CHENIER RONQUILLE BARRIER ISLAND RESTORATION PROJECT
ENVIRONMENTAL ASSESSMENT
Fed No. BA-76

Plaquemines Parish, Louisiana

U.S. Department of Commerce

National Oceanic and Atmospheric Administration

National Marine Fisheries Service

November 2013

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A CORRESPONDENCE AND SUPPORTING DOCUMENTATION

ACRONYMS

CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CPRA	Louisiana Coastal Protection and Restoration Authority
CWA	Clean Water Act
CWPPRA	Coastal Wetlands Planning, Protection and Restoration Act
CZMA	Coastal Zone Management Act
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
GEC	Gulf Engineers and Consultants
GMFMC	Gulf of Mexico Fisheries Management Council
HTRW	Hazardous, Toxic, and Radioactive Waste
LCWCRTF	Louisiana Coastal Wetlands Conservation and Restoration Task Force
LDEQ	Louisiana Department of Environmental Quality
LDWF	Louisiana Department of Wildlife and Fisheries
NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum 88
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration, U.S. Department of Commerce
NRCS	Natural Resources Conservation Service, U.S. Department of Agriculture
NRHP	National Register of Historic Places
PEIS	Programmatic Environmental Impact Statement
SAV	Submerged aquatic vegetation
SHPO	State Historic Preservation Office
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service, U.S. Department of Interior
USGS	U.S. Geological Survey, U.S. Department of Interior
WCRA	Wetlands Conservation and Restoration Authority
WVA	Wetland Value Assessment

UNITS OF MEASURE

ft	feet
mm	millimeter; 1mm = 0.39 inches

INTRODUCTION

The proposed project (**Chenier Ronquille Barrier Island Restoration Project, BA-76**) is authorized under the Coastal Wetlands, Planning, Protection and Restoration Act (CWPPRA) of 1990 (16 United States Code [U.S.C.] §777c, 3951-3956), which stipulates that five federal agencies and the State of Louisiana jointly develop and implement a plan to reduce the loss of coastal wetlands in Louisiana (16 U.S.C. §3952 (b) (2)). Other federal agencies that make up the CWPPRA Task Force are the U.S. Army Corps of Engineers (USACE); the U.S. Fish and Wildlife Service (USFWS), Department of the Interior; the Natural Resources Conservation Service (NRCS), Department of Agriculture; and the U.S. Environmental Protection Agency (EPA). The CWPPRA Task Force selected this project through a publicly vetted process for engineering and design (Louisiana Coastal Wetlands Conservation and Restoration Task Force [LCWCRTF] 2009).

As the federal sponsor for the project, the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) is responsible for project oversight, including National Environmental Policy Act (NEPA) compliance, as required under the CWPPRA program guidelines. Through their responsibilities under Sections 401 and 404 of the Clean Water Act, the US Army Corps of Engineers reviewed the preferred alternative prior to issuing a permit for project construction. This project received a permit for construction of the preferred alternative on November 7, 2012. NOAA, with the Louisiana Coastal Protection and Restoration Authority (CPRA), the non-federal local project sponsor and cost-share partner, is providing funding through CWPPRA to rebuild approximately 274 acres of marsh and 137 acres of dune/beach using dredged materials.

This EA complies with the NEPA of 1969 and Council on Environmental Quality (CEQ) regulations for implementation of NEPA (Title 40 *Code of Federal Regulations* [CFR] Parts 1500 through 1508 [CEQ 1992]).

For background, note that the CWPPRA Task Force and the Louisiana Coastal Wetlands Conservation and Restoration Task Force (LCWCRTF) prepared a Programmatic Environmental Impact Statement (PEIS) (LCWCRTF 1993) that included information on this type of project (barrier islands). In addition, a Final Programmatic EIS prepared by the USACE as part of the Louisiana Coastal Area Ecosystem Restoration Study (USACE 2004) also includes barrier islands in their evaluation of restoration actions. This document includes background information on the goals of the CWPPRA program and coastal protection and restoration in Louisiana. While the project proposed here is consistent with the goals mentioned in these two programmatic EIS documents, the purpose and need, affected environment, and analysis of alternatives for potential impacts for the Chenier Ronquille proposed project are completely contained in this document and not tiered from these two EIS's..

This EA specifically evaluates the impacts on the human environment associated with the proposed action and alternatives. This EA provides the required analysis to determine whether the proposed action and alternatives are likely to result in substantial impacts to the human environment. Only short-term adverse impacts are anticipated related to construction and are considered minor and reversible. This conclusion is based on a review of relevant literature, site-specific data, and project-specific engineering reports related to biological, physical, and cultural resources. The natural resource benefits anticipated from implementing the preferred alternative would include creation and restoration of saline marsh, dune, and associated barrier island habitats within the proposed project area. The increase in both quality and acreage of fisheries habitat would be expected to have long-term beneficial impacts on the local economy. This EA provides information on measures that would be taken to avoid and minimize potential adverse impacts to existing resources, such as threatened and endangered species.

Project Location
The proposed project is located in Plaquemines Parish, Louisiana roughly 47 miles southeast of New Orleans and 8 miles east of Grand Isle, Louisiana (Figure 1). The proposed project area encompasses approximately 400 acres of saline marsh and shallow open water (2007 survey in Louisiana Office of Coastal Restoration and Protection 2011). Four offshore borrow areas have been identified for dredging sediments.

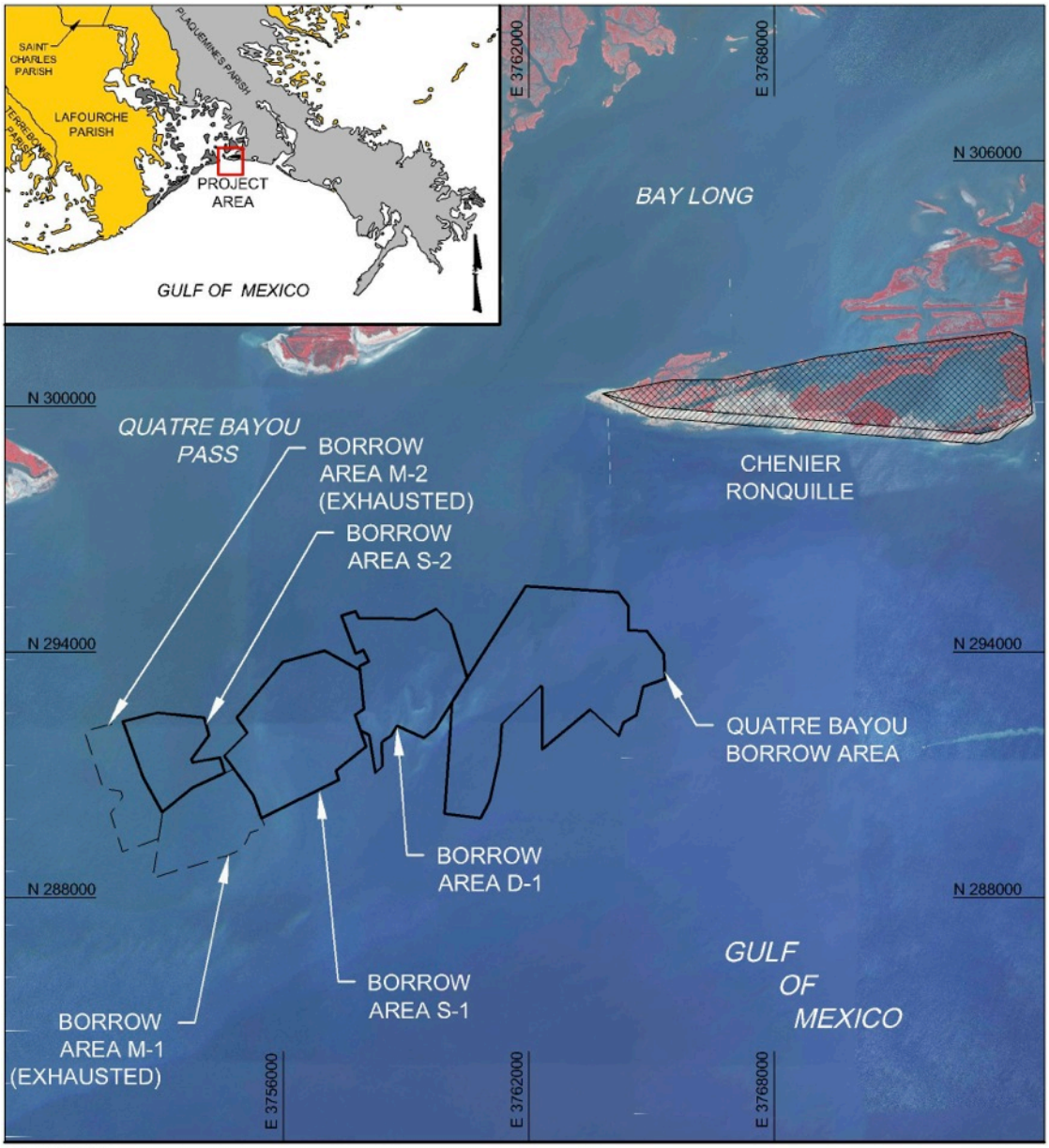
The proposed project area lies in Barataria Basin along the shoreline of the Chenier Ronquille Mapping Unit of Region 2 of the Coast 2050 Restoration Plan (LCWCRTF and Wetlands Conservation and Restoration Authority [WCRA] 1998, 1999). This Mapping Unit is 51,200 acres extending from lakes Washington and Grand Ecaille to the Gulf of Mexico.

CWPPRA Project Selection Process
The project was authorized for engineering and design (Phase 1) on the 19th CWPPRA annual Priority Project List. The CWPPRA project selection process takes several months to complete, involves extensive public involvement and review by federal and state agencies, and narrows the field of potential projects down to approximately four a year that are approved to enter the formal engineering and design process. As a result of this process, the field of available alternatives under consideration for a project generally includes those alternatives that would meet project goals developed during the engineering and design process and that take place within the general proposed project area.

During the engineering and design process, a CWPPRA project is subjected to layers of public, academic, and interagency review to ensure that effective projects move forward for design and ultimate construction. The project selection process begins around February of each year, when a series of Regional Planning Teams convene across the coast to solicit project nominations from the public, State, and federal agencies, as well as members of industry and academia. The meetings are publicized via public notices, and all members of the public are invited to attend. Every nominated project contains conceptual project features, approximate construction costs, and anticipated benefits to wetland resources. The nominated projects are screened and pared down to 20 nominees at a public voting meeting. Each federal agency represented in the CWPPRA program, the State, and each coastal parish participates in voting.

Interagency and academic working groups then evaluate the conceptual project features for cost and associated wetland benefits for feasibility and appropriateness to addressing the local land loss. The 20 nominee projects are then voted on by the program's federal agencies and the State to obtain a list of the 10 top-ranking projects to continue through the process. These candidate projects undergo several months of further design and interagency evaluation to determine whether the proposed project features are feasible, the anticipated benefits are likely, and the project costs fall within the funding constraints of the program. Certain project features are typically discounted during this preliminary design phase based on concerns about inferior performance, adverse impacts, technical infeasibility, or unreasonable costs. In the first months of each calendar year, the candidate projects are publicly presented and voted on by the program agencies to be funded for Phase 1 analysis, which includes the activities necessary to complete engineering and design, permitting, land rights, and environmental compliance before the project moves to construction.

FIGURE 1. GENERAL LOCATION OF PROPOSED PROJECT AND BORROW AREAS



LEGEND:

PROJECT AREA - BEACH RESTORATION
PROJECT AREA - MARSH RESTORATION

NOTES:

1. COORDINATES ARE IN FEET BASED ON LOUISIANA STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF AERIAL PHOTOGRAPH: OCTOBER 2005.

0 2000 4000
GRAPHIC SCALE IN FT

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Public Participation:
Coordination with state resource agencies, federal resource agencies, and local government was conducted throughout project development. The draft Environmental Assessment (EA) was available for public review and comment at the Plaquemines Parish Public Library in Belle Chasse, Louisiana, and at the NOAA website http://www.habitat.noaa.gov/pdf/chenier_ronquille_ba_76_draft_environmental_assessment.pdf. Notice of the draft EA availability was published in the Advocate (State newspaper) and the Times-Picayune (local newspaper) as shown in Appendix A. No public comments were received on the draft EA. Agency comments, which can be found in Appendix A have been addressed and included in this final EA.

Environmental Setting
The proposed project is located on the Plaquemines shoreline that evolved from the Mississippi River Delta cycle. Naturally, river deltas develop and then degrade on a time scale in the 100s to 1000s of years. Coastal processes rework delta sediments and form barrier islands and headlands along the Gulf of Mexico, like the proposed project area. The Barataria Basin shoreline and associated barrier islands are degrading as evidenced by numerous breaches and island overwashes. Increased eustatic sea-level rise, diminished sediment supply, repeated storm events, construction of canals and navigation channels, and high rates of subsidence compromise the Barataria Basin integrity (Boesch and others 1994). The project area (near sea level) is frequently inundated with several feet (ft) of gulf water during hurricanes and tropical storms.

Barrier islands have a low topography where minor elevation changes, such as from +2.0 to 0.0 ft, result in habitat conversion. The elevation and location (bay or ocean side) largely determine habitat type. Much of the previously existing marsh, beach, and dune of the proposed project area have been converted to open water. The Chenier Ronquille Mapping Unit has been saline marsh since 1949 (LCWCRTF and WCRA 1999). High rates of subsidence (2.1 to 3.5 ft/century), wind erosion, canal dredging and altered hydrology are historic causes of land loss (LCWCRTF and WCRA 1999) that continue to convert land to open water in these units.

Purpose and Need
Purpose
The purpose of this proposed project is to support the coastal restoration objectives of CWPPRA by re-establishing the Gulf of Mexico shoreline and associated marshes in the approximately 400-acre project area using offshore sediment. The project goal is to "reestablish and maintain the functional barrier island ecosystem of Chenier Ronquille for fish and wildlife habitat by restoring and creating shoreline, dune and back-barrier marsh acreage (Thompson and others 2011)." Specific objectives are:

- Prevent island breaching over the 20-year project life.
- Provide an intertidal marsh platform with tidal exchange by the fourth year after construction.
- Maintain dune crest elevation of greater than +4 ft NAVD 20 years after construction.
- Maintain a dune elevation of greater than +5 ft NAVD following the first 10-year storm event.
- Maintain 50% of the year-after-construction subaerial acreage throughout the 20-year project life.
- Maintain the shoreline seaward of the pre-construction shoreline 20 years after construction.

Need for Action
The need for the proposed action is directly related to the rapidly degrading environmental conditions at the proposed project site and the necessity to re-establish the structural integrity and enhance barrier island habitat value by establishing approximately 274 acres of marsh and 137 acres of dune/beach that will assist in slowing the losses in the immediate vicinity. Aerial photo series from 1998 to 2010 shows

the change from intact to overwashed shoreline of the project area (Thompson and others 2011). A healthy coastal marsh provides rearing habitat for shellfish and finfish; furnishes habitat for waterfowl, wading birds, small mammals, and numerous amphibians and reptiles; protects interior lands from storm surges; helps maintain water quality; and provides other services. Louisiana's coastal wetlands are essential to sustain renewable fisheries resources integral to the local, state, and national economies. Of the 1.3 billion pounds of fisheries landings reported for the Gulf Coast in 2007, more than 71% were caught in Louisiana (NOAA 2009). Marshes provide nursery, foraging, and spawning habitat for numerous marine and estuarine species of commercial and recreational importance. Maintaining coastal shorelines and marshes also helps protect the habitat, infrastructure, and communities inland by reducing storm surge.

NEPA Requirements and the Scope of the NEPA Analysis

This EA discloses information on and analyzes the direct, indirect, and cumulative impacts on the human environment likely to result from the Chenier Ronquille Barrier Island Restoration Project proposed action and the alternatives. The need for this EA is to inform the decision of whether or not to fund and authorize this project, including the proposed action and alternatives, and to determine whether the proposed restoration of Chenier Ronquille has the potential for significant impacts to the human environment.

PROPOSED ACTION AND ALTERNATIVES

The No-Action Alternative

NEPA refers to the no-action alternative as the continuation of baseline conditions without implementation of the proposed action. Evaluation of the no-action alternative is required by CEQ regulations. Under this alternative, no steps would be taken to restore the Chenier Ronquille barrier island habitat.

Build Alternatives

To meet project goals and objectives, all build alternatives involve creation of a beach and dune and were designed based on results of geotechnical studies, coastal process assessments, and topographic, bathymetric, and magnetometer surveys (Thomson and others 2011). Build alternatives were simulated in SBEACH models to determine changes to potential dune construction options under historic storm events situations (Thompson and others 2011). All build alternatives include the same marsh elevation, borrow areas, access areas, plantings, and containment dike construction, as stated below. Marsh construction would be to a +2.5 ft NAVD88 for all build alternatives, because settlement analysis indicated this would provide the optimum number of years above mean high water and is similar to the marsh elevation used for similar successful projects (Thompson and others 2011 Appendix D).

Containment dikes would be necessary for all build alternatives to retain placed sediments. The amount of containment and their placement differs for build alternatives. The average containment dike profile would include a +5 ft NAVD elevation, a crest width of 10 ft, and side slopes 1V: 4H. Containment dikes are expected to degrade through natural erosion from waves. Dikes would be gapped after settlement of marsh fill materials, if necessary, to allow hydrologic connection should the expected erosion or settlement not occur.

All build alternatives include dune cross-sections designed to maintain a minimum of +5 ft NAVD88 dune height after a 10-year storm event (Thompson and others 2011). Sand fencing (fencing to capture sand that is naturally transported by wind) would be erected on the constructed dune to capture naturally windblown sand and passively build or maintain the dune feature. Sand fencing would be inspected annually and replaced as necessary over the 20-year project life on all build alternatives. The effects of

this sand fence maintenance are considered throughout this analysis. The construction of the sand fence is of limited duration using equipment that has little lasting impact on the project area.

Plantings would be similar for all build alternatives. After a period of settlement and salinity stabilization of placed materials, native intertidal and dune habitat species would be planted in phased events over the first 3 years. Plantings would help establish the plant community, and foster retention of placed sediments. Marsh plantings would likely be smooth cordgrass and black mangrove (NMFS 2009). Dune species would likely be bitter panicum. Other possible dune species include seaoats, roseau cane, marshhay cordgrass, gulf cordgrass, matrimony vine or wax myrtle. Seeding with rye grass is an option depending on timing of construction to maintain placed soils and encourage local vegetation establishment (NMFS 2009).

Additionally, pre- and post-construction monitoring would be a component of all build alternatives. Monitoring would potentially consist of: access to the island via small vessels and equipment, use of individually operated equipment (topography, bathymetry, and geotechnical equipment) that would not cause more than a temporary disturbance in marsh vegetation, and use of transects and other monitoring means to assess primary and secondary production (such as above-ground biomass harvest using quadrats and drop samples for nekton/epifauna with associated soil cores). Monitoring by qualified staff would also include site visits of the project area to determine the need for post-construction activities such as: breaching of containment dikes for access by coastal living marine resources (dike gapping), additional vegetative planting, and sand fence replacement or repair. Monitoring would be in short intervals before construction and at periodic intervals post-construction. The borrow site areas may be surveyed (back-filling, dissolved oxygen) in areas where the borrow will create a localized depression in the sea floor. Other means of monitoring, such as aerial photography, may be utilized as well.

Figures 2 through 7 show the plan views of six build alternatives, while Table 1 summarizes some key points of each alternative. Cross-sections of the build alternatives are available in Thompson and others (2011).

TABLE 1. SUMMARY OF BUILD ALTERNATIVE DETAILS

Alternative	Fill Volume (cubic yards)		Dune Height (ft)	Dune Width (ft)	Construction Footprint (acres above 0 NAVD)
	Beach	Marsh			
1	1,830,000	1,380,000	+8	270	437
2	1,830,000	940,000	+8	270	381
3	1,830,000	590,000	+6	270	311
4	1,840,000	940,000	+6	445	394
5	1,310,000	1,380,000	+8	150	411
6	1,310,000	1,020,000	+8	150	350

- Alternative 1 provides the largest construction footprint and volume of any alternative.

- Alternative 2 was developed to compare the cost and performance impacts of relocating the primary dike further south to avoid the Columbia Gulf pipeline but using the same access channel as in Alternative 1.

- Alternative 3 can highlight the possible range of performance and costs. The beach volume is 1,830,000 cubic yards while the marsh fill volume has decreased to 590,000 cubic yards, the lowest marsh volume in any alternative. This is the smallest footprint of the six build alternatives.

- Alternative 4 was designed to compare the +6 ft, NAVD and +8 ft, NAVD construction dune crest elevation options.

- Alternative 5 was designed to pair the smallest beach template with the largest marsh template. Alternative 5 also allows the comparison of the effect of a smaller beach on project performance. Since Alternatives 1 and 5 have the same backing marsh, the effect of the beach fill can be directly compared.

- Alternative 6 was designed to provide the lowest overall cost alternative that could still meet the project goals and objectives. Alternative 6 comprises the smallest beach template and the second smallest marsh template of the build alternatives.

Alternatives Considered but Eliminated

Through the CWPPRA process, it was determined that restoration of the shoreline and back-barrier saline marsh is the appropriate approach to meet the project goals and objectives for the project area. During the CWPPRA planning process, several alternative restoration techniques were considered but eliminated from further evaluation including the use of riverine sediment diversions and construction of shoreline armoring and protection; these restoration approaches would not meet fundamental project goals of restoring and creating coastal habitats within project life timeframes and funding constraints. Comprehensive engineering and design efforts focus on project alternatives that are considered technically feasible and cost effective.

During the design phase, the six build alternatives were assessed for short and long term attainment of the project objectives. Through various engineering assessments and computer-aided modeling, it was determined that Alternatives 2, 3 and 4 did not meet one or more of the critical project objectives (Thompson and others, 2011). Alternatives 2, 3, and 4 were considered but eliminated because these alternatives did not meet the purpose and need for the action. The investment in the dune height and acreage would reduce overwash and increase dune longevity, but experience has shown that it is the back marsh that provides the platform for island roll-over and migration, and the marsh platform widths under Alternatives 2, 3, and 4 were too low. Additionally, their lower marsh acreage restored would not offset as much marsh acreage that would be adversely impacted in the near term as would Alternatives 1, 5, and 6. Consequently, Alternatives 2, 3 and 4 were eliminated from detailed evaluation.

Alternatives Considered in Detail

The No-Action Alternative, Alternative 1, Alternative 5, and Alternative 6 will be assessed in detail through the Environmental Consequences portion of this EA. Alternative 5 has been identified as the preferred build alternative, given the balance between dune height, marsh acreage, environmental consequences, and cost.

Borrow Sources

Coarse-grained sediments such as sand are critical to restoration of barrier shorelines. Sources of suitable borrow for beach and dune construction are limited due to the geological setting (Kulp and others 2005) and have been identified and characterized through previous surveys for geotechnical appropriateness for dune and marsh building (Galliano and van Beek 1973; USACE 2004 Appendix D, Chapter 7; CPE 2004). The Chenier Ronquille project proposes to use previously identified sediment borrow areas (Coastal Planning and Engineering (CPE) 2004). The borrow areas to be used for all build alternatives are located approximately 2 miles southwest of the proposed project area (Figure 1). Areas S-1, S-2, D-1, and Quatre Bayou may be used for the build alternatives. These areas contain approximately 3.9 million

cubic yards and 6.5 million cubic yards fill material suitable for beach and marsh creation, respectively (CPE 2004, 2005, 2008, 2011 as cited in Thompson and others 2011).

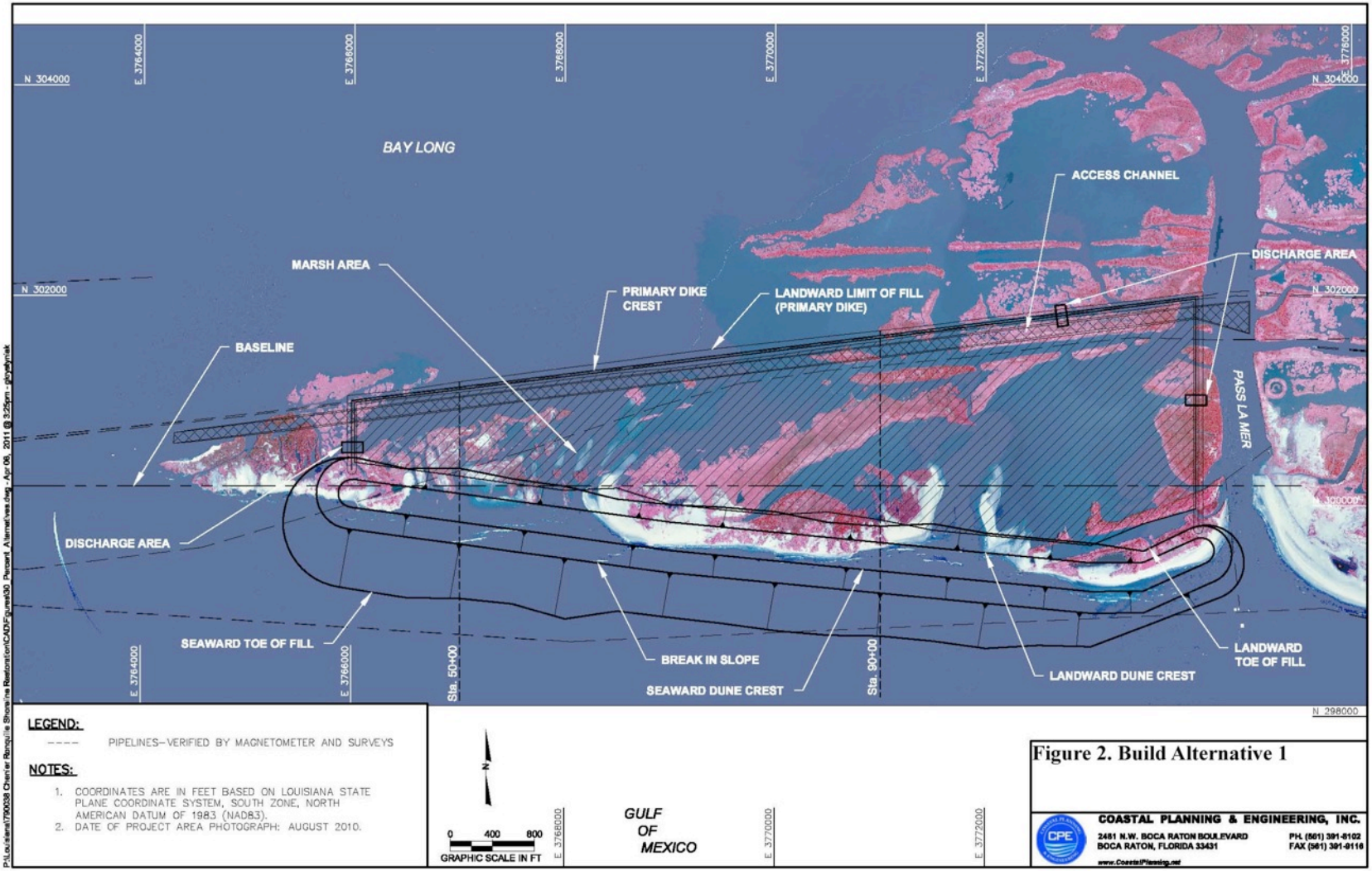


Figure 2. Build Alternative 1

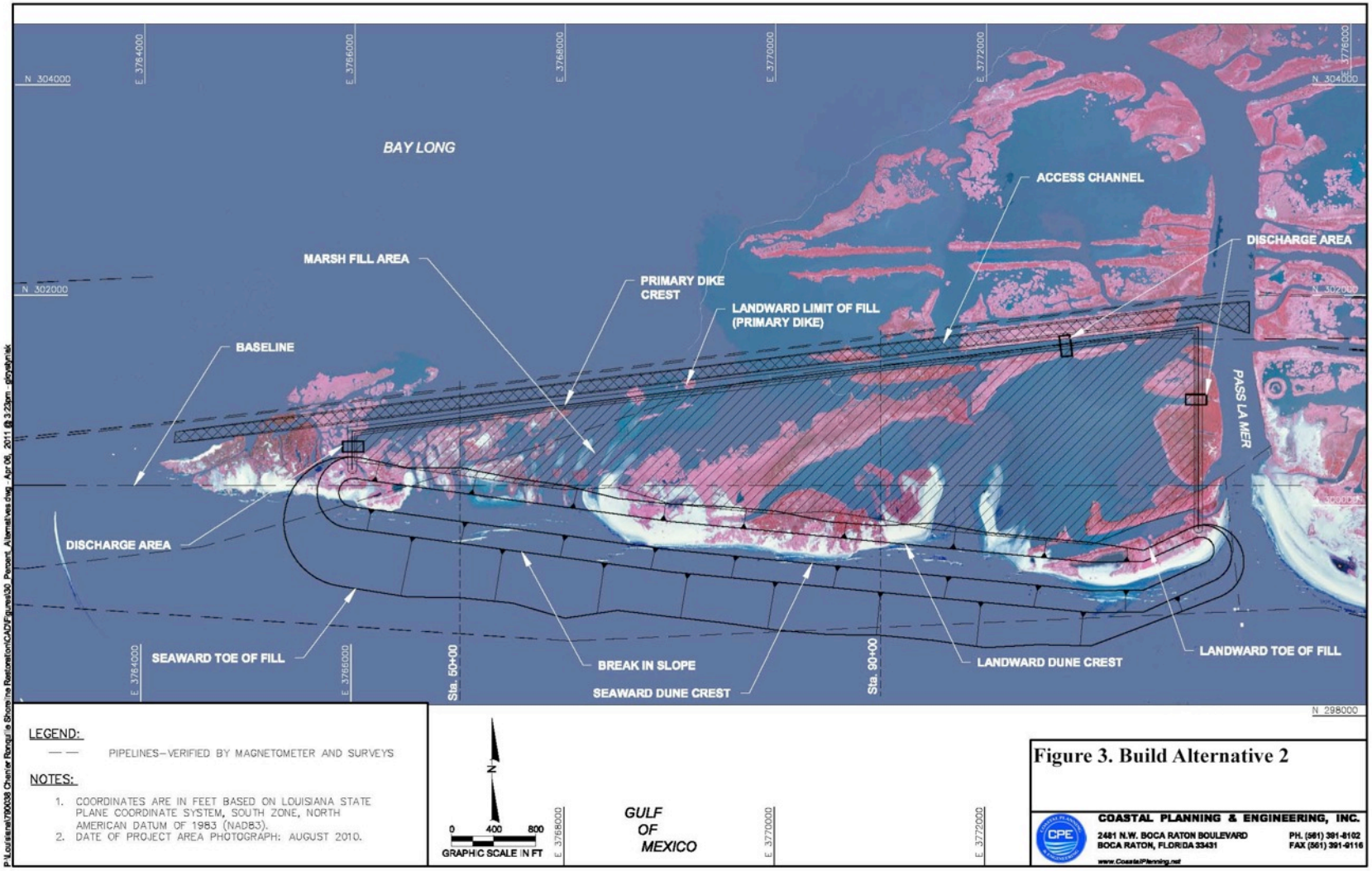


Figure 3. Build Alternative 2

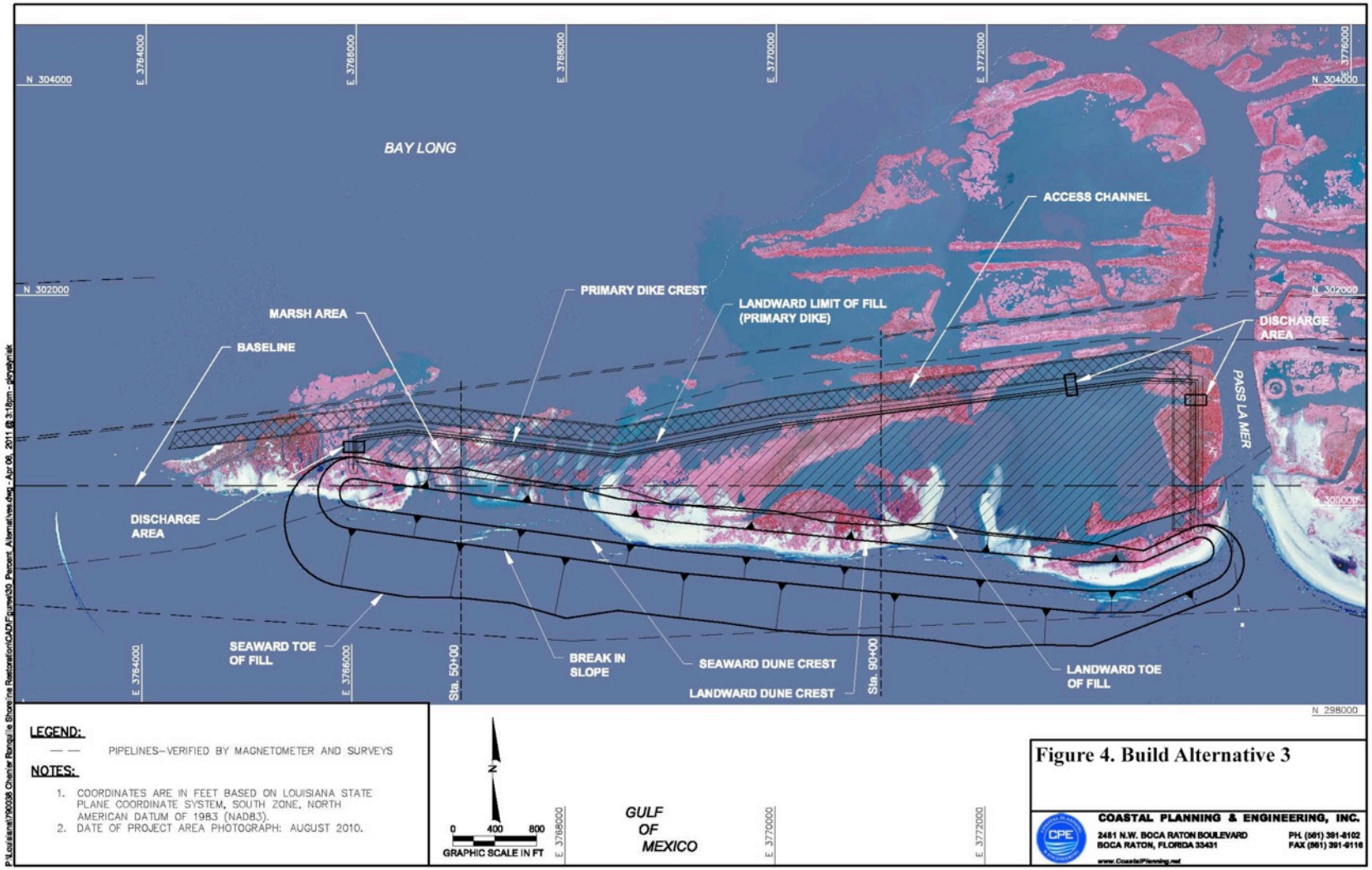
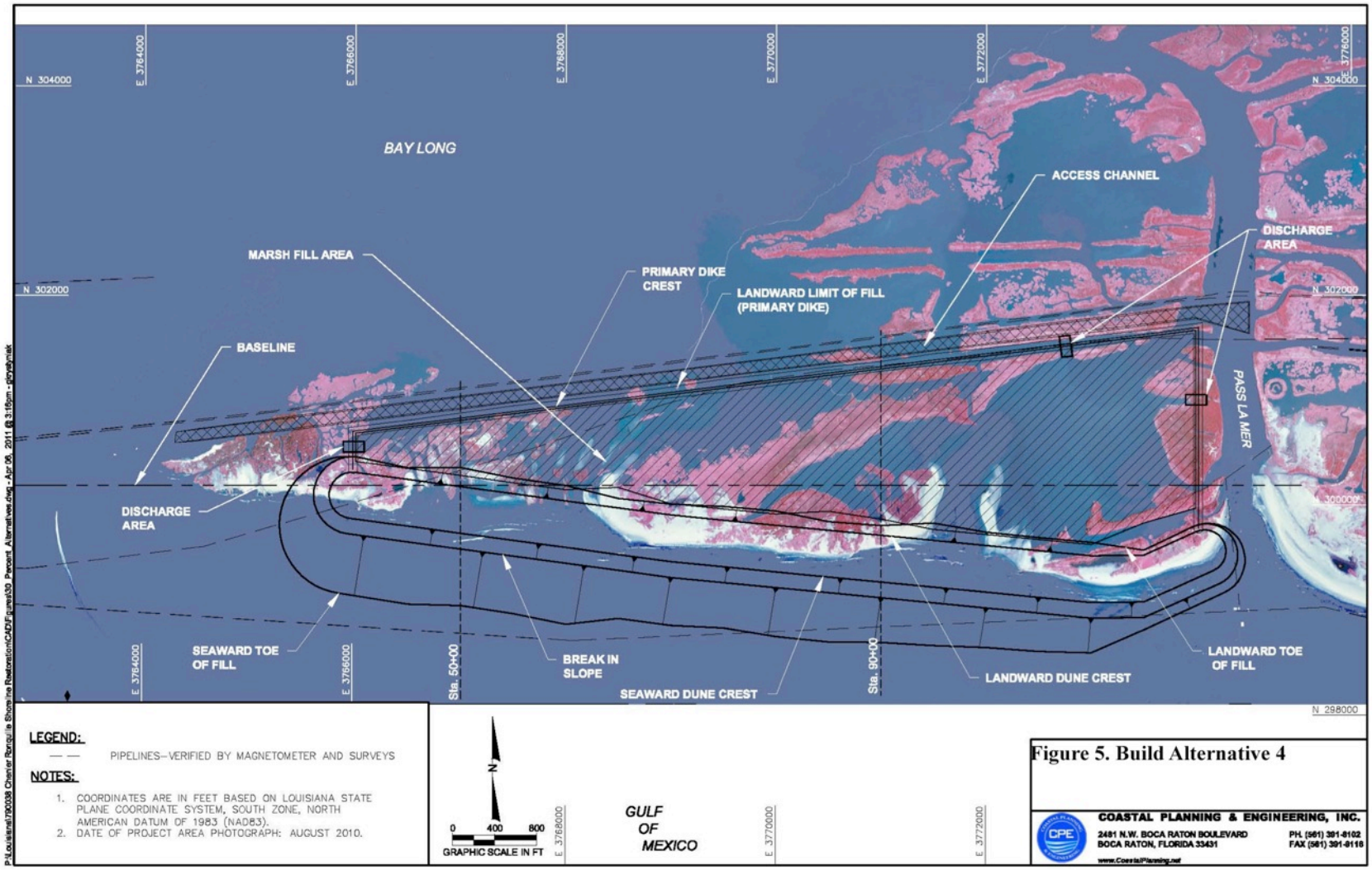


Figure 4. Build Alternative 3



LEGEND:

— — PIPELINES–VERIFIED BY MAGNETOMETER AND SURVEYS

NOTES:

1. COORDINATES ARE IN FEET BASED ON LOUISIANA STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF PROJECT AREA PHOTOGRAPH: AUGUST 2010.

Figure 5. Build Alternative 4

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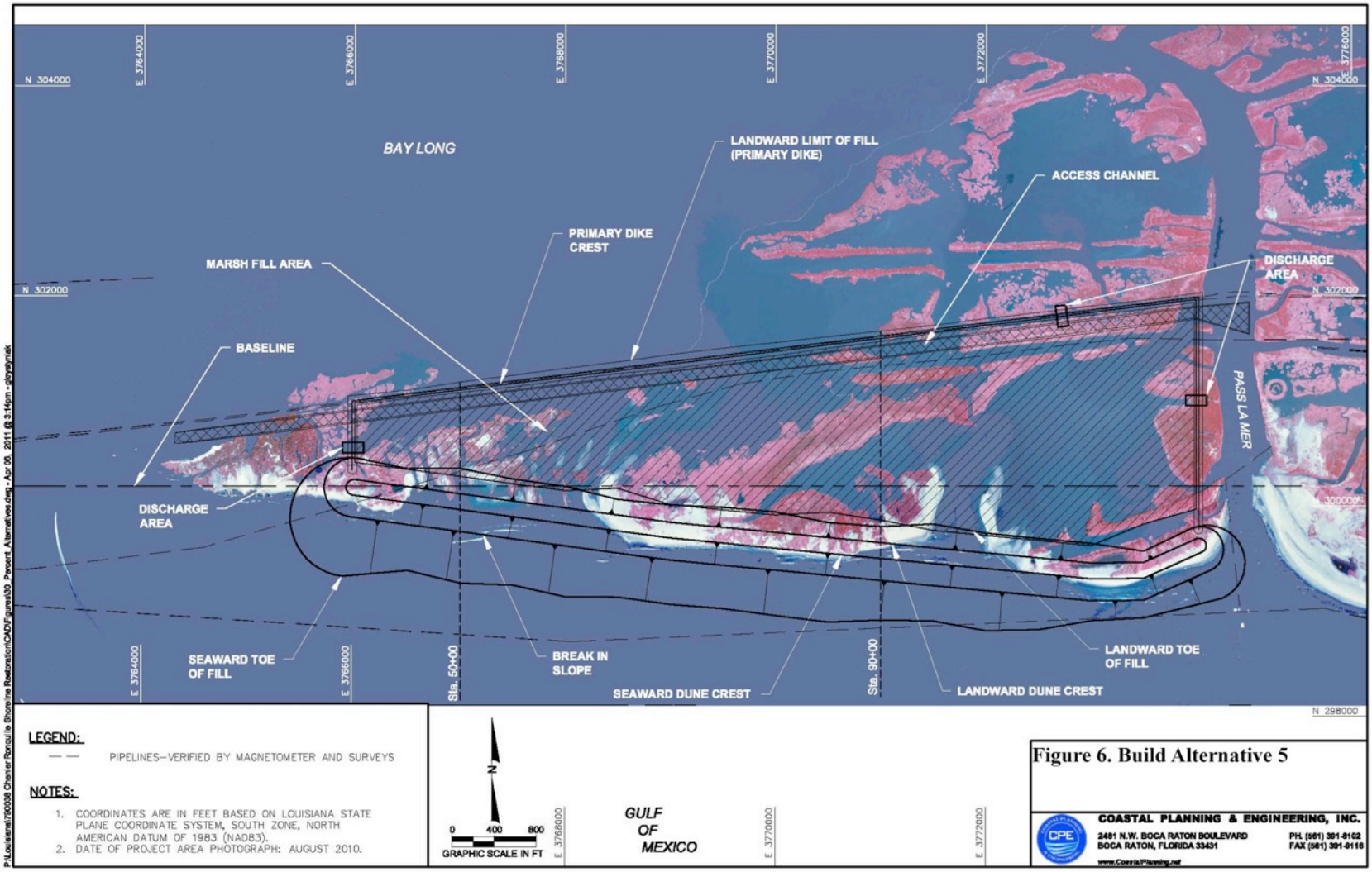

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2. DATE OF PROJECT AREA PHOTOGRAPH: AUGUST 2010.

Figure 6. Build Alternative 5

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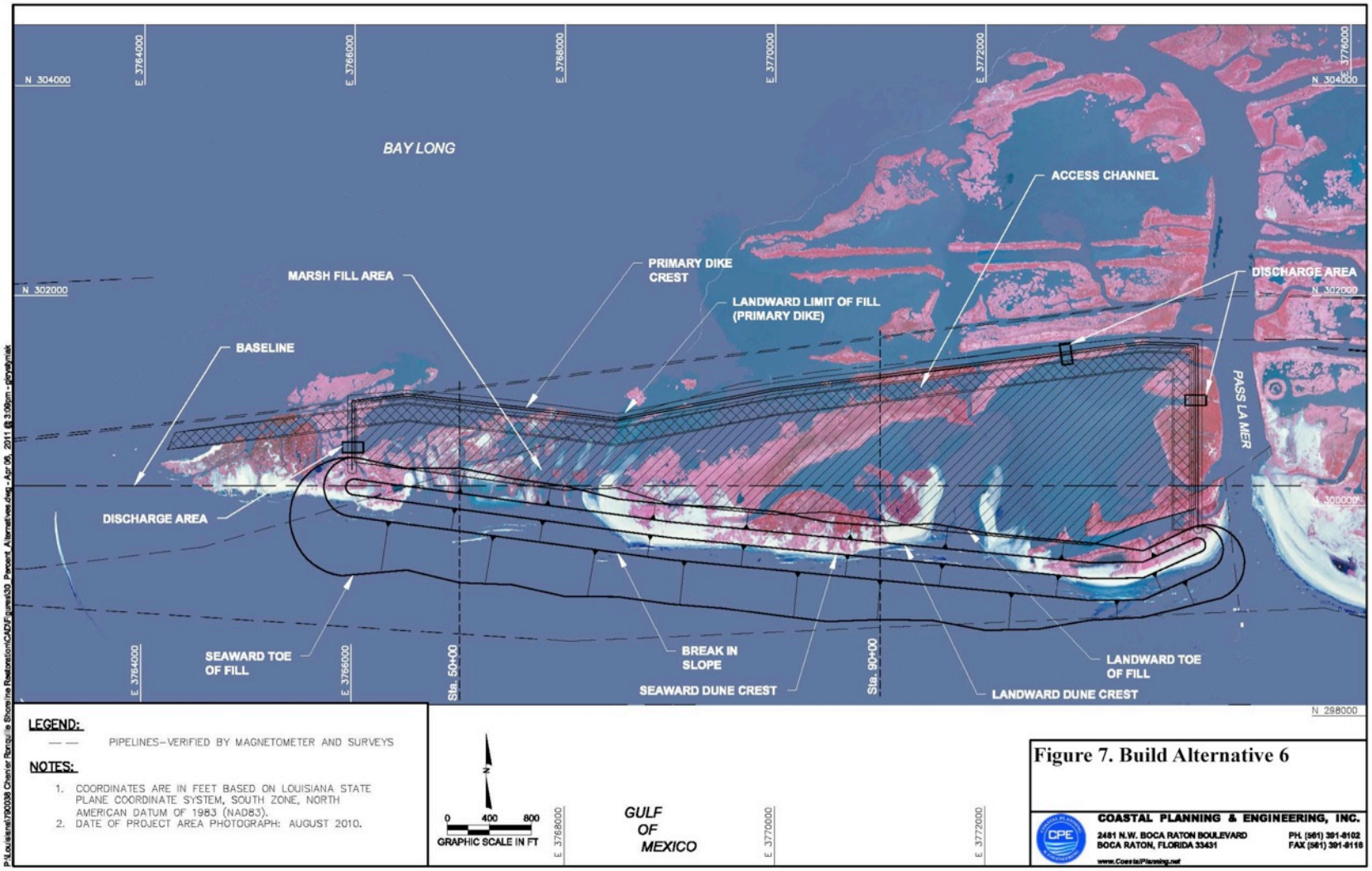

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2. DATE OF PROJECT AREA PHOTOGRAPH: AUGUST 2010.

Figure 7. Build Alternative 6

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AFFECTED ENVIRONMENT

Physical Environment

Geology, Soils, and Topography

Chenier Ronquille is approximately 11,600 ft long along the Gulf of Mexico shoreline. The island is roughly triangularly shaped with the apex located approximately 5,000 ft north of the shoreline. The sandy beach face is narrow leaving a backing marsh to provide the island width. There are two significant breach areas along the breach face (as of February 2011). The first is located just west of the center of the island and flows into Bay Long. It does not have a clearly defined flow channel but is a combination of shallow flow paths. The second breach located just east of the island's center flows into Bay La Mer. This is a well-defined breach with sandy spit features entering the bay. The backing marsh is discontinuous with large open water areas. Several pipelines cross the project area with accompanying pipeline canals and spoil banks, which have contributed to the discontinuous nature of the backing marsh.

The western side of the project area experienced heavy oiling during the course of the Deepwater Horizon Oil Spill. Beach response activities were incorporated into the sand beach assessment, and the beaches experienced months of deep mechanical and manual treatment.

Approximately 200 acres of the project area are located at or above a +1.5' elevation. Table 2 provides the percentage of acres within various elevation ranges. Gulf intertidal, bay intertidal, and subtidal habitats are all considered wetland habitats with respect to Clean Water Act Section 404 permitting.

TABLE 2. ISLAND HABITAT AREAS AND DEFINED ELEVATION

Elevation Range	Topography	Percentage of existing acres within various elevation range
≥ +2 ft NAVD88	Dune and Supratidal	6%
≥ 0 to < +2.0 ft NAVD88	Gulf Intertidal	9%
≥ 0 to < +2.0 ft NAVD88	Bay Intertidal	49%
≥ -1.5 to < 0.0 ft NAVD88	Subtidal	36%

A primary factor governing land loss along this portion of the Louisiana coast is relative sea level rise. Relative sea level rise consists of two components: eustatic sea level change and subsidence. Eustatic sea level change is defined as the global change in oceanic water level relative to a fixed vertical datum. Subsidence is defined as the local change in land elevation relative to a fixed vertical datum.

Along the Louisiana coast the land elevation is decreasing while the mean sea level elevation is increasing, resulting in significant land loss. Estimates of eustatic sea level rise and subsidence for the project area are 0.0056 ± 0.0016 ft/year and 0.0247 ft/year, respectively.

The proposed marsh area consists of Felicity and Scatlake soils (NMFS 2009). Felicity soils are "somewhat poorly drained, mineral soils that are very rapidly permeable, saline, and firm (USDA 2000)." Scatlake soils are "very poorly drained, mineral soils that are very slowly permeable, saline, very fluid and flooded most of the time (USDA 2000)." Relative sea level rise near the project is increasing at a rate of 0.03 ft/year (calculated from 1947-2006 data) and is expected to continue over the 20-year proposed project life (Thompson and others 2011). Shoreline retreat (northward movement or loss) due to relative sea level rise was estimated to be 1.6 ft/year in alternatives analysis (Thompson and others 2011).

Borrow areas consists of sands and silts (Table 3). These were analyzed and partially used in actions similar to the proposed project (East-West Grand Terre and Barataria Complex, CPE reports as cited in Thompson and others 2011.

TABLE 3. SUMMARY OF BORROW AREAS AND VOLUMES CURRENTLY AVAILABLE (THOMPSON AND OTHERS 2011)

Borrow Area	Mean Grain Size (mm)	Percent Silt (%)	Beach Fill Volume (cubic yards)	Water Bottom Depth (ft)	Marsh Fill Volume (cubic yards)
S-1	0.11	15	1,651,000	-10 to -11.5	-
S-2	0.11	17	691,000	-9 to -10	-
D-1 (sand deposit)	0.11	28	1,931,000	-10 to -14 -24 to -29	-
D-1 (overburden)	-	-	-	-10 to -14	1,393,000
Quatre Bayou	-	-	-	-	5,088,000
Total			4,273,000	-	6,481,000

Climate and Air Quality

The subtropical climate of coastal Louisiana is characterized by long, hot summers and short mild winters with high humidity year round. Over the past 40 years, air temperature ranged from 14 to 102 °F; average winter and summer temperatures are 55.3 and 82.4 °F. In a typical year, more than 60 inches of rain falls, mostly in the spring and summer. In the fall and winter, winds tend to be from the north-northeast; in spring and summer, winds are generally from the south-southeast.

Waves generally govern sediment transport offshore and were evaluated in detail in the Borrow Area Impact analysis (CPE 2004) and alternatives modeling (Thompson and others 2011). Wave data from 1980-1999 indicate a 2.9 ft average wave height at the proposed project area (Thompson and others 2011). Largest waves occur between August and October from hurricanes, or between November and April under normal storm conditions. Wave heights can reach in excess of 36 ft (Thompson and others 2011).

Hurricanes and tropical storms typically occur over the study area between June and November. On average, since 1871, a tropical storm or hurricane is expected somewhere within the state of Louisiana every 0.7 years; hurricanes make landfall about every 2.8 years (Roth 1998). Historic data from the National Hurricane Center dataset on tropical cyclones (including tropical depressions, tropical storms, and hurricanes) along the Louisiana coast from 1899 to 2007 indicates a total of 63 storms, of which 49 were Category 3 or less.

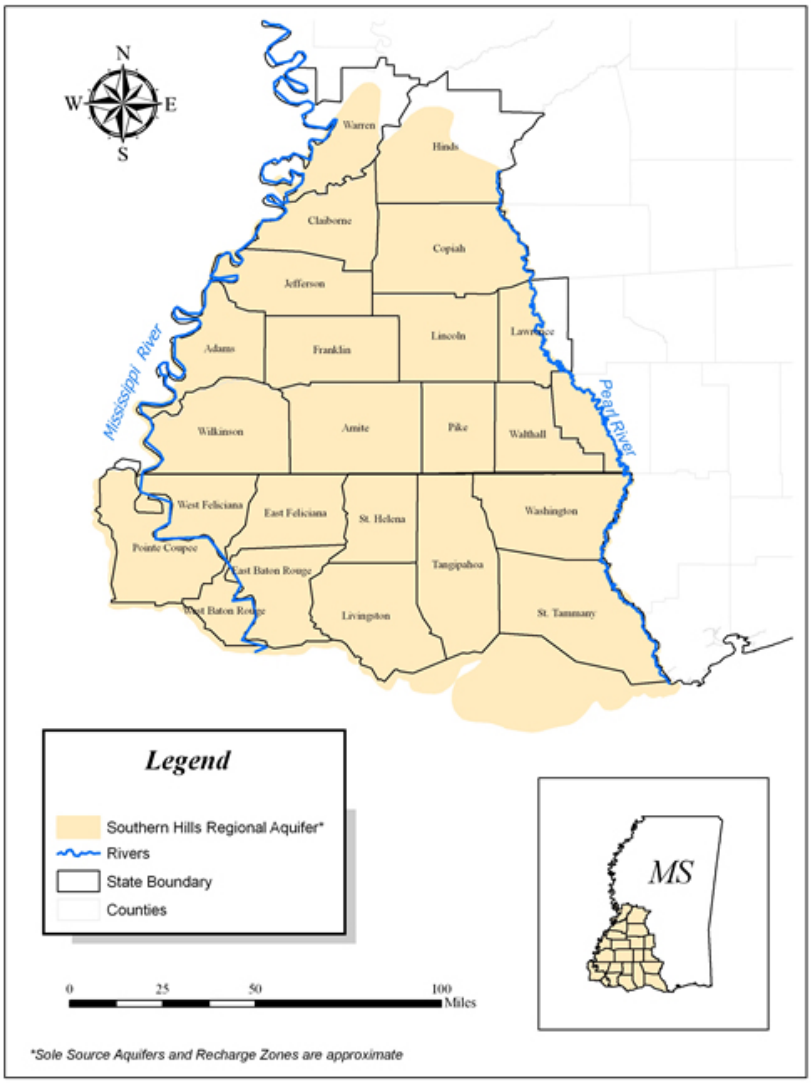
Plaquemines Parish and offshore air quality is ranked good to moderate with ozone levels being unhealthy for sensitive groups (Louisiana Department of Environmental Quality (LDEQ) 2009). Offshore breezes mix and freshen the air and frequent precipitation prevents accumulation of particulates.

Water Resources

The EPA defines a sole source aquifer as an underground water source that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas have no alternative drinking water source(s) that could physically, legally, and economically supply all those who depend upon the aquifer for drinking water. The Sole Source Aquifer Program is authorized by Section 1424(e) of the Safe Drinking Water Act of 1974. Designation of an aquifer as a sole source aquifer provides EPA with the authority to review federal financially assisted projects planned for the area to determine their

potential for contaminating the aquifer. The Southern Hills Regional Aquifer System is located in eastern Louisiana and southwestern Mississippi and is shown on Figure 8.

FIGURE 8. SOUTHERN HILLS REGIONAL AQUIFER



No fresh groundwater is found in the subsurface of Barataria Basin (Gulf Engineers and Consultants (GEC) 2001). Precipitation and tide are the primary factors that affect surface water in the proposed project area. The borrow areas are located in state water bottoms of the Gulf of Mexico where low dissolved oxygen waters occur periodically due to Mississippi River discharge (Osterman and others 2008).

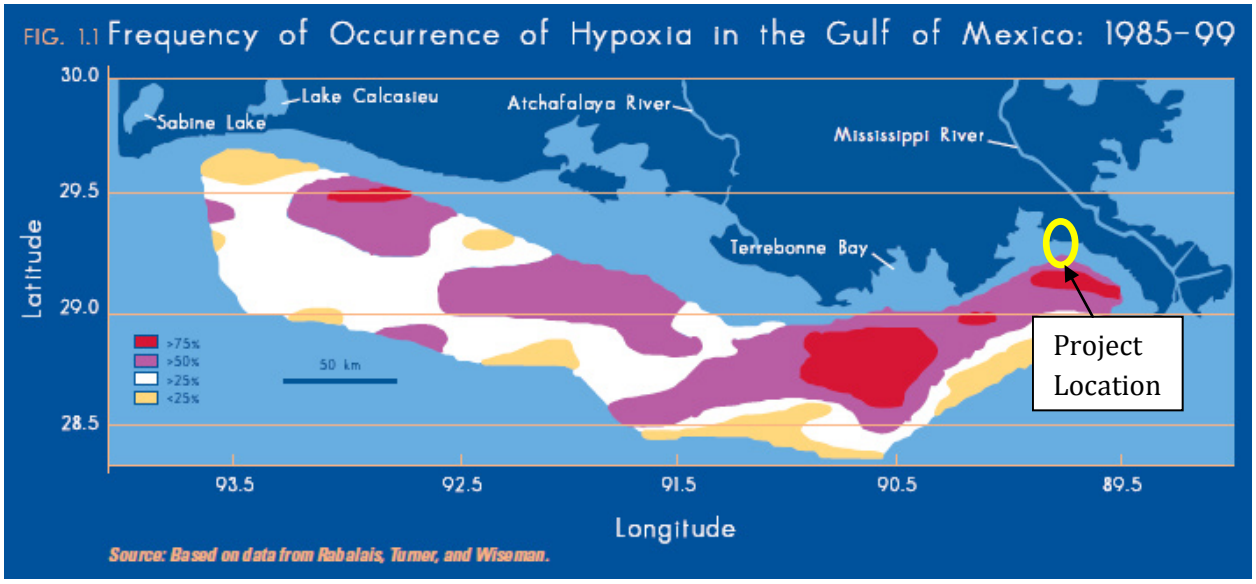
Salinity varies seasonally and decreases landward from the coast (GEC 2001). Salinity in coastal areas is highest from October through November and lowest in February and March. Designated uses of the coastal bays of the Barataria Basin and nearshore waters of the Gulf of Mexico include recreation (such as swimming, fishing, and boating), as well as support of commercially and ecologically valuable biological systems (GEC 2001).

Barataria Basin fully supports the designated uses of primary and secondary contact recreation and oyster propagation (LDEQ 2008). Fish and wildlife propagation was designated as "not fully supported" due to oxygen depletion from upstream sources and a mercury warning for fish consumption, the source of impairment is unknown (LDEQ 2008).

Chenier Ronquille lies within the Bastian Bay, Adams Bay, Scofield Bay, Coquette Bay, Tambour Bay, Spanish Pass, and Bay Jacques (Segment 0210001) identified by the LDEQ. USEPA included the segment in a list for oil, grease, and pathogen indicators, in response to a 1999 court order. The segment has not been reassessed for primary and secondary recreation contact, shellfishing, or fish and wildlife promulgation.

Scientific investigations in the Gulf of Mexico have documented a large area of the Louisiana continental shelf with seasonally depleted oxygen levels (< 2 milligrams/liter). Most aquatic species cannot survive at such low oxygen levels. The oxygen depletion, referred to as hypoxia, begins in late spring, reaches a maximum in midsummer, and disappears in the fall. The hypoxic zone forms in the middle of the most important commercial and recreational fisheries in the coterminous United States and could threaten the economy of this region of the Gulf. Hypoxic waters are distributed from shallow depths near shore (13 to 16 ft) to as deep as 197 ft but more typically appear between16 and 98 ft. Hypoxia occurs mostly in the lower water column but encompasses as much as the lower half to two-thirds of the entire column. The area of hypoxia varies by year and can occur at the borrow sites. The proposed borrow site locations are located near or within the area of >50% annual occurrence of hypoxia in Figure 9 and range between 13 to 23 ft deep.

FIGURE 9. HYPOXIA IN THE GULF OF MEXICO 1985-1999



Biological Environment

Coastal Louisiana contains an estimated 40 percent of the vegetated estuarine wetlands in the contiguous United States (USACE 2004). Approximately 735 species of birds, finfish, shellfish, reptiles, amphibians, and mammals spend all or part of their life cycle in the estuaries (USACE 2004).

Vegetation Resources

Vegetated habitats in the proposed project area are the dune and marsh (supratidal and intertidal areas). The project area contains saline marsh vegetation that is primarily smooth cordgrass and wiregrass with some black mangrove and saltgrass (NMFS 2009). The average marsh elevation as surveyed by John Chance Land Surveys in fall of 2010 was +1.0 ft NAVD88. There are approximately 97 acres of marsh habitat in the proposed project area (NMFS 2011b). There are approximately 11 acres of vegetated dune and supratidal habitats, primarily vegetated by marshhay cordgrass and roseau cane (NMFS 2009, NMFS2011b). No vegetation is present in the borrow area.

Aquatic and Benthic Habitats

Aquatic and benthic habitats in the proposed project area include some intertidal and all subtidal areas (Table 2). The borrow area is benthic habitat under open marine water column. Shallow waters and benthic habitats support a variety of organisms that are important in supporting organisms at higher levels in the food chain, such as small fish and shrimp (Conner and Day 1987; Day and others 1989). Oysters are the primary benthic organisms of interest, as they are of commercial value, are sensitive to habitat changes, important for water filtration and when established create their own (reef) habitat.

Essential Fish Habitat (EFH)

The proposed project area contains EFH as designated by the Gulf of Mexico Fisheries Management Council (GMFMC) for species that are federally managed under the Magnuson-Stevens Fishery Conservation and Management Act, P.L. 104-297; 16 U.S.C. 1801 et seq. (Magnuson-Stevens Act). Categories of EFH in the proposed project area include estuarine emergent wetlands, mud substrates, submerged aquatic vegetation (SAV), estuarine water column, and marine water column (GMFMC 2005). Table 4 lists the EFH, federally managed species, and their life stages expected to occur in the proposed project and borrow areas.

Red drum, brown shrimp and white shrimp are estuarine-dependent species. In the Barataria Basin, the estuarine-dependent assemblage, including white and brown shrimp and red drum, has shown decreasing trends over the last 10 to 20 years (LCWCRTF and WCRA 1999). These species migrate through tidal passes during their post-larval life stage and depend on the estuarine environment for survival and reproduction. Shrimp are prey species for other federally managed fish and crustaceans (GMFMC 1998).

TABLE 4. ESSENTIAL FISH HABITAT OF PROJECT AND BORROW AREAS

Common Name	Life Stage System (M=marine, E=estuarine)	EFH (1 meter (m)= approximately 3.3 ft)
Brown shrimp (Estuarine-dependent)	eggs M	<18-110 m, sand/shell/soft bottom
	larvae/postlarvae M/E	<82 m, planktonic, sand/shell/soft bottom, submerged aquatic vegetation (SAV), marsh oyster reef
	juvenile E	<18 m, sand/shell/soft bottom, SAV, marsh, oyster reef
	adults M	14-110 m, sand/shell/soft bottom
White shrimp (Estuarine-dependent)	eggs M	<9-34 m, sand/shell/soft bottom
	larvae /postlarvae M/E	<82 m, planktonic, soft bottom, marsh
	juvenile E	<30 m, soft bottom, marsh
	adults M	9-34 m, soft bottom
Red drum (Estuarine-dependent)	larvae/postlarvae E	planktonic, SAV, sand/shell/soft bottom, marsh
	juvenile M/E	<5 m, SAV, sand/shell/soft/hard bottom, marsh
	adults M/E	1-46 m SAV, pelagic, sand/shell/soft/hard bottom, marsh
Red snapper	adults M	7-146 m, reefs, hard/sand/shell bottom
Bonnethead shark	juvenile and adult M	inlets, estuaries, coastal waters > 25 m in depth
Lane snapper	larvae E/M	4-132 m, reefs, SAV
	juvenile E/M	<20 m, SAV, mangrove, reefs, sand/shell/soft bottom
Dog snapper	juvenile E/M	SAV, mangrove, emergent marsh

Source: GMFMC 2005

Fishery Resources

A wide variety of estuarine-dependent fishery species found in the Barataria Basin (LCWCRTF and WCRA 1999) are of national economic importance in accordance with Section 906(e)(l) of PL 99-602, the Water Resources Development Act of 1986. Most species vary in abundance from season to season due to their migratory life cycle, habitat preferences according to life stage, and the variation in salinity (Herke 1978, Rogers and others 1993, LCWCRTF and WCRA 1999). Most spawn offshore in the open Gulf of Mexico and enter the marsh area as postlarvae or young juveniles to use the marshes as a nursery, and return to the open gulf as subadults or adults.

Fishery guilds common to coastal Louisiana within each salinity-preference assemblage are below along with current population trends established for the Chenier Ronquille Project Area (LCWCRTF and WCRA 1998):

- Spanish mackerel guild (marine) – Increasing population trend for species within project area
- red drum, black drum, spotted seatrout, Gulf menhaden, southern flounder, white shrimp, brown shrimp, and blue crab guilds (estuarine dependent) – Generally decreasing population trend with the exception of Gulf menhaden and southern flounder for species within project area
- American oyster guild (estuarine resident) - Decreasing population trend for species within project area
- largemouth bass and channel catfish guilds (freshwater) – Not applicable to project location

Marine Mammal Resources

Marine mammals that occur in Louisiana waters include the Blue, Sei, Sperm and Fin whale; and the dolphin and manatee. Whales were found to be "unlikely to occur near the project area (NMFS 2010)", so are not further discussed. West Indian manatees are rare in coastal Louisiana waters and dolphins are common along the shore. Manatee would occur in Louisiana to seek shelter and aquatic plants or algae in shallow waters. Dolphin follow schooling fishes, such as menhaden that are prey, along the coast, and seek food and refuge in interior bay waters.

Migratory Bird Resources

Waterbirds were specifically considered pursuant to the Migratory Bird Treaty Act. No colonies of colonial nesting waterbirds have been observed in the proposed project area, but could occur (USFWS 2011). This resource includes herons, egrets, night-herons, ibis, roseate spoonbills, anhingas, and/or cormorants.

Wildlife Resources

Louisiana's coastal zone supports 19 percent of the United States' winter population for 14 species of ducks and geese. The North American Waterfowl Management Plan identified coastal Louisiana as one of the most important regions for the maintenance of continental waterfowl populations in North America (USACE 2004).

The Barataria Basin has 411 species of birds; 60 species of reptiles and amphibians; 8 species of bats; and 11 species of small mammals, armadillo and marine mammals (Connor and Day 1987). The proposed project area is unlikely to support many of these species due to the non-wooded and non-freshwater vegetation (Connor and Day 1987). The basin is located at the bottom of the Mississippi Flyway, and birds from central and northern North America start to converge in the fall. Waterfowl populations in the Barataria basins have declined as marsh converts to open water (LCWCRTF and WCRA 1999).

Table 5 lists the wildlife species and/or species groups prominent (LCWCRTF and WCRA 1998) within coastal Louisiana along with the habitat function, status, trend, and projection within the project area.

TABLE 5. LOUISIANA AND PROJECT AREA WILDLIFE AND/OR SPECIES GROUPS

Type	Species	Category	1988 Habitat	
			Open Water	Saline Marsh
			86% of Unit	13% of Unit
Avifauna	Brown Pelican	Function	W	
		Status	Hi	NH
		Trend	I	
		Projection	I	
	Bald Eagle	Status	NH	NH
	Seabirds	Function	Mu	Mu
		Status	Hi	Mo
		Trend	Sy	D
		Projection	Sy	D
	Wading Birds	Function		Mu
		Status	NH	Mo
		Trend		D
		Projection		D
	Shorebirds	Function		W
		Status	NH	Lo
		Trend		D
		Projection		D
	Dabbling Ducks	Status	NH	NH
	Diving Ducks	Function	W	W
		Status	Lo	Lo
		Trend	D	D
		Projection	D	D
	Geese	Status	NH	NH
	Raptors	Status	NH	NH
	Rails, Coots, and Gallinules	Function		Mu
		Status	NH	Lo
		Trend		D
		Projection		D
	Other Marsh/OW Residents	Function	Mu	Ne
		Status	Mo	Mo
		Trend	Sy	D
		Projection	Sy	D
Avifauna (Cont'd)	Other Wood-land Residents	Status	NH	NH
	Other Marsh/OW Migrants	Function	Mu	Mu
		Status	Mo	Mo
		Trend	Sy	D
		Projection	Sy	D
	Other Wood-land Migrants	Status	NH	NH
Furbearers	Nutria	Function		Mu
		Status	NL	Lo
		Trend		D
		Projection		D
	Muskrat	Function		Mu
		Status	NL	Lo
		Trend		D
		Projection		D
	Mink, Otter, and Raccoon	Function		Mu
		Status	NL	Lo
		Trend		D
		Projection		D
Game Mammals	Rabbits	Function		Mu
		Status	NL	Lo
		Trend		D
		Projection		D
	Squirrels	Status	NH	NH
	Deer	Status	NL	NL
Reptiles	American Alligator	Function		Mu
		Status	NL	Lo
		Trend		D
		Projection		D

Functions of Particular Interest: Ne = Nesting; St = Stopover Habitat; W = Wintering Area; Mu = Multiple Functions

Status: NH = Not Historically Present; NL = No Longer Present; Lo = Low Numbers; Mo = Moderate Numbers; Hi = High Numbers

Trends (Since 1985) / Projections (through 2050): Sy = Steady; D = Decrease; I = Increase; U = Unknown

Threatened and Endangered Species

The threatened piping plover feeds on the intertidal beaches, mudflats, sandflats and unvegetated areas, such as those of the proposed project area. Plover may occupy these areas in winter, however, the proposed project area is not located in an area designated by USFWS as critical habitat of the plover (USFWS 2011).

Loggerhead, Kemp's ridley, hawksbill, leatherback, and green sea turtles occur in Louisiana. Green sea turtles may be in the borrow area while migrating between their nesting and foraging sites in Florida and Texas. Major threats are from exploitation for food, foraging habitat loss. They feed on phytoplankton, zooplankton, SAV, and small fish. Kemp's ridley nest in Mexico and immature individuals are believed to stay in shallow, warm, nearshore waters in the northern Gulf of Mexico. They forage for crabs, mollusks, shrimp, and small fish. Loggerhead sea turtles occur in coastal and marine areas along the margins of the Atlantic, Pacific, and Indian Oceans. Their major threats are direct take, incidental capture in fisheries, and loss of habitat. The loggerhead is the most abundant species of U.S. sea turtles, and has a complex life history that is highly migratory. No sea turtle nesting is known to occur in the vicinity of the project.

Gulf sturgeon and smalltooth sawfish are threatened or endangered fishes that may occur in the vicinity of the project area or borrow areas. Threatened or endangered marine mammals are not known to occur in the vicinity of the project, but those that occur in Louisiana are the Blue, Sei, Sperm and Fin whale. Also, the West Indian manatee could occur near the proposed project area in summer months, though it is unlikely (USFWS 2011).

Cultural Resources

Historic, Prehistoric, and Native American Resources

No historic properties would be affected by any element of the proposed project. While two historic sites were previously reported near the project area (NMFS 2011), those sites are now located offshore of the proposed project area due to the areas high erosion, or oil and gas developments buried them. The State Historic Preservation Office (SHPO) concurred with this determination (SHPO 2011).

Socioeconomics (Income and Environmental Justice)

The population of Plaquemines Parish is 23,042 (U.S. Census 2010). This is 20% less than prior to Hurricanes Katrina and Rita in 2005 that adversely impacted the area (Plaquemines Parish Government 2011). The nearest towns and roads are 13 miles northeast of the proposed project area at Port Sulphur and Empire. The project site is contained within Census Tract 504 in Plaquemines Parish that extends north to the western side of the Mississippi River excluding Port Sulphur, Empire, and Belle Chasse. Figure 10 provides the general population distribution for the area. Table 6 provides population/poverty data for Census Tract 504, Plaquemines Parish, and Louisiana.

FIGURE 10. 2010 POPULATION DENSITY MAP (BY TRACT)

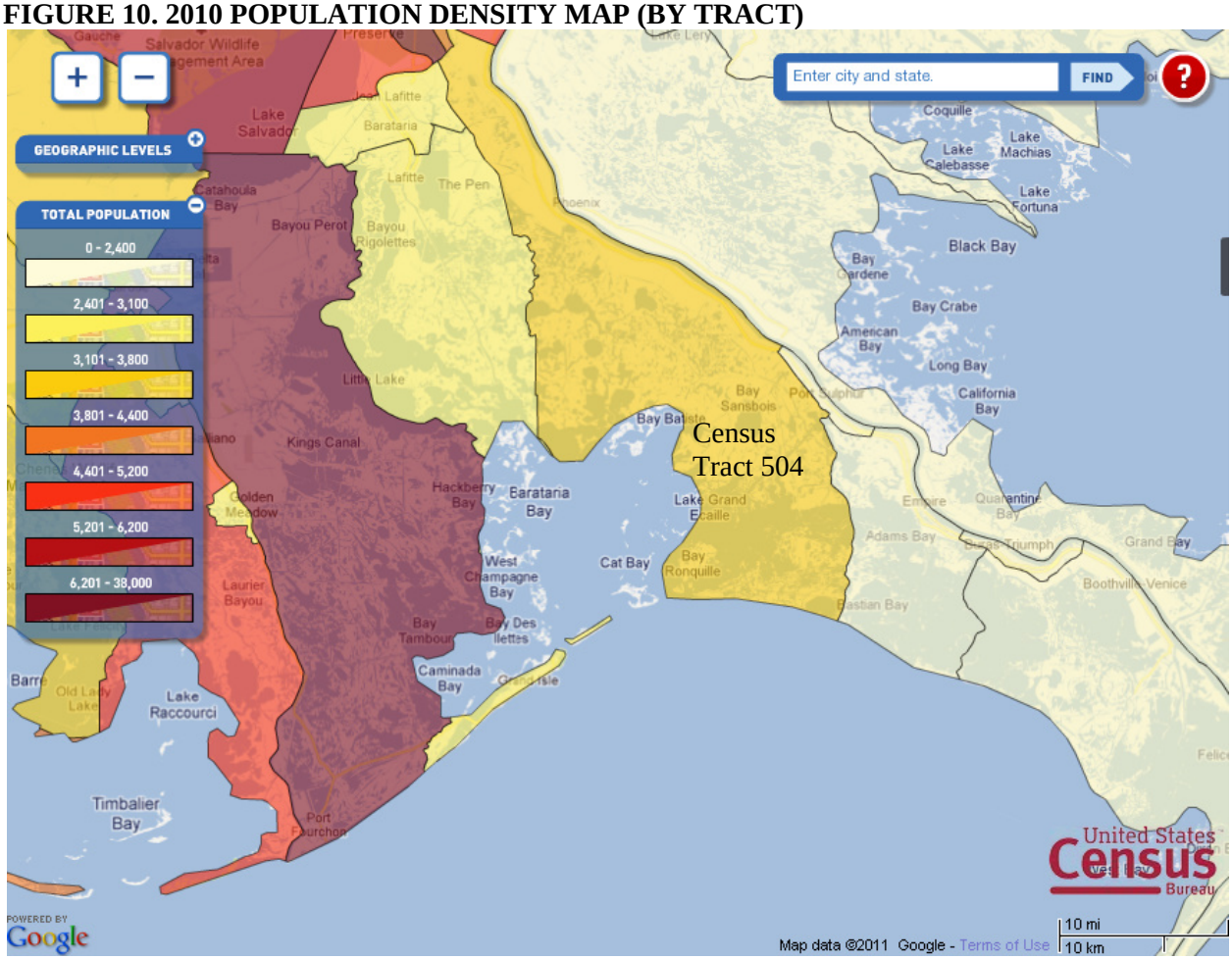


TABLE 6. POPULATIONS OF LOUISIANA, PLAQUEMINES PARISH AND CENSUS TRACT 504

Topic	Louisiana		Plaquemines Parish		Census Tract 504	
2010 Total Population	4,533,372		23,042		3,708	
White alone	2,836,192	62.6%	16,246	70.5%	2,311	62.3%
Black or African American alone	1,452,396	32.0%	4,715	20.5%	1,127	30.4%
American Indian and Alaska Native alone	30,579	0.7%	371	1.6%	129	3.5%
Asian alone	70,132	1.5%	731	3.2%	39	1.1%
Native Hawaiian and Other Pacific Islander alone	1,963	0.0%	31	0.1%	1	0.0%
Some Other Race alone	69,227	1.5%	323	1.4%	32	0.9%
Two or More Races:	72,883	1.6%	625	2.7%	69	1.9%
2000 Total Population (provided income information)	4,334,094		25,969		3,423	
Below poverty level	851,113	19.6%	4,682	18.0%	835	24.4%

Land Use and Infrastructure

Oil/natural gas, and maritime transport activity is prominent throughout coastal Louisiana. Oil and gas pipelines lay throughout the proposed project vicinity as active or remnant conveyance of this industry (Figure 11). Waterbottoms are leased by the state for oyster harvest. Figure 12 shows the six oyster leases (with respective lease numbers) located within the project area.

The marshes and bayous of Barataria Basin are used for recreation, such as hunting, fishing, and birding. Industries of the area are primarily agriculture, fishing and hunting; education, health, and social services; and retail (U.S. Census 2000).

The Plaquemines Parish Master Plan (http://www.plaqueminesmasterplan.com) identifies the current land use of the project area as undeveloped or water (Appendix A).

Hazardous, Toxic, and Radioactive Wastes

Hazardous, toxic, and radioactive waste (HTRW) status of the proposed project area was investigated and is recorded in October 2011 HTRW Analysis for Chenier Ronquille, which is incorporated here by reference. NMFS personnel conducted a site investigation of the project area. There were no signs of HTRW problems, such as dead or discolored vegetation, stained soil, chemical sheens or odors, or dead or dying fish, amphibians, reptiles, or mammals, or discarded drums, tanks, or chemical containers. Based on a review of applicable federal and state regulatory agency records, historical records, interviews with persons knowledgeable about the subject property, and a physical site investigation, NMFS, through this analysis, has discovered no evidence of HTRW issues.

Noise

The proposed marsh creation area is remote with no industry other than oil production and fisheries. Ambient noise in the area results from oil and gas production, boats, and wildlife. The borrow area is in the Gulf of Mexico with noise associated with navigation and oil and gas extraction.

FIGURE 11. PIPELINES/ WELLS AT PROPOSED PROJECT AREA.

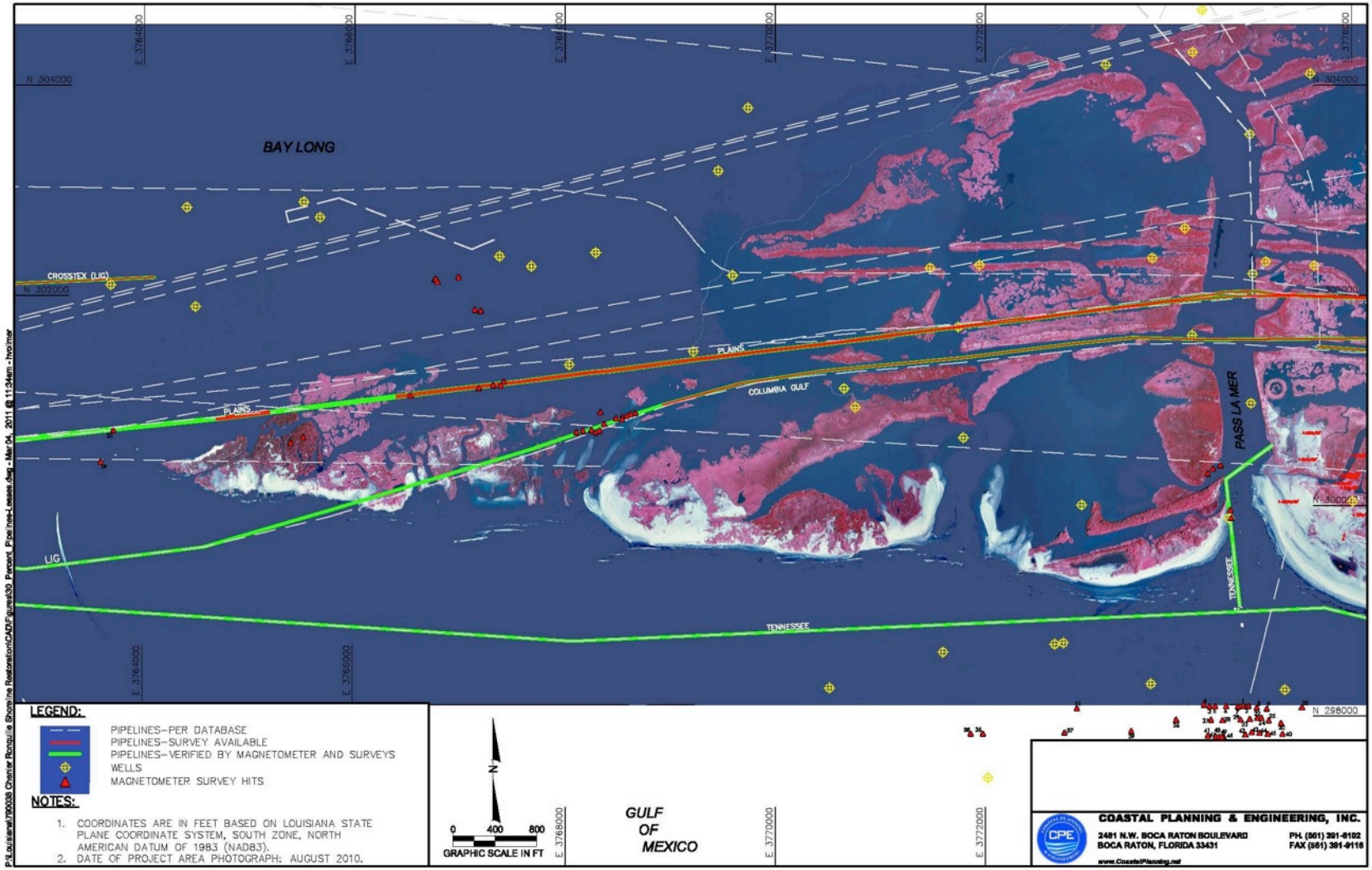
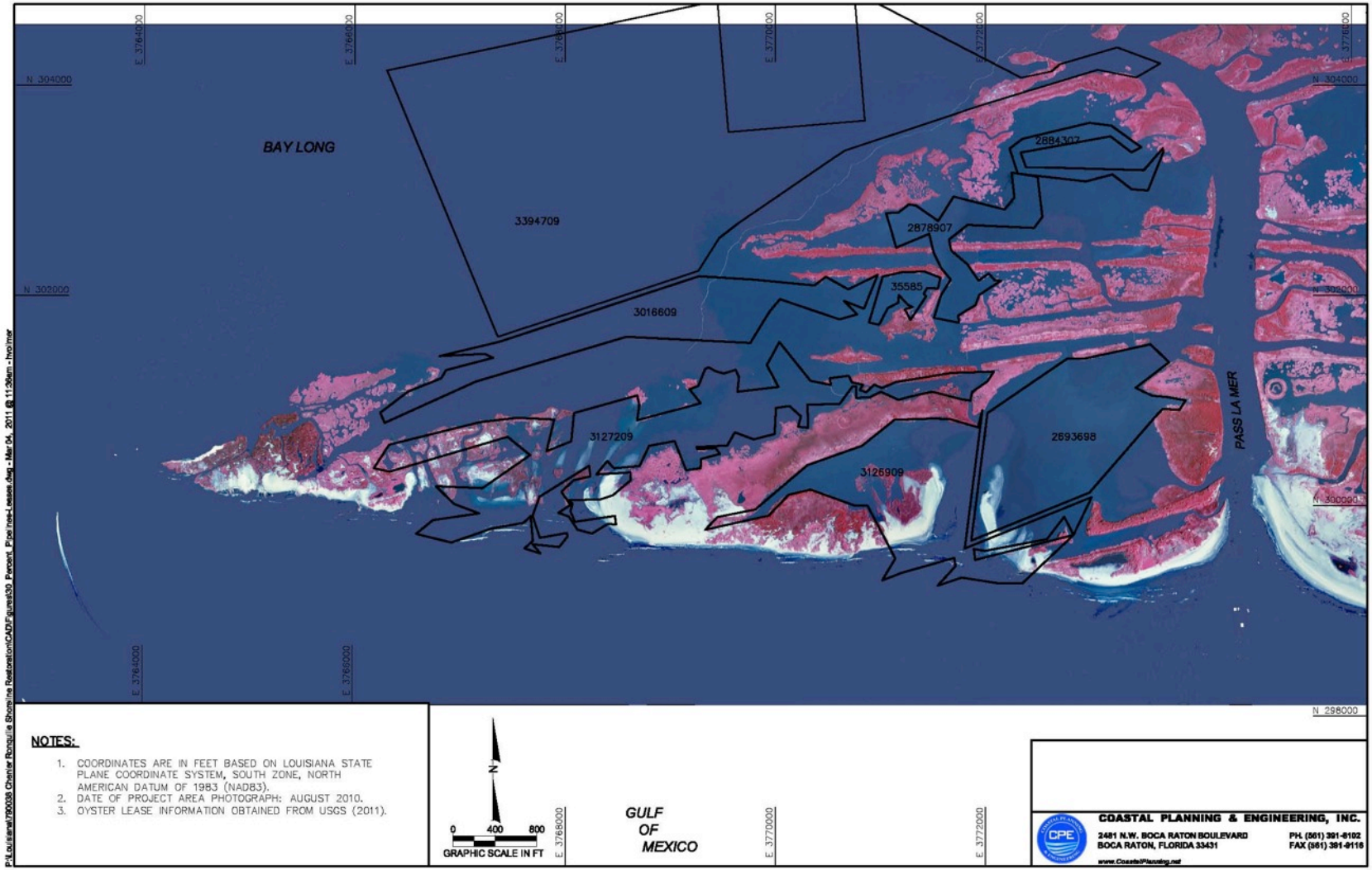


FIGURE 12. OYSTER LEASES IN THE PROPOSED PROJECT AREA.



ENVIRONMENTAL CONSEQUENCES

This review is consistent with CEQ regulations and NOAA Administrative Order 216-6. Specific sources of analysis used to consider environmental impacts throughout proposed project development are the Wetland Value Assessment (WVA, NMFS 2009, 2011b) and engineering design analyses (Thompson and others 2011). Other factors considered during the selection process included, but were not limited to: wetland benefit — creation, enhancement, or protection; cost effectiveness; longevity and sustainability; risk and uncertainty; consistency with Coast 2050 Plan (LCWCRTF and WCRA 1998); public support; and synergy with other restoration efforts (LCWCRTF 2009).

Wetland benefits are assessed through the CWPPRA WVA process, a quantitative, habitat-based assessment model developed to estimate anticipated fish and wildlife habitat benefits. The WVA compares conditions over a 20-year period to determine the net difference in "future without project" and "future with project" scenarios. Initial and future conditions are set based on historical land loss, aerial imagery, and on-site visits to the proposed project area. Expected benefits are based on a combination of experience with previous projects, construction plans, models, and biological and engineering experience of the assessment team.

In addition to the temporal component of each impact, the magnitude or severity of the impact is described in qualitative terms. Alternatives were designated as having *no impact, no significant impact (minor* or *moderate*), or *significant impact. Minor impacts* are those that may be measurable but not result in adverse effects to humans or their resources; these are short-term and reversible. *Moderate* impacts may have longer-term effects that have a measurable change to the identified environment, and thus warrant consideration of revision of the project component causing the adverse impact. *Significant* impacts to humans or their environment and long-lasting that warrant preparation of a full EIS. The qualitative assessment is based on reference material and professional judgment. A quantitative assessment is included when sufficient data are available to do so.

Table 1 provides a quick reference for differences in the elements of the build alternatives, which includes not only dredge and fill activities, but also sand fencing, planting, and monitoring , both pre-, during, and post-construction. Table 7 presents a comparison of environmental impacts associated with the no-action, and build alternatives. Table 8 presents the minimization and avoidance measures of the preferred alternative.

TABLE 7. COMPARISON OF ENVIRONMENTAL IMPACTS OF ALTERNATIVES

Resource	No Action	Preferred Alternative – Alternative 5	Alternative 1	Alternative 6
Geology, Soils, Topography	Land loss and erosion continues. Borrow area material likely used for other restoration projects.	Long-term, direct, beneficial impacts by extending shoreline and island longevity, recreating organic sediment source (marsh). Short-term, direct, moderate, adverse effects would occur in borrow areas from suspended sediments.	Slightly greater long-term benefits than preferred alternative. Slightly greater short-term, direct, moderate borrow area adverse impacts than the preferred alternative.	Less long-term beneficial impacts than other build alternatives, but more than no action. Borrow area impacts are less than other build alternatives.
Climate and Air Quality	No impacts	Short-term, localized, minor adverse impacts from emissions and construction-generated dust.	Same as preferred alternative.	Same as preferred alternative.
Water Resources	No direct impact. Indirectly, loss of land and shoreline retreat could increase vulnerability to storm surge of surrounding areas.	Short-term, minor, adverse impacts at the dredge and placement sites. Long-term, moderate, beneficial impacts would result from filtering action of marsh and wave cessation of created land mass.	Same as preferred alternative.	Same as preferred alternative.
Vegetation Resources	Reduction in saline marsh and shallow water habitat, as shoreline erodes and land subsides.	Short-term, direct, minor, adverse, impact to existing saline marsh and long-term, direct, moderate benefits to saline marsh and dune vegetation.	Adverse impacts similar to preferred alternative. Beneficial impacts would be greater than all alternatives because the larger dune area is expected to most increase island longevity.	Adverse impacts similar to preferred alternative. Beneficial impacts not as long lasting as with the other build alternatives.
Aquatic and Benthic Habitats	Continued increase in open water, and reduction in less common sandy and marsh habitat.	Short-term, direct, minor adverse impacts by coverage of shallow water habitat and disturbance of borrow area. Moderate benefits through increased marsh edge, and sandy benthos.	Adverse and beneficial impacts would be greater than the preferred alternative.	Adverse impacts would be greater overall and beneficial impacts not as long lasting as the other build alternatives.

Resource	No Action	Preferred Alternative – Alternative 5	Alternative 1	Alternative 6
Essential Fish Habitat and Fisheries	Variety and quality of estuarine, sandy bottom and marsh edge EFH would decline.	Short-term, minor unavoidable, adverse impacts from construction would be offset by long-term, moderate, benefits to EFH and nursery resources through creation of marsh and beach, and sandy intertidal habitats.	Adverse and beneficial impacts would be greater than other build alternatives.	Adverse and beneficial impacts would be less than other build alternatives.
Marine Mammals	Continued loss of forage species habitat.	Short-term displacement from feeding areas during construction resulting in in temporary minor adverse impacts. Long-term moderate benefit from increasing prey species nursery habitat.	Similar to the preferred alternative.	Similar to the preferred alternative.
Migratory Birds	Continued loss of foraging species habitat.	Short-term displacement from feeding areas during construction resulting in temporary minor adverse impacts. Long-term moderate benefits through increasing quality and longevity of foraging grounds.	Similar to the preferred alternative.	Similar to the preferred alternative.
Wildlife	Continued decreases due to habitat losses.	Direct, adverse, short-term, minor impacts by construction disturbance. Long-term beneficial, direct, minor impacts through habitat creation and increased island longevity.	Adverse impacts would be similar to other build alternatives and beneficial impacts greater than other alternatives.	Adverse impacts would be similar to, but benefits less than the other build alternatives.
Threatened and Endangered Species	Indirect adverse impacts through loss of habitat.	Temporary minor adverse impacts of displacement, with long-term benefits from increased habitat are expected.	Similar to preferred alternative.	Similar to preferred alternative.
Historic, Prehistoric, and Native American	No impact.	No impact.	No impact.	No impact.
Socioeconomics	Long-term, moderate, indirect, adverse impacts related to fisheries decline would result.	Beneficial, and no adverse economic impacts are expected, as oyster leasers would be mitigated as described below, and improved fisheries nursery habitat are expected.	Similar to preferred alternative.	Similar to preferred alternative.
Land Use and Infrastructure	Infrastructure would become more vulnerable to storm damage and erosion.	Short-term, reversible, minor adverse impacts to fishing are possible. Long-term, beneficial impacts would be expected for infrastructure.	Similar to preferred alternative.	Less benefit than other build alternatives but more than with no action.

Resource	No Action	Preferred Alternative – Alternative 5	Alternative 1	Alternative 6
Hazardous, Toxic, and Radioactive Waste	No anticipated impact.	No impact.	No impact.	No impact.
Noise	No impact.	Temporary, adverse, minor impacts during construction.	Similar to preferred alternative.	Similar to preferred alternative.

TABLE 8. SUMMARY OF AVOIDANCE AND MINIMIZATION MEASURES OF THE PREFERRED ALTERNATIVE

Resource	Potential Avoidance and Minimization Measures
Geology, Soils, and Topography	• Construction of the marsh area would replace borrow sediments used for access and dikes. • Vegetative plantings of disturbed areas would stabilize soil, and reduce resuspension of recently deposited sediment. Sand fencing would entrap naturally windblown deposits.
Climate and Air Quality	• Best management practices would minimize exhaust fumes and fugitive dust. Primary production through marsh and dune plantings would benefit air quality in long-term.
Water Resources	• Best management practices and containment dikes would prevent or minimize turbidity. • Compliance with the Clean Water Act and other regulations would protect water resources.
Vegetation	• Best management practices would minimize disturbance of intact wetlands. • Compliance with the Clean Water Act, Section 404 and Section 301, would protect wetlands from unnecessary disturbance • Vegetative plantings would use native species.
Aquatic and Benthic Habitats	• Best management practices would reduce scour, erosion, and sedimentation. • Limiting access routes would reduce adverse impacts. • Back filling much of the access route would offset adverse impacts.
Essential Fish Habitat and Fisheries	• Areas adjacent to borrow areas would provide source organisms for recolonization. • Project-specific evaluations and coordination with appropriate federal, state, and local agencies would focus on protecting sensitive species. • Containment dikes would be gapped after construction to provide tidal connection.
Marine Mammals	• Project-specific evaluations and coordination with USFWS and NMFS would focus on protecting this resource.
Migratory Birds	• Same as above.
Wildlife	• Project-specific evaluations and coordination with appropriate federal, state, and local agencies would focus on protecting sensitive wildlife species.
Threatened, and Endangered Species	• Education of the Federal and State teams and construction contractors on the species interactions to avoid would be part of the ongoing Federal oversight. • Nesting colonial waterbirds, piping plover, and manatee would be avoided given provisions provided by USFWS and NMFS Protected Resources.
Historic, Prehistoric, and Native American	• Magnetic and acoustic anomalies identified sensitive submerged cultural resources in the borrow areas that would be avoided. • Appropriate Section 106 Consultation with the Louisiana State Historic Preservation Office has been completed.
Socioeconomics	• Coordination with appropriate federal, state, and local agencies would focus on maintaining the quality of public recreation. • All staging areas used for construction materials or debris would be restored to pre-construction conditions (or better). • Compensation of oyster leasers at current market value.
Land Use / Infrastructure	• The alternatives have been designed to avoid pipelines, which have already been identified by magnetometer surveys of the proposed project areas.
Hazardous, Toxic and Radioactive Waste	• Care would be taken to avoid impacts to the existing oil and gas infrastructure.
Noise	• Coordination with appropriate federal, state, and local agencies would ensure that public concerns are addressed.

Physical Resources

Impacts on Geology, Soils, and Topography

No Action The island has severely eroded, such that sections historically in the proposed project area are now shallow open water. With no action, borrow area material is likely to be used for other restoration projects in the area as sediment sources are a limited resource (Galliano and van Beek 1973). Adjacent to the project area marshes exist in a degrading state from erosion and subsidence. Geomorphology in the project area is characteristic of a highly eroding, sediment-deficient barrier island converting to open gulf water. With no action, continued erosion and conversion of land to water would occur.

Alternative 5 - Preferred Alternative Short-term, direct, moderate, adverse effects would result in the suspension of sediments and disturbance to natural sediment sorting and layering within the borrow area. Water depth would increase in the area as sediments were removed. Over the long term, dredged materials removed from the borrow area would be expected to rearrange by natural processes.

Long-term, direct, moderate, benefits would result from extending the beach, dune, and marsh, and recreating organic sediment through marsh creation. Re-creation of a marsh on the bayside would add longevity to the island and diversity of habitat. Elevation in the proposed project area would increase buffering from storm surges.

Construction would cover some existing marsh and shallow open water habitat. Marsh would be constructed at a higher elevation to account for material desiccation, consolidation, and compaction. After sediment is consolidated, gaps may be placed in strategic places along the dike to return tidal influence to the marsh if natural settlement and erosion of the dikes does not occur.

The dredged material used in beach, dune and marsh construction would consist of naturally occurring material deposited in the borrow areas over time by natural processes. Vegetative plantings would be used to stabilize soil, reduce resuspension of recently deposited sediment, and encourage sedimentation. Plantings would increase plant diversity and provide a seed source of diverse species for marsh and dune growth in the project area. Sand fencing would be installed during construction and an estimated two more times over the course of the project life to trap windblown sediments and encourage dune growth. There are moderate beneficial impacts of this activity on the dune habitats and no significant adverse impacts.

Alternative 1 The beneficial and adverse impacts are slightly greater than the preferred alternative. More borrow material would be needed for dune creation that would slightly increase short-term adverse impacts, and more dune would be created which would slightly increase the long-term benefits. Impacts of placing dredged materials onto existing marsh habitat would be the same as the preferred alternative. Sand fencing, plantings, and monitoring would similarly have no to minor, temporary adverse and moderate long term beneficial effects as the preferred alternative.

Alternative 6 The long-term, direct, moderate benefits would be less than the preferred alternative, though initial benefits would be similar to the other build alternatives. Because access would not be back filled, the marsh is of less size and elevation, less longevity of benefits would be achieved than other build alternatives, but more than with no action. Borrow area adverse impacts would be less than other build alternatives, as less material would be dredged. Sand fencing, plantings, and monitoring would similarly have no to minor, temporary adverse and moderate long term beneficial effects as the preferred alternative.

Impacts on Climate and Air Quality

No Action The no-action alternative would not result in any changes to existing air quality in the area.

Build Alternatives (including preferred alternative) Short-term, direct, minor, adverse impacts to air quality from construction would be associated with emissions from diesel engines that would power the dredging machinery, and material placement operations. Emissions would occur over a period of a few months, with most emissions occurring at the dredge and ridge creation sites. The emissions would consist predominantly of nitrogen oxides, with smaller amounts of carbon monoxide, sulfur dioxide, particulate matter, and volatile organic compounds.

Prevailing winds would dissipate airborne pollutants and limit them to the proposed project's construction phase. In addition, newly placed, unconsolidated dredged material is subject to drying and blowing during high wind events, adding particulates to the air. Vegetation would hold sediments in place after a time. The impact to human health would be negligible because the proposed project area is remote from any residential area. In the long term, air quality in the area is expected to be unchanged. While Alternative 1 would potentially add 35 days to the dune creation dredging and Alternative 6 would subtract 11 days from the marsh creation dredging as compared to the preferred alternative, this number of days is insignificant in comparison of effects on climate and air quality. Sand fencing, planting, and monitoring would require some level of vehicular access to the project site and equipment operations; however, the duration would be very limited in duration and extent.

Impacts on Water Resources

No Action The no-action alternative would not directly affect local water quality. Long-term, indirect, moderate, adverse impacts would result from land conversion to open water that would increase in vulnerability of surrounding areas to storm surge.

Build Alternatives (including preferred alternative) The build alternatives would not impact any drinking water resources. Long-term, minor, indirect benefits to water quality would result from the ability of created marsh to remove nitrates and phosphate and reduce turbidity in the water (EPA 2008). Short-term, direct, minor, adverse impacts associated with dredging required for both access and borrow material of this alternative would include: (1) increased turbidity in the water column at the dredge site (dredge plume) and at the construction location; (2) potential decreased dissolved oxygen in the water column at the access route due to increased water depth; (3) possible exhumation of buried trash and debris; and (4) discharges from the dredge vessel.

To minimize adverse impacts to water quality, retention dikes and building the sand beach first would be used to retain materials and minimize sediment losses. Beach and marsh fill areas would be constructed using hydraulic dredge equipment. Interior training dikes may be used to aid material consolidation of these materials. The containment dike system would be constructed using mechanical dredge equipment. Mechanical that requires less de-watering of materials that would reduce adverse impacts to water. The greater overall amount of cubic yards dredged and fill placed for Alternative 1, and the lesser amount under Alternative 6, as compared with the preferred alternative could be expected to incrementally negative and positive effects in regards to water quality. However, the percent difference and days added or subtracted is insufficiently different to warrant categorizing these effects differently among alternatives.

The levels of dissolved oxygen within borrow sites after construction of coastal restoration projects are generally not well known. NOAA plans to perform dissolved oxygen surveys in order to better categorize potential impacts in the future. To date, no issues related to decreased dissolved oxygen have emerged from previous coastal restoration projects of this type.

Sand fencing, planting, and monitoring would be expected to have no effect to minor beneficial effects on water quality for the project area.

Biological Environment

Impacts on Vegetative Communities

No Action With no action, continued erosion and subsidence are expected to occur, resulting in loss of saline marsh.

Alternative 5 - Preferred Alternative The preferred alternative would exert long-term, direct, moderate beneficial impacts on vegetative communities of the area by adding marsh, beach, and dune elevation; increasing vegetative diversity; and decreasing` land conversion to open water. Building up the barrier island dune and marsh habitats would also have long-term, indirect moderate beneficial impacts on vegetative communities and associated biological resources through protection of adjacent marsh habitats inland through wave protection.

Short-term, direct, minor, unavoidable, adverse impacts to marsh, shallow open water, and their associated plant communities would occur. Access and construction areas would be dredged or buried by slurry sediments initially. Long-term, direct, moderate beneficial impacts would result the anticipated increased quality, quantity, and diversity of vegetative habitat.

Sand fencing and plantings would have minor, temporary adverse effects and moderate long term beneficial effects, while monitoring would have likely have no discernible effect.

Alternative 1 This alternative would have the greatest long-term benefit to the area vegetation of all alternatives. The overall quantity and quality of vegetated habitat would be the highest, whereas adverse impacts would be the same as the preferred alternative. Sand fencing, plantings, and monitoring would similarly have no to minor, temporary adverse and moderate long term beneficial effects as the preferred alternative.

Alternative 6 Adverse impacts to vegetation would be the same as with the preferred alternative. Long-term benefits would be less than other build alternatives but greater than the no-action alternative, due to back of back filling the access canal; less marsh created; and lower elevation. This alternative would have less ability to withstand storm surges, erosion, and subsidence, because it has the narrowest marsh platform and an overall lower volume of placed material of the alternatives analyzed in depth. Sand fencing, plantings, and monitoring would similarly have no to minor, temporary adverse and moderate long term beneficial effects as the preferred alternative.

Impacts on Aquatic and Benthic Habitats

No Action The quality of aquatic and benthic habitat is expected to decrease as the marsh habitats are converted to open water through erosion and subsidence. Abundant open water habitat is available in coastal Louisiana. An increase in open water habitat comes at the expense of emergent habitats, which are less common and more vulnerable to disturbance. The function of the remaining marsh as producer of organic material in the food chain would continue to degrade.

Alternative 5 - Preferred Alternative Under the preferred alternative, minor, short-term, direct, local, adverse impacts to aquatic and benthic resources would occur during the construction phase of the proposed project. The immediate effect of dredging is the removal of sediment along with the organisms living in the sediment. In addition to direct removal of organisms, impacts could include entrainment and entrapment of slow-moving organisms and polycheates, during dredging in the borrow areas; and smothering of benthic organisms and more sessile aquatic species in the deposition sites. Mobile aquatic animals would be expected to move away from the proposed project area during construction and return after construction is complete. Invertebrates and fish that do not move out of the area would likely be injured as suspended particulates clog gills. Short-term, moderate adverse effects on fish eggs and larvae

in the immediate area may occur. Dredging would change substrate topography, causing a temporary redistribution of organisms in the immediate vicinity.

Benthic organisms would likely recolonize borrow areas. Early-stage recruitment of defaunated sediments occurs rapidly in coastal systems (Grassle and Grassle 1974, McCall, 1977, Simon and Dauer 1977, Ruth and others 1994, all as cited in EPA 2003). Dredged sites would be rapidly colonized by opportunistic infauna (EPA 2003). Later stages of colonization would be more gradual and would depend on environmental conditions after cessation of dredging. Local fish and invertebrate populations would be expected to recover as turbidity returns to pre-construction levels. There is expected to be a low potential for creation of persistent low dissolved oxygen conditions that would impact fisheries and aquatic biota in the borrow and placement areas (Thompson and other 2011, response to comments). The diversity and quality of fish habitat would be greater than with no action over the 20-year life of the preferred alternative.

Sand fencing, plantings, and monitoring would have no discernible effects on aquatic and benthic habitats, as there would be no additional disturbance of these habitats.

Alternative 1 The increased area of construction in this alternative directly corresponds with increased adverse and beneficial impacts compared to the preferred alternative. Longevity and diversity of habitats would be similar to the preferred alternative. Sand fencing, plantings, and monitoring would no discernible effects on aquatic and benthic habitats, as with the preferred alternative.

Alternative 6 Shallow water benthos adverse impacts would be similar to other build alternatives. Benefits to aquatic and benthic habitats may be less lasting in the area north of the project area, since lower elevation beaches would not provide wind and wave protection for as long as with other build alternatives. Sand fencing, plantings, and monitoring would have no discernible effects on aquatic and benthic habitats, as with the preferred alternative.

Impacts on Essential Fish Habitat

No Action The variety and quality of some types of EFH associated with estuarine areas (emergent marsh and estuarine sand bottoms) are expected to continue to decrease as the marsh converts to open-water habitat. Only open-water EFH would increase.

Alternative 5 - Preferred Alternative Long-term, moderate benefits would result from reestablishing marsh and estuarine sand waterbottoms and protecting marsh habitat from erosion that would improve estuarine-related EFH. Marsh and marsh edge habitat would increase with vegetative and hydrological features that develop post-construction. Those features may be initiated from dike gapping and plantings. Increased amounts of detrital material, formed by the breakdown of emergent vegetation, would contribute to the aquatic food web of the surrounding ecosystem. Decreases in tidal and storm erosion would protect estuarine mud bottoms and marsh ponds. Thus, the preferred alternative would restore more productive habitats supportive of brown shrimp, white shrimp, and red drum.

No substantial adverse effects on EFH are expected, because hundreds of acres of similar open water and substrate are available to organisms outside of the proposed areas to be constructed and dredged. Short-term, unavoidable, direct, minor adverse impacts to habitats supportive of various life stages of brown shrimp, white shrimp, and red drum would occur during the construction phase of the proposed project as marsh is filled and created. However, there would be post-construction increases in the quality and quantity of the marsh habitats. Turbidity would return to ambient conditions post-construction. Potential short-term, adverse impacts to EFH include movement of prey species away from the construction and borrow areas, and temporary interruption of feeding or spawning.

Sand fencing and plantings, and monitoring would have no discernible effects on EFH, as there would be no additional disturbance of these habitats.

Alternative 1 The impacts to EFH would not differ substantially from those associated with the preferred alternative, as a greater quality of EFH would be constructed but temporary adverse impacts associated with dredging would occur. Sand fencing, plantings, and monitoring would have no discernible effects on EFH, as with the preferred alternative.

Alternative 6 Temporary, adverse impacts to EFH in the borrow area would be slightly less than for the other build alternatives because less dredging and disturbance of estuarine habitat would occur. However, the long-term benefits would also be less because less increase in quality EFH habitat would be created and maintained. Other impacts to EFH would not differ substantially from those associated with the preferred alternative. Sand fencing, plantings, and monitoring would have no discernible effects on EFH, as with the preferred alternative.

Impacts on Fishery Resources

No Action The quality of fish habitat is expected to decrease as the marsh habitats are converted to open water through erosion and subsidence and the remaining barrier island erodes. The function of the marsh as nursery habitat for estuarine-dependent species would be degraded. Open water habitat is abundantly available in coastal Louisiana; its increase replaces less common habitats that are more vulnerable to disturbance.

Alternative 5 - Preferred Alternative Under the preferred alternative, short-term, minor, direct, local, adverse impacts to fisheries resources would occur during the construction phase of the proposed project. Prey species may be removed in dredging and slow moving fish species or eggs smothered in the deposition sites. Mobile aquatic animals would be expected to move away from the proposed project area during construction and return after construction is complete. Adverse impacts would be localized to the dredge and placement areas.

As benthic organisms would likely re-colonize borrow areas so would their predators, such as fish and larger invertebrates. Early-stage recruitment of defaunated sediments occurs rapidly in coastal systems (Grassle and Grassle 1974, McCall, 1977, Simon and Dauer 1977, Ruth and others 1994, all as cited in EPA 2003). Dredged sites would be rapidly colonized by opportunistic infauna (EPA 2003). Later stages of colonization would be more gradual and would depend on environmental conditions after cessation of dredging. Fish and invertebrates are expected to recover as turbidity returns to pre-construction levels.

Long-term, moderate, direct and indirect beneficial impacts would result from created marsh habitat providing nursery for estuarine-dependent fisheries that does not currently exist and would not exist with the no-action alternative. Access to the marsh habitat would be maintained after construction through dike gapping, if post-construction monitoring indicates it is required, and protected waters in the bay north of the project area would be quality habitat resulting from the created landmass that reduces wind and wave perturbations.

Sand fencing and plantings, and monitoring would have no discernible effects on fishery resources, as there would be no additional disturbance of their habitats.

Alternative 1 An increased longevity of the benefits is expected compared to the preferred alternative though temporary, minor adverse impacts would be greater to fishery resources and aquatic organisms as

well. Fishery resources dependent on estuarine habitats would have greater benefit in the long-term than with the preferred alternative because greater dune width would increase the longevity of the landmass that would provide the quality quiescent bay waters. Sand fencing, plantings, and monitoring would have no discernible effects on fishery resources, as with the preferred alternative.

Alternative 6 The adverse and beneficial impacts on fishery and aquatic resources would be more than with no action, but less than other build alternatives. Less quality fisheries habitat would be created and the smaller marsh would provide less benefit and less longevity of benefits. Adverse impacts to fisheries would be similar to other build alternatives. Sand fencing, plantings, and monitoring would have no discernible effects on fishery resources, as with the preferred alternative.

Impacts on Marine Mammal Resources

No Action With no action, the marsh used by marine mammal forage species, such as small fish, would decline.

Build Alternatives Whales are unlikely to occur in the project area (NMFS 2010). Manatees are rare for this area, so are unlikely to occur, but dolphin are common along the coast of the project area. Dolphins are likely to avoid project areas during construction. They would be temporarily displaced, as would their fish food source. The dolphin would follow the fish populations for feeding and both prey and predator would return shortly after construction. Therefore, the build alternatives have short-term, indirect, minor, adverse impacts. In the long-term, moderate, direct and indirect benefits would result from increasing the quantity and longevity of prey nursery grounds, and refuges. Contractors would be instructed to watch for marine mammals. Should any manatee or dolphin be seen, any workboats in the area would be instructed to cease work until the manatee or dolphin is over 500 ft away, per construction contract clauses that are standard. Additionally, through the Section 404 permitting process, NMFS Protected Resources has included a list of measures for reducing entrapment risk to protected species (Appendix A) that will be followed in the construction process. Sand fencing and plantings, and monitoring would have no discernible effects on marine mammals.

Impacts on Migratory Bird Resources

No Action With no action, the marsh used by migratory birds and their forage species would decline.

Build Alternatives The project area is located in an area where colonial and solitary seabird/shoreline nesting may occur although there are no known and documented historic nesting sites in the project area. Coordination with USFWS was performed through both the Clean Water Act Section 404 permitting process and through USFWS's review of the EA in order to comply with the Migratory Bird Treaty Act (correspondence can be found in Appendix A). USFWS has advised that colonies may be present that are not currently listed in the database maintained by the Louisiana Department of Wildlife and Fisheries (LDWF).

Due to the extended duration of proposed construction activities (and post-construction sand fencing and monitoring activities), it is not possible to conduct all work outside of nesting seasons. Consequently, a qualified biologist will inspect the project area for the presence of undocumented nesting birds and if needed, an abatement plan will be developed in coordination with USFWS and implemented for the duration of project construction. Additionally, the following measures will be implemented to the maximum extent practicable to further minimize potential disturbance to nesting birds:

- For colonies containing nesting brown pelicans, all activity occurring within 2,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 15 through March 31). Nesting periods vary considerably among Louisiana's brown pelican colonies, so it is possible that this

activity window could be altered based upon the dynamics of the individual colony. The LDWF Fur and Refuge Division should be contacted to obtain the most current information about the nesting chronology of individual brown pelican colonies. Brown pelicans are known to nest on barrier islands and other coastal islands in St. Bernard, Plaquemines, Jefferson, Lafourche, and Terrebonne Parishes, and on Rabbit Island in lower Calcasieu Lake, in Cameron Parish.

- For colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present).

- For areas containing isolated or colonial nesting gulls, terns, plovers, and/or black skimmers, all activity occurring within 650 feet of a nest area should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this window depending on species present).

In addition, USFWS recommends that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests, and should avoid affecting them during the breeding seasons specified above.

Impacts on Wildlife Resources

No Action Ducks, furbearer, game mammals, wading birds, and seabirds would continue to decrease in the proposed project area (LCWCRTF and WCRA 1999). No habitat for migratory birds or lesser scaup would be created.

Alternative 5 - Preferred Alternative Direct, minor short-term adverse impacts to marsh and shallow water habitat would result from this alternative. Long-term, minor, direct benefits would result from increased habitat available for wildlife through creation of marsh, dune and beach. During construction, wildlife would avoid the proposed project area due to the noise of equipment. The increased diversity and quantity of habitats would encourage return and recruitment of wildlife from other areas. Sand fencing and plantings would have minor long term beneficial impacts wildlife resources, as there would be some increase in the structural complexity and composition of habitats from these features, and monitoring is expected to temporary minor adverse effects and no discernible long term effects on wildlife resources.

Alternative 1 The temporary disturbance of wildlife during construction would be similar to the preferred alternative. However, long-term benefits of increased diversity of habitat and greater longevity of the land mass would be of greater benefit than for the preferred alternative. Sand fencing and plantings would have minor long term beneficial impacts wildlife resources, as there would be some increase in the structural complexity and composition of habitats from these features, and monitoring is expected to temporary minor adverse effects and no discernible long term effects on wildlife resources.

Alternative 6 Temporary, adverse impacts to wildlife during construction would be similar to the preferred alternative, but long-term benefits would be less than for the preferred alternative. The benefits would be greater than no action by extending the life of the island and associated wildlife habitats. Sand fencing and plantings would have minor long term beneficial impacts wildlife resources, as there would be some increase in the structural complexity and composition of habitats from these features, and monitoring is expected to temporary minor adverse effects and no discernible long term effects on wildlife resources.

Impacts on Threatened and Endangered Species

No Action Without action, indirect, long and short-term adverse impacts would result from the continued conversion of marsh to open water. No marsh or dune habitat would develop. Less habitat would be available for nesting waterbirds as land loss continues. Losses may temporarily increase feeding locations for piping plover as remaining sand and marsh are converted to mud flat. No roosting areas would develop and temporary feeding locations would convert to open water non-feeding areas for the winter piping plover.

Build Alternatives (including preferred alternative) The build alternatives would increase piping plover habitat by creating foraging habitats for a long-term beneficial impact; the marsh creation area and beach face would be sparsely vegetated and would increase the size and longevity of any currently occurring plover habitat. Temporary, moderate, direct impacts to foraging habitat (i.e. unvegetated intertidal areas and wrack line) would result from smothering of the natural wrack and benthic prey from construction till recovery 6 months to 2 years post-construction. During the recovery time, the area would be less suitable for foraging but available for roosting. Minor, indirect, temporary adverse impacts to plover would result from displacement; LDWF observed 12 piping plover in the area from 2007 to 2011, which would be dispersed to the abundance of nearby habitat (e.g., East Grand Terre, Shell Island, and Pelican Island) during construction. If plovers were to roost prior to construction, the USFWS would be contacted for instruction. During construction, the noise and activity would likely prevent plovers from selecting the area. Construction would be temporary (approximately 1 year), in comparison to the increase in plover habitat (5 or more years before marsh areas are fully established).

Because manatees are unlikely, but possible, to occur during construction, contractors would be instructed to be on the lookout for them in summer months and take measures to avoid collision if manatees are encountered. If a manatee were sighted within 100 yards of the active work zone, contractors would be instructed to contact USFWS at 337-291-2100 and LDWF at 225-765-2821 for further guidance. Therefore, no impact is anticipated for manatee.

Informal ESA consultations with both USFWS and NMFS were conducted through the U.S. Army Corps of Engineers Clean Water Act Section 404 permit process for the proposed project. The NMFS concurred with the determination that endangered sea turtles and Gulf Sturgeon are not likely to be adversely affected by the proposed project. Additionally, NMFS Protected Resources has included a list of measures for reducing entrapment risk to protected species (Appendix A) that will be followed in the construction process. For the purposes of the EA, the ESA consultation process was completed with the USFWS on June 7, 2012 and with NMFS Protected Resources through the permitting process on June 6, 2012. Consultation with USFWS will have to be refreshed before commencement of construction, as per their guidance (Appendix A).

Sand fencing and plantings, and monitoring would have no discernible effects on Threatened and Endangered Species, as there would be no additional disturbance of their habitats. Measures would be taken when monitoring would occur on tidal and supratidal habitats to ensure they would not disturb threatened and endangered species.

Cultural Resources

Impacts to Historic, Prehistoric, and Native American Resources

No Action No impacts to cultural resources are expected under the no action alternative. Under the no-action alternative, the shoreline would continue to erode and marshes subside. As with previously

identified cultural resources (NMFS 2011), the continued land loss process leads to resources being increasingly located offshore in deeper waters, assuming any others exist.

Build Alternatives (including preferred alternative) There are no anticipated impacts to cultural resources. Cultural resources in the borrow area vicinity were identified and would be avoided. Sand fencing, plantings, and monitoring would have no effects on cultural resources. The Louisiana State Historic Preservation Office has reviewed the project area and concurred that no archeological or historic resources would be adversely impacted by the proposed project or any of the build alternatives considered. Correspondence from Louisiana State Historic Preservation Office can be found in Appendix A.

Impacts to Socioeconomics

No Action Long-term, indirect, moderate adverse impacts would result from the loss of shrimp habitat and associated losses of income to fisheries in the region are expected because marsh habitats provide essential nursery function to shrimp. This and similar losses to commercial and recreation use of the area could contribute to poverty in the parish, last reported at 20.5 % at Port Sulphur (U.S. Census Bureau 2010).

Build Alternatives (including preferred alternative) The build alternatives would not adversely affect economic resources. Short-term and long-term, minor benefits would result. Under the build alternatives, marshes created in the proposed project area would provide the benefit of forage, nursery, and grow-out sites for a variety of commercially and recreationally important fisheries species. Improvements to marsh habitats are expected to enhance fisheries resources in the immediate area. Increased recreational and commercial fishing would, in turn, positively and indirectly support nearby businesses. Existing oil and gas infrastructure (such as pipelines) would be better protected, and economic activity in the area would continue at present levels or would increase. During construction, a small increase in employment of dredge operators, crewmembers, and other construction-related technicians would occur. Any short-term adverse impacts to oyster leases that may result from the proposed action would be compensated by the state of Louisiana at fair market value. Sand fencing, plantings, and monitoring are typically done by small local contractors, but would likely provide no discernible economic boost to the adjacent communities.

Impacts to Land Use and Infrastructure

No Action Long-term, direct, minor adverse impacts to fishery activities would result as species that rely on marsh habitat decline. This alternative would not immediately affect infrastructure in the area. Infrastructure would continue to increase in vulnerability to storm surge damages concurrent with land erosion and subsidence.

Alternative 5 - Preferred Alternative Long-term, direct benefits would result from the increased quality of finfish, shellfish, and waterfowl habitats; the provision of a storm buffer area; and increased recreation and commercial uses. Short-term, direct, reversible, minor, adverse impacts to land use in the vicinity would result from construction activities. Construction would avoid pipelines and commercial infrastructure.

Dredging and associated activities can affect pipelines if the dredging crosses an active pipeline. Multiple surveys to identify potential areas of pipelines, correspondence with pipeline owners and landowner searches are conducted so this can be avoided by selecting an access route with the least potential to cross pipelines. The access channel for the back dike (primary dike) (Figure 6) was carefully selected in this manner. Pipelines lie on either side and inspectors and contractors would take care to observe safety buffer zones around the located pipelines as well as any crossings.

Sand fencing, plantings, and monitoring would have no effects on land use and infrastructure.

Alternative 1 Impacts both adverse and beneficial to land use/recreation would be similar to the preferred alternative. Sand fencing, plantings, and monitoring would have no effects on land use and infrastructure.

Alternative 6 The benefits would not be as long lasting, because the created habitat would erode more quickly than with the preferred alternative. Sand fencing, plantings, and monitoring would have no effects on land use and infrastructure.

Impacts to Hazardous, Toxic, and Radioactive Waste
No Action There are no hazardous, toxic, or radioactive waste concerns.

Build Alternatives (including the preferred alternative) There are no anticipated impacts to hazardous, toxic and radioactive waste sites associated with any build alternative.

Impacts to Noise
No Action The no-action alternative would not cause any change to the existing noise conditions in the proposed project area.

Build Alternatives (including preferred alternative) Under the build alternatives, short-term, minor adverse impacts through the increase in noise associated with construction equipment would occur. No long-term changes in ambient noise levels would result from the build alternatives, as noise-producing equipment would vacate the area after construction. While the construction duration for Alternative 1 would likely be longer, and the duration for Alternative 6 would likely be shorter, than the preferred alternative, the relative effects given the project location are relatively functionally unquantifiable.

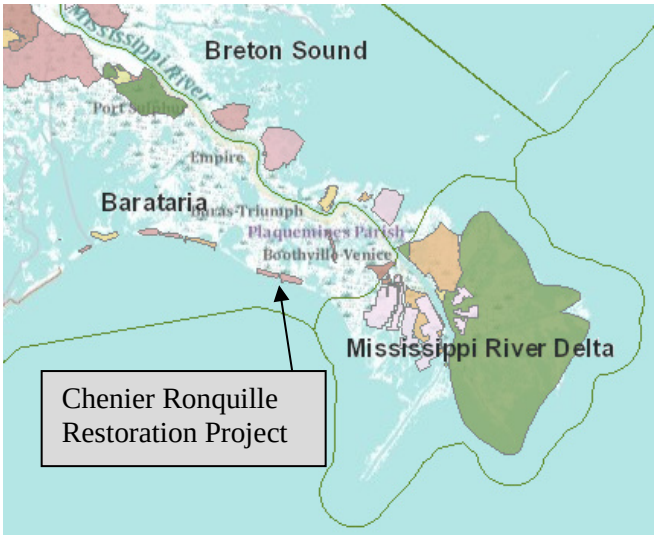
Other Considerations
Oil and gas pipelines are densely located in and around the proposed project area, so special attention was given to locating these and identifying or contacting the owners to coordinate safe access to the proposed project site (Thompson and others 2011 table 4, pg 19). Given the inherent risk and danger, numerous magnetometer studies are performed to locate these by the design team and by the construction contractor and to minimize interaction by choosing the designs that best avoid potential interactions. Construction BMPs are in place to best respond in the case of an active line breach and pipeline owners are notified in advance of active work adjacent to the lines. In many years of work, no active pipelines have been breached in CWPPRA projects.

Cumulative Impacts
Direct and indirect impacts of past, present, and reasonably foreseeable future events were considered in the analysis of the proposed project consequences. This analysis was considered basin-wide and over the past 20 years. These impacts include historical and predicted future land loss rates for the area and other restoration projects in the vicinity. The preferred alternative would have temporary adverse impacts to some environmental resources but cumulative benefits to the environmental resources.

The coastal habitats and associated resources of Louisiana, including the project area, have been greatly impacted by natural subsidence (Reed and Yuill 2009), levees, hurricanes, and oil and gas infrastructure. Recent events, particularly hurricanes, contribute to the loss of habitat but not enough to be discernible from other impacts.

Though CWPPRA projects are nominated and implemented one at a time and must have individual merit, the cumulative value of all wetland restoration and protection projects in an area can far exceed the summed values of the individual projects. Similar wetland restoration projects in the area would operate with the preferred alternative to enhance the structural and functional integrity of the ecosystem, improve primary productivity rates, and thereby improve the overall environmental resources.

FIGURE 13. CWPPRA PROJECTS IN THE PROJECT VICINITY



Shaded areas of Figure 13 identify individual CWPPRA projects. Since CWPPRAs inception, 151 coastal restoration or protection projects have been authorized, benefiting over 110,000 acres in Louisiana. Information on similar and nearby CWPPRA projects in the vicinity is available at www.lacoast.gov.

Physical cumulative impacts of this and other restoration projects are to slow the land loss rate in coastal Louisiana. Currently, land loss is at an average rate of an acre every 38 minutes. If the current rate of loss is not slowed by the year 2040, an additional 800,000 acres of wetlands will convert to open water.

Physical cumulative adverse impacts are related to mining borrow sediments. Borrowing from offshore for the proposed project and for other CWPPRA projects is not expected to have any long-term adverse cumulative impacts. Cumulative impacts as a result of disposal would be minimal, temporary, and localized to the dredging and disposal sites.

The cumulative impact of the proposed action on air and water quality, when considered in addition to other CWPPRA projects, would not differ substantially from the effects of the alternatives considered individually. Air quality would be temporarily and locally affected during construction of each of the projects. Short-term, localized increases in turbidity would result from all of the projects, but these impacts are considered to be localized and short-term because projects would not co-occur in space or time. The cumulative beneficial impact to water quality would be a long-term increase in quality by increasing marsh and decreasing turbidity.

Biological cumulative impacts of all the CWPPRA and other restoration projects would be similar to the direct and indirect impacts of the alternatives described previously. All alternatives, except the no-action alternative, would work with existing projects to enhance habitat for fish, wildlife, vegetation, and EFH. Cumulatively, all build alternatives would increase benefits to the area by decreasing land loss rates. No cumulative adverse impacts are anticipated from the proposed project, other CWPPRA projects, and other habitat restoration projects.

Cumulative beneficial impacts to socio-economic resources would result from synergy of the build alternatives with nearby restoration projects. These projects would cumulatively decrease losses of habitat, thereby benefiting the local economy and providing improved storm protection when compared with no action. The build alternatives are similar to previous restoration actions in coastal Louisiana that have had no adverse cultural impacts. No adverse cumulative impacts to cultural resources would be expected to result from implementation of the proposed alternative.

Invasive Species

Executive Order 13112 requires federal agencies to use authorities to prevent introduction and control (in cost effective and environmentally sound manners) invasive species, and to provide for restoration of native species and habitats in ecosystems that have been invaded. There is little potential to introduce novel invasive species to the project area. Given the number of barges and boats transiting the oceans waters and the Nation's waterways daily, and the frequency of use of these vessels in the area for similar purposes, the biofouling source from dredges would represent an insignificant increase in invasive species introduction potential. Additionally, only nursery using local seeds and vegetative matter sources for plantings are utilized, so as to not introduce non-native phenotypes.

Coordination

Coordination in development of the proposed action, its alternatives and selection of the preferred alternative has been maintained with each CWPPRA Task Force agency. The proposed project was vetted publicly through the CWPPRA process, which includes opportunities for the public and CWPPRA agencies to comment on the proposed project. The proposed project was discussed in public meetings for CWPPRA where proposed project details were made available on several occasions. A draft of this EA was provided to those listed herein, as well as made available for public comment. No public comments were received. Agency comments that were received are provided in Appendix A. The preferred alternative is not expected to cause adverse environmental impacts that would require compensatory mitigation through the permit review process (e.g. Section 404).

Compliance with Laws and Regulations

This section presents a review of the potentially applicable laws and regulations that govern this proposed restoration project, and describes the measures taken to ensure compliance with all relevant laws and regulations. Many federal, state, and local laws and regulations were considered during development of the proposed restoration project, as well as several regulatory requirements that are typically evaluated during the permitting process. A brief review of potentially applicable laws and regulations that may pertain to this proposed project is presented below. The project manager would ensure that there is coordination among these programs where possible and that project implementation and monitoring are in compliance with all applicable laws and regulations.

National Environmental Policy Act of 1969 NEPA was enacted in 1969 to establish a national policy for the protection of the environment. The CEQ was established to advise the President and to carry out certain other responsibilities relating to implementation of NEPA by federal agencies. Pursuant to Presidential Executive Order, federal agencies are obligated to comply with NEPA regulations adopted by the CEQ (40 CFR Parts 1500-1508). These regulations outline the responsibilities of federal agencies under NEPA and provide specific procedures for preparing environmental documentation to comply with NEPA.

Clean Water Act (CWA) The CWA is the principal law governing pollution control and water quality of the nation's waterways. It requires the establishment of guidelines and standards to control the direct or indirect discharge of pollutants to waters of the United States. Discharges of material into navigable waters, including wetlands, are regulated under Sections 401 and 404 of the CWA. The USACE has the primary responsibility for administering the Section 404 permit program. Under Section 401 of the CWA, projects that involve discharge or fill to wetlands or navigable waters must obtain certification of compliance with state water quality standards. The preferred alternative was permitted under Section 404 on November 7, 2012 under permit number MVN 2011-03148-ETT. Included in Appendix A are clearances or specific guidance as a result of the permit process, including: no objection from NMFS Habitat Conservation Division regarding permit issuance dated January 13, 2012, measures from the USFWS on avoiding impacts to ESA listed species and migratory birds from January 25, 2012, clearance

of water quality from the State of Louisiana Department of Environmental Quality from February 12, 2012, and a letter from NMFS Protected Resources Division including Sea Turtle and Smalltooth Sawfish Construction Conditions and Measures for Reducing Entrapment Risk to Protected Species dated June 6, 2012.

Clean Air Act of 1970 Under the Clean Air Act of 1970, Congress established procedures for developing National Ambient Air Quality Standards (NAAQS) for the protection of human health and public welfare. EPA published the NAAQS in 1971, and they became effective at that time. Standards are provided for the following criteria pollutants: carbon monoxide, sulfur dioxide, nitric oxide, ozone, lead, and fine particulate matter.

Coastal Zone Management Act The Coastal Zone Management Act (CZMA) provides for protection of resources found in the coastal zone, proactive land management practices, and preservation of unique coastal resources. Included in the CZMA is the requirement that all federal actions within the coastal zone of Louisiana must be consistent with the federally approved State of Louisiana Coastal Resource Management Plan. The State of Louisiana has concurred that the proposed project is consistent with Louisiana's federally-approved Coastal Management Plan. Concurrence from the State of Louisiana that this project is consistent with the CZMA can be found in Appendix A.

Executive Order 11990, Protection of Wetlands The intent of Executive Order 11990, Protection of Wetlands, is to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support for new construction in wetlands whenever there is a practicable alternative.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs that the programs of federal agencies identify and address disproportionately high and adverse effects on human health and the environment of minority or low-income populations.

The Endangered Species Act of 1973 (ESA) The ESA directs all federal agencies to conserve endangered and threatened species and their habitats and encourages such agencies to utilize their authorities to further these purposes. Under the Act, NMFS and USFWS publish lists of endangered and threatened species. Section 7 of the act requires that federal agencies consult with these agencies to minimize the effects of federal actions on endangered and threatened species. NOAA has, through both the NEPA and CWA Section 404 interagency review processes, coordinated with both USFWS and NOAA regarding endangered species. Both USFWS and NMFS have concurred with the determination that the proposed action is not likely to adversely affect federally-listed species or associated critical habitat. Therefore, a formal ESA Section 7 consultation is not required. Correspondence can be found in Appendix A.

Migratory Bird Treaty Act of 1918 (MBTA) The MBTA requires the protection of all migratory bird species and protection of ecosystems of special importance to migratory birds against detrimental alteration, pollution, and other environmental degradation. Coordination under MBTA is generally incorporated into Section 404 of the CWA, NEPA, or other federal permit, license or review requirements. Concurrence of conclusion of both ESA and MBTA requirements with USFWS for the preferred alternative was received via letter dated June 7, 2012 and can be found in Appendix A.

Fish and Wildlife Coordination Act The Fish and Wildlife Coordination Act requires agencies to consult with the USFWS, NMFS, and appropriate state agencies, prior to modification of any stream or other body of water, to ensure conservation of wildlife resources. Compliance with the FWCA is

integrated into the USACE interagency review process under Section 404 of the CWA as well as through the NEPA review process.

Archeological and Historic Preservation Act of 1974 The Archeological and Historic Preservation Act of 1974 states that, if an activity may cause irreparable loss or destruction of significant scientific, prehistoric, historic, or archeological data, the responsible agency is authorized to undertake data recovery and preservation activities, in accordance with implementing procedures promulgated by the Secretary of the Interior.

National Historic Preservation Act of 1966 The National Historic Preservation Act of 1966, as amended in 1992, requires that responsible agencies taking action that affects any property with historic, architectural, archeological, or cultural value that is listed on or eligible for listing on the National Register of Historic Places (NRHP) comply with the procedures for consultation and comment issued by the Advisory Council on Historic Preservation. The responsible agency also must identify properties affected by the action that are potentially eligible for listing on the NRHP, usually through consultation with the state historic preservation officer. The Louisiana State Historic Preservation Office concurred on March 20, 2011 that no archeological or historic resources would be adversely impacted by the proposed project. Concurrence from Louisiana State Historic Preservation Office can be found in Appendix A.

Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) In 1996, the act was reauthorized and changed by amendments to require that fisheries be managed at maximum sustainable levels and that new approaches be taken in habitat conservation. EFH was defined broadly to include "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (62 Fed. Reg. 66551, § 600.10 Definitions). The act requires consultation for all federal agency actions that may adversely affect EFH. Under Section 305(b)(4) of the act, NMFS is required to provide advisory EFH conservation and enhancement recommendations to federal and state agencies for actions that adversely affect EFH. NMFS provided a letter indicating their review of this EA on October 5, 2012 and concurrence with the assessment of no long-term adverse impacts to EFH under the proposed alternative through the permitting process on January 13, 2012. Correspondence on this can be found in Appendix A.

CONCLUSIONS

Adverse environmental consequences of the no-action alternative are in contrast with the benefits of the preferred alternative. With no action, continued loss of marsh habitats likely would occur along with associated declines in the quality of fish and wildlife resources. The preferred alternative would provide long-term benefits to these habitats.

The natural processes of subsidence, habitat switching, and erosion of wetlands have been exacerbated by widespread human alterations of sediment delivery and other processes, resulting in marked degradation of the Louisiana coastal area. Without intervention to retard or reverse the loss of marshes and barrier islands, Louisiana's healthy and highly productive coastal ecosystem would not be maintained.

This EA finds that the Chenier Ronquille Barrier Island Restoration Project would have long-term beneficial impacts on the coastal resources of south Louisiana and would not result in any substantial long-term adverse environmental impacts. Construction-related adverse impacts are considered minor, short-term and not substantial because they are temporary or reversible. Positive impacts would be moderate. This conclusion is based on a comprehensive review of relevant literature, site-specific data, and project-specific engineering reports related to biological, physical, and cultural resources, as well as on the cumulative experience gained through many similar coastal restoration projects in south Louisiana

over the past decade. The increase of available habitat that benefits fishery resources is expected to have long-term beneficial impacts on the local economy and culture as it relates to improved recreational and commercial fishing.

PREPARERS

This EA was prepared by Biologists Joy Merino, Rachel Sweeney, Cecelia Linder, John Foret, Ph.D, and Phillip Parker, P.E. of NMFS in consultation with USFWS, Louisiana SHPO, and the CWPPRA Technical Committee. Correspondence is provided in Appendix A.

DISTRIBUTION LIST

This EA was distributed for comment to agencies of the CWPPRA Task Force and resource agencies as listed below. A 30-day comment period was provided. A draft EA was available for public review. This final EA will be made available to the public at www.lacoast.gov along with other public records for the project. This EA was distributed to:

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