



OFFICE FOR COASTAL MANAGEMENT  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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## **FINAL ENVIRONMENTAL ASSESSMENT**

### **Point-au-Chien Cultural Heritage Protection Reef in Coastal Louisiana**



February 2019

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## **Common Acronyms**

BBL	Barrels
CAAA	Clean Air Act Amendments
CEQ	Council on Environmental Quality
CO <sub>2</sub>	Carbon dioxide
CRCL	Coalition to Restore Coastal Louisiana
DO	Dissolved Oxygen
EA	Environmental Assessment
EDF	Environmental Defense Fund
EFH	Essential fish habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act
GCRL	Gulf Coast Research Lab
GOMA	Gulf of Mexico Alliance
GHG	Greenhouse gas
IPaC	Information for Planning and Consultation
LDEQ	Louisiana Department of Environmental Quality
LDWF	Louisiana Department of Wildlife and Fisheries
LNG	Liquefied natural gas
LSU	Louisiana State University
MCF	Thousand cubic feet
MMT	Million metric tons
MPA	Marine protected area
MSA	Metropolitan Statistical Area
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO <sub>2</sub>	Nitrogen dioxide
NOAA	National Ocean Atmospheric Administration
NRHP	National Register of Historic Places
O <sub>3</sub>	Ozone

OCM	Office for Coastal Management
PACIT	Pointe au Chien Indian Tribe
Pb	Lead
PM	Particulate matter
SHPO	State Historic Preservation Office
SO <sub>2</sub>	Sulfur dioxide
USACE	US Army Corps of Engineers
USEIA	US Energy Information Administration
USFWS	US Fish and Wildlife Service



# 1. PROJECT OVERVIEW

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## 1.1 Introduction

This Environmental Assessment (EA) was prepared by the National Oceanic and Atmospheric Administration's (NOAA) Office for Coastal Management (OCM) in accordance with the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. §§ 4321 *et seq.*, as implemented by the Council on Environmental Quality (CEQ) Regulations (40 CFR Parts 1500 through 1508). NEPA requires that Federal agencies carefully consider all environmental effects of their proposed actions, analyze potential environmental effects of proposed actions and their alternatives, avoid or minimize adverse effects of proposed actions, and restore and enhance environmental quality to the extent practicable during their decision-making processes.

## 1.2 Proposed Action

In October 2017, OCM awarded a \$23,320 coastal resiliency grant to the Gulf of Mexico Alliance (GOMA), subject to a Special Award Condition that OCM complete a NEPA analysis for any proposed project(s). Through this EA, the OCM analyzes the environmental effects of its proposed action—the funding of the *Installation of an*

project through the coastal resiliency grant awarded to GOMA. The Pointe au Chien Native American Tribe (PACIT or Tribe) developed the oyster reef project in partnership with representatives from Terrebonne and Lafourche Parishes and the Coalition to Restore Coastal Louisiana. The project proposes measures to protect ancient mounds with cultural significance sacred to the Pointe au Chien Tribe. The project would consist of installing a natural oyster reef to help preserve the mounds from future coastal erosion and sea level rise.

## 1.3 Purpose and Need

The Pointe au Chien Indian Tribe (PACIT) is made up of approximately 750 members who occupy the southernmost portions of Terrebonne and Lafourche Parishes along Bayou Pointe au Chien. Their ancestors are the Chitimacha, and they are also believed to be descendants of the Acolapissa, Atakapas, and Biloxi Indians. Historically, the residents of this area made a living as farmers, fishermen, and hunters. Unfortunately, this way of life has been compromised over time by the impacts of sea level rise and coastal storms which have led to land loss, saltwater intrusion, and lack of freshwater. Land loss has been exacerbated by oil and gas canals, which further fragment the marsh landscape.

Land loss and flooding from coastal storms have increased in recent years, and residents have adapted to the changing landscape by migrating further north along the bayou and elevating their homes. Members of this community do not want to relocate. They want to live where they grew up and continue to live off the land as their ancestors did (Lambeth, 2016).

An archaeological survey conducted by the Gulf South Research Institute in 1975 indicated various archaeological and historical sites in the study area. The report stated there were various earth mounds in the Terrebonne and Lafourche Parish. Mounds were used for ceremonial purposes by the native tribal members.

There are several earthen mounds located in the vicinity of the project area that are currently at risk due to coastal erosion. The mounds are located at the confluence of a natural bayou (Bayou Pointe au Chien) and a man-made oil and gas canal. The Bayou has been hydro-modified (see Appendix A) and does not presently run through its natural channel. Water moves through this area at a high rate of speed resulting in significant erosion along the shoreline. This erosion will be made more severe by coastal storms and sea level rise over time. The project area is only accessible by boat, and it is surrounded by wetlands and water.

The PACIT has been working with Louisiana partners, through a NOAA financial assistance award to the Gulf of Mexico Alliance, to assess the vulnerabilities of their community to climate change. They have used local, historic knowledge of the area to identify and map habitat changes over time as well as key cultural sites that are in danger of eroding away. Efforts to assess vulnerability have enabled them to prioritize areas of cultural significance for adaptation measures.

The purpose of the proposed action is to provide funding for the PACIT oyster reef project in order to install a natural oyster bed to harden the shoreline and protect the integrity of the bayou and the land from coastal erosion due to wave action, tidal currents, wave currents, and sea level rise. Oysters are an important species in the lower Mississippi River, having economic value as a commercial fishery and improving water quality and habitat. They filter water, remove sediment and nutrients, and provide a hard structure that serves as habitat for not only future generations of oysters, but also for a variety of recreationally- and commercially-valuable fish and benthic species. It is anticipated that installing the natural oyster reefs will provide habitat and water quality improvements that will promote a healthy estuarine system locally.

Oyster restoration is a significant component of the current efforts to restore the Lafourche Parish ecosystem. This project also will evaluate the effectiveness of using oyster beds for surge protection in hopes that it may be transferable to other areas of Southern Louisiana (and the country) that are experiencing erosion in culturally sensitive areas.

The Tribe has limited access to resources needed to adapt or mitigate the hazards and risks of their dynamic coastal environment (Lambeth, 2016). As such, the coastal resiliency grant funding from the Office for Coastal Management is needed to provide the Tribe with necessary resources for completing the oyster reef project.

*Figure 1. Project Site*



## **1.3 Opportunities for Public Involvement**

### **1.3.1 Meeting Advertisement**

The Gulf of Mexico Alliance issued a [press release](#) on November 6, 2017 to announce this project. Since that time, the Pointe au Chien Tribe has held Tribal Council meetings and community socials where the oyster reef project was discussed in an open forum and public engagement or comments were welcomed. Tribal Council Meetings take place on the third Saturday of every month. Announcements about Council Meetings and community socials are shared primarily through Facebook. The Coalition to Restore Coastal Louisiana (CRCL) participated in a Tribal Council Meeting on September 8, 2018 and a community social on September 22, 2018 to share updates concerning this project and to recruit volunteers to assist with field work.

### **1.3.2 Meeting Summary**

During the Tribal Council Meeting on September 8, 2018, CRCL staff shared details about the project, including potential field work dates, materials that will be needed and volunteer opportunities. The Tribe provided contact information for local vendors who can

help provide materials and equipment as well as information about expectations and cultural norms for participating staff and volunteers. The Tribe also extended an invitation to participate in a community social on September 22, 2018 to begin recruiting volunteers from the community.

## ***1.4 Coordination with Agencies***

Correspondence in Appendix C.

### **Louisiana State Historic Preservation Officer**

Louisiana Office of Cultural Development  
State Historic Preservation Division  
P.O. Box 44247  
Baton Rouge, LA 70804-4241

### **Louisiana Tribal Historic Preservation Officer**

Seminole Nation of Oklahoma  
P.O. Box 1498  
Wewoka, OK 74884

### **National Oceanic and Atmospheric Administration**

National Marine Fisheries Service  
Southeast Regional Office  
Protected Resources Division  
263 13<sup>th</sup> Avenue South  
St. Petersburg, Florida 33701-5505

### **Pointe-au-Chien Indian Tribe**

P.O. Box 416  
Montegut, LA 70377

### **Seminole Nation of Oklahoma**

Historic Preservation Officer  
Seminole Nation of Oklahoma  
P.O. Box 1498  
Wewoka, OK 74884

### **USFWS Louisiana Ecological Services Field Office**

646 Cajundome Boulevard, Suite 400  
Lafayette, LA 70506-4290118

## 2. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

In determining whether to allow coastal resiliency grant funds to be used for the PACIT's oyster reef project, NOAA OCM considered and evaluated the preferred alternative (i.e., undertaking the proposed action) and a no-action alternative.

### 2.2 Preferred Alternative (proposed action)

The preferred alternative is to undertake the proposed action - funding of the *Installation of an Oyster Bed Coastal Protection and Restoration* project through the coastal resiliency grant awarded to GOMA - was developed by the PACIT in partnership with representatives from Terrebonne and Lafourche Parishes and the Coalition to Restore Coastal Louisiana.

The project would consist of installing a natural oyster reef to help preserve and protect six ancient mounds from future coastal erosion and sea level rise. The mounds have cultural significance sacred to the PACIT and are located in Lafourche Parish on the corner of a natural bayou and a man-made canal suffering from significant shoreline erosion. The preferred alternative would result in the construction of approximately 3,100 square feet of living shoreline along the site to stabilize the shoreline, buffer the local tribal earth mounds from further erosion, and increase oyster reefs to benefit ecologically and economically important fish, shrimp and crab species. The living shoreline would be comprised of nearshore oyster breakwaters constructed of shell bags and oyster castles that recruit oysters.

### 2.3 Alternative 1 - No Action Alternative

Under the No Action Alternative, the OCM coastal resiliency grant funds would not be used for construction of the PACIT's oyster reef project. The No Action Alternative would prevent project partners from carrying out the project due to a lack of funding and resources. This action does not fulfill the purpose and need of the project.

The No Action Alternative assumes no funding from OCM would be available to the Tribe so no improvements in the project site would occur other than those planned by others or implemented as part of routine grounds keeping. Although it does not meet the purpose and need of the proposed action, the No Action Alternative serves as the baseline condition against which the benefits and effects of the proposed action are evaluated.

*Table 1. Project Schedule and Total Project Cost by Alternative*

Project Schedule	
Design Approval:	May 29, 2018
Construction Start:	February, 2019
Construction Complete:	March, 2019
Alternative 1 (No Action)	Proposed Action
\$0	\$23,320

## 2.2.1 Feature Descriptions

If funded, the PACIT would use bagged cultch to construct the oyster reef, as it is economical and would achieve the project objectives. This method uses aquaculture grade mesh ( $\leq 1$ -inch mesh size) to create bags that are filled with cultch material. This design is often used in softer sediments, and they remain stable in areas with higher wave velocities (Brumbaugh and Coen, 2009). The final design of the project that would be funded by the preferred alternative is attached in Appendix E. This project aims to stop erosion at the shore to protect an ancient cultural resource. Limiting wave action alone will not protect this cultural asset.

### **Materials**

#### *Oyster Shell*

If funded by the preferred alternative, the oyster reef would consist of oyster shell, a resource found naturally within this area. The oyster shell would be sourced from New Orleans-area restaurants participating in Coalition to Restore Coastal Louisiana's (CRCL) Oyster Shell Recycling Program. All shells would be cured for at least six months to remove remaining any organic material which provides a clean surface for larval settlement, reduces the risk of disease, and reduces the risk of fouling from algae (Bushek et al., 2004). Oyster shell is preferable to rock for meeting the objectives of this project for three reasons: 1) the structure formed by many shells stacked together includes complex interstitial spacing, creating a durable, yet porous matrix that is more effective at dissipating current energy than more uniform structures; 2) the same volume of shell weighs less than rock, reducing the amount that the structure will sink into the bottom substrate; and 3) oyster larvae prefer to settle onto cured oyster shell, so this material is more likely to recruit living oysters.

### **Bags**

The bags that would be used for the oyster reef project are an aquaculture-grade, diamond-oriented, tubular nylon mesh. Each bag of shells has an approximate diameter of 9.5 inches and height of 20 inches, producing a volume of about 0.82 cubic feet each (see Figure 2). The use of aquaculture-grade nylon mesh bags could be a potential concern if ripped pieces are released in the area. However, the installers would discard any ripped bags to avoid the release of plastic. The mesh openings are too small and stiff to cause entanglement, so in the unlikely event that any bag pieces fell into the water; this would not pose a hazard to any species of concern. Once spat set has occurred (within one month of deployment), natural oyster growth should hold the bagging material in place, as oysters secrete a calcium carbonate-based cement to attach to hard substrates.



### **Quantity**

The CRCL has the maximum of 218 cubic yards of shells bagged and ready for use (9,156 bags). It currently costs CRCL approximately \$9,620 to collect and transport each 50 tons of oyster shell. CRCL plans to mobilize 200 tons of oyster shell for the Pointe au Chien Cultural Heritage Protection Reef project. CRCL is supplementing the expense for an additional 150 tons with matching funds.

## **2.2.2 Equipment Methods**

### **Wrapping**

The bagged shell is stacked on pallets at CRCL's staging site in Buras, LA. Each pallet holds 42 bags of shell and weighs approximately one ton. To secure the pallets for movement and transport, they would each be wrapped in thin, stretchable plastic sheeting. CRCL would obtain materials and recruit volunteers to help prepare 200 pallets in Buras. The plastic sheeting would be removed upon delivery to the project site and disposed of in appropriate waste containers.

### **Forklift Operation**

A forklift would be required to maneuver the wrapped pallets onto trucks for transport. A local forklift operator has been identified and priced at Joshua's Marina in Buras. Loading time is estimated at approximately four hours.

### **Trucking**

CRCL has determined that trucking by land would be more economically efficient than barge transport for the needed amount of shell. Each truck can handle approximately 20 pallets. This would require 10 truck trips to deliver the pallets approximately 120 miles from Buras to Pointe au Chien.

### **Water Vehicles**

By using shallow draft boats (e.g., crew, oyster, pontoon, and/or similar boats), CRCL would avoid impacting the environment during deployment.

### **Installation**

Installation should occur between November and March to follow peak oyster spawning periods (April to October). Volunteers would use dolly carts to load bagged shell onto

*Figure 2. Bagged Cultch*



shallow draft boats from the pallets at the Pointe-au-Chien Marina. The Pointe au Chien Indian Tribe would provide four boats to be used for transporting oyster shell bags and volunteers to the deployment site.

The shoreline would be flagged to indicate volume targets for each of the 13 spans of shoreline indicated in the permit drawings (see Appendix E). Volunteers (number per boat depends on boat size) would drop shell bags from the boat into the water one at a time, as close to the shoreline as possible, thus stacking the bags using a random orientation (“blind”) placement technique. The flexibility of the bags would facilitate the contouring, and their weight would hold them in place. Installation is expected to take 1 - 2 days, depending on the number of volunteers and boats available.



### **3. AFFECTED ENVIRONMENT**

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This section describes the environment that would be affected by the implementation of the alternatives. It is organized under impact topics, which include the areas of physical resources, biological resources, wildlife resources, socioeconomic resources, and cultural resources.

#### **3.1 Physical Resources**

##### **3.1.1 Air Quality**

###### *Description of the Affected Environment*

The Clean Air Act Amendments (CAAA) of 1970, 42 U.S.C. §§ 7401-7671, directed the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for air pollutants listed as “criteria” pollutants. The EPA determined there were adequate reasons to believe their presence in ambient air “may reasonably be anticipated to endanger public health and welfare.” The NAAQS apply to sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), carbon monoxide (CO), ozone (O<sub>3</sub>), particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), and lead (Pb) (40 CFR Part 50). The primary standards are set at levels to protect public health with an adequate margin of safety. The EPA has designated secondary standards to protect public welfare. All the standards are expressed as concentration in air and duration of exposure. Many standards address both short- and long-term exposures. Any individual state may adopt a more stringent set of standards.

Louisiana DEQ (LDEQ) reports that the state is in compliance with all NAAQS apart from one nonattainment area in St. Bernard Parish for sulfur dioxide. This area is well east of Lafourche Parish.

##### **3.1.2 Climate**

###### *Description of the Affected Environment*

Lafourche Parish has long, hot, humid summers and brief warm winters. Annual precipitation is 60 inches (152 cm), more than half of which occurs between April and September. The temperature ranges from 14°F (-10°C) to 97°F (36°C). The average summer temperature is 81°F (27°C), while winter temperatures average 54°F (12°C). The area is prone to hurricanes and subject to frequent winter storms off the coast (NOAA, 2017).

##### **3.1.3 Hydrology**

###### *Description of the Affected Environment*

For most of its almost 25-mile extent, Bayou Pointe au Chien flows independently and does not connect with other surface waters until it reaches open marshes near its southern boundary. Pointe au Chien has been heavily channelized as has most of the Lafourche Basin. The Bayou is not in its original stream bed but instead flows through a series of ditches. Its current northern beginnings as an agricultural ditch running through forest and sugarcane fields are not likely the original headwaters. Its mid-reaches are a roadside

drainage canal that parallels LA 665 for much of its extent. At its southern end, Bayou Pointe au Chien widens and becomes indistinguishable from the surrounding marsh. The wetlands and marshes of the southern region help buffer flooding and tidal inundation during storm events.

### **3.1.4 Geology and Soils**

#### *Description of the Affected Environment*

The land area in Lafourche Parish occupies about 1,133 square miles of the Lafourche Delta complex in the south-central region of the Mississippi River Delta Plain. Lafourche Parish is bordered on the east by Bayou Blue and Bayou Pointe au Chien, on the west by the Atchafalaya River, and by the Gulf of Mexico on the south. Several large bodies of water, Caillou Bay, Four League Bay, Lake Pelto, Terrebonne Bay, and numerous smaller water bodies including bays, lakes, and bayous, are within the boundaries of the parish. Numerous marshy islands in the Gulf are isolated remnants of former broad areas of marsh. These islands provide evidence of extensive deterioration of the marshes. Sandy barrier shorelines and islands at the seaward edge of the parish and in the Gulf of Mexico have linear or curvilinear forms because of the effects of marine reworking.

Elevations in Lafourche Parish range from 13 feet (4 m) on natural levees in the northern part of the parish to below sea level in back swamps and marshes throughout the parish. In places, elevations of swamps and marshes have decreased because of oxidation, de-watering, and subsidence.

### **3.1.5 Soils**

#### *Description of the Affected Environment*

Soils are a necessary element of coastal habitats because they support vegetation growth and open-water benthic productivity. Soils in the Pointe au Chien watershed are silt loam, clay and peat with a very slow infiltration rate, poor drainage and high runoff.

### **3.1.6 Water Quality**

#### *Description of the Affected Environment*

The designated uses of Bayou Pointe au Chien are primary contact recreation (e.g., swimming), secondary contact recreation (e.g., fishing and boating), and fish and wildlife propagation. Between 1996 and 2010, the most common suspected cause of water quality impairment was low dissolved oxygen, followed by fecal coliform, non-native aquatic plants, total phosphorus, nitrate plus nitrite nitrogen, and nutrients. The most common suspected source of impairment was wastewater treatment package plants and other permitted small discharges, followed by introduction of nonnative organisms, on-site treatment systems, total retention domestic sewage lagoons, unknown sources, and natural sources.

In 2008, the LDEQ published a Watershed Implementation Plan that assesses the water quality, uses, and causes for impairment of Bayou Pointe au Chien (LDEQ, 2008). The Plan provides recommendations for reducing point and nonpoint sources of pollution loading.

The LDEQ placed long-term water quality monitoring stations west of the project area, located at the Bayou St. Jean Charles.

The stations are monitoring the dissolved oxygen; trends at all stations indicate that dissolved oxygen concentrations improved between 1996 and 2010 (USACE, 2013). Nitrate plus nitrite levels showed very little change over the past thirty years. Overall, dissolved oxygen and fecal coliform levels have improved within the past thirty years.

## **3.2 Biological Resources**

### **3.2.1 Submerged Aquatic Vegetation**

#### *Description of the Affected Environment*

Aquatic vegetation common in the area are **sago pondweed** (*Potamogeton pectinatus*), **southern naiad** (*Najas guadalupensis*), **widgeon grass** (*Ruppia maritima*), **water milfoil** (*Myriophyllum heterophyllum*), **coontail** (*Ceratophyllum demersum*), and **wild celery** (*Vallisneria Americana*). These are among the plants that grow from the bottom of shallow marsh ponds and lagoons.

### **3.2.2 Wetland and Wetland Vegetation**

#### *Description of the Affected Environment*

Brackish marshes are transitional areas between freshwater and salt marsh communities. These intertidal emergent wetlands are dominated by grasses, forbs, and shrubs that are tolerant to salinities from slight to moderate (0.5 to 18 ppt salt). They form occasionally along the upland edge of salt marshes and tidal riverbanks where freshwater runoff or groundwater dilutes the salinity of the high marsh surface. This allows a mix of fresh and salt marsh species intolerant of higher or lower salinity to coexist along with species restricted to brackish conditions. They are only flooded during spring tides and storm surges (high and low brackish riverbank marshes are two similar communities, but they are tidally flooded more frequently than by spring tides alone). The dominant plant species and growth forms vary widely along the Bayou depending on local hydrology and salinity level.

### **3.2.3 Upland Vegetation**

#### *Description of the Affected Environment*

Vegetation along the Bayou Pointe au Chien and Bayou Blue ridges is alluvial hardwoods (oak) grading into swamp (*Tupelogram*, *Cypress*) vegetation. Fresh to brackish marsh plants are predominant in the unit between alluvial soils and Grand Bayou.

A few common species in the project area are **stout bulrush** (*Bolboschoenus robustus*), **chaffy salt sedge** (*Carex paleacea*), **common creeping bentgrass** (*Agrostis stolonifera*), **salt marsh rush** (*Luncus gerardii*), **seaside goldenrod** (*Solidago sempervirens*), **New York aster** (*Symphyotrichum novi-belgii*), **Greenbrier** (*Smilacaceae*), **Rabbit Grass** (*Fabaceae*) and the **Rue** (*Rutaceae*).

### 3.3 Wildlife Resources

#### 3.3.1 Aquatic Species

##### Blue Crabs

###### *Description of the Affected Environment*

Blue crabs are found throughout estuaries and in adjacent marine waters. Crabs mate during the warmer months in fresher waters (USACE, 2013). Sperm transferred to female crabs can remain viable for over a year and can be used for multiple spawnings (USACE, 2013). Female crabs migrate southward to higher salinity waters after mating (USACE, 2013). Spawning and larval development occur in the more saline waters (USACE, 2013). Larval blue crab abundances peak during February and March (USACE, 2013); megalopae then enter fresher areas. Juvenile crabs prefer areas with soft, mud substrate and are most abundant from November to May, more frequently in the northern portions of estuaries. After 1 to 1.5 years, crabs move from shallow areas into larger bays and bayous as adults where they reside for at least one more year (USACE, 2013). Recruitment of blue crabs in some areas is highest during the late spring, early summer, and fall.

##### Brown and White Shrimp

###### *Description of the Affected Environment*

Brown and white shrimp spawn in the Gulf of Mexico. Post-larval shrimp are transported into estuarine waters and coastal wetlands. Brown shrimp generally enter estuaries from February to April (USACE, 2013); white shrimp enter from late spring to autumn (USACE, 2013). White shrimp typically spawn in shallower Gulf waters; post-larval and juvenile white shrimp move farther inshore than brown shrimp (USACE, 2013). Juvenile shrimp move from the estuaries into offshore waters where they become adults. Brown shrimp migrate from the estuaries to the Gulf from May to August (USACE, 2013); white shrimp migrate offshore from September to December (USACE, 2013).

##### Fish

###### *Description of the Affected Environment*

Freshwater and intermediate marshes provide habitat for freshwater recreational and commercial fisheries species. Freshwater species include **largemouth bass** (*Micropterus salmoides*), **yellow bass** (*Morone mississippiensis*), **black crappie** (*Pomoxis nigromaculatus*), **bluegill** (*Lepomis macrochirus*), **redeer sunfish** (*L. microlophus*), **warmouth** (*L. gulosus*), **blue catfish** (*Ictalurus furcatus*), **channel catfish** (*I. punctatus*), **buffalo** (*Ictiobus sp.*), **freshwater drum** (*Aplodinotus grunniens*), **bowfin** (*Amia calva*), and **gar** (*Lepisosteus sp.*) (USACE, 2013).

Marshes in the area support many commercially and recreationally important marine fish and shellfish species including **red drum** (*Sciaenops ocellatus*), **black drum**, **sheepshead** (*Archosargus probatocephalus*), **striped mullet**, **southern flounder** (*Paralichthys lethostigma*), **Gulf menhaden**, **sand seatrout**, **gray snapper** (*Lutjanus griseus*), **Spanish mackerel** (*Scomberomorus maculatus*), **white shrimp**, **brown shrimp**, **blue crab**, **eastern oyster** (*Crassostrea virginica*), and **Gulf stone crab** (*Menippe adina*) (USACE, 2013).

### 3.3.2 Wildlife

#### **Birds**

##### *Description of the Affected Environment*

Many bird species use Louisiana's coastal wetlands as an important habitat. Millions of neotropical and other migratory avian species such as wading birds, shorebirds, rails, gallinules, and numerous songbirds live in or pass through the area. The coastal wetlands provide migratory birds an essential stopover habitat on their migration route.

Gadwall, American coot, mallard, and blue-winged teal are the most abundant species in salt and brackish marshes. Puddle ducks inhabit marshes with shallow (less than half a meter deep) ponds; they prefer pondweed, naiad, and duckweed in freshwater areas and widgeon grass in brackish marsh.

The Pointe aux Chenes Wildlife Management Area occupies 33,488 acres in Lafourche and Terrebonne Parishes. It provides migration and wintering habitat for more than 15 species of waterfowl.

#### **Reptiles**

##### *Description of the Affected Environment*

Reptiles likely to inhabit the project area include: American alligator (*Alligator mississippiensis*), alligator snapping turtle (*Chelydra serpentina*), eastern box turtle (*Terrapene carolina*), water moccasin (*Agkistrodon piscivorus*), eastern mud snake (*Farancia abacura*), bullfrog (*Rana catesbeiana*), southern leopard frog (*Lithobates sphenoccephalus*), and Gulf Coast toad (*Incilius valliceps*).

The **alligator** was removed from the USFWS endangered species list in 1987. Alligators are common in fresh to brackish bayous and lakes. Their diet consists of a broad range of prey including insects, crawfish, crab, birds, fish, muskrat, nutria, turtles, shrimp, and snails (Chabreck, 1971). Nesting occurs throughout southern Louisiana in the spring and is impacted by drought and floods with a range of 2 to nearly 60 eggs laid per nest (Joanen and McNease, 1989).

**Kemp's ridley turtles** (*Lepidochelys kempii*) is an endangered species that inhabit shallow nearshore and inshore waters of the northern Gulf of Mexico. This small sea turtle is believed to prefer sheltered areas along the coast, such as bays, bayous, and estuaries, during the non-nesting period. Although this species does not rest in Louisiana, the estuarine and off-shore waters of Louisiana may afford key feeding and developmental sites (WLF Louisiana, 2018). Kemp's ridleys are often found in salt marsh water bodies and have been collected in Louisiana from Lake Borgne, Barataria and Terrebonne Bays, and near Calcasieu Pass. During winter, turtles in the northern Gulf of Mexico may migrate to deeper water. Hatchlings often become entrained in Gulf of Mexico eddies, where they are dispersed by oceanic surface currents and then enter coastal shallow water habitats when they reach about 20 cm in length (USFWS, 1992).

**Hawksbill turtles** (*Eretmochelys imbricata*) is an endangered species that uses different habitats at different stages of their life cycle but are most commonly associated with healthy coral reefs. Post-hatchlings (oceanic stage juveniles) are believed to occupy the

"pelagic" environment, taking shelter in floating algal mats and drift lines of flotsam and jetsam in the Atlantic. This species is not likely to occur at the project site.

Hawksbill turtles are circumtropical, usually occurring from 30° N to 30° S latitude in the Atlantic, Pacific, and Indian Oceans and associated bodies of water. Hawksbills are widely distributed throughout the Caribbean Sea and western Atlantic Ocean, regularly occurring in southern Florida and the Gulf of Mexico (especially Texas), in the Greater and Lesser Antilles, and along the Central American mainland south to Brazil. Hawksbills do not occur in the Mediterranean Sea.

**Diamondback terrapin** (*Malaclemys terrapin*) could be present in these brackish waters. The diamondback terrapin is found in brackish (water with some salinity) coastal waters. Typical habitats include coastal swamps, estuaries, lagoons, tidal creeks, mangrove thickets, and salt marshes. Although the species is found in brackish waters, periodic access to freshwater is necessary for health. Shoreline development and recreational use of nesting areas interfere with terrapin nesting as they use sandy dunes or scrub vegetation (not marsh) for nesting (Roosenburg, 1994).

**Green turtles** (*Chelonia mydas*) are generally found in shallow waters (except when migrating) inside reefs, bays, and inlets. The turtles are attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting. Green turtles have strong nesting site fidelity and often make long distance migrations between feeding grounds and nesting beaches. This species is not likely to occur at the project site.

### **Small Mammals**

#### *Description of the Affected Environment*

Fur bearers have a long history of being an important product in this area of North America. The nutria, mink, muskrat, raccoon, and river otter could be present in the project area. Louisiana's coastal marshes also provide habitat for important game species such as the **whitetail deer** (*Odocoileus virginianus*) and **swamp rabbit** (*Sylvilagus aquaticus*). The **muskrat** (*Ondatra zibethicus*) is primarily found in brackish marshes. The muskrat eats one third of its weight per day (about 0.3 kg/day) (O'Neil 1949); this equates to about one percent of plant production. Nest-building and digging cause more marsh deterioration than feeding activities

The **nutria** (*Myocastor coypus*) and **feral hog** (*Sus scrofa*) are the only two mammals considered invasive species in Louisiana. The nutria also is listed as an aquatic invasive species, see below. Nutria are large, herbivorous, aquatic mammals that inhabit fresh, intermediate, and brackish marshes and wetlands.

### ***3.4 Essential Fish Habitat***

The Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires Federal agencies to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH). EFH is defined as those waters and substrate necessary to fish for spawning,



breeding, or growth to maturity for species regulated under a Federal fisheries management plan.

### 3.5 Threatened, and Endangered Species

When Congress passed the Endangered Species Act (ESA) in 1973 (Public Law 91-135), it recognized that our rich natural heritage is of "esthetic, ecological, educational, recreational, and scientific value to our Nation and its people." It further expressed concern that many of our nation's native plants and animals were in danger of becoming extinct.

The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). The USFWS has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NMFS are mainly marine wildlife such as whales and anadromous fish such as salmon.

Under the ESA, species may be listed as either endangered or threatened. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened. For the purposes of the ESA, Congress defined species to include subspecies, varieties, and, for vertebrates, distinct population segments.

Federally threatened (T) and endangered (E) species present in Lafourche Parish are listed in Table 2. None of these species are expected to be found near the project area (Appendix C).

*Table 2. Threatened and Endangered Species in Lafourche Parish in or Near the Project Area*

Species			
<i>Trichechus manatus</i>	West Indian Manatee	No	T
<i>Caretta caretta</i>	Loggerhead Sea Turtle	No	T
<i>Acipenser oxyrinchus</i> (= <i>oxyrhynchus</i> ) <i>desotoi</i>	Atlantic Sturgeon (gulf Subspecies)	No	T

Table data acquired from: USFWS Louisiana Ecological Services Field Office, species data accessed 6/04/2018 from USFWS IPaC Web Portal. (<http://ecos.fws.gov/ipac/>)

### 3.5.1 Federally Listed Marine Species

**West Indian manatee** was listed as endangered species on June 2, 1970 and received federal protection with the passage of the ESA in 1973. Critical habitat was designated in 1976, 1994, 1998, 2002, and 2003 for the Florida subspecies. Manatees inhabit both salt and fresh water of enough depth (5 feet to usually less than 20 feet) throughout their range. Shallow grass beds with ready access to deep channels are preferred feeding areas in coastal and riverine habitats (USFWS, 2007). They also may be encountered in canals, rivers, estuarine habitats, saltwater bays, and have been observed as much as 3.7 miles off the Florida Gulf Coast. Between October and April, Florida manatees concentrate in areas of warmer water. Severe cold fronts have been known to kill manatees when the animals did not have access to warm water refuges. During warmer months they appear to choose areas based on an adequate food supply, water depth, and proximity to freshwater. Manatees may not need freshwater, but they are frequently observed drinking water from hoses, sewage outfalls, and culverts.



**Loggerhead Sea Turtle** was listed as endangered throughout its range on July 28, 1978. Commercial harvest, habitat degradation, coastal development, disease, and predation have all contributed to the decline of the species. The threatened loggerhead is the most abundant species of sea turtle occurring in U.S. waters. The nearshore waters of the Gulf of Mexico are believed to provide important developmental habitat for juvenile loggerheads.

Photo Credit USFWS



Coastal areas not only provide an excellent food source for adults inhabiting the area, but they also allow for easy access to migratory routes. Large nesting populations have been recorded along the coastal islands of the North and South Carolinas, Georgia, and the Gulf coasts of Florida. In Louisiana, this species has recently been found nesting on Grand Isle in Terrebonne Parish for the first time in 30 years (Louisiana Sportsman, 2016).

As described by the University of Southern Mississippi's Gulf Coast Research Lab, **Gulf sturgeon** is a large, primitive fish that has bony plates, or "scutes," rather than scales and a hard, extended snout with a toothless, vacuum-like mouth and whisker-like barbels (2018). Sturgeon typically range in color from a blue-black to light brown color on their dorsal side and a white under belly. Another distinguishing feature is the tail fin, which has an upper lobe that is longer than the lower (GCRL, 2018). Adult Gulf sturgeon range from 4 feet (1-2.5 m) in length and weigh up to 200 pounds. Females are typically larger than males. The average lifespan of the Gulf sturgeon is 20-25 years, but they can live for as long as 60 years, (GCRL, 2018).



The Gulf sturgeon is a federally-listed threatened species (Federal Register 1991) and much of the river, bay and nearshore areas throughout its range are considered critical habitat that supports spawning, growth, or feeding activities (GCRL, 2018). Federal and Mississippi regulations prohibit Gulf Sturgeon from being caught, harmed or disturbed.



Photo Credit NOAA Fisheries

According to GCRL (2018), Gulf sturgeon occur in drainages from the Suwannee River in Florida to the Pearl River on the boundary of Louisiana and Mississippi. Gulf sturgeon are anadromous as adults. Adults migrate upriver from the Gulf of Mexico in the springtime to spawn, returning to their natal streams to spawn. Gulf sturgeon eggs are sticky and sink to the bottom, where they adhere in clumps to snags, or outcroppings. They spawn in freshwater and migrate into marine waters in the fall to forage and overwinter. Juvenile Gulf sturgeon stay in the river for about the first two to three years and then move to the estuary where they forage until they reach sub-adult sized (approximately three to four feet). Then they move to the barrier islands to forage, generally between December and March (IPaC, 2018).

### 3.7 Migratory Birds

The Migratory Bird Treaty Act (16 U.S.C. \_\_\_\_\_) makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations. The migratory bird species protected by ESA are listed in 50 CFR § 10.13.

#### *Description of the Affected Environment*

Bird species that may occur in the proposed project area and proposed period for placement of the protection reef include the **Black Skimmer** (*Rynchops niger*), **Dunlin** (*Calidris alpina arctica*), **Gull-billed Tern** (*Gelochelidon nilotica*), **Least Tern** (*Sternula antillarum*), **Lesser Yellowlegs** (*Tringa flavipes*), **Ruddy Turnstone** (*Arenaria interpres morinella*), **Seaside Sparrow** (*Ammodramus maritima*), and **Willet** (*Tringa semipalmata*).

### 3.8 Socioeconomics

#### 3.8.1 Recreational Resources

##### *Description of the Affected Environment*

The Pointe au Chien Wildlife Management Area comprises 35,266 acres purchased by the state in 1968 (LDWF, 2014). The area is excellent for freshwater and brackish water fishing and for waterfowl hunting. Other public uses of this area include camping and saltwater fishing. Redfish, speckled trout, flounder, shrimp, and crabs are popular species. Waterfowl hunting is also popular within the Wildlife Management Area. Other recreational activities in this area include boating, birdwatching, and photography.

### **3.8.2 Environmental Justice**

#### *Description of the Affected Environment*

In 1994, Executive Order 12898 was signed to focus federal attention on environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. This Order was intended to promote nondiscrimination in federal programs that substantially affect human health and the environment, provide minorities and low-income populations with public information, and offer public participation in matters relating to human health and the environment.

Lafourche Parish has a population of 98,305. Approximately 19.5% of the population is minority. The median age is 36.6, and 12.5% of the population is age 65 or over. The median household income is \$52,071, while the per capita income is \$24,299. Over 15% of the population lives at or below the poverty rate (Data USA, 2018). Seventy-five percent of the population has a high school education or higher (US Census, 2018). Approximately 28% of the total population is minority. A total of 11.2% of the total population is 65 years of age or older. The median age of the total population is 35.4 years, and the median household income for this area is \$48,166 annually. Per capita income for this area is \$25,069. A total of 21.1% of the population lives at or below the poverty level. Seventy-seven percent of the total population have a high school education (or higher). Approximately 5.3% of the labor force are unemployed (DADS, 2010).

The economy of Lafourche Parish employs 43,290 people. Of this, nearly 14,000 people are employed by the ocean economy. Ship and boat building and mineral and gas extraction are dominant industries (ENOW Explorer, 2018). Other important non-ocean industries are transportation and warehousing, agriculture, forestry, fishing, hunting, retail and healthcare (Data USA, 2018).

In contrast to the surrounding area, the Pointe au Chien Tribe resides primarily in southern Terrebonne and Lafourche Parishes. The population of this community is around 680 members. The Tribe descended from the Acolapissa, Atakapas, Biloxi and Chitimacha Indians. Most residents speak Cajun French, and they make a living through commercial fishing. Elevated homes and shrimp boats line Bayou Pointe au Chien for several miles (PACIT, 2018).

Historically, members of this community were farmers, fishermen, and hunters. In recent years, erosion and saltwater intrusion have impacted the quantity and quality of the soil for agriculture, and this industry has dissipated. State and federal policies prohibited Tribe members from attending high school until the late 1960's and 1970's. Recent generations are among the first to complete a college education (PACIT, 2018).

### **3.8.3 Noise**

#### *Description of the Affected Environment*

Noise is defined as unwanted sound and, in the context of protecting public health and welfare, implies potential effects on the human and natural environment. Noise is a significant concern associated with construction, dredging, and transportation activities

and projects. Ambient noise levels within a given region may fluctuate over time because of variations in intensity and abundance of noise sources.

Currently noise factors at the oyster reef project location include limited local traffic, boat traffic, occasional airplanes, and local animal sounds.

### **3.9 Cultural Resources and Historic Resources**

#### **3.9.1 Cultural Resources**

##### *Description of the Affected Environment*

The following information was provided by the Point au Chien Tribe (see Appendices A and B). There are several tribal earth mounds that are located within the Lafourche area. The mounds occur in groups of three or four and can be found within the distance of the Terrebonne village. The sites are in the area and are located on natural levees.

It is difficult to assign the prehistoric aboriginal inhabitants of southern Louisiana to a historically known tribe because of the considerable movement around the area during the eighteenth and early nineteenth centuries. Conflicts, friendships, or trade relations with the French government in New Orleans caused many Indian groups to move frequently.

The results of the archaeological survey in the Lafourche Parish located three prehistoric campsites and one historic house site, in the survey area. However, in the 2016 Archaeology Inventory Survey conducted by the state of Louisiana, this site was originally described by Saltus et al. (1975) as having 4 mounds. Based upon the descriptions provided, their mounds 1 - 4 correlate with Mounds C-F as labeled here (noted below in individual mound descriptions).

The survey apparently did not see Mounds A and B due to the adjacent spoil banks. A modern canal defines the northern and northeastern limits of the site and probably impacted non-mound deposits when it was excavated. Spoil from the canal is piled along the south side of the canal and buries part of the site and on laps onto the margins of Mounds A and B. In particular, the original size and shape of Mound A is difficult to determine due to the spoil bank.

The site was visited on January 9, 2016 with members of the Pointe au Chien Indian Tribe. The ground in this area is subsiding and the original ground surface for the plaza is now well below the water table. The original height of the mounds is likewise unknown. No excavations or probing was undertaken during this visit; efforts were limited to walkovers of Mounds A, B, C, E and F.

##### **Lafourche Parish Mounds**

**Mound A** - The mound appears to be approximately 15 m in diameter and rises about 1 m above the marsh. Given the other mounds at the site, this one is likely circular in plain view, but the canal spoil on laps considerably along the northern half of the mound and it is difficult to determine by surface inspection what is mound and what is spoil. No evidence of pothunting was observed, but the armadillos are having fun.

**Mound B** - This mound lies very close to the junction of the canal and Bayou Pointe au Chien. The spoil abuts against the northern edge but does not appear to onlap much of the

mound. This appears to be one of the largest mounds at the site, perhaps 25 m in diameter and rising 1.5 m above the marsh. It is dome shaped and generally circular in plain view.

**Mound C** - This is probably Mound 4 of Saltus et al. 1975. It is circular in plain view, dome-shaped, and approximately 30 m in diameter. It rises nearly 2 m above the marsh. Currently the bayou is eroding the western edge of the mound with a 25-30 cm scarp evident. A few plain, grog-tempered sherds and numerous *Rangia* and oyster shells are at the water edge, although it is not clear if any of the materials were derived from the mound fill. The mound was once the habitation of a Pointe au Chien tribal member, and concrete pier blocks and other debris lie on the surface. There is also evidence of some garden or other domestic plants on the southern half of the mound. There is not much evidence that the historic occupation did significant disturbance to the mound.

**Mound D** - This is probably Mound 3 of Saltus et al. 1975. It is circular in plain view, dome-shaped, and according to Saltus is approximately 25 m in diameter and rises about 2 m above the marsh. It was not examined during the current visit.

**Mound E** - This is probably Mound 2 of Saltus et al. 1975. It is circular in plain view, dome-shaped, and approximately 25 m in diameter. It rises nearly 2.5 m above the marsh. Saltus et al. note a large depression in the top center of the mound and suggest it may represent sunken burials. Observation during this visit suggests the hole is a large pothole, approximately 3 m in diameter and 1 m deep. Several plain body sherds were seen in the exposed back dirt and in recent armadillo burrows. One of the sherds is an unusually thick (1 cm or more) grog-tempered, poorly mixed example from an unknown vessel type.

**Mound F (Project Site)** - This is probably Mound 1 described in Saltus et al., 1975. The mound is approximately 30 m in diameter and rises to 2.5 m above the marsh. It is generally circular in plain view, although a detailed map might show a rounded square form. It has a broad flattened top, although it is unclear if this is its original form or if historic occupation has modified it; the flattened area is approximately 15x15 m in size. A dredged canal lies on the north side of the mound and erosion is cutting into the mound with a 50 cm high scarp visible at the canal edge. No evidence of stratigraphy was visible in the scarp, but it was not cleaned or closely inspected due to the depth of the water. Several plain and two decorated sherds were observed on the surface. One example has a single thin incised line, while the other exhibited 3 curvilinear thin incised lines; neither are preferable to a known type. The top of the mound has been used as a hunting/fishing camp for some time with lots of debris scattered around. A small barge is currently moored in the canal along the north side of the mound

#### **Excerpt From 1975 Archeology Survey Context- Lafourche Parish Mounds**

The one prehistoric site, 16 TR 32, consisting of a mound complex was found in the Lafourche Parish portion of the survey area. Two of the mounds have historic components. The four mounds associated with the natural levee of Bayou Pointe au Chien were readily detected by their eminence and distinctive vegetation. All the mounds have a growth of live oaks and prickly pear cactus, while Mound 1 also has citrus trees and Mound 3, a thicket of yucca. Prehistoric artifacts were collected from three of the mounds; two mounds also yielded historic artifacts.

**Mounds 1, 2, and 3** have approximate dimensions (diameter and height) of 90 by 8 feet, 75 by 10 feet, and 75 by 6 feet respectively. **Mound 4**, now the site of a trapper's house, was not viewed from the ground because of signs which warned against trespassing. Surface collections from the mounds consisted entirely of potsherds, although oyster shells were observed. Plain clay-tempered sherds, often severely leached and quite friable, dominate the collection. Decorated ceramic fragments were scarce; they consist of Plaquemine Brushed and, less certainly, Coles Creek Incised.

**Mounds 1 and 3** bore evidence of having been used as house sites in the nineteenth century, notably through the presence of brick and ceramic fragments.

**Mound 2** was devoid of historic artifacts; a condition that may relate to the fact (learned from local sources) that one of the mounds was used as a cemetery during the historic period. A large depression in the center of Mound 2 suggests sunken burials, but no grave markers were in evidence.

### **3.9.2 Historic Resources**

#### *Description of the Affected Environment*

A search of the National Registers of Historic Places and has determined that there are no historic properties in or adjacent to the project area that are listed in the National Register of Historic Places.

## **4. ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE AND NO ACTION ALTERNATIVE**

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In this chapter the OCM applies the elements described in Chapter 2 to the existing conditions to assess projected environmental consequences of the alternatives. In each discussion the potential environmental consequences are described first, followed by the projected results for each resource and for the preferred alternative. As with development of the alternatives.

### ***4.1 Summary of Alternative 1- No Action Alternative***

Under the No Action Alternative, the coastal resiliency funds OCM granted to the Gulf of Mexico Alliance would not be used for the construction of the oyster reef project. The No Action Alternative would potentially prevent project partners from carrying out the preferred alternative. This action does not fulfill the purpose and need of the preferred alternative.

The No Action Alternative assumes no improvements in the project site other than those planned by others or implemented as part of routine grounds keeping. If no action is taken, the shoreline will continue to erode during storm events, adversely affecting localized water quality, allowing continued flooding of the site area, and causing the tribal earth mounds to disappear.

### ***4.2 Summary of Preferred Alternative***

The preferred alternative is for OCM to fund the oyster reef project through the coastal resiliency grant awarded to GOMA in order to: construct approximately 3,100 square feet of living shoreline to stabilize the shoreline; buffer local tribal earth mounds from further erosion; and establish oyster reefs to benefit ecologically and economically important fish, shrimp and crab species. The living shoreline will be comprised of nearshore oyster breakwaters constructed of shell bags that recruit oysters.

The use of the bagged cultch is considered the right methodology due to cost concerns and objectives. This method will use the aquaculture grade mesh ( $\leq 1$ -inch mesh size) to create bags that are filled with cultch material. This design is often used in softer sediments, and will remain stable in areas with higher wave velocity.

### ***4.3 Physical Resources***

#### ***4.3.1 Air Quality***

Air quality impacts will result from transporting the shell bags to the project site and running boat motors for their placement. This project will require ten truck trips of approximately 120 miles from Buras to Point au Chien to deliver all the pallets. The CO<sub>2</sub> emissions from onshore transport are estimated based on the Environmental Defense Fund (EDF) Green Freight Handbook (EDF, 2018) as follows:



Number of trips:	10
Miles per round trip:	240
Total Miles:	2,400
Tons (short) hauled:	200
Total Ton-Miles:	480,000
Emission Factor, all trucks:	161.8 g/ton-mile
Total CO <sub>2</sub> emissions, tons	77.7
Total Emissions, metric tons	70.6

The CO<sub>2</sub> emissions from the boat motors are overwhelmed by those from the onshore transport and can be discounted from the analysis. The projected emissions from this project are vanishingly small in comparison to overall emissions in the state, based on several metrics.

State level emissions of Green House Gases (GHG) totaled 218 million metric tons (MMT) of CO<sub>2</sub> equivalent in 1996 (LSU, 1996). The US Energy Information Administration (USEIA) has compiled state-level CO<sub>2</sub> emissions data for the years 2000 and 2005 to 2015 (USEIA, 2018). Louisiana CO<sub>2</sub> emissions ranged from 210 MMT to 237 MMT and trended down from 237 MMT in 2011 to 218 MMT in 2015. Because the LSU data are based on total GHG as CO<sub>2</sub> equivalents (i.e., include other ozone depleting compounds such as methane and chlorofluorocarbons), their data are not the same as the total CO<sub>2</sub> emissions compiled by USEIA. However, the data are sufficiently comparable for the relative assessments presented below.

In 1996, the residential GHG emissions totaled 62.1 MMT; commercial emissions totaled 28.4 MMT. Emissions for this project are less than 0.0001% of residential or 0.003% of commercial emissions. In 2015, USEIA estimated CO<sub>2</sub> emissions in Louisiana totaled 218 MMT, of which residential and commercial emissions respectively were 0.9% and 1% of the state total, or 1.96 and 2.18 MMT. Thus, projected emissions from this project are 0.004% and 0.003% of total state CO<sub>2</sub> emissions. Also, the 2015 CO<sub>2</sub> per capita emission for Louisiana was 46.7 MMT, against which this project's emissions represent less than 0.0002%.

Based on the above analysis, the preferred alternative will have no effect on the current state of emissions and would be consistent with the applicable Air Pollution Control District guidelines of the area. There could be temporary increase in the air pollution emissions due to increase in transportation vehicles during construction phase of the project; however, that condition will be short lived. Neither short-term nor long-term air quality impacts are anticipated from the preferred alternative.

Under the No Action alternative, the emissions will continue as existing and the air quality will remain unchanged.

### **4.3.2 Climate**

The preferred alternative is not expected to have any impact on climate resources. Considering the small scope of the proposed project, neither short-term nor long-term, adverse impacts are anticipated on the overall climate of the area.

Under the No Action Alternative, there will be no impact on the overall climate of the area.

### **4.3.3 Hydrology**

The preferred alternative is not expected to have any impact on hydrology resources. The reef will be located along the existing shoreline and will not impact water flow through the surrounding area. Considering the scope of the project, no short-term or long-term adverse impacts are anticipated on the overall hydrology of the area.

Under the No Action Alternative, the overall hydrology of the area will remain unchanged.

### **4.3.4 Geology and Soils**

The preferred alternative is not expected to have any impact on geology and soils. No excavation or use of heavy equipment will take place onsite. Therefore, no short-term or long-term adverse impacts are anticipated on the geology and soils of the area.

Under the No Action Alternative, the overall geology and soils of the area will remain unchanged. However, in the absence of the shoreline stabilization proposed in the preferred alternative, localized erosion of soil and sediments is anticipated.

### **4.3.5 Water Quality**

Beneficial, long-term direct and indirect biological and water quality impacts are expected from the restoration actions under the preferred alternative. Oyster restoration for remote setting and shell cultch placement projects directly increase oyster community opportunities. Oysters also are recognized to provide a valuable water filtering process by removing excess nutrients from the water column. Short-term increased turbidity may occur during reef placement due to sediment disturbance from bag placement and boat traffic. This should quickly subside post-placement. Long-term, adverse impacts are not expected.

Under the No Action Alternative, the shoreline will continue to erode during storm events, which would adversely affect the localized water quality due to sediment run-off. In addition, the nutrient removing benefits of additional oyster populations would not be realized.

## **4.4 Biological Resources**

### **4.4.1 Submerged Aquatic Vegetation**

The preferred alternative is not expected to have any impact on submerged aquatic vegetation. There may be some burial of existing vegetation along the shoreline with the



placement of the bags. This burial should be minimal, and vegetation should recover with the resulting stabilization of the sediments. Long-term adverse impacts are not expected.

Under the No Action Alternative, erosion and sediment run off will continue as existing resulting in adverse direct impact on submerged aquatic vegetation. However, additional erosion in the area could result in additional losses of existing vegetation.

#### **4.4.2 Wetland and Wetland Vegetation**

Beneficial, long-term direct and indirect impacts to wetland and wetland vegetation are expected to prevent the continued erosion of estuarine wetlands and adverse impacts associated with storm events. Long-term adverse impacts are not expected.

Under the No Action Alternative, erosion and sediment run off will continue as existing resulting in adverse impact on the wetland and wetland vegetation.

#### **4.4.3 Upland Vegetation**

The preferred alternative is not expected to have any impact on upland vegetation. The project will not require any foot traffic in upland areas. Long-term adverse impacts are not expected.

Under the No Action Alternative, there may be eventual loss of upland vegetation due to continued erosion. Beneficial impacts on the upland vegetation due to proposed shoreline stabilization will not be realized under the No Action alternative.

### **4.5 Wildlife Resources**

#### **4.5.1 Aquatic Species**

##### **Blue Crabs**

Beneficial, long term direct and indirect impacts are expected for the blue crabs because the oyster reefs that would result from the preferred alternative would provide crevices that crabs use to hide from predators. Blue crab species that spend time around the oyster reefs are recreationally and commercially valuable. Long-term adverse impacts to blue crabs are not expected.

Under the No Action Alternative, the benefit of additional habitat creation due to the proposed oyster reef construction will not be realized for the blue crab population.

##### **Brown and White Shrimp**

Beneficial, long term direct and indirect impacts are expected for the brown and white shrimp because the living shoreline that would result from the preferred alternative would promote a habitat for the shrimp to hide. Shrimp species that spend time around the oyster reefs are recreationally and commercially valuable. Long-term adverse impacts to shrimp are not expected.

Under the No Action Alternative, the benefit of additional habitat creation due to the proposed oyster reef construction will not be realized for brown and white shrimp populations.

## **Fish**

Beneficial, long term direct and indirect impacts are expected for fish from constructing a living shoreline that would result from the preferred alternative, which would provide habitat and improve water quality. Long-term adverse impacts to fish are not expected due to preferred alternative.

Under the No Action Alternative, the benefits of additional habitat creation and water quality improvement due to the proposed oyster reef construction will not be realized for fish populations.

## **4.6 Wildlife**

### **4.6.1 Birds, Reptiles, and Small Mammals**

Short-term, minimal impact to wildlife species could occur as a result of the preferred alternative. Any wildlife species that may occupy the oyster reef project site would likely be temporarily displaced during the 1 - 2 days required for placement of the bags. There are ample adjacent areas in which to feed or take cover during construction. Once construction has been completed, the preferred alternative should have a positive effect on local wildlife by reducing shoreline erosion and increasing habitat diversity. Long-term, adverse impacts to birds, reptiles, small mammals, and invasive species are not expected.

Under the No Action Alternative, beneficial impacts due to the proposed shoreline stabilization and the resulting habitat improvement will not be realized for bird, reptile, and small mammal populations.

## **4.7 Essential Fish Habitat (EFH)**

There are no EFH identified near the oyster reef project area (see Appendix C). The preferred alternative will not influence EFH species covered under the Magnuson-Stevens Act. OCM made this determination on September 17, 2018. Long-term, adverse impacts to fish habitat are not expected because the area is not identified as EFH.

Because there is no identified EFH in the project area, the No Action alternative also will have no impact.

## **4.8 Threatened and Endangered Species**

OCM analyzed the potential impacts of the preferred alternative on state- and federally-listed species as part of the ESA Section 7 consultation with USFWS and NMFS. Because the project is not expected to require excavation or the use of heavy equipment onsite, OCM has determined that the preferred alternative *may affect but is not likely to adversely affect any* federal or state listed species. USFWS and NMFS concurred with the OCM determination on November 2, 2018 (USFWS) and November 21, 2018 (NMFS) (see Appendix C).

### **Potential Impacts:**

Potential impacts to these threatened species include:

- Equipment, Boat Traffic and Noise

- Materials

### **Equipment, Boat Traffic and Noise:**

Heavy equipment will not be used for deployment of oyster shells in the water or at the project site. Bags of oyster shell will be placed at the project site by hand. This will eliminate the threat of injury to manatees, sea turtles, and sturgeon from falling shells. There will also be minimal, localized disturbance to bottom sediments.

Boats will be used to access the project site. Fishing and recreational boats routinely use Bayou Pointe au Chien and associated canals on a daily basis; therefore, this will not differ from typical activities in the area. To reduce the risk of disturbing or striking any of the listed species, boat captains and volunteer will employ best practices such as:

- Informing all project staff and volunteers of the potential presence of manatees and the need to avoid collisions with and injury to the listed species.
- Personnel and volunteers will be instructed to operate vessels at low speeds in the project area and obey all boating speed signs.

Noise resulting from the preferred alternative is expected to have no effect on the manatee, sea turtles, and sturgeon. Because heavy equipment is not being used, only boat traffic and deployment activities will generate noise on the water. These activities are not significantly different from standard fishing and boating activities in the area. Long-term, adverse impacts to threatened or endangered species are not expected.

Under the No Action Alternative, there will be continued loss of favorable habitat of listed species; resulting in a long-term adverse effect. Beneficial impacts due to the proposed oyster reef construction also would not be realized for threatened and endangered species.

*Table 3. Federally Listed Marine Species*

<b>Scientific Name</b>	<b>Common Name</b>	<b>Habitat Requirements</b>	<b>Rationale</b>
<i>Trichechus manatus</i>	West Indian Manatee	Found in marine, estuarine, and freshwater environments with a strong preference for warm and well vegetated waters.	The West Indian manatee is extralimital in Louisiana coastal waters. Sightings off the Louisiana coast or stranding's on Louisiana shorelines are rare. The West Indian Manatee is unlikely to be present in the project area.
<i>Caretta</i>	Loggerhead Sea Turtle	Nesting habitat includes high energy warm water, beaches. Non-nesting includes: bays, sounds, and estuaries along the Atlantic and Gulf coasts and nearshore and oceanic habitats.	Young adult turtles sometimes enter brackish water to feed; however, this usually happens during warmer months. The current project implementation schedule targets October/November. As such, it is unlikely that turtles will be encountered at the project site.

Scientific Name	Common Name	Habitat Requirements	Rationale
<i>Acipenser oxyrinchus (=oxyrhyngus) desotoi</i>	Atlantic Sturgeon (Gulf subspecies)	Anadromous species that spends most of its life in freshwater habitats and spawns in estuarine bays.	Gulf sturgeon occur in drainages from the Suwannee River in Florida to the Pearl River on the boundary of Louisiana and Mississippi. The Gulf sturgeon is unlikely to be present in the project area.

Table data acquired from: USFWS Louisiana Ecological Services Field Office species data accessed 7/20 /2018 from USFWS IPaC Web Portal. (<http://ecos.fws.gov/ipac/>) (NOAA Office of Protected Fisheries – Loggerhead Turtle Website, Accessed 7/20/2018 (<http://www.nmfs.noaa.gov/pr/species/turtles/loggerhead.htm#habitat>))

## 4.9 Migratory Birds

Short-term, minimal impact to migrating bird species may occur if migrating species are present on the day(s) that the oyster shell bags are being deployed. Using the eBird data mapping tool, provided by USFWS, no migrating birds have been sighted in or around the oyster reef project area (eBird, 2018). However, if they are displaced from the site for 1 - 2 days due to construction activities, the project area is surrounded by similar habitat that migrating birds can use.

Beneficial, long term direct effects may result from the preferred alternative because young oysters are a food source for some migratory birds, like the oyster catcher ( Long-term, adverse impacts are not expected.

Under the No Action Alternative, there will be continued loss of migratory bird habitat due to erosion and the potential loss of upland vegetation.

## 4.10 Cultural Resources and Historic Resources

No NRHP-eligible historic sites are located within the APE for the project; however, the mounds are culturally significant.

Beneficial, long-term direct effects should result from the installation of the oyster reef. The oyster reef will harden the shoreline and prevent future erosion of the tribal earth mounds. The site is not listed as an American Indian Religious Site or a cultural resource in Louisiana. However, the tribal earth mounds located at the project site have been considered a cultural resource to the local native tribe. The shoreline where the tribal mounds are located will only be marked and flagged under supervision of the Tribe. Volunteers and members of the project team will not be permitted access to the marshland or mounds along the shoreline. Long-term, adverse impacts are not expected.

The Louisiana State Historic Preservation Office (SHPO) corresponded with OCM through a letter dated October 26, 2018 stating that “no known historic properties will be affected by this undertaking” (Appendix C).

Under the No Action Alternative, the area surrounding the tribal mounds will continue to erode and eventually disappear, resulting in an adverse effect to the cultural resources of the area.

## ***4.11 Socioeconomic Conditions***

### **4.11.1 Community, Land Use and Recreational Resources**

Beneficial, long term direct effects should occur for land use and recreation. By creating a living shoreline, oyster beds and reefs provide foraging, spawning and sheltering locations for a variety of other shellfish and finfish. Increased recreational fishing opportunities for other sought-after fish and invertebrates are expected.

During placement, some recreational boaters may be displaced, but this will be short-term and temporary (1 - 2 days). The oyster reef will not have great enough heights to impact navigation routes. Therefore, long-term, adverse impacts to community, land use and recreational resources are not expected.

Under the No Action Alternative, community and recreational resources will remain as existing. Beneficial impacts of shoreline stabilization and water quality improvement from the proposed oyster reef construction will not be realized by the community.

### **4.11.2 Environmental Justice**

The Lafourche Parish does contain significant low income and minority populations. However, this project will provide additional shoreline stabilization to reduce storm and flood damage, increase recreational fishing opportunities, and preserve the culturally-significant land areas for the local tribe. Long-term, adverse impacts are not expected.

Under the No Action Alternative, the tribal mounds will continue to erode and eventually disappear, resulting in an adverse effect to the local tribe.

### **4.11.3 Noise**

Short-term and minimal impacts from noise can be expected. Noise levels at the site will be slightly elevated during construction due to the number of people onsite and the use of boats to place the oyster shells. These elevated levels of noise will cease once construction is complete after 1 - 2 days. Long-term, adverse impacts are not expected.

Under the No Action alternative, the noise environment will continue as existing with no impact.

## ***4.12 Cumulative Impacts***

Potential cumulative effects are assessed to determine the incremental consequences of an action when added to other past and reasonably foreseeable future actions (40 C.F.R. 1508.7) in Bayou Pointe au Chien. The direct effects of an individual action may be negligible but may contribute to a measurable environmental impact when considered cumulatively with indirect effects and with other past/and or reasonably foreseeable future projects. The following table presents a summary of the direct, indirect, and cumulative impacts anticipated from the alternatives evaluated.

*Table 4. Summary of Environmental Consequences Direct and Indirect Effects*

Resource	No Action Alternative			Preferred Alternative		
	Direct Effects	Indirect Effects	Cumulative Effects	Direct Effects	Indirect Effects	Cumulative Effects
<b>Physical Resources</b>	None	Current level of pollutants loading will remain unchanged.	No decrease in pollutants being discharged or filtered.	Turbidity may temporarily increase during reef placement. Minimal additional air emissions from transport of materials.	May improve water quality due to oyster filtering process that removes excess nutrients.	None
<b>Biological Resources</b>	None	None	None	Will prevent continued erosion of estuarine wetlands and reduce adverse impacts associated with storm events.	None	None
<b>Animal Resources</b>	None	None	Loss of suitable habitat for surrounding species if mounds are washed away.	Oyster reef will provide habitat for the blue crab, brown and white shrimp and fish.	Increase in wildlife/ plant species	None
<b>Essential Fish Habitat</b>	None	None	None	None	None	None
<b>Threatened &amp; Endangered Species</b>	None	None	Continued loss of habitat due to erosion.	Noise Equipment Boat Traffic Materials	Shoreline stabilization may provide additional habitat.	None
<b>Wildlife</b>	None	None	Continued loss of habitat due to erosion. Habitat fragmentation. Reduced wildlife diversity and increase in urban wildlife.	Mounds being preserved will preserve habitat.	Preserves wildlife/ plant species.	None
<b>Socio-economics</b>	None	None	None	Oyster reef will increase recreationally and commercially valuable fishery habitats.	None	None
<b>Noise</b>	None	None	None	None	None	None
<b>Cultural &amp; Historic Resources</b>	None	Tribal Mounds will continue to erode and eventually disappear.	Loss of cultural resources.	Tribal Mounds will be preserved.	Shoreline erosion is reduced.	The tribe can protect a cultural asset.



Other current and reasonably foreseeable commercial activities in the area of impact that potentially affect the resources are driven by two major sources: oil and gas extraction and commercial fishing. There is little other commercial activity in the area consisting of a few marinas and retail stores. Recreational fishing is important, as a source of local revenue from associated activities (e.g., fuel, food, ice, bait, marina fees, etc.) but less economically significant. Ship building and fabrication, which heavily relies on and follows oil and gas extraction activity, also is located in the parishes. However, this activity is distant from the area of the preferred alternative.

The Bayou Pointe au Chien Watershed Implementation Plan identified only two point source discharges to the bayou, the Pointe au Chien School and a convenience store, H's Corner Stop (LDEQ, 2008). Either of these point sources are potential nonpoint sources. However, the major contributor to nonpoint pollution to the bayou is from agricultural runoff from above stream sources. Its key impact is nutrient enrichment leading to low dissolved oxygen (DO), which has led to the bayou's impairment in fish and wildlife propagation.

The current and foreseeable activities in the area indicate a static or slow decrease in oil and gas extraction and in commercial/recreational fishing. Based on these static or declining activities, their projected impacts will range from no adverse impacts to a decrease in adverse impacts. The preferred alternative will not result in any interactions with oil and gas extraction activities or commercial/recreational fishing activities that would result in any expected cumulative impact.

### **Oil and Gas Extraction**

According to a local business development group promoting Lafourche and Terrebonne Parishes, the oil and gas extraction industry employs 5,400 in the two parishes. These workers have an average annual wage of \$81,402 and the industry contributes \$24 million annually in local property taxes (Grow Louisiana Coalition, 2018). There are seventeen active operators in Terrebonne Parish and nineteen active operators in Lafourche Parish (Drilling Edge, 2018). The wells in Terrebonne Parish are all located well away from the area of the preferred alternative, west of Houma. The closest wells in Lafourche Parish are in Catfish Lake, near Golden Meadow, and also are not located close to the area of the preferred alternative.

*Table 5. 2018 Oil and Gas Production in Terrebonne and Lafourche Parishes*

<b>Operator</b>	<b>Oil Prod (bbl)</b>	<b>Gas Prod (MCF)</b>	<b>Active Leases</b>	<b>Active Wells</b>
<b>Terrebonne Parish</b>				
Alta Mesa Services, LP	63,696	268,331	23	14
Brammer Engineering, Inc.	9,086	34,037	15	16
Castex Energy, Inc.	7,015	123,077	11	14
Cel Properties LLC	1,364	4,576	2	1
Desco Oil Company	6,441	0	2	0
Dimension Energy Co., L.L.C.	38,285	64,867	17	49
Energy Properties Inc.	10	18,022	1	0
Evangeline Natural Resources, LLC	1,145	4,340	2	5

<b>Operator</b>	<b>Oil Prod (bbl)</b>	<b>Gas Prod (MCF)</b>	<b>Active Leases</b>	<b>Active Wells</b>
Helis Oil & Gas Company, LLC	98,552	52,689	29	95
Hilcorp Energy Company	521,374	3,686,352	284	537
Mannon L. Walters, Inc.	1,799	3,138	2	2
Rockleigh K. Thurman	182	14,443	2	2
S2 Energy Operating LLC	27,526	752,116	17	109
Square Mile Energy, L.L.C.	34,782	560,915	6	9
Talos Energy Offshore LLC	16,242	22,692	6	6
Texas Petroleum Investment Company	422,085	1,707,536	205	964
Walter Oil & Gas Corporation	5,265	63,463	4	3
TOTAL Terrebonne Parish			628	1826
<b>Lafourche Parish</b>				
Badger Energy LLC	16,516	14,151	4	3
Castex Energy, Inc.	7,015	123,077	11	14
Chevron U.S.A. Inc.	83,453	33,608	35	24
Energy Xxi Gom, LLC	9,501	9,351	6	6
Glassell Producing Company, Inc.	7,787	0	1	1
Henderson Pet Corp Of Delaware	2,361	6,354	1	1
Hilcorp Energy Company	521,374	3,686,352	284	537
Llox, L.L.C.	46,621	192,456	9	12
Louisiana Delta Oil Co, LLC	6,060	7,757	4	3
Mesa Gulf Coast LLC	4,896	37,612	12	16
Proven Fuel Exploration, Inc.	901	24,922	2	2
Samson Contour Energy E&P, LLC	2,033	153,860	24	3
Shoreline Southeast LLC	41,819	158,285	32	12
South River Operating, LLC	5,376	0	1	0
Square Mile Energy, L.L.C.	34,782	560,915	6	9
Tana Exploration Company LLC	61,103	184,778	41	39
Texaco, Inc.	1,124	25,381	1	0
Texas Petroleum Investment Company	422,085	1,707,536	205	964
White Oak Operating Co, LLC	20,573	318,907	34	50
TOTAL Lafourche Parish			713	1696

Historically, oil and gas production in the area has consistently decreased. From a 1978 high of 22 million bbl of oil and 446 MCF of gas, Terrebonne Parish produced 2.6 million bbl of oil and 19 MCF of gas in 2017. Lafourche Parish was very similar: from 24 million bbl of oil and 210 MCF of gas in 1978 to 3.7 million bbl of oil and 15 MCF of gas in 2017.

Louisiana State University prepared a 2018-2019 economic outlook for the state in 2017 (Scott and Collins, 2017). The forecast is based on data for the Houma Metropolitan Statistical Area (MSA), which is composed of Terrebonne and Lafourche Parishes. Scott and Collins forecast for the Houma MSA called for another year of decline of 1,800 jobs (2.1%) in 2018, a much slower rate than recently experienced, followed by the beginnings of a recovery in 2019 with an increase of 700 jobs (0.7%). Shipbuilding and fabrication have been depressed recently and will continue in 2018, resulting in a projected further loss of

1,800 jobs. Higher sustained oil prices and a significant new LNG facility at Port Fourchon are projected to provide modest (700 jobs) growth in 2019.

There is great volatility in the economics of oil and gas extraction, the source of which is global in scope. However, for the area potentially affected by the preferred alternative, the future activity, and the environmental impact of oil and gas extraction, appears to be stable or in a continued slow decline. Based on this projected impact, the preferred alternative will not result in any interaction with oil and gas extraction activities that would result in any expected cumulative impact.

### **Commercial and Recreational Fishing**

Commercial and recreational fishing activity is less volatile than oil and gas extraction but is annually variable (see Table 6). The data indicate commercial fishing is stable with annual variability of +/- 30% or is in a slow (<5%) decline from 2009 to 2016 (NMFS, 2010, 2011; 2012; 2013; 2014; 2015; 2016).

*Table 6. Commercial and Recreational Fishing Data*

Year				
2009	1.2	328	28.5	16.4
2010	1.0	248	25.3	13.8
2011	1.5	339	36.3	17.7
2012	1.2	328	28.8	15.3
2013	1.1	402	32.9	16.5
2014	0.9	449	--	6.7
2015	1.1	340	--	7.7
2016	1.2	407	--	8.2
-- No weight data collected for Louisiana				

For recreational fishing, the landings data indicate no trend in the weight of fish caught over the limited, 5-year span from 2009 to 2013 (NMFS, 2010, 2011; 2012; 2013; 2014; 2015; 2016). There also was no clear trend over this period for the number of fish caught. However, there is a substantial (49-58%) decrease in the number of fish caught from 2014 to 2016 compared to the 2009-2013 average number of fish caught. Unfortunately, there are no weight data for these years, so drawing any conclusion about trend is tenuous. The projected trend in recreational fishing appeared to be stable until 2014 but was followed by a reduction of 60% in numbers of fish caught compared to 2013. Over the brief period of 2014 to 2015, a steady growth in numbers of fish caught has occurred, although 2016 was still only half of that caught over the 2009-2013 period.

In reviewing the cumulative impacts of the preferred alternative, the activities that would contribute to environmental stresses in the area of the preferred alternative all have projected growth that is comparable to current activity or will show a slow decline. Therefore, any potential impacts of the preferred alternative will not cause any additional

adverse environmental consequences when considered in addition to the impacts of either ongoing or reasonably foreseeable activities.

## 5.0 CONCLUSION

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After a thorough evaluation of the preferred alternative and Alternative 1 (No Action Alternative), as presented in this EA, OCM concludes that the preferred alternative will not have significant environmental effects. The preferred alternative would result in funding the bagged cultch to stabilize shoreline habitat and protect the tribal earth mounds from further erosion. The project also will increase oyster reef habitat that will benefit ecologically and economically important fish and crab species. Finally, it may increase the resiliency of the tidal marsh to the impacts of sea level rise and climate change predictions for more intense storms. If no action is taken OCM will not provide funding to PACIT to help protect the shoreline from continuing to erode, which could expose the tribal earth mounds to additional tidal and storm surge and permanently damage or eliminate this tribe's sacred area.

## **6.0 COMPLIANCE WITH OTHER ENVIRONMENTAL AND ADMINISTRATIVE REVIEW REQUIREMENTS**

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### **6.1 *Clean Air Act***

The Clean Air Act (42 U.S.C. §§ 7401 *et seq.*) directs the EPA to set limits on air emissions to ensure basic protection of health and the environment. The fundamental goal is the nationwide attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). Primary NAAQS are designed to protect human health. Secondary NAAQS are designed to protect the public welfare (for example, to prevent damage to soils, crops, vegetation, water, visibility, and property).

*Compliance:* The project will not significantly increase emissions that impact air quality. All vehicles and machinery that emit any air pollution are expected to be operated by the staff and others in compliance with all applicable federal, state, and local air quality rules and associated requirements.

### **6.2 *Clean Water Act***

The Clean Water Act (CWA; 33 U.S.C. §§ 1251 *et seq.*) is the principal law governing pollution control and water quality of the Nation's waterways. Section 404 of the CWA authorizes a permit program for the beneficial uses of dredged or fill material in navigable waters. The USACE administers the program. As a condition of wetlands permits issued under Section 404, the USACE also requires compliance with Section 401 of the CWA, which requires applicants for federal licenses or permits to conduct activities that may result in a discharge of pollution into the waters of the United States to obtain a certification, of compliance with applicable water quality standards and goals, from the appropriate state (or a waiver from the state).

*Compliance:* The project partners will have secured all necessary permits for this project, in accordance with CWA requirements.

INSERT New Law – CZMA

### **6.3 *Department of Commerce Requirements for Grants and Cooperative Agreements***

The Department of Commerce published, in the *Federal Register*, on December 30, 2014, (at 79 *Federal Register* 78390) updates to and a compilation of the Department of Commerce pre-award requirements and standard terms and conditions for grants and cooperative agreements awarded by the Department. These cover the laws, regulations, administrative requirements, and federal and Department of Commerce policies and procedures for financial assistance awards.



*Compliance:* Special Award Conditions on the financial assistance award that would fund the proposed project require compliance with these pre-award requirements. The proposed project is in compliance with the Department of Commerce Requirements for Grants and Cooperative Agreements.

## **6.4 Endangered Species Act**

The Endangered Species Act (16 U.S.C. §§ 1531 *et seq.*; 50 C.F.R. parts 17, 222, and 224) directs all federal agencies to conserve endangered and threatened species and their habitats and encourages such agencies to utilize their authority to further these purposes. Under the Act, NOAA's National Marine Fisheries Service and USFWS publish lists of endangered and threatened species and their critical habitat. Section 7 of the Act requires that federal agencies consult with these two agencies to minimize the effects of federal actions on endangered and threatened species.

*Compliance:* NOAA's OCM requested lists of species and habitats with special status under the ESA from NMFS and USFWS. Chapter 3 lists the species and habitats that the services identified as having the potential to occur within the proposed area of the project. OCM consulted with the services in regards to the West Indian Manatee, and USFWS concurred with the determination of "not likely to adversely affect" the species.

## **6.5 Executive Order 12898- Environmental Justice**

To be consistent with Executive Order 12898 (February 11, 1994), Executive Order 12948 (Amendment to Executive Order 12898, Jan. 30, 1995), and the Department of Commerce's Environmental Justice Strategy, applicants must ensure that their projects will have no disproportionately high and adverse human health or environmental effects on minority or low-income populations.

*Compliance:* The project action complies with the Environmental Justice, Executive Order 12948. As noted, in Chapter 4 the population, does not contain a significant low income and minority populations. The project does not negatively impact any minority or low-income populations.

## **6.6 Executive Order 11990 – Protection of Wetlands and Executive Order 11988 – Floodplain Management**

Executive Order 11990 (May 24, 1977) requires federal agencies to avoid the adverse impacts associated with the destruction or loss of wetlands, to avoid new construction in wetlands if alternatives exist, and to develop mitigation measures if adverse impacts are unavoidable. Executive Order 11988 (May 24, 1977) requires federal agencies to avoid, to the extent possible, long and short-term adverse impacts associated with the occupancy and modification of floodplains

*Compliance:* The preferred alternative complies with Executive Order 11990. The project action is not located in delineated wetlands or floodplains (or other areas where the new federal flood risk management standard applies); and (2) would involve the construction of

buildings, altering wetlands and waterbodies, and/or long-term ecosystem changes. These executive orders would not apply to the preferred alternative.

### ***6.7 Executive Order 13112 – Invasive Species***

The purpose of Executive Order 13112 (Feb. 8, 1999) is to prevent the introduction of invasive species, respond to and control invasions in a cost-effective and environmentally sound manner, and to provide for restoration of native species and habitat conditions in ecosystems that have been invaded.

*Compliance:* The project action complies with Executive Order 13112. The project action is not introducing non-native species to the ecosystem and with not introduce non-native species, there will be no harm or environmental harm to human health.

### ***6.8 Executive Order 13158 – Marine Protected Areas (MPAs)***

Executive Order 13158 (May 26, 2000) requires federal agencies to identify actions that affect natural or cultural resources that are within MPAs. It further requires federal agencies, in taking such actions, to avoid harm to the natural and cultural resources that are protected by MPAs.

*Compliance:* The project action complies with Executive Order 13158. The project area is not in or near an identified MPA.

### ***6.9 Magnuson-Stevens Fishery Conservation and Management Act***

The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§ 1801 *et seq.*) as amended and reauthorized by the Sustainable Fisheries Act (Public Law 104-297), established a program to promote the protection of essential fish habitat in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. After essential fish habitat has been described and identified in fishery management plans by regional fishery management councils, federal agencies are obligated to consult with the National Marine Fisheries Service with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat.

*Compliance:* There are no essential fish habitats located in the project area as determined on August 16, 2018. At the present time, there is insufficient specific information available about future in-water activities to assess if the project area will be identified as an EFH.

### ***6.10 Marine Mammal Protection Act***

The Marine Mammal Protection Act (16 U.S.C. §§ 1361 *et seq.*), as amended, prohibits the take of marine mammals in U.S. waters and by U.S. citizens on the high seas, as well as the importation of marine mammals and marine mammal products into the U.S. The primary management objective of the Act is to maintain the health and stability of the marine ecosystem, with a goal of obtaining an optimum sustainable population of marine mammals within the carrying capacity of the habitat. The Marine Mammal Protection Act is

intended to work in concert with the provisions of ESA. There are some exceptions to the prohibitions on taking marine mammals, including a mechanism for requesting authorization from the NMFS Office of Protected Resources for “incidental,” but not intentional, taking, of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing or directed research on marine mammals) within a specified geographic region. Regulations adopted under the Marine Mammal Protection Act restrict harassment (meaning any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal in the wild by causing disruption of behavioral patterns, including breathing, breeding, feeding, migration, and sheltering).

*Compliance:* Components of the oyster reef project with the potential to impact West Indian manatee include equipment, boat traffic, noise and the materials used (see Section 4.8). It is possible that this federally-listed species may be affected, but it is not likely to be adversely affected by the project. The project action will include monitoring for protected species before, during, and/or after project implementation. Such monitoring would be used to reduce the potential for adverse impacts from the project activities on marine mammals. Other mitigation measures also will be considered, if needed, such as time restrictions for projects or boating speed restrictions.

### ***6.11 Migratory Bird Treaty Act***

The Migratory Bird Treaty Act (16 U.S.C. §§ 715 *et seq.*) provides for the protection of migratory birds. For example, it regulates capturing or killing migratory birds, their import and export, scientific collection, and possession for educational purposes. The Act does not specifically protect migratory bird habitat, but USFWS may suggest consideration of time of year restrictions for construction or remedial activities at sites where it is likely migratory birds may be nesting or project schedules that would avoid the nesting seasons of migratory birds.

*Compliance:* The project action does not require consultation under the Migratory Bird Treaty Act. The volunteer staff would need to comply with the act by avoiding the production of a stressor/impact to birds altogether. OCM has contacted the USFWS in accordance with its obligation to consult the services under the ESA to ensure no effect to Migratory Birds.

### ***6.12 National Historic Preservation Act***

The purpose of the National Historic Preservation Act (NHPA) (54 U.S.C. §§ 300101 *et seq.*) is to provide for the preservation of historic properties, including sites, buildings, objects, and antiquities of national significance. Section 106 of the NHPA requires Federal agencies to take into account the effects on historic properties of projects they carry out, approve, or fund.

*Compliance:* Pursuant to Section 106 of the NHPA, NOAA’s OCM contacted more than 10 Native American Tribes (see Appendix C) on August 14, 2017, to: (1) gain assistance with identifying properties within the area of potential effects that might be eligible for listing on the National Register of Historic Places; (2) request information related to the significance any such organizations attach to the areas potentially affected by the preferred

alternative; (3) invite Native American Tribes to advise NOAA if they would like to participate in the NHPA consultation process as a consulting party; and (4) identify any additional Native Hawaiian Organizations to involve in the process. OCM received three responses from federally-recognized tribes to its letter. Two were non-substantive responses. The Seminole Nation of Oklahoma provided a written response requesting that they be contacted should there be inadvertent discovery of any archaeological or cultural resources.

OCM also received written communication from the Pointe Au Chien Indian Tribe, reiterating their support for the project. The PACIT are one of the project partners and has been actively engaged in project development and has provided logistical support to the larger project team.

Additionally, OCM completed the Section 106 consultation process with the LA State Historic Preservation Office, and received written concurrence that there are no known historic properties that would be affected by this project and therefore had no objection.

### ***6.13 National Marine Sanctuaries Act***

Under the National Marine Sanctuaries Act (16 U.S.C. §§ 1431 *et seq.*), federal agency actions, internal or external to a national marine sanctuary, including private activities authorized by licenses, leases, or permits, that are likely to destroy, cause the loss of, or injure any sanctuary resource are subject to consultation with the Secretary of Commerce. 16 U.S.C. § 1434(d). Each federal agency proposing such an action must provide a written statement describing the action and its potential effects on sanctuary resources no later than 45 days before the final approval of the action. In addition, sanctuary permits may be required for certain actions that would otherwise be prohibited.

*Compliance:* The project action is not located within any National Marine Sanctuaries. The proposed project is not likely to destroy, cause the loss of, or injure any National Marine Sanctuary resources.

### ***6.14 Rivers and Harbors Act***

The Rivers and Harbors Act of 1899 (33 U.S.C. §§ 401 *et seq.*) regulates development and use of the nation's navigable waterways. Section 10 of the Act prohibits unauthorized obstruction or alteration of navigable waters and vests the U.S. Army Corp of Engineers with authority to regulate discharges of fill and other materials into such waters.

*Compliance:* The project is in compliance with the Rivers and Harbors Act of 1899. The project partners will have secured all necessary permits for this project, and all work will be done in compliance with all conditions.

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## **Appendix A**

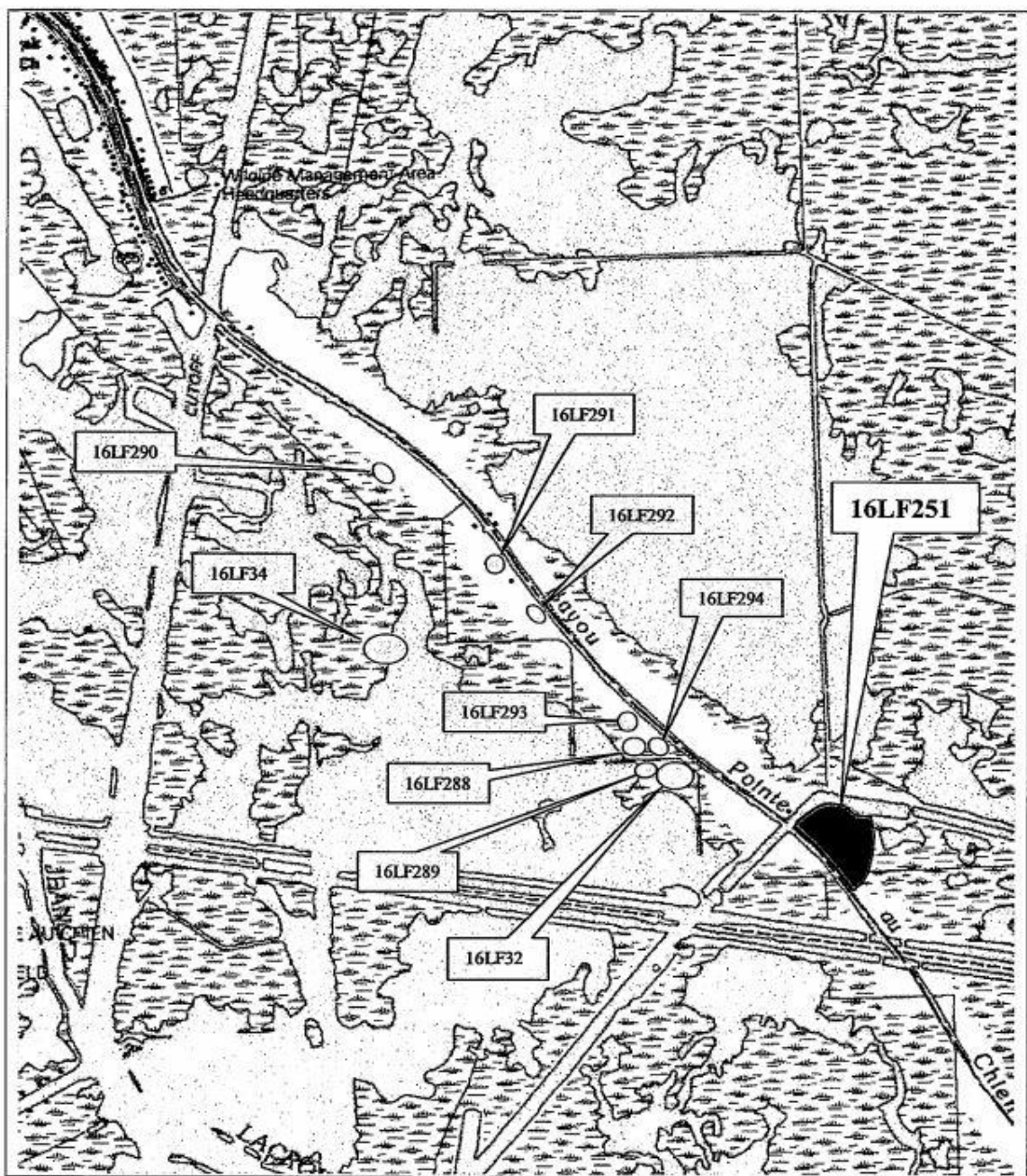
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### **Tribal Information**



Aerial Date 11/2014





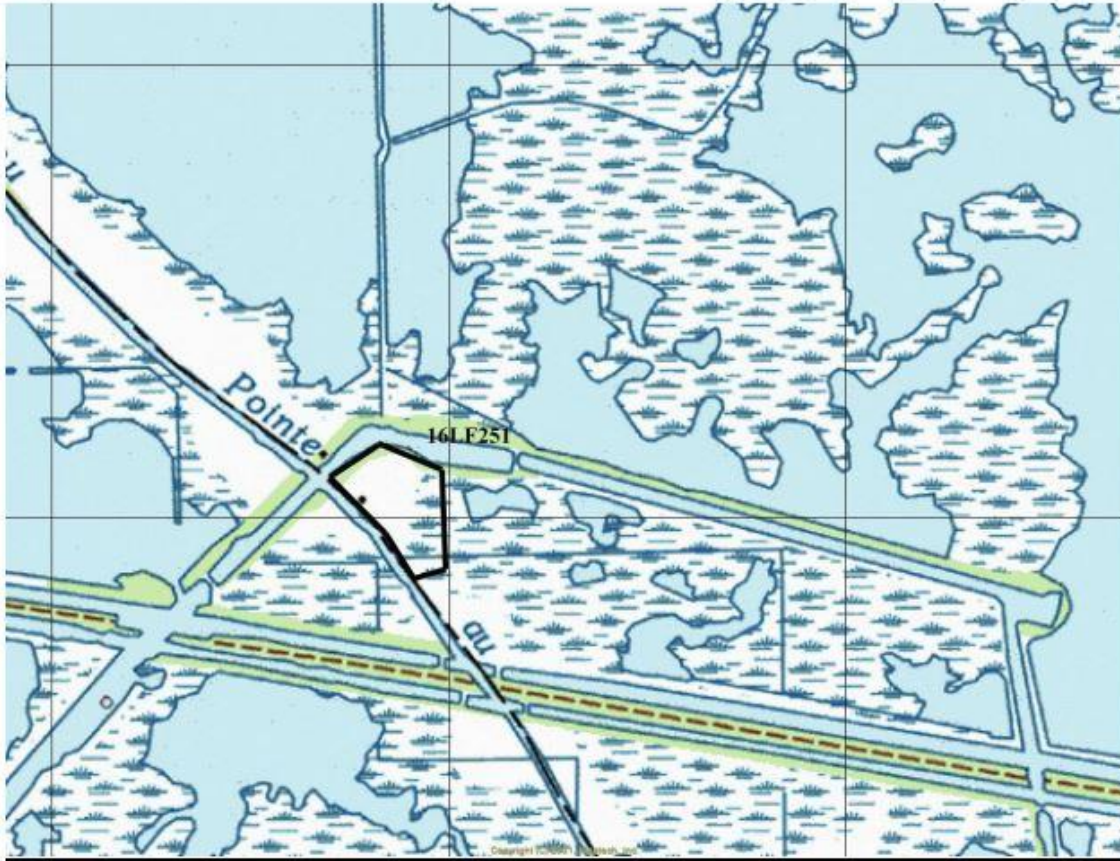
0 0.3 0.6 0.9 1.2 1.5 km

0 0.1 0.2 0.3 0.4 0.5 mi

UTM 15 29.4004N, 90.4260 (NAD83)  
 USGS Lake Bully Camp (LA) Quadrangle  
 Projection is UTM Zone 15 NAD83 Datum

M=0.651  
 G=1.26

USGS 7.5' Quadrangle Map of Site Area





## Appendix B

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### Oral Histories

#### Pointe-au-Chien Indian Tribe Submission for NOAA Environmental Assessment

The grouping of several mounds forms a single site, both in archaeological assessment by the State of Louisiana and in community knowledge.<sup>1</sup> The mound complex has been referred to as 16LF251 and 16TR32, and has been described as Coles Creek/Plaquemine/Mississippian period mounds.<sup>2</sup> Although there are several mound complexes in lower Terrebonne and Lafourche Parishes, this is the largest mound complex in the lower Pointe-au-Chien region of the Tribe's aboriginal territory. The mound complex serves several community functions for the Pointe-au-Chien Indian Tribe: as a sacred site, a burial site, village site, a marker of community resilience, and an important resource for traditional ecological knowledge (TEK), including the growth of medicinal plants.

This site was connected to the larger PACIT community and only became separated once extractive industries started to cut canals through the land. Tribal elders remember walking all the way to en bas le Pointe, where the sugar mill was located (16LF47).

#### *Background of Community*

PACIT is a modern subsistence community comprised of 750 tribal members. The Pointe-au-Chien are primarily Chitimacha, but also have Biloxi, Acolapissa and Attakapas ancestry. The Pointe-au-Chien people and their ancestors have historically occupied the aboriginal territory along Bayou Pointe-au-Chien to the Gulf of Mexico. The Pointe-au-Chien community has maintained its Indian identity by continuing subsistence lifeways in a once-isolated area that is no longer so isolated. This identity is derived from a long history of independence and the ability to provide for themselves. The PACIT community's subsistence activities included, fishing, shrimping crabbing, trapping, planting crops, cattle grazing and hunting. This subsistence economy includes the view of common property, the continued use of traditional ecological knowledge and the subsistence ethic of only harvesting what is needed. Today, the majority of PACIT households depend on commercial and subsistence fishing for their livelihood. Some community members have transferred their maritime skills to the oil industry and continue to work on the water as oil workers and as fishermen. The predominance of water-related employment is the modern manifestation of Pointe-au-Chien's coastal subsistence heritage.

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<sup>1</sup> Jake Billiot Dep. 39, June 16, 1995, *Louisiana Land & Exploration Co. v. Verdin*, 681 So. 2d 63 (La. Ct. App. 1996). The site description in the Site Update Form for 16LF251 provides the following for cultural features: "5 or possibly 6 platform mounds; as many as 8 reported by local informants."

<sup>2</sup> Hays, Christopher, 1996 Annual Report for Management Units IV and V Regional Archaeology Program, Museum of Natural Science, Louisiana State University, 47, 55 (1996).

### *Sacred Site*

The mounds are well over 100 years old.<sup>3</sup> Community members often refer to this site as being “Indian mounds.”<sup>4</sup> It served as a ceremonial site and is still considered sacred.<sup>5</sup> The mounds also served the practical function as an elevated place to which the community could retreat during Mississippi River flooding.<sup>6</sup>

“People from Pointe-au-Chien voiced their concerns over losing their ancestral ceremonial mounds if nothing was done to protect what land was left, which holds with it part of their history.” Tribal member Theresa Dardar said, “That’s our ancestors...I feel [the mound is] part of us, part of our people.” The cemeteries were also in danger of washing away. “People talked about going to the cemetery to visit their family members who had passed away and feeling a sense of peace and comfort when talking to them, but now the cemeteries were at risk of being lost.”<sup>7</sup>

### *Burial Site*

Traditional burials took place on the mounds.<sup>8</sup> The community calls one mound within the complex “Oban’s Cemetery” or “Oban’s mound.”<sup>9</sup> The mound is located on land traditionally occupied by Oban Billiot, and his descendants including the Verdins, near Sidney Verdin’s green camp.<sup>10</sup> The community utilized Oban’s Cemetery as the final resting place for many victims of a deadly hurricane in the early 1900s, which caused over 100 fatalities.<sup>11</sup> More recent burials have also occurred within living memory, as community members can recall attending funerals at the mound.<sup>12</sup> The last person buried in the Oban Cemetery was in 1949.<sup>13</sup> Some of the graves are marked with crosses.<sup>14</sup>

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<sup>3</sup> Sidney Verdin Answers to Interrogs, *Louisiana Land & Exploration Co. v. Verdin*, 681 So. 2d 63 (La. Ct. App. 1996).

<sup>4</sup> Interview of Charles “Chuckie” Verdin, Sr. 14, March 27, 2006; Oral History of Marie Jeanne Naquin Billiot at 11, July 13, 1999.

<sup>5</sup> Interview of Charles “Chuckie” Verdin, Sr. at 14.

<sup>6</sup> *Id.*

<sup>7</sup> Maldonado, Julie Koppel, *Facing the Rising Tide: Co-Occurring Disasters, Displacement, and Adaptation in Coastal Louisiana’s Tribal Communities* at 170, Ph.D. Dissertation in Anthropology from American University, Washington, D.C., 2014.

<sup>8</sup> Oral History of Samuel Dardar and Nazia Naquin Dardar at 76, July 14, 1999.

<sup>9</sup> Oral History of Charles “Chuckie” Verdin, Sr. at 9, 13; Interview of Samuel Dardar and Nazia Naquin Dardar at 75-77; Oral History of Marcelite Billiot Naquin at 15-16, July 13, 1999.

<sup>10</sup> Oral History of Marcelite Billiot Naquin at 16; Sidney Verdin Answers to Interrogs; Deposition of Wickliff Verdin at 16-17, June 16, 1995, *Louisiana Land & Exploration Co. v. Verdin*, 681 So. 2d 63 (La. Ct. App. 1996).

<sup>11</sup> Oral History of Jeanne Naquin Billiot at 3, 6, July 13, 1999.

<sup>12</sup> Wickliff Verdin Dep. at 16-17; Oral History of Samuel Dardar and Nazia Naquin Dardar at 75-77, 79; Oral History of Jeffery Verdin at 47-48, August 7, 2006.

<sup>13</sup> Jake Billiot Dep. at 39.

<sup>14</sup> Interview of Charles “Chuckie” Verdin, Sr. at 14, March 27, 2006.

### *Village Site*

Tribal Members once lived and continue to hunt and fish in mound complex area. Wickliff Verdin was born and grew up in the location of the Oban Mound.<sup>15</sup> Sidney Verdin had a camp near the mound complex.<sup>16</sup> Oban and Rosa Billiot lived in a palmetto camp near the Oban Mound,<sup>17</sup> and their son Warren Billiot lived on the mound closest to Bayou Pointe-au-Chien.<sup>18</sup> The Tribe's ancestors-built camps on the mounds.<sup>19</sup> Mound F, the mound that is washing away, has recently been used as a fishing camp by tribal members.<sup>20</sup>

The mound complex has live oaks from which to harvest Spanish moss for sale (at \$.02 per pound) and for stuffing in children's toys and dolls, chimneys, mattresses, and pillows.<sup>21</sup> Prickly pear cactus, citrus trees, and thickets of yucca were available for consumption among numerous plants used for medicinal purposes.<sup>22</sup>

### *Community Marker*

Community members consistently monitor the mound site and have consistently worked to exclude outsiders. The responsibility of watching the mound site is shared by the community as a whole, and community members often stop by the area to check on it.<sup>23</sup> Gillis Verdin and Wickliff Verdin routinely chased intruders from outside communities, for example hunters and fishers, who would cross the dam and come into the area.<sup>24</sup> However, the most momentous occasion of exclusion occurred in the when an oil company attempted to carry out a plan to cut through the Oban cemetery on the mound complex.<sup>25</sup> A group of community members, including several members of the Verdin family, armed themselves and successfully deterred company incursion on the site.<sup>26</sup> Tribal members stopped the cemetery from being cut up about 50 feet from the cemetery.<sup>27</sup> This location is an important marker of "community history and identity as a[] milestone of standing up to outsiders in

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<sup>15</sup> Wickliff Verdin Dep. at 16-17.

<sup>16</sup> Oral History of Marcelite Billiot Naquin at 15-16.

<sup>17</sup> Oral History of Jeanne Naquin Billiot at 29; Oral History Of Samuel Dardar and Nazia Naquin Dardar at 75-77; Oral History of Ellis Billiot at 3-4, July 14, 1999.

<sup>18</sup> Oral History of Ellis Billiot at 3-4. This is referred to as Mound C in the Site Update Form for 16LF251 recorded on February 4, 2016.

<sup>19</sup> Oral History of Marcelite Billiot Naquin at 60-61.

<sup>20</sup> 16LF251, Narrative Page, Feb. 4, 2016.

<sup>21</sup> Oral History of Ecton Billiot at 5-7, September 30, 2007; Oral History of Jeffery Verdin at 51-53; Ethnobotany Interview of Marcelite Billiot; Oral History of Jeanne Naquin Billiot at 5-6; Oral History of Father Roch Naquin at 19, July 5, 2007; Oral History of Wickliff Verdin at 46-49.

<sup>22</sup> State of Louisiana Site Record form for Site 16TR32.

<sup>23</sup> Interview of Charles "Chuckie" Verdin, Sr. 15.

<sup>24</sup> Wickliff Verdin Dep. at 18; Oral History of Charles "Chuckie" Verdin, Sr., at 13, June 4, 2007.

<sup>25</sup> Oral History of Charles "Chuckie" Verdin, Sr. at 9-10, June 4, 2007.

<sup>26</sup> Id.; Oral History of Gary Verdin at 5, March 5, 2005.

<sup>27</sup> Oral History of Gary Verdin at 5.

defense of community integrity and survival.”<sup>28</sup> Tribal members also visited the site after an important meeting in the 1990s regarding tribal self-determination.<sup>29</sup>

### *Traditional Ecological Knowledge*

Tribal members continue to share traditional ecological knowledge with its younger members and has served as a means of adapting to changes with the resources. Every year, the Tribe hosts a Culture Camp for youth, focused on learning the history and traditions of the Tribe. As part of the camp, tribal youth visit the mounds and pick up debris on them, when the weather and sandflies permit.

The Tribe has a rich history of using local plant resources for a variety of functions, including healing.<sup>30</sup> Traiteurs provided medical services to the community using natural resources.<sup>31</sup> Local plants were used to treat such diverse complaints as worms, prostate, chest pain, shingles, croup, asthma, and concerns during pregnancy.<sup>32</sup> Older members of the community continue to use natural remedies based on plants in PACIT.<sup>33</sup> Community members also lived a subsistence lifestyle that relied heavily on the local ecosystem for food and building materials.<sup>34</sup>

These natural resources have been under threat due to flooding, erosion, and salinity.<sup>35</sup> Much of the plant use knowledge and culture has declined over the past several decades.<sup>36</sup> Nonetheless, community members are committed to maintaining and restoring this knowledge.<sup>37</sup>

The mound that is the site for the proposed oyster bed project hosts several valuable plant species.<sup>38</sup> A field visit on March 18, 2017, documented the presence of several significant plant species – *citrus aurantium*, *smilax bona-nox*, and *vicia sp.*<sup>39</sup> *Citrus aurantium* – colloquially known as Bois des Oranges Augrir, Sour Orange, and Bitter Orange – is a food

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<sup>28</sup> HDR, Traditional Cultural Properties Inventory DWH – MC-252 Incident Response at 62, Draft Final Report February 2013.

<sup>29</sup> Oral History of Charles “Chuckie” Verdin at 9.

<sup>30</sup> See, e.g., Oral History of Miguel Verdin 44, April 1, 2006; Oral History of Earline Billiot Verdin 22, April 24, 2007 (on file with author); Liz Katchko, 6, Changing Landscapes: Impacts of Environmental Change on Knowledge and Use of Medicinal and Edible Wild Plants in the Communities of Point au Chien and Isle de Jean Charles in Southern Louisiana (2013).

<sup>31</sup> Oral History of Earline Billiot Verdin at 22; Katchko at 6.

<sup>32</sup> Oral History of Earline Billiot Verdin at 22-24.

<sup>33</sup> *Id.* at 22; Katchko at 6, 17.

<sup>34</sup> Katchko at 12; see generally Robert Gramling et. al, Subsistence Use and Value: The Sharing, Distribution and Exchange of Wetland Resources among Households in Coastal Communities, University of Louisiana at Lafayette (2007).

<sup>35</sup> Katchko at 1.

<sup>36</sup> Katchko at 23.

<sup>37</sup> Katchko at 11, 23.

<sup>38</sup> Tribal members refer to this mound as the mound that is washing away.

<sup>39</sup> Photographs from researcher Margaret K. Maurer, March 18, 2017 (attached).

source that can be sweetened with sugar to make lemonade.<sup>40</sup> The roots of the *smilax bona-nox*– colloquially known as Cantaque, Kanták, and Saw Greenbrier – also serve as a food source that can be first dried and then made into a flour.<sup>41</sup> The seeds of *vicia sp.* – colloquially known as rabbit grass or vetch – can be eaten and the grass itself is also used decoratively.<sup>42</sup> Therefore, the mound remains a site of not only spiritual and historical significance, but also a host site to threatened ecological resources that retain cultural significance.

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<sup>40</sup> Margaret K. Maurer, Native Knowledge Plants Database (2017).

<sup>41</sup> *Id.*

<sup>42</sup> Katchko at 8 (citing Donald Dardar).

## Appendix C

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### Consultations

*WILL BE INSERTED AFTER FINALIZED*

### Project Design and Logistics Narrative

# Pointe-au-Chien Cultural Heritage Protection Reef

## Project Design and Logistics Narrative

### *Reef Design*

#### *Project Location*

The *Pointe-au-Chien Cultural Heritage Protection Reef* will begin in Bayou Pointe-au-Chien, approximately 1.75 miles southeast of the Point-au-Chien Marina located at the confluence of bayou Pointe au Chien and the Cutoff Canal. The reef will follow the Bayou northwest until turning east at the intersection with an east-west manmade canal. Bayou Pointe-au-Chien divides Terrebonne and Lafourche Parishes, and the proposed reef would be situated along the Bayou's east bank before continuing further east, thus, the entire structure will reside in Lafourche Parish. The proposed reef will be situated along the interface of two distinct mounds with the waters of the Bayou/canal.

#### *Dimensions*

The proposed reef will span approximately 394 linear feet. It will cover approximately 3,100 square feet and will consist of 5,262 cubic feet (195 cubic yards) of material. "Blind" placement of oyster shell bags (see descriptions below) will result in a natural angle of repose somewhere between a near vertical slope to 1 horizontal to 1 vertical side slope. A 1:1 side slope was used to conservatively calculate final shell quantity.

### *Materials*

#### *Oyster Shell*

The reef will consist of oyster shell, a resource found naturally within this area. The oyster shell will be sourced from New Orleans-area restaurants participating in CRCL's Oyster Shell Recycling Program. All shell will have been cured for at least six months to remove remaining organic material which provides a clean surface for larval settlement, reduces the risk of disease, and reduces the risk of fouling from algae (Bushek 2004). Oyster shell is preferable to rock for meeting the objectives of this project for three reasons: 1) the structure formed by many shells stacked together includes complex interstitial spacing, creating a durable, yet porous matrix that is more effective at dissipating current energy than more uniform structures; 2) the same volume of shell weighs less than rock, reducing the amount that the structure will sink into the bottom substrate; 3) oyster larvae prefer to settle onto cured oyster shell, so this material is more likely to recruit living oysters.

#### *Bags*

Volunteers have shoveled oyster shell into mesh bags to create the units of this living shoreline. The bags are an aquaculture-grade, diamond-oriented, tubular nylon mesh. Each bag of shell has an approximate diameter of 9.5 inches and height of 20 inches, producing a volume of about 0.82 cubic



feet each. The use of aquaculture-grade nylon mesh bags may be a potential concern. We will discard any ripped bags to avoid adding any loose plastic into the environment. The mesh openings are too small and stiff to cause entanglement, so in the unlikely event that any bag pieces fell into the water, this would not pose a hazard to any species of concern. Once spat set has occurred (within one month of deployment), natural oyster growth should hold the bagging material in place, as oysters secrete a calcium carbonate-based cement to attach to hard substrates.

### *Quantity*

We have a maximum of 218 cubic yards of shell bagged and ready for use (9,156 bags). It currently costs CRCL approximately \$9,620 to collect and transport each 50 tons of oyster shell. We plan to mobilize 200 tons of oyster shell for the *Pointe-au-Chien Cultural Heritage Protection Reef* project. CRCL is supplementing the expense for additional 150 tons with matching funds.

## ***Transport of Materials***

### *Wrapping*

The bagged shell has been stacked onto pallets at CRCL's staging site in Buras, LA. Each pallet holds 42 bags of shell and weighs approximately one ton. To secure the pallets for movement and transport, they will first need to each be wrapped in thin, stretchable plastic sheeting. CRCL will obtain materials and recruit volunteers to help prepare 200 pallets in Buras. Plastic sheeting will be removed upon delivery to the project site and disposed of in appropriate waste containers.

### *Forklift Operation*

A forklift will be required to maneuver the wrapped pallets onto trucks for transport. We have identified and priced a local forklift operator at Joshua's Marina in Buras. Based on an hourly rate of \$50, and the ability to move 40 pallets/hour, this will cost approximately \$200. A forklift operator will also be required at the Pointe-au-Chien Marina to unload all the pallets.

### *Trucking*

CRCL has determined that trucking by land will be more economically efficient than barge transport for the needed amount of shell. Each truckload can handle approximately 20 pallets and prices range from \$850 - \$1,497/load, plus additional hourly charges. Therefore, the trucking cost estimate for 200 pallets is \$10,000.

## ***Deployment***

### *Timing*

To optimize the probability of oyster recruitment onto the structure (i.e., spat set), deployment of the shell cultch material should occur between November and March, following peak oyster spawning periods (April – October).

### *Installation Technique*

Volunteers will use dolly carts to load bagged shell onto shallow draft boats from the pallets at the Pointe-au-Chien Marina. Approximately four boats will be provided voluntarily from the Point-au-Chien Indian Tribe and used for transporting oyster shell bags and volunteers to the deployment site. The tribe will be compensated \$700 for the use of each boat. The shoreline will be flagged to indicate volume targets for each of the 13 spans of shoreline indicated in the permit drawings. Volunteers (number per boat depends on boat size) will drop shell bags from the boat into the

water one at a time, as close to the shoreline as possible, thus stacking the bags using a random orientation (“blind”) placement technique. The flexibility of the bags will facilitate the contouring, and their weight will hold them in place.

### *Equipment & Potential Impacts*

Fishing and recreational boats already use Bayou Pointe-au-Chien and associated canals daily, so our presence will not differ from typical activities in the area. By using shallow draft boats (e.g., crew, oyster, pontoon, and/or similar boats) we will avoid impacting the environment during deployment. Other equipment used during installation will include probing poles (will not be used to move or puncture any objects, only to “feel” surfaces in murky water), safety gear for volunteers (life vests, etc.).

Unless presented with an emergency, no volunteers will be permitted to access the marshland or mounds along the shoreline. CRCL will access the shoreline only to mark the project area with flagging, under supervision of the Tribe. Therefore, we do not anticipate any potential impacts to the environment or cultural resources using the described deployment techniques.

### *Best Practices*

Species of environmental/management concern which may be present in the area include the Gulf Atlantic sturgeon (*Acipenser oxyrinchus desotoi*), Diamondback terrapin (*Malaclemys terrapin*), green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp’s ridley sea turtle (*Lepidochelys kempii*), loggerhead turtle (*Caretta caretta*), and West Indian manatee (*Trichechus manatus*).

- Gulf sturgeon populations generally occur east of the Mississippi River and during the winter they migrate to marine habitat, so they are unlikely to be present in this area at all, and especially not when we plan to deploy in November (St. Pierre and Parauka 2006; USFWS 2014).
- Diamondback terrapin could be present in these brackish waters. To reduce the risk of disturbing any terrapins, boat captains will observe all boating speed zone signs, travel at slow speeds. The armoring of this stretch of shoreline would not interfere with terrapin nesting as they use sandy dunes or scrub vegetation (not marsh) for nesting (Roosenburg 1994).
- Juvenile green, hawksbill, and Kemp’s ridley sea turtles will sometimes enter brackish waters to feed, however, this tends to occur during the warmer months, which our deployment timeframe will avoid (R. A. Valverde, *pers. comm.*).
- Manatees could potentially be present, although this would represent a very rare occurrence. To reduce the risk of disturbing or striking any terrapins or manatees, boat captains will observe all boating speed zone signs, travel at slow speeds, and give proper lookout to avoid any objects or “swirling” patterns that occur when manatees dive (USFWS 2007).

### *Volunteer Labor*

Volunteers will (1) help load oyster bags onto boats (unless boats can be positioned to receive pallets of shell directly off the trucks) and (2) stack the bags along the shoreline. CRCL will provide dollies, gloves, water, and lunches for volunteers. We estimate that one volunteer can handle/move approximately one cubic yard of shell in one hour. Thus, not counting travel time, fifteen (15) volunteers could accomplish moving the following:

**Table 1: Volunteer Labor Output Table**

Volunteer Number	Length (feet)	Volume (cubic yards)	Time (hours)
1	1.2	1	1
15	122	103	6.7
15	163	152	10.2
15	394	195	13.1

## Feasibility

### Shoreline Dynamics

The project replaces sections of eroding benthic mud with oyster shell, which will add areas for encrusting organism settlement, providing food and habitat for other organisms in the ecosystem such as fish, crabs, and shrimp. Thus, the project will develop into a living shoreline. The structure is designed to reduce the erosive effects of the current on the shoreline and reduce the rate that the canal is widening.

### Anticipated Performance

Life of the design is estimated to be perpetuity. The weight of the stacked shell bags will hold the shoreline protection structure in place. Oyster growth should keep pace with future sea-level rise and predicted future salinity regimes are favorable to oysters.

### Cost Estimate

**Table 2: Cost Estimate Table**

Item			
Oyster Shell	\$9,620	1	\$9,620
Wrapping	\$500	1	\$500
Forklift Operation	\$200	2	\$400
Trucking	\$1,000	10	\$10,000
Boats	\$700	4	\$2,800
TOTAL			\$23,320

## References

St. Pierre, R. & Parauka, F.M. (U.S. Fish & Wildlife Service). 2006. *Acipenser oxyrinchus* (errata version published in 2016). The IUCN Red List of Threatened Species 2006: e.T245A107249015. <http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T245A13046974.en>

Valverde, Roldán A. Scientific Director, Sea Turtle Conservancy. Professor of Biology, Southeastern Louisiana University. Apartado Postal 246-2050, San José, Costa Rica. Tel (CR) +506-8642-6312, Tel (USA) 985-549-3029.

USFWS. 2007. West Indian Manatee (*Trichechus manatus*). 5-Year Review: Summary and Evaluation. U.S. Fish & Wildlife Service, Southeast Region. Jacksonville, Florida and Boqueron, Puerto Rico. 79pp.

USFWS. 2014. Species profile for Atlantic sturgeon (Gulf subspecies) (*Acipenser oxyrinchus* (=oxyrhynchus) *desotoi*). U.S. Fish & Wildlife Service. ECOS: Environmental Conservation Online System. <https://ecos-beta.fws.gov/ecp0/profile/speciesProfile?sId=651>

## **Appendix E**

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### **Engineering Designs**

***INSERT***



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