Hurricane protection levee between Oakville and La Reussite (elevation 10.5 feet)	Plaquemines
004.HP.15	Abbeville and Vicinity	Construction of a levee south of Delcambre, Erath, and Abbeville roughly following Highway 330 from the Delcambre Canal to the western extents of Abbeville (elevation 23.0 to 27.0 feet)	Iberia; Vermilion
03a.HP.02b	Morganza to the Gulf	Hurricane protection levee around Houma and Terrebonne ridge communities from Larose to Humphreys Canal (elevation 19.5 to 36.5 feet)	Lafourche; Terrebonne
03a.HP.20	Maintain Larose to Golden Meadow-basic	Maintenance of existing Larose to Golden Meadow hurricane protection levees to design elevation for 50-year period of analysis	Lafourche
03a.HP.101	Maintain Larose to Golden Meadow-enhanced	Maintenance of existing Larose to Golden Meadow hurricane protection levees to design elevation for 50-year period of analysis	Lafourche
03a.HP.102	Morganza to the Gulf-enhanced inducements investigation	Hurricane protection levee around Houma and Terrebonne ridge communities from Larose to Humphreys Canal	Lafourche; Terrebonne
03a.HP.103	Morganza to the Gulf- basic inducements investigation	Hurricane protection levee around Houma and Terrebonne ridge communities from Larose to Humphreys Canal	Lafourche; Terrebonne
03b.HP.08	Amelia Levee Improvements (3E)	Hurricane protection levee, pump station, and vertical lift gates along the GIWW between Lake Palourde and the Bayou Boeuf Lock (elevation 18.0 feet)	Assumption; St. Mary
03b.HP.10	Morgan City Back Levee	Hurricane protection levee along Lake Palourde in the vicinity of Morgan City (elevation 13.5 feet)	St. Mary

Project ID	Project Name	Description	Parish
03b.HP.12	Franklin and Vicinity	Hurricane protection levee along the GIWW between the Wax Lake Outlet and Charenton Drainage and Navigation Canal and along Bayou Sale (elevation 16.5 feet)	St. Mary
03b.HP.13	Bayou Chene Floodgate	Floodgate across Bayou Chene near Amelia (elevation 10.0 feet)	St. Mary; Terrebonne
03b.HP.14	St. Mary/Iberia Upland Levee	Hurricane Protection levee in Iberia and St. Mary Parishes between the Delcambre Canal and the Charenton Canal (elevation 15.5 to 20.0 feet)	St. Mary; Iberia
004.HP.15	Abbeville and Vicinity	Construction of a levee south of Delcambre, Erath, and Abbeville roughly following Highway 330 from the Delcambre Canal to the western extents of Abbeville (elevation 23.0 to 27.0 feet)	Iberia; Vermilion

Note: All elevations are referenced to the North American Vertical Datum of 1988 (NAVD88 Geoid 12a).

1.2.3 Nonstructural Risk Reduction Projects

Nonstructural Risk Reduction projects include non-residential floodproofing, residential elevation, and residential voluntary acquisition. Table 10 presents the 54 Nonstructural Risk Reduction project areas evaluated in the 2017 Coastal Master Plan. These projects include floodproofing non-residential properties where 100-year flood depths are 3 feet or less, elevating residential properties where 100-year flood depths are 3-14 feet, and acquiring residential properties where 100-year flood depths are greater than 14 feet based on the Federal Emergency Management Agency (FEMA) Base Flood Elevation +2.0 feet of freeboard or CPRA's recommended elevation height (100-year flood depths plus 2 feet freeboard), whichever is higher, in order to add a wider safety margin for future flood risk.

Table 10: Nonstructural Risk Reduction Project Areas Evaluated in the 2017 Coastal Master Plan.

Project ID	Name	Parish
ACA.01N	Acadia	Acadia
ASC.01N	Ascension – Donaldsonville	Ascension
ASC.02N	Ascension – Prairieville/Sorrento	Ascension
ASU.01N	Assumption	Assumption
ASU.02N	Assumption – Amelia	Assumption
CAL.01N	Calcasieu	Calcasieu

Project ID	Name	Parish
CAM.01N	Cameron	Cameron
IBE.03N	Iberia	Iberia
IBE.01N	Iberia – Lower	Iberia
IBV.01N	Iberville	Iberville
JEF.01N	Jefferson – Grand Isle	Jefferson
JEF.03N	Jefferson – Kenner/Metairie	Jefferson
JEF.02N	Jefferson – Lafitte/Barataria	Jefferson
JEF.04N	Jefferson – Marrero/Gretna	Jefferson
JFD.01N	Jefferson Davis	Jefferson Davis
LFT.01N	Lafayette	Lafayette
LAF.02N	Lafourche – Larose/Golden Meadow	Lafourche
LAF.01N	Lafourche – Lower	Lafourche
LAF.03N	Lafourche – Raceland	Lafourche
LIV.01N	Livingston	Livingston
ORL.04N	Orleans – Algiers	Orleans
ORL.02N	Orleans – Lake Catherine	Orleans
ORL.03N	Orleans – New Orleans	Orleans
ORL.01N	Orleans – Rigolets	Orleans
PLA.04N	Plaquemine – Belle Chasse	Plaquemines
PLA.02N	Plaquemines – Braithwaite	Plaquemines
PLA.03N	Plaquemines – Grand Bayou	Plaquemines
PLA.05N	Plaquemines – Phoenix/Pointe A La Hache	Plaquemines
PLA.01N	Plaquemines – West Bank	Plaquemines
STB.02N	St. Bernard	St. Bernard

Project ID	**Name**	**Parish**
STB.01N	St. Bernard – Yscloskey/Delacroix	St. Bernard
STC.04N	St. Charles – Ama	St. Charles
STC.03N	St. Charles – Destrehan	St. Charles
STC.01N	St. Charles – Hahnville/Luling	St. Charles
STC.02N	St. Charles – Montz	St. Charles
STC.05N	St. Charles – Salvador	St. Charles
STJ.01N	St. James – Convent	St. James
STJ.02N	St. James – Vacherie	St. James
SJB.03N	St. John the Baptist – Edgard	St. John the Baptist
SJB.02N	St. John the Baptist – Garyville	St. John the Baptist
SJB.01N	St. John the Baptist – Laplace/Reserve	St. John the Baptist
SMT.01N	St. Martin	St. Martin
STM.04N	St. Mary – Franklin/Charenton	St. Mary
STM.02N	St. Mary – Glencoe	St. Mary
STM.05N	St. Mary – Lower	St. Mary
STM.01N	St. Mary – Morgan City	St. Mary
STM.03N	St. Mary – Patterson	St. Mary
STT.01N	St. Tammany	St. Tammany
STT.02N	St. Tammany – Slidell	St. Tammany
TAN.01N	Tangipahoa	Tangipahoa
TER.02N	Terrebonne – Houma	Terrebonne
TER.01N	Terrebonne – Lower	Terrebonne
VER.01N	Vermilion	Vermilion
VER.02N	Vermilion – Abbeville/Delcambre	Vermilion

2.0 Project Attributes Assumptions

2.1 Task Attribute Descriptions and Background

Following development of the candidate projects list, specific project details were required to define project features affecting the landscape and hydrology in the coastal system. This was accomplished by the development of specific attributes for each type of candidate project to provide parameters needed for both the predictive models and the Planning Tool. Due to the variety of candidate restoration and risk reduction projects, attribute descriptions were developed for each project evaluated. Attributes for all projects evaluated are presented in the 2017 Coastal Master Plan project attributes table (Attachment A2, A3, A4, and A5). The implementation of 2017 Coastal Master Plan projects should adhere to the most current version of the Louisiana Flood Protection Design Guidelines (2015b) and the Louisiana Restoration Design Guidelines (2015c).

2.2 General Attributes Common for all Project Types

The following list of attributes is common for each candidate restoration project and risk reduction project:

1. **Project Number:** A unique project identification number, arranged by "Component Planning Unit. Project Type. Sequential Number" (e.g., 001.MC.09) for restoration and structural protection projects and "Community. Sequential Number" (e.g., VER.02N) for Nonstructural Risk Reduction projects.
2. **Project Name:** A unique name for each project.
3. **Project Type:** BS=Bank Stabilization, MC=Marsh Creation, DI= Diversion, SP=Shoreline Protection, BH=Barrier Island/Headland Restoration, RC=Ridge Restoration, HR=Hydrologic Restoration, OR=Oyster Barrier Reef, HP=Structural Protection, and NS=Nonstructural Risk Reduction.
4. **Description:** Brief description of project features and intent.
5. **Tier:** Used to prioritize the order in which groups of projects were run through the suite of models.
6. **Model Group:** Identifier to track and name model outputs.
7. **Eco-Hydro Group:** Denotes which of the three eco-hydrology regions the project was located within: ATT refers to the Atchafalaya/Terrebone region; PBB refers to the Pontchartrain/Barataria/Breton region; and ChP refers to the Chenier Plain region.
8. **Name Source:** Project name as specified in the source document.
9. **Source:** Source plan or document from which the project was taken.
10. **Planning Unit:** Planning unit(s) in which the project footprint is located (1, 2, 3a, 3b, and 4).
11. **Model number:** A unique identification number provided for Hydrologic Restoration, Barrier Island/Headland Restoration, Marsh Creation and Structural Protection projects, where individual components are separated out for modeling, costing, or project-selection purposes.
12. **Parish:** Parish(es) in which the project footprint is located.

2.3 Planning Tool Attributes Common for all Project Types

The following list of attributes is common for each candidate restoration project and risk reduction project:

- **P/E&D Duration:** Expected length of time to complete all planning, engineering, and design (P/E&D) activities based on average historical data or previous study data of similar project planning and design durations. Durations inform the Planning Tool of the lag time required between project selection and realization of a project and its impacts on the landscape.
- **Estimated P/E&D Cost:** Total estimated cost associated with all aspects of P/E&D phase including engineering, surveying, hydraulic modeling, geotechnical work, wetland delineations, land rights, and cultural resources investigation. Calculated as 10% of estimated construction cost (before contingency) for all project types except for diversions greater than 75,000 cfs and Structural Protection projects. P/E&D was calculated as 6% of the estimated construction cost for diversions greater than 75,000 cfs. P/E&D was calculated as 15-20% of the Estimated Construction Cost for Structural Protection projects.
- **Construction Duration:** Expected length of time to complete all construction activities based on average historical data or previous study data of similar project construction durations. Durations inform the Planning Tool of the lag time required between project selection and realization of a project and its impacts on the landscape.
- **Estimated Construction Cost:** Total estimated cost associated with all aspects of construction phase including a 20% contingency. Details of estimated construction cost by project type are outlined in Section 3.0.
- **Estimated O&M Cost:** Total estimated cost associated with all aspects of operations and maintenance (O&M) phase. Details of O&M cost by project type are outlined in Section 3.0.
- **Estimated Construction Management Cost:** Total estimated cost associated with the oversight of construction. This cost is 5% of the estimated construction cost and is included with the estimated construction cost when reported to the Planning Tool.
- **Cost Uncertainty Factor:** Represents the uncertainty associated with the estimated construction cost and is outlined in Section 2.5.3.
- **Prerequisites:** List of other projects that would need to be implemented before the candidate project would be implemented.
- **Mutually Exclusive Projects:** List of other projects that would not be included in an alternative should the current project be selected.
- **Latitude/Longitude:** Centroid of project used for tracking purposes within the Planning Tool expressed in the NAVD88, Universal Transverse Mercator (UTM) spatial reference.
- **Planning Tool Number:** A unique identification number provided for Barrier Island/Headland Restoration and Marsh Creation projects with sub-components that may be tracked separately (from the complete project) in the Planning Tool.
- **Cost Number:** A unique identification number provided for Barrier Island/Headland Restoration and Marsh Creation projects with sub-components for which both complete project and sub-component costs will be tracked in the Planning Tool.

Note: Project-specific details about P/E&D, construction, and O&M costs are presented by project type in the following sections. All costs are calculated for 2015. P/E&D duration, estimated P/E&D cost, and cost uncertainty factor are not attributes for Nonstructural Risk Reduction projects.

2.4 General/Planning Tool Attributes Specific to Project Types

Table 11 presents a list of general and Planning Tool attributes that are specific to project types. Additional information about these attributes is presented by project type in the following sections.

Table 11: Project Attributes Specific to Project Types.

Attribute	Description	Applicable Project Types
Operational Regime	Explanation of the operational strategies and triggers for each structure.	DI, HR
Created Acres	Total acres of land created or nourished by project.	BH, MC, RC,
Length	Total length of project centerline.	BS, BH, DI, OR, RC, SP, HP
Volume	Total estimated volume of fill material required to construct the project feature using one initial lift based on the target elevation at the time of construction.	BS, BH, MC, RC, SP
Borrow Source	Borrow area(s) required to construct project feature(s).	BS, BH, MC, RC
Fill Source	Numerical code corresponding to an identified borrow source/region from which fill material will be obtained (used by Planning Tool for sediment constraint application).	MC
Dune Elevation	Dune crest elevation at the time of construction.	BH
Beach Elevation	Beach crest elevation.	BH
Dune Volume	Design volume based on the barrier island design template and an initial advanced volume equal to 100% of the design volume.	BH
Beach Volume	Design volume based on the barrier island design template and an initial advanced volume equal to 100% of the design volume.	BH
Marsh Volume	Total estimated volume of marsh fill material required to construct the back barrier marsh component of a Barrier Island/Headland project.	BH

Attribute	**Description**	**Applicable Project Types**
Crest Elevation	Top of crown elevation.	OR, RC, SP, BS
Marsh Elevation	Marsh elevation of consolidated fill material after one year of settlement.	BH, MC
Invert Elevation	Invert elevation of control structure (taken from previous report if available; assumed if unknown).	DI, HR
Opening Geometry Area	Total area of control structure opening (taken from previous report if available; assumed if unknown).	DI, HR
Opening Geometry	Description of the dimensions and geometric shape of control structure opening.	DI, HR
Discharge	Peak design flow through the structure and channel.	DI
River	Numerical code corresponding to river that is the source of fresh water for a diversion project.	DI
Footprint	Levee footprint based on the length and width of each levee.	HP
Existing Average Elevation	Average surface elevation within project footprint.	BS, HP, RC
Design Elevation	Target height of proposed protection features.	HP
Top Width	Total width at the top of project perpendicular to the project centerline.	SP, BS, OR, RC, HR, HP
Base Width	Total width at the base of the project perpendicular to the project centerline.	SP, BS, OR, RC, HR, HP
Side Slope Water	The slope of the fill expressed as the ratio of horizontal distance to vertical distance on water side of project.	SP, BS, OR, BH, RC, HR, HP
Side Slope Marsh	The slope of the fill expressed as the ratio of horizontal distance to vertical distance on marsh side of project.	SP, BS, OR, BH, RC, HR, HP
Wave Attenuation	Percent of wave energy deflected away/prevented from contact with the shoreline by the project.	SP, BS, OR, HR
Armoring Type	Type of armoring such as turf, concrete, riprap, revetment mats, etc.	BS, HP

Attribute	**Description**	**Applicable Project Types**
Date of Planting	The implementation date of the planting program.	BS, BH, MC, RC
Fraction Vegetation Species	The fraction of each 500 m^2 cell within the project footprint covered by each vegetation species identified for planting.	BS, BH, MC, RC
Vegetation Type	Vegetation type(s) to be planted following project construction.	BS, BH, MC, RC
Side Slope Beach	The slope of the fill expressed as the ratio of horizontal distance to vertical distance on water side of project.	BH
Beach Area	Total area of beach created or nourished by project.	BH
Beach Width	Width of the beach portion created or nourished by the project.	BH
Dune Area	Total area of dune created or nourished by project.	BH
Marsh Area	Total area of marsh created or nourished on the seaward side of the barrier island by project.	BH, MC
D_{50}	50^{th} percentile diameter of sediment.	BH
Percent Sand in Eroding Profile	Percentage of sand within the eroding profile ($d>0.063$mm).	BH
Percent Silt in Eroding Profile	Percentage of silt within the eroding profile ($d<0.063$mm).	BH
Bulk Density	Bulk density of fill material.	MC, DI
Sediment Size Distribution	Particle size distribution of fill material.	MC
Ridge Area	Total area of ridge created or nourished by project.	RC
Diversion Channel Depth	Average depth of diversion conveyance channel.	DI
Diversion Channel Length	Length of diversion channel from the beginning of the diversion, including the diversion structure, to the outfall area.	DI

Attribute	Description	Applicable Project Types
Diversion Channel Width	Bottom width of conveyance channel from diversion structure to outfall area.	DI
Sand, Silt, and Clay Concentration	Sand, silt, and clay concentration of water during peak diversion flow.	DI
Sediment to Water Ratio	Sediment capture efficiency.	DI
Earthen Levee Length	Total length of the earthen levee section.	HP
Construction Grade	The crown elevation of the levee including the design elevation plus construction overbuild that compensates for settlement.	HP
Base Thickness	The base thickness of the concrete T-wall which was developed as a function of the wall height.	HP
Wall Height	Distance from the top of the base foundation to top of wall.	HP
Wall Length	The total length of the T-wall section.	HP
Wall Thickness	Thickness of T-wall as proportioned to the wall height.	HP
Gate Height	Distance from sill to the top of gate.	HP
Gate Type	Type of floodgate utilized.	HP
Impeller Elevation	Elevation to the impeller.	HP
Capacity	Discharge of the pumps at the design head.	HP

Legend:
BS – Bank Stabilization
DI – Diversion
HR – Hydrologic Restoration
OR – Oyster Barrier Reef
SP – Shoreline Protection
BH – Barrier Island/Headland Restoration
HP – Structural Protection
MC – Marsh Creation
RC – Ridge Restoration

2.5 Detailed Project Attribute Assumptions and Rationale (Excluding Nonstructural)

2.5.1 Project Feature Development

In an effort to delineate project features for the candidate projects, conceptual restoration feature design templates were developed for each type of restoration project. These templates are based on current design methodologies and lessons learned from recently constructed restoration projects. The templates were used to populate the project attributes for each project. The conceptual restoration design templates are shown on Figures 5 through 12 in Section 4.0.

2.5.2 Project Total Cost Development and Rationale

Project cost estimates were developed for each project type and are typically based on the conceptual design of known project features. The conceptual restoration and protection feature design templates, historical bid and cost data, and cost methodology were researched and developed by the CPRA Engineering Division to estimate cost. When applicable, unit prices from recently bid projects or completed study values from other coastal programs were also used to develop unit cost parameters. All cost estimates and unit costs are in 2015 dollars.

2.5.3 Project Total Cost Breakdown

The following criteria were assumed for the development of the project total cost. Cost attributes are listed in Attachment A5. Project total cost estimates are presented in the Project Fact Sheets in Attachment A8.

- The implementation year was calculated by adding the engineering duration and the construction duration (durations of all project stages were based on historical data of similar projects) and then the addition of one year.
- The estimated construction cost was developed according to the unit cost method of estimation using both a detailed and systems approach. The unit cost method is the sum of costs for various project components based on estimated unit costs times the estimated quantities of material. Estimated construction bid items, unit costs, and quantities were developed for each candidate project type.
- A 20% contingency was used to develop the final estimated construction cost for restoration projects. A 15-30% contingency was applied to Structural Protection projects (see Section 3.9 for additional detail) based on CPRA Engineering Division guidance. Contingency is a dollar amount intended to provide an allowance for costs expected to be part of a project total, but that have not been specifically identified or for which no quantities have been estimated.
- The cost uncertainty factor represents the uncertainty associated with the estimated construction cost. It is based on the scale of the project, presently available information, level of prior study, and constructability.
- The P/E&D cost is a percentage of the estimated construction cost. A P/E&D cost was estimated at 10% of the estimated construction cost (before contingency in the case of

restoration projects) with the exception of Diversion and Structural Protection projects. For diversions, P/E&D cost was estimated at 10% of estimated construction cost for those with a capacity less than 75,000 cfs and 6% for those with a capacity greater than 75,000 cfs. For Structural Protection projects, P/E&D cost ranged between 15-20% based on historical data from previously constructed projects.

- Construction management cost is a cost for professional services during construction to monitor contractor compliance with contract requirements and to monitor schedules and costs. It was estimated as 5% of the construction cost (before contingency in the case of restoration projects). Construction management costs are reported separately for clarity, but are included in construction cost for Planning Tool analysis.
- The O&M cost is specific for each project type as described in the subsections below.
- The total cost is the sum of the estimated construction cost (including contingency), the P/E&D cost, the construction management cost, and the O&M cost. Rounded costs for each of the above listed costs were rounded to the nearest $100,000.

Tables 12 and 13 were developed to provide guidelines for estimating uncertainty in project costs. The uncertainty factor acknowledges that project components are not fully developed and defined at the planning level, that projects may be more complex and costly than proposed, or that selected costs are higher than anticipated. The range of uncertainty defines an anticipated window within which costs are expected to fall based on the project complexity and outside influences.

Cost uncertainty methodology was assigned based on two main factors: how much information exists about the proposed project and its location and the scale of the proposed project. Table 12 tracks the uncertainty factors used to consider the uncertainty assignment for each project type. Table 13 lists the bounding ranges of uncertainty for each project type and the actual uncertainty ranges calculated for all projects within each project type. Bounding allowable ranges were assigned by the CPRA Engineering Division based on prior project experience. A scoring system gave each distinct project credit for the amount of existing information available and the scale of the project. The ranges within each project type of all individual project uncertainty factor scores are listed in Table 13 as the calculated variation. All project-specific cost uncertainty factors can be found in Attachment A7.

Table 12: Cost Uncertainty Factors by Project Type.

	BS	BH	DI	HP	HR	MC	OR	RC	SP
Existing Survey Information • No Information • Regional Maps/Charts • Remotely Sensed (Light Detection and Ranging [LiDAR]) • Local Survey • Design Level Survey Report	X	X	X	X		X	X	X	X

	BS	**BH**	**DI**	**HP**	**HR**	**MC**	**OR**	**RC**	**SP**
Existing Geotechnical Information • No Information • Regional Information/Borings • Sporadic Local Information/Borings • Project-Specific Borings/Testing • Design Level Geotechnical Report	X	X	X	X		X	X	X	X
Existing Design Reports • No Prior Study • Basic Feasibility Report • Detailed Feasibility or Basic 30% Design Report • Detailed 30% Design or Basic 65% Design Report • 95-100% Design Report	X		X	X			X	X	X
Existing Borrow Source Investigation • No Prior Study • Sparse Sampling • Detailed Sampling and Testing • Detailed Information Exists and Location has been Permitted for Excavation • Site has Previously been Mined for Borrow		X				X			
Existing Pipeline Corridor Investigation • No Prior Study • Basic Information and Survey from Public Datasets • Sparse Survey, Magnetometer, Pipeline Location Data • Local Survey, Magnetometer, Pipeline Location Data • Design Level Study or Previously Permitted Pipeline Corridor		X				X			
Scale-Project Length (miles) • Shorter Lengths Yield Lower Uncertainty	X			X			X	X	X

	BS	BH	DI	HP	HR	MC	OR	RC	SP
Scale-Number of Structures. • Fewer Structures Yield Lower Uncertainty				X	X				
Scale-Magnitude of Hydrologic Exchange/Flow Exchange (cfs) • Smaller Flow/Exchange Yields Smaller Structures and Lower Uncertainty			X		X				
Scale-Local Water Depth (feet) • Shallower Water Depths Yield Lower Uncertainty in Fill Quantity and Cost								X	

Legend:
BS – Bank Stabilization
BH – Barrier Island/Headland Restoration
DI – Diversion
HP – Structural Protection
HR – Hydrologic Restoration
MC – Marsh Creation
OR – Oyster Barrier Reef
RC – Ridge Restoration
SP – Shoreline Protection

Note: Length, Structure, and Hydrologic Exchange/Flow and uncertainty cutoffs vary between project types.

Table 13: Cost Uncertainty Factor Bounding and Calculated Ranges.

	Bounding Allowable Uncertainty Range	**Calculated Variation**
Bank Stabilization	10-80%	54-65%
Barrier Island/Headland	5-50%	8-16%
Diversions	10-80%	13-68%
Structural Protection	10-70%	30-57%
Hydrologic Restoration	10-80%	48-58%
Marsh Creation	5-30%	5-27%
Oyster Reef	10-80%	47-54%
Ridge Restoration	10-80%	37-72%
Shoreline Protection	5-50%	21-42%

2.5.4 Planning/Engineering and Design Duration Rationale

The estimated P/E&D project durations were developed based on a review of past projects and current design and construction practices. Durations are the expected length of time to complete either all P/E&D or construction activities and were estimated based on CPRA Engineering Division's prior project experience. P/E&D duration includes the time and efforts associated with obtaining landowner agreements, servitudes, environmental regulatory compliance permits, and contracting agreements. Durations were estimated based on the project size and complexity, and specific duration assumptions are discussed by project type in Section 3.0. Table 14 was developed to provide guidelines for estimating project durations by project type. Table 15 was developed for estimating Nonstructural Risk Reduction project durations based on the number of structures to be mitigated within a given project. Duration attributes are included in Attachment A5.

Table 14: Duration Ranges.

	P/E&D Duration Range (Years)	**Construction Duration Range (Years)**
Bank Stabilization	2-3	1-4
Barrier Island/Headland	3	3
Diversions	4-6	2-7
Structural Protection	3-4	1-10
Hydrologic Restoration	2-3	1-4
Marsh Creation	2-3	1-20
Oyster Reef	3	3
Ridge Restoration	2	2
Shoreline Protection	2-3	2-4

Table 15: Duration Ranges for Nonstructural Risk Reduction Projects.

	P/E&D Duration Range (Years)	**Construction Duration Range (Years)**
Nonstructural Risk Reduction	N/A	0-30 Structures: 1 31-200 Structures: 2 201-500 Structures: 3 501-1000 Structures: 4 1001-2000 Structures: 5 2001+ Structures: 7

2.5.5 Cost and Feasibility of Marsh Creation and Barrier Island/Headland Projects

The master plan is considering the implementation of a multitude of Marsh Creation and Barrier Island/Headland projects. The cost and feasibility of constructing these projects will likely vary depending on when the projects are implemented since sea levels are anticipated to continue rising. This section describes an approach to reflect this in the cost estimates and a new feasibility constraint for the 2017 Coastal Master Plan.

2.5.5.1 Approach for 2012 Coastal Master Plan

For the 2012 Coastal Master Plan, the effects of each project and cost of construction were based on implementation in year 1 of the 50-year planning period. When constructing alternatives, the Planning Tool would simply shift the effects of the project in time to account for engineering, design, and construction phases and delay due to implementing in later periods. It would assume the costs and sediment would remain the same in current dollars, despite the possible greater requirements in the future.

2.5.5.2 Approach for 2017 Coastal Master Plan

The 2017 Coastal Master Plan reflects higher potential costs and different sediment requirements to account for the time for engineering and design and for the implementation period when a project goes into the landscape (i.e., first, second, or third implementation periods). The 2017 Coastal Master Plan also introduces a feasibility screen when formulating an alternative so that resources are not allocated in the Planning Tool to an infeasible project (e.g., projects selected for the third implementation period whose construction duration is longer than the number of years in that period). This approach treats project increments separately. To do this, construction cost and sediment requirements were developed for implementation in periods 1, 2, and 3 for each environmental scenario. The approach applies to project types where cost is dependent on conditions at the time of implementation (i.e., Barrier Island/Headland and Marsh Creation projects).

2.5.5.3 Developing the Needed Data

As part of the project evaluation phase, the modeling team worked with the attributes team to generate a sediment requirement and wetland/barrier area for each environmental scenario and implementation period. The attributes team then used these sediment requirements to develop associated cost estimates for each project/scenario/implementation case. This resulted in nine potential costs resultant from all possible combinations of implementation period (three) and environmental scenario (three). If a project was selected by the Planning Tool for a given combination, the proper cost selection (of the nine possible choices) was used in the Planning Tool.

2.5.5.4 Dredge Mobilization Estimator

A detailed cost estimating sheet was developed to estimate hydraulic dredging costs for the Barrier Island/Headland and Marsh Creation project types. This effort was necessary to capture the myriad of factors that affect the cost of hydraulically dredging and placing material over sometimes great distances on a per-project basis.

Because many of the Barrier Island/Headland and Marsh Creation projects are composed of up to tens of thousands of acres of proposed restoration, the attributes team employed a system to subdivide each project into multi-part polygons with a maximum area of 2,000 acres per cell per polygon. The 2,000 acre cutoff point was arrived upon via analysis through the Draft Feasibility Report, Innovative Dredging Initiative (Arcadis, 2011). This allowed the analysis team to approach vast projects on a scale that is relatable to the scale found in previously constructed CPRA hydraulic fill projects.

For each 2,000 acre cell, aerial photography and Geographic Information System (GIS) software were used to determine the areas of dredge material placement and potential borrow sources. The dredge pipeline corridor was split into segments of pipeline to include subline, shoreline (land-based line or shallow water with firm bottom), and pontoon (floating line required behind the dredge). The pipeline was then further divided into segments that had to be in placed before dredging could begin and those sections that would require pickup when dredging is complete. Unit costs were estimated using values from recent dredging projects conducted by CPRA based on pumping distance, sediment type, dredge plant, and number of dredges assumed for each project. CPRA created unit cost relationships based on project bid data, which capture the effects that distance and sediment type have on unit cost. Results of this analysis are shown on Figure 4. Mobilization and demobilization costs, boosters, containment, bucket dredges, jack and bore, earth-moving equipment, and other necessary costs were estimated and included as well on a per-project basis. The sum of all 2,000 acre cells within a given project was then used to calculate the overall project construction cost.

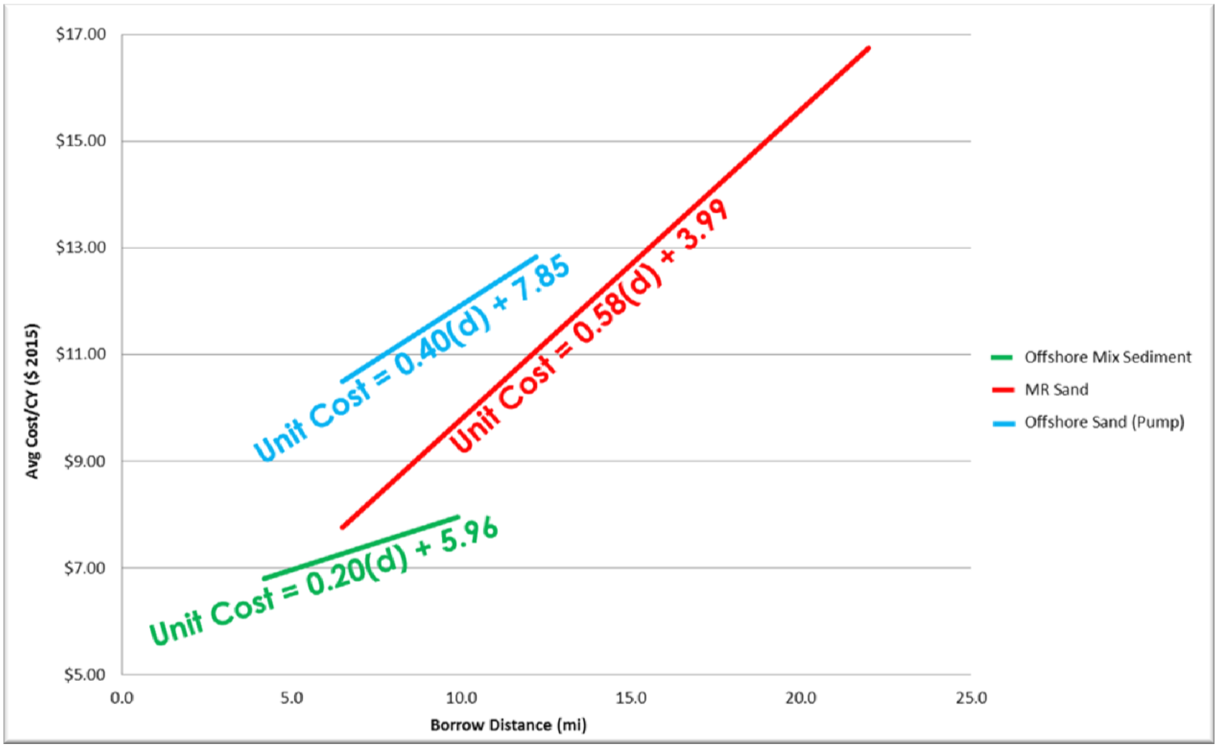

Figure 4: Pumping Cost versus Distance Pumped by Sediment Type.

2.5.6 Construction Elevation for Marsh Creation Projects

In the project level model runs, marsh creation projects were placed on the landscape to a fixed elevation relative to NAVD88 for all areas meeting a fill depth criterion explained in Section 3.5. This elevation was based on current construction practice. In later periods and more extreme environmental scenarios, especially in areas with high subsidence rates, the marsh built using these specifications was sometimes so low in the tidal frame that it did not endure following construction. An adjustment was made following the project level analysis to implement marsh creation projects by adjusting the elevation to account for sea level rise and subsidence. All alternatives model runs included these modified assumptions on initial construction elevation.

3.0 Project Attribute Assumptions for Each Project Type

The following sections present information about the principal project attribute assumptions for each project type. Tables of all project attributes can be found in Attachments A2, A3, A4, and A5.

3.1 Bank Stabilization (BS)

Bank Stabilization projects are defined as the onshore placement of earthen fill and vegetative plantings and are primarily used to reduce wave energies and maintain shorelines in open bays, lakes, and natural and artificial channels. Conceptual design templates and costs were developed for Bank Stabilization projects using recently designed projects. Large-scale project features and costs that significantly exceed the size of recently designed projects are based on scaling of these features.

The cost of a Bank Stabilization project is primarily influenced by the in-situ material properties, wave conditions, and geographic location. Vegetative plantings will be required during O&M cycles. The uncertainty in design, costs, and duration increases with project size.

3.1.1 Bank Stabilization Project Assumptions and Attributes

1. **Length:** Total length of the Bank Stabilization project.
2. **Crest Elevation:** Top of crown elevation of the Bank Stabilization project**.**
3. **Top Width:** Total width at top of Bank Stabilization project perpendicular to the project centerline.
4. **Base Width:** Total width at base of project perpendicular to the project centerline.
5. **Side Slope Water:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on water side of project.
6. **Side Slope Marsh:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on marsh side of project.
7. **Wave Attenuation:** Percent of wave energy deflected away/prevented from contact with the shoreline by the project. This value was calculated on a per-project basis using methodology found in the USACE Coastal Engineering Manual (2002).
8. **Armoring Type:** The type of armoring used to construct the bank stabilization and protect against erosion (articulated concrete block mat, riprap, or high performance turf reinforcement mat).
9. **Borrow Source:** The borrow area(s) required to construct the feature(s). Note: Bank Stabilization projects assumed an in-situ source (i.e., material immediately adjacent to project site).
10. **Volume:** Total dredge volume required for project. Note: Bank Stabilization projects assumed sediment constraints do not apply to in-situ material sources. Fill volume was calculated by multiplying the average cross sectional area by the length. The cross-sectional area was calculated using the template and the existing average elevation. Source volume was calculated by multiplying the fill volume by a loss factor based on historical data from similar projects constructed by CPRA.
11. **Existing Average Elevation:** Elevation of the existing ground calculated as an average for length of project based on the 2017 Coastal Master Plan Initial Conditions Digital Elevation Model (DEM).
12. **Estimated Construction Cost:** Total estimated cost associated with all aspects of the construction phase including a 20% contingency. Includes construction and construction management costs as well as the following bid items: mobilization and demobilization, earthen fill, vegetative plantings, and surveys.
13. **Estimated Operation and Maintenance Cost:** Includes O&M costs for annual activities as well as the following bid items: one lift, vegetative planting, and profile survey (TY5). This project type calculated specific O&M event quantities based on a 50-year project life. Those summed 50-year costs were annualized for the Planning Tool so that O&M costs could be calculated to represent actual project lifespan, should it be less than 50 years if the project is selected for a later Implementation Period.

Bank Stabilization Project Landscape Feature Assumptions (See Figure 5 in Section 4.0):

- Geometry:
    - A crown elevation of +4.0 feet NAVD88 (geoid 12a) to be maintained for the duration of the project.
    - A 20 foot crown width; 20:1 – water-side slopes /10:1 – marsh-side slopes.
    - Placement of material on shoreline edge.

Bank Stabilization Project Cost Assumptions:

- Access and flotation channels included.
- Using in-situ material placed by mechanical dredge.
- Vegetative plantings included in O&M cost to ensure that 30% of the area has vegetative coverage.

Bank Stabilization Project Duration Assumptions:

- Bank stabilization duration estimation accounted for the durations of activities typically associated with similar project types such as mobilization/demobilization of equipment, borrow area, preconstruction, magnetometer surveying, production rate of typical equipment such as mechanical bucket dredge/barges, earth-shaping equipment such as dozers, installation rate of armor type specific to each project, and project acceptance. See Table 14 for project duration ranges for Bank Stabilization projects.

3.2 Barrier Island/Headland Restoration (BH)

Barrier Island/Headland Restoration projects create and restore dune, beach, and back barrier marsh to restore or augment Louisiana's barrier islands and headlands and to provide additional storm surge attenuation. Barrier Island/Headland Restoration projects primarily rely on near-shore and/or offshore sediment sources to obtain the required borrow volume to construct the project features. The marsh fill unit cost is typically influenced by the type of material to be dredged, the dredging distance, payment method, and dredging experience. Mobilization and demobilization of construction equipment cost is influenced by the project size, borrow source, dredging distance, pipeline corridor, dredging equipment, dredging volume, manpower, and contractor risk. Projects along the Gulf of Mexico are typically at greater risk from storm effects and may require several demobilizations due to storm impacts. Larger dredging volumes may require several dredges, pipeline corridors, and borrow sources.

Due to the use of large offshore sediment sources, permitting of these borrow sources would require a longer period for permit review and approval and could lengthen the time to finalize the design and implement construction. Consequently, the uncertainty in design, costs, and duration increases with project size.

3.2.1 Barrier Island/Headland Project Assumptions and Attributes

1. **Length:** Total length of project.
2. **Base Width:** Total width at base of project perpendicular to the project centerline.
3. **Side Slope Water:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on the water side of project.
4. **Side Slope Marsh:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on the marsh side of project.
5. **Side Slope Beach:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on the water side of project.

6. **Borrow Source:** The borrow area(s) required to construct the feature(s). For further project development, the source of material should be optimized using material from shoals, relic channels, the Mississippi River, or other. A 500 foot buffer should be used near existing inland pipelines and a 1,500 foot buffer for offshore pipelines. Borrow sources were selected from those identified in the Report on Louisiana Surficial Sediment Distribution Maps Compilation and Sand/Sediment Volume Estimates (Larenas et al., 2015).
7. **Volume:** Total dredge volume required for project, including assumed loss factor.
8. **Beach Area:** Total area of beach created or nourished by project.
9. **Beach Elevation:** The beach crest elevation post construction.
10. **Beach Volume:** Design volume based on the 50-year barrier island design template (see geometry assumptions below).
11. **Dune Area:** Total area of dune created or nourished by project.
12. **Dune Elevation:** The dune crest elevation post-construction.
13. **Dune Volume:** Design volume based on the 50-year barrier island design template (see geometry assumptions below).
14. **Marsh Area:** Total area of marsh created or nourished on the bay side of the barrier island by project.
15. **Marsh Elevation:** Marsh elevation on seaward side of Barrier Island/Headland typical template after one year of settlement.
16. **Marsh Volume:** Total estimated volume of marsh fill material required to construct the project feature using one initial lift based on the target marsh fill elevation.
17. **D_{50}:** The 50th percentile diameter of the sediment to be used.
18. **Percent Sand in Eroding Profile:** Percentage of sand within the eroding profile.
19. **Estimated Construction Cost:** Total estimated cost associated with all aspects of the construction phase including a 20% contingency. Includes construction and construction management costs as well as the following bid items: mobilization and demobilization, settlement plates, beach fill, dune fill, marsh fill, earthen containment dikes, navigation aids, sand fencing, surveys, sea turtle relocation, and vegetative plantings.
20. **Estimated Operation and Maintenance Cost:** Includes O&M costs for annual activities and assumed to be 5% of the estimated construction cost (before contingency). O&M costs were assumed to include the following bid items: sand fencing replacement (TY5, TY15, TY25, TY35, and TY50), vegetative plantings (TY5, TY15, and TY25), containment dike gapping (TY1, TY3, and TY5), and profile surveys (TY5, TY15, TY25, TY35, and TY50). This project type calculated specific O&M event quantities based on a 50-year project life. Those summed 50-year costs were annualized for the Planning Tool so that O&M costs could be calculated to represent actual project lifespan, should it be less than 50 years if selected for a later implementation period.

Barrier Island/Headland Project Landscape Feature Assumptions (See Figures 6 and 7 in Section 4.0):

- Geometry**:** All geometric aspects of Barrier Island/Headland design were taken from the Barrier Island/Barrier Headland Restoration Design Template Development Technical Memorandum (CPRA, 2015d) created by Coastal Engineering Consultants on behalf of the CPRA Planning and Research Division.
    - **Barrier Island:** A beach and dune feature with sand fencing; a dune crest elevation of +9.0 feet NAVD88 (geoid 12a), a width of 100 feet, and a 30H: 1V slope; 1,500 foot marsh platform; target marsh fill elevation between +4.0 and +5.0 feet NAVD88 (geoid 12a) at TY0 for back barrier marsh platform.
    - **Headland:** A beach and dune feature with sand fencing; a dune crest elevation of +8.0 feet NAVD88 (geoid 12a), a width of 385 feet, and a 20H: 1V slope; beach dune at +6.0 feet NAVD88 (geoid 12a); 1,000 foot marsh platform; target marsh fill elevation

between +4.0 and +5.0 feet NAVD88 (geoid 12a) at TY0 for back barrier marsh platform.

Barrier Island/Headland Project Cost Assumptions:

- Borrow Source and Pipeline Corridor:
  - **Borrow Source Quantity:** Sufficient borrow source volume to build each conceptual candidate project was assumed through assignment of up to two borrow sources for each island within a project to draw from.
  - **Borrow Source Material Type:** Unit costs for marsh fill and beach/dune fill were adjusted accordingly based on source location and material type.
  - **Geographic Location:** Use of sediment sources outside the system (such as the Gulf of Mexico beyond the depth of closure) was maximized. The borrow source location could significantly impact the cost of the project. Therefore, a dredging implementation plan will be required to optimize preliminary project development features by further evaluation of the borrow source location(s), available sediment, dredging logistics, implementation, and environmental criteria. Details on available sediment by borrow source are included in Attachment A6.
  - **Dredge Types:** Depending on project location and scale, a number of 20 inch to 30 inch hydraulic cutter suction dredges were identified on a per-project basis.
  - **Pumping Distance:** The maximum distance from the proposed beach/dune fill area(s) to the borrow source(s) identified for each project. Pumping distance was calculated on a per-project basis as discussed in Section 2.5.5 and a requisite number of boosters were then identified, if needed.
  - **Pipeline Corridor:** The hydraulic dredging pipeline route required to deliver the sediment slurry from the borrow source to the beach/dune fill area(s). The pipeline corridor is required to be maintained throughout construction.
    - The amount of land-based pipe and marine-based pipe was calculated on a per-project basis as discussed in Section 2.5.5.
    - Marsh buggies will be utilized for pipeline outfall work in fill area(s).
- Beach/Dune/Marsh Fill Area(s):
  - Fill volumes for beach, dune, and marsh were determined via superimposing the 50-year design template over the 2017 Coastal Master Plan Initial Conditions DEM and evaluating the volume difference required using ArcGIS software. Fill volumes account for loss factors based on previously constructed projects by CPRA.
- Earthen Containment Dike:
  - Containment dikes placed along the perimeter of the proposed marsh fill cells and in the interior to create cells.
  - Constructed using marsh buggy backhoe and in-situ material.

Barrier Island/Headland Project Duration Assumptions:

- Barrier Island/Headland duration estimation accounted for the durations of activities typically associated with similar project types such as mobilization/demobilization of equipment, borrow area, preconstruction, magnetometer surveying, production rate of typical equipment such as hydraulic dredges, earthen containment dike construction, pipeline maintenance and construction, earth-shaping equipment such as dozers, installation rate of vegetative plantings, and project acceptance. See Table 14 for project duration ranges for Barrier Island/Headland projects.

3.3 Diversions (DI)

Diversion projects create new conveyance channels to divert freshwater and/or sediment from coastal Louisiana's rivers into adjacent basins to stabilize or restore salinity gradients, nourish existing wetlands, and support land building. Diversion projects are primarily located near the Mississippi River and rely on the nutrients and sediments present in freshwater flows to deliver benefits to the outfall area. Conceptual design templates were developed for candidate diversion projects with flows between 1,000 and 250,000 cfs. Costs are based on current studies such as those shown below. For candidate projects which do not have direct design reports or studies, unit costs derived and scaled from existing design reports were used. The cost of a diversion is affected by river stage, outfall stage, sediment data, dredging requirements, inflow and outfall channel geometry and lengths, infrastructure crossings, control structure type, and operational plan. The uncertainty in design, costs, and duration increases with diversion capacity.

1. **Mid-Barataria Sediment Diversion:** Value Engineering Report. 30% Basis of Design (HDR, 2014).
2. **Lower Breton Sound Sediment Diversion:** Final Site Selection Conceptual Design Engineering Report (URS, 2013).
3. **Design Analysis report:** Lower Barataria Sediment Diversion (Arcadis, 2014).
4. **Louisiana Coastal Area (LCA) Medium Diversion at White Ditch:** preconstruction Engineering and Design Location Analysis (USACE, 2013b).
5. **Mississippi River Diversion into Maurepas Swamp.** (URS, 2014).
6. **Convey Atchafalaya Flow to Terrebonne: Opinion of Probably Cost and Planning Report.** (Moffat & Nichol, 2015).

3.3.1 Diversion Project Assumptions and Attributes

1. **Invert Elevation:** Invert elevation of diversion intake control structure.
2. **Length:** Total length of project conveyance channel.
3. **Opening Geometry Area:** Horizontal distance of the inflow and outflow conveyance channels (if known). Description of the opening type of the intake structure using information from existing planning or feasibility-level studies. For those projects where existing information was not available, the dimensions and geometric shape of the control structure opening were calculated based on peak design flow and a scaling of similar projects in the area which have undergone some level of feasibility and/or design.
4. **Opening Geometry:** Description of the dimensions and geometric shape of control structure opening.
5. **Operational Regime:** Explanation of the operational strategies and triggers for each structure.
6. **Bulk Density:** Bulk density assumption of sediment transported.
7. **Discharge:** Peak design flow through the structure and channel (e.g., 2,000 cfs, 50,000 cfs, 250,000 cfs, or other).
8. **Diversion Channel Depth:** Average depth of diversion conveyance channel.
9. **Diversion Channel Length:** Length of diversion channel from the beginning of the diversion, including the diversion structure, to the outfall area.
10. **Diversion Channel Width:** Bottom width of the conveyance channel from the diversion structure to the outfall area.

11. **Sand, Silt, and Clay Concentration:** Sand, silt, and clay concentration of water during peak diversion flow.
12. **Sediment to Water Ratio:** Sediment capture efficiency.
13. **Estimated Construction Cost:** Total estimated cost associated with all aspects of the construction phase including a 20% contingency. Includes construction and construction management costs. It includes all costs pertaining to facilitation of the construction of the inflow/outflow channels, control structure, road and railroad bridges, pipeline relocations, and guide levees.
14. **Estimated Operation and Maintenance Cost:** Includes O&M costs for annual activities. The O&M costs are calculated as 25% of construction cost (before contingency).

Diversion Project Landscape Feature Assumptions:

- Geometry:
  - Inflow channel extending 500 to 1,000 feet from the Mississippi River bank; control structure located 1,000 feet from the Mississippi River bank.
  - A gated control structure appropriate for proposed flows. Gated box culverts were proposed for flows less than 15,000 cfs and tainter gates for flows greater than 15,000 cfs.
  - Extended outfall channel 500 to 1,000 feet into existing basin and/or beyond the existing basin side hurricane protection system.
  - Maximum invert range assumed to be -7.0 feet for diversions less than 15,000 cfs and -40 feet for diversions greater than 15,000 cfs. All elevations given in NAVD88 (geoid 12a).
  - Earthen guide levees on both sides of the channel; earthen levee tie-ins assumed for existing Mississippi River levee; a 12 foot crown width; 4H: 1V side slopes; Mississippi River levee crown elevation adjusted due to location and known data.
- Conveyance channels sized for maximum proposed flows and high velocities for potential sediment capture and delivery to outfall area.
- A 24 inch riprap scour protection layer for inflow and outflow channel underlain with non-woven geotextile.
- Articulated concrete block mats or riprap were used for channel armoring of the conveyance channel.
- A woven geotextile assumed for guide levee stability support due to soft soils.

Diversion Project Cost Assumptions:

- Mississippi River hydraulic dredging volumes assumed during construction.
- Excavation volumes based on required channel geometry.
- Earthen levee volumes based on guide levee geometry using hauled-in material.
- Riprap tonnage based on a 24 inch rock layer for 100% with 20% spillage.
- Diversions less than 15,000 cfs flow capacity assumed maximum velocity of roughly 3 feet per second for conveyance channel. Riprap channel armoring was only assumed for conveyance channel portions falling within leveed areas. Diversions less than 15,000 cfs flow capacity assume maximum invert of -7 feet for conveyance channel and riprap channel armoring only for conveyance channel portions falling within leveed areas.
- Diversions greater than 15,000 cfs flow assume maximum velocity of roughly 8 feet per second for conveyance channel and articulated concrete block channel armoring for entire conveyance channel. Diversions greater than 15,000 cfs flow assume maximum invert

of -40 feet for conveyance channel and riprap channel armoring only for conveyance channel portions falling within leveed areas.

- Highway and railroad bridge costs based on existing design reports referenced in Section 3.3.
- Pipeline and infrastructure crossings were determined from Strategic Online Resource Information System (http://www.sonris.com/). Costs were based on existing design reports referenced in Section 3.3.

Diversion Project Duration Assumptions:

- Diversion project duration assumptions were derived from recent completed design reports referenced in Section 3.3. Diversion project duration estimation accounted for the durations of activities typically associated with similar project types such as mobilization/demobilization of equipment, preconstruction, magnetometer surveying, production rate of typical equipment such as mechanical bucket dredge/barges, earth-shaping equipment such as dozers, installation rate of armor type specific to each project, and project acceptance. See Table 14 for project duration ranges for Diversion projects.

3.4 Hydrologic Restoration (HR)

Hydrologic Restoration projects are primarily used to convey freshwater to proposed outfall areas or to improve water circulation and reduce saltwater intrusion within a hydrologic system. Conceptual design templates were developed for candidate Hydrologic Restoration projects using past projects and proposals. Hydrologic Restoration features and cost are based on current design studies.

The cost of a Hydrologic Restoration project is influenced by the water stage, inflow and outfall channel dimensions and lengths, project scale, control structure type, and operational plan. Uncertainty in design, costs, and duration increases with project size.

3.4.1 Hydrologic Restoration Project Assumptions and Attributes

1. **Invert Elevation:** Invert elevation of the control structure.
2. **Opening Geometry Area:** Total area of the control structure opening.
3. **Opening Geometry:** Area of control structure opening.
4. **Operational Regime:** Explanation of the operational strategies and triggers for each structure.
5. **Crest Elevation:** Top of crown elevation.
6. **Top Width:** Total width at top of project perpendicular to the project centerline.
7. **Base Width:** Total width at base of project perpendicular to the project centerline.
8. **Side Slope Water:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on the water side of project.
9. **Side Slope Marsh:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on the marsh side of project.
10. **Wave Attenuation:** Percent of wave energy deflected away/prevented from contact with the shoreline by the project. This value was calculated on a per-project basis using methodology found in the USACE Coastal Engineering Manual (2002).
11. **Estimated Construction Cost:** Total estimated cost associated with all aspects of the construction phase including a 20% contingency. Includes construction and construction

management costs. It includes all costs pertaining to construction of the hydrologic restoration feature.

12. **Estimated Operation and Maintenance Costs:** Includes O&M costs for annual activities. The O&M costs were calculated as 5% of construction cost (before contingency).

Hydrologic Restoration Project Landscape Feature Assumptions:

- Excavated channels assumed for restoring hydraulic circulation.
- Hydrologic and salinity control structures assumed to consist of a rock dike, sluice gate, barge gate, or other structure. Project descriptions indicate which type of structure was assumed.

Hydrologic Restoration Project Cost Assumptions:

- Excavation volumes based on required channel geometry.
- Structure costs such as sluice gates were based on similar projects constructed by CPRA.
- Major element costs based on similar projects such as those described in the Calcasieu Ship Channel Salinity Control Measures Project (004.HR.06) Planning and Feasibility Decision Document (CPRA, 2015a).

Hydrologic Restoration Project Duration Assumptions:

- Hydrologic Restoration duration estimation accounted for the durations of activities typically associated with similar project types such as mobilization/demobilization of equipment, preconstruction, magnetometer surveying, production rate of typical equipment such as mechanical bucket dredge/barges, earth shaping equipment such as dozers, and project acceptance. See Table 14 for project duration ranges for Hydrologic Restoration projects.

3.5 Marsh Creation (MC)

Marsh Creation projects create wetlands in open water areas through placement of dredged material and vegetative plantings to restore landscape and ecosystem processes and provide additional storm surge attenuation. Marsh Creation projects have historically relied on near-shore or Mississippi River sediment sources to obtain the required borrow volume to construct the project features. The marsh fill unit cost is typically influenced by the type of material to be dredged, the dredging distance, payment method, fuel costs, and dredging experience. The mobilization and demobilization cost is influenced by the project size, borrow source, dredging distance, pipeline corridor, dredging equipment, dredging volume, manpower, and contractor risk. Projects near the Gulf of Mexico are typically more at risk from storm effects. Larger dredging volumes may require several dredges, pipeline corridors, and borrow sources.

Marsh Creation projects are constructed primarily in open water areas or areas with deteriorated marsh. Conceptual design templates were developed for candidate Marsh Creation projects using data from recently designed and constructed projects (see Figure 8 in Section 4.0). Uncertainty in design, costs, and duration increases with project size. Costs pertaining to oyster lease acquisition are not included.

3.5.1 Marsh Creation Project Assumptions and Attributes

1. **Borrow Source:** The borrow area(s) required to construct the feature(s). The borrow source is typically the nearest available and suitable borrow source by distance to the marsh area boundary. For further project development, the source of material was optimized using material from shoals, relic channels, the Mississippi River, or other. A 500

foot buffer should be used near existing inland pipelines and a 1,500 foot buffer for offshore pipelines. Borrow sources were selected from those identified in the Report on Louisiana Surficial Sediment Distribution Maps Compilation (Larenas et al., 2015).
2. **Marsh Area:** Total acres of marsh created or nourished by project.
3. **Volume:** The total estimated volume of marsh fill material required to construct the project feature using one initial lift based on the construction grade elevation, including assumed loss factor.
4. **Marsh Elevation:** Marsh elevation of consolidated fill material after one year of settlement.
5. **Bulk Density:** Bulk density of fill material to be placed.
6. **Sediment Size Distribution:** Particle size distribution of fill material.
7. **Estimated Construction Cost:** Total estimated cost associated with all aspects of the construction phase including a 20% contingency. Includes construction and construction management costs as well as the following bid items: mobilization and demobilization, marsh fill, earthen containment dikes, surveys, settlement plates, and vegetative plantings as discussed in Section 2.5.3.
8. **Estimated O&M Cost:** Includes O&M costs for annual activities. The O&M costs were calculated as 5% of construction cost (before contingency). It includes the following bid items: vegetative plantings (TY5, TY15, and TY25), containment dike gapping (TY1, TY3, and TY5), and profile surveys (TY5, TY15, TY25, TY35, and TY50). Those summed 50-year costs were annualized for the Planning Tool so that O&M costs could be calculated to represent actual project lifespan, should it be less than 50 years if selected for a later implementation period.

Marsh Creation Project Landscape Feature Assumptions (See Figure 8 in Section 4.0):

- Geometry:
  - **Marsh Creation Fill Area:** One initial marsh fill lift placed to the target marsh fill elevation at TY0 as derived from the regional settlement curves; maximum target marsh fill elevation of +3.2 feet NAVD88 (geoid 12a).
  - **Earthen Containment Dikes:** A crest width of 5 feet, side slopes of 4H: 1V; crown elevation of +4.5 feet NAVD88 (geoid 12a) assumed to be maintained during construction; constructed using in-situ material.

Marsh Creation Project Cost Assumptions:

- Borrow Source and Pipeline Corridor:
  - **Borrow Source Quantity:** Sufficient borrow source volume to build each conceptual candidate project was assumed through assignment of up to two borrow sources for each project increment within a project to draw from.
  - **Geographic Location:** Use of sediment sources outside the system (including in-situ, inland borrow sources, the Mississippi River, Atchafalaya River, and the Gulf of Mexico beyond the depth of closure) was maximized. The borrow source location could significantly impact the cost of the project. Therefore, a dredging implementation plan will be required to optimize preliminary project development features by further evaluation of the borrow source location(s), available sediment, dredging logistics, implementation, and environmental criteria. Details on available sediment by borrow source are included in Attachment A6.
  - **Dredge Types:** Depending on project location and scale, a number of 20 inch to 30 inch hydraulic cutter suction dredges were identified on a per-project basis.

  - **Pumping Distance:** The maximum distance from the proposed marsh fill area(s) to the borrow source(s) identified for each project. Pumping distance was calculated on a per-project basis as discussed in Section 2.5.5 and a requisite number of boosters were then identified, if needed.
  - **Pipeline Corridor:** The hydraulic dredging pipeline route required to deliver the sediment slurry from the borrow source to the beach/dune fill area(s). The pipeline corridor is required to be maintained throughout construction.
    - The amount of land-based pipe and marine-based pipe was calculated on a per-project basis as discussed in Section 2.5.5.
    - Marsh buggies will be utilized for pipeline outfall work in fill area(s).
- Marsh Creation Fill Area(s):
  - Fill volumes for marsh were determined via superimposing the design template over the 2017 Coastal Master Plan Initial Conditions DEM and evaluating the volume difference required using ArcGIS software.
    - All areas within the project polygon less than -2.5 feet NAVD88 (geoid 12a) were filled to 100% land; this new land was then built to a project-specific target elevation. Open water areas greater than -2.5 feet deep were not filled. Areas with elevations greater than the design elevation had no material placed on top.
  - Marsh acreages were provided by the Integrated Compartment Model based on surface footprint of filled areas.
- Earthen Containment Dike:
  - Containment dikes placed along the perimeter of the proposed marsh fill cells and in the interior to create cells.
  - Constructed using marsh buggy backhoe and in-situ material.

Marsh Creation Project Duration Assumptions:

- Marsh Creation duration estimation accounted for the durations of activities typically associated with similar project types such as mobilization/demobilization of equipment, borrow area, preconstruction, magnetometer surveying, production rate of typical equipment such as hydraulic dredges, earthen containment dike construction, pipeline maintenance and construction, earth-shaping equipment such as dozers, installation rate of vegetative plantings, and project acceptance. See Table 14 for project duration ranges for Marsh Creation projects.

3.6 Oyster Barrier Reef (OR)

Oyster Barrier Reef projects are defined as bioengineered oyster reefs to improve oyster cultivation and to reduce wave energies on shorelines in open bays and lakes. Conceptual design templates were developed for Oyster Barrier Reef projects using demonstration projects (see Figure 9 in Section 4.0). Smaller features and costs are based on recently designed and constructed projects. Larger features and costs are based on scaling of these features.

The cost of an Oyster Barrier Reef project is primarily influenced by the underlying soil conditions, construction access, local wave conditions, and geographic location. Additional material may be required during construction and for O&M as a result of weak soil conditions. Uncertainty in design, costs, and duration increases with project size.

3.6.1 Oyster Barrier Reef Project Assumptions and Attributes

1. **Length:** Length along the centerline of the project.
2. **Crest Elevation:** Top of reef crown elevation.
3. **Top Width:** Total width at top of project perpendicular to the project centerline.
4. **Base Width:** Total width at base of project perpendicular to the project centerline.
5. **Side Slope Water:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on the water side of project.
6. **Side Slope Marsh:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on the marsh side of project.
7. **Wave Attenuation:** Percent of wave energy deflected away/prevented from contact with the shoreline by the project. This value was calculated on a per-project basis using methodology found in the USACE Coastal Engineering Manual (2002).
8. **Estimated Construction Cost:** Total estimated cost associated with all aspects of the construction phase including a 20% contingency. Includes construction and construction management costs as well as the following bid items: mobilization and demobilization, access and flotation channels, woven geotextile fabric, oyster reef structure, surveys, and navigation aids.
9. **Estimated Operation and Maintenance Cost:** Includes annual O&M costs and is calculated at 25% of construction cost. It includes repair and profile surveys (TY5, TY15, TY25, TY35, and TY50).

Oyster Barrier Reef Project Landscape Feature Assumptions (See Figure 9 in Section 4.0):

- Oyster Barrier Reef Geometry:
  - Base width of approximately 60 feet; units to be placed up to +2.0 feet above mean high water elevation and assumed to be maintained for the duration of the project.
- Reef Material:
  - Concrete armor unit capable of resisting wave forces and supporting oysters. Armor units to be placed over non-woven geotextile and rock base.

Oyster Barrier Reef Project Cost Assumptions:

- For open water area, an average water bottom elevation of -2.0 to -5.0 feet NAVD88 (geoid 12a) was assumed for volume calculations. Additional volume was included to account for initial and long-term consolidation settlement.
- Flotation channels placed along barrier with a 40 foot bottom width; draft of at least -7.0 feet below mean low water.
- A geotextile/rock marine mattress placed under rock.
- A 50 foot fish access placed every 1,000 feet.
- Navigational aids placed every 1,000 feet.

Oyster Barrier Reef Project Duration Assumptions:

- Oyster Barrier Reef project duration estimation accounted for the durations of activities typically associated with similar project types such as mobilization/demobilization of equipment, preconstruction, magnetometer surveying, production rate of typical equipment such as installation barges, bed construction, and project acceptance. See Table 14 for project duration ranges for Oyster Barrier Reef projects.

3.7 Ridge Restoration (RC)

Ridge Restoration projects are intended to reestablish historical ridges through sediment placement and vegetative plantings to provide additional storm surge attenuation and restore forested maritime habitat. Conceptual design templates were developed for candidate Ridge Restoration projects using existing projects (see Figure 10 in Section 4.0).

The cost of a Ridge Restoration project is influenced by the project length, local water depth, in-situ soil conditions, and geographic location. The uncertainty in design, costs, and duration therefore increases with project size.

3.7.1 Ridge Restoration Project Assumptions and Attributes

1. **Length:** Length along the centerline of the feature.
2. **Crest Elevation:** Top of the ridge crown elevation.
3. **Top Width:** Total width at top of project perpendicular to the project centerline.
4. **Base Width:** Total width at base of project perpendicular to the project centerline.
5. **Side Slope Water:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on the water side of project.
6. **Side Slope Marsh:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on the marsh side of project.
7. **Ridge Area:** Total area of ridge created or nourished by project.
8. **Volume:** Total estimated volume of fill material required to construct the project feature using one initial lift to target elevation at TY0 including loss factor. Note: Ridge Restoration projects assumed an in-situ source (i.e., material immediately adjacent to project site).
9. **Existing Average Elevation:** Elevation of the existing ground calculated as an average for the length of project based on the 2017 Coastal Master Plan Initial Conditions DEM.
10. **Estimated Construction Cost:** Total estimated cost associated with all aspects of the construction phase including a 20% contingency. Includes construction and construction management cost. An average water bottom elevation of -1.5 feet NAVD88 (geoid 12a) for open water areas and marsh elevation measured at each location. It includes the following bid items: mobilization and demobilization, earthen fill, surveys, vegetative plantings. Reforestation and filling of low areas assumed for Chenier restoration projects.
11. **Estimated Operation and Maintenance Cost:** This cost includes O&M costs for a 50-year project lifespan and was calculated at 25% of the construction cost. It includes the following bid items: vegetative plantings (TY5, TY15, and TY25), earthen fill (TY5, TY15, and TY25), and profile surveys (TY5, TY15, TY25, TY35, and TY50) as well as events assumed for invasive species eradication.

Ridge Restoration Project Landscape Feature Assumptions (See Figure 10 in Section 4.0):

- Geometry:
  - A crest width of 50 feet, side slopes of 5H: 1V; crown elevation of +5.0 feet NAVD88 (geoid 12a) assumed to be maintained for the duration of the project; constructed using in-situ material.
- Plantings to ensure that 60% of the area has vegetative coverage.
- Chenier restoration projects include reforestation and filling of low areas.

Ridge Restoration Project Cost Assumptions:

- Costs are based on use of in-situ borrow material for the earthen ridge fill material using several lifts.

- O&M costs were estimated as 35% of the construction cost. They are assumed to include vegetative plantings to ensure that 20% of the area has vegetative coverage and invasive species are removed.

Ridge Restoration Project Duration Assumptions:

- Ridge Restoration project duration estimation accounted for the durations of activities typically associated with similar project types such as mobilization/demobilization of equipment, borrow area, preconstruction, magnetometer surveying, production rate of typical equipment such as bucket dredges, earthen ridge construction, earth-shaping equipment such as dozers, installation rate of vegetative plantings, and project acceptance. See Table 14 for project duration ranges for Ridge Restoration projects.

3.8 Shoreline Protection (SP)

Shoreline Protection projects are defined as near-shore segmented rock breakwaters and are primarily used to reduce wave energies on shorelines in open bays, lakes, sounds, and natural and manmade channels. Conceptual design templates were developed for Shoreline Protection projects using recent design methodology (see Figures 9 and 10 in Section 4.0). Shoreline Protection features and costs are based on recently constructed projects.

The cost of a Shoreline Protection project is primarily influenced by underlying soil conditions, construction access, local wave conditions, and geographic location. Additional material is usually required during the construction phase and during the O&M phase due to weak soil conditions. The uncertainty in design, costs, and duration increases with project size.

3.8.1 Shoreline Protection Project Assumptions and Attributes

1. **Length:** Length along the centerline of the rock breakwater feature.
2. **Crest Elevation:** Top of breakwater crown elevation.
3. **Top Width:** Total width at top of project perpendicular to the project centerline.
4. **Base Width:** Total width at base of project perpendicular to the project centerline.
5. **Side Slope Water:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on the water side of project.
6. **Side Slope Marsh:** The slope of the fill expressed as the ratio of horizontal distance to vertical distance on the marsh side of project.
7. **Wave Attenuation:** Percent of wave energy deflected away/prevented from contact with the shoreline by the project. This value was calculated on a per-project basis using methodology found in the USACE Coastal Engineering Manual (2002).
8. **Volume:** The total estimated volume of rock required to construct the project feature. An open water contour elevation of -1.0 feet NAVD88 (geoid 12a) was assumed for volume calculations. Additional volume was included to account for the initial and long-term consolidation settlement as well as for losses during construction. A 250 pound class rock was assumed for the breakwater.
9. **Estimated Construction Cost:** Total estimated cost associated with all aspects of the construction phase including a 20% contingency. Includes construction and construction management costs as well as the following bid items: mobilization and demobilization, access and flotation channels, woven geotextile fabric, 250 pound class rock, navigational aids, surveys, and settlement plates.
10. **Estimated Operation and Maintenance Cost:** Includes O&M costs computed for a 50-year project lifespan and then annualized. Rock fill maintenance events assumed at

Years TY5, TY15, and TY25. It includes the following bid items: access and flotation channels (TY5, TY15, and TY 25), rock (TY5, TY15, and TY25 for projects in southeast Louisiana; TY15 and TY25 for projects in southwest Louisiana), and profile surveys (TY5, TY15, TY25, TY35, and TY50).

Shoreline Protection Project Landscape Feature Assumptions (See Figures 11 and 12 in Section 4.0):

- Breakwater Geometry:
  - **Inland Breakwater:** crest width of 4 feet, side slopes of 3H: 1V; crown elevation of +3.5 feet NAVD88 (geoid 12a) assumed to be maintained for the duration of the project.
  - **Gulf Breakwater:** crest width of 16 feet, side slopes of 3H: 1V; crown elevation of +3.5 feet NAVD88 (geoid 12a) assumed to be maintained for the duration of the project.
- Breakwater Contour:
  - **Inland Breakwater:** constructed at the -1.0 foot NAVD88 (geoid 12a) contour based on calculated wave breaking depth.
  - **Gulf Breakwater:** constructed at the -1.2 foot NAVD88 (geoid 12a) contour to account for the formation of salients and tombolos. See Louisiana Shoreline Erosion Reduction Evaluation for Segmented Rock Breakwaters Technical Memorandum (Technical Memorandum; CPRA, 2014).
- A stone class of 250 pounds was utilized due to the mean stone diameters and the stone mass required to resist wave forces.

Shoreline Protection Project Cost Assumptions:

- Access channels placed every 15,000 feet with a 60 foot bottom width.
- Flotation channels placed along rock breakwater with an 80 foot bottom width; draft at -8.0 feet below mean low water.
- A woven geotextile placed under rock; 15% overage to account for overlapping.
- A 50 foot fish access placed every 1,000 feet.
- A rock-to-cubic yard ratio of 1.55 and a 10% rock spillage value (i.e., 10% of rock volume assumed to spill into adjacent areas) were used to determine the rock volume.
- Regional settlement percentages were developed for volume calculations and included in the O&M costs: volumes were determined for Years TY5 (50% of volume), TY15 (25% of volume in southeast Louisiana; 15% of volume in southwest Louisiana), and TY25 (10% of volume) and were based on constructed projects.
- Navigation aids placed every 1,000 feet.

Shoreline Protection Project Duration Assumptions:

- Shoreline Protection project duration estimation accounted for the durations of activities typically associated with similar project types such as mobilization/demobilization of equipment, preconstruction, magnetometer surveying, production rate of typical equipment such as installation barges, bed construction, and project acceptance. See Table 14 for project duration ranges for Shoreline Protection projects.

3.9 Structural Protection (HP)

Structural Protection projects evaluated in the 2017 Coastal Master Plan include one or more of the following basic components: earthen levee, concrete T-wall, and floodgates. Floodgates are typically constructed at road, railroad, and water body crossings. Additionally, pump stations are included in the interior of ring levees. Structural Protection projects are designed to reduce risk from storm surge damage associated with tropical events.

3.9.1 Structural Protection Project Assumptions and Attributes

Project attributes were developed for candidate Structural Protection projects using data from recently studied, designed, or constructed projects. Examples include the Morganza to the Gulf Post Authorization Change Report (2013a), the West Shore Lake Pontchartrain Hurricane and Storm Damage Risk Reduction Study Final Integrated Feasibility Report and Environmental Impact Statement (2014) and the Southwest Coastal Louisiana Revised Integrated Draft Feasibility Report and Environmental Impact Statement (2015). The cost of a Structural Protection project is primarily influenced by structure type, underlying soil conditions, construction access and available right of way, local surge and wave conditions, and geographic location. The uncertainty in design, costs, and duration increases with project size.

1. **Length:** Length along the centerline of the project. Locations of future levees were obtained using locations identified from previous reports and studies and identifying reasonable tie-in points to other existing Structural Protection projects and natural features. The length of the GIS centerline for each levee was used as the project length. The portion of the length which is earthen or wall is also reported.
2. **Predominant Structure Type:** The predominant structure type for all projects is earthen levee, but each project could be composed of one or more of the following structure types:
    a. **Earthen Levee***:* The principal component of each Structural Protection project is the earthen levee. The following attributes describe earthen levees:
        i. <u>Location</u>: Levees are designated as linear or ring levees. Ring levees typically do not cross water bodies, but will have associated internal drainage pumping unless the levee or drainage pumping is pre-existing. All levee alignments and locations are depicted in a GIS shapefile and were generally taken from the conceptual design report or modification plans for existing levees.
        ii. <u>Levee length</u>: The length of gates and T-walls was deducted from the overall project length to obtain the earthen levee portion.
        iii. <u>Top height</u>: Top elevations for earthen levees were obtained from the appropriate conceptual design report.
        iv. <u>Side slopes</u>: Typical side slopes used by USACE for levee design were assumed for all Structural Protection projects. These slopes varied by project. Front slopes ranged between 3H: 1V and 6H: 1V while back slopes ranged between 3H: 1V and 4H: 1V.
        v. <u>Top width</u>: A top width of 10 feet was used for all levees as is typical of USACE earthen levee projects to provide reasonable access after levee construction.
    b. **Concrete T-wall**: T-walls are typically located at points along the levee where there is a high potential for erosion or insufficient space for an earthen levees.

Although T-walls may be constructed at various locations along a levee, for the purposes of this analysis, it is assumed that T-walls would primarily be constructed at locations with limited right of way, locations of high erosion potential, junctions with water crossings, railroads, and major roadways (i.e., interstates and state highways). The following attributes were determined to describe T-walls:

i. Location: T-walls are located on either side of every river, railroad, interstate, and state highway crossings.
ii. Wall height: T-wall height was set to equal one to two feet higher than the adjoining earthen levee height due to structural superiority considerations.
iii. Wall thickness: Wall thickness varies by wall height and ranged between 1.5 and 4.5 feet.
iv. Wall length: It was assumed that T-walls would be constructed on each side of a crossing. T-walls are assumed to extend 200 feet on either side of a floodgate and 120 feet on each side of a railroad or major road crossing.
v. Base width and thickness: Base width and thickness varied by location and wall height. Base width ranged from 6 to 22.5 feet and base thickness ranged from 2 to 4.25 feet.

c. **Floodgate-Land** (Road, Railroad)*:* Floodgates are needed where levees cross a road or railroad. Crossings have been determined for each levee and gate attributes determined for each of these crossings. The following attributes were determined to describe floodgates:
   i. Gate type: Swing or roller gates were assumed at all railroad, interstate, and state highway crossings.
   ii. Location: Only major roads were assumed to have gates. Minor crossings would have earthen embankment crossings because of the large number of secondary road crossings (gates were not assigned to these other minor crossings because they typically have earthen embankment crossings).
   iii. Width: The width of each gate is based on GIS data and set to an opening size of either 30 or 40 feet to accommodate road/railroad traffic.
   iv. Gate height: All gate heights are assumed to be 1 to 2 feet higher than the adjoining levee height.
d. **Floodgate-Water** (Canal Surge Gate)*:* Floodgates are needed where levees intersect water bodies. Crossings have been determined for each levee and gate attributes determined for each of these crossings. The following attributes were determined to describe floodgates.
   i. Gate type: Either a sector gate, stop log gate, swing gate, barge gate, or lock was assumed. Gate type was dictated by the source study or report for the alignment when available.
   ii. Width: Gate width varied by gate type. Sector gate lengths ranged from 30 to 250 feet, barge gates ranged from 30 to 220 feet, stop log gates ranged from 20 to 30 feet, and swing gates ranged from 25 to 40 feet. The width of gates is determined by the anticipated traffic loads in the waterway and authorized dimensions of the channel.
   iii. Gate height: All gate heights were set to be 1 to 2 feet higher than the adjoining T-wall height.
e. **Pumps** (Internal to Ring Levees)*:*

   i. Pump type: Low-head, high-capacity, axial flow.
   ii. Number of pumps: Based on an estimate of pumping rate required for a 10-year, 12 hour storm.
   iii. Pump capacity: Pump capacity of the proposed pump station. Capacity varied by project and location based on the previous design or feasibility reports.
3. **Footprint:** Levee footprints reflect the right of way required for the levee and inspection/maintenance corridors flanking the levee multiplied by the overall length of the alignment.
4. **Existing Average Elevation:** Average surface elevation within project footprint (either ground surface in unprotected areas or existing crown height when project footprint overlays an existing project system as measured from the 2017 Coastal Master Plan Initial Conditions DEM.
5. **Design Elevation:** Target height of proposed protection features. The design elevation is a vertical reference used over time for the material placed in the hurricane risk reduction areas. Design elevations for earthen levees, T-walls, and gates were obtained from the appropriate conceptual design report.

Structural Protection Project Cost Assumptions:

- **Estimated Construction Cost:** Total estimated cost associated with all aspects of the construction phase including a 20% contingency. Includes construction costs for the levee plus any pump stations, T-walls, and/or floodgates as well as the following bid items: mobilization and demobilization, soil stabilization, hauling costs, fill and compaction, vegetative plantings and other restoration, construction access roads, armoring, T-wall and foundation construction, gate and tie-in feature costs, and other typical components.
  - Cost data for recent Louisiana projects were gathered from a variety of public agencies including local parishes and USACE. These data sets were then reviewed and evaluated and typical costs for the major components of the levee system were determined.
  - Calculations were based on a unit cost method of estimating or gross project costs based on the quantity of the major project component (e.g., 56 foot sector gate and tie-in features). The costs are estimated in 2015 dollars.
  - Fill volume was calculated using the length, height, and side slopes of each levee. In order to account for compaction of material, the calculated fill volume includes 25% overbuild to account for initial subsidence. This allowance is to account for the initial compaction of earth beneath the levee, not long-term subsidence. Note: A regional borrow approach was assumed for this effort. Levee fill unit costs vary on a per-project basis based on analysis of recently constructed projects and planning study estimates. Variation accounts for proximity to suitable borrow material. Specific locations for fill material were not identified as part of this effort.

- **Estimated Operation and Maintenance Cost:** Includes annual O&M costs to maintain the intended level of risk reduction and computed per project. It includes items such as routine inspections and reporting, vegetative plantings, gravel access road maintenance, mowing, varmint control, surveys, floodwall maintenance, pump repair, floodgate and dry dock maintenance, and other typical maintenance items.

- There is no assumption of maintenance lifts for any levee system other than the HSDRRS surrounding New Orleans and the Mississippi River and Tributaries (MR&T) levees along the Mississippi and Atchafalaya Rivers. This assumption was made because there is no guarantee of dedicated maintenance or improvement funds for lifts of systems (other than HSDRRS and MR&T) to account for combating relative sea level rise and maintain a consistent or improved level of risk reduction. Maintenance lifts to maintain present levels of risk reduction are considered local responsibility and therefore are not considered projects with dedicated costs in the master plan as are the ones discussed in Table 9.
- Scheduled HSDRRS and MR&T maintenance lifts were reflected over the 50-year modeling timeframe so that the present level of risk reduction was maintained over the entire 50 years in the face of increasing relative sea level rise rates. Maintenance was based on available USACE New Orleans District survey data. For model years 0 to 25, HSDRRS and MR&T levees were subsided and raised at model years 10 and 25 back to present day design elevations if they had subsided below the present design elevations. For model years 26 to 50, levees were subsided and re-raised to new design elevations from 2057 and 2063 based on provisional outlook study data compiled by USACE. MR&T levee elevations were taken as the higher value of the survey data or the USACE flowline design elevation because MR&T flowline design elevations will be maintained by USACE.

Structural Protection Project Duration Assumptions:

- Duration of Project Phases:
    - **P/E&D**: In addition to the planning and design of the Structural Protection project, this phase includes required tasks such as permitting and land and/or right-of-way acquisition. The estimated duration is a function of the total length of the project. Estimates of project duration were based on recently constructed projects and recently completed feasibility studies.
    - **Construction:** Construction duration was estimated to be a function of the length of the levee, complexity of design of gates, and number of gates. For very long levee projects, it is assumed that the size of the project will require multiple contractors working as a team to complete the project.

3.10 Nonstructural Risk Reduction (NS)

Given the array of candidate restoration and protection projects under consideration, project attributes were developed for each project type, including Nonstructural Risk Reduction projects, to provide a basis for evaluation in comparing individual projects and alternatives. Nonstructural Risk Reduction project costs are categorized by mitigation measures (i.e., floodproofing, elevation, and voluntary acquisition). The following narrative presents the primary components, assumptions (on size and cost development), unit cost ranges, and comparisons to unit costs developed for previous planning efforts for each Nonstructural Risk Reduction mitigation measure. These estimated costs were used in the Coastal Louisiana Risk Assessment (CLARA) model to provide a comparison of candidate Nonstructural Risk Reduction projects and to assemble groups of mitigation measures based on cost-effectiveness (as well as other criteria as described in Section 4.2.2 of Appendix E: Flood Risk and Resilience Program Framework). These cost estimates will also be beneficial in the Phase II Initial Assessment application for the Flood Risk and Resilience Program.

Nonstructural Risk Reduction project attributes for the 2017 Coastal Master Plan are as follows:

1. **Location:** Location is provided as latitude/longitude coordinates.
2. **Structure Classifications:** Structure classifications include residential (single family, small multi-family, large multi-family, and manufactured homes) and non-residential buildings.
3. **Project Types:** Nonstructural Risk Reduction project types applied include non-residential floodproofing, residential elevation, and residential acquisition.

3.10.1 Nonstructural Risk Reduction (Floodproofing, Elevation, Acquisition) Project Assumptions and Attributes

The 2017 Coastal Master Plan refines the Nonstructural Risk Reduction project attributes used in project modeling and analysis to provide additional details that will aid parishes and residents in evaluating and moving forward with potential flood mitigation projects.

Nonstructural Risk Reduction measures are voluntary in nature. The anticipated participation rates are a critical component of the evaluation process. While CPRA will make every effort to include as many property owners as possible, past experience with nonstructural projects indicates that the participation rate will be less than 100%. For the 2017 Coastal Master Plan, participation rates of 80% were used.

3.10.1.1 Elevation Projects:

Elevation project cost estimating involves several components:

- Design, engineering, structural feasibility analysis, and cost estimate preparation (10% of construction costs).
- Surveying and soil sampling.
- Permitting and title search.
- Inspections, elevation certificate, and other legal fees.
- Physical lifting and lowering of the structure onto new foundation (shoring and excavation).
- Demolition and disposal of old foundation.
- Construction of a new elevated foundation that complies with CPRA elevation requirements and/or local flood ordinance(s), whichever is higher.
- Construction of typical builder's grade new stairs, landings, and railings.
- Disconnection, elevation of, and reconnection of utilities.
- Basic landscape restoration.
- Debris disposal, site cleanup, and erosion control.
- Reasonable living expenses while temporarily relocated in general area during elevation construction.

The following subsection presents notes and assumptions associated with elevation cost estimating.

Notes and Assumptions for Elevation Costs

1. Unit cost estimates are developed using data and approaches provided in RSMeans® Building Construction Cost Data 2014, 72nd Annual Edition. A geographic adjustment factor is applied to adjust cost based on variable economic conditions in different types of areas (e.g., generally higher labor rates in/near urban areas associated with higher costs of living). A geographic adjustment factor (relevant to a mix of development types)

is applied to coastal Louisiana localities within one hour of urban areas. The geographic adjustment factor applies a multiplier of 0.88 to the overall projected construction cost to account for slightly more expensive labor/materials typical of the economies in more urbanized areas.

2. The estimates are also based on information in FEMA documents P-499 (2010) and P-550 (2009). The estimates assume that elevated structures fit within two rectangular modules, each of which is a minimum size of 28 feet wide by 24 feet long. Unusual structure floor plans will require more engineering and thus will have additional costs.
3. Structures are assumed to be in the 500 to 3,000 square foot range with an average size of 2,000 square feet.
4. It is assumed that existing structures are single family, ranch style, timber-framed homes built on shallow concrete foundations. The first floor is a concrete slab-on-grade that will be included in the lift. Notes: 1) Elevated structures over a crawl space are less expensive to lift, 2) the cost of raising a two-story structure is based on the first floor square footage, and 3) the estimates are not applicable for homes more than two stories in height.
5. It is assumed that elevated framing is built on new timber piles. The required depth of the piles is assumed to be 40 feet. For structures elevated more than 10 feet (per FEMA P-550), concrete grade beams and columns are required in combination with the timber piles to resist anticipated loads. For timber pile installation, the existing home will need to be lifted and temporarily moved. It is assumed that adequate space is available for moving the existing structure.
6. Two means of egress are provided, each with a 4 foot by 6 foot deck at the home entryway.
7. The new space under the elevated foundation must be open, consisting of piles, piers, and columns with knee or x-bracing.
8. Materials used solely for the elevation process are assumed to have a 75% salvage value.
9. These cost estimates are valid for elevations up to 14 feet above the existing grade elevation.
10. The estimates include basic landscape restoration, debris removal, and site cleanup, as well as removal and restoration of 300 square feet of concrete driveway ($1,250). This assumption pertains to the part of the driveway near the house where construction activity would take place. The cost for removing and restoring a driveway was derived from RSMeans® 2014 using a cost of $4.18 per square foot.
11. The structure is not located in a V Zone.
12. Several elements are not included in this cost estimate because they are contingency items allowable only where specific conditions exist. These include:
    a. Ramps/elevators for Americans with Disabilities Act access when an occupant of the structure has a permanent physical handicap and a physician's written certification.
    b. Historical/architectural considerations if required by the State Historic Preservation Office.
    c. Code upgrades other than elevation costs are subject to a case by case determination and approval, in writing, by CPRA if they are determined to be allowable.

Elevation Project Cost Estimates

Table 16 shows the residential elevation costs for an average-size structure (2,000 square feet) for different elevation height ranges.

Table 16: Elevation Cost estimates.

Component Description	Estimated Unit Cost (for a 2,000 square foot structure)
Cost to elevate over 3 feet up to 7 feet	$82.50/square foot
Cost to elevate over 7 feet up to 10 feet	$86.25/square foot
Cost to elevate over 10 feet up to 14 feet*	$103.75/square foot
Temporary occupant relocation costs during construction, reimbursable by CPRA	$3,500/structure
Estimated permitting cost	$2,175/structure
Inspection cost	$4,300/structure
Survey	$470
Title search	$300
Project administration and construction management	$10,000 flat fee (based on an estimated 200 hours of work)

*10 to 14 foot elevation above grade will require concrete columns; more than 14 foot elevation above grade will require voluntary acquisition.

Comparison to Other Elevation Cost Estimating Efforts

- USACE methodology results in costs that ranged from $59 per square foot to $80 per square foot (USACE, 2010).
- The 2012 Coastal Master Plan provided the following cost estimates for different elevation height ranges: a) over 3 feet up to 7 feet – $85 per square foot; b) over 7 feet up to 14 feet – $95 per square foot; and c) over 4 feet up to 18 feet – $100 per square foot (CPRA, 2012).
- Actual project results from Terrebonne Parish show costs that range from $55 per square foot to $106 per square foot.

3.10.1.2 Acquisition Projects

Acquisition project cost estimating involves three components: 1) an engineering estimate for the demolition; 2) an estimate of typical real estate transaction costs in Louisiana; and 3) a Fair Market Value (FMV) purchase price for the structure and land. The FMV is calculated using structure value data with no depreciation from the FEMA Hazus Structure Database. The Hazus data include a multiplier to bring it closer to FMV.

Notes and Assumptions for Demolition Costs

1. Estimates are based on unit cost data developed using data and approaches provided in RSMeans® Building Construction Cost Data 2014, 72nd Annual Edition.

2. Most residential acquisition projects will likely occur in rural areas of Louisiana. These areas have a geographic adjustment factor that uses a 0.81 multiplier to the projected demolition cost to account for less expensive labor/materials typical of the economies in such areas.
3. Given that the project areas are assumed to be rural, there will not be an additional cost for confined space (e.g., dense urban area) for demolition.
4. Demolition estimates include basic site restoration such as grading.
5. Demolition estimates do not include removal of hazardous materials.
6. Demolition estimates do not include removal of driveways, separate structures, or underground storage tanks/wells on the property.
7. The formulas provided are effective for 1,500 to 3,000 square foot homes.

To account for variations in housing types and degree of foundation removal, six options are presented below:

Option A:
- Ranch home built on concrete slab-on-grade with shallow concrete footings; includes complete removal of the foundation.
- The cost of demolition = $13.75 x floor area in square feet.

Option B:
- Ranch home built on concrete slab-on-grade, with shallow concrete footings. The cost estimate is applicable for demolition of either a partial concrete foundation or foundation walls consisting of masonry block.
- The ranch home is built over a crawl space without concrete slab. The cost estimate includes complete shallow concrete foundation removal.
- The cost of demolition = $12.00 x floor area in square feet.

Option C:
- Two-story home built on concrete slab-on-grade with shallow concrete footings; includes complete removal of the foundation. (The first floor and second floor areas are assumed to be equal.)
- The cost of demolition = $10.75 x floor area in square feet.

Option D:
- Multi-family, three-story home (small multi-family) constructed on concrete slab-on-grade with shallow concrete footings; includes complete foundation removal. (All floor areas are assumed to be equal.)
- The cost of demolition = $11.25 x floor area in square feet.

Option E:
- Multi-family, three-story apartment building (large multi-family) assumed to have a 4,000 square foot footprint and 12 units (1,000 square feet each). It is constructed on concrete slab-on-grade with shallow concrete footings; includes complete foundation removal. (All floor areas are assumed to be equal.)
- The cost of demolition = $6.67 x floor area in square feet.

Option F:
- Manufactured home constructed on concrete slab-on-grade.

- The cost of demolition = $8.83 x floor area in square feet.

Estimated Typical Real Estate Transaction Costs in Louisiana and Other Project Costs for Acquisition Projects

The following costs (Table 17) are typically required of real estate transactions (minus the underwriting and lending fee because the community is the buyer with grant funds), as well as other project costs (e.g., environmental assessment, project management).

Table 17: Acquisition Project Cost Estimate Components and Estimated Costs.

Component Description	Estimated Unit Cost
Appraisal	$425
Survey	$470
Title search (Note: Title insurance is optional unless required by a lending institution to provide protection against title claims post-purchase. A general estimate of the cost (not included in this estimate) is 0.05%.)	$300
Real estate transaction fees including attorney closing fee or settlement	$490 (Note: This is generally calculated at $2 per $1,000 of purchase price, plus $250)
Deed recordation/deed restriction costs	$90
Demolition – see Options A through F earlier in this section	-
Site restoration costs	Part of demolition costs
Environmental site assessment/asbestos inspection	$500
Abatement of asbestos/asbestos disposal (if necessary)	Add $3 to $5 per square foot to demolition costs
Lead-based paint removal/disposal (if necessary)	No additional cost beyond demolition
Project management fee for property owner coordination and management of the various acquisition components (e.g., appraisals, surveys, title searches, offers, contracts, closings). This is typically a flat fee per structure instead of percentage based.	$5,000 per structure (based on an estimated 100 hours of work)

The estimated FMV employs a multiplier on the non-depreciated values (NDV) for each structure classification from the FEMA Hazus Database. These values are based on RSMeans® replacement values and are periodically updated.

Based on the costs detailed above, the overall cost estimation for acquisition projects includes FMV (NDV times multiplier) plus demolition costs (using square footage costs earlier in this section) plus $7,275 in fixed costs (totaled from above), which does not include title insurance or asbestos abatement. Multi-family buildings are assumed to have one owner and therefore only one transaction cost for purchase.

Itemized costs vary greatly for real estate transactions and structure demolition. Typical real estate transactions (e.g., appraisals, surveys, title work) will differ from one region to another, and even by parish within the state, depending on available resources. Additional factors impacting these costs include structure size (square footage), age, location (rural vs. urban), price range, value, and lot size. As a result, it is difficult to assign a single value that will accurately portray the standard costs for an entire region. Best available estimates or averages for southern Louisiana are based on an analysis of multiple reliable resources, as noted below:

- Real Estate Fees – Louisiana closing costs for approximate costs for appraisals, title search, closing fees, surveys, and deed recordation (Bankrate, 2015). Additional references include Properties Closing Cost Explained (for appraisal and title search) (Bonano ND) and Charting your Course to Home Ownership (for closings costs such as survey and attorney fees) (LSU AgCenter, 2008).
- Asbestos Abatement and Disposal – the following sources were reviewed:
    - Houston Chronicle: "How to Determine Building Demolition Costs"
    - Ohio Environmental Protection Agency (2015) Fee Schedule (p. 7)
    - Asbestos Inspection and Testing Cost (Fixr, No Date)

- Lead-Based Paint Removal/Disposal – During demolition of an entire building, debris is considered a nonhazardous waste, even with lead-based paint, given the large ratio of the total amount of debris to the relatively small amount of lead-based paint:
    - Nevada Department of Conservation and Natural Resources, Division of Environmental Protection (2007) Lead-Based Paint Fact Sheet.
    - USEPA Landfill Lead-Based Paint Ruling.

Acquisition Project Cost Estimates by Structure Type

Table 18 shows the acquisition costs for different types of residential structures and a cost for vacant lots.

Table 18: Acquisition Project Cost Estimate Components.

Structure Type	Acquisition Multiplier	Total Cost* (NDV = Non-Depreciated Value)
Single Family	1.6	NDV x 1.6 + Demolition by square foot (Options A, B, or C) + $7,275
Small Multi-Family	1.7	NDV x 1.7 + Demolition by square foot (Option D) + $7,275
Large Multi-Family	1.8	NDV x 1.8 + Demolition by square foot (Option E) + $7,275
Vacant Lots	N/A	$72,500

*Assumes no asbestos removal needed.

Comparison to Other Acquisition Cost Estimating Efforts

USACE Estimates (USACE, 2010)

- FMV Multiplier for Residential is 1.18

(Note: It is assumed that the USACE multiplier accounts for fixed costs. This is subject to verification.)

3.10.1.3 Floodproofing Projects

Floodproofing encompasses two broad categories: dry and wet floodproofing. Due to its greater range of applicability, only dry floodproofing techniques will be employed for the purposes of cost estimating.

Dry floodproofing project cost estimating involves multiple components, as follows:

- Flood shields for all doors and windows at or below the flood protection level on exterior walls.
- Use of flood-resistant materials on interior of building up to the level where water is expected to accumulate due to seepage (spray-on cement for waterproofing in this estimate).
- Labor and materials to install floodproofing (excavation, mobilization, and asphalt).
- Code-required egress above flood elevation.
- Sewage backflow preventer.
- Internal drainage system for seepage.
- Survey and title search.
- Permitting and final inspection.
- Project administration and construction management.
- Engineering design costs (10% of construction costs).

The following subsection presents notes and assumptions associated with floodproofing cost estimating.

Notes and Assumptions

1. Estimating methods include USACE-provided costs and unit cost data developed using data and approaches provided in RSMeans® Building Construction Cost Data 2014, 72nd Annual Edition. Based on a coastal Louisiana locality within one hour of an urban area, floodproofing projects use a coast-wide geographic adjustment factor to apply a 0.88 multiplier to the projected construction costs to account for slightly more expensive labor/materials typical of the economies in more urbanized areas.
2. Estimates are for dry floodproofing non-residential structures and limited to floodproofing of three feet or less above-ground.
3. Cost estimates are developed using the perimeter footprint (not straight square footage).
4. Design requirements are based on FEMA P-259, part 5D (FEMA, 2012) and state building requirements presented in the American Society of Civil Engineers (ASCE) 24 (ASCE, 2014).
5. Dry floodproofing methods assume that the existing structure (wall, foundation, and slab) and sanitary system are capable of resisting the hydraulic forces imposed by the flood.
6. The existing structure’s wall material should be conducive to receiving floodproofing material. Acceptable examples include concrete masonry units, masonry, and brick.
7. The concrete slab-on-grade is water-tight.

8. The existing sanitary pipe system must add a backflow preventer. It is assumed that the existing plumbing will be capable of resisting the hydraulic flood forces.
9. The flood shields at the doorways (and windows less than three feet above-ground) will require manual activation and, once in place, will prohibit egress from the facility.
10. A means of egress above the design flood-protection elevation is required in case local code requires freeboard. For example, if a building is floodproofed to three feet, then egress is needed (e.g., window, door) above three feet, given that floodproofed doors will be blocked.
11. This floodproofing methodology is subject to impacts due to flood depth and duration and may only be effective for a few hours.
12. The floodproofing requirements are based on FEMA P-259 Part 5D (FEMA, 2012).
13. The building code requirements prescribed in ASCE 24-05 (requirement of the International Building Code 2012, adopted in Louisiana 1/1/2014) further limit dry floodproofing methods in Coastal A Zone and V Zone high-wave velocity areas (ASCE, 2006). Also, a method for egress is required above the flood elevation (ASCE, 2010). The required egress is previously mentioned in Item 10 in this list.
14. Estimates are based on actual quantities in lieu of a facility location to more closely represent the actual conditions of the facility.
15. Estimates do not include the following elements which may be required (case by case):
    - Landscaping restoration.
    - Walkway or driveway demolition and restoration.
    - Shoring for structure during installation.

Floodproofing Project Cost Estimates

Table 19 shows the dry floodproofing costs for a representative non-residential structure (6,000 square feet) and a summary cost per square foot in the last row. Table 19 provides a comparison of key costs with USACE estimated costs.

Table 19: Dry Floodproofing Cost Estimate Components and Cost per Square Foot.

Component Description	Estimated Unit Cost (for representative non-residential 6,000 square foot structure)
Code-required egress above the design flood protection elevation	$6,800/each
Backflow preventer (required to be regularly maintained, assumes plumbing can withstand the hydraulic forces)	$6,200/each
Flood shields (metal), maximum three feet wide (assumed), require adequate structure for fastening shield. Cost does not include bracket installation. (Note: any windows below the design flood protection elevation will also require a flood shield.)	$135/square foot of doors/windows below flood elevation

Component Description	Estimated Unit Cost (for representative non-residential 6,000 square foot structure)
Spray-on cement (1/8 inch thick); existing structure must be of cementitious material (i.e., not applicable for timber/metal siding)	$5.50/square foot
Asphalt (two coats below grade); see periphery drainage below for excavation requirements	$3/square foot
Periphery drainage, includes excavation (see notes below)	$30/linear foot
Sump pump and back-up power required for addressing seepage	Sump pump – $360; Back-up power (from gas-powered generator delivering 277/480 volts) – $8,260
Survey and title search	$770 (same as acquisition survey and title search cost)
Permitting and inspection	$6,475 (same as elevation permitting and inspection cost)
Project administration and construction management	$7,500 flat fee (based on an estimated 150 hours of work)
Engineering design costs	10% of construction costs
Floodproofing costs per square foot	$19.40/square foot

*Assumes structure requires no shoring, that excavated soils can be used for backfill, and that landscaping restoration and concrete walkway demolition/restoration is not needed.

Comparison to Other Floodproofing Cost Estimating Efforts

Table 20 provides key floodproofings costs compared to USACE-estimated costs.

Table 20: Key Floodproofing Costs versus USACE-Estimated Costs.

Required Components	USACE Cost (National Costs - USACE, 2010)	CPRA 2017 Coastal Master Plan Costs
Required egress	N/A	$6,800 each
Backflow valve	N/A	$6,200 each
Flood shield	$110 each	$135/square foot of door or window openings below flood elevation
Spray-on cement	$5/square foot	$5.50/square foot

Required Components	USACE Cost (National Costs - USACE, 2010)	CPRA 2017 Coastal Master Plan Costs
Asphalt	$2/square foot	$3/square foot
Periphery drainage	$35/square foot	$30/linear foot
Sump pump/back-up power	N/A	Sump pump – $360; Back-up power generator – $8,260

4.0 Typical Design Templates

The typical design templates used to develop project attributes including costs for restoration projects are provided on Figures 5-12. See Section 3 for descriptions of attributes by project type.

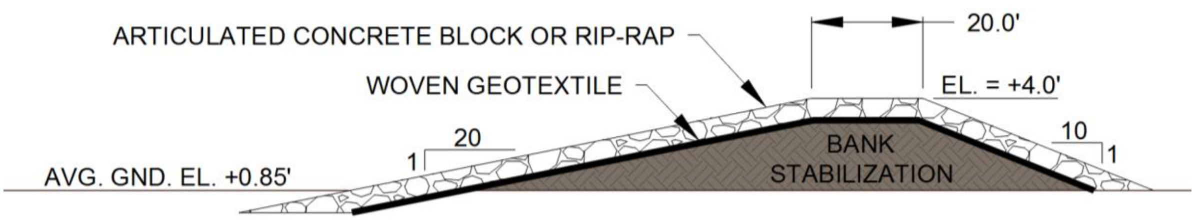

Figure 5: Bank Stabilization Design Template.

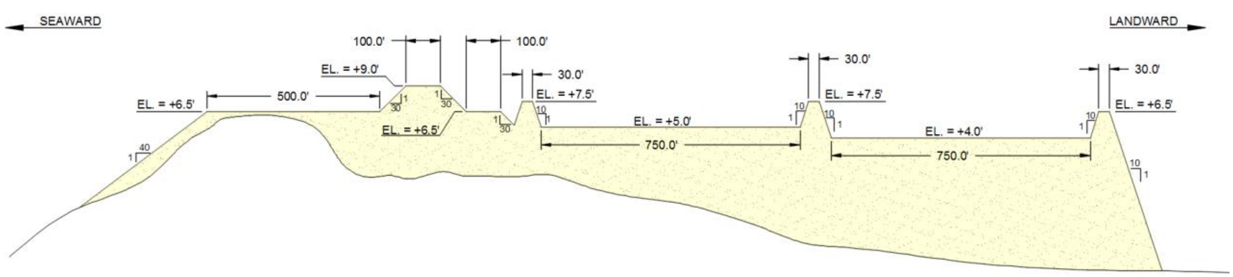

Figure 6: Barrier Island Conceptual Design Template.

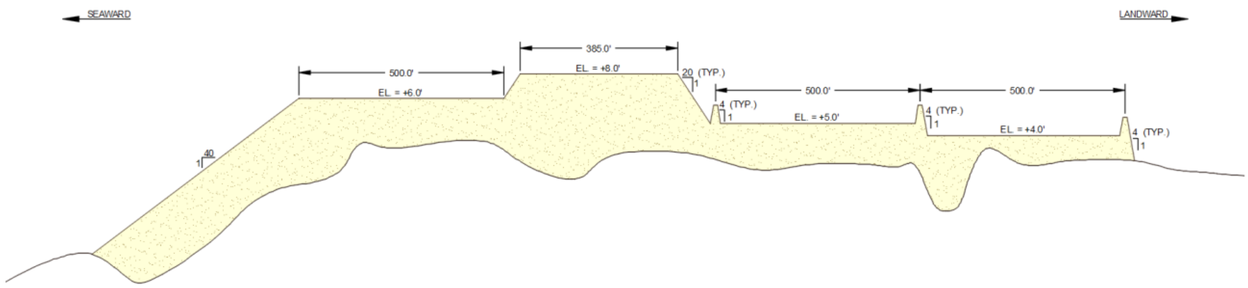

Figure 7: Barrier Headland Conceptual Design Template.

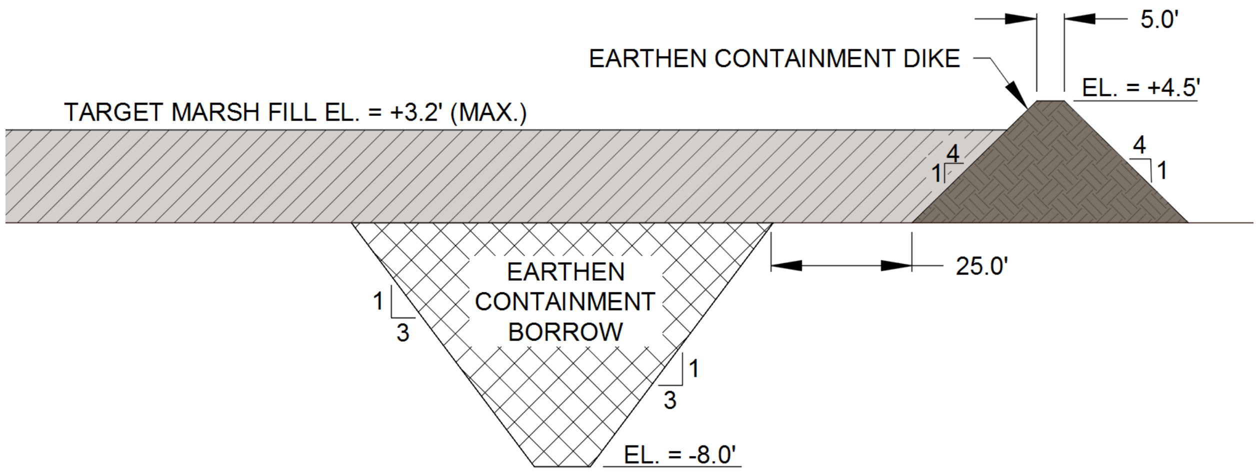

Figure 8: Marsh Creation Conceptual Design Template.

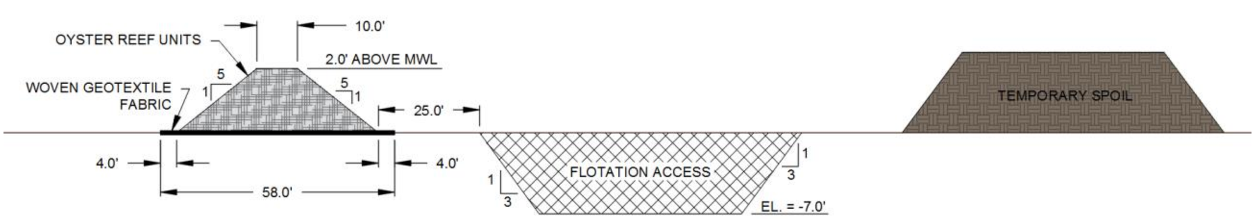

Figure 9: Oyster Reef Conceptual Design Template.

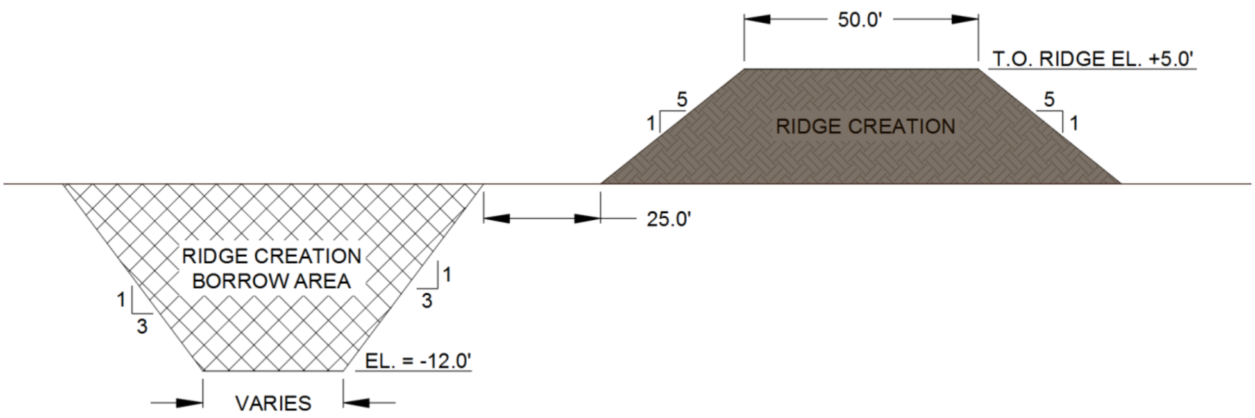

Figure 10: Ridge Restoration Conceptual Design Template.

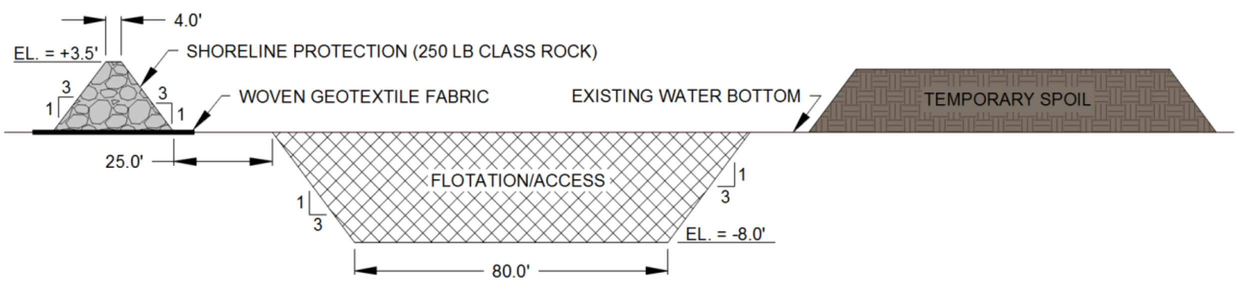

Figure 11: Shoreline Protection Conceptual Design Template (Inshore).

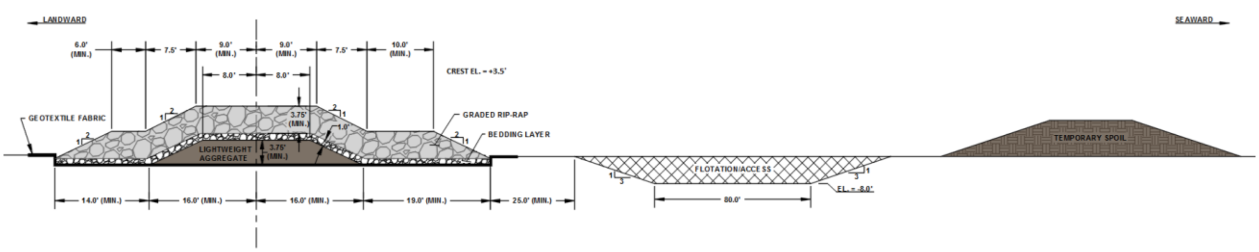

Figure 12: Shoreline Protection Conceptual Design Template (Gulf Shoreline).

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