November 2013

FINAL SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

FOR THE ISSUANCE OF A NON-COMPETITIVE NEGOTIATED AGREEMENT FOR THE USE OF OUTER CONTINENTAL SHELF SAND RESOURCES FOR CAMINADA HEADLAND BEACH AND DUNE RESTORATION – INCREMENT 2 (BA-143)

LAFOURCHE AND JEFFERSON PARISHES, LOUISIANA

PREPARED FOR:
UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF OCEAN ENERGY MANAGEMENT

ON BEHALF OF:

Coastal Protection and Restoration Authority of Louisiana
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November 18, 2013

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

Section **Page**

TABLE OF CONTENTS (cont'd)

Section **Page**

LIST OF TABLES

Table Number **Page**

LIST OF FIGURES

Figure Number **Page**

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Louisiana Coastal Protection and Restoration Authority (CPRA) has submitted a request to the Department of Interior's Bureau of Ocean Energy Management (BOEM) to dredge as much as 6.1 million cubic yards (mcy) of Outer Continental Shelf (OCS) sand resources to restore the eastern portion of the Caminada Headland, one of the most rapidly eroding shorelines in the Nation. The borrow area is located in two OCS lease blocks, South Pelto Blocks 13 and 14, at the eastern end of the Ship Shoal sand body. The United States Government, and specifically, BOEM has sole jurisdiction over all mineral resources on the Federal OCS. The U.S. Army Corps of Engineers (USACE) issued a Section 10/404 permit on August 29, 2013 and is the lead Federal agency for regulating activities in state waters and the terrestrial portion of the Caminada Headland Beach and Dune Restoration Increment 2 (Caminada Increment 2) Project (BA-143). The BOEM and USACE are working collaboratively in consultation with other state and Federal agencies under the National Environmental Policy Act (NEPA) and other relevant Federal Acts.

The CPRA intends for the design and construction of Caminada Increment 2 to serve as a portion of the State of Louisiana cost share towards the design and construction of the Barataria Basin Barrier Shoreline Restoration Study (BBBS Project). The BBBS Project was identified as a critical near-term restoration project in the *Louisiana Coastal Area, Louisiana Ecosystem Restoration Study Report* (2004) and was authorized under the Water Resources Development Act of 2007. The Final Integrated Construction Report and Final Environmental Impact Statement for the BBBS Project was completed in March 2012 and completed public, state and agency review in April 2012. A Report of the Chief of Engineers for the BBBS Project was signed on June 22, 2012 and a Record of Decision was signed in March 2013.

The Final Environmental Assessment (EA) for Caminada Increment 1 (BOEM 2012) was completed in June 2012. The Finding of No Significant Impact (FONSI) for Caminada Increment 1 was signed on June 27, 2012. The purpose of this Supplemental EA is to determine if there are significant new circumstances or information bearing on the proposed actions or their impacts that were not addressed in the Caminada Increment 1 EA. This Supplemental EA for Caminada Increment 2 incorporates by reference the entire June 2012 Caminada Increment 1 EA.

Caminada Increment 1 involved dredging as much as 5.2 mcy of sand from a 219.7-acre South Pelto borrow area for placement along 31,000 linear feet of shoreline to create approximately 473.2 acres of continuous beach and dune habitat on the western portion of the Caminada Headland from Belle Pass eastward to Bayou Moreau. Construction of the Caminada Increment 1 project began in June 2013.

Caminada Increment 2 involves dredging as much as 6.1 mcy of sand from the 305.0-acre South Pelto borrow area for placement along 38,500 linear feet of shoreline to create approximately 482 acres of continuous beach and dune habitat on the Caminada Headland from Bayou Moreau eastward to Caminada Pass. Originally, the Caminada Increment 2 project did not plan to construct the dune fill along the 10,500-foot easternmost portion of the template due to the presence of healthy dune along this section of the shoreline.

However, on August 29, 2012, Hurricane Isaac made a second Louisiana landfall just west of Port Fourchon, resulting in significant shoreline erosion, breaching of the existing headland, and overwash causing the headland to roll back to the north. A post-storm topographic and bathymetric survey was conducted in November 2012 to determine the post-hurricane location of the existing dune along the headland. The beach and dune fill template was evaluated for the optimal position on the post-storm profile and reconfigured northward to minimize the volume of sediment required to construct the fill template to its original design criteria and avoid direct impacts to existing vegetated intertidal habitat. The fill template was reconfigured northward approximately 210 ft on the western quarter where the highest migration occurred and transitioned to a northward shift of approximately 80 ft in the western second quarter of the fill template. The fill template remained primarily in its original position on the third quarter to avoid impacts to existing vegetated intertidal habitat. No additional impacts to intertidal vegetation would occur beyond those previously permitted. Prior to Hurricane Isaac, a dune feature from a prior restoration effort was present along the fourth quarter (eastern end) of the project. The currently permitted fill template design incorporated the dune feature along this segment by constructing a beach-only component on the gulfward side. Subsequent to the hurricane, this existing dune feature had been overwashed and almost completed diminished. A beach and dune fill extension was developed to enable a continuation of the reconfigured beach and dune fill template to be extended along this segment. The resulting modification to the project will not affect the borrow area located in two South Pelto OCS lease blocks.

Caminada Increment 2 was originally scheduled to construct 84 acres of beach and dune habitat along 8,500 linear feet of shoreline within the Caminada Increment 1 template adjacent to Belle Pass. This additional 84 acres was previously included in the western portion of Fill Template 4 described in the 2012 Caminada Increment 1 EA (BOEM 2012) and was permitted under the Caminada Increment 1 project and is not shown on the figures in this report. However, after the Caminada Increment 1 project was successfully bid in January 2013 with the awarded bid less than the available funds for construction of Caminada Increment 1, it was decided that the remaining available construction funds would allow the western segment of the Caminada Increment 2 to be constructed. Because the Caminada Increment 1 construction fill template originally began approximately 7,000 ft from the Lower Belle Pass Pump-Out Area during construction, it was a natural progression to construct this western segment during construction of Caminada Increment 1.

Due to the changes described above, a number of details regarding excavation and fill for the Caminada Increment 2 project were revised from the initial permit application. The revised project details from the initial permit for Caminada Increment 2 to the current version are shown in the table below. Excavation of the Upper and Lower Belle Pass Pump-Out Areas were permitted under the Caminada Increment 1 project. Issuance of the Caminada Increment 1 permit eliminated the need for separate permitting under Caminada Increment 2 and excavation of these pump-out areas was removed from the permit amendment request.

	Initial Permit	Amended Permit
Area Created/Restored	448 acres	482 acres
South Pelto Borrow Area	305 acres	
South Pelto Borrow Area Fill Volume	up to 6.1 mcy	
Project Length	38,500 lf	
Proposed Fill (Beach and Dune)	5,034,121 cy	6,097,028 cy
Proposed Excavation South Pelto	6,100,000 cy	
Proposed Excavation Pump Outs	up to 168,700 cy	0 cy

Because sand is a limited resource in coastal Louisiana, the contractor for the Caminada Increment 2 Project is required to exhaust the suitable sediment within the Caminada Increment 1 borrow area at South Pelto prior to excavating any of the Caminada Increment 2 borrow area at South Pelto.

The borrow area design volume for Caminada Increment 2 is estimated to be 6.1 mcy of sand. The preliminary borrow area plan covers 305 acres with an average cut depth to −43 feet NAVD88 with a 2-foot allowable overdredge (−45 feet NAVD88). Hopper and/or cutterhead dredges could be used depending on the contractor. Excavated sand would be discharged into the hopper hulls or scow barges for transport to the headland. Hopper dredges would suspend the sand within the hoppers and directly pump out the sand to the headland using a booster pump and sediment pipeline. Alternatively, a conventional cutterhead dredge would excavate the sand mechanically using a rotating cutter, then use a large suction pump to pump sand to the surface, then transfer sand through a spider-barge distribution system into multiple scow barges. These scow barges would be towed to a pump-out area where a hydraulic dredge connected to a booster pump and sediment pipeline would offload the scows and pump the sand to the headland.

Sediment pipelines would be floated and/or placed on the Belle Pass channel bottom, laid on the beach, or on existing access roads; therefore, conveyance corridors would not require dredging or excavation for sediment pipeline installation. No sediment transport pipelines would be placed on the OCS. One additional offshore pump-out area (Offshore 3) in State waters could be used to convey sand from the hopper dredges or scow barges to the headland.

The Caminada Increment 2 project and the No-Action Alternative were evaluated for their effects on environmental resources. The physical, biophysical, critical biological, cultural, and socioeconomic and human resources were evaluated for direct, indirect, and cumulative effects. The project has either no negative effects or minor and short-term effects on these resources. As such, the cumulative effects are minor as well. Generally, the mid-term effects were positive in that the headland and associated habitats would be restored and preserved. The project would provide habitat for all forms of fish and wildlife, as well as affording the infrastructure, including Port Fourchon, an increased level of storm protection. Certain procedures were incorporated into the project to reduce the effects on some of these resources. A bird abatement program was included to reduce impacts to avian communities, including shore birds (including the piping plover, which has critical habitat designated on the headland) and colonial nesting birds. Benthic communities at the headland and the South Pelto Blocks 13 and 14 Borrow Area would be

affected for six months to three years. There would also be a potential for incidental takes of sea turtles during dredging operations if hopper dredges are employed, despite the implementation of all possible precautions (e.g., use of turtle exclusion devices, observers, relocation trawling, etc.) to avoid, minimize, and reduce any such impacts.

FINAL SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

FINAL SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT CAMINADA HEADLAND BEACH AND DUNE RESTORATION – INCREMENT 2

LAFOURCHE AND JEFFERSON PARISHES, LOUISIANA

1.0 INTRODUCTION

The Louisiana Coastal Protection and Restoration Authority (CPRA) has submitted a request to the Department of Interior's Bureau of Ocean Energy Management (BOEM) to dredge as much as 6.1 million cubic yards (mcy) of Outer Continental Shelf (OCS) sand resources to restore the eastern portion of the Caminada Headland.

The borrow area is located in two OCS lease blocks, South Pelto Blocks 13 and 14, at the eastern end of the Ship Shoal sand body (Figures 1-1, 1-2), beyond the State of Louisiana's jurisdictional boundary. The United States Government, and specifically, BOEM has sole jurisdiction over all mineral resources on the Federal OCS. Public Law 103-426, enacted 31 October 1994, gave the Department of Interior the authority to convey, on a non-competitive basis, the rights to OCS sand, gravel, or shell resources for shore protection, beach, or wetlands restoration projects, or for use in construction projects funded in whole or part or authorized by the Federal government. Following an environmental evaluation of the total project (including the sediment conveyance and fill area) as required by the National Environmental Policy Act (NEPA), the BOEM may issue non-competitive negotiated agreements for the use of OCS sand to the requesting entities. The U.S. Army Corps of Engineers (USACE) issued a Section 10/404 permit on August 29, 2013 and is the lead Federal agency for regulating activities in state waters and for the terrestrial portion of the Caminada Headland Beach and Dune Restoration–Increment 2 (Caminada Increment 2) Project. The BOEM and USACE are working collaboratively for consultation with other state and Federal agencies under NEPA and other relevant Federal acts.

The Caminada Headland Beach and Dune Restoration Project–Increment 1 (Caminada Increment 1) Project involved placement of approximately 3 mcy of sand to create beach and dune along 31,000 feet of shoreline. The Final Environmental Assessment (EA) for Caminada Increment 1 (BOEM 2012) was completed in June 2012 and the Finding of No Significant Impact (FONSI) was signed on June 27, 2012. The purpose of this Supplemental EA is to determine if there are significant new circumstances or information bearing on the proposed actions or their impacts that were not addressed in the Caminada Increment 1 EA. This Supplemental EA for Caminada Increment 2 incorporates by reference the entire June 2012 Caminada Increment 1 EA.

A Coastal Zone Management (CZM) consistency determination is required from the Louisiana Department of Natural Resources (LDNR) on BOEM-authorized OCS activities. Additionally, a Water Quality Certification from the Louisiana Department of Environmental Quality (LDEQ) is required. Federal agency consultations with the U.S. Fish and Wildlife Service (USFWS), the

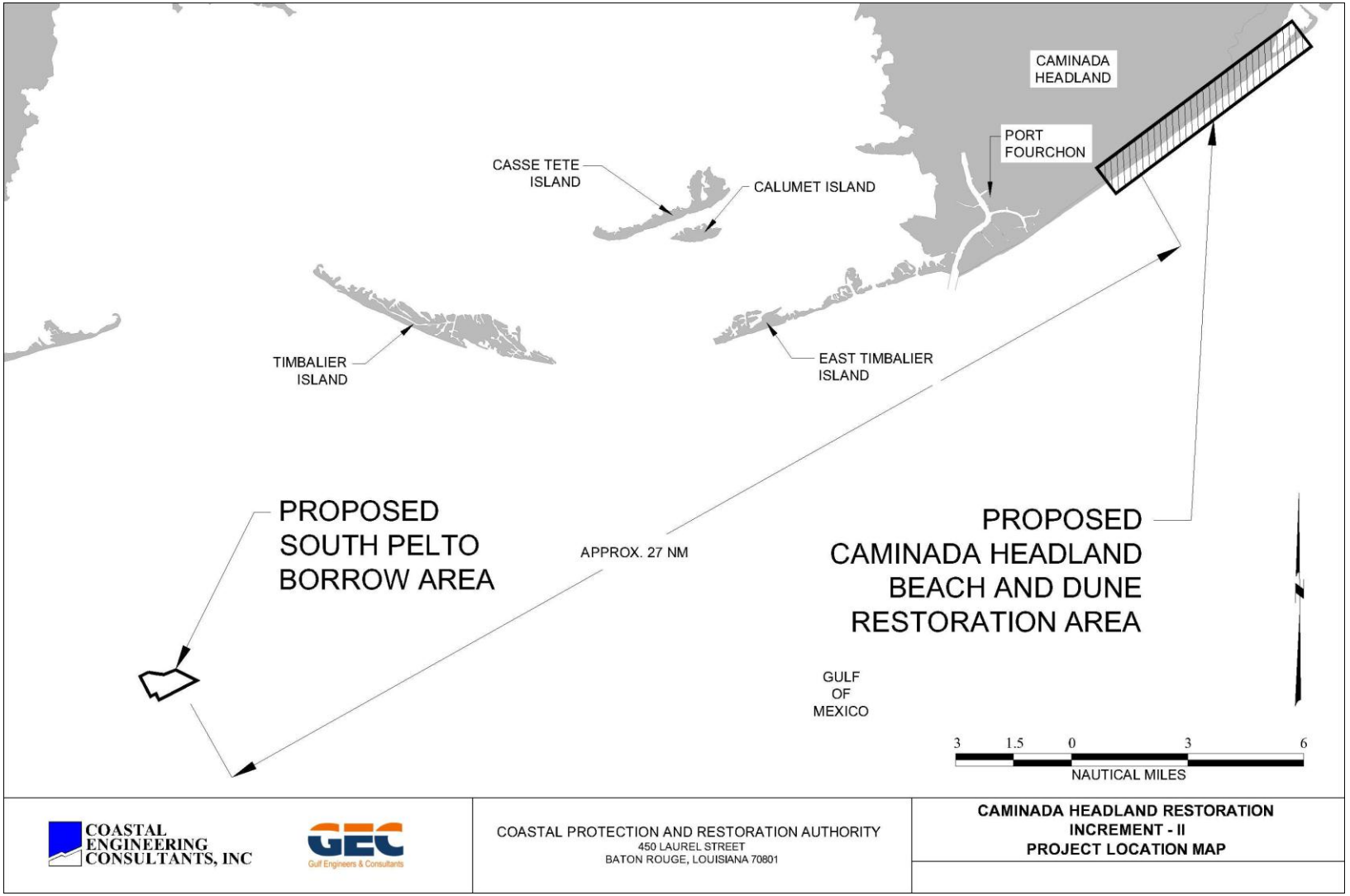

Figure 1-1. Increment 2 Project Location Map

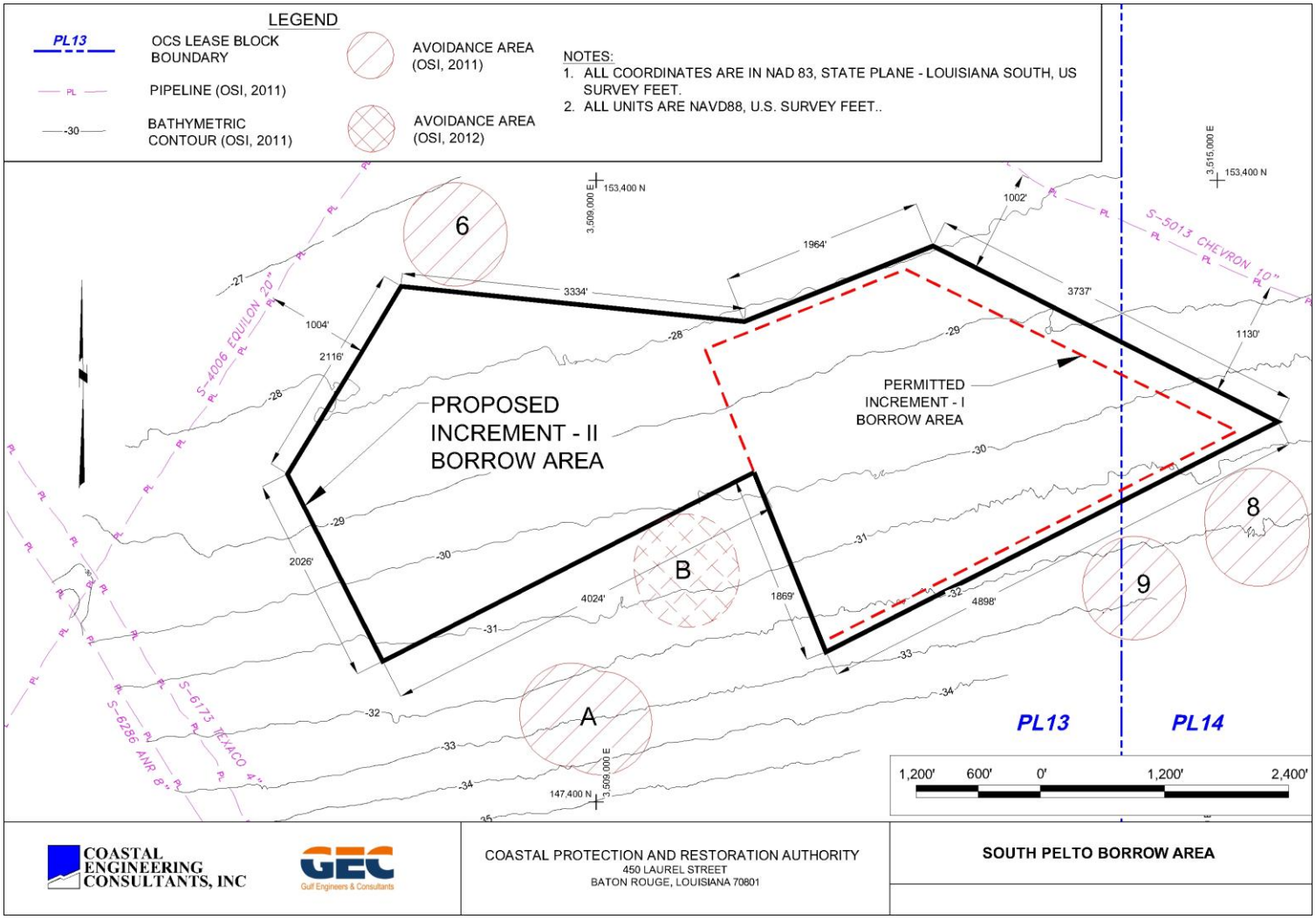

Figure 1-2. Increment 2 South Pelto Borrow Area

National Marine Fisheries Service (NMFS), and the U.S. Environmental Protection Agency (EPA) will be accomplished through the USACE Section 10/404 regulatory process. Compliance with other environmental requirements is presented in Section 6.0.

The goal of Caminada Increment 2 is to protect and preserve the integrity of the barrier shoreline of the eastern portion of the Caminada Headland that was not constructed under Caminada Increment 1.

1.1 PROJECT LOCATION

Caminada Increment 2 extends from Bayou Moreau eastward to Caminada Pass in Lafourche and Jefferson Parishes, Louisiana. The borrow area is located in two OCS lease blocks, South Pelto Blocks 13 and 14, at the eastern end of the Ship Shoal sand body, approximately 27 nautical miles southwest of the Caminada Headland (Figures 1-1, 1-2).

1.2 PROJECT HISTORY

The CPRA intends for the design and construction of Caminada Increment 2 to serve as a portion of the State of Louisiana cost share towards the design and construction of the Barataria Basin Barrier Shoreline Restoration Study (BBBS Project). The BBBS Project was identified as a critical near-term restoration project in the *Louisiana Coastal Area*, *Louisiana Ecosystem Restoration Study Report* (2004) and was Federally authorized under the Water Resources Development Act of 2007. The final integrated construction report and final environmental impact statement for the BBBS Project was completed in March 2012 and completed public, state and agency review in April 2012. A Report of the Chief of Engineers for the BBBS Project was signed on June 22, 2012 and a Record of Decision was signed in March 2013.

1.3 PROJECT PURPOSE AND NEED

The purpose of Caminada Increment 2 is to restore the beach and dune on the eastern portion of the Caminada Headland barrier shoreline. The Caminada Headland is one of the most rapidly eroding shorelines in the Nation, with average rates of 35–55 ft/year during the past century (Martinez et al. 2009). OCS sand from South Pelto Blocks 13 and 14, at the eastern end of the Ship Shoal sand body, will be utilized for the restoration project, introducing new sand to the sand-starved coastal system that extends laterally beyond the project area.

Restoration will ensure the continuing geomorphic, hydrologic, and ecologic form and function of the landscape, providing protection to commercial, public, and private infrastructure from increased exposure to storms and wave energy associated with continued shoreline retreat and breaching. Beaches provide a unique habitat for invertebrate species and many important birds, reptiles, and other animals which nest, breed, feed, and rest on the dunes or open beach. Beaches are an important ecosystem that links the ecology of sand dunes, the surf zone, intertidal zones, and nearshore waters. Coastal dunes are an integral part of the coastal environment, providing storm protection and are the basis of important ecosystems supporting valuable communities of plants and animals. The project will create beach and dune habitat and protect and maintain

function of the vast interior wetland and estuarine habitat of the Barataria-Terrebonne National Estuary. The presence of barrier islands and headlands at the mouth of bays enhances residence time by restricting water exchange with the shelf; provides storm surge, wind, and wave action protection to wetlands; modifies currents and salinity within the bay system; and controls the area of the inner bay and marsh. The shape and resilience of barrier islands directly relates to the amount of sediment that reaches the coast and the physical processes that distribute it. The sand infusion at the headland will ultimately benefit downdrift barrier islands to which the headland serves as an erosional sand source.

The project will also protect primary infrastructure that includes the only evacuation route for the Caminada Headland and Grand Isle (La. Hwy. 1), as well as Port Fourchon and related petroleum storage and transport facilities, including the Fourchon Booster Station, the onshore component of the Louisiana Offshore Oil Port (LOOP) which supplies oil to the Clovelly Dome Storage Terminal. Crude oil from the LOOP can be pumped to nearly 50 percent of the nation's refining capacity through other pipelines connected to the terminal. These oil facilities are located on the inland portion of the headland. Port Fourchon supports 75 percent of the deepwater oil and gas production in the Gulf of Mexico as the point of departure for crew boats, equipment and supplies, rig components, and oilfield services.

1.4 DESCRIPTION OF THE INCREMENT 2 PROPOSED ACTION

1.4.1 Increment 2 Fill Template

Caminada Increment 1 involved dredging as much as 5.2 mcy of sand from a 219.7-acre South Pelto borrow area for placement along 31,000 linear feet of shoreline to create approximately 473.2 acres of continuous beach and dune habitat on the western portion of the Caminada Headland from Belle Pass eastward to Bayou Moreau.

Caminada Increment 2 would place sand dredged from the South Pelto borrow area along 38,500 linear feet of shoreline to create approximately 482 acres of continuous beach and dune habitat on the eastern portion of the Caminada Headland from Bayou Moreau eastward to near Caminada Pass (Figure 1-3).

The estimated fill volume for beach and dune construction is approximately 4.06 mcy. Estimated construction tolerance volumes area approximately 541,240 cy for construction compaction and settlements and approximately 790,450 cy for the gulfward beach slope. The total estimated fill volume is 5.40 mcy. The anticipated cut to fill factor is 1.13; thus, the total volume requirement is approximately 6.1 mcy. The available volume in the borrow area is 6.1 mcy. The Caminada Increment 2 borrow area encompasses the previously permitted Caminada Increment 1 borrow area, which will be excavated first and is anticipated to have a surplus of material.

The dune will be constructed at a target elevation of +7 ft. NAVD88, with fore- and back-slopes of 1V:20H and a typical width of over 350 ft (Figures 1-4, 1-5). The target elevation of the beach will be +4.5 ft. NAVD88. A construction tolerance of one foot is proposed to account for consolidation and settlement of the fill. A 1:40 slope tolerance from mean low water seaward is

proposed to account for construction, sediment variability, and profile adjustment. Pump-out area sediment would be placed beneficially along the headland at or below mean high water within the beach and dune fill template (Figure 1-6).

1.4.2 Increment 2 Borrow Area

The borrow area design volume for Caminada Increment 2 is estimated to be 6.1 mcy of sand (Figure 1-2). The preliminary borrow area plan covers 305 acres with an average cut depth to −43 feet NAVD88 with a 2 ft allowable overdredge (−45 feet NAVD88). The total volume of the combined Caminada Increment 1 and 2 borrow areas (Figure 1-2) is approximately 11.1 mcy of sand with a surface area of approximately 525 acres. The sand body encompasses approximately 85,000 acres (Michael Miner, BOEM, pers. comm., 2012). This combined area equates to approximately 0.6 percent of the total Ship Shoal sand body surface area.

Due to the changes described above, a number of details regarding excavation and fill for the Caminada Increment 2 project were revised from the initial permit application. The revised project details from the initial permit for Caminada Increment 2 to the current version are shown in Table 1-1. Excavation of the Upper and Lower Belle Pass Pump-Out Areas were permitted under the Caminada Increment 1 project. Issuance of the Caminada Increment 1 permit eliminated the need for separate permitting under Caminada Increment 2 and excavation of these pump-out areas was removed from the permit amendment request. The resulting modification to the project will not affect the borrow area located in two South Pelto OCS lease blocks.

Table 1-1. Project Details for Initial and Amended Permits

	Initial Permit	Amended Permit
Area Created/Restored	448 acres	482 acres
South Pelto Borrow Area	305 acres	
South Pelto Borrow Area Fill Volume	up to 6.1 mcy	
Project Length	38,500 lf	
Proposed Fill (Beach and Dune)	5,034,121 cy	6,097,028 cy
Proposed Excavation South Pelto	6,100,000 cy	
Proposed Excavation Pump Outs	up to 168,700 cy	0 cy

Because sand is a limited resource in coastal Louisiana, the contractor for the Caminada Increment 2 Project is required to exhaust the suitable sediment within the Caminada Increment 1 borrow area at South Pelto prior to excavating any of the Caminada Increment 2 borrow area at South Pelto.

1.4.3 Sediment Pump-Out at the Headland

One additional pump-out area (Offshore No. 3) was designed to convey the sand from the hopper dredges or scow barges to the Caminada Increment 2 template (Figure 1-3). In addition, the Lower Belle Pass, Upper Belle Pass, Offshore No. 1 (formerly Offshore West), and Offshore No. 2 (formerly Offshore East) Pump-out Areas described in the Caminada Increment 1 EA may be

used for Caminada Increment 2. These five pump-out areas would be made available to the construction contractors to enable the construction process to take advantage of available physical plants and auxiliary/ancillary assets and provide the most flexibility during bidding and construction.

1.4.4 Sand Fencing

Approximately 38,500 linear feet of sand fencing would be installed to promote deposition of windblown sand, create dune features, reduce trampling of existing dunes, and protect existing or transplanted vegetation (Khalil 2008).

1.4.5 Construction Duration

Sailing distances (times) from the borrow area differ for each pump-out area. Probable construction durations, in days, based on the likely pump-out area, or combinations thereof, are summarized in Table 1-2. The probable sailing times, dredge cycles per day, and sediment excavation times per day for each pump-out area, or combination thereof, are summarized in Table 1-3. Production rates were based on an average working time per day of 18 hours. Weather delays are factored into the probable construction duration. The anticipated construction start date is May 2014.

Table 1-2. Increment 2 Probable Construction Duration (days)

Sediment Pump-Out Area(s) Utilized	Mobilization	Pump-out Excavation	Fill Activities	Demobilization	Duration Total
Lower Belle Pass	30	34	474	30	568
Upper Belle Pass	30	3	555	30	618
Offshore No.1	30	0	584	30	644
Offshore No.2	30	0	581	30	641
Offshore No.3	30	0	591	30	651
Offshore No. 1 - Offshore No. 3	30	0	594	30	654
Offshore No. 2 - Offshore No. 3	30	0	591	30	651
				Average	632

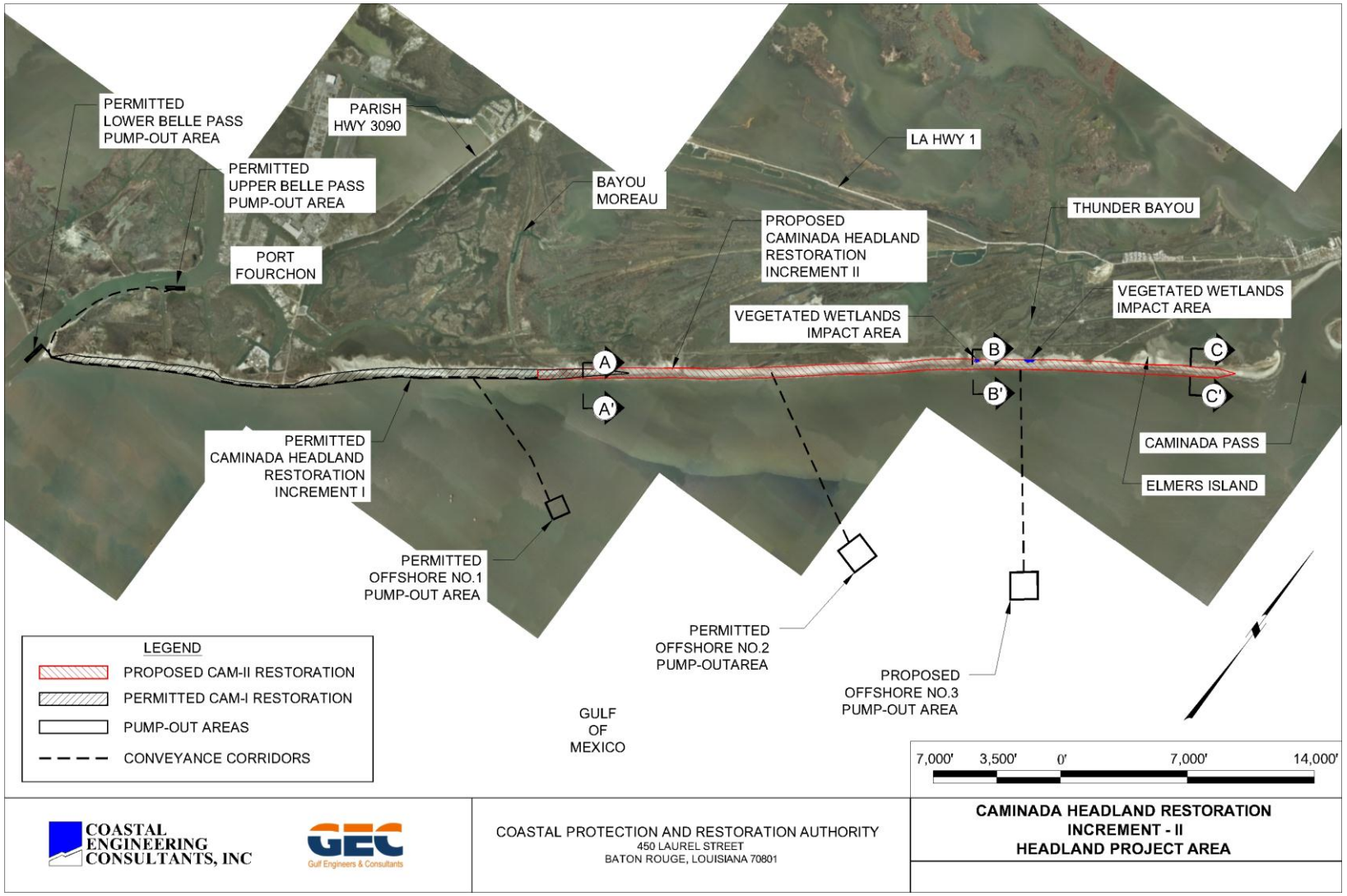

Figure 1-3. Increment 2 Fill Template

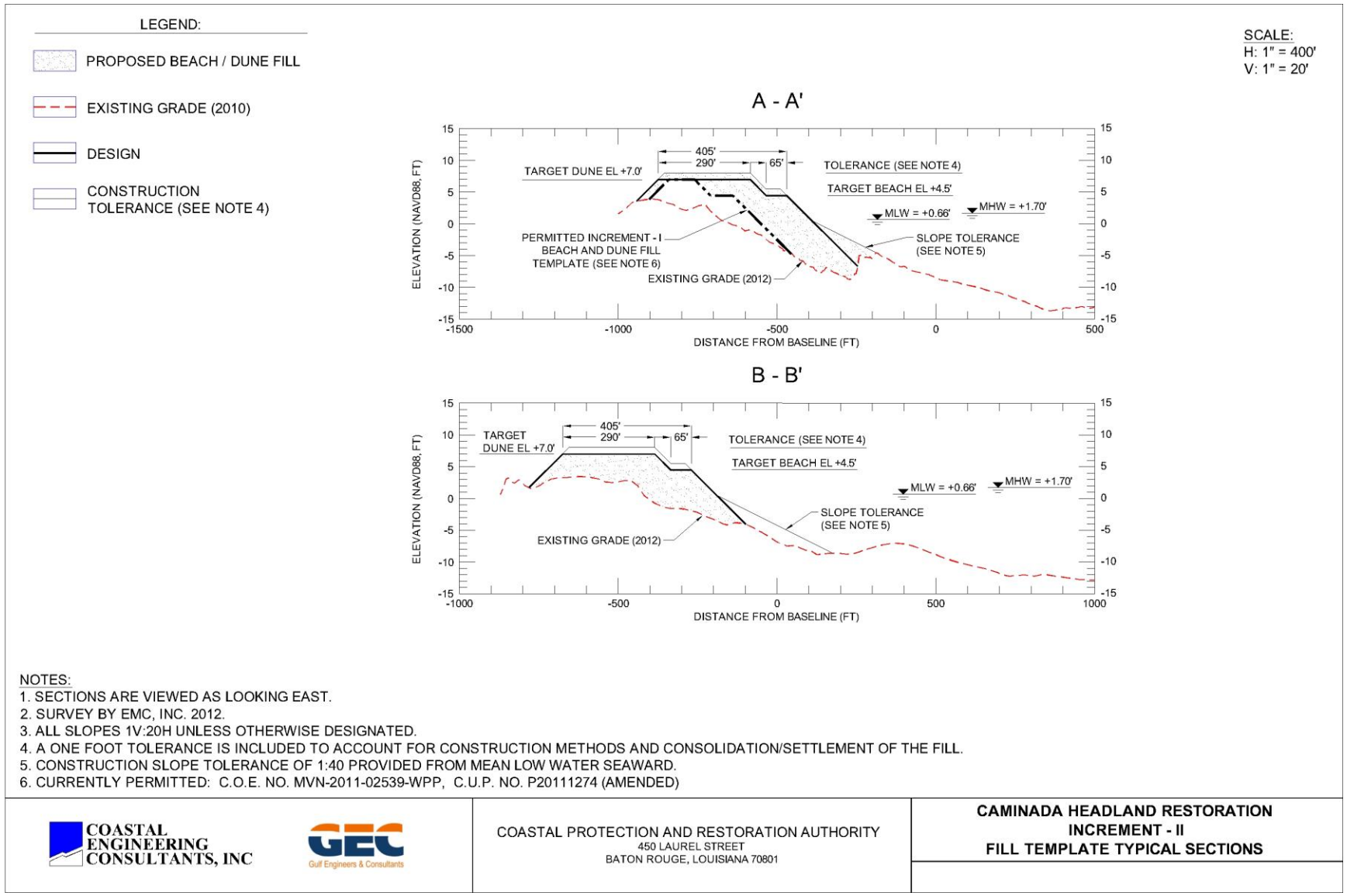

Figure 1-4. Increment 2 Fill Template Typical Sections Beach and Dune

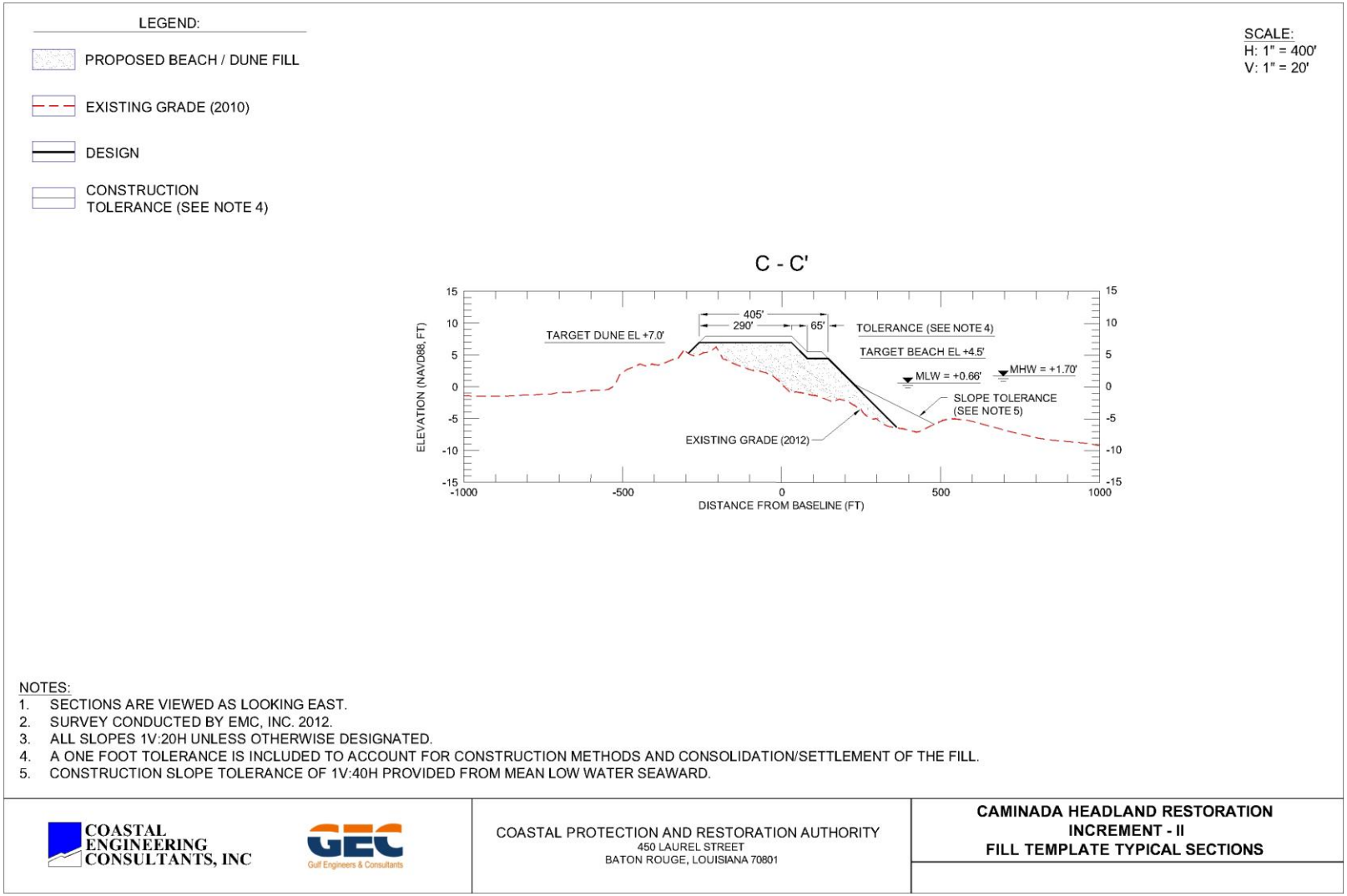

Figure 1-5. Increment 2 Fill Template Typical Section Beach and Dune Fill

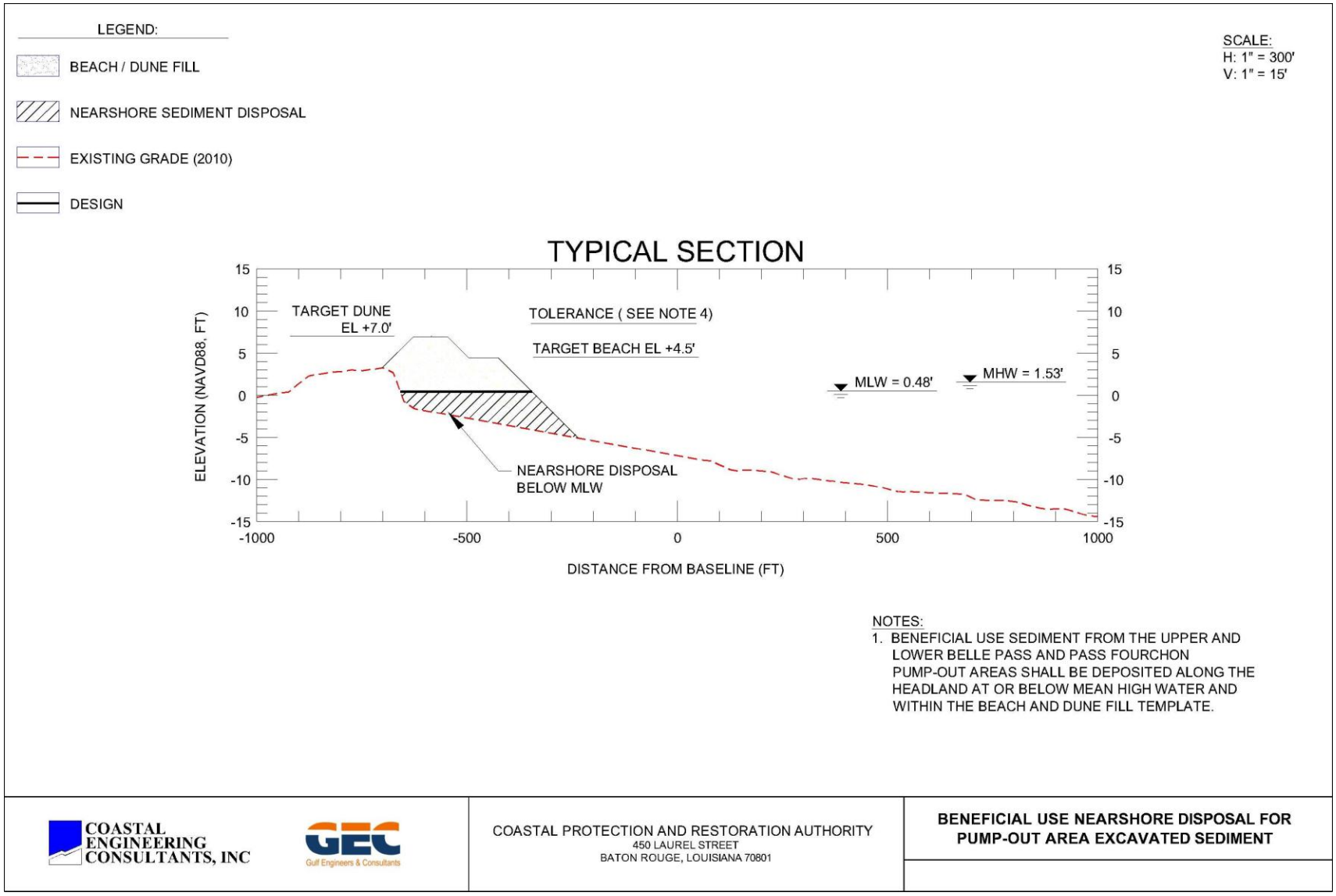

Figure 1-6. Beneficial Use – Nearshore Disposal for Pump-Out Area Excavated Sediment

Table 1-3. Probable Increment 2 Cycle Times

Sediment Pump-Out Area(s)	Probable Sediment Excavation (Hrs. / Day)	Probable Sailing Hrs. / Day	Probable Pump-Out Hrs. / Day	Probable Dredge Cycles / Day
Lower Belle Pass	1.2	13.4	3.4	2.6
Upper Belle Pass	1.0	13.9	2.8	2.2
Offshore No.1	0.9	14.2	2.7	2.1
Offshore No.2	0.9	14.2	2.7	2.1
Offshore No.3	0.9	14.2	2.7	2.1

* Pump-out areas may be used in combinations, as depicted above in Table 1-1.

1.5 RELATED NEPA AND OTHER ENVIRONMENTAL DOCUMENTS

The Louisiana Coastal Area (LCA) Barataria Basin Barrier Shoreline Restoration (BBBS) Final Integrated Construction Report and Final Environmental Impact Statement (FEIS) (USACE 2012a) assessed the impacts of restoring the Caminada Headland and Shell Island. Associated with the FEIS is the Biological Assessment: Louisiana Coastal Area (LCA) Barataria Basin Barrier Shoreline Restoration Feasibility Study Caminada Headland and Shell Island Restoration (USACE 2009, 2011), The Supplemental Biological Assessment (USACE 2010a), and the Louisiana Coastal Area Barataria Basin Barrier Shoreline Restoration Project, Jefferson, Lafourche, and Plaquemines Parishes, Louisiana Biological Opinion 04EL1000-20120F-0594 (USFWS 2011).

Several documents assessed the impacts of dredging Ship Shoal for sand, including the Environmental Assessment for Issuance of Non-Competitive Leases for the Use of Outer Continental Shelf Sand Resources from Ship Shoal, Offshore Central Louisiana for Coastal and Barrier Island Nourishment and Hurricane Levee Construction (Ship Shoal Multi-Project EA) (DOI-MMS 2004). The Ship Shoal Multi-Project EA tiered from the Final Environmental Impact Statement for Proposed Central Gulf of Mexico OCS Oil and Gas Lease Sales 185, 190, 194, 198, and 201, and Proposed Western Gulf of Mexico OCS Oil and Gas Lease Sales 187, 192, 196, and 200 (CPA/WPA Multisale FEIS) (DOI-MMS 2002). The Multi-Project Biological Assessment, Ship Shoal, Offshore Louisiana (DOI-MMS 2004) and the Endangered Species Act – Section 7 Consultation Biological Opinion for Hopper and Hydraulic Cutterhead Dredging Associated with Sand Mining for Coastal Restoration Projects Along the Coast of Louisiana Using Sand from Ship Shoal in the Gulf of Mexico Central Planning Area, South Pelto Blocks 12, 13, and 19, and Ship Shoal Block 88 (NMFS 2004).

United States Department of Interior Bureau of Ocean Energy Management (BOEM). 2012. Final Environmental Assessment for the Issuance of a Non-Competitive Negotiated Agreement for the use of Outer Continental Shelf Sands for Caminada Headland Beach and Dune Restoration (BA-45), Lafourche Parish, Louisiana. Prepared by Coastal Protection and Restoration Authority of Louisiana, Baton Rouge, Louisiana. FONSI June 27, 2012.

The West Belle Pass Barrier Headland Restoration CWPPRA Project Fed No. TE-52 Environmental Assessment, Lafourche Parish, Louisiana (NOAA-NMFS 2010) assessed the impacts of restoring the West Belle Pass Barrier Headland.

Draft Environmental Assessment Fourchon Beach Shoreline Protection, Greater Lafourche Port Commission, Lafourche Parish, Louisiana, FEMA-1603-DR-LA, November 2012 (FEMA 2012).

1.6 CORRESPONDENCE AND OTHER PROJECT DOCUMENTS

Federal and State Agency correspondence and copies of permits and approvals associated with the USACE and LDNR permit actions for this project are presented in Appendix A. Project reports are presented in Appendix B.

2.0 ALTERNATIVES

This section describes the Caminada Increment 2 Alternative and the No-Action Alternative. Based on the information and analysis presented in Section 3.0 (Affected Environment) and Section 4.0 (Environmental Effects), this section presents the beneficial and adverse environmental effects of both alternatives in comparative form, providing a clear basis for choice among the options for the decision maker and the public. Fill template alternatives and borrow areas were screened in the BBBS EIS and fill templates for Caminada Increment 1 were evaluated in the Caminada Increment 1 EA (BOEM 2012) and during the Section 10/404 and Coastal Use Permit Process.

2.1 INCREMENT 2 FILL TEMPLATE AND SOUTH PELTO BORROW AREA

The Caminada Increment 2 fill template proposed for the project is presented in Figures 1-3 to 1-6. The fill template was described in detail in Section 1.5 and represents an eastward expansion of the Caminada Increment I fill template east to Caminada Pass. The Caminada Increment 2 borrow area, adjacent to the Caminada Increment 1 borrow area, presented in Figure 1-2 and described in Section 1.4.2, would be used.

2.2 NO-ACTION ALTERNATIVE

Evaluation of the No-Action Alternative is a requirement of NEPA regulations (40 CFR Part 1500 *et seq*.). The No-Action Alternative assumes Caminada Increment 2 will not be constructed and no dredging of OCS sand from the Caminada Increment 2 borrow area would occur. The high erosion rate at the Caminada Headland would continue; increasing breaching of shoreline and exposure of backbarrier wetlands to increased salinity, scour from increased tidal velocities, and effects of storm surges; compromising the estuarine gradient; continuing loss of beach, dune and backbarrier marsh habitat; continuing erosion of the headland may affect wave conditions and sediment transport at the shoreline; increasing shoreline retreat rate; loss of the existing vegetative communities, including mangroves; and affecting beach/shoreline-related benthic infaunal communities, habitat of fish, invertebrates and wildlife species, including critical habitat for the piping plover. As this shoreline recedes, coastal infrastructure, such as Port Fourchon, roads, pipelines, etc. would be more susceptible to damage from storms.

2.3 COMPARISON OF ALTERNATIVES

The major features and consequences of Caminada Increment 2 and the No-Action Alternative are described in Table 2-1. Section 4.0 (Environmental Effects) includes a more detailed discussion of the impacts of the alternatives.

Table 2-1. Comparison of the Alternatives

Environmental Resource	Caminada Increment 2 Alternative	No-Action Alternative
PHYSICAL RESOURCES		
Oceanographic and Coastal Processes	Placement of borrow area sediment would unavoidably bury existing dune, supratidal, Gulf intertidal and Gulf subtidal habitats, thus altering the topography and bathymetry within the fill template. The project is unlikely to affect wave conditions at the shoreline. Restoration would decrease wave energy in the back barrier area. Little to no longshore sediment transport impacts are expected from small-scale excavation at the pump-out areas. The introduction of new sand would increase the volume available for transport and should indirectly benefit downdrift flanking barrier islands following sediment transport along the headland due to equilibrium and spreading processes associated with beach fill. Sand from the project will likely be transported to the east. Some of this sand will be transported into the Caminada Pass, adding to existing shoals within the pass, potentially expanding the Caminada spit, and adding to other sediment flow into Caminada Pass or Caminada Bay. However, the majority of sand would be transported to the Caminada Pass ebb shoal and the shoreline of Grand Isle. Construction of the beach and dune project features will reduce the potential of breaching along the Gulf shoreline; this may allow hydrologic conditions to return to a pattern which is more similar to the recent historic pattern. Excavation of the borrow area will directly temporarily affect the existing water bottoms by altering the bathymetry within the dredge footprint and side slopes of the dredge cut. Physical removal of sediments at the borrow area will alter the bathymetry of the seabed, creating depressions. Bathymetry changes can locally reduce currents, lower dissolved oxygen levels, and increase the accumulation of fine sediments. These effects would be minor and short-term.	Existing conditions of coastal erosion and land loss would continue. No effect on bathymetry would occur. Continued erosion of the headland may affect wave conditions at the shoreline. Continued erosion of the headland may affect sediment transport at the shoreline.

Geology	Restoration of the headland via placement of as much as 6.1 mcy of beach and dune compatible sand will improve the ability of the headland to resist shoreline erosion, wave overtopping, and breach formation. Installation of sand fencing and dune vegetation will provide a mechanism for future Aeolian sand transport and dune enhancement, which enhances shore protection. The combined borrow area for Caminada Increments 1 and 2 equate to approximately 0.6 percent of the total Ship Shoal sand body surface area. Continued erosion of the headland. Reduced shoreline retreat rate.	Continued erosion of the headland. Increased shoreline retreat rate.
Air Quality	Small, localized, temporary increases in concentrations of air pollutant emissions. The short-term impact from emissions by the dredge or other vessels, vehicles, or equipment would not affect the overall air quality of the area.	No impact.
Water Quality	Temporary reduction of water quality due to turbidity from dredge and fill operations. These effects would be minor and short-term.	No impact.
Noise	Temporary increase in the noise level during construction near dredge and fill operations. These effects would be localized, short-term, and minor.	No impact.
BIO-PHYSICAL RESOURCES		
Vegetation	Placement of fill material would unavoidably fill 2.9 acres of black mangrove wetlands; however, given existing erosion rates and overwash events in this area, those wetlands likely would have been converted to open water or filled with sand sometime in the future without project implementation. The direct effects of implementing the project would create 482 acres of sparsely vegetated beach and dune habitat, providing for essential vegetated habitats used by wildlife for shelter, nesting, feeding, roosting, cover, nursery, and other needs; and increased vegetation growth and productivity. Conservative estimate of 424 acres of vegetated intertidal marsh would be protected by project implementation over 20 years.	Continued erosion of the headland and effects of storms and overwash events would lead to the loss of the existing vegetative communities, including mangroves. Conservative estimate of 424 acres of vegetated intertidal

		marsh would be lost without project implementation over 20 years.
Benthic	Temporary impacts to infaunal benthic communities on the headland and in nearshore waters due to entrainment, increased turbidity and sedimentation; and changes to the soft bottom bathymetry. Effects would be short-term, recovery in six months to two years. For the South Pelto borrow area, the primary impact-producing factor affecting benthic resources would be from mechanical disturbance. The combined borrow area for Caminada Increments 1 and 2 equate to approximately 0.6 percent of the total Ship Shoal sand body surface area. Direct impacts would be mid-term; it would take 2 to 3 years for the dredged area to recover to existing conditions. Physical, localized, disturbances at Ship Shoal include disruption of the sea bottom by removing sand, suspension of fine-grained sediments at the bottom and in a surface dredge plume, dispersion and persistence of turbidity, and temporary deepening.	Continued erosion of the headland could affect beach/ shoreline-related benthic infaunal communities. No impacts to Ship Shoal would occur. The loss of protective barrier shoreline could affect backbarrier estuarine benthic habitat.
Plankton	Minor, short-term, and localized adverse impacts due to construction activities.	No impact.
Fish and Macro-invertebrates	Impacts could include entrainment of organisms during dredge operation; vessel strike; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; changes to soft bottom bathymetry in the borrow area during dredging; and temporary loss of prey items and foraging habitat. Effects would be short-term and localized; similar undisturbed habitat is adjacent to the borrow area.	Continued erosion of the headland could impact habitat of fish and invertebrates.
Invasive Species	No impact.	No impact.
Amphibians, Reptiles, Terrestrial Mammals, and Invasive Wildlife Species	Populations are naturally low on the headland; therefore, there would be no direct impact. Beach and dune restoration would reduce the rate of loss of available habitat.	Continued erosion of the headland would decrease available habitat.

Marine Mammals	Although unlikely, possible impacts include entrainment of organisms during dredge operation; sea turtle relocation trawling; vessel strike; behavioral alterations due to sound, light, and structure; increased turbidity and sedimentation; and changes to soft bottom bathymetry in the borrow area during dredging.	No impact.
Avian Communities	No direct negative impacts. Temporary impacts to foraging and nesting habitat. Minor, short-term, and indirect impacts include air emissions; water quality degradation from a dredge plume at the dredging site and slurry discharge at the beach restoration site; dredge, service vessel, or construction vessel noise; light attraction; and discarded trash and debris from dredge or service vessels. Positive effects of the project include providing increased dune, beach, and intertidal sandy foraging and nesting habitat.	Continued erosion of the headland would lead to continued avian habitat loss.
CRITICAL BIOLOGICAL RESOURCES		
Threatened and Endangered Species	Impacts to threatened and endangered species due to dredging could include potential lethal and sub-lethal effects to sea turtles and marine mammals if hopper dredges are used. Increased beach and dune area could provide potential sea turtle nesting habitat. Temporary loss of foraging habitat for piping plover; however, the project is not likely to result in jeopardy to the piping plover species, or adverse modification of its designated critical habitat. Project implementation is likely to protect and expand piping plover foraging habitat in the future. Gulf sturgeon, West Indian manatee, and whales are unlikely to be in the project area.	Continued erosion of the headland could adversely impact threatened and endangered species, including critical habitat for the piping plover.

Essential Fish Habitat (EFH)	For the headland, the project would not likely adversely affect EFH. Placement of fill would unavoidably fill 2.9 acres of black mangrove wetlands; however, these wetlands would likely convert to open water or be filled with sand in the future. In addition, project implementation is likely to help protect wetlands categorized as EFH along the entire 38,500 feet of shoreline from erosion in the future. For Ship Shoal, the impacts could include changes to soft bottom bathymetry in the borrow area due to dredging and temporary loss of prey items and foraging habitat. Effects would be short-term and localized; similar undisturbed habitat is adjacent to the headland and borrow area.	Continued erosion of the headland could affect EFH due to continued headland degradation, reduced function of protective barrier shoreline, that helps to regulate estuarine conditions landward of the shoreline, would result without project.
CULTURAL	Targets identified during cultural resources survey for Ship Shoal will be avoided and are not located within the dredge template. Archaeological sites on the headland would be avoided and placement of sand will protect sites from continued erosion.	Archaeological sites on the headland would be subject to destruction from continued erosion.
SOCIOECONOMIC AND HUMAN RESOURCES		
Population and Housing	Creation of temporary jobs and the need for short-term housing in adjacent areas. However, fluctuations in jobs and housing are common in this area due to the oil and gas industry. Housing on the headland in the Port Fourchon area would be better protected with the project.	Housing on the headland in the Port Fourchon area would be less protected.
Employment and Income	Creation of temporary jobs; the overall effect would be minor and short-term.	No impacts.

Environmental Justice	No disproportionate impacts on ethnic or racial minorities or low-income populations would result from the project.	No impacts.
Commercial Fisheries	Significant adverse effects on commercial fisheries are not expected. Several oyster leases near the fill template could be affected; these effects would be assessed and mitigated prior to construction. Fishing areas would temporarily not be available and fishing gear could be damaged. However, the project would preserve fishery habitat that supports commercial fisheries.	Continued erosion and habitat loss could lead to reduced commercial fisheries populations.
Infrastructure	Negligible impacts on the region's existing onshore and offshore infrastructure, land-use patterns, navigation, and port usage. Restoration of the headland could provide some storm damage reduction for the infrastructure, including roads, utilities, and Port Fourchon.	The infrastructure (e.g. Port Fourchon, La. Hwy.1) would be more susceptible to storm impacts.
Waterborne Commerce	The Ports of Terrebonne and Fourchon can provide the relatively low level of support services necessary for the project. No onshore expansion or construction would be expected to result from the proposed project. No significant changes would be expected for land-use patterns, navigation, and port usage. Port Fourchon would be less susceptible to storm impacts.	Port Fourchon would be more susceptible to storm impacts.
Oil, Gas, and Minerals	No direct impact on protecting oil and gas resources. Direct impact by dredging of OCS sand resources (a mineral resource) and transport of the OCS sand to a fill site removes resources from commerce. The project would cover any existing pipelines in the project area, providing additional protection against storms and erosion. Implementing the project would protect oil and gas reserves at Port Fourchon by reducing the impact of coastal deterioration with an additional layer of soil protection, thereby increasing protection from future storm surges.	No direct effects. Indirect effects of not implementing the barrier headland restoration would result in the continued deterioration of existing conditions for oil and gas infrastructure.

Aesthetics	Restored beach and dunes, coupled with vegetation plantings, would improve the visual interests in the area. Preserved vegetation and marsh could enhance the intrinsic scenic quality of the drive along La. Hwy. 1. During construction, equipment used for dredging and filling would be visible, resulting in a temporary reduction in the aesthetic value offshore.	Continued erosion of the headland would negatively impact aesthetic resources.
Recreational	Restoration of the headland would provide recreational opportunities for many outdoor activities. Over the short-term, the impact-producing factors associated with transport and beach restoration could have minor and short-term effects on recreational resources at the headland and pump-out areas. These include increased turbidity and water quality degradation from resuspended organic matter in the dredge plume, material spills from vessels, visual impacts from shore, and temporary unavailability of preferred recreational fishing space due to presence of the dredge vessel or dredge plume.	Continued erosion of the headland could impact recreational resources with loss of shoreline, wetlands, and fishery habitat.
Navigation and Public Safety	During dredging and fill placement, the use of the area immediately surrounding the borrow area and the headland in the vicinity of the shore restoration would be temporarily restricted for public safety. Access restrictions would be short-term and are expected to be minor to boat operators.	Continued erosion of the headland could impact navigation.

3.0 AFFECTED ENVIRONMENT

The Affected Environment section describes the existing environmental resources of the areas that would be affected if Caminada Increment 2 was implemented. The purpose of this Supplemental EA is to determine if there are significant new circumstances or information bearing on the proposed actions or their impacts, as stated in the Caminada Increment 1 EA (BOEM 2012).

This section describes only those environmental resources relevant to the decision making process. The condition of most environmental resources in the project area remain unchanged from the June 2012 Caminada Increment 1 EA, except for some habitat and biological resources which may have changed due to naturally occurring processes and the effects of Hurricane Isaac and Tropical Storm Karen. Hurricane Isaac made a second Louisiana landfall just west of Port Fourchon on August 29, 2012 (NOAA 2012). Tropical Storm Karen approached Louisiana on October 5, 2013, but dissipated on October 6th (NOAA 2013). The effects of wave action and storm surges from these storms are still being assessed. In addition, the sand bags, rock, and sheet pile bulkheads installed across breaches on the headland during cleanup for the 2010 oil spill were removed. Construction on the Caminada Increment 1 project on the western portion of the headland began in June 2013.

A resource is considered important if it is recognized by statutory authorities including laws, regulations, Executive Orders (EOs), policies, rules, or guidance; if it is recognized as important by some segment of the public; or if it is determined to be important based on technical or scientific criteria. The final EIS for the BBBS Study (USACE 2012), the final PEIS for the LCA Study (USACE 2004), the Ship Shoal Multi-Project EA (DOI-MMS 2004), the CPA/WPA Multisale FEIS (DOI-MMS 2002), and the June 2012 Caminada Increment 1 EA (BOEM 2012) supporting the June 27, 2012 FONSI presented detailed historic and existing information relevant to this project and that information is incorporated by reference.

Circumstantial changes and new information are discussed below for the following resources: coastal habitat, open water and benthic habitats, water quality, birds, marine mammals, sea turtles, fish and essential fish habitat, cultural resources, oil and gas infrastructure, and marine navigation.

Completed and Ongoing Restoration and Protection Projects

The West Belle Pass Headland Restoration (TE-52) CWPPRA project, completed in November 2012, used approximately 2 mcy of material dredged from Little Pass Timbalier ebb tidal delta, approximately 9 miles west of the fill template area, to rebuild beach and dune on the Caminada Headland west of Belle Pass (NOAA-NMFS 2010). Nearly 1 mcy of material dredged from a borrow area 2.8 miles south of the project area was used to rebuild 150 acres of marsh habitat (NOAA-NMFS 2010). Native vegetation was planted after construction to help stabilize the rebuilt marsh and dune habitat (LCWRTF 2010).
The Fourchon Beach Repair Renourishment (Geotube Project), scheduled for construction in 2013, would place pre-fabricated sand-filled geotubes along 5,500 linear feet of Fourchon Beach

to create a dune (FEMA 2012). The geotubes would be placed directly behind and on the same alignment as the existing *boudin bags*. Staging activities would occur within the right-of-way at the end of A.O. Rappelet Road adjacent to the beach and at the end of an unimproved access road to the west off of Chevron Road also adjacent to the beach. Sand for the filling of the geotubes and backfilling around the structures once they are installed would be brought to the location by the Contractor (FEMA 2012). The Geotube Project is within the template for Caminada Increment 1.

Construction on the Caminada Increment 1 project (BOEM 2012) on the western portion of the headland began in June 2013.

3.1 PHYSICAL RESOURCES

Section 3.1 of the 2012 Caminada Increment 1 EA described the physical resources in the project area: Oceanographic and Coastal Processes (Meteorology, Freshwater Inflow and Salinity, Tides and Currents, Sediment Transport, Waves, and Geology); Air Quality; Water Quality; and Noise. This information is incorporated by reference. Addition information on Oceanographic and Coastal Processes (Sediment Transport) in Caminada Pass is presented below.

3.1.1 Oceanographic and Coastal Processes

Sediment Transport

Sand from Caminada Increment 2 will likely be transported to the east. Some of this sand will end up in the Caminada Pass; however, the majority of sand would be transported to the Caminada Ebb Shoal and the shoreline of Grand Isle. Batten et al. (2004) estimated the flux of sand to the Grand Isle littoral cell, across Caminada Pass, to be approximately 83,000 cy/year (yr). The 2007 CHE study estimated the bypass rate of sand to Grand Isle as 20 percent; therefore, the eastern end of the headland should result in approximately 400,000 cy/yr. A 2012 CHE study for NOAA estimated the sediment budget leaving the eastern end of Elmer's Island was 454,000 cy/yr with 90,800 cy/yr bypassing to Grand Isle and 331,800 cy/yr of sand for shoal growth (either flood or ebb), subaqueous spit growth, and other sediment flow into Caminada Pass or Barataria Bay. The Caminada Pass ebb shoal has grown during the past century (List et al. 1994; CHE 2007).

The sand body along Caminada Pass, referred to as Caminada spit (CHE 2012), that is attached to the Cheniere Caminada extending under the La. Hwy. 1 bridge to Grand Isle began to form after the hurricane season of 2005 when the Gulf shoreline was breached along with the formation of a breach just south of the Cheniere Caminada sand body (Figures 3-1 and 3-2) into Caminada Pass which remains open providing tidal exchange with the lagoon. The hydrologic connection of the lagoon and marshes north of Elmer's Island has been altered; this has resulted in a change of sediment dynamics. In 2010, the initial breach was closed. Aerial photography shows the formation of a new breach and inlet due north of the previous breach, at the end of the rock from the closure. These breaches have reoccured along this area of Caminada Pass where no marsh occurs behind the shoreline to allow tidal exchange. The new tidal exchange inlet into

Caminada Pass replaced the old pass, allowing the Caminada Spit to form. Construction of the Caminada Increment 2 project features will reduce the potential of breaching along the Gulf shoreline; this may allow hydrologic conditions to return to a pattern which is more similar to the recent historic pattern. Projects to mine sand from the Cheniere Caminada beach and close the new breach/tidal inlet along Caminada Pass were proposed by the state and NOAA Fisheries but, to our knowledge, neither of those projects are currently progressing.

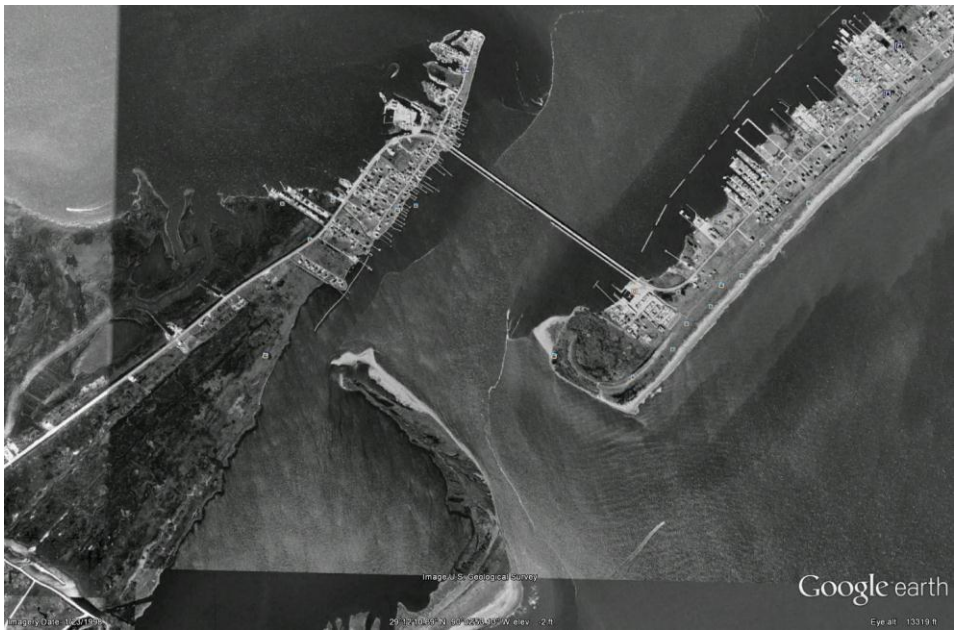

Figure 3-1. January 1998 Google Earth image of Caminada Pass

Figure 3-2. November 2012 Google Earth image of Caminada Pass (Caminada spit is located in the center of the photo, extending under the La. Hwy. 1 bridge)

3.2 BIO-PHYSICAL ENVIRONMENT

Section 3.2 of the 2012 Caminada Increment 1 EA described the bio-physical resources in the project area: Vegetation; Aquatic Resources and Communities (Benthics, Plankton, Fish and Macroinvertebrates, and Invasive Species); Wildlife (Amphibians, Reptiles, Terrestrial Mammals, Invasive Wildlife Species, Marine Mammals, and Avian Communities). This information is incorporated by reference. Additional information on vegetation (mangrove) resources and updated information on marine mammals and avian communities is presented below. Critical biological resource information is also presented below.

3.2.1 Vegetation Resources

Approximately 2.9 acres of black mangrove wetlands are within the Caminada Increment 2 fill template (Figure 3-3). Black mangroves *(Avicennia germinans)* and smooth cordgrass *(Spartina alterniflora)* are co-dominant species of the salt marsh and backbarrier marsh plant communities on the Caminada Headland (Hester et al. 2009). Black mangroves typically dominate higher elevation sites, such as creek banks, bay shores and barrier islands, whereas smooth cordgrass occurs at lower elevations with greater water depths and duration of inundation. Three vegetation zones were observed at Bay Champagne on the headland: a zone adjacent to the bay dominated by black mangroves, an inland zone dominated by smooth cordgrass, and a transitional zone containing both species (Patterson and Mendelssohn 1991). Black mangroves are a tropical species and are susceptible to cold temperatures; in Louisiana, mangroves are at their northernmost distributional limits and are periodically damaged or killed by freezes. Consequently, Louisiana mangroves rarely grow taller than 2 meters due to freeze-intolerance (Patterson et al. 1993; Houck and Neill 2009).

Black mangroves provide important ecological functions because they are salt- and flood-tolerant; provide habitat for juvenile fish, shrimp, and crabs; provide nesting habitat for the brown pelican; and help to stabilize the shoreline by reducing storm surge and wave energy even as small shrubs (Jeffrey D. Weller, USFWS, letter dated November 7, 2012).

Given existing erosion rates and overwash events in this area, the mangrove wetlands that would be affected by the project likely will have been converted to open water or filled with sand sometime in the future without project implementation (Virginia M. Fay, NMFS, letter dated November 1, 2012; Appendix A).

3.2.2 Marine Mammals

In 2012, 94 cetaceans (dolphins and whales) were reported stranded in Louisiana, down from the 163 strandings reported in Louisiana in 2011 (NOAA Fisheries 2013a). In 2013, (through September 1), 121 cetaceans were reported stranded (NOAA Fisheries 2013a). A dolphin carcass was observed during a reconnaissance field trip to the Caminada Increment 2 project area on April 18, 2012.

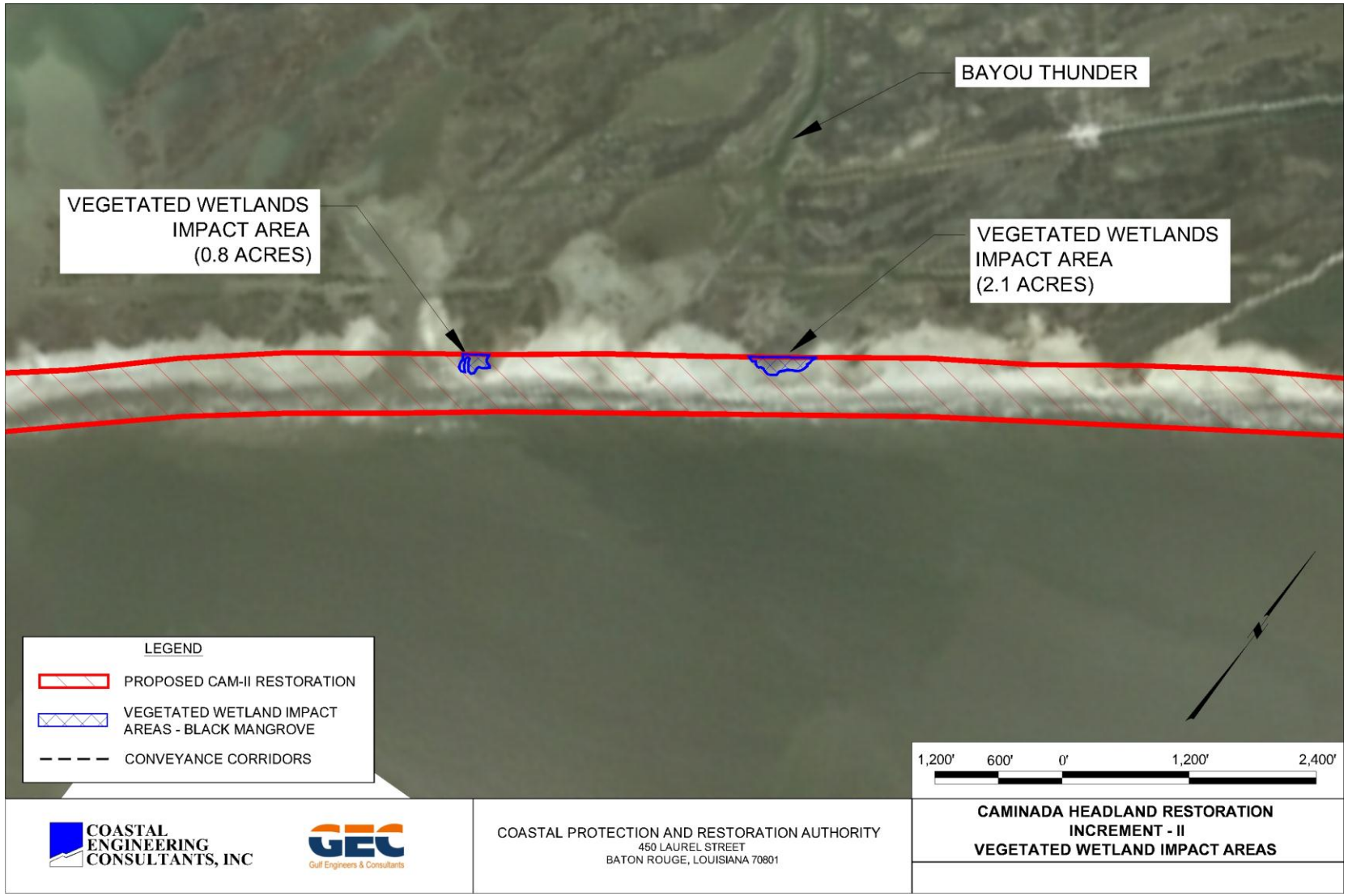

Figure 3-3. Vegetated Wetland Impact Areas for Caminada Increment 2

3.2.3 Avian Communities

Coastal bird species observed on the headland and adjacent areas during the fall 2011 National Audubon Society coastal bird survey (Johnson 2011) are presented in Table 3-1.

Table 3-1. Coastal Bird Species Observed During the Fall 2011 National Audubon Society Coastal Bird Survey (Johnson 2011)

Common Name	Scientific Name	Location	Number Observed
Magnificent Frigatebird	*Fregata magnificens*	Grand Isle King Tarpon Park	36
Double-crested Cormorant	*Phalacrocorax auritus*	Grand Isle King Tarpon Park	34
Cormorant spp.	*Phalacrocorax* spp.	Elmer's Island, Grand Isle West	1
Brown Pelican	*Pelecanus occidentalis*	Grand Isle King Tarpon Park	4,200
Great Blue Heron	*Ardea herodias*	Elmer's Island	6
Great Egret	*Casmerodius albus*	Elmer's Island	21
Snowy Egret	*Egretta thula*	Elmer's Island	28
Little Blue Heron	*Egretta caerulea*	Elmer's Island	10
Tricolored Heron	*Egretta tricolor*	Elmer's Island	10
Reddish Egret	*Egretta rufescens*	Broussard Beach, East Jetty, Grand Isle King Tarpon Park	3
Roseate Spoonbill	*Ajaia ajaja*	Elmer's Island	3
Osprey	*Pandion haliaetus*	Elmer's Island	2
Clapper Rail	*Rallus longirostris*	Elmer's Island	3
Semipalmated Plover	*Charadrius semipalmatus*	Elmer's Island, Trinity Island East	22
Piping Plover	*Charadrius melodus*	Elmer's Island	15
Greater Yellowlegs	*Tringa melanoleuca*	Elmer's Island	3
Willet	*Tringa semipalmata*	Elmer's Island	30
Red Knot	*Calidris canutus*	Grand Isle King Tarpon Park	5
Short-billed Dowitcher	*Limnodromus griseus*	Grand Isle King Tarpon Park	9
Least Tern	*Sterna antillarum*	Grand Isle King Tarpon Park	85
Common Tern	*Sterna hirundo*	Grand Isle King Tarpon Park	18
Eurasian Collared-Dove	*Streptopeleia decaocto*	Grand Isle King Tarpon Park, Holly Beach	2
Ruby-throated Hummingbird	*Archilochus colubris*	Grand Isle West, Rutherford Beach	1
Belted Kingfisher	*Megaceryle alcyon*	Elmer's Island	1
Eastern Kingbird	*Tyrannus tyrannus*	Grand Isle West	4
American Crow	*Corvus brachyrhynchos*	Grand Isle King Tarpon Park	10
European Starling	*Sturnus vulgaris*	Grand Isle West	75
Common Yellowthroat	*Geothlypis trichas*	Grand Isle West	2
Palm Warbler	*Dendroica palmarum*	Grand Isle West	3
Blue Grosbeak	*Passerina caerulea*	Elmer's Island	1
Red-winged Blackbird	*Agelaius phoeniceus*	Elmer's Island	45

Common Name	Scientific Name	Location	Number Observed
Boat-tailed Grackle	*Quiscalus major*	Elmer's Island	30
Brown-headed Cowbird	*Molothrus ater*	Grand Isle King Tarpon Park	2
Orchard Oriole	*Icterus spurius*	Grand Isle King Tarpon Park	6

3.3 CRITICAL BIOLOGICAL RESOURCES

3.3.1 Essential Fish Habitat

Section 3.3.1 of the 2012 Caminada Increment 1 EA describes the Essential Fish Habitat (EFH) in the project area. The species listed in Table 3-2 may be present in the area and may be affected by Caminada Increment 2 (Virginia M. Fay, NMFS, letter dated November 1, 2012; Appendix A).

Table 3-2. EFH for the Species and Life Stages Listed in the Caminada Increment 2 Project Area (M-Marine; E-Estuarine)

Species	Life Stage	System	EFH
Shrimp Fishery Management Plan			
Brown shrimp *(Farfantepenaeus aztecus)*	eggs	M	All estuaries; the US/Mexico border to Fort Walton Beach, Florida, from estuarine waters out to depths of 100 fathoms; Grand Isle, Louisiana, to Pensacola Bay, Florida, between depths of 100 and 325 fathoms; Pensacola Bay, Florida, to the boundary between the areas covered by the GMFMC and the SAFMC out to depths of 35 fathoms, with the exception of waters extending from Crystal River, Florida, to Naples, Florida, between depths of 10 and 25 fathoms and in Florida Bay between depths of 5 and 10 fathoms.
	larvae/postlarvae	M/E	
	juveniles	E	
	adults	M	
White shrimp *(Litopenaeus setiferus)*	eggs	M	
	larvae/postlarvae	M/E	
	juveniles	E	
	adults	M	
Red Drum Fishery Management Plan			
Red drum *(Sciaenops ocellatus)*	eggs	M	All estuaries; Vermilion Bay, Louisiana, to the eastern edge of Mobile Bay, Alabama, out to depths of 25 fathoms; Crystal River, Florida, to Naples, Florida, between depths of 5 and 10 fathoms; and Cape Sable, Florida, to the boundary between the areas covered by the GMFMC and the SAFMC between depths of 5 and 10 fathoms.
	larvae/postlarvae	E	
	juvenile	M/E	
	adults	M/E	
Reef Fish Fishery Management Plan			
Red snapper *(Lutjanus campechanus)*	adults	M	All estuaries; the U.S./Mexico border to the boundary between the areas covered by the GMFMC and the SAFMC from estuarine waters out to depths of 100
Lane snapper *(Lutjanus synagris)*	eggs	M	
	larvae	E/M	

Species	Life Stage	System	EFH
	juvenile	E/M	fathoms.
Dog snapper *(Lutjanus jocu)*	juvenile	E/M	
Greater amberjack *(Seriola dumerili)*	eggs	M	
	larvae	M	
	juvenile	M	
Lesser amberjack *(Seriola fasciata)*	eggs	M	
	larvae	M	
Gray triggerfish *(Balistes capriscus)*	eggs	M	
	postlarvae/juvenile	M	
Coastal Migratory Pelagic Species Fishery Management Plan			
Cobia *(Rachycentron canadum)*	eggs	M	All estuaries; the U.S./Mexico border to the boundary between the areas covered by the GMFMC and the SAFMC from estuarine waters out to depths of 100 fathoms
	larvae	M	
	juvenile	M	
King mackerel *(Scomberomorus cavalla)*	larvae	M	
	juvenile	M	
Highly Migratory Pelagic Species Fishery Management Plan			
Bonnethead shark *(Sphyrna tiburo)*	juvenile	E	Coastal areas in the Gulf of Mexico along Texas, and from eastern Mississippi through the Florida Keys. Atlantic east coast from the midcoast of Florida to South Carolina.
	adult	M	

3.3.2 Threatened and Endangered Species

Section 3.3.2 of the 2012 Caminada Increment 1 EA describes the threatened and endangered species in the project area. The species listed in Table 3-3 may be present in the area and may be affected by Caminada Increment 2 (Jeffrey D. Weller, USFWS, letter dated November 7, 2012; David Bernhart, NMFS, letter dated April 8, 2013).

Table 3-3. Listed Species that Could be Affected by Caminada Increment 2 (E=endangered, T=threatened)

Species	Scientific Name	Federal Status
FISHES		
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	**T**
Smalltooth sawfish	*Pristis pectinata*	**E**
SEA TURTLES		
Green turtle	*Chelonia mydas*	**T**
Hawksbill	*Eretmochelys imbricate*	**E**
Kemp's ridley	*Lepidochelys kempii*	**E**
Leatherback	*Dermochelys coriacea*	**E**
Loggerhead	*Caretta caretta*	**T**
BIRDS		

Species	Scientific Name	Federal Status
Piping plover	*Charadrius melodus*	**E**
MARINE MAMMALS		
Florida manatee	*Trichechus manatus latirostris*	**E**
Sperm whale	*Physeter macrocephalus*	**E**
Sei whale	*Balaenoptera borealis*	**E**
Humpback whale	*Megaptera novaeangliae*	**E**
Fin (Finback) whale	*Balaenoptera physalus*	**E**
Blue whale	*Balaenoptera musculus*	**E**
Northern right whale	*Eubalaena glacialis*	**E**

Biological opinions for Caminada Headland projects and Ship Shoal borrow area include: Louisiana Coastal Area Barataria Basin Shoreline Restoration Project, Jefferson, Lafourche, and Plaquemines Parishes, Louisiana (March 28, 2011); and Hopper and Hydraulic Cutterhead Dredging Associated with Sand Mining for Coastal Restoration Projects Along the Coast of Louisiana Using Sand from Ship Shoal in the Gulf of Mexico Central Planning Area, South Pelto Blocks 12, 13, and 19, and Ship Shoal Block 88 (September 19, 2005). The USFWS determined that Caminada Increment 2 is a subset of the larger BBBS Project and the biological opinion for the BBBS Project was amended (Jeffrey D. Weller, USFWS, letter dated November 7, 2012) to include Caminada Increment 2. The NMFS determined that the Ship Shoal biological opinion that covers hopper dredging associated with sand mining at Ship Shoal for restoration projects along the Louisiana Coast, and analyzes and accounts for the effects of sand mining on ESA-listed species, was applicable for Caminada Increment 2 (David Bernhart, NMFS, letter dated April 8, 2013).

3.3.2.1 Sea Turtles

The project has the potential to adversely affect sea turtles (Kemp's ridley, green, and loggerhead) during dredging operations. In 2012, a total of 127 sea turtles were stranded in Louisiana; stranded species included Kemp's ridley (100), green (9), and loggerhead (3) (NOAA Fisheries 2013b). In 2013 (through August 25, 2013), 198 sea turtles were stranded in Louisiana; stranded species included Kemp's ridley (145), green (4), and loggerhead (6) (NOAA Fisheries 2013b).

3.3.2.2 Piping Plover

The proposed project has the potential to have temporary adverse effects on wintering piping plover and their habitat, including designated critical habitat in Critical Habitat Unit LA-5, within the action area. However, the project is not likely to result in jeopardy to the piping plover species, or destruction or adverse modification of its designated critical habitat (Jeffrey Weller, USFWS, letter dated January 30, 2013).

Johnson (2011) reported 15 piping plover on Elmer's Island during the fall 2011 National Audubon Society coastal bird survey. One piping plover was observed during a reconnaissance field trip to the Caminada Increment 2 project area on April 18, 2012.

3.4 CULTURAL RESOURCES

Section 3.4 of the 2012 Caminada Increment 1 EA describes the cultural resources in the project area. Cultural surveys of Ship Shoal conducted for Caminada Increment 1 also surveyed the Caminada Increment 2 borrow area. A cluster of magnetic anomalies (referred to as M50 and M52) were identified by OSI during survey investigation in June 2011 on Ship Shoal in BOEM South Pelto Lease Block 13. BOEM recommended that they be either avoided during future permitted activities on the shoal or investigated further. In May 2012, OSI acquired supplemental geophysical survey data in the vicinity of the suspect magnetic anomalies to better define their extent and possible correlation to submerged cultural resources. The survey plan consisted of the acquisition of sounding, chirp subbottom profiler, side scan sonar and magnetometer data along a series of 10 meter (~33 feet) spaced tracklines oriented parallel and perpendicular to the original survey track plan (30 meter spaced [~99 feet]) in the vicinity of the suspect anomalies.

Analyses of magnetic data acquired within the 200-foot buffer around the M50 and M52 pair revealed a cluster of four anomalies detected on separate survey tracklines. Sounding, subbottom profiling and side scan sonar imagery collected in the vicinity of the detected magnetic anomalies were examined closely. None of these data sets revealed what the source of the anomaly might be suggesting it is either of limited size and/or masked in its surroundings.

Based on a review by the CPRA contracted project archaeologist of the combined geophysical data sets that OSI acquired in the area during June 2011, February 2012, and May 2012. It was interpreted that the suspect M50 and M52 anomaly pair is related to a single source anomaly location. Considering this interpretation, the CPRA project archaeologist requested that BOEM reconsider the recommendation that the M50 and M52 anomaly pair should be avoided by a minimum of 500 feet during any sediment removal to be performed in the site. BOEM did not concur with this recommendation because the character of the magnetic signature of the anomaly pairs matches those of known small wooden historic shipwrecks elsewhere along the Gulf coast as documented in Enright et al. (2006) and Gearhart (2011). Based on this alternate interpretation and potential for the presence of significant cultural resources, the borrow area for Caminada Increment 2 was reconfigured to avoid the M50 and M52 anomaly pair by the recommended 500-foot buffer (see Avoidance Area B on Figure 1-2).

Caminada Headland

R. Christopher Goodwin & Associates, Inc. performed a Phase I submerged cultural resources assessment in support of Caminada Increment 2 (Appendix B). The project area surveyed included the Offshore No.3 Pump-Out Area of approximately 0.7 by 0.7 statute miles (283.5 acres); and a proposed pipeline conveyance corridor 600-ft wide approximately 1.9 statute miles in length. This submerged cultural resources assessment entailed review and analyses of survey data collected, by Ocean Surveys, Inc., over 48.3 linear miles of transects spaced at 98.0-ft intervals.

In February 2012, Fathom Research, LLC completed a study that assessed the potential for Offshore No. 1 and 2 Pump-Out Areas and their proposed pipeline conveyance corridors to contain archaeological resources and the Project's potential to affect any such archaeological resources (Fathom 2012). No evidence of cultural resources was identified as a result of the assessment and no additional investigation was recommended.

The study area's geomorphology, regional prehistory and data on previously identified cultural resources indicated a low probability for significant submerged prehistoric archeological sites, a moderate probability for prehistoric watercraft and a low to moderate potential for the discovery of historic shipwrecks.

The data analyses identified two targets (Targets 1 and 3) located outside the conveyance corridor that exhibited the potential to represent submerged cultural resources. These targets will not be impacted by activities associated with construction or operation of the submerged sediment pipeline. Target 2 consisted of two magnetic anomalies with amplitudes ranging from 26.0 to 2276 nT, and with durations ranging from 70.7 to 230.4 ft. Target 2 is a shallow hazard, and not a historic property. A determination of *no historic properties affected* (36 CFR 800.4) was recommended for Targets 1-3 and concurrence with this recommendation was received from BOEM and the Louisiana Division of Archaeology (Pam Breaux, SHPO, letter dated November 2, 2012; Appendix A).

R. Christopher Goodwin & Associates (RCGA) consulted with the State Historic Preservation Office (SHPO) in regard to terrestrial cultural resources within the Caminada Increment 2 template on May 8, 2012. The Elmer's Island Canoe, a prehistoric Native American vessel, was identified on the headland in the early 1970s following disturbance from a storm; in 1974, Hurricane Juan passed through the area and the canoe has not been seen since. No archaeological site form was prepared for the canoe when it was identified in the 1970s. During the Deepwater Horizon Oil Spill, a total of seven archaeological sites were identified and recorded on the beach by BP Shoreline Cleanup Assessment Team (SCAT) archaeologists. All seven site forms noted the sites were not eligible for the National Register of Historic Places (NRHP) but no concurrence with this determination was issued by SHPO at the time of submittal. The Cathy I site, located within the Caminada Increment 2 footprint, was determined ineligible for the NRHP following archaeological investigations by RCGA (Pam Breaux, SHPO, letter dated April 16, 2012).

On May 15, 2012, SHPO stated the individual archaeological sites recorded by BP's SCAT archaeologists had been consolidated into a single, continuous artifact scatter assigned the archaeological site number 16LF282 and was ineligible for the NRHP (Pam Breaux, SHPO, letter dated May 15, 2012; Appendix A).

3.5 SOCIOECONOMIC AND HUMAN RESOURCES

Section 3.5 of the 2012 Caminada Increment 1 EA describes the socioeconomic and human resources in the project area: Population and Housing; Employment and Income; Environmental Justice; Commercial Fisheries; Infrastructure; Waterborne Commerce; Oil, Gas, and Minerals;

Aesthetic Resources; Recreational Resources; Navigation and Public Safety. This information is incorporated by reference. Additional information on oyster leases and pipelines in and around the Caminada Increment 2 project area is presented below.

3.5.1 Commercial Fisheries

3.5.1.1 Oysters

Oyster leases near the Caminada Increment 2 project area are shown in Figure 3-4. Four oyster leases are within the 1,500 feet buffer zone of the Caminada Increment 2 fill template. No oyster seed grounds are within this buffer zone (James Wray, CPRA, pers. comm., August 23, 2012). These oyster leases will be assessed before the project is constructed.

3.5.2 Infrastructure

3.5.2.1 Offshore Infrastructure

No OCS bottom-founded surface structures are in the Caminada Increment 2 borrow area on Ship Shoal. The Caminada Increment 2 additional pump-out area and conveyance corridor were sighted to avoid pipelines (Figure 3-5). No pipelines are in the Caminada Increment 2 borrow area (Figure 3-6). No caissons or fixed jacketed platforms are located in the Caminada Increment 2 borrow area.

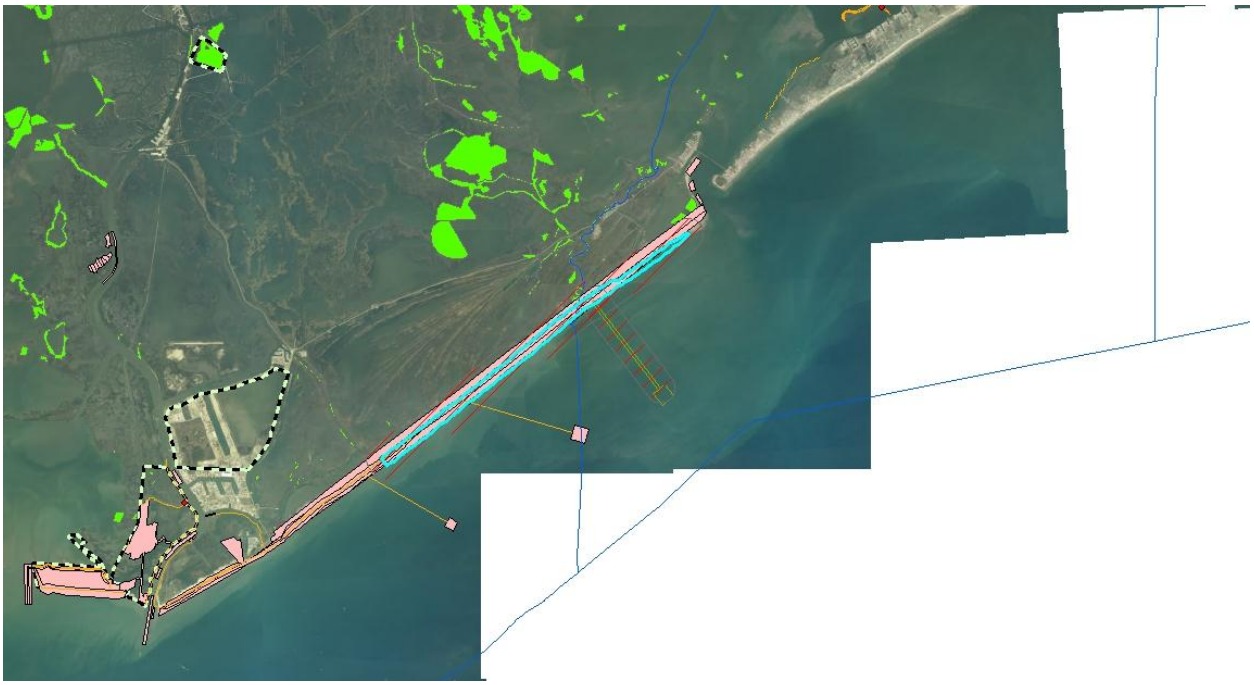

Figure 3-4. Oyster Leases near the Caminada Increment 2 Project Area (James Wray, CPRA, pers. comm., Aug. 14, 2012)

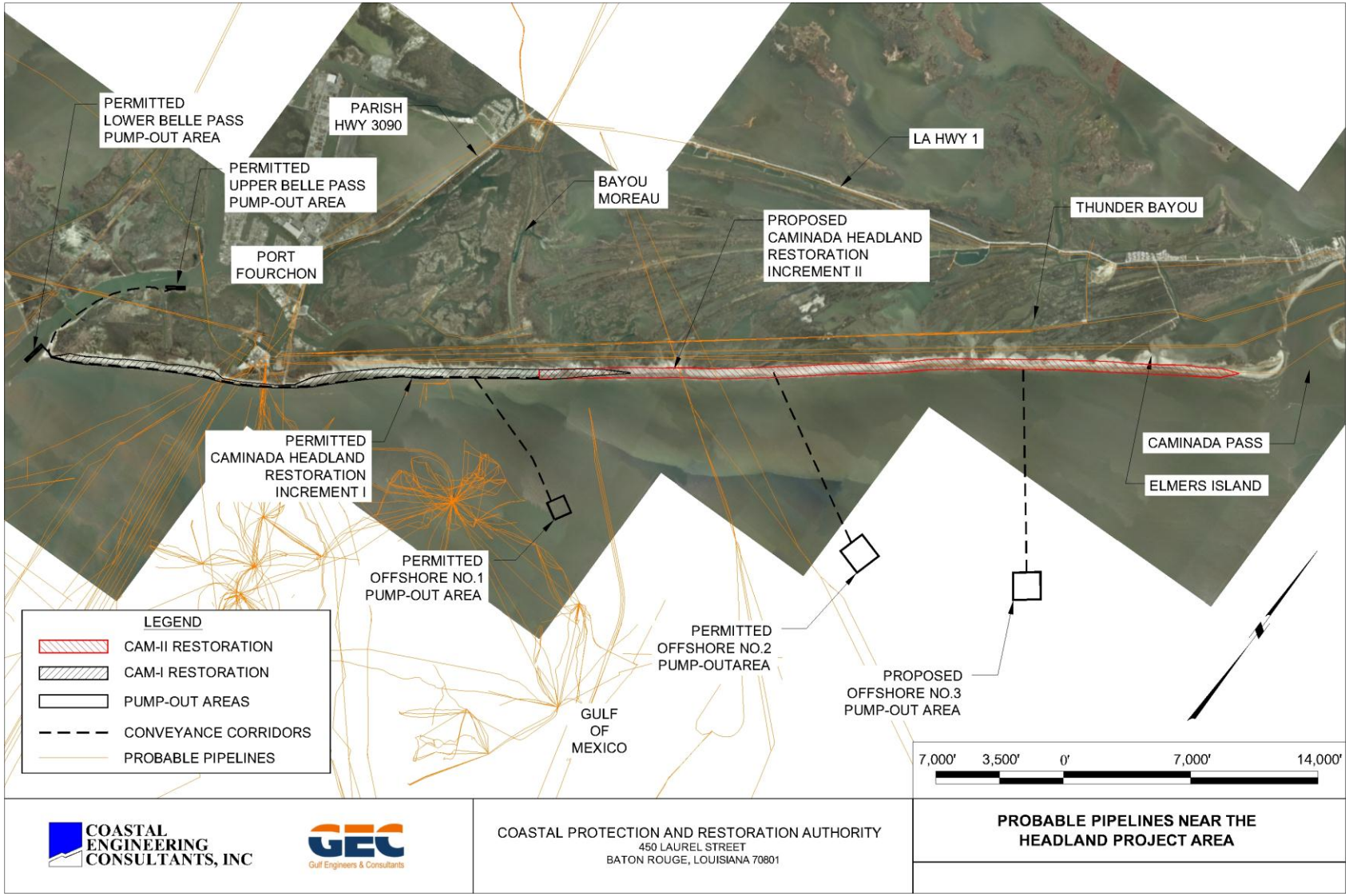

Figure 3-5. Location of Probable Pipelines near Increment 2 Conceptual Conveyance Corridors and Pump-Out Areas

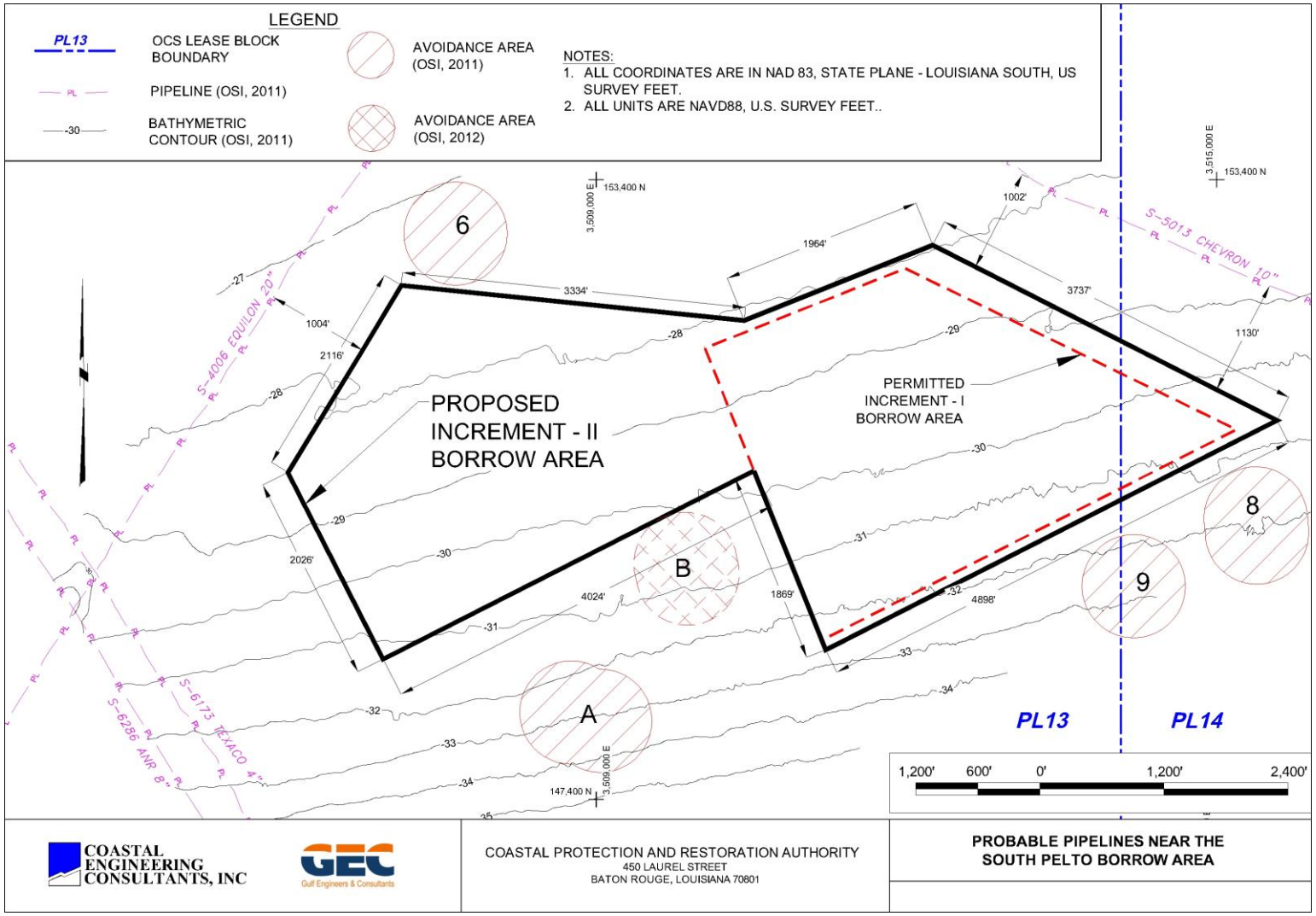

Figure 3-6. Location of Probable Pipelines in the Vicinity of the Increment 2 South Pelto Borrow Area

3.6 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)

Section 3.6 of the 2012 Caminada Increment 1 EA describes Hazardous, Toxic, and Radioactive Waste in the project area. This information is incorporated by reference.

Fourchon Beach experienced heavy oiling as a direct result of the *Deepwater Horizon* oil spill. The oiling at Fourchon Beach is characterized by both surface and buried oil in various forms occurring throughout the intertidal and supratidal zones.

Several protective measures were undertaken at Fourchon Beach with the goal of minimizing the amount of oil that reached the marsh and back bays. One of the protective measures included the installation of sand bags, rock, and sheet pile bulkheads to close breaches along the beach. The breach closure structures were installed under Emergency Use Authorization (EUA) 10-036-1, which includes a condition requiring their removal by no later than July 1, 2012. The follow-up Coastal Use Permit, P20100670, is currently in the application process and will include the same removal date condition.

Cleanup activities at Fourchon Beach have included both manual (e.g., rakes and shovels) and mechanical (e.g., excavators) methods to remove surface and buried oil. Patrolling and maintenance activities with manual removal of surface oil continue in some areas along Fourchon Beach, while other areas along Fourchon Beach continue to be monitored and surveyed. Hurricane Isaac resulted in significant beach erosion (see Section 4.1 below).

Based upon the results of this sediment sampling assessment of the South Pelto Borrow Area of the Caminada Restoration Project, no additional investigation is recommended for the proposed borrow area prior to implementation of the restoration activities (BEM 2011).

4.0 ENVIRONMENTAL EFFECTS

This section is the scientific and analytic basis for the comparisons of the effects of the alternatives on the environment. It summarizes changes that may occur to the existing environment including direct, indirect, and cumulative effects and compares these effects for the No-Action Alternative (Future Without-Project Conditions) and Caminada Increment 2 (Future With-Project Conditions). Caminada Increment 2 includes the Fill Template on the Caminada Headland, the Pump-Out Areas, and the South Pelto Borrow Area. Environmental effects were developed and integrated from the Caminada Increment 1 EA (BOEM 2012), USACE (2012), DOI-MMS (2004), and other documents.

Section 4.0 of the 2012 Caminada Increment 1 EA analyzed the direct, indirect, and cumulative social, economic, and environmental impacts of the proposed activities on resources in the project area. Based on the Caminada Increment 1 EA, BOEM issued a FONSI. Current baseline conditions are generally believed to be similar to conditions described in the 2012 Caminada Increment 1 EA.

This Supplemental EA evaluates whether the proposed action, new circumstances not previously analyzed, or information not previously available contribute to significantly different environmental effects (43 CFR 46.120). The effects of Caminada Increment 2 are expected to be similar to effects of Increment 1; however, since the CPRA has revised the proposed action to include a larger fill template and borrow area, there is the potential for new impacts to occur during dredging and fill placement. An additional offshore pump-out area is also included in Caminada Increment 2.

4.1 PHYSICAL RESOURCES

Section 4.1 of the 2012 Caminada Increment 1 EA analyzed direct and indirect effects of the Increment 1 Project and the No-Action Alternative on physical resources (Oceanographic and Coastal Processes; Geology; Air Quality; Water Quality; and Noise) on the Caminada Headland and Ship Shoal in the project area and is incorporated by reference. Caminada Increment 2 is expected to have similar effects on physical resources; effects are summarized in Table 2-1.

On August 29, 2012 Hurricane Isaac passed over the project area causing a roll back to the north and shoreline erosion of the existing headland. A post-storm topographic and bathymetric survey was conducted to determine the post-hurricane location of the existing dune along the headland. The beach and dune template was evaluated for the best position on the post-storm headland and it was reconfigured northward while maintain the original design criteria and intertidal habitat avoidance. Background erosion of 96,000 cy annually was calculated by comparison of the volume losses between the 2010 and 2012 surveys within the design template footprint. It is anticipated that the final design template would not be shifted any further northward prior to construction as intertidal habitat encroachment would occur. To account for the volumetric losses between the 2012 survey and the anticipated date of construction, two years of background erosion totaling 193,600 cy was accounted for in the final design (CEC 2013).

The project would restore the geomorphic form of the beach and dune, enabling the barrier shoreline to absorb wave energy during storms and fair-weather conditions and provide some storm surge protection, reducing storm damage to upland areas landward of the beach and dune; inhibiting breaching; and decreasing land loss rates

4.2 BIO-PHYSICAL ENVIRONMENT

Section 4.2 of the 2012 Caminada Increment 1 EA analyzed direct and indirect effects of Caminada Increment 1 and the No-Action Alternative on bio-physical resources [Vegetation; Aquatic Resources and Communities (Benthic Resources, Plankton Resources, Fishes and Macroinvertebrates, Invasive Fish and Macroinvertebrate Species); Wildlife Resources; Amphibians, Reptiles, Terrestrial Mammals, and Invasive Wildlife Species; Marine Mammals; and Avian Communities and Resources] on the Caminada Headland and Ship Shoal in the project area and is incorporated by reference. Caminada Increment 2 is expected to have similar effects on bio-physical resources; effects are summarized in Table 2-1. An additional assessment of the effects of Caminada Increment 2 on vegetation is detailed below.

4.2.1 Vegetation Resources

Future With-Project Conditions

Direct
The direct effects of implementing Caminada Increment 2 would create 482 acres of beach and dune habitat in the Caminada Increment 2 template. The project would also fill 2.9 acres of mangrove wetland habitat. However, given existing erosion rates and overwash events in this area, the affected wetlands likely would have been converted to open water or filled with sand sometime in the future without project implementation. These wetlands would be mitigated through the appropriate compensatory mitigation, if required. Caminada Increment 2 would restore and rehabilitate dune, supratidal, and intertidal vegetated coastal barrier habitats; reduce conversion of these habitats to open water habitat; and provide nursery habitat for several species, including brown and white shrimp, and blue crab. The wetland habitat lost provides nursery habitat for several species; however, this habitat would be compensated for by the creation of wetland habitat that would provide the same function.

Indirect
Indirect effects would include providing stability and support for the surrounding habitats and adjacent headlands. Based on the 2012 shoreline along the Caminada Increment 2 project area, a background erosion rate of 60 ft per year computed between 2006 and 2011 was applied for 20 years across the intertidal marsh area landward of the proposed project beach and dune features. The Future Without Project (FWOP) intertidal area impacted by the shoreline erosion was conservatively estimated to be 1,061 acres. This conservative estimate assumes uniform erosion of the existing beach and dune in the Caminada Increment 2 project area over the next 20 years; however, this is inconsistent with historic patterns of breaching along the Caminada Headland which could lead to significantly higher shoreline erosion and intertidal marsh land loss rates. A more accurate estimate of the 20 year FWOP to include breaching of the existing shoreline

would require a robust data collection and modeling effort beyond the scope of this analysis. Based on visual estimates of 2012 aerial photography (post-Hurricane Isaac aerial photography from NOAA, August 31, 2012) of the FWOP polygon, approximately 60 percent of the polygon was open water and 40 percent of the polygon was vegetated intertidal marsh. Based on this estimate of open water to vegetated intertidal marsh in the 1,061-acre impacted intertidal area, a conservative estimate of 424 acres of vegetated intertidal marsh would be lost without implementation of Caminada Increment 2 over 20 years.

4.3 CRITICAL BIOLOGICAL RESOURCES

Section 4.3 of the 2012 Caminada Increment 1 EA analyzed direct and indirect effects of Caminada Increment 1 and the No-Action Alternative on critical biological resources [Essential Fish Habitat (EFH) and Threatened and Endangered Species (Gulf Sturgeon, Sea Turtles, Piping Plover, Florida Manatee, and Whales)] on the Caminada Headland and Ship Shoal in the project area and is incorporated by reference.

Caminada Increment 2 is expected to have similar effects on critical biological resources; effects on critical biological resources are summarized in Table 2-1. An additional assessment of the effects of Caminada Increment 2 on EFH is detailed below.

4.3.1 Essential Fish Habitat

Future With-Project Conditions

Direct/Indirect
Caminada Increment 2 would directly convert 2.9 acres of mangrove wetland vegetation habitat to dune habitat. This mangrove wetland habitat provides EFH; however, given existing erosion rates and overwash events in this area, these affected wetlands likely would have been converted to open water of filled with sand sometime in the future without project implementation. Project implementation is likely to help protect wetlands characterized as EFH along the entire 38,500 feet of shoreline from erosion in the future; mitigation to offset project impacts to 2.9 acres of EFH is not necessary (Virginia M. Fay, NMFS, letter dated November 1, 2012; Appendix A).

4.4 CULTURAL RESOURCES

Section 4.4 of the 2012 Caminada Increment 1 EA analyzed direct and indirect effects of Caminada Increment 1 and the No-Action Alternative on cultural resources on the Caminada Headland and Ship Shoal in the project area and is incorporated by reference. Caminada Increment 2 is expected to have similar effects on cultural resources; effects on cultural resources are summarized in Table 2-1. An additional assessment of the effects of Caminada Increment 2 on cultural resources is detailed below.

Future With-Project Conditions

Caminada Headland

Direct/Indirect
There are no known cultural resources within the proposed Caminada Increment 2 dredge or pump-out areas; therefore, no effects on cultural resources are anticipated. Two targets located outside the conveyance corridor with the potential to represent submerged cultural resources will not be impacted by activities associated with construction or operation of the submerged sediment pipeline. The previously recorded archaeological sites within the proposed beach and dune template are ineligible for the NRHP; therefore, no effects on cultural properties are anticipated.

Ship Shoal Borrow Area

Direct/Indirect
There are no known cultural resources in the proposed Caminada Increment 2 borrow area; therefore, effects to cultural resources are not anticipated. However, there remains a potential for the unanticipated discovery of cultural resources during dredging operations. An Unanticipated Discovery Plan would be implemented if cultural resources are discovered during dredging operations.

4.5 SOCIOECONOMIC AND HUMAN RESOURCES

Section 4.5 of the 2012 Caminada Increment 1 EA analyzed direct and indirect effects of Caminada Increment 1 and the No-Action Alternative on Socioeconomic and Human Resources [Population and Housing; Employment and Income; Environmental Justice; Commercial Fisheries; Infrastructure (Onshore Infrastructure, Offshore Infrastructure); Waterborne Commerce; Oil, Gas, and Minerals; Aesthetic Resources; Recreational Resources; and Navigation and Public Safety]. This information is incorporated by reference.

Caminada Increment 2 is expected to have similar effects on Socioeconomic and Human Resources; effects on socioeconomic and human resources are summarized in Table 2-1. An additional assessment of the effects of Caminada Increment 2 on commercial fisheries is detailed below.

4.5.1 Commercial Fisheries

Future With-Project Conditions

Caminada Headland

Direct
Caminada Increment 2 would not be expected to have significant adverse effects on commercial fisheries. There is a potential of disturbance to four oyster leases in the area. These leases will be assessed and compensated for prior to construction.

Indirect
Indirect effects include turbidity and would be minor and short term. These leases will be assessed and compensated for prior to construction.

4.6 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)

Section 4.7 of the 2012 Caminada Increment 1 EA analyzed direct and indirect effects of the Increment 1 Project and the No-Action Alternative on Hazardous, Toxic, and Radioactive Waste (HTRW). This information is incorporated by reference. Caminada Increment 2 is expected to have similar effects on HTRW; effects are summarized in Table 2-1. Borrow Area testing is discussed in Section 3.6.

Accidental spills and releases of waste/fuel, although remote, are possible. The Contractor will prevent oil, fuel, or other hazardous substances from entering the air or water. This will be accomplished by design and procedural controls. All wastes and refuse generated by project construction would be removed and properly disposed. The Contractor will implement a spill contingency plan for hazardous, toxic, or petroleum material for the borrow area. Compliance with U.S. EPA Vessel General Permits would be ensured, as applicable. The use of Ship Shoal would not adversely affect HTRW within the project area.

4.7 CUMULATIVE IMPACTS

Section 4.6 of the 2012 Caminada Increment 1 EA analyzed cumulative effects of the Caminada Increment 1 Project. This information is incorporated by reference. Caminada Increment 2 is expected to have similar cumulative effects.

4.7.1 Future Projects on the Caminada Headland

It is assumed that construction activities for Caminada Increment 1 and the Geotube Project (described in Section 1.0) will have been completed before the implementation of Caminada Increment 2. Future projects in the headland area include the continued maintenance dredging of Bayou Lafourche and the BBBS Project.

The Recommended Plan for the BBBS Project restores and protects the shorelines, dunes, and marshes of the Caminada Headland and Shell Island, east of Grand Isle. On the Caminada Headland, approximately 880 acres of beach and dunes and 1,186 acres of marsh will be restored or created. The Recommended Plan includes renourishment of the Caminada Headland, sustaining the benefits created by the project construction. Over each 10-year period, a minimum of 3.9 mcy of material will be returned. Material from the Bayou Lafourche, Louisiana navigation project will be placed in the littoral drift south of Bayou Moreau where the long shore transport of material splits eastward and westward, allowing longshore transport and wave action to move and place the sediment along the headland. The renourishment will benefit the headland as longshore transport nourishes the beach and adds width to the shoreline.

4.7.2 Cumulative Effects

Cumulative effects mainly include the restoration of the Caminada Headland to offset coastal land loss in Louisiana. Since most of the effects on resources are short-term and minor, the overall cumulative effects are minor. Compared to the No-Action alternative, cumulative effects would be the synergistic effects of restoring coastal land forms that are estimated to be lost at a rate of 6,600 acres per year over the next 50 years, and the removal of sand resources from the borrow area as part of other planned Federal and state utilization of Ship Shoal for restoration efforts. Cumulative effects on the Caminada Headland are beneficial. Cumulative effects on the pump-out areas and Ship Shoal are minor and localized, and short-term.

The proposed cumulative placement of over as much as 6.1 mcy of beach and dune compatible sand would create 482 acres of barrier headland beach and dune, improving the ability of the headland to resist shoreline erosion, wave overtopping, and breach formation. Installation of sand fencing and dune vegetation will provide a mechanism for future Aeolian sand transport and dune enhancement, which furthers shoreline protection through fostering the nourishment of downdrift shorelines. The creation and protection of shoreline provides for some storm damage reduction. The Future Without Project intertidal area impacted by the shoreline erosion was conservatively estimated to be 1,061 acres; a conservative estimate of 424 acres of vegetated intertidal marsh would be lost without implementation of Caminada Increment 2 over 20 years.

Cumulative effects on the Ship Shoal sand resources would be minor, even in combination with other planned Federal and state utilization of Ship Shoal for restoration efforts. Ship Shoal encompasses approximately 76,600 acres and contains an estimated 1.57 billion cubic yards of very fine- to medium-grained sand (DOI-MMS 2004; USACE 2012). The designated borrow areas for the LCA-Barataria Basin Barrier Shoreline Restoration (BBBS) and the LCA-Terrebonne Basin Barrier Shoreline Restoration Project (TBBSR) (USACE 2010) have been located on portions of Ship Shoal Lease Blocks 88 and 89 and South Pelto Lease Blocks 12, 13, and 14. The cumulative estimated excavation volume for both the BBBS and TBBSR projects is 43.2 mcy or 2.8 percent of the total volume. Caminada Increment 2 would affect 305 acres and dredge as much as 6.1 mcy. The total volume of the combined Caminada Increment 1 and 2 borrow areas is approximately 11.1 mcy of sand with a surface area of approximately 525 acres. This combined area equates to approximately 0.6 percent of the total Ship Shoal sand body surface area. When this project is combined with other proposed projects, the cumulative effects would only represent approximately 9,200 acres, or 12 percent of the estimated Ship Shoal sand body acreage.

4.8 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Ship Shoal is the largest of a series of inner shelf sand shoals off the Louisiana coast. The use of the sand from South Pelto Blocks 13 and 14 is unlikely to deplete the supply of sand suitable for future restoration projects. There would be sufficient sand remaining in the dredged areas for re-colonization of benthic organisms. Use of the sand from this area is not an irreversible/ irretrievable commitment of resources.

4.9 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

The Caminada Increment 2 and No-Action Alternatives have minor, short-term, unavoidable, adverse, direct and indirect environmental effects that are discussed in this document. However, many of these effects are temporary and minor.

4.10 COMPATIBILITY WITH FEDERAL, STATE, AND LOCAL OBJECTIVES

Caminada Increment 2 is compatible with Federal, state, and local objectives of restoring the Caminada Headland.

4.11 CONFLICTS AND CONTROVERSY

Section 4.11 of the 2012 Caminada Increment 1 EA described Conflicts and Controversy in the Increment 1 Project Area. These are believed to be the same for the Caminada Increment 2 Project Area.

5.0 ENVIRONMENTAL COMMITMENTS

CPRA commits to avoiding, minimizing, or mitigating for adverse effects during construction activities by including the following commitments in the contract specifications. Mitigation and monitoring has been derived through consultation and coordination with Federal and state agencies. The USACE, LDNR, and LDEQ permits contain extensive requirements/conditions to ensure the minimizing and mitigation of adverse effects (see Appendix A).

PROTECTION OF FISH AND WILDLIFE RESOURCES

CPRA will comply with all requirements of consultation documents associated with this project provided under the Endangered Species Act from the USFWS, NMFS, and LDWF. All sea turtle safety precautions will be maintained to comply with the NMFS Biological Opinion requirements. Mitigation measures that will be incorporated into the project include relocation trawling, the use of turtle observers, floodlights, artificial lighting, turtle deflector devices, turtle reports, and the use of time intervals between dredging.

The Contractor will keep construction activities under surveillance, management, and control to minimize interference with, disturbance to, and damage of fish and wildlife. A Bird Abatement Plan will be implemented during construction of this project (see Appendix A). Reasonable and prudent measures outlined in the USFWS Biological Opinion regarding piping plover and critical habitat will be adhered to during project implementation (see Appendix A).

WATER QUALITY

The contractor will prevent oil, fuel, or other hazardous substances from entering the air or water. This will be accomplished by design and procedural controls. All wastes and refuse generated by project construction will be removed and properly disposed. The contractor will implement a spill contingency plan for hazardous, toxic, or petroleum material. Compliance with EPA Vessel General Permits would be ensured, as applicable. A Water Quality Certification was issued for this project on November 1, 2012 (WQC 120906-01/AI 183799) (see Appendix A).

CONSTRUCTION MONITORING

Electronic positioning information, production, and volume data will be collected and forwarded to BOEM. Pre- and post-dredging hydrographic surveys will be conducted to monitor physical changes in the borrow area. The dredge would be equipped with an on-board global positioning system capable of maintaining or recording the location of the dredge, dragarms, and/or cutterhead. Physical monitoring of the construction profile and the pipeline corridors will be conducted. The construction will be monitored by CPRA to ensure that the project stays within the design template. Pipelines will be monitored for leaks.

CULTURAL RESOURCES

Potential cultural resources identified during surveys of South Pelto Blocks 13 and 14 will be avoided during dredging operations by implementing a 500-meter buffer. Protocols in the Unanticipated Discoveries Plan (Caminada Increment 1 EA - Appendix A) would be implemented in the event that the contractors discover any archaeological resource during borrow area dredging. In the event cultural resources are discovered during construction on the headland, construction activities will be halted immediately and the discovery would be reported to SHPO, the BOEM Gulf of Mexico Region, Office of Environment, and CPRA. If human remains are encountered during construction, Section 680 of the Louisiana Unmarked Human Burial Sites Preservation Act (RS 8:671) will be implemented and coordination will be undertaken with the State Archaeologist, coroner, the Sovereign Nation of the Chitimacha, BOEM, and CPRA.

6.0 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

Appendix A contains all correspondence related to USACE, LDNR, and LDEQ permit actions for this project.

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

Environmental information on the project has been compiled in this Supplemental EA. The project is in compliance with the National Environmental Policy Act (NEPA).

ENDANGERED SPECIES ACT OF 1973

Consultation was initiated with the USFWS and NMFS through the USACE Sections 10 and 404 permitting processes. Compliance with the Threatened and Endangered Species Act is being closely coordinated with the USFWS and NMFS for those species under their respective jurisdictions.

The Hopper and Hydraulic Cutterhead Dredging Associated with Sand Mining for Coastal Restoration Projects Along the Coast of Louisiana Using Sand from Ship Shoal in the Gulf of Mexico Central Planning Area, South Pelto Blocks 12, 13, and 19, and Ship Shoal Block 88 NMFS Biological Opinion (Consultation No. F/SER/2003/01247) issued on Sept. 19, 2005, covers hopper dredging associated with sand mining at Ship Shoal for restoration projects along the Louisiana coast, and analyzes and accounts for the effects of sand mining on ESA-listed species (NMFS 2005). NMFS believed that the existing biological opinion entirely encompasses the scope of this project, and adequately addresses the issues associated with threatened and endangered species under their purview for Caminada Increment 2 (David Bernhart, NMFS, letter dated April 8, 2013). All terms and conditions and conservation recommendations of the NMFS biological opinion will be adhered to for this project.

Caminada Increment 2 is a subset of the BBBSR Project and is scheduled to be completed before the BBBSR Project is implemented. As a result, the USFWS amended the December 21, 2011 Louisiana Coastal Area Barataria Basin Barrier Shoreline Restoration Project, Jefferson, Lafourche, and Plaquemines Parishes, Louisiana Biological Opinion (USFWS 2011) to include Caminada Increment 2 (Jeffrey D. Weller, USFWS, letter dated November 7, 2012). All terms and conditions of the USFWS biological opinion will be adhered to for this project.

NATIONAL HISTORIC PRESERVATION ACT OF 1966 (INTER ALIA)

Archival research, channel surveys, and consultation with the Louisiana State Historic Preservation Officer (SHPO) were conducted for the project. All activities have been conducted in accordance with the National Historic Preservation Act, as amended; the Archeological and Historic Preservation Act, as amended; and Executive Order 11593. Coordination with SHPO and the Sovereign Nation of the Chitimacha for the BOEM sand lease and the USACE permit actions are complete. SHPO concurrence was received on November 2, 2012 for the Phase 1 Cultural Resources Investigation of the Caminada Headland portion of the project (Appendix

A). Marine Archaeological surveys were completed for the OCS portion of the project during the Caminada Increment 1 Project (BOEM 2012). The OSI marine survey reports were reviewed and approved by BOEM archaeologists. Buffer zones were created around potentially significant resources to avoid accidental disturbance from dredging activities. Buffer zone requirements will be specifically detailed in the BOEM non-competitive negotiated agreement. In summary, no cultural resources eligible for or listed on the National Register of Historic Places (NRHP) are located within the areas of potential effects (APEs) for the fill template, in the OCS Ship Shoal borrow areas, borrow or the pump out areas. Therefore, no historic properties will be affected by the planned undertaking, as proposed (36 CFR Part 800.4(d)(1).

CLEAN WATER ACT OF 1972

The project is in compliance:

Sec. 311: A standard spill control plan for the borrow area will be initiated prior to construction.

Sec. 401: This section of the Clean Water Act requires the Water Quality Certification of all Federal licenses and permits in which there is *a discharge of fill material into navigable waters*. The certification is used to determine whether an activity, as described in the Federal license or permit, will impact established site specific water quality standards. A Water Quality Certification was issued for this project on November 1, 2012 (WQC 120906-01/AI 183799) (Appendix A).

Sec 404: Potential project-related impacts subject to these regulations have been evaluated as in compliance with Section 404 of the Clean Water Act. The USACE issued a Section 10/404 permit (MVN-2012-02134-WPP) on August 29, 2013 (Appendix A).

CLEAN AIR ACT OF 1972

The project is in compliance:

Sec. 176: No permanent sources of air emissions are part of the project. No air quality permits would be required for this project.

Sec. 309: The project has been coordinated with the public and agencies.

COASTAL ZONE MANAGEMENT ACT OF 1972

Section 307 (16 U.S.C. 1456(c)(1)(A)) of the Coastal Zone Management Act of 1972 directs Federal agencies proposing activities or development projects (including civil work activities), whether within or outside the coastal zone, to assure that those activities or projects are consistent, to the maximum extent practicable, with the approved state coastal zone management program. Implementation of the project is considered consistent, to the maximum extent practicable, with the approved Louisiana Department of Natural Resources Coastal Use Permit No. P20121150 on February 14, 2013. The Ship Shoal Borrow Area is located in Federal waters

and a consistency determination under Subpart D was granted on December 3, 2012 (C20120338). Federal OCS actions that include oil, gas, minerals (sand), have to be consistent with the coastal management plan (Appendix A).

MARINE MAMMAL PROTECTION ACT OF 1972

Marine mammals are not likely to be adversely affected by the project (David Bernhart, NMFS, letter dated April 8, 2013).

ESTUARY PROTECTION ACT OF 1968

The Caminada Headland provides protection for the Barataria-Terrebonne National Estuary; the project would not result in adverse impacts to the estuary.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976, AS AMENDED

An assessment of the effects of the project on Essential Fish Habitat (Section 3) concluded that the project would have minimal short term adverse impacts, some of which would be temporary, on EFH of the species managed under this Act. The project is in compliance. NMFS concurred that the 2.9 acres of black mangrove vegetated habitat that would be filled as part of the project would not be required to be mitigated (Virginia M. Fay, NMFS, letter dated November 1, 2012; Appendix A). EFH coordination was completed through the USACE 10/404 permit evaluation process and the issued permit was appropriately conditioned and reviewed by NMFS.

SUBMERGED LANDS ACT OF 1953

The borrow area is located in Federal waters. Beach nourishment on submerged lands of the State of Louisiana has been coordinated with the State and the project is in compliance.

COASTAL BARRIER RESOURCES ACT AND COASTAL BARRIER IMPROVEMENT ACT OF 1990; COASTAL BARRIER RESOURCES REAUTHORIZATION ACT OF 2000 AND 2005

The Caminada Headland is part of the John H. Chafee Coastal Barrier Resources System (CBRS); however, Caminada Increment 2 would not affect development. This project is in compliance.

RIVERS AND HARBORS ACT OF 1899

The proposed work would not obstruct navigable waters of the United States. The USACE issued a Section 10/404 permit (MVN-2012-02134-WPP) on August 29, 2013 for this project; therefore, this project is in compliance and the CPRA will be required to coordinate with the U.S. Coast Guard (USCG).

ANADROMOUS FISH CONSERVATION ACT

Anadromous fish species are not likely to be affected. The project has been coordinated with both the NMFS and the USFWS, and is in compliance.

MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT

Migratory birds may be temporarily affected by project activities. Monitoring and mitigation efforts with regard to migratory birds are being coordinated with USFWS and LDWF; a migratory bird abatement plan (see Appendix A) will be implemented. All terms and conditions of the USFWS biological opinion (see Appendices A and B) will be adhered to for this project.

E.O. 11990, PROTECTION OF WETLANDS

Placement of borrow would unavoidably fill 2.9 acres of black mangrove wetlands; however, additional wetlands would be created to replace the lost wetlands. This project is in compliance with the goals of this Executive Order.

E.O. 12898, ENVIRONMENTAL JUSTICE

The project would not result in adverse human health or environmental effects, nor would it affect subsistence consumption of fish or wildlife. The project is in compliance.

E.O. 13186, RESPONSIBILITIES OF FEDERAL AGENCIES TO PROTECT MIGRATORY BIRDS

This Executive Order requires that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern. In addition, each Federal agency shall restore and enhance the habitat of migratory birds, as practicable. All terms and conditions of the USFWS biological opinion will be adhered to for this project. A Bird Abatement Plan will be implemented during this project and is included as a condition on the USACE 10/404 permit (see Appendix A).

VEHICULAR ACCESS

The project, as designed, will not limit vehicular access for public access purposes, but per R.S. 38:213 LDWF would need a permit from CPRA to drive on a feature of an integrated coastal protection project in the coastal area. Pursuant to R.S. 38:213, *No person shall ride, drive or haul upon public levees or integrated coastal protection projects or their rights-of- way except where, in the judgment of the levee commissioners of a district and the Department of Transportation and Development, or, for levees or integrated coastal protection projects in the coastal area as defined in R.S. 49:214.2(3), the Office of Coastal Protection and Restoration, ample provision has been made to guard against any damage to which the levees or integrated*

coastal protection projects may thereby be exposed from wear, tear and abuse. Each levee district shall publish guidance, erect signage and require special permits as they seem appropriate to allow them to make provisions for limited riding, driving or hauling.

7.0 LIST OF PREPARERS

Name	Organization	Role in Preparation
Michael Miner, Ph.D.	BOEM	Document Review
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8.0 REFERENCES

Balanced Environmental Management (BEM). 2011. Sediment Sampling Assessment Report. West Caminada Headland Beach/Dune Restoration and Marsh Creation Project. Prepared for Louisiana Office of Coastal Protection and Restoration, 450 Laurel Street, Suite 1200, Baton Rouge, LA.

Batten, B.K., Ebersole, B.A., King, D.B., Smith, E.R. 2004. Coastal Processes Assessment and Project Re-Evaluation: Grand Isle, Louisiana, Shore Protection Project. U.S. Army Corps of Engineers Engineer Research and Development Center, ERDC/CHL TR-04.

Bureau of Ocean Energy Management (BOEM). 2012. Final Environmental Assessment for the Issuance of a Non-Competitive Negotiated Agreement for the use of Outer Continental Shelf Sands for Caminada Headland Beach and Dune Restoration (BA-45). Prepared for U.S. Department of Interior Bureau of Ocean Energy Management on Behalf of Coastal Protection and Restoration Authority of Louisiana, June 2012. http://www.boem.gov/uploadedFiles/Caminada%20Headlands%20Final%20EA%20and%20FONSI.pdf

Coast and Harbor Engineering, Hartman Engineering (CHE). 2007. Grand Isle Barrier Shoreline Stabilization Study, Preliminary Engineering Report, Part 1, 2, and Appendix A. Prepared by Hartman Engineering and Coast and Harbor, Inc. for the Louisiana Department of Natural Resources. LDNR Contract No. 2512-05-05.

Coastal Engineering Consultants, Inc. (CEC). 2013. Caminada Headland – Increment II. Final Design Report (BA-143). LDNR Contract No. 2503-10-16. (Scheduled to be submitted to the Coastal Protection and Restoration Authority in March 2013).

Enright, J.M., R. Gearhart II, D. Jones, and J. Enright. 2006. Study to Conduct National Register of Historic Places Evaluations of Submerged Sites on the Gulf of Mexico Outer Continental Shelf. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2006-036. 136 pp.

Fathom Research, LLC. 2012. Caminada Headland Beach and Dune Restoration Project (BA-45) Marine Archaeological Sensitivity Assessment of the Underwater Portions of the Belle Pass (Lower and Upper), Pass Fourchon, and Offshore (West and East) Dredged Materials Conveyance Corridor and Pump-Out Alternatives. Study prepared for OSI, CEC, and Louisiana CPRA.

Federal Emergency Management Association (FEMA). 2012. Draft Environmental Assessment Fourchon Beach Shoreline Protection, Greater Lafourche Port Commission, Lafourche Parish, Louisiana, FEMA-1603-DR-LA, U.S. Department of Homeland Security, Federal Emergency Management Agency, Region VI, New Orleans, LA. November 2012.

Gearhart, R., 2011. Archeological Interpretation of Marine Magnetic Data, Chapter 4, in, The Oxford Handbook of Maritime Archeology; Catsambis, A., Ford, B., and Hamilton, D.L., eds., Oxford University Press, New York, p. 90-113.

Hester, M.W., L.K. Alleman, and J.M. Willis. 2009. CREST 2006 – 2008 Final Report, Restoration Enhancement of Black Mangrove Establishment in Barrier Island/Headland Project Design: Determination of Differential Tolerance Thresholds of Propagules and Seedlings, March 31, 2009 Coastal Plant Ecology Laboratory, Department of Biology, University of Louisiana Lafayette, Lafayette, LA. 50 p. http://www.gulfcrest.org/Science/Project%20Reports/hester_final_report.pdf

Houck, M. and R. Neill. 2009. Plant fact sheet for black mangrove (*Avicennia germinans* (L.) L.). USDA-Natural Resources Conservation Service, Louisiana Plant Materials Center, Galliano, Louisiana http://plants.usda.gov/factsheet/pdf/fs_avge.pdf

Johnson, E.I. 2011. Audubon Coastal Bird Survey. Fall 2011 Summary. National Audubon Society. Baton Rouge, LA.

Khalil, S.M. 2008. The Use of Sand Fences in Barrier Island Restoration: Experience on the Louisiana Coast. U.S. Army Engineer Research and Development Center, Environmental Laboratory, Vicksburg, MS, ERDC TN-SWWRP-08-4, Mar. 2008, 23 p. http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA479139

List, J.H., Sallenger, A.H. Jr., Williams, S.J., McBride, R.A., and Penland, S. 1994. Louisiana Barrier Island Erosion Study: Atlas of Sea-Floor Changes from 1878 to 1989. U.S. Geological Survey Misc. Invest. Series I-2150-B. 82 p.

Louisiana Coastal Wetlands and Restoration Task Force (LCWRTF). 2010. West Belle Pass Headland Restoration (TE-52). Louisiana Coastal Wetlands Conservation and Restoration Task Force, rev. March 2010. 2 p. http://lacoast.gov/reports/gpfs/TE-52.pdf

Martinez, L., S. O'Brien, M. Bethel, S. Penland, and M. Kulp. 2009. Louisiana Barrier Island Comprehensive Monitoring Program (BICM). Volume 2: Shoreline Changes and Barrier Island Land Loss 1800's–2005. University of New Orleans, Pontchartrain Institute for Environmental Sciences, New Orleans, LA. 32 p. http://lacoast.gov/reports/project/3890772~1.pdf

National Marine Fisheries Service (NMFS). 2005. Endangered Species Act – Section 7 Consultation Biological Opinion for Hopper and Hydraulic Cutterhead Dredging Associated with Sand Mining for Coastal Restoration Projects Along the Coast of Louisiana Using Sand from Ship Shoal in the Gulf of Mexico Central Planning Area, South Pelto Blocks 12, 13, and 19, and Ship Shoal Block 88 (Consultation No. F/SER/2003/01247). National Marine Fisheries Service, St. Petersburg, FL.

National Oceanic and Atmospheric Administration (NOAA). 2012. Hurricane Isaac Tropical Cyclone Position Estimate NWS National Hurricane Center, Miami FL, 300 AM CDT WED AUG 29 2012. http://www.nhc.noaa.gov/archive/2012/al09/al092012.posest.08290758.shtml

National Oceanic and Atmospheric Administration (NOAA). 2013. Remnants of Karen Discussion Number 14, NWS National Hurricane Center, Miami FL, 1000 AM CDT SUN OCT 06 2013. http://www.nhc.noaa.gov/text/refresh/MIATCDAT2+shtml/031438.shtml

National Oceanic and Atmospheric Administration (NOAA) Fisheries. 2012. Sea Turtle Strandings in the Gulf of Mexico. Accessed online November 25, 2012 http://www.nmfs.noaa.gov/pr/species/turtles/gulfofmexico.htm

National Oceanic and Atmospheric Administration (NOAA) Fisheries. 2013. 2010-2012 Cetacean Unusual Mortality Event in Northern Gulf of Mexico, accessed February 21, 2013 http://www.nmfs.noaa.gov/pr/health/mmume/cetacean_gulfofmexico2010.htm#map

National Oceanic and Atmospheric Administration - National Marine Fisheries Service (NOAA-NMFS). 2010. West Belle Pass Barrier Headland Restoration CWPPRA Project Fed No. TE-52, Environmental Assessment, Lafourche Parish, Louisiana. NOAA NMFS. 78 p.

Patterson, C.S. and I.A. Mendelssohn 1991. A comparison of physicochemical variables across plant zones in a mangal/salt marsh community in Louisiana. Wetlands 11:139-161.

Patterson, C.S., I.A. Mendelssohn, and E.M. Swenson. 1993. Growth and survival of *Avicennia germinans* seedlings in a mangal/salt marsh community in Louisiana, U.S.A. Journal of Coastal Research, 9(3): 801-810.

U.S. Army Corps of Engineers (USACE). 2004. Louisiana Coastal Area (LCA) Louisiana Ecosystem Restoration Study. Final Volume 1: LCA Study-Main Report. New Orleans, LA.

U.S. Army Corps of Engineers (USACE). 2010. Supplemental Biological Assessment Louisiana Coastal Area (LCA) Barataria Basin Barrier Shoreline Restoration Feasibility Study Caminada Headland and Shell Island Restoration, U.S. Army Corps of Engineers, New Orleans District. August 9, 2010. 88 p plus appendices.

U.S. Army Corps of Engineers (USACE). 2012a. Louisiana Coastal Area Barataria Basin Barrier Shoreline Restoration Final Integrated Construction Report and Final Environmental Impact Statement. U.S. Army Corps of Engineers, Mississippi Valley Division, New Orleans District, March 2012. http://www.lca.gov/Projects/4/

U.S. Dept. of the Interior. Minerals Management Service (DOI-MMS). 2002. Gulf of Mexico OCS Oil and Gas Lease Sales: 2003-2007; Central Planning Area Sales 185, 190, 194, 198, and 201 Western Planning Area Sales 187, 192, 196, and 200—Final Environmental Impact Statement. 2 vols. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA.

U.S. Dept. of the Interior. Minerals Management Service (DOI-MMS). 2004. Environmental Assessment – Issuance of Non-Competitive Leases for the Use of Outer Continental Shelf Sand Resources from Ship Shoal, Offshore Central Louisiana for Coastal and barrier Island Nourishment and hurricane levee Construction. April 2004.

U.S. Fish and Wildlife Service (USFWS). 2011. Louisiana Coastal Area Barataria Basin Barrier Shoreline Restoration Project, Jefferson, Lafourche, and Plaquemines Parishes, Louisiana. 04EL1000-2012-F-0594 Biological Opinion, December 21, 2011.